

98th Indian Science Congress

January 3-7, 2011, Chennai

I

PRESIDENTIAL ADDRESS

President : Prof. U. C. Srivastava

PRESIDENTIAL ADDRESS

Neuronal Projections, Classes and Behaviour: A Futuristic Approach

Professor U. C. Srivastava*

At the outset, I welcome all of you to the deliberations of the Section: Animal, Veterinary and Fishery Sciences of the **98th session** of the **Indian Science Congress Association**, being held in this historic place of Chennai at **SRM University**, from January 3 to 7, 2010. I am delighted to have the honour of presiding the Section of Animal, Veterinary and Fishery Sciences; and feel privileged in addressing the galaxy of scientists from far and wide. In particular, I humbly express my reverence and gratitude to my teachers, mentors, research associates and the institutions, for inspiring me all along my professional career. Infact, it is nostalgic to recall the memories of my doctoral research under Prof. D. N. Vishnoi in the Department of Zoology, University of Allahabad, during which I, not only learned many histochemical techniques to investigate changes during transformation periods of insects, but also could produce interesting results, which were published in International journals¹⁻¹¹ giving me the opportunity to work as Post-Doctoral Fellow of Scuola Normale Superiore, Pisa, Italy, with Prof. O. Pompeiano, Director, Institute of Physiology, Pisa University, Pisa. The Post-Doctoral degree in advance studies of Neurophysiology was awarded with honours.

Classical experiments indicate that labyrinth and neck reflexes play an important role in the maintenance of posture¹². It is known that tilt about the longitudinal axis of the animal evokes vestibulospinal reflexes, whose function is to keep the head in horizontal position both by righting the head on the neck¹³ and by righting the body using the limbs. Experiments have shown that side-down tilt of the whole animal¹⁴ or side-down rotation of the head after neck differentiation¹⁵ produced contraction, whereas side-up displacement resulted in relaxation of forelimb extensors. The same pattern of EMG responses may also affect the hindlimb extensors during sinusoidal tilt. The changes in posture occurring during animal tilt depend upon stimulation of macular (utricle) receptors. Moreover the responses are apparently mediated by the lateral vestibular nucleus of Deiters (LVN),

*Department of Zoology, Allahabad University, Allahabad-211 002.

which exerts an excitatory influence on ipsilateral extensor motoneurons. It appears in particular that most of the LVN neurons recorded in decerebrate cats showed an increase in discharge rate during side-down tilt of the animal and a decrease during side-up tilt. These findings are in agreement with the responses to tilt of the majority of primary afferents from the utricle, which depend on the morphological polarization of the receptors¹⁶.

In addition to the labyrinthine input, afferent volleys originating from neck receptors play an important role in the control of posture. In fact side-down rotation of the neck (i.e. side-up rotation of body while the head remains stationary) produces relaxation of limb extensors, whereas side-up rotation of the neck results in opposite posture. The neck input may control the activity of forelimb motoneurons by utilizing propriospinal descending pathways. In fact neck reflexes are still present after high spinalization. Indeed a short latency pathway has been described from C2 ganglion to hindlimb motoneurons and monosynaptic EPSPs in propriospinal neurons terminating on forelimb motoneurons have been recorded following stimulation of C1, C2 and C3 ganglia¹⁷. The fact that afferent signals from neck receptors act on fore and hindlimb motoneurons by utilizing propriospinal pathways does not exclude that supraspinal structures, which in turn project to spinal cord, are involved in the cervical control of posture. The lateral vestibular nucleus of Deiters (LVN) is one of these structures, since most of the LVN units showed a decrease in discharge rate during side-up neck rotation¹⁸.

In addition to vestibulospinal neurons originating from the LVN, reticulospinal neurons may also contribute to the vestibular and cervical control of posture. Indeed, it has been speculated that reticulospinal neurons could be driven by the labyrinthine signals as well as by the neck signals. Moreover, there is evidence that interruption of the vestibulospinal pathways does not suppress the responses of the ipsilateral neck and forelimb extensors¹⁸ to vestibular stimulation.

It is clear that both vestibular and neck receptors may modify the activity of reticular neurons, thus having the potential of modifying the posture during the labyrinth and neck reflexes¹⁹. The main question was to investigate whether in addition to the excitatory vestibulospinal neurons, reticulospinal neurons originating from the inhibitory area of the medullary reticular formation contribute to the postural adjustments during these reflexes. The responses characteristics of presumably inhibitory reticulospinal neurons to selective stimulation of vestibular receptors; neck receptors, the degree of convergence of both the macular and neck inputs on the inhibitory reticulospinal neurons and the modalities of interaction of the two inputs elicited during costimulation of the corresponding receptors on

the same population of neurons; finally the relation between cell size and response characteristics of reticulospinal neurons to vestibular or neck receptors stimulation were the main questions to be answered.

The response characteristics of reticulospinal neurons identified antidromically and histologically located in the inhibitory area of the medullary reticular formation were studied in unanesthetized, decerebrate cats following independent sinusoidal stimulation of macular vestibular and neck receptors²⁰⁻³².

Reticulospinal neurons showing convergence of both macular and neck inputs were studied in detail to find out whether they exert an antagonistic influence on postural mechanisms involving the limb musculature during labyrinth and neck reflexes. In this a selective population of reticulospinal neurons originating from the inhibitory part of medulla and projecting to lumbosacral segment of the spinal cord has been recorded to study the possible correlation between their response characteristics to afferent (labyrinth and neck) inputs^{22,30} and cell size inferred from the conduction velocity of reticulospinal axons. If response characteristics are determined by neuronal properties related to cell size, then they should be invariant in spite of differences in input drive³¹. On the other hand, if response characteristics depend mainly on synaptic organization such as topography and density of synaptic contacts, then differential control of particular neuronal groups could be observed provided the relevant input system distributed to pooled neurons with different pattern.

These observations are related to the results in which the responses of vestibulospinal neurons originating from the lateral vestibular nucleus to sinusoidal tilt of the whole animal have been investigated^{19,20}. The observation that the predominant response pattern of the medullary reticulospinal neurons to roll tilt is just opposite to that of the lateral vestibulospinal neurons suggest that the former neurons are presumably inhibitory, in contrast to the vestibulospinal neurons, which are excitatory on ipsilateral extensor motoneurons. It is postulated, therefore, that during side-down tilt the motoneurons innervating ipsilateral limb extensors are excited by the increased discharge of vestibulospinal neurons but are disinhibited by the reduced discharge of reticulospinal neurons; the opposite would occur during side-up tilt. Reticulospinal neurons located in the inhibitory area of the medullary reticular formation may thus contribute, with excitatory vestibulospinal neurons, to the postural adjustments of hindlimb muscles during the labyrinth reflexes.

The response of presumably inhibitory reticulospinal neurons originating from the medial aspect of the medullary reticular formation, together with the response of lateral vestibulospinal neurons to neck input, may, therefore, contribute to the postural adjustments,

as well as to the modulation of the monosynaptic extensor reflexes that occur during the tonic neck reflexes. It is of interest that both reticulospinal as well as lateral vestibulospinal neurons, projecting to lower segments of the spinal cord, also send terminal branches to the cervical enlargements. The two systems could then be involved in the coordinated cervical control of both the fore- and hindlimb musculature³²⁻³⁸.

Independently upon the patterns of convergence of neck and macular vestibular inputs within the reticular structures, the responses of medullary reticulospinal neurons to head rotation leading to combined stimulation of both types of receptors closely corresponded to the values obtained by vectorial summation of the responses to the individual inputs. Similar results were also obtained from the lateral vestibular nucleus, the precerebellar lateral reticular nucleus, the Purkinje cell of the cerebellar vermis, the fatigial, interpositus and dentate nuclei and the anterior suprasylvian gyrus of the cerebral cortex. Our findings indicated that interaction of both macular and neck inputs fulfill the requirements of linear summation at the level of the presumably inhibitory reticulospinal neurons, as shown previously for the excitatory vestibulospinal neurons. This conclusion is obviously valid in the decerebrate preparation, but does not preclude an additional and more subtle operating mode of these inputs in the intact free-moving animal. Furthermore, the demonstration that in the frequency domain the gain, sensitivity and phase angle of the responses of individual reticulospinal and vestibulospinal neurons to either neck or macular labyrinth inputs may change offers new possibilities of extending our observations by studying the modalities of interaction between the two inputs for a wide range of stimulus parameters³⁸⁻⁴¹.

The activity of presumably inhibitory reticulospinal neurons with cell bodies located in the medial aspects of the medullary reticular formation and axons projecting to lumbosacral cord have been related to cell size inferred from the conduction velocity of the corresponding axons. No significant correlation was found between resting discharge and conduction velocity of the axons. Among the recorded reticulospinal neurons, 64/134 (i.e. 47.8%) units responded to roll tilt, while 66/110 (i.e. 60.0%) units responded to neck rotation (0.026 Hz, +10). A positive correlation was found between gain (imp./s/deg) of the labyrinth and neck responses and conduction velocity of the axon. Thus, due to absence of correlation between resting discharge and conduction velocity of the axons, larger neurons exhibited a greater percentage modulation (sensitivity) to the labyrinth and the neck input than smaller neurons. These findings are attributed to an overall increase in density of efficacy of the synaptic contacts made by the vestibular and neck afferent pathways on reticulospinal neurons of increasing size. Due to a parallel increase in gain of the reticulospinal neurons to both neck and labyrinth inputs, the relative effectiveness of the two inputs did not vary in different units as a function of cell size. The reticulospinal neurons were mainly excited

by the direction of animal orientation and / or neck displacement. In particular, most of these positional sensitive units were excited by side-up animal tilt (37/58, i.e. 63.8%) and by side-down neck rotation (47/60, i.e. 78.3%). These predominant response patterns were particularly found between large size neurons, whereas small size neurons tended to show also other response patterns. The evidence indicates that in addition to intrinsic neuronal properties related to cell size, the quantitative and qualitative organization of synaptic inputs represents the critical factor controlling the responsiveness of reticulospinal neurons to vestibular and neck stimulation⁴¹.

It worth to mention that reticulospinal neurons of comparable size recorded from the same or different experiments had sometimes different response gains to labyrinth and neck stimulation. This finding has been attributed to size-independent differences either in the intrinsic properties of the neurons themselves or in connectivity of the macular labyrinth and neck afferent pathways.

The contraction of limb extensor muscles during side-down roll tilt of the animal depends upon an increased discharge of excitatory vestibulospinal (VS) neurons (\ddot{U} -response) and a reduced discharge of inhibitory reticulospinal (RS) neurons of the medulla (\hat{a} -response), both acting on ipsilateral limb extensor motoneurons. In the decerebrate cat, a modulation of the multiunit EMG activity was clearly present in forelimb extensors, but was extremely weak or absent in hindlimb extensors⁴¹.

In decerebrate cats with the deafferented GS muscle fixed at a constant length have shown that Renshaw (R)-cells, monosynaptically coupled with gastrocnemius-soleus (GS) motoneurons, were either unresponsive or displayed only very weak, small amplitude \ddot{U} -response to sinusoidal stimulation of labyrinth receptors elicited during slow head rotation after bilateral neck deafferentation. This effect was attributed to excitatory VS volleys acting on GS motoneurons and, through their recurrent collaterals, on the related R-cells. In these instances the recurrent inhibition of the GS motoneurons contributed to the very low gain of the EMG response of the corresponding muscles to labyrinth stimulation. In particular, a reduced discharge of the R-cells linked with the GS motoneurons occurred during side-down head rotation as shown for the majority of the RS neurons. It appears therefore that the same R-cells, which in the normal decerebrate cat responded to the excitatory VS volleys acting through the GS motoneurons, were now decoupled from their input motoneurons during head rotation, thus behaving as if they underwent the most efficient direct excitatory control of the RS system. The reduced discharge of the R-cells linked with the GS motoneurons during side-down head rotation would lead to disinhibition of these motoneurons, thus enhancing the response gain of the corresponding muscle to labyrinth stimulation. This hypothesis was supported by the results of electromyographic experiments

showing that the modulation of the multiunit activity of the GS muscle, which in normal decerebrate cats was negligible or extremely poor in amplitude, greatly increased after injection of the same dose of anticholinesterase. These investigations have defined the modalities of operation of the recurrent inhibitory circuit when an increased muscular force is required during the postural adjustments elicited by the labyrinth input, and indicate that R-cells and the related feed-back mechanism from motor outflow may display a high degree of flexibility, thus playing a crucial and subtle role in the final control of posture.

Experiments were also performed in decerebrate cats, with the de-efferented gastrocnemius-soleus (GS) muscle fixed at a constant length, to find out whether Renshaw (R) cells linked with GS motoneurons responded to labyrinth stimulation elicited by head rotation, while the neck had been bilaterally deafferented. We hoped in this way to clarify the role and the mechanism by which these inhibitory inter-neurons act on limb extensor motoneurons during the vestibular reflexes. In conclusion, R-cells linked with the GS motoneurons displayed an \ddot{U} -pattern of response during low frequency head rotation, suggesting that they were largely activated by the recurrent collaterals of the corresponding motoneurons driven by the VS volleys. The same R-cells, however, exhibited the opposite \hat{a} -pattern of response at higher stimulus frequencies, thus behaving as if they were decoupled from their input motoneurons and controlled more directly by the medullary RS neurons. In these instances, activation of GS motoneurons during side-down head rotation could be attributed not only to an increased discharge of the excitatory VS neurons, but also to a reduced discharge of the R-cells driven by the medullary RS neurons. This system may thus contribute to the gain regulation of the EMG responses of hindlimb extensors to labyrinth stimulation^{39,40}.

While carrying out these experiments certain important points came in the mind and to solve those problems we have studied cholinergic mechanism controlling the response gain of forelimb extensor muscles to sinusoidal stimulation of macular labyrinth and neck receptors. This experiment indicated that the inhibitory reticulospinal system, which is under the tonic excitatory control of a cholinergic mechanism, operates as a variable gain regulator, acting at motoneuronal level during the vestibular and neck reflexes. Since the cholinergic system, activated by the anticholinesterase, is responsible for the spontaneous fluctuations in posture related to the sleep-waking cycle, it may well intervene as a control system in order to adapt to the animal state the response gain of limb extensor muscle following labyrinth and neck stimulations. In continuation another experiment was performed to find out whether in decerebrate cats the responses of forelimb extensor muscles to sinusoidal stimulation of labyrinth and neck receptors are modified during the episodes of postural atonia, associated with bursts of REM, which occur following activation of a cholinergic

mechanism. The postural atonia as well as the tonic depression of the vestibular and neck reflexes acting on forelimb extensor muscles can in part at least be attributed to cholinergic activation of medullary reticulospinal neurons exerting a postsynaptic inhibitory influence on extensor motoneurons. However, since these inhibitory reticulospinal neurons collaborate with excitatory vestibulospinal neurons to the motoneuronal responses during stimulation of the vestibular and neck reflexes may also depend on occlusion of the unit responses at reticular level³¹.

NEURONAL PROJECTIONS:

HRP Neurochemistry:

Horseradish peroxidase (HRP) – a plant enzyme – is known to be transported retrogradely and anterogradely, when it is injected in an aqueous solution in the nerve cells of vertebrates. This technique has been widely used to study the beginning and ends of the particular neurons of vertebrates. Identification of cell bodies belonging to the axon terminals at a given site can be performed by taking advantage of retrograde transport. In this case a marker material HRP, which can be identified histochemically is applied to the terminal region. After an appropriate time interval it can be identified in cell bodies. Similarly, the terminals can be identified by injecting HRP in cell body and tracing it histochemically via anterograde transport. Neuronal functions are being carried out through these two transport systems.

In frog *Rana tigrina* there are two main supraspinal projections of rhombencephalon to spinal cord; (I) one from ventral nucleus of VIIIth nerve and (II) the other from the medial part of reticular formation were observed using HRP transport. The fibers from these two nuclei run all over the entire length of spinal cord. An outstanding finding of our investigation is that a few cells are labeled at the region of XIIth nuclear group when the injection was made in the ventral funiculus of cervical region of spinal cord. No such labeling was observed when the injection was made at the lumber region. This strongly suggests that fibers from XIIth cranial nerve nuclear group travel to the cervical region alone. This projection suggests a possible functional organization of XIIth cranial nerve nucleus⁴²⁻⁴⁶.

The existence of the reticulospinal, tectospinal and trigeminospinal projections in *Rana tigrina* by retrograde axonal transport of HRP from spinal cord to mesencephalon was demonstrated by HRP Neurochemistry. It appears that rostrally situated mesencephalic reticular cell groups project into all the regions of the spinal cord through the ventral funiculus. The absence of labeled cells in the Pv region of mesencephalic reticular formation

when HRP was injected in the ventral funiculus & its being HRP positive when the injection was given in the dorsal funiculus shows that the Pv region runs into the dorsal funiculus only. This projection is uncrossed and runs throughout the spinal cord length. The presence of labeled cells in the lamina of mesencephalon on the contralateral side of HRP injection in ventral funiculus of cervical spinal cord indicate the crossed tectospinal pathway in frog, however, labeling has not been observed in the ipsilateral tectum. On this basis it is believed that the rubrospinal projection is not present in *Rana tigrina*, but further confirmatory work may still be done^{43,45}.

The distribution and termination of ascending 2nd dorsal root afferents have been investigated by degeneration and HRP tracing method. The degenerating fibres have been traced in the spinal cord region at different survival time, after 2nd dorsal root transection and their higher percentage was observed on the ipsilateral side. In HRP method, bundles of HRP filled axons showing primary afferent fibers were observed at the level of 2nd dorsal root entering the spinal cord, dorsal column of the spinal cord and to a lesser extent in the cerebellar region⁵¹.

The cyton of spinal ventral horn was located in frog *Rana tigrina* by using Horse-radish peroxidase (HRP) at the cut end of 2nd, 4th, 6th and 8th ventral roots. The ventral roots reach upto the motoneurons of spinal grey which form two columns in the whole length of spinal cord only on the ipsilateral side⁵¹. The rate of transport of HRP in central nervous system of *Rana tigrina* was determined by retrograde and anterograde labeling of enzyme. The rate of transport of HRP was calculated by measuring the length, traveled by HRP from injection site to localization site and the period of time taken by enzyme (HRP) to reach in a particular region. The rate of transport of HRP in the present study ranged from 2-3 mm/day. The average rate of transport of HRP in *Rana tigrina* was 2.6 mm/day. These findings have been categorized in slow rate of transport as compared to mammals. The rate of transport of HRP is slow in amphibians because of the slow metabolism of cold blooded animals⁴⁷.

We investigated central projections (afferent) of trigeminal (Vth), facial (VIIth), glossopharyngeal (IXth) and vagus (Xth) cranial nerves of frog by utilizing degeneration methods of Fink and Heimer (1967) and Eager (1970). It was interesting to observe that the nuclei of Vth, VIIth, IXth and Xth cranial nerves were situated at the lateral region of the brain stem and degenerated afferent fibres were filamentous type. The distribution of afferent fibres was entirely unilateral and ipsilateral to the nerve transection. The afferent fibres of trigeminal, facial, glossopharyngeal and vagus cranial nerves were not found into the motor nucleus of respective nerves in the brain. Afferent fibres of Vth, VIIth, IXth and

Xth surrounded the fasciculus solitarius (f. sol.). Amphibian afferent fibres are comparable to the mammals^{50,54}.

The above studies have not been possible unless the topology of the different nuclear group of the brain of *Rana tigrina* is well understood. We studied in detail the nuclear groups of basal plate and alar plate of the brain of *Rana tigrina*. Size, location and general arrangement of different cell masses and their exact relation to different grooves have been thoroughly investigated to identify the various nuclear groups. It was interesting and important to know that accessory abducens nucleus is absent and a cell free gap is present between the nucleus of IXth and Xth cranial nerves. In addition the nucleus fasciculus solitarius is clearly delimited from the adjacent nucleus tractus descendens nerve trigemini^{47,49}. In continuation we studied the topology of the brain of bat (Megachiroptera)⁵³ and *H. flaviviridis*⁵⁵.

While investigating the physiological, anatomical connectivity of neurons in different vertebrates, we came to the burning question of learning and memory. Modern scientists have described and established that learning and memory takes place at synapse which are physiological connections through which the neurons communicate. These synapse are made by protrusions from the neurons either axon terminal or dendrites. The question was the intelligence in different animals specially in amniotes and in addition to this some information of neuronal types leading to the differentiation, similarity and evolutionary aspects can be traced and understood. These questions have motivated us to study and investigate the neuronal classes specially the type of neurons, then connectivity and giving emphasis on the spines and their density which really help in the memory process. We have taken a number of animals of the class- Reptilia, Aves and Mammals and studied the enzymatic activity, neuronal classes, connectivity, spine density and trying to give some information in the evolutionary aspect leading to intelligentsia from reptiles to mammals⁵¹⁻⁸⁰.

NEURONAL CLASSES:

Cerebral cortex of reptiles:

The cerebral hemisphere of reptiles from rostral to caudal region is divisible into pallium (includes cortical layers) and subpallium (include septal complex, dorsal ventricular ridge, striatal complex and amygdaloid complex). The cerebral cortex of reptiles is differentiated into four areas having distinct cellular composition. These are named according to their relative position as medial cortex (MCx), dorsomedial cortex (DMCx), dorsal cortex (DCx) and lateral cortex (LCx).

The cerebral cortex shows three-layered structure made up of a cell layer (cl) with highly packed neuronal cell bodies sandwiched between cell-sparse outer (opl) and inner plexiform layer (ipl)^{57,58,62}. The outermost layer-2 has only few neuronal somata and also the dendrites ascending from subjacent layers. There are only few somata in layer-I of different reptilian species viz. lizard and snakes whereas in tegu lizard neurons are absent in layer-I. Layer-II of the cerebral cortex of reptiles is characterized by the presence of densely packed neuronal somata in *M. carinata*^{58,62}, and snakes. It also contains dendrites descending from outer layer-2 and ascending from inner layer-2²². The sheet of somata in the cell layer-2²² is interrupted by a discontinuity in the different regions of cerebral hemisphere. The cortex of all the reptiles except crocodylian is characterized by a distinct discontinuity in layer-II. In many reptilian species layer-II of the dorsal cortex is overlapped by the adjacent cortical layers forming medial and lateral superpositions, whereas in snakes such as *Eryx* or in turtles little overlapping is observed. The significance of this discontinuity and overlapping is not clear but the basic trilaminar pattern is replaced by five-layered annulus of cortex with dendrites being exchanged between the densely packed somata of overlapping layers⁶². The somata are loosely packed in layer-III of the cerebral cortex and also snakes. It also contains dendrites descending from layer-2 & 2²² and ascending processes from ependymal layer. Below the inner plexiform layer an ependymal layer is also observed just above the ventricle (V). Ependymal layer has been observed in all the cortical areas except the lateral cortex^{57,58,62}.

Neuronal types in reptiles:

By using classical well established Golgi-impregnation method different investigators described the different number and types of the neuronal classes in all the cortical areas in ophidian and lacertilian groups. In the medial cortex, only one type of neuron in snake genera *Natrix* and *Boa*, five types in the lizard *L. pityusensis*, *P. hispanica* and *M. carinata*⁶², seven types in *H. flaviviridis*⁵⁷ and five types in *C. versicolor*⁷⁶ have been reported. In case of dorsomedial cortex one type of neuron in the lizard *A. agama* and three types in each layer of snake's dorsomedial cortex, five types of neurons in *M. carinata*⁶², six types in *C. versicolor*⁷⁶ and in *H. flaviviridis*⁶⁹ have been reported.

In the dorsal cortex, four types of neurons in the lizard *P. algirus*, five types in *M. carinata*⁶², four types in *C. versicolor*⁷⁶ and seven types in *H. flaviviridis*⁶⁷ have been reported. In lateral cortex, four types of neurons are present in all the three layers of snakes, whereas three types were observed in the *M. carinata*⁶²; four types were present in the *H. flaviviridis*⁷² and three types in *C. versicolor*⁷⁶.

Of late, different neuronal types described in lacertilian species are pyramidal (may be inverted and bipyramidal), multipolar, monotufted, bitufted, stellate neurons, candelabra like monotufted, monotufted monopolar and monotufted bipolar neurons. Further, they have been classified on the basis of the presence or absence of spines. Different investigators have used different methodology to reveal the morphology of the neurons and neuropil in the cerebral cortex of reptiles. These investigations have given a line to trace the evolution of the cerebral cortex in vertebrates.

Cerebral cortex of birds:

The boundaries of the avian hippocampus have not been well established. The hippocampal complex (dorsomedial forebrain) of birds, separated from the rest of the cerebral hemisphere by lateral ventricle, is a narrow curved strip of tissue present on the dorsomedial surface of telencephalic hemisphere. Anatomically, the hippocampal complex is subdivided into two main structures, a dorsal parahippocampal area and a ventral hippocampus. The hippocampus is widest dorsally at the junction with the parahippocampal area, and it tapers ventrally with the septum. On the basis of the presence of different neuronal types, the hippocampal complex have been divided into five different fields viz. medial (HCm) and lateral (HCl) hippocampus, parahippocampal area (APH), central field of parahippocampus (PHc) and crescent field (CF). The adjacent region, corticoid complex (CC) occupies the dorsolateral surface of the telencephalic pallium in Strawberry finch, *Estrilda amandava*^{59,66}. The corticoid complex is divided into two subfields viz an intermediate corticoid area (CI) and a dorsolateral corticoid area (CDL). The extent of these two areas varies considerably in different species of birds. The intermediate corticoid region and different regions of hippocampal complex progressively disappear in the caudal region at the level of the cerebellum. The avian dorsomedial forebrain or hippocampal complex is involved in memory processes associated with spatial behaviour and food storing. The hippocampal volume of the food storing passerine species is larger than non food storing species^{59,66}.

Neuronal types in birds:

On the basis of neuroanatomical study, the neurons of hippocampus of birds have been classified into two main groups. The predominant cell types were projection neurons with spinous dendrites and local circuit neurons having sparsely spinous and aspinous dendrites. In HCm area pyramidal, multipolar, bitufted, monotufted; in PHc and CF region multipolar neurons have been observed^{59,74}. The neurons of the corticoid complex are

classified into three main cell groups: predominant projection neurons, local circuit neurons and stellate neurons. These neurons are subclassified into pyramidal neurons (located only in CI) and multipolar neurons (located both in CI and CDL). The stellate neurons of the CI have a small round or ovoid cell body that extends 4-6 long thin dendrites. The spines on the dendrites are moderately distributed. The axon of these neurons originates either from cell body or from a dendrite, and ramifies locally^{66,68,70}.

Cerebral cortex of mammals:

The cerebral cortex of mammals: a sheet of nervous tissue in the telencephalic roof is commonly referred to as gray matter due to the predominance of cells which appears grayish brown. These neurons are connected to other neurons within the brain by axons located beneath the cortex and within the cortex. The neocortex of mammals shows the typical six layered structure in the frontal, parietal, temporal and occipital lobes, corresponding to the names of skull plates that protect them. The characteristics of six different layers of different fields are different.

Among eutherians, Golgi study of the specific sixth layer of cerebral cortex in brains of insectivore, chiroptera, rodentia, lagomorpha, artiodactyla, carnivore and primate revealed differences in cortical thickness, soma types, soma size, dendritic extents and orientation of neurons. Neuronal morphology and distribution of calcium binding proteins on cortical neurons have been found to be similar in cetacea and artiodactyla but differ considerably from that in primates, carnivores and rodents. This shows several species and order specific patterns which can be used to assess taxonomic affinities among species.

Dendritic spines, a characteristic feature of typical mammalian pyramidal neurons represent important structural specialization of eutherian isocortical neurons and provide most of the postsynaptic sites of axon terminating upon pyramidal neurons. Differences in pyramidal neuron's spine density could reflect important functional differences in the isocortex. These phenotypic differences in pyramidal neurons may reflect some evolutionary trends⁷³.

Neuronal types in mammals:

In general, two main types of neurons have been described in mammalian cerebral cortex: pyramidal and nonpyramidal types^{75,78}. The specialization in these neurons shows homology and differences not only among the different mammalian species but also in sauropsids.

Comparative account of the neuronal types of the cerebral cortex in amniotes:

The medial cortex of reptiles and the hippocampal fascia dentata of mammals have been considered homologous centers on the grounds of their common cyto and chemo-architectonical patterns, their position in cortical circuitry, and their late ontogenesis. The neurons of the cell layer-II of the medial cerebral cortex of reptilian species show resemblance with the granule cells present in the hippocampal formation of different mammalian species such as rat, rabbit, monkey, primates, human, squirrel, mongoose and bats. The dentate granule cell layer of mammals is occupied by homogeneous cell population which is very similar in different reptiles. Moreover, basal dendrites are rare in mature granule cells of rabbits, but they are regularly seen in granule cells of other mammalian species including primates and humans. The morphology of dentate granule cells with basal dendrites is very much similar to different types of spiny bitufted bipolar neurons in the cell layer-II of medial cortex of the reptiles.

The neurons of the hippocampal complex of the birds share some common features with the neurons present in the homologous structures of the reptilian and mammalian telencephalon. In the hippocampus of birds dominant projection neurons are the multipolar neurons unlike the situation in the mammalian hippocampus, where the only projection neurons are pyramidal. In the mammalian hippocampus, the pyramidal neurons are located only in the pyramidal layer while in the hippocampus of the birds the dominant multipolar projection neurons were found in all layers, but the pyramidal and pyramidal-like neurons were located only in the pyramidal layer-II.

The spinous and highly branched monotufted neurons present in the lateral hippocampus of birds and extending their projection towards the pia seems to be similar with those of the candelabra cells, granular neurons or spiny monotufted neurons present in the cell layer-II of the medial cortex in different lizard species. The bitufted neurons present in the lateral and medial hippocampus of the bird also show resemblance with those found in the bitufted and bipyramidal neurons of medial and dorsomedial cortex of the lizards.

The hippocampus of birds corresponds to a part of Ammon's horn, APH to the subiculum, and hyperpallium densocellulare (HD) to the entorhinal cortex of mammals. Using Golgi method, it has been suggested that the medial arm of the V-shaped layer corresponds to Ammon's horn, the central field of the parahippocampus to the subiculum, and the intermediate corticoid to the entorhinal cortex.

Similarities between reptilian medial and dorsomedial cortex with avian hippocampus and parahippocampus include the position medial and dorsal to the ventricle, a more or less

pronounced three layered organization, neuronal types, and efferent and afferent projections. The dorsomedial cortex of reptiles shows resemblance with the parahippocampal area of birds due to its position dorsal to the ventricle and medial hippocampus, and the presence of multipolar neurons in the parahippocampal area of birds with medium/large cell body and four to six spinous dendritic branches.

The pattern of extra cortical afferences and efferences of the dorsomedial cortex neurons, and the intra cortical scheme of connections of the reptilian cerebral cortex have a clear resemblance to that of the mammalian hippocampus and the entorhinal olfactory cortex. The dendritic tree pattern of pyramidal and bipyramidal neurons with their dendritic spines of dorsomedial cerebral cortex of reptiles are comparable with the corresponding elements on pyramidal neurons of the CA3 (Cornu ammonis 3) area of the mammalian hippocampus.

Anatomically, reptilian dorsal cortex resembles with the isocortex of mammals in many respect. The three neurons of reptilian dorsal cortex namely bitufted neurons, multipolar neurons and pyramidal neurons have formed the basis for comparing the medial aspect of dorsal cortex being homologous to the mammalian hippocampal formation, whereas the lateral aspect of the dorsal cortex has been compared to the mammalian isocortex. Anatomically the dorsal cortex of reptiles differ from the isocortex in being three layered instead of six layered and in lacking columnar organization. The dorsal cortex is a structure unique to reptiles, and its relationship to structures in mammalian brain is of great theoretical interest.

The pyramidal neurons of the hyperpallium apicale (HA) of birds⁷⁹ are comparable with the layer V-VI of the mammalian neocortex. Sparsely spinous pyramidal neurons of the HD are slightly similar with the pyramidal neurons found in the layer-III of the echidna somatosensory cortex and layer-V of bottlenose dolphin visual cortex. The multipolar neurons of the laminae: interstitial nucleus of the HA, hyperpallium intercalatum and HD of wulst of the birds show similarities with the sparsely spinous multipolar cells of the layer II-III of the mammalian visual cortex and also with the spinous multipolar neurons of the layer III and IV of echidna somatosensory cortex, spiny cells without apical dendrites of the rat Sm1 cortex and type 7 cells in primate somatosensory cortex. The local circuit neurons observed in the HA, HI and HD of different birds species are comparable with the chandelier cells of the somatosensory and visual cortex of the different mammalian groups. The sparsely spinous stellate neurons of the wulst of birds, strawberry finch, zebra finch, Japanese quail show resemblance with the spiny stellate neurons of the layer III, IV and VI of the visual cortex of bottlenose dolphin and other mammals.

The wulst of birds is comparable to dorsal isocortex comprising occipital, parietal and sensorimotor parts of the frontal cortex. Wulst of birds includes a somatomotor area, which could neither be found in lizards nor in turtles. Like the avian Wulst, the dorsal cortex (DC) of turtles displays a visual area that includes the pallial thickening, which receives a projection from the dorsal lateral geniculate nucleus of the thalamus. In lizards, this projection reaches just the pallial thickening.

The reptilian pallium has a three-layered cortex, consisting of a medial, a dorsomedial part (both similar to the mammalian hippocampal formation), a lateral (olfactory) cortex, and finally a dorsal cortex (comparable to the Wulst of birds) which receives visual projections from the dorsal lateral geniculate nucleus, as well as some somatosensory input. The dorsal cortex of reptiles and its avian equivalent, the Wulst, are considered to be homologous to both the striate or primary visual cortex and the somatosensory cortex of mammals.

In the corticoid complex (CI) of birds, dominant pyramidal neurons possess spinous apical dendrites that give rise to oblique side branches and several basal dendrites. The axon collaterals of these neurons show connections with their own dendritic spines and other neuronal dendritic spines. Some of these collaterals run laterally towards the CDL and APH regions. The pyramidal cells of mammals have one dominant large apical dendrite that often branches close to the soma, whereas the basal dendrites extend extensively in all directions within the deep layers. The apical dendrites and the axon collaterals extend towards the superficial layers, sometimes even reaching the pial surface. The projection from the corticoid complex to the HCC in birds might originate from CI pyramidal neurons, which can be compared with the projections of the entorhinal cortex to the various parts of hippocampus in mammals.

The horizontal cells of the CDL region of birds are comparable with the horizontal neurons of entorhinal cortex of mammals characterized by sparsely spiny apical dendrites extending to the pial surface and slightly spiny basal dendritic plexus that extend horizontally, whereas their axon travels up to the angular bundle. In the entorhinal cortex of mammals, the somata of stellate cells extend dendritic arbor comprising multiple, roughly equal-sized, primary dendrites that branch widely in the mediolateral entorhinal cortex. The axons of stellate neurons run towards the angular bundle from a primary dendrite or the base of the soma. The stellate neurons of the birds correspond to the stellate neurons of the entorhinal cortex of mammal, having an equal-sized primary spiny dendritic tree.

The lateral cortex of reptiles may be considered homologous to the mammalian olfactory cortex as it receives the bulk projection from the principal olfactory bulb. The lateral

cortex in reptiles serves as an interface between the olfactory bulb and other cortical areas and that the CI and CDL in birds carry out the same work between adjacent regions of hippocampus, whereas the same function is carried out in the mammals by the entorhinal cortex between neocortex and hippocampal formation. Thus, all these regions in distant animal groups work as a gateway through which bidirectional information passes.

FINAL COMMENTS:

The comparison of the morphology and connections of the neuronal classes of the cerebral cortex of reptilian, aves and mammals shows following important outcomes⁷³:

1. The hippocampus of birds and fascia dentata of mammals are homologous to the medial cortex of reptiles.
2. The parahippocampal area of birds and CA3 region of mammalian hippocampus are homologous to the dorsomedial cortex of reptiles.
3. The dorsal cortex of reptiles shows homology with visual wulst of birds and mammalian isocortex.
4. The lateral cortex of reptiles is comparable to corticoid complex of birds and to entorhinal olfactory cortex of mammals.

These findings may provide a further basis of investigations of homology to establish a more detailed correspondence between subdivisions of hippocampal region of cerebral cortex in amniotes.

FUTURE DIRECTIONS

The cerebral cortex is a thin sheet of nervous tissue in the telencephalic roof and can be observed in reptiles, aves and mammals. The evolution of the cerebral cortex in amniotes has been studied for almost a century but competing theories about the homologies of individual cortical areas continue to coexist. How the cerebral cortex of mammals should be compared to that of reptiles and birds is one of the oldest and most intensely debated questions in the field of comparative neurology.

The cerebral cortex of reptiles is divided into four areas viz. medial, dorsomedial, dorsal and lateral cortices having different neuronal components. The areas of the hippocampal complex of birds are subdivided into a dorsal parahippocampal region and a ventral hippocampus. The different neuronal types divide the hippocampus of birds into five fields' viz. medial and lateral hippocampus, parahippocampal area, central field of

parahippocampal area and crescent field. The cerebral cortex of mammals is a complex structure. The neocortex of mammals shows the typical six layered structure in the frontal, parietal, temporal and occipital lobes having typical pyramidal and nonpyramidal neurons which show phenotypic variations. Different workers have attempted to draw parallels of cortical structures between reptilian and mammalian, avian and mammalian, and also in amniotes on the basis of cyto-architecture, neuroanatomy, connections and immunocytochemistry, but no agreement has been reached.

When a neuron is first formed it does not yet have dendrites, and therefore also does not have dendritic spines. Dendritic filopodia are formed from the dendrites first and then convert into spines after being innervated by synaptic fibers. Learning and memory take place at synapses, which are junctions through which brain cells communicate. These synapses reside on specialized branchlike protrusions on neurons called dendritic spines. The dendrites of a single neuron can contain hundreds to thousands of spines. In addition to spines providing an anatomical substrate for memory storage and synaptic transmission, they may also serve to increase the number of possible contacts between neurons.

Dendritic spines are known to change shape, to the extent of appearing and disappearing entirely. It has long been hypothesised that such changes may be the basis of memory itself. Dendritic spines are sites of excitatory synaptic transmission, and their structure and density are important measures of synaptic function. The small spines are preferential sites for long-term potentiation induction, whereas large spines might represent physical traces of long-term memory. Spine dynamics are cellular phenomena with important implications for cognition and memory. Furthermore, impaired spine dynamics can cause psychiatric and neurodevelopmental disorders.

How the evolutionary mechanisms produced and incorporated the cortical neurons to the mammalian (Isocortex) cerebral cortex is a challenge. The study of Cyto-architectonic subdivisions, neuronal types, dendritic arborization, dendritic spine density and neuronal projections in the amniotes is necessary to understand the evolutionary mechanism behind the development of neurons and functional ability of cerebral cortex.

Several lines of evidence support the idea that the four cortical areas of the cerebral cortex of reptiles show functional and morphological similarities with avian and mammalian cerebral cortex. A comparative study of cerebral cortex of amniotes that include the neuronal morphologies, neuronal projections will suggest homologies of the medial cortex, the dorsomedial cortex, the dorsal cortex, the lateral cortex of reptiles with different areas of avian and mammalian brain.

References

1. Vishnoi, D.N. and **Srivastava, U.C.**: Phosphomonoesterases in the alimentary tract cells of the larva of *Atteva fabriciella* (Lepidoptera). **Proc. Nat. Acad. Sci. (India)**, 42 (B), 154-164 (1972).
2. Vishnoi, D.N. and **Srivastava, U.C.**: Studies on the polysaccharides and lipids in the larval enteric cells of *Atteva fabriciella*. **Ald. Univ. Stud.**, 4 (2), 53-65 (1972).
3. Vishnoi, D.N. and **Srivastava, U.C.**: Cytochemical studies on the PAS-positive and metachromatic substances in the enteric epithelial cells of *Achoea janata* (Noctuidae : Lepidoptera). **Folia Histochem. Cytochem.**, 14 (1), 49-56 (1976).
4. Vishnoi, D.N. and **Srivastava, U.C.**: Distribution and significance of acid phosphatase in the enteric epithelial cells of *Paralellia algira* (Lepidoptera) during metamorphosis. **Zool. Jb. Anat. Bd.**, 95, 511-518 (1976).
5. **Srivastava, U.C.**: Studies on the cytochemistry of some lepidopteran pests of Gangetic plain. D.Phil. Thesis, **Allahabad University**, 1-184 (1976).
6. **Srivastava, U.C.** and Vishnoi, D.N.: Cytochemical investigations on alkaline phosphatase in differentiating and functional enteric epithelial cells of *Achoea janata* (Lepidoptera). **Zool. Jb. Anat. Bd.**, 99, 9-16 (1980).
7. **Srivastava, U.C.** and Vishnoi, D.N.: Distribution and significance of esterases in the enteric epithelial cells of certain lepidopteran pests during metamorphosis. **Folia Histochem. Cytochem.**, 18 (1), 41-48 (1980).
8. **Srivastava, U.C.** and Srivastava, U.S.: The effect of a Juvenoid on the acid phosphatase activity in the midgut epithelium of *Spodoptera litura* (Fabr.) **Proc. Indian Natn. Sci. Acad.**, B 52(6), 723-727 (1986).
9. **Srivastava, U.C.**: Further investigations on the PAS positive and metachromatic substances in the enteric epithelial cells of Lepidoptera (*Hypsa alciforom* and *Paralellia algira*). **Proc. Nat. Acad. Sci.**, 57(B) III 211-215 (1987).
10. Srivastava, U.S. and **Srivastava, U.C.**: The effect of synthetic juvenile hormone on acid phosphatase activity in the hindgut epithelium of *Spodeptera litura*. Fabr. **Proc. Indian Nat. Acad. Sci.**, B54 (5), 303-306 (1988).
11. **Srivastava, U.C.**: Cytochemical studies on the degenerating enteric epithelial cells during developmental stages of moths. **Proc. Nat. Acad. Sci. (India)**, – LIX B IV 459-461 (1989).
12. Roberts, T.D.M.: Reflex balance **Nature London.**, 244: 156-158 (1973).
13. Soechting, J.F. Anderson, J.H. and Berthoz, A: Dynamic relations between natural vestibular inputs and activity of forelimb extensor muscles in the decerabrate cat III. Motor output during rotations in the ventral plane. **Brain Res.**, 120: 35-47 (1977).
14. Nagari, J.: Effects of natural vestibular stimulation on alpha extensor motoneurons of the cat. **Kumamoto Med. J.**, 20: 102-111 (1967).
15. Lindsay, K.W., Roberts, T.D.M. and Rosenberg, J.R.: Asymmetrical tonic labyrinth reflexes and their interaction with neck reflexes in the decerabrate cat. **J. Physiol. London**, 261: 588-601 (1976).
16. Wilson, V.J. and Melvill Johns, G.: Mammalian vestibular physiology. **Newyork-London, Plenum Press** XI- 365 pp (1979).

17. MC Couch, G.P., Deering, I.D. and Ling, T.H.: Location of receptors for tonic neck reflexes. **J. Neurophysiol.**, 14: 191-195 (1951).
18. Wilson, V.J. and Peterson, B.W.: Vestibulospinal and reticulospinal system. **Handbook of Physiology, the Neuron System II**, Chapter 14: 667-702 (1978).
19. Illert, M., Lundberg, A., Padel, Y. and Tanaka, R.: Integration in descending motor pathway controlling the forelimb in that Cat. 5 properties of and monosynaptic excitatory convergence on C₃-C₄ profriospinal neurons. **Brain Res.**, 33: 101-130 (1978).
20. Boyle, R. and Pompeiano, O.: Reciprocal responses to sinusoidal tilt of neurons in Deiters nucleus and their dynamic characteristics. **Arch. Ital. Biol.**, 118: 1-32 (1968).
21. Boyle, R. and Pompeiano, O.: Relation between cell size and response characteristics of vestibulospinal neurons to labyrinth and neck inputs. **J. Neuroscience.**, 1: 1052-1066 (1981).
22. Pompeiano, O. Santarcangelo, E., Stampacchia, G. and **Srivastava, U.C.**: Changes in posture and reflex movements due to kainic acid lesions of the Inferior olive. **Arch. Ital. Biol.**, 119, 279-313 (1981).
23. Pompeiano, O. Santarcangelo, E., **Srivastava, U.C.** and Stampacchia, G.: L'inibizione cerebellaro del tono posturale dipende dall' attivazione dal centro inhibitors bulbare? **Boll. Soc. Biol. Sper.**, LVIII-I, 93-94 (1981).
24. Manzoni, D., Pompeiano, O., Stampacchia, G. and **Srivastava, U.C.**: Dynamic characteristic of responses of medullary reticulospinal neurons to roll tilt. **Boll. Soc. Ital. Biol. Sper.** LVIII-N-24, 37-40 (1982).
25. **Srivastava, U.C.**, Manzoni, D., Pompeiano, O. and Stampacchia, G.: Dynamic characteristics of responses of medullary reticulospinal neurons to neck rotation. **Boll. Soc. Ital. Biol. Sper.** LVIII-N-24, 41-44 (1982).
26. Pompeiano, O., Manzoni, D., **Srivastava, U.C.** and Stampacchia, G.: Responses of medullary reticulospinal neurons to natural stimulation of neck and labyrinth receptors. **Neuroscience Lett.**, Supl. 10, S 393 (1982).
27. **Srivastava, U.C.**, Manzoni, D., Pompeiano, O. and Stampacchia, G.: State dependent properties of medullary reticular neurons involved during the labyrinth and neck reflexes. **Neuroscience Lett.**, 10, S 461 (1982).
28. Manzoni, D., Pompeiano, O., Stampacchia, G. and **Srivastava, U.C.**: Frequency response of medullary reticulospinal neurons to natural stimulation of labyrinth receptors. **Adv. Oto-Rhino-Laryng.**, 30, 298-301 (1983).
29. **Srivastava, U.C.**, Manzoni, D., Pompeiano, O. and Stampacchia, G.: Frequency response of medullary reticulospinal neurons to sinusoidal rotation of neck. **Adv. Oto-Rhino-Laryng.**, 30, 302-305 (1983).
30. Manzoni, D., Pompeiano, O., **Srivastava, U.C.** and Stampacchia, G.: Responses of forelimb extensors to sinusoidal stimulation of macular labyrinth and neck receptors. **Arch. Ital. Biol.**, 121, 205-214 (1983).
31. Manzoni, D., Pompeiano, O., **Srivastava, U.C.** and Stampacchia, G.: Inhibition of vestibular and neck reflexes in forelimb extensor muscles during the episodes of postural atonia induced by an anticholinesterase in decerabrate cat. **Arch. Ital. Biol.**, 121, 267-283 (1983).
32. Manzoni, D., Pompeiano, O., **Srivastava, U.C.** and Stampacchia, G.: Cholinergic mechanism controlling the response gain of forelimb extensor muscles to sinusoidal stimulation of macular labyrinth and neck receptors. **Arch. Ital. Biol.**, 121, 285-303 (1983).

33. Pompeiano, O., Manzoni, D., **Srivastava, U.C.** and Stampacchia, G.: Relation between cell size and response characteristics of medullary reticulospinal neurons to labyrinth and neck inputs. **Pflugers Arch.**, 398, 298-309 (1983).
34. Manzoni, D., Pompeiano, O., Stampacchia, G. and **Srivastava, U.C.**: Response of medullary reticulospinal neurons to sinusoidal stimulation of labyrinth receptors in decerebrate cat. **J. Neurophysiol.**, 50(5), 1059-1079 (1983).
35. Pompeiano, O., Wand, P. and **Srivastava, U.C.**: Effects of Renshaw cells activity on the response gain of limb extensors to sinusoidal labyrinth stimulation. **Neuroscience Lett.**, 14s 289 (1983).
36. Manzoni, D., Pompeiano, O., **Srivastava, U.C.** and Stampacchia, G.: Gain regulation of vestibular reflexes in fore and hindlimb muscles evoked by roll tilt. **Boll. Soc. Ital. Biol. Sper.**, LX, 9-10 (1984).
37. Pompeiano, O., Wand, P. and **Srivastava, U.C.**: The role of Renshaw cells in the gain regulation of vestibulospinal reflexes evoked by roll tilt. **Boll. Soc. Ital. Biol. Sper.**, LX, 11-12 (1984).
38. **Srivastava, U.C.**, Manzoni, D., Pompeiano, O., Stampacchia, G.: Responses of medullary reticulospinal neurons to sinusoidal rotation of neck in decerebrate cat. **Neuroscience**, II(2) 473-486 (1984).
39. Pompeiano, O., Manzoni, D., **Srivastava, U.C.** and Stampacchia, G.: Convergence and interaction of neck and macular vestibular inputs on reticulospinal neurons. **Neuroscience**, 12(1), 111-128 (1984).
40. Pompeiano, O., Wand, P. and **Srivastava, U.C.**: Responses of Renshaw cells coupled with hindlimb extensor motoneurons to sinusoidal stimulation of labyrinth receptors in the decerebrate cat. **Pflugers Arch.**, 403, 245-257 (1985).
41. Pompeiano, O., Wand, P. and **Srivastava, U.C.**: Influence of Renshaw cells on the response gain of hindlimb extensor muscles to sinusoidal labyrinth stimulation. **Pflugers Arch.**, 404, 107-118 (1985).
42. **Srivastava, U.C.**: Response characteristics of reticulospinal neurons to sinusoidal stimulation of macular vestibular and neck receptors. Thesis – **Doctor of Neurophysiology (Scuola Normale Superiore, Pisa, ITALY)**, 1-78 (1985).
43. **Srivastava, U.C.** and Srivastava, Shubha: Brain stem projections to spinal cord and their origin in *Rana tigrina*. **Nat. Acad. Sci. Lett.**, II(3), 93-96 (1988).
44. **Srivastava, U.C.** and Srivastava, Shubha: Retrograde axonal transport of Horseradish peroxidase from spinal cord to rhombencephalon in Indian frog – *Rana tigrina*. **Arch. Biol.**, 100(1), 83-95 (1989).
45. **Srivastava, U.C.** and Srivastava, Shubha: Retrograde axonal transport of Horseradish peroxidase from spinal cord to mesencephalon in Indian frog – *Rana tigrina*. **Arch. Biol.**, 101(1), 17-30 (1990).
46. **Srivastava, U.C.** and Srivastava, Shubha: A HRP-TMB reaction for tracing neuronal connections in central nervous system of frog – *Rana tigrina*: the possibility of artifact 60 (B). **Proc. Nat. Acad. Sci. India**, IV: 381-387 (1990).
47. **Srivastava, U.C.** and Srivastava, Shubha: Nuclear groups of alar plate of brain stem of *Rana tigrina*. **Proc. Nat. Acad. Sci. India**, 61 (B) III: 303-309 (1991).
48. **Srivastava, U.C.** and Srivastava, Shubha: Rate of transport of Horseradish peroxidase (HRP) in central nervous system of *Rana tigrina*. **Eur. Arch. Biol.**, (Bruxelles) 102: 41-66 (1991).
49. **Srivastava, U.C.** and Srivastava, Shubha: Nuclear groups of basal plate of brain stem of *Rana tigrina*. **Proc. Nat. Acad. Sci. India**, Vol. I VII (B): 1-13 (1992).
50. Kumari, Manisha: Central projections of some cranial nerves in frog. D.Phil thesis, **Allahabad University**, 1-125 (1993).

51. Srivastava, Shubha and **Srivastava, U.C.**: Ascending dorsal root projections to brain stem in frog *Rana tigrina*. **Biol. Memoirs**, 28(1): 14-20 (2002).
52. **Srivastava, U.C.** and Srivastava, Shubha: Ventral root projections in the spinal cord in frog. *R. tigrina*. **Proc. Nat. Acad. Sci. India**, 72 B (II): 169-172 (2002).
53. Prakash, Ved: Studies on the topology of the brain of Bat (Megachiroptera). D.Phil thesis, **Allahabad University**, 1-40 (2002).
54. **Srivastava, U.C.** and Kumari, Manisha: Central projections of the trigeminal nerve in Indian bull frog, *Rana tigrina*. **Biol. Memoirs**, 28(2) 95-101 (2002).
55. Kumar, Binod: Topological analysis of the central nervous system of Indian house wall lizard, *Hemidactylus flaviviridis*. D.Phil thesis, **Allahabad University**, 1-113 (2003).
56. **Srivastava, U. C.** and Kumari, Manisha: Central projections of primary afferent fibres of the glossopharyngeal nerve in Indian bull frog, *Rana tigrina*. **Zoology and Human Welfare (Graphic offset Allahabad)**, 362-370 (2004).
57. Maurya, R. C. & **Srivastava, U. C.**: Morphological diversity of the medial cortex neurons in the common Indian Wall Lizard, *Hemidactylus flaviviridis*. **Natl. Acad. Sci. Lett.**, 29 (9 & 10), 375-383 (2006).
58. Abhinav & **Srivastava, U. C.**: Neuroanatomy of cerebral cortex of Indian lizard, *M. carinata*. **J. Appl. Biosci**, 32 (2): 160-163 (2006).
59. **Srivastava, U. C.**, Chand, P. & Maurya, R. C.: Cytoarchitectonic organization and morphology of the cells of hippocampal complex in Strawberry finch, *Estrilda amandava*. **Cell. Mol. Biol.** (France), 53,103-120 (2007).
60. Tripathi, A. & **Srivastava, U.C.**: Histochemical distribution of acetylcholinesterase in the cerebral hemispheres of Indian wall lizard, *Hemidactylus flaviviridis*. **Ann. Neurosci.**, 14: 64 -71 (2007).
61. **Srivastava, U. C.** & Tripathi, A.: Distributive pattern of acetylcholinesterase in the medulla oblongata of Indian house wall lizard, *Hemidactylus flaviviridis*. **Natl Acad Sci Lett.**, 30 (9&10): 325-333 (2007).
62. **Srivastava, U. C.**, Maurya, R. C. & Shishodiya, U.: Cyto-architecture and morphology of the different neuronal types of the cerebral cortex of an Indian lizard, *Mabouia carinata*. **Proc. Nat. Acad. Sci.**, 77 (B), IV: 331-347 (2007).
63. Tripathi, A. & **Srivastava, U. C.**: Histochemical mapping of acetylcholinesterase in the mesencephalon of Indian wall lizard *Hemidactylus flaviviridis*. **J. Appl. Biosci.**, 33 (2): 145-149 (2007).
64. Maurya, R.C. & **Srivastava, U.C.**: Histochemical distribution of Acetylcholinesterase in the rostral forebrain of Squirrel, *Funambulus pennanti*. **Natl. Acad. Sci. Lett.**, 31 (11 & 12): 361-367 (2008).
65. Tripathi, A. & **Srivastava, U. C.**: Acetylcholinesterase: A versatile enzyme of nervous system. **Ann. Neurosci.**, 15 (4): 106-111 (2008).
66. **Srivastava, U. C.**, Chand, P. & Maurya, R. C.: Neuronal classes in the corticoid complex of the telencephalon of the strawberry finch, *Estrilda amandava*. **Cell Tissue Res.**, 336: 393-409 (2009).
67. Maurya, R.C.: Identification and classification of different types of neurons of the cerebral cortex of the common Indian Wall lizards, *Hemidactylus flaviviridis*. D.Phil thesis, **Allahabad University**, 1-93 (2009).

68. Chand, P.: Neuronal classes in the central nervous system of a bird, *Estrilda amandava*. D.Phil thesis, **Allahabad University**, 1-87 (2009).
69. **Srivastava, U. C.**, Maurya, R. C. & Chand, P.: Cyto-architecture and neuronal types of the dorsomedial cerebral cortex of the common indian wall lizard, *Hemidactylus flaviviridis*. **Arch. Ital. Biol.**, 147: 21-35 (2009).
70. Chand, P. & **Srivastava, U. C.**: Charecteristics of the projection neurons in the corticoid complex of the strawberry finch, *Estrilda amandava*. **Proc. Nat. Acad. Sci.**, 79 (III): 227-234 (2009).
71. **Srivastava, U. C.**: Remembering Nobel laureate Rita Levi Montalcini: On her successful completion of 100 years. **Proc. Nat. Acad. Sci.**, 78 II 77-80 (2009).
72. **Srivastava, U. C.** & Maurya, R.C.: Neuronal morphology of lateral cerebral cortex of Indian wall lizards, *Hemidactylus flaviviridis*. **Natl. Acad. Sci. Lett.**, 36 (9/10): 291-295 (2009).
73. **Srivastava, U.C.** and Maurya, R.C.: Evolution of the cerebral cortex in amniotes: Anatomical consideration of neuronal types. In Nature at work: on going saga of Evolution. **V.P. Sharma ed. Springer (India) Private Limited.**, 329-354 (2010).
74. **Srivastava, U.C.** and Chand, P.: The hippocampal complex of birds: An overview In Bioresources for rural livelihood Vol II **Physiology and Ecotoxicology**. G.K. Kulkarni ed. **Narendra Publishing House, New Delhi**. 165-177 (2010).
75. **Srivastava, U.C.** and Chauhan, Prashant: Morphological differences among pyramidal neurons in parietal lobe of a carnivora, Indian Mongoose, *Herpestes edwardsii*. **Natl. Acad. Sci. Lett.**, 33 (3 & 4): 89-94 (2010).
76. Sakal, I.D.; Maurya, R.C. and **Srivastava, U.C.**: Quantitative neuronal diversity in the cerebral cortex of *Calotes versicolor* (Daudin, 1802). **Natl. Acad. Sci. Lett.**, 33(5 & 6): 171-176 (2010).
77. Tripathi, Anurag and **Srivastava, U.C.**: Histochemical distribution of acetylcholinesterase in the olfactory lobe of Indian wall lizard, *Hemidactylus flaviviridis*. Ruppel. **Proc. Nat. Acad. Sci. India Sec B** 80 (III), 250-253 (2010).
78. **Srivastava, U.C.** and Pathak, S.V.: Interlaminar differences in the pyramidal cell phenotype in parietal cortex of Indian Bat, *Cynopterus sphinx*. **Cell and Mol. Bio.(France)**, 56, 1410-1426 (2010).
79. Chand, P. and **Srivastava, U.C.**: Morphological characteristics of the projection neurons in the hyperpallium apicale of the strawberry finch, *Estrilda amandava*. **Nat. Acad. Sci. Lett.**, (11-12) (In Press) (2010).
80. Chand, P. and **Srivastava, U.C.**: Cellular morphology and spine density of the visual wulst of the strawberry finch, *Estrilda amandava*. **Brain Research Bulletin**, (In Press) (2011).

98th Indian Science Congress

January 3-7, 2011, Chennai

II

ABSTRACT OF PLATINUM JUBILEE LECTURE

PLATINUM JUBILEE LECTURE

**The Clocks, Rhythms and Behaviour:
The Story as unfolds from Birds**

Prof. Vinod Kumar

DST-IRHPA Center for Excellence in Biological Rhythm Research
Department of Zoology, University of Delhi, Delhi 110 007

Biological systems regulate their internal environments as well as their relationships to the outside world. The regulatory mechanism usually involves negative feedback, which always generates oscillations since there is bound to be delay in the feedback loop. Natural selection has often acted to dampen the amplitude of these oscillations but a few have been enhanced and their periods have been adjusted to match closely the periods of astronomical events that are of importance to living things. Hence, the period of these rhythms can be from minutes to several months. In all vertebrates, the circadian (*circa* = about; *dian* = day) organization, showing rhythmicity of about a day, is driven by a central oscillation generating system, represented by the hypothalamic suprachiasmatic nucleus, the pineal, the retina and the pathways, both neural and humoral, that couple these structures. There are also circadian oscillators in the peripheral tissues. Long lived animals also appear controlling the time and duration of the different life-history stages in the year using another clock system, called the circannual (*circa* = about; *annuum* = year) system. Birds truly exhibit both kinds rhythms in daily events and annual life-history stages and repeat them at regular periods during the life cycle of the individual. They like other organisms adapt their physiology and behavior to the regular cycles in their environment. There are clear differences between day and night. Diurnal birds sleep at night and are active during the day. Nocturnal birds are the reverse. During the year, they undergo different distinct life history stages; e.g. vernal migration, reproduction, molt and autumnal migration. In this lecture, I shall present a perspective of the clocks, rhythms and behavior with particular reference to birds inhabiting a highly periodic environment.

98th Indian Science Congress

January 3-7, 2011, Chennai

III

ABSTRACTS OF AWARD LECTURE / YOUNG SCIENTIST AWARD PROGRAMME

YOUNG SCIENTIST AWARD PROGRAMME

**Pattern dependent regulation of signalling molecules
involved in synaptic plasticity and memory**

Chinmoyee Maharana^{1*} and Shiv K Sharma¹

¹National Brain Research Centre,
Manesar, India -122050

*Email: chinmoyee@gmail.com

Key Words : *Depolarization, Memory, ERK, CaMK II, Histone acetylation*

Long-lasting memories are formed more robustly with multiple training trials spaced in time (spaced training) than massed together with little or no temporal spacing (massed training). This spacing effect phenomenon has been well studied at the behavioural level in diverse animal model systems. However, the molecular mechanisms that contribute to this effect are not completely understood. This study focuses on molecular events that may contribute to superiority of spaced over massed training in the formation of long-term memory. We found differential phosphorylation of ERK and CaMK II, key molecules known to be involved in memory, by single pulse, spaced and massed depolarization of hippocampal slices from rat brain. We further found differential sensitivity of different phases of ERK activation to translational and transcriptional inhibition. In addition, we found that ERK regulates histone acetylation, a modification important in gene regulation. This study provides insights into the overall mechanisms of multiple phases of memory.

G.K. MANNA MEMORIAL AWARD LECTURE

Indian Monogenoids: A Fascinating World of Parasitism

Nirupama Agrawal

Department of Zoology
University of Lucknow,
Lucknow, U.P. 226007

Monogenoidea (adj. monogenoidean) is a class of Phylum Platyhelminthes, member species of which are mainly ectoparasitic usually infecting gills and/or external surfaces of freshwater and marine fishes; some species become endoparasitic by inhabiting the urinary bladder and rectum of amphibia and reptiles. None infect aves, but one (*Oculotrema hippopotami*) infects eye of a hippopotamus, a mammal.

Monogenoidea form *a major group of aquatic parasites destroying a valuable commercial fishery*. While they can cause direct losses due to mortality, usually to younger fish and in intensive culture conditions, they may also affect appetite, growth, behaviour and marketability of fish (Paperna 1991. *Annual Review of Fish Diseases* 1: 155-194; Buchmann 1999. *Folia Parasitologica* 46: 1-9). They are the *most host-specific of all fish parasites* (Whittington et al. 2000. *International Journal for Parasitology* 30: 305-320), and have therefore been widely used as a useful model *for the study of biogeography and co-evolution* (Boeger and Kritsky 2003. *Zoologica Scripta* 32: 3-11) and also *as indicators of host population migrations* (Gusev 1976. *Indian Journal of Helminthology* 25/26: 1-241).

They are also *important as ecological agents* present in large number in all habitats in water bodies (Khan & Thulin 1991. *Advances in Parasitology* 30: 200-238). Their diversity is a sensitive and meaningful model for environmental studies for two reasons: 1) they are ectoparasitic and therefore in direct contact with both the surrounding environment and the fish host and 2) they have short life cycles and are thus capable to react immediately on changes in environmental factors. Last but not the least; because monogenoidean parasites are diverse not only in terms of numbers but also with respect to their morphology and ecology (Poulin 2002. *International Journal for Parasitology* 32: 245-254), they clearly belong on the biodiversity research agenda, a growing area within modern biology.

98th Indian Science Congress

January 3-7, 2011, Chennai

IV

ABSTRACTS OF SYMPOSIUM/INVITED LECTURE

PROCEEDINGS
OF THE
NINETY EIGHTH SESSION OF THE
INDIAN SCIENCE CONGRESS
CHENNAI, 2011

PART II : ABSTRACTS OF SYMPOSIUM / INVITED LECTURE

SECTION OF
ANIMAL, VETERINARY AND FISHERY SCIENCES

President : Prof. U.C. Srivastava

**Maintaining Quality Education Through Innovative Research in
Animal Sciences**

INVITED LECTURES

- 1. Modulation of Serotonin_{2A} Receptors and Phosphoinositide Signaling by Hypothalamus-Pituitary-Adrenal Axis: Implication for Depressive Illness**

Ghanshyam N. Pandey, Ph. D.

Department of Psychiatry, College of Medicine,
University of Illinois at Chicago
1601 W Taylor St., Chicago, IL 60612, USA

Key words: *Adrenalectomy (ADX), corticosterone (CORT), depression, hypothalamus-pituitary-adrenal (HPA) axis, phosphoinositide (PI), phospholipase C (PLC), protein kinase C (PKC), serotonin_{2A} (5HT_{2A}) receptors, suicide*

Background : An increase in serotonin (5HT)_{2A} receptors and abnormal phosphoinositide (PI) signaling system has been implicated in pathophysiology of depression

and suicide. However, the reasons either for increased 5HT_{2A} receptors or for abnormal PI signaling system in depression and suicide are not clear. Abnormalities in hypothalamus-pituitary-adrenal (HPA) axis have also been observed to be associated with depressive illness. There is also some evidence suggesting interaction between HPA axis and serotonergic system. We have examined the possibility that abnormalities in serotonergic system, especially 5HT_{2A} receptors and 5HT_{2A} receptors-linked PI signaling system may be modulated by HPA axis, and have therefore examined the effect of treatment with corticosterone (CORT) on 5HT_{2A} receptors and other components of the PI signaling system, such as protein kinase C (PKC) and phospholipase C (PLC) in the rat brain.

Methods: The rats were implanted with CORT pellets (25 or 50 mg) and sacrificed 10 days later. 5HT_{2A}, PKC or PLC protein expression was determined in the cortex by Western blot.

Results: We found that administration of CORT increases 5HT_{2A} receptors in rat cortex. We also observed that adrenalectomy (ADX) caused significant increases in PKC activity and in the steady-state levels of the PKC isozymes in membrane and cytosol fractions of the rat cortex and these changes were reversed by the administration of CORT pellet to ADX rats. Similarly, ADX induced increase in PI-PLC activity as well as in the level of PLC α_1 isozyme after ADX, which was reversed after treatment with CORT pellet.

Conclusion: These results suggest an interaction between alterations in HPA axis and alterations in 5HT_{2A} receptors and receptor-linked components of the PI signaling system. It is therefore quite possible that some of the abnormalities observed in the 5HT_{2A} receptors, PKC and PLC in depressed patients may be related to an overactive HPA axis.

(Supported by NIMH grant RO1 MH048153)

2. Environmental Contaminants : Impact on Endocrinal Calcium Regulation in Fish

Ajai Kumar Srivastav, Vijai K. Das, Sunil K. Srivastav
and Abhishek Kumar

Department of Zoology, DDU Gorakhpur University,
Gorakhpur 273 009, India

The environment, in addition to support the organisms' life, also significantly affects

the health of the living organisms as several hazardous contaminants from industrial effluents, waste disposal, urban and domestic inputs, atmospheric deposition and farming activities are continuously being added every day to the environment. Environmental contaminants may be short-lived (non-persistent) or long-lived (persistent even for decades). Short-lived contaminants affect only the immediate area of their release whereas long-lived contaminants may either be restricted to the area of release or may be transported to other areas, accumulate in animal tissues, biomagnify in food chains, and provoke significant impacts on organisms health. When released at large amounts in the aquatic reservoirs, these contaminants may cause severe effects (even mortality) either directly or due to starvation by destruction of food organisms whereas at lower concentrations they produce sub-lethal effects such as behavioral changes, physiological changes, biochemical changes and histological changes. Among aquatic organisms, fish occupy a key position being the most diverse class of vertebrates having around 28,000 species which is more than the total number of other vertebrates and represents a diversity of body forms, lifestyles and habitat – from freshwater to marine. These peculiarities enable the fish to be used as an excellent model for toxicological evaluation. The environmental contaminants exposed fish may survive but in their natural environment such influences can render the fish more vulnerable to predators, less able to compete with other fish species and less able to withstand the natural stresses.

All vital processes depend on changes in osmotic concentration and ion composition of the body fluids. Any alteration in osmotic and ionic regulation would affect the normal physiological processes of the organisms and hence their natural survival. Few investigators have observed inconsistent effects on blood/serum content of calcium of fish treated with environmental contaminants – a decrease, an increase and no effect. The inactivity of ultimobranchial gland and corpuscles of Stannius has been reported after treating the fish with various environmental contaminants. Contradictory results have also been reported regarding the activity of prolactin cell/level – enhanced activity and no effect. Much less is known about the circulating hormonal levels of calcitonin and prolactin after exposure to these environmental contaminants. Almost no data is available regarding the blood contents of stanniocalcin and vitamin D metabolites with regards to treatment with these environmental contaminants, such a study is badly needed and would be more fruitful.

3. Strengthening Dairy Education in India through Innovative Research and Academia-Industry Linkages

Bimlesh Mann

Principal Scientist, Dairy chemistry division
National Dairy Research Institute, Karnal, India
bmann@rediffmail.com

India is among the fastest growing dairy nation in the world and leads the world in the milk production. The need of the hour is to provide multi skilled, well trained, highly motivated manpower as required by the dairy industry. There are about 15 institutes imparting dairy science education and catering to the increasing need of technically qualified personnel for the dairy industry. Most of the institution are invariably be launched by various constrains. Research is important for the survival of any industry as it opens up new area of growth and opportunities. It is also provides better understanding of the various aspect of milk and milk products. The dairy education has a big responsibility to conduct research for developing better technologies, products and processes. In an ideal university- industry student interaction scenario, the university has the responsibility of training, future researchers and product developers for the industry, and in so doing generate new technology for the industry. To make the dairy more attractive for talented students at undergraduate level and retain the best talent at higher level there is an urgent need to make the whole dairy sector more profitable and lucrative by increasing the product diversification, value addition to milk and efficiently utilizing the installed capacities of dairy plants. At government level also there is need to make this sector more profitable and attractive to talented youngsters. The dairy education in India though old, but still has huge potential to grow. The need of the hour is to synergize the educational training and research training activities being run independently under various schemes.

4. Glia in neurodegeneration and neuroregeneration

I.K. Patro, Aarti Nagayach and Nisha Patro

School of Studies in Neuroscience
Jiwaji University, Gwalior 474 011

Until recent years glia were always considered as the brain glue with insignificant

role in functioning of the neurons. Today we have increasing evidence to suggest that the glia play essential and crucial role in the development, maintenance, functioning, repair and regeneration of the brain in health and diseased condition. Astrocytes and the microglia constitute the immune system of the brain. During development the glia help in organization and maturation of the neural network. Following injury the immune response perform both neurodegenerative and neuroprotective role. Suppression of the lethal phase of neuroglia not only stops degeneration but also supports neuronal recovery following injury. Following surveillance of infection the glia also influence regeneration and neurogenesis in the affected brain. The present day understanding of the role of astrocytes and microglia in neurodegeneration and neuroregeneration shall be discussed with evidence from our group.

5. Maintaining Quality Education Through Innovative Research in Animal Science

Maheep Bhatnagar

Postgraduate Department of Zoology,
University College of science, M.L.Sukhadia
University, Udaipur-313001,
email: mbhatnagar@yahoo.com,

Higher education is always been a yardstick of social, economic and political development of a nation. While school education equips the society with literacy, higher education provides competent and qualified human resource such as scientists, engineers, doctors, teachers, managers, which finally takes the responsibility of the development of the nation. In the past sixty years, the country has taken a giant leap in various sectors including, agriculture, communication, and electricity, infrastructure like roads, dams and in science and technology which is only possible through a highly literate or qualified work force developed through quality education. This need to be strengthened through improving quality in our class rooms by updating content of the syllabi, introduction of more application oriented teaching, academic infrastructure and quality of research undertaken. In past few years animal science has been put to back seat as compared to plant or environmental science by our policy planners, financial institutions and academia. Activities of organizations against use of animals in experimentation have further put the animal science on the reverse track. Only a major drive for improving teaching and research in animal science can help the animal science to find a place in the forefront of higher education.

6. Effect of endocrine disruptors on male reproduction

P. P. Mathur

Dept. of Biochemistry & Molecular Biology
School of Life Sciences
Pondicherry University,
Pondicherry-605 014, India
Email: ppmathur@gmail.com

In recent years, many studies have reported the adverse effects of various environmental toxicants on reproductive health in humans and experimental animals. Among the various chemicals affecting male fertility, endocrine disruptors are of special concern because of their widespread usage. Extensive studies have been carried out in our laboratory using rat as experimental model to investigate the impact of various environmental contaminants on testis and to elucidate the molecular mechanism(s) underlying their effects. The animals were exposed to lindane, methoxychlor, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, nonylphenol and bisphenol A at various doses and duration to assess the dose-dependent effects on testicular antioxidant system. Doses were selected well below the reported LD₅₀ for the respective compounds. The animals were weighed, sacrificed, and epididymides and testes were dissected out. Sperm collected from the cauda region of the epididymis were used for the assessment of count, motility and viability. The levels of stress proteins (heat shock proteins and clusterin), activities of antioxidant enzymes, generation of hydrogen peroxide and lipid peroxidation levels were evaluated in testes. Also the levels of steroidogenic acute regulatory protein (StAR), androgen binding protein (ABP) and the activities of steroidogenic enzymes (3 β -hydroxysteroid dehydrogenase and 17 β -hydroxysteroid dehydrogenase) were evaluated. The levels of apoptosis-related proteins were evaluated to assess sequential induction of apoptosis. A dose-dependent decrease in sperm concentration and motility were observed following exposure to several contaminants. Significant decline in the activities of superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase along with an increase in lipid peroxidation were also observed at different exposure levels. Further, evaluation of apoptotic parameters along with histological assessment of testis following toxicant exposure clearly indicated extensive germ cell damage. In conclusion, endocrine disruptors impair male reproductive functions by inducing oxidative stress, inhibiting the steroidogenic pathway and induction of apoptosis in testis.

7. Ameliorative Potential of *Curcuma Aromatica* Leaf Extract in Hepato-renal Distress Induced by Arsenic in *Rattus Norvegicus*, a Mammalian Species

Prabhu N. Saxena

Toxicology Laboratory, Department of Zoology,
School of Life Sciences, Khandari Campus,
Dr. B.R. Ambedkar University, Agra
prof_pnsaxena@yahoo.com dr_pnsaxena@yahoo.co.in

Key words: *Rattus norvegicus*, *arsenic trioxide*, *hepato-renal functions*, *Curcuma aromatica*, *ameliorative potential*

Arsenic, a metalloid belonging to Vth group of periodic table exerts hepatorenal distress when introduced orally in a mammalian species; *Rattus norvegicus* which has been adjudged on the basis of hepatorenal dysfunctioning based on both histoarchitectural and biochemical levels. The alterations in the levels of enzymes leading to hepatic functioning as well as renal functioning indicate arsenic induced changes in the marker enzymes viz. ALT, AST, ALP, ACP as well as in the levels of electrolytes viz. Na⁺, K⁺, Cl⁻, proteins besides hepatic-histoarchitectural and reno histophysiological and histomorphological changes alongwith morphometric changes in form of B/G ratio following acute and sub-acute arsenic trioxide intoxication after analyzing LD₅₀ determination. Modulation in the severity of arsenic trioxide induced changes has been found mitigated by *Curcuma aromatica* amelioration. Phytochemical analysis of the leaf extract has been found worthy to overcome arsenic induced stress.

8. *In Vitro* Systems for Understanding Neuro-Aids

Pankaj Seth and Bhuvaneshwari J

Cellular and Molecular Neuroscience, National Brain Research Center,
Manesar, Gurgaon, Haryana - 122 050, INDIA.
Email: pseth@nbrc.ac.in

Key Words : *HIV-1 infection*, *cell culture system*, *blood brain barrier*, *brain cells*, *Tat*, *gp-120*.

Human Immunodeficiency Virus-1 (HIV-1) infection of the central nervous system

(CNS) occurs quite early in HIV-1 pathogenesis and the presence of virus in human brain has been demonstrated. The virus present in the CNS may finally result in the neuronal loss causing severe motor, cognitive and behavioral disorders in full blown AIDS patients. Despite the high success rate of HAART, HIV-1 infection still remains an incurable disease. The poor understanding of the *in vivo* mechanism involved in the HIV-1 neuropathogenesis is the prime factor that is holding back the success rate clinicians would like to achieve. The *in vitro* systems developed using the various types of brain cells are capable of mimicking the *in vivo* environment of the brain and are helpful in studying the mechanism of HIV-1 neuropathogenesis. Here, we discuss the current understanding of HIV-1 neuropathogenesis, and some *in vitro* systems developed and used by several laboratories to study HIV-1 neuropathology and disease progression.

9. Respiratory Allergy: Basic Mechanism, Clinical Presentation and Allergen Specific Immunotherapy

S. N. Gaur

Prof. and Head, Dept. of Respiratory Medicine,
V. P. Chest Institute, University of Delhi,
Delhi, India-110007
Email: sngaur@yahoo.com

Key words: Allergen, Hypersensitivity, Allergen specific immunotherapy

The fully developed immune system of humans and most mammals is constituted by a variety of cells and tissues, whose functions are remarkably well integrated. A properly regulated immune response generally protects the host from pathogens and other environmental challenges through innate and acquired immune response. But in certain circumstances, it is impossible to eradicate an invading pathogen without destroying the infected cells. But inappropriate immune response to an antigen is harmful to the host and is termed as hypersensitivity or allergy. The term “allergy” is often used to designate a pathological condition resulting from hypersensitivity, particularly when the symptoms occur shortly after exposure. The term allergy was originally defined as altered reactivity to exogenous antigens and is now used synonymously with the word atopy.

Bronchial asthma and allergic rhinitis are the commonest respiratory allergic disease mediated through type-1 immune reaction. The imbalance of TH1 and TH2 cells are

responsible for increased IgE level and the release of immune mediators producing symptoms in the particular genetically predetermined target organ. The pharmacotherapy is quite effective in controlling the symptoms of these allergic diseases, but it has to be taken for prolong period or even lifelong. Withdrawal of medications leads to reappearance of symptoms in a short span of time. Other therapeutic modalities like allergens specific immunotherapy, which corrects the TH1 and TH2 imbalance and thus effects the natural course of allergic diseases is desired addition to the pharmacotherapy. Immunotherapy has also been found to prevent development of newer allergies and progression of patient of rhinitis to asthma. The subcutaneous immunotherapy with perennial and stepwise procedures of subcutaneous allergen injection is the standard procedure. However, efforts to simplify the method are going on and presently sublingual immunotherapy is providing comparable results and safety. The researches on the line are promising and we expect further advancement in this for of therapy.

10. The hypothalamo-pituitary-adrenal axis regulation during the perinatal period: the role of vasopressin

**Subodh Kumar Jain^{1,2}, János Varga², Barbara Klausz²,
Ottó Pintér², István Barna², Dóra Zelena²**

¹Department of Zoology, Dr. H.S. Gour University,
SAGAR-470003 M.P. India

²Institute of Experimental Medicine,
Hungarian Academy of Sciences, Budapest, Hungary

Stress may have profound consequences for the development influencing the lifetime vulnerability to diseases. For correct interpretation of the long-term consequences it is crucial to understand the immediate effects. As in adults the corticotrophin-releasing hormone is the main regulator of the stress-axis, while vasopressin (AVP) has just supporting role, we addressed the question if the situation is similar during the perinatal period.

AVP producing and deficient (AVP-) Brattleboro rat pups were used. In 10-day-old pups the 24h maternal separation induced a remarkable corticosterone elevation in both genotypes without adrenocorticotropin (ACTH) increase in AVP- rats. As the time-course of ACTH and corticosterone are different we examined the 1-4-12-24h separation period, too, with similar result (no ACTH elevation in AVP- with remarkable corticosterone increase). Maternal separation is a special stimulus, while hypnorm (fentanyl)-induced ACTH

rise also failed in the absence of AVP without changes in corticosterone elevation. The corticosterone binding globulin concentration could influence the free corticosterone concentration, and indeed AVP- pups had higher levels. Altered sensitivity of the adrenal gland might also explain the findings, therefore we examined adrenal secretion in vivo with exogenous ACTH administration, and AVP- pups had a bit higher sensitivity.

During the postnatal period AVP seems to be the main secretagogue of the hypophyseal ACTH. The discrepant ACTH and corticosterone secretion is not due to the different time-course of the two hormones and just partly explained by enhanced corticosterone binding globulin concentration and enhanced adrenal gland sensitivity. Therefore we assume that there are alternative secretagogues of glucocorticoid release.

11. Phytochemicals as cure of worm infections in traditional medicine systems

V. Tandon*, A. K. Yadav, B. Roy and B. Das

Department of Zoology,
North-Eastern Hill University,
Shillong 793022, Meghalaya, India
E-mail: tandonveena@hotmail.com

Keywords: *Anthelmintic plants, traditional medicine, phytochemicals, intestinal helminths, northeast India.*

Helminthic infections continue to be the major health hazard to the people, especially those living in tropical developing countries. Although these infections do not cause significant morbidity and mortality when compared with many other parasitic infections, they do cause substantial, but often less measurable effects. For example, infections with gastrointestinal helminths often lead to malabsorption, diarrhoea, anaemia and other states of poor health, particularly in infants and school-age children. Though there are several synthetic anthelmintics available at the present time against these parasites, the fact remains that a large proportion of the world's population still does not have access to, or cannot afford to pay for modern medicines, particularly in remote rural areas in poor countries. Besides, the continued usage of current anthelmintic drugs is also posing a major problem of drug resistance in several parasite species. There is thus an urgent need for newer and inexpensive drugs that are able to act for longer periods before resistance sets in. In this context,

traditional medicines, based largely on medicinal plants, offer a major and accessible source of health care to people living in developing countries.

For much of our past history, forages, plant parts or extracts have been used to combat worm infections, and in many parts of the world natural products are still in use as herbal remedies. In recent years, there has been a rapid increase in new reports of the antiparasitic activity of natural products, both from scientific studies and from studies into the traditional uses of these products for treating diseases. Thus, plant/herbal based medicines are gaining a lot of attention and forming an integral part of the primary health care system the world over. Reports from around the world include an exhaustive list of plants that have been found to possess significant activity against helminth parasites. In several of such studies based on traditional use information, the crude extract of the plant has been tested for its putative anthelmintic properties, while in others the active ingredients responsible for the activity have also been identified and characterized to establish their mode of action.

North-east India is known for its vast resources of medicinal plants. There is a strong tradition of using plant-based medicines in alternate system of medicine that is widely practiced among the native societies of the region and continues to thrive based on oral and empirical traditions. However, in respect of many phytochemicals, their medicinal potential and efficacy- as vermifugal- has been scientifically validated.

This paper reviews the present state of knowledge regarding the use of some traditional medicinal plants in curing worm infections in different regions of the world, with particular reference to north-east India.

12. Sequence characterization of Mitochondrial *COII* gene fragment in three species of termites (ISOPTERA: TERMITIDAE)

**Vijay Lakshmi Sharma ², Mandakini Singla², Jaspreet Gaba²,
Neha Goyal², Ranbir Chander Sobti¹**

¹Department of Biotechnology, Panjab University, Chandigarh, 160014, India;

²Department of Zoology, Panjab University, Chandigarh, 160014, India.

Key words: *COII*, *Microtermes*, *transitions*, *Phylogenetic analysis*

A phylogenetic analysis of three species of termites belonging to the genus *Microtermes*

(Isoptera, Termitidae), based on partial sequence of cytochrome oxidase II (*COII*), is presented. The mitochondrial gene sequences of 780 bp encoding cytochrome oxidase subunit II (*COII*) were determined for three *Microtermes* species from North-Western India. Partial *COII* gene fragments of the species *M. unicolor*, *M. mycophagus* and *M. obesi* were amplified by using specific primers. The observed sequence differences showed a strong bias towards transitions and significantly high percentage of A + T base composition content ranging from 59.5% to 61.3% was found. Sequences were aligned by using the Basic Local Alignment Search Tool (BLAST) with the sequences of same or related genera retrieved from the nucleotide database of National Centre for Biotechnology Information (NCBI). Phylogenetic analysis revealed the grouping of *Microtermes* and the termites of outgroup taxa into two separate clusters.

13. Identification and characterization of bioactive substances in the carotid labyrinth and pseudobranchial neurosecretory cells in an Indian catfish, *Clarias batrachus*

A Gopesh^a, M. Sengar^a, D Zaccone^b, G Lanteri^c, F Marino^c, E Ciriaco^d

^aDepartment of Zoology, University of Allahabad,
Allahabad, India

^bDepartment of Animal Biology and Marine Ecology,
Faculty of Science, University of Messina, I- 98166 Messina, Italy

^cUnit of Veterinary Pathology, Dept. Sanità Pubblica Veterinaria,
University of Messina, Polo Universitario dell' Annunziata,
I-98168 Messina, Italy

^dDepartment MO.BI.FI.PA, Faculty of Veterinary Medicine,
Polo Universitario dell' Annunziata,
I-98168 Messina, Italy

The carotid labyrinth- a chemosensory organ present uniformly in all the catfishes, is homologous to the carotid body of higher vertebrates. A new system of neurosecretion has been found to be located in the gill region of catfishes in close association with the carotid labyrinth- the pseudobranchial neurosecretory system. The system falls in the category of diffuse neuroendocrine system (DNES), known to exist in different parts of the vertebrate body, regulating various functions by paracrine and/or autocrine mode of action and cells belonging to this system can be likened with the 'Paraneurons', a concept introduced into the domain of endocrine system during late eighties. In an attempt to identify and characterize

the bio-active substances associated with these cells and also to understand the functional significance of this system in the biology of these economically and taxonomically important group of fishes, present investigation was undertaken on an Indian catfish, *Clarias batrachus*, using confocal immunofluorescence technique. The innervation reflects a high level of correlation of neurotransmitters and neuropeptides even at a level of a lower vertebrate like fish. The findings are reported and the homology of carotid labyrinth and associated neurosecretory cells of catfish with that of carotid body and glomus cells of mammals, in the light of present findings, have been discussed.

14. An Approach to Tapeworm Study

A.K. Srivastav

Head Zoology Department
B.B. (P.G.) College (Bundelkhand University)
Jhansi (U.P.) India.

Helminth constitute a very important group of animals which are harmful to its host. The parasitic platyhelminthes arose from free-living progenitors. Thus the endoparasitic forms resulted from those free-living forms that were accidentally introduced into the host.

The change in structure and physiology are the result of continuous mutation e.g.

- 1- Alimentary canal degenerate in flukes & absent in tape worms.
- 2- N. System degenerate
- 3- Dev. of hooks/suckers for attachment
- 4- Well developed Reproductive system
- 5- Complex life cycle (1 or more intermediate hosts)

There are acoelomates showing bilateral symmetry, they are either unsegmented or segmented.

Taxonomy the science of discovering and naming new species. T.N. Khosho ten years ago said that all wisdom begins by calling all living and nonliving things by their proper names.

More serious is the declining number of taxonomist at the time when more are required. Nearly 60,000 species of vertebrates are known and only 5,000 species of cestodes have been described, it shows that an immense number of species is yet to be found. This is fruitful area of research.

Unfortunately a few Zoologists are working on the taxonomy of cestoes whole heartedly in the county.

This field was totally untouched by any workers in Bundelkhand.

The Bundelkhand is the land of great patriot Maha Rani Laxmi Bai of Jhansi, National poet Sri, Mathili Saran Gupt of Chirgaon, Storey Writer Sri Brindaban Lal Veram of Jhansi and Aalha-udal of Mahoba etc.

They inspired me and my colleges to work on this field.

15. Radiation Protection by Herbs and Plants

Ashok Kumar¹ and Yoshihisa Matsumoto²

¹Radiation and Cancer Biology Laboratory,
Centre for Advanced Study in Zoology,
University of Rajasthan, Jaipur,

²Research Laboratory for Nuclear Reactors,
Tokyo Institute of Technology,
Tokyo, Japan

A major source of energy essential for biological processes is in the form of radiant energy of radiation, which affects living materials in variety of ways. Most of these radiations are harmless and are essential for the life but certain types of high energy of ionizing radiations are known to produce deleterious effects in all forms of life from relatively simple unicellular animals to the higher organisms. The greatest exposure of the general population comes from natural terrestrial radiation. The next most significant source is the use of X-rays and radiopharmaceuticals in various diagnostic and therapeutic procedures

The development of effective radioprotectors and radiorecovery drugs is of great importance in view of their potential application during both planned radiation exposure (e.g. radiotherapy) and unplanned radiation exposure (e.g. in the nuclear industry, natural background radiation emanating from the earth or other sources). These drugs are also

likely to be useful in nuclear warfare to provide protection to personnel. Over the past 50 years, research in the development of radioprotectors world-wide has focused on screening a plethora of chemical and biological compounds.

Numerous drugs of both synthetic and natural origin have been tested in both *in vitro* and *in vivo* models, and in human clinical trials to mitigate injuries caused by ionizing radiation exposure in the sublethal to supralethal range. Combinations of agents have also been tested with little success. The development of radioprotective agents has been the subject of intense research in view of their potential for use within a radiation environment, such as space exploration, radiotherapy and even nuclear war. However, no ideal, safe synthetic radioprotectors are available to date, so the search for alternative sources, including plants, has been on going for several decades.

Radiobiologists are now evaluating the non-toxic herbal preparations for radiation protection. Plants extracts eliciting radioprotective efficacy contain a plethora of compounds including antioxidants, immunostimulants, cell proliferation stimulators, anti-inflammatory and anti-microbial agents, some of which may act in isolation as well as in combination with other constituents from the same plant. They may also argue the efficacy of compounds present in other plant species, to provide protection against radiation induced damage. A number of medicinal plants evaluated for their radioprotective efficacy have shown protective effects against the damaging effects of ionizing radiation.

16. Arsenic menace in ground water in West Bengal and mitigation activities.

R. C. Srivastava

Prof. and Head, Department of Environmental Sanitation & Sanitary Engineering,
All India Institute of Hygiene & Public Health, Kolkata - 700073

Arsenic contamination in ground water is a global problem with highly disastrous long term health effects of a large population. Arsenic occurs in sedimentary rocks as pyrites and arsenopyrites – FeAsS , realgar – As_4S_4 , orpiment – As_2S_3 , copper arsenite – CuAsNO_3 and arsenic trioxide – As_2O_3 . However, it occurs mainly as calcium and potassium salts of arsenate or arsenite in the oxygenated / deoxygenated ground water respectively due to leaching of geological materials / dissolution of arsenic minerals and reduction or chemical transformation of minerals.

Ground water arsenic contamination in West Bengal was officially confirmed in July 1983 by a dermatologist of School of Tropical Medicine, Kolkata to an outdoor patient of Baruipur in the district of south 24 parganas. Subsequent investigations revealed its presence in water of different tube wells in 79 blocks / 2600 villages of 9 districts in West Bengal. So far 1,32,000 water supply sources have been tested in West Bengal for arsenic contamination and 3,000 arsenic treatment units have been installed in the arsenic affected areas. The total population at risk in the 9 districts of West Bengal is 12 millions and 16 millions in urban and rural areas respectively, however only 8500 people have been reported to have clinical symptoms of arsenicosis diseases.

The impact of arsenic exposure to human being starts with dermatological symptoms like spotted or diffused melanosis or leucomelanosis, however, chronic toxicity may be reflected in the form of skin lesions, keratosis, and apart from weakness the patients have appetite and weight loss and anaemia, leading to multi organ failure.

The four main technologies available for removal of arsenic from ground water are – i) co-precipitation and filtration, ii) adsorption, iii) ion exchange and iv) membrane technology. Co-precipitation with metal (aluminium or iron) salts and lime followed by filtration is an established method of arsenic removal from water. Iron salts have been reported to perform well over the aluminium salts. Based on this technology tube well attached, community arsenic treatment plants have been designed by different agencies and installed at various arsenic affected villages for supply of safe drinking water.

Several adsorption media like activated alumina, activated carbon iron and manganese coated sand etc. have been reported to remove arsenic from water. Activated alumina has a good sorptive surface and is popularly used as columns for the adsorption of arsenic from ground water. When the column becomes saturated with arsenic, regeneration of the saturated column has to be carried out by 4% caustic soda followed by pH correction. A number of such arsenic treatment plants have been installed attached with hand pump tube wells for the community at various arsenic affected areas of West Bengal.

Ion Exchange technology is similar to that of adsorption technology except that the media is synthetic resin, and when the resin is exhausted, it needs to be regenerated. The membrane (reverse osmosis) technology, nano-filtration and electro dialysis are also effective in arsenic removal but their application is restricted due to highly technical maintenance and cost.

Safe disposal of arsenic bearing sludge produced from arsenic treatment units pose a serious environmental problem. Considerable amount of sludge is produced from plants

based on co-precipitation and filtration technology. Detailed investigations carried out have focused mainly the following two alternatives for disposal of sludge - i) mixing and burning with clay during brick manufacture and ii) mixing with cement in the manufacture of concrete cubes. In both the options the ratio of sludge and clay or sludge and cement have to be optimized to check leaching of arsenic into the environment (TCLP) beyond permissible limit and strength of bricks or concrete cubes thus manufactured may not be affected.

17. Leading to Cure Heart Diseases

Dr. Rajeev Gupta*, **Prof. Santosh Kumar****, **Dr. Rajendra Gupta*****,
Dr. Sudha Gupta ****, **DrManju Tembhre *******

Associate Professor Cardiology, Gandhi Medical College, Cardiac Science Centre,
Bhopal, M.P. India – 462001.

**Professor & Former Vice Chancellor, Doctor Hari Singh Gour University, Sagar (Now Central University) & Director International Institute of Waste management, Bhopal.

*** Medical Officer, KNK Hospital, Bhopal, M.P.

**** Medical Officer, Kamla Nehru Hospital, Bhopal, M.P.

*****Principal, HardaramGirls College, Bhopal.

Correspondance author- E mail.santosh9kumar@gmail.com

Key words: *Biosimilars, Protein kinases as therapeutic target, Gene libraries, Gene therapy, stem cell*

During the last millennium both biotechnological and technological advancements made a great revolution in the diagnosis and treatment of many heart diseases. Many medicines prepared by recombination DNA technology made a paradigmatic shift in the therapy of myocardial infarction (heart attack). These medicines if injected timely will help in the salvage of ischemic myocardium. The important discoveries which played an important role in the development of rDNA technology have been dealt briefly. Discovery of locus on chromosome 7q³ for Wolff-Parkinson syndrome and hypertrophy cardiomyopathy due to exon 13 located on chromosome14 is due to molecular genetics in cardiology.

In the present review, the researches which still are in experimental stages like the developments of biosimilars, protein kinases as therapeutic target, silencing the mRNA to code abnormal protein by antisense RNA and stem cell therapy are discussed in detail. These researches would take a shape and would be as common like by-pass surgery, angioplasty, artificial pace maker or automatic defibrillator verter in early 21st century.

18. Cope-up with Advanced Processing Technologies to Sustain Dairy Industry

J.N. Khedkar and D.M. Choudhari

Department of Animal Science and Dairy Science,
Post Graduate Institute, Mahatma Phule Krishi Vidayapeeth,
Rahuri – 413 722
Dist. Ahmednagar (M.S.) India
e-mail: jaihind_khedkar@rediffmail.com

Key words: *Milk, Processing, Sustainable, Technology*

Since, last 13 years India is the leading milk producer in the world. This has been basically achieved through a combination of constructive policies and institutional network that has supported to the millions of rural milk producer, through small scale dairy farming. More than 12 million small scale milk producers linked to urban markets, provide them a stable source of income. Because of this change in milk availabilities, market economy, globalization and the entry of the private sector in dairy industry is witnessed. The value addition and variety in availability of milk products are on every body's agenda. There is an increasing demand for new milk products and processing technology. The main reasons are an increase in disposable incomes, changes in consumer concerns and participation on nutritional quality and safety, arrival of foreign brands, increasing popularity of satellite/cable media and availability of new technologies and functional ingredients. Increased market demand and the accompanying value addition present a great opportunity to take up the production of dairy products on industrial scale by application of newly emerging technologies in a cost effective. Use of high pressure technology is most effective for inactivation of microorganism and extension of shelf-life of milk. Bactofugation is process that enhances the keeping quality of milk and milk product through removal of bacteria. Use of microwave processing in milk industry there is increasing demands for newer types of convenience food having more nutritional value and sensory quality for products.

Moreover the use of these (High pressure technology, Bactofugation, Aseptic packaging, Membrane technology, Hurdle technology, Microwave processing, Pulsed electric field, Irradiation, High intensity light and Infrared treatment) emerging technologies improves not only physico-chemical, nutritional and sensory qualities, but also the microbiologically safe milk products. Therefore today's need is to cope-up with technology advancement and demand of time.

19. Arsenic Induced Male Reproductive Toxicity and it's Amelioration

Madhu Kumar and Garima Sharma

Cell and Molecular Biology lab,
Department of Zoology,
Centre for Advanced studies,
University of Rajasthan, Jaipur. India.

Arsenic is the important global environmental toxicant for man due to it's mutagenic, teratogenic, carcinogenic effects. Man's continuous activities mediate the efflux of this element into the environment and humans are unavoidably exposed to this toxic metalloid primarily through air, food and water. Available literature of arsenic toxicity on male reproduction has been reviewed (1964-2010). Arsenic forms strong complexes with various sulfhydryl groups and exert its toxicity by generating reactive oxygen species (ROS) leading to oxidative damage which is a major cause of male reproductive failure. Arsenic induces male infertility by germ cell degeneration, inhibit androgen production along with abnormal sperms and reduction in gene expression level in testosterone synthesis.

Therapeutical properties of medicinal plants have always been considered a healthy source of life for all people. Protective effects of leaves extract of *Triticum aestivum* (wheatgrass) and root extract of *Chlorophytum borivilianum* was observed against impaired spermatogenesis in arsenic treated Swiss albino mice. Both extract exhibited good free radical scavenging activity as observed by DPPH assay. The biochemical estimation of LPO, GSH, cholesterol, protein, acid phosphatase, alkaline phosphatase were done in testis and modulatory activity was observed by both extracts in different parameters.

20. Developmental neurotoxicity of pyrethroids: Structural and functional retardation of cerebellar development

Nisha Patro¹, Meghna Saxena¹, Kamendra Kumar¹ and Ishan K. Patro^{1,2}

¹School of Studies in Neuroscience, Jiwaji University, Gwalior 474011

²School of Studies in Zoology, Jiwaji University, Gwalior 474011

There has been an exponential increase in the use of pyrethroids as residential and agricultural insecticides, thus developmental neurotoxicity of pyrethroid insecticides has

become a subject of concern. Developing CNS is more vulnerable to injury and exposure to environmental hazards in utero or during early phase of development when various parts of the CNS develop at different stages during development through proliferation, migration, differentiation and synaptogenesis of different cell types. Postnatal exposure to deltamethrin, a class II synthetic pyrethroid, has been found to significantly influence the proliferation and migration of postnatally generated granule cells and induce apoptosis of their progenitors resulting in neurodegenerative changes via upregulation of S100 α affecting the dendritogenesis of the Purkinje neurons and finally leading to reduced motor coordination.

21. Preventive effect of curcumin on lindane induced histological changes and oxidative stress in liver and kidney of male wistar rats

Poonam Sharma¹ Rambir Singh² Neelam Yadav¹

¹Department of Zoology, Institute of Basic Sciences,
Bundelkhand University, Kanpur Road,
Jhansi- 284128 INDIA

²Department of Biomedical Sciences,
Bundelkhand University, Kanpur Road,
Jhansi- 284128 INDIA

Key words: *Lindane, curcumin, oxidative stress, histology*

The aim of study was to investigate the possible protective effect of curcumin on lindane induced hepatotoxicity and nephrotoxicity using biochemical and histological changes. Adult male wistar rats were randomly divided into seven groups of six rats each. The control group-I received DMSO; animals in exposure group-II and III for 14 and 28 days received lindane (30mg/kgbw) orally in DMSO; pretreatment group-IV received a 14 day of curcumin before administration of lindane while animal in post treatment group-V received a 14 day curcumin following administration of lindane. In combination group-VI both lindane and curcumin administered for 14 days however in group VII lindane was allowed to metabolized for 14 days after administration. Lipid peroxidation, antioxidant enzymes activity and histological findings in liver and kidney were investigated.

Administration of lindane to rats in exposure groups increased liver and kidney lipid peroxidation (P<0.001) while decreased GST, CAT, GSH and SOD activity (P<0.001) as compared to control group. Pre-treatment with curcumin restored GST (P<0.01), lipid

peroxidation, GSH, SOD and catalase concentrations ($P < 0.001$), its post-treatment caused normalization in both GST, GSH ($P > 0.05$) lipid peroxidation, catalase ($P < 0.001$) and SOD levels ($P < 0.01$) in liver as compared to exposure group. During pre and post treatment all parameters were restored ($P < 0.001$) in kidney as compare to exposure groups. Curcumin co-administered with lindane did not show any ameliorating effect. Lindane hepatotoxicity and nephrotoxicity was observed after 14 days of metabolism indicating its persistence. The histological examination of liver of rats treated with lindane revealed the vacuolization, fatty changes in parenchyma, congestion in central and portal veins. Kidney histologic observation showed degenerative and necrotic changes in proximal convoluted tubules, detachment of necrosed lining cells, vascular congestion and tubular dilation as compared to control.

The results from this experimental study suggest that the curcumin have a possible protective effect against lindane induced hepatotoxicity and nephrotoxicity in pre and post treatment regimens.

22. Innovative Approaches in Animal Sciences and Veterinary Education and Research In India

(Dr.) M.P.Yadav

Ex Director, Indian Veterinary Research Institute,
Izatnagar

Higher education and research are complimentary to each other. A strong research agenda, HR excellence and enabling relevant infrastructure create a befitting environment in the universities and institutes for imparting innovative teaching, both for theory as well as practical hands on training to the students for shaping them as future researches, teachers and entrepreneurs of par excellence. The Nobel laureate's laboratories are a great attraction for research students as there the students find best combinations of scholastic talent and research manifesto. To address the unemployment and brain drain problems faced by India, there is a need to produce entrepreneurs to create jobs rather than to seek jobs. This will require experiential learning facilities in the universities, institutions and colleges for hands on training along with 6 months attachment with relevant industries and institutions for gaining experiences of working and learning under real life situations. Veterinary and animal sciences students should be attached with dairy plants; livestock, poultry and fish farms; polyclinics, slaughter houses and various integrated farming systems.

Presently, veterinary and animal science education in India is at cross roads due to lack of clear cut direction as a result of multiple controls. Being in the concurrent list, veterinary education is a State subject. While the States have the authority to open new colleges and universities, Veterinary Council of India (VCI) established by an Act of Parliament in 1984, regulates the educational standards at UG level. Contrary to UGC, no financial assistance is provided by the VCI to Veterinary and Animal Science colleges. The funding to Veterinary Colleges/Universities is provided by the respective State governments and by the ICAR in the form of grants for strengthening and development. The veterinary and animal science research is looked after by about 45 colleges which are either part of State Agricultural Universities (SAUs) or Veterinary and Animal Science / conventional Universities. Baring a few Veterinary Colleges established under private sector in recent years 2003 onwards, majority are under public sector. As per Planning Commission, if India is to become a developed nation, our economy should grow by 9 to 10%. To accomplish this, agriculture should grow minimum by 4%. However, the growth in agriculture has been less than 2% in the past decade. To achieve 4% growth in agriculture, the livestock and fisheries which contribute up to 30% of the agriculture GDP and are growing comparatively at a higher rate varying from 4.5% for dairying to 10% for fisheries, should have a composite growth of 9 to 10%. As such, there is a need to strengthen veterinary and animal science education and research on priority. In want of qualified personnel, over 40% of faculty positions are lying vacant in the veterinary colleges all over the country due to funding crunch and neglect by the concerned governments. Public- Private Partnership in veterinary education is the need of hour and should be adopted on trial basis.

For strengthening of competent faculty in veterinary & animal science and fishery colleges / universities, innovative planning is required to attract and retain meritorious UG and PG students in teaching and research. To accomplish this, the students after completion of BVSc & AH and post-graduation, should be involved in teaching as Teaching Associates/ Graduate Assistants in the colleges and encouraged for higher education and research. Provision of Post-Doctoral Research Fellowship and Junior and Senior Resident schemes with attractive remuneration may also be considered in this regard. Other incentives including higher increments for obtaining Masters and Doctoral degrees will attract meritorious students to opt for a career in teaching and research. These provisions will help in circumventing the acute shortage of faculty in Veterinary colleges in the country.

In view of the concern of global warming and climate change, there is need for including alternative ethno- veterinary medicine inclusive of herbal, Ayurvedic and

Homeopathic drugs which are eco-friendly and cost effective, in the curriculum of veterinary graduates. Similarly, while IPR, SPS measures, biosecurity, MRL, food hygiene, food safety and zoo animal medicine need more emphasis in the syllabi; risk analysis, organic animal husbandry, climate change, shelter management, cloning, stem cell require attention both for research and education. Priority research areas of immediate concern, namely immunomodulation for better vaccines; cost effective thermo stable, edible marker vaccines; biosensor and DNA chip based diagnostics, pen side diagnostic kits and DIVA tests; breeding for disease resistance, marker assisted selection and sexing of sperms for reduction of livestock population by producing more females; antioxidants, designer food from livestock such as low cholesterol milk, ghee, eggs and meat; PUFA , omega 3 and CLA rich milk; reduction in methane production by ruminants, by pass protein and fats in ruminant feeding; residue analysis and cardiovascular diseases in pets, require immediate attention of the concerned institutions and policy makers. State of the art facilities for GLP, GMP, and pharmaco-vigilance, forensic, BSL-3 and BSL-4 laboratories need to be created to achieve international competitiveness for trade in livestock and livestock products.

23. SDS-PAGE analysis of corpuscles of Stannius secretion in the freshwater fish, *Notopterus notopterus*

Pruthvi raj C.B. & R.S.Kulkarni

Fish Endocrinology Research Laboratory
Department of Studies in Zoology,
Gulbarga University Gulbarga-585 106
E-mail:rskgug@gmail.com/pcbfish@rediffmail.com

Key words: *SDS-PAGE*, *Notopterus notopterus*, *hypocalcin*

The SDS-PAGE analysis of corpuscles of Stannius extract was carried out in the freshwater fish, *Notopterus notopterus*. Pair of corpuscles of Stannius is present embedded in the posterior portion of the kidney. The results indicate that the SDS-PAGE application of CS tissue homogenate indicates that the products of CS of *Notopterus notopterus* is a protein having molecular weight 41 kDa which might be a hypocalcemic hormone reported in other fishes and can be called as hypocalcin.

24. Antidiabetic and toxicological evaluation of *Momordica dioica* fruit extracts in diabetic rats

Rambir Singh^{1*} Poonam Sharma²

¹Institute of Biomedical Sciences,
Bundelkhand University,
Kanpur Road, Jhansi- 284128, INDIA

²Department of Zoology,
Institute of Basic Sciences,
Bundelkhand University, Kanpur Road,
Jhansi- 284128, INDIA

* Presenting author: sehrawat_r@yahoo.com

Key words : *Momordica dioica*, *Diabetes*, *Alloxan*, *wistar rats*.

Antidiabetic effect of *Momordica dioica* fruit extracts was evaluated in alloxan induced diabetic wistar rats. Aqueous extract of *Momordica dioica* (AEMD) showed maximum fall (52.8%) in 0 to 1 hour fasting blood glucose (FBG) in glucose tolerance test (GTT) compared to hexane (39%), chloroform (37.2%) and ethanol (37.7%) extract in normal healthy rats. Since AEMD exhibited maximum hypoglycaemic activity as compared to other extracts, it was further studied for antidiabetic effect in diabetic rats. The oral effective dose (ED) of AMED was 200 mg/kg body weight, which produced a fall of 57.5% ($p < 0.001$) in diabetic rats. 200 mg/kg body weight AMED once daily for 21 days reduced the elevated blood glucose (BG) by 64.8% ($p < 0.001$), post prandial glucose (PPG) by 76.9% ($p < 0.001$) and glycosylated hemoglobin(HbA1c) by 37.6% ($p < 0.001$). Urea, creatinine and urinary sugar levels were also reduced after AEMD treatment in diabetic rats. Toxicological evaluation of AEMD indicated that it was non hepto and nephro toxic. Lethal dose (LD-50) of AEMD was above 3g/kg bw i.e. 15 times of ED indicating high margin of safety. Our study suggests possible use of aqueous extract of fruits of *M. dioica* for the management of diabetes mellitus.

25. Metabolism and Utilization of Pigments Molecules in Designing feeds for Freshwater Ornamental fish and Crustaceans Culture.

Umesh C.Goswami

Department of Zoology, (DST-FIST- Govt. of India)
& UGC-SAP Sponsored Department.
Centre for Aquaculture & Aquatic Resources Monitoring Centre,
Biodiversity and Bioinformatics Centre
North East Aquaculture Network :e-mail-ucgoswami@rediffmail.com
Gauhati University, Guwahati - 781014, Assam, India

Key words: *Carotenoids, Vitamin A, Pigmentation, Ornamental fish*

Freshwater fish and different species of prawns and crabs contains variety of carotenoids, the pigment molecules in their body showing the brilliant colouration in fins, scales, muscle gonads and carapaces. Carotenoids such as astaxanthin, β - carotene, cryptoxanthin, lutein, derivatives of β - carotene, canthaxanthin, zeaxanthin etc are the predominant molecules available in their bodies. The metabolic transformation of the molecules into vitamin A through either central or terminal cleavage has been shown after taking β - carotene, lutein and cryptoxanthin. The different metabolites and their ultimate conversion into either retinol or dehydroretinol have been shown. In the present communication, different types of carotenoids present, the problems associated with the designing of utilization of carotenoids as feed additives, understanding the mechanism of absorption, and sources of different pigments for the farmers and entrepreneurs have been discussed.

26. An Apt solution for the affrighting vector borne diseases in India

USN Murty

Scientist G/Head Biology Division
Indian Institute of Chemical Technology (CSIR)
Hyderabad 500607 India

Efforts to melt-off vector-borne diseases can affirm in considerable health gains and mitigate a crucial constraint on development in poor regions. Many of these diseases,

particularly dengue fever, Japanese Encephalitis (JE) and malaria now occur in epidemic form almost on an annual basis causing considerable morbidity and mortality. Over the past decade, technological advances in measuring health have improved the understanding of the importance of these diseases. At any rate, the stateliness of any technology would be absolutely acknowledged when it liberates the end-users from the real world problems. Information technology has been proving this pragmatism in vector biology, by well-disposed tools and applications towards 'Vector control and management' endorsed by the approaches of Biology Division, IICT. The peninsula is perimetered with a variety of natural and social traits attesting the prevalence of vector borne diseases. Environmental and health issues, especially cohered to mosquitoes are always complex problems requiring information from many sources. And not only just the requirements, but also the processing and presentation of such information in an enhanced way to the community, constitutes the major target. The ultimate goal thus became the stipulation of support for knowledge discovery applications through data mining and bioinformatics tools. Our affirmation is marched through updates on the outbreak information tagged along with the development of web applications and databases, decision support systems etc... on major vector borne diseases like Malaria (Database to control Malaria), Dengue (DDSS), Filariasis (FMVS, VB Classif), Japanese Encephalitis (JEBNET) etc... The nutshell of tools developed such a way is launched through the website dedicated for the purpose (<http://iictenvis.nic.in>), under the plan programme of Government of India named ENVIS (Environmental Information System), themed on 'Vector borne diseases' which is exclusively dedicated for dissemination on the disease spectrum . The essence of its objective lies in accepting the challenge to play an active role in the local and global networks, through transfer of technology (http://www.iictindia.org/IICT_WEB/Filariasis.htm), for the receipt of the solutions necessary in the disease endemic zones. Furthering the utilities with advancements in the world of communication to keep on pace with the springing up trepidations in vector control, makes the principal deed at this instant.

27. Blood Samples of Sheep Vaccinated with Anthrax Spore Vaccine – FTIR Spectral Study and Statistical Analysis

A. Rajalakshmi¹, T. S. Renugadevi² and S. Gunasekaran³

¹ Sri Chandrasekharendra Saraswathi Viswa Maha Vidyalaya,
Enathur, Kanchipuram- 636 011, Tamilnadu.

² P. G Dept. of Physics, Women's Christian College, Chennai.

³ Registrar, Periyar University, Salem.
E-mail : rajspectrum@gmail.com

Keywords: *Spectroscopy, anthrax spore vaccine, antibody, ELISA.*

The application of spectroscopy for the study of biomedical compounds has increased tremendously in recent years. Blood is the chief circulatory medium in human and in animal body which can be subjected to non-invasive technique for testing. Pre and post vaccinated blood samples of sheep vaccinated with anthrax spore vaccine was studied using spectrometer. The internal standards among the application peaks were calculated. There was a marked difference in the absorption levels of the pre and post vaccinated blood samples. The resultant variation was attributed to the chemical changes happened in the animal blood due to the vaccination. Spectral study can emerge as an alternate and cost effective test for screening the animal. In future this study can be extended and compared with other antibody tests like ELISA (Enzyme-Linked Immuno Sorbent Assay).

28. Soil fauna development and diversity at mine sites: a case study of Kathara coalmine area, Jharkhand

Amita Hembrom* and Braj Kishore Sinha**

*Research Scholar, Deptt. of Zoology,
Ranchi University, Ranchi, Jharkhand,

**Department of Zoology
S S M College, Ranchi University, Ranchi, 834 008 Jharkhand
E mail: b_kishoresinha@yahoo.co.in

Keywords : *Overburden dumps, meso-arthropods, Berlase-Tullgren funnel, taxonomic diversity, r-select, ecesis*

Reclaimed over burden dumps (OBDs) are natural laboratory, where ecological

functions can be observed and understood. A study of reclaimed OBDs of Kathara coalmine area of ages varying from 5 years to 60 years were carried out from 2006-2009. Soil meso arthropods of varying sizes from 0.2mm to 10mm were collected by standardized soil corer from randomised quadrates of 1meter x 1meter. Soil samples were analysed for biotic and abiotic information. The products of the Berlese-Tullgren funnel were subjected to taxonomic and statistical analysis. Among the biotic products, Collembola and Acari dominated with higher Shannon diversity index and higher biomass than other soil arthropods like Diplura, Protura, Pseudoscorpion, Enchytraeids etc. Acari dominated by having their presence by more than 25 per cent followed by collembola up to 25 per cent. Further, present paper focuses on the taxonomic diversity of collembola as they are rudrals and withstand the adverse ecological conditions consequently supporting ecesis.

29. The absence of molecular clock during parallel evolution of Androgen binding proteins

Basant K. Tiwary

Centre for Bioinformatics,
Pondicherry University,
Puducherry-605 014

Key-words: *Parallel evolution, Molecular clock, Androgen receptor, Aromatase*

Molecular parallel evolution is characterized by coordinated substitutions of amino acids in two proteins. Aromatase (CYP19) and androgen receptor (AR) bind to androgen for performing their function and therefore, are under a common selective constraint. Majority of genes (proteins) do not follow global molecular clock but show some deviations in form of a local clock. AR and CYP19 do not show parallel evolution in form of common local molecular clock despite a strong parallel evolution in terms of evolutionary distances. It indicates that genes (proteins) under parallel evolution may not show a parallel local clock model in their evolutionary history.

30. Influence of Novel Exopolysaccharides Producing *Lactobacillus fermentum* Strain on Rheological and Sensory Attributes of Low-Fat Dahi

Behare, P. V*., Rameshwar, Singh¹., Shendurse, A. M.,
Kele, V. D. and Khedkar, C. D.

*Corresponding Author (pradip_behare@yahoo.com)

College of Dairy Technology, Udgir,

Latur, Maharashtra.

¹National Dairy Research Institute,

Karnal, Haryana.

Keywords: EPS, exopolysaccharides, low-fat, dahi, *Lactobacillus fermentum*

The investigation was undertaken to study effect of new indigenously isolated *Lactobacillus fermentum* strain on technological attributes of low-fat dahi. Several lactobacillus cultures were isolated from dahi and naturally soured milk samples, collected from different villages of Karnal District, Haryana. Initial screening for technotextural properties indicated only one strain of *Lactobacillus fermentum* V10 was promising and selected for further study. The strain was able to produce large capsules surrounding the cell surface and produced maximum quantity of polysaccharides in fermentation medium. The effect on technological properties of low-fat dahi found to be significantly improved for *Lactobacillus fermentum* V10 as compared to control dahi made by EPS⁺ *Lb. delbreuckii* subsp. *bulgaricus* NCDC 285 and EPS⁻ *Lb. delbreuckii* subsp. *bulgaricus* 09 cultures available for commercial use. Low fat dahi prepared by exopolysaccharides producing *Lactobacillus fermentum* V10 exhibited optimum acid production, lesser whey separation, higher viscosity, increased adhesiveness and stickiness values whereas decreased firmness and work of shear values as compared to control batches of dahi. The *Lactobacillus fermentum* V10 strain is recommended for commercial preparation of fat-free, reduced fat and low fat dahi.

31. Body growth characteristics of Holstein Friesian X Sahiwal crossbred (Frieswal) bulls

D.K. Mandal¹, S. K. Tiwari², A. Sharma², B. K. Roy²
and Mahesh Kumar¹

¹ Sr. Scientist, ² Research Associate

Project Directorate on Cattle (Indian Council of Agricultural Research),
P Box No. 17, Grass Farm Road, Meerut Cantt 250 001,
U P, India

Key words: *Body growth, average daily weight gain, Frieswal crossbred Bull, Season*

Knowledge on body weight and growth rate of animals and the factors that influence these is essential for monitoring the body development, designing of management practices, optimization of feeding schedule, ration calculation, drug dosage determination etc. Body weight records of 293 Frieswal (Holstein Friesian x Sahiwal; having 5/8 exotic inheritance) bull calves /bulls maintained at the Bull rearing Unit of the Directorate was taken. The Data was spread over a period of 4 years (2006-2010). The mean (\pm SE) body weight of bull calves aged 3, 6 and 12 months were 83.45 \pm 4.79, 122.36 \pm 2.61 and 206.91 \pm 4.56 kg, respectively. At 18 months (age of induction for semen collection) weight of young bulls become 57% of their mature body weight (550 kg). At 2, 3, 4, 5 and 6 years of age the mean (\pm SE) body weight was 411.95 \pm 6.01, 550.24 \pm 10.03, 644.74 \pm 10.22, 657.50 \pm 15.28 and 680.23 \pm 21.43 kg, respectively. The body weight of Frieswal bulls showed continuous enhancement up to 6 ½ years, thereafter declined to 663.50 \pm 11.50 kg at 7 years of age, which indicated onset of senility in these crossbred bulls between 6 ½ to 7 years. Age of bull significantly influenced the average daily body weight gain (ADG in g/d) and average daily increase in body surface area (BSA in cm²/d). In young bulls (03-36 months) ADG and daily enhancement in BSA were significantly ($P < 0.01$) higher (440.35 \pm 6.64 and 225.17 \pm 3.39, respectively) as compared to adult bulls (173.84 \pm 6.39 and 62.76 \pm 4.56, respectively). Body weight and BSA increased with age advancement, however, ratio of BSA to unit body weight (BSA/Kg) gradually decreased. Seasons of feeding and management significantly ($P < 0.05$) influenced the growth patterns of young bulls (03-36 months). It was highest during winter, followed by summer and lowest during rainy seasons. The difference between winter and summer was non significant ($P > 0.05$). The trends of seasonal influence on average daily body weight gain and enhancement in body surface area in mature bulls (37-92 months) were also similar to that of young bulls. Season of

birth of bull calves showed no significant impact on growth rate of young bulls. Age of bull showed significant ($P < 0.01$) positive relationship with body weight and body surface area, however, negative relationship with BSA/kg of body weight. The present study reported baseline information on body weight, growth rate and body development of Frieswal crossbred bulls of different age categories; age of bull and season of rearing had significant influence on average daily gain in body weight and body development, season of birth showed no significant influence on growth traits and probable age for onset of senility in Frieswal bull was between 6 ½ -7 years.

32. Food selection by gustatory organs of *Antheraea assama* larvae

D.S. Bora¹, B. Deka², A. sen³ and A. Kasav⁴

^{1,2}Department of Life Sciences,
Dibrugarh University, Dibrugarh,

^{3,4}Department of Entomology,
National Chemical Laboratory, Pune.

Key words : *Antheraea assama*, *gustatory organ*, *normal host*, *acceptable nonhost*.

Sensory organs perceive phytochemical informations emanated from hostplants for being used by the phytophagous insects in selection of their host plants. Gustatory organs play a key role in such food discriminating behaviour of insects. In this investigation, attempts were made to determine the role of galea and labrum-epipharynx, the gustatory organs around buccal cavity of *Antheraea assama*, a specialist phytophagous insect in food discrimination. Fifth instar larvae having only galea with sensilla styloconica and lateralis and labrum-epipharynx after microsurgery were subjected to food choice test using normal host, acceptable non host, unacceptable non host and neutral media (water). Considering percent consumption, rate of percent consumption and food choice as parameters, the competence of galea and labrum-epipharynx in food preference and rejection was evaluated.

Both galea and labrum-epipharynx were fully competent in preference for normal host plants *Persea bombycina* over the acceptable nonhost *L. grandifolia*. But although galea was competent in mediating strong host preference for another normal host plant, *Litsea polyantha* over the acceptable nonhost, labrum alone was not sufficient in rejecting

the acceptable nonhost in a choice between *L. polyantha* and *L. grandifolia* and in a choice between *L. grandifolia* and water. Both the organs could not differentiate between host plants and water, the neutral media. The gustatory organs were competent in rejecting the unacceptable host, *Ziziphus jujube*. Different complements of chemosensory organs might be involved in selection of different host plants.

33. Taxonomy of Freshwater Monogenean: Problems and Prospects

H. S. Singh

Department of Zoology

Ch. C. S. University, Meerut

E. Mail: hirdaya_singh @ rediffmail.com

Monogeneans are common parasite of gills and skin of fishes. In India about 300 species of monogeneans has been described by the workers belonging to 125 genera and 30 families. As far as fresh water fishes are concerned, about 288 species of freshwater fishes are known from this region. Parasitic monogeneans have narrow range of host specificity which is very often lost in aquaculture conditions.

Monogeneans are a group of helminthes characterized by the presence of a characteristic shape of male copulatory complex and haptor parts. These structures were observed by early researchers in microscope. The morphological discrimination of species within the species-rich and diverse class monogenea is mainly based on the opisthaptor hard parts. Marginal hooks, ventral bars and anchors of the posterior attachment organ, the haptor, are variable, but being adaptive and under strong evolutionary constraints are not optimal for phylogenetic reconstructions and creates problems in the taxonomy of parasites. Moreover, these characters also exhibit a range of intraspecific genetic or phenetic variation. Recent developments in microscopical techniques and data processing have greatly improved resolution of morphological characters, but the lack of dimensionality of morphological measures probably limits the usefulness of this approach.

The present talk deals with problems faced by classical taxonomist. Besides this, an attempt has also been made to enlighten future course of action in general and with special reference to use molecular markers are

34. **Flesh-Fly Genetics: from Chromosome to Molecular Markers**

Uma Rani Agrawal¹, Neelam Bajpai² and R R Tewari^{2*}

¹Department of Zoology, CMP Degree College,
University of Allahabad, Allahabad-211 002

²Department of Zoology, University of Allahabad,
Allahabad-211 002

E-mail: umar_agrawal@rediffmail.com, rrtewari@rediffmail.com

Key words: *Flesh flies, cytogenetics, Sarcophagidae, biochemical genetics, molecular marker.*

The genetic study of sarcophagid flies have embraced cytogenetic and molecular data. The cytogenetic studies have revealed a great deal of similarity in the eukaryotic genome, while the repetitive DNA shows variation in the form of distribution and content of AT rich DNA. The molecular markers, however, offer an opportunity to discriminate various species and the phylogenetic relationship among sarcophagids.

35. **Cyto-architecture and morphology of neuronal types of the cerebral cortex of Reptiles**

R. C. Maurya, I. D. Sakal¹ and U. C. Srivastava²

Department of Zoology
University of Allahabad,
Allahabad – 211002 (INDIA)

¹On leave from Department of Zoology,
7th of April University, Zawia-Libya.

²Corresponding author
Email: ucsrivastava@rediffmail.com

Key words : *Golgi technique, neuronal types, pyramidal neurons, multipolar neurons, reptiles*

The central nervous system of reptiles is a typical vertebrate type consisting of brain and spinal cord. The brain of reptiles is differentiated into forebrain, midbrain, and hindbrain. The forebrain is divided into olfactory lobe, cerebral hemisphere and diencephalons. The

cerebral hemisphere of reptiles consists of a roof (pallium) and a floor (subpallium). In reptiles, the telencephalic roof (pallium) has developed into a three-layered cortical structure and divided into four cytoarchitecture areas: medial, dorsomedial, dorsal, and lateral cortices. The medial portion of subpallium is called the septal complex, whereas the lateral portion consists of the dorsal ventricular ridge, the striatal complex and the amygdaloid complex. By using classical Golgi-impregnation method different investigators described the different number and types of the neuronal classes in all the cortical areas of reptiles. Different neuronal types described in reptilian species are pyramidal (may be inverted and bipyramidal), multipolar, monotufted, bitufted, stellate neurons, candelabra like monotufted, monotufted monopolar, monotufted bipolar neurons. Further they have been classified on the basis of the presence or absence of spines. Different investigators have used the different methodology to reveal the morphology of the neurons and neuropil in the cerebral cortex of reptiles. The present review sheds a light on the morphological characteristics of neuronal types described by different workers in different reptiles and also their comparison with avian and mammalian cortical structures (supposed to be homologous) on the basis of neuronal morphology and their connections.

36. Anti – JH Compounds and Insect Pest Management

Satya Singh* and Krishna Kumar

Department of Zoology,
University of Allahabad,
Allahabad-211001, India

*E-mail: satya27singh@gmail.com

Key Words : *JH, anti-JH compounds, IGRs, endocrine disruptors, insect pests, fourth generation insecticides.*

The discovery of anti-JH compounds heralded a new era in juvenile hormone research as these compounds were used to evaluate the role of JH in various JH regulated processes like molting and metamorphosis, reproduction, embryogenesis, caste determination and other physiological processes. The anti-JH compounds have been successfully employed for insect pest control because of being selectively toxic to corpora allata and as such interfering with the synthesis and secretion / release of juvenile hormone. In most of the cases administration of these precocious metamorphosis but there are several instances where these compounds also produce JH agonist effects.

37. Neuronal classes in the corticoid complex of the telencephalon of the food storing Indian bird *Corvus splendens*.

U.C. Srivastava and Prashant Kumar

Department of Zoology,
University of Allahabad, Allahabad

Keywords : *Telencephalon, Corticoid complex, Food storing birds, Pyramidal like neurons, spine density.*

The present study is based on the neurohistological techniques: Nissl- staining for neuronal identification and Golgi-Colonnier for neuronal morphology, focuses light on the cytoarchitecture of the corticoid complex in the common house crow, *Corvus splendens*, belonging to family Corvidae of order Passeriform. This complex occupies the dorsolateral surface of the telencephalic pallium just above the ventricle. Corticoid complex is subdivided into an intermediate corticoid area (CI) and dorsolateral corticoid area (CDL). CDL is a thin superficial part of the caudal pallium adjoining the medially situated hippocampal formation. Intermediate corticoid area occupies position in between the dorsolateral corticoid area and area parahippocampalis (APH) of the hippocampal complex.

Neurons of the corticoid complex are classified into three subtypes depending upon the axonal projection, dendritic arrangement and soma shape. Projection neurons have distant projecting axon, which also extend several varicose collaterals. Projection neurons also have big soma size and dendritic field. Projection neurons are further sub-divided into multipolar neurons (present both in CI and CDL), horizontal cells (present both in CI and CDL), pyramidal like neurons (present only in CDL) and pyramidal neurons (present only in CI and absent in CDL). Local circuit neurons shows medium sized somata, small dendritic field and locally arborising axon. Local circuit neurons are mostly oval and pyramidal in shape but some are squarish, barrel shaped and some have distorted shape also. Local circuit neurons are present both in CI and CDL region. Stellate neurons are characterized by small somata, small dendritic field and locally arborising axons. Dendrites are smooth and wavy in appearance. Stellate neurons are present both in CI and CDL region.

Food storing bird species cache food for later consumption. This is an adaptive evolutionary behavior to cope with food shortage during adverse conditions when there is scarcity of food. Non- food storing bird species do not cache food. This behavioral conflict between food storing and non-food storing bird species can be explained on the basis of

neuronal differences. There are neuronal differences in corticoid complex of food storing and non food storing birds. All types of neurons are spinous in food storing birds. Pyramidal like neurons are found in CDL region which are absent in non food storing bird as reported in case of *Estrilda amendava*, belonging to family Estrilididae of order Passeriform. There are clear cut differences in soma size, dendritic field and axonal projection. Local circuit neurons are spinous as compared to aspinous or sparsely spinous in non food storing birds. Neurons of food storing birds have more spine density as compared to non food storing birds. Spines are involved in synapse formation between neurons, more spines provide better transmission of information among neurons.

98th Indian Science Congress

January 3-7, 2011, Chennai

V

**ABSTRACTS OF
ORAL/POSTER PRESENTATION**

PROCEEDINGS
OF THE
NINETY EIGHTH SESSION OF THE
INDIAN SCIENCE CONGRESS
CHENNAI, 2011

PART II : ABSTRACTS

SECTION OF
ANIMAL, VETERINARY AND FISHERY SCIENCES

President : Prof. U.C. Srivastava

CONTENTS

<i>Sub-sections</i>	<i>Pages</i>
I. Aquatic Biology, Hydrobiology, Fish and Fisheries Science	75–110
II. Cytogenetics, Cancer Biology and Immunology	111–127
III. Ecology, Environmental Biology, Vildlife Biology and Animal Behavior	127–154
IV. Entomology	154–162
V. Environmental Biology and Biotechnology	163–184
VI. Neurobiology and Endocrinology	185–203
VII. Physiology, Biochemistry and Reproductive Biology	204–250
VIII. Toxicology and Pollution Biology	250–265
IX. Veterinary Science	266–277

PROCEEDINGS
OF THE
NINETY EIGHTH SESSION OF THE
INDIAN SCIENCE CONGRESS
CHENNAI, 2011

PART II : ABSTRACTS

SECTION OF
ANIMAL, VETERINARY AND FISHERY SCIENCES

President : Prof. U.C. Srivastava

I. Aquatic Biology, Hydrobiology, Fish and Fisheries Science

**1. The Phylogenetic Analysis and Evolutionary Ecology of the
Freshwater Turtles in Northeast India**

Kulendra Ch. Das, Shantanu Kundu and Sankar K. Ghosh

Department of Biotechnology,
Assam University, Silchar-781 001,
Assam, India

kulendradas2002@yahoo.co.in ; drsankarghosh@gmail.com

***Key words :** Mitochondrial DNA, evolutionary ecology, conservation genetics,
phylogenetic analysis and COI.*

Turtles are one of Earth's most instantly recognizable life forms, distinguished for over 200 million years in the fossil record. However, the subsequent evolution of turtles has been a matter of much speculation and debate, as is reflected in uncertainties about evolutionary relationships at taxonomic levels ranging from subspecies to suborders. To address this issue, we sequenced 17 samples of the mitochondrial DNA for 10 species

representing all freshwater turtle. Findings of special relevance to conservation biology include discovery of a distant relationship among chelonian species. A longstanding debate in evolutionary ecology was resolved by phylogenetic analysis. Here we provide an independent assessment of evolutionary relationships among all ten extant species, based on a 650 bp region of nucleotide sequences from the cytochrome oxidase subunit-I (COI) gene of mitochondrial DNA (mt DNA). One motivation for this study is to clarify freshwater turtle phylogeny in problematic areas that are relevant to the fields of both evolutionary ecology and conservation genetics.

2. The Pigment cell Structure & Distribution in Certain Fresh Water Fishes

Sareen Sarah John¹ and John K. C.²

¹School of Environmental Studies,
Cochin University of Science & Technology,
Kalamassery, Kochi, Kerala

²School of Applied Life Sciences,
Mahatma Gandhi University,
Chuttipara, P.O. Kalamassery, Kochi
e-mail : sareensj@yahoo.co.in

Key words : *Freshwater fish, Embryonic pigment, Chromatophore, Irridophore*

Chromatophore & irridophore combinations give a particular hue in fresh water fishes. The identification & their distribution in a few freshwater fishes is the focus of the study. fishes of the species *Puntius melanamphyx*, *Puntius vittatus*, *Rasbora daniconius*, *Macropodus cupanus* and Guppies were used for the study. The organisation & fine structure of Melanophores, Xanthophores, Erythrophores & Irridophores in these specimens were observed closely and the nature of the pigment movement in these species were viewed. The melanophore structure and concentration in the embryonic stages of *Labeo rohita* was also traced. Melanophore exists in the granular form capable of saltatory movement and the xanthophores exist in the granular form and also in the form of fat droplets with dissolved pigments. Details of chromatophore structure are presented and discussed.

3. Impact of Photoperiod on Oxygen Consumption in a Fresh Water Air – Breathing Teleost, *Channa Gachua*

Qaisur Rahman, D. N. Sadhu and Sandeep Sanu

Department of Zoology, St. Columba's College,

Hazaribag-825301, Jharkhand, India

Department of Computer Science,

National Institute of Science & Technology,

Berhampur, Orissa, India, Pin-761008

Email : dns_hzb@yahoo.co.in / qaisur.rahman@gmail.com / sanus_id@yahoo.co.in

Key words : *Photoperiod, Oxygen consumption, Channa gachua*

In the present investigation an attempt has been made to study the impact of photoperiod on oxygen consumption in a fresh water air- breathing teleost. *Channa gachua*. The aquatic, aerial and total oxygen consumption in winter (December & January) day length (10.14 – 10.29 hrs.) was noted as 49.98, 52.02 and 102.0 (ml/kg/hr) and 50.88, 55.12 and 106.0 (ml/kg/hr) respectively whereas in summer (June & July) day length (13.29 – 13.14 hrs) was observed as 69.3, 95.70 and 165.0 (ml/kg/hr) and 70.53, 84.47 and 155.0 (ml/kg/hr) respectively.

Significant positive relationship exists between the photoperiod and oxygen consumption. The correlation coefficient (r) for aquatic, aerial and total oxygen uptake was noted as 0.9685, 0.6167 and 0.6219 respectively. It was observed that in *Channa gachua* the aquatic, aerial and total oxygen consumption increased by a power of 6.18, 4.599 and 7.072 respectively with unit increase in photoperiod length.

4. Diurnal Variations in A Rearing Pond of Gopiballavpur

S. R. Pal¹, Priyanka Pal², Rohit Pal³

¹Deptt of Biology, S. P. College, Jamshedpur-831002

²Jamshedpur Women's College, Bistupur-831001

³NHES, Bistupur 831001

Email : satyaranjan_pal@yahoo.com

Key words : *Diurnal variation, Dissolved oxygen, Plankton, Rearing pond.*

Diurnal variations in water chemistry and plankton in rearing pond were quite apparent.

Large fluctuations were noted in dissolved oxygen, pH, carbonate concentrations, temperature (both air and water). The pond water was over saturated with oxygen during day time (9.4 ppm) and oxygen was depleted at night (1.9 ppm). The maximum temperature of air and water were noticed during afternoon at about 15:00 hours and minimum at dusk at 0600 hours. This fluctuation was because of intense solar heating during daytime. Changes in pH of the water were found to be directly related to changes in carbonate concentration as pH of the water increased during the daytime and decreased in the night. Plankton did not show any apparent diurnal variation except *Microcystic aeruginosa*. Among zooplankton, *Daphnia* and *Cyclops* showed diurnal movement but *Cypris* and *Diaptomus* did not show any apparent diurnal movements. Dissolved oxygen concentration drops down to minimum and free carbon dioxide accumulates at night due to absence of sunlight and photosynthesis.

5. Study on the Protozoan Parasites of Fresh Water – Fishes

Rajesh Kumar Sinha

Professor of Zoology
Gaya College,
Gaya, Bihar

In the present study investigations were carried out on the protozoan parasites of fresh water fishes of the different ponds which are stocked for fish culture. Due to heavy stocking and pollutions a large number of parasites attack the fish which is a serious problem for aquaculturist. Thus for proper culture one should know about the different types of disease & their control. Protozoans are single-celled organisms, many of which are free-living in the aquatic environment. Typically, no intermediate host is required for the parasite to reproduce. The protozoan parasites cause weight loss, debilitation and mortality to fishes. In the present investigation the protozoan parasites which are observed include ciliates such as **Ichthyophthirius, Trichodina, Glossatella and Ambiphyra** and flagellates include **Ichthyobodo and cryptobia**. It has been observed that salt solution, formalin solution and potassium permanganate solutions are easily available and cheap method of control of protozoan infections.

6. Zooplankton Periodicity and Phenology of *Daphnia Carinata*. In a Freshwater Pond of Dhanbad (Jharkhand)

Tapan Kumar Chakravarty, Norr Alam¹ and Kiran Kumari Saw

Retired Professor of Zoology

Bhagalpur University (Bihar)

¹ Giridish College,

²Research Scholar Binobahae University, Hazaribag

Key words : *Zooplankton, Phenology, Daphnia*

A total of 15 species of Zooplankton of different groups have been observed and identified from a fresh water fisheries pond of Dhanbad (Jharkhand) in different seasons of the year 2006. These Zooplankton species belong to Cladocerans, Copepoda, Rotifera, Rhizopoda. These Zooplankton are an important item of food of fishes and hence, they are of immense help in the Piscicultural practices of India. Each group of Zooplankton shows seasonal periodicity and fluctuations and have its own pattern of life cycle. *Daphnia Carinata* is a very prominent species of zooplankton which completes its life cycle by producing 13 instars, during a life span of 24 days. This, Zooplankton periodicity and study of life history stages of *Daphnia Carinata* have been investigated in this paper. Physiochemical parameters of the medium like – temperature, ph, carbonate and bicarbonate alkalinities including silicate, phosphate contents were also analyzed to show the correlation.

7. Effect of Biocides in Relation to Fish Production

Rameshwar Singh¹, Ashok Kumar² and Rajesh Kumar Singh³

¹Dept. of Zoology R. J. College,

J. P. University, Chapra, 841 301, Bihar

²Dept. of Zoology and Industrial Fish and Fisheries,

Ganga Singh College, J. P. University Chapra, 841 301, Bihar

³Dept. of Zoology B.D.S.D. College Garkha,

J. P. university, Chapra, 841301, Bihar

Email : ²dr.ashok108@gmail.com / ³ singhrajeshsamrat@gmail.com

One of the oldest branches of Pharmacology is toxicology i.e. the science of poisons which have been affecting fishes & again in turn it affected human life. In recent years, a

sub branch of toxicology, called environmental toxicology has grown increasingly important. Again it has been divided on the basis of the compounds & materials present in them as organochlorine, organophosphates, carbamates Pyrethroids etc. Which are being used to protect agricultural crops and reach the aquaculture ponds and tanks as agriculture run off. These pesticides / insecticides brings possible detrimental effects on the health of the residing fish population in the ponds and tanks, where pisciculture remains in progress.

Fish are the most important inhabitants of the aquatic ecosystem such as marine, estuarine and fresh water and provides the human population a cheap and easily digestible proteins, PUFA, i.e.; omega-3 (eicosapentaenoic acid) Omega-6 (Decosahexaenoic acid), Phosphorus, calcium e.t.c; which are healthful in many respects. In pisciculture besides the use of organic & inorganic fertilizers, various biocides also enter as agricultural run off and hence the fish become one of the immediate targets of such biocides as they are known to be more sensitive to biological doses than that of terrestrial animals. There fore for maintaining healthy stock of fish in our inland water, water quality objectives have to be determined for each pollutant including the pesticides; which can ensure that the species present are not adversely affected in any way. Though several workers have surveyed preventive levels of different pollutants in fish for calculating the possible danger for human health, caused by consumption of such affected fish, but the source of getting information about the effect of such pollutants does not cover all round effects on fish biology especially fish physiology. Hence the works and results obtained may initiate N.G.O., some private agencies and government to make periodical checkup of the biocides in productive water to check the indiscriminate use of these compounds, which would be beneficial to fish farmers & aquaculturists.

8. Fish Species Diversity in Chandil Dam (Reservoir), West Singhbhum, Jharkhand, India

M. C. Mahata*, Sanjay Dandapat*, Shivani Majhi* and S. R. Pal

*P. G Dept. of Zoology, R.U., Ranch-834008

E-mail : mahatamanik@rediffmail.com

Dept. of Biology, S. P. College,

Jamshedpur-831002,

E-mail : satyaranjan_pal@yahoo.com

Study on Fish Species Diversity of Chandil Dam (Reservoir) (lies approximately on

22° 58' 15" N to 86° 1' 20" E) was carried out in 2002-2003 and in 2008-2009. It has been constructed on the river Subernarekha (Since 1971 onward), a holi river of this region, near Chandil, a semi urban area of the West- Singhbhum district, Jharkhand, India. The fishes of the reservoir were collected with the help of fishermen fishing in the reservoir it year round, in each season. A total of 60 species of fishes belonging 31 genera under 18 families and 08 orders were recorded. The fishes are identified with the help of standard literatures. The fishes found in the reservoir are mostly used to prepare fish-curry by the local people and are oftenly supplied to local fish markets of the semi urban and urban areas of the region and other adjacent areas of the state.

Many of the fish species recorded during the study period are **Vulnerable** (e.g. *Gudusia chapra* (Ham.), 1822, *Notopterus notopterus* (Pallas), 1767, *Barilius Bola* (Ham.), 1822, *Chela labuca* (Ham.), 1822, *Cirrhinus reba* (Ham.), 1822, *Garra gotyla gotyla* (Gray), 1832-33, *Labeo calbasu* (Ham.), 1822, *L. goniis* (Ham.), 1822, *Lapidocephalichthys guntia* (Ham.), 1822, *Rita rita* (Ham.), 1822, *Bagarius bagarius* (Ham.), 1822, *Clarias batrachus* (Linn.), 1785, *Heteropneustus fossilis* (Bloch.), 1758, *Channa orientalis* (Bloch & Schn.), 1801) **Endangered** (e.g. *Amphipnous cuchia*, *Symbranchus bengalensis* (Mc Clelland), 1845, *Ompok biamaculatus* (Bloch) 1797 etc.), **Rare** (e.g. *Mystus mukherjeei* (Ganguli & Dutta), 1975, *Glyptothorax telehitta* (Ham.), 1822) and **Endemic** (i.e., *Garra satyendranathi* (Ganguli & Dutta), 1973).

9. Polychaetous Annelids From Digha-Junput coast of West Bengal, India

Santanu Mitra* and A. Misra

Zoological Survey of India
F.P.S. Building, 27 J. L. Nehru Road
Kolkata-700016
*Santanuzsi@gmail.com

Key words : *Polychaetes, Taxonomy, Identification Key*

Polychaetes, commonly called as 'bristle worms', are recognized as a very important and significant group among the marine organisms. Majority of these worms are benthic, a few are pelagic. Benthic Polychaetes prefers sandy or muddy substratum of sea shore to the greatest depth of the sea. Some are also like to live in the crevices of rocks and coral

reefs. West Bengal coast having a relatively short coast line (40 km) facing the Bay of Bengal, of which the Coastal tract in between Digha and Junput are considered as the sandy marine zone, and other parts are included in Hugly-Matla estuary. Taxonomic study of polychaetes of Digha-Junput coastal tract were undertaken with the materials collected by different survey parties of Zoological Survey of India, reveals a total 40 species under 29 genera and 18 families, this is about 60% of total polychaete species of this state. Five species namely, *Sigalion capense* Day, 1960; *Chloeia rosea* Potts, 1909; *Lumbrinereis simplex* (Southern, 1921); *Euclymene annandalei* Southern, 1921 and *Laonome indica* Southern, 1921 were recorded first time from the state of West Bengal. In the present papers attempt has been taken to include a taxonomic key to the species in addition to diagnostic features and short habitat data, which may serve an important base line data for the future research works on the biotic constitution and ecological monitoring of this coastal tract.

10. Effects of Habitats on the Structure of the Vagal Lobe in two Teleosts

P. S. Sherly

P G and Research Department of Zoology,
Sree Narayana College,
Kollam, Kerala, S. India
E-mail : PSSherly@yahoo.com

Comparative studies on the hindbrain was analysed for getting scientific information on the morphological and histological aspects of brain in two teleost, namely *Etroplus Suratensis* and *Mystus gulio*. The former, an omnivorous surface feeder and the latter an omnivorous bottom feeder. Different types of feeding brings out changes in the structure of the myelencephalic area representing the vagal lobe. Histology of the brain was carried to trace the gustatory tracts and neuronal differences exist in these fishes. Feeding reflects the brain structure. These two fishes depend on gustation during feeding and hence vagal lobes were well developed. In *E. Suratensis* the length of the vagal lobe represents 11.6% of the total brain length whereas in *M. gulio* it 9.24%. The origin and development of neurons and gustatory tracts were traced and it differs in these two fishes. In *E. Suratensis* the neurons arise from the nucleus ambiguus, which is a gustatory centre. In *M. gulio* the origin of gustatory neuron is near the gustatory tracts indicating some other mechanisms than gestation in *M. gulio*.

11. Three New Records of Sea Cucumber (Class: Holothuroidea) From Ritchie's Archipelago, Andaman Sea

Koushik Sadhukhan and C Raghunathan

¹Zoological Survey of India,
Andaman & Nicobar Regional Centre,
National Coral Reef Research Institute,
Port Blair-744 102,
Andaman & Nicobar Islands.

*Email : koushik_sadhukhanami@yahoo.co.in

Key words : *Holothuria, Ritchie's Archipelago, Survey, New records, habitats, Intertidal area, Morphological features*

Members of class Holothuroidea commonly known as Sea cucumbers have the body elongated along the oro-anal axis with a thick leathery body wall. They are commonly found in intertidal and subtidal upto a depth of 30 m in the reef area of Andaman and Nicobar Island. An extensive survey on corals and their associated fauna was conducted by NCRI team during the period of April '09 to Jan '10 in different Islands of Ritchie's Archipelago. In Andaman & Nicobar Island, the Holothurian family Holothuriidae has the maximum representation among all the echinoderms with 29 species followed by Synallactidae with 14 species and others one to nine species. In the present paper, three new records of holothuroids species from Ritchie's Archipelago have been described with their salient morphological features and habitats.

12. Seasonal Variation in Zooplankton and Phytoplankton densities in Rapti River at Balrampur (U.P.), India

Dharm Raj Verma, Ashish Kumar Singh and U. B. Singh

Department of Zoology, P. B. College,
Pratapgarh (U.P.), India

Key words : *Rapti River, Balrampur, Phytoplankton, Zooplanktan, Density*

Phytoplankton and Zooplanktan, Densities in Rapti River were studied July 2008 to june 2009.

In addition, Zooplankton and Phytoplankton biomass was measured. The density of Zooplankton and Phytoplankton were low in Pre-Monsoon seasons.

For, Phytoplankton, Family – Chlorophyceae was around dominant, species Composition, Seasonal distribution and species density variations Show that the River was advanced mesotrophic.

The irregularity in variation in the Quality and Quantity of Phytoplankton was mostly as a result of increases in nutrient Concentrations. The Zooplankton and Phytoplankton are essential for the development of fishes and essential for diet of fishes.

Phytoplankton population represents a vital link in the food chain.

13. Supplementation of Marigold Flower Meal as Natural Carotenoid Source in Feed for Colour Enhancement in Ornamental Fish, Dwarf Gourami (*Colisa lalia*)

Aniket Borkar, G. H. Pailan, Mrinal Kumar and S. K. Prabhakar

Central Institute of Fisheries Education (Deemed University), Kolkata Center
32 G N Block, Sector-V, Salt Lake City, Kolkata
* aquaborkar@gmail.com

Key words : *Natural carotenoid source, marigold flower, ornamental fish, Colisa lalia*

A study was conducted to see the effect of supplemental feeding of marigold flower meal as natural carotenoids sources on skin colouration in dwarf gourami (*Colisa lalia*). The control diet was prepared by selected ingredients viz. fish meal 25%, soybean meal 22%, groundnut oil cake 15%, rice bran 20%, wheat flour 12%, starch powder 3%, soya oil 2% and vitamins & minerals 1%. Ten experimental diets were prepared by supplementing either marigold powder at five concentrations viz. 1%, 4%, 6% and 8% of the control diet replacing the same amount of rice bran. Two experimental feeding trials each for 7 weeks duration has been conducted in dwarf gourami using the experimental feeds. With marigold supplemented diets at the start of the experiment the initial total carotenoids concentration in the muscle and skin was 2.23 and 1.33 µg/g in male and female dwarf gourami respectively. Both in male and female fish after 3rd and 7th week of experimental feeding trial showed that the total carotenoids concentration increased in proportion to marigold

supplementation in the diet, highest being 4% level for male (8.10 µg/g) and 6% level for female (2.72 µg/g) fish. The weight gain was significantly higher in 4% marigold meal supplemented diets. The feed conversion efficiency was significantly lower in 4% marigold meal supplemented diets. The survival % of fish was not affected due to incorporation of various level of marigold meal in the experimental diets. The results showed that marigold meal can safely be supplemented at 4% respectively in the diets of dwarf gourami to increase their skin coloration.

14. Comparative Study of Avifaunal Status of Two Freshwater Lakes of Kheda District, Gujarat

**Thakor F. J.^{*1}, Roal B. V.² Bhoi D. K.³ Prajapati J. R.⁴
and Chauhan N. B.⁵**

¹Department of Biology, J. & J. College of Science,
Nadiad, Dist. Kheda (Guj.) 387 001

²Department of Microbiology, P.H.G. Municipal Arts & Science College,
Kalol (Guj.)-382 721

³Department of Chemistry, J. & J. College of Science,
Nadiad, Dist. Kheda (Guj.)-387 001

⁴Department of Biology, P.H.G. Municipal Arts & Science College,
Kalol (Guj.)-382 721

⁵Department of Biology, Ashok & Rita Institute of Integrated Study
and Research in Biotechnology,
V. V. Nagar, Dist. Kheda (Guj.)
Email : fulsangjithakor@yahoo.co.in

***Key words* : Avifauna, Feeding Habitat, Pij lake, Vaso lake**

Vaso lake and Pij Lake is located in Nadiad taluka, Dist–Kheda Gujarat are the freshwater bodies containing rich flora and fauna. The wetland attracts a large number of birds throughout the year. Present work deals with the comparative study of avifaunal diversity of two lakes and their surrounding area. The work was carried out for a period of one year during 2008-09 total 75 bird species observed in and around both the lakes. Among them 54 species were found at both the lakes while 16 species were observed specific to Vaso lake and 05 species to Pij lake. Depending on the basis of their food preference and feeding habits, the birds have been categorized in 8 groups like carnivorous,

omnivorous, granivorous, insectivorous, herbivorous, frugivorous, piscivorous and nectar feeder.

In both the lakes 35 species were common, while 35 less common and 05 species were rare in occurrence.

15. Morpho-Taxonomic Status of a New Species of Caryophyllidean Cestode, *Pseudobatrachus pahujensis* sp. nov. from *Heteropneustes fossilis* (Bloch) from Bundelkhand

***A.K. Srivastav **Abha Raj Singh and ***Aditya Narayan**

*Parasitological Lab., Department of Zoology,
Bipin Bihari (P.G.) College, Jhansi (U.P.)

**S.G.H.K. Degree College, Jhansi (U.P.)

***R. S. Yadav Degree College, Poonch Jhansi (U.P.) India

Six fresh water cat fishes, *Heteropneustes fossilis* (Bloch) were collected from Pahuj river, district-Jhansi (U.P.) for study of cestode infection. After thorough examination we obtained two alike cestodes from their intestine. Morphological studies of cestodes revealed them to belong to the genus, *Pseudobatrachus* Pathak and Srivastav, 2005 of the family Capingentidae Hunter, 1930; order Caryophyllidea. It differs from the other reported species of the genus and accommodated as a new species.

16. Study of an Interesting Tapeworm of *Heteropneustes Fossilis* (Bloch) from Bundelkhand Region of Uttar Pradesh, India

***A.K. Srivastav, Aditya Narayan and **Abha Raj Singh**

Parasitological Lab., Department of Zoology,
Bipin Bihari (P.G.) College, Jhansi (U.P.)

**S.G.H.K. Degree College, Jhansi (U.P.)

*E.mail- akscks@rediffmail.com

A new tapeworm of genus, *Pseudoneckinverta dhuaniensis* n.g., n.sp. is described here from the intestine of fresh water catfishes, *Heteropneustes fossilis* (Bloch). The

present species, medium sized, unsegmented with spoon shaped scolex and scolex bears apical disc at the anterior tip. Neck very small with longitudinal groove. Testes numerous, oval and medullary. Cirrus pouch well developed, median with or without internal seminal vesicle. External seminal vesicle present. Ovary inverted “A” shaped, posteriorly located. Vitellaria partly cortical and partly medullary, touches the ovarian lobes. Postovarian vitellaria absent. Receptaculum seminis present. Uterus long, coiled, nonglandular, uterine coils not extending anterior to cirrus pouch. Eggs oval and non-operculate.

17. Salinity tolerance of Skunk clownfish *Amphiprion akallopisos* (Bleeker, 1853) larvae and juveniles in captivity

^aDhaneesh, K.V., ^aNanthini Devi, K., ^{a,*}Ajith Kumar, T. T.,

^aBalasubramanian, T. and ^bKapila Tissera

^aCentre of Advanced Study in Marine Biology,
Faculty of Marine Science, Annamalai University,
Parangipettai-608 502, Tamil Nadu, India

^bKerala Aqua Venture International Ltd.,
Cochin, Kerala, India

Key words: Clownfish, *A. akallopisos*, larva, juvenile, salinity tolerance, survival

Culture of clownfish species in low-saline water is still in its infancy. Salinity of the culture environment is one of the more relevant parameters affecting fish physiology, modifying food intake and growth performance in many fish species. The objectives of this study were to determine the upper and lower lethal salinity for juveniles and the tolerance of five different salinities (20, 25, 30, 35 and 40‰) and their effect on the survival rate of skunk clownfish (*Amphiprion akallopisos*) larvae. Higher (53-55 ‰) and lower (3-6 ‰) salinities produced loss of appetite and movement, finally leading to mortality in juveniles. In 96 h experiment, larvae showed 100% survival at the salinities of 30 (control) and 35 ‰. They showed 88% survival in 40 ‰ salinity and 76% survivals in 20 and 25 ‰ salinities. In conclusion juveniles of *A. akallopisos*, a reef fish, exhibit satisfactory rates of survival and no signs of stress in high (up to 53 ‰) and low saline (up to 6 ‰) waters. These results demonstrate that using such salinities, which can reduce the incidence of diseases and mortality does not produce significant physiological alterations in this species. In addition to this, descriptive studies on embryonic development and mass scale larval rearing were also carried out during the present study.

18. Fish Fauna of Ken River in Banda District (U.P.) India

Anuradha Ranjan and Praveen Kumar Pandey

Pt. J.N.P.G. College,
Banda

Key word : *Fish Fauna, Ken River, Banda district, Cypriniformes.*

Fish Fauna of Ken river in Banda district has been analyzed in the present study. The fishes were collected from four survey station selected along the stretch of Ken river, which have perennial flow with stony, sandy and muddy beds, during 2 years with the help of cost net, drag net town net, bag net, hooks and by hand picking methods also. The fishes were identified on the spot and later confirmed. 69 species of fishes belonging to 9 orders and 21 families were recorded. About 63% of the recoded fishes belongs to a single orders Cypriniformes and rest to Clupeiformes, Beloniformes, Mugiliformes, Ophiocephaliformes, Symbranchiformes, Perciformes, Mastacembeleformes, Tetrodontiformes.

19. Studies on Water Quality of Pravara River in Relation to Pisciculture, Ahmednagar District, Maharashtra

B. A. Pawar and G. R. Pandhare*

Department of Zoology, P.V.P. College, Pravaranagar,
Tal. Rahata, Dist. Ahmednagar-
413 713, Maharashtra, India.

E-mail : ba_pwr2007@rediffmail.com

*Department of Chemistry, P.V.P. College,
Pravaranagar, Tal. Rahata, Dist. Ahmednagar- 413 713,
Maharashtra, India.

Key words : *Pravara river, water quality, pisciculture*

The present work deals with the water quality of Pravara river, Ahmednagar district, Maharashtra during July 2008 to June 2009 in order to assess its suitability for pisciculture. Various physico-chemical parameters determined reveals that seasonal fluctuations in water temperature, dissolved oxygen (DO), pH and nitrite in all the season were within the

favourable limits for fish and fisheries practices. However, very low level of alkalinity during winter to summer at station I, chloride during all the season at station I and III and during winter and monsoon at station II, hardness during summer at station I, calcium in all the season and magnesium during all the season at station I and III and during monsoon at station II and high level of alkalinity during post-monsoon at station II, chloride during summer at station II, hardness during post-monsoon and summer at station II, and phosphate during monsoon, winter and summer in all the stations were recorded. These parameters need to be modifying in order to favour the fish culture. It was found that the Pravara river was suffering from the domestic type of pollution and the most of the parameters showed their peak values at station II (Akole). Hence, it is suggested that control of these low and high level water parameters in the river conform to the levels suited for aquaculture practices.

20. Culture of *Labeo bata* , a minor carp along with Indian Major Carps and Exotic Carps from Brahmaputra basin

Debahuti Purkayastha and Umesh C.Goswami

Department of Zoology,(DST-FIST-Govt. of India) &
UGC-SAP Sponsored Department
Centre for Aquaculture & Aquatic Resources Monitoring Centre,
Biodiversity and Bioinformatics Centre
North East Aquaculture Network
e-mail-ucgoswami@rediffmail.com
Gauhati University , Guwahati - 781014 , Assam , India

Key words: *Labeo bata*, minor carps, composite culture.

Culture of *Labeo bata*, a potential Minor Indian Carp having good market value after rearing for 6-8 months, has solved several questions of culturing indigenous species, where exotic carps can be replaced by introduction of such species. *L. bata*, a mid-column feeder and herbivorous species shows good response in the composite fish culture system. The fish attains maturity during the months of April to July. In the culture system it is bred during the May to July. Breeding can be induced by using pituitary gland extract or ovaprim showing 95-98% survival. In composite culture system it can easily be cultured with other Indian Major Carps and attaining a weight of around 100-120 gms within a

period of 6-8 months. The fishes can be harvested twice a year. The impact of culturing the species with Major Indian Carps and exotic carps has been analysed with reference to the relative growth of other species of Major Indian Carps and exotic species. The results showed the idea of eliminating the exotic species in a step-wise manner after utilising the *L. bata* in the composite culture system.

21. Salinity tolerance of Skunk clownfish *Amphiprion akallopisos* (Bleeker, 1853) larvae and juveniles in captivity

^aDhaneesh, K.V., ^aNanthini Devi, K., ^{a,*}Ajith Kumar, T. T.,

^aBalasubramanian, T. and ^bKapila Tissera

^aCentre of Advanced Study in Marine Biology,
Faculty of Marine Science, Annamalai University,
Parangipettai-608 502, Tamil Nadu, India

^bKerala Aqua Venture International Ltd.,
Cochin, Kerala, India

Key words: *Clownfish, A. akallopisos, larva, juvenile, salinity tolerance, survival*

Culture of clownfish species in low-saline water is still in its infancy. Salinity of the culture environment is one of the more relevant parameters affecting fish physiology, modifying food intake and growth performance in many fish species. The objectives of this study were to determine the upper and lower lethal salinity for juveniles and the tolerance of five different salinities (20, 25, 30, 35 and 40‰) and their effect on the survival rate of skunk clownfish (*Amphiprion akallopisos*) larvae. Higher (53-55 ‰) and lower (3-6 ‰) salinities produced loss of appetite and movement, finally leading to mortality in juveniles. In 96 h experiment, larvae showed 100% survival at the salinities of 30 (control) and 35 ‰. They showed 88% survival in 40 ‰ salinity and 76% survivals in 20 and 25 ‰ salinities. In conclusion juveniles of *A. akallopisos*, a reef fish, exhibit satisfactory rates of survival and no signs of stress in high (up to 53 ‰) and low saline (up to 6 ‰) waters. These results demonstrate that using such salinities, which can reduce the incidence of diseases and mortality does not produce significant physiological alterations in this species. In addition to this, descriptive studies on embryonic development and mass scale larval rearing were also carried out during the present study.

22. Limnological Status of Sarsi-both Lake, TA. Mangrulpir, Dist. Washim (M.S.) India

G. P. Patil and R. M. Yewale

Deptt. of Zoology,
S.S.S.K.R. Innani Mahavidyalaya, Karanja (Lad),
Dist. Washim (M.S.) India
E-mail : ssskrimv@gmail.com

Key words : *Sarsi-Both Lake, Limnological Status, Pisciculture Practices*

Sarsi-Both lake, Ta. Mangrulpir, Dist. Washim, (M.S.) India, a rural aquatic ecosystem was selected to assess the water quality status. Various physico-chemical parameters such as transparency, pH, dissolved oxygen, total hardness and nutrients i.e. sulphates, phosphates and nitrates were analysed monthly for a period of one year i.e. from October 2006 to September 2007 to assess the water quality status of the lake. During the investigations transparency fluctuated between 19.85 to 36.32 cm, dissolved oxygen 6.00 to 9.10 mg/L, pH 7.25 to 8.67, total alkalinity 70.00 to 125.50 mg/L, total hardness 60.00 to 128.50 mg/L, sulphates 0.12 to 0.70 mg/L, total phosphates 0.25 to 0.65 mg/L and nitrates 0.60 to 1.07 mg/L. the values of various physico-chemical parameters show the suitability of water quality for pisciculture practices.

23. Corbendazim Induced Histopathological and Histochemical Changes in Liver Tissues of Common Carp *Cyprinus Carpio* var. *Communis*

K. Sridhar and P. Esther Joice

Post- Graduate and Research Department of Zoology,
Government Arts College (Autonomus)
(NAAC Accredited-4 stars), Coimbatore- 641 018, Tamil Nadu, India.

Key words: *Cyprinus carpio, Carbendazim, Histopathology, Histochemical, Liver.*

The global environmental pollution problem leaves not the fresh water fishes. The chemical pesticides which are the agricultural run-off find their way in to the fresh water

bodies affecting the fishes. Carbendazim a majorly used fungicide can have the chance of entry into the fish physiological activities. Hence a histopathological and histochemical study has been made with carbendazim (sub-lethal doses) treated *Cyprinus carpio*. The liver tissues showed various changes over the normal cells. The cellular necrosis, sinusoids, dilated and congested blood vessels were observed in the liver cells. Based on the comparison of the colour intensities in control and treated fishes, the histochemical results show decrease in protein, carbohydrate and increase in the lipids, ALP, ACP. The study of histology and histochemistry of the control and carbendazim treated fishes explain the histopathological conditions of the organisms due to the toxicity and acts as a biomarker.

24. Free living pathogenic and non pathogenic amoebae in *Trapa bispinosa* (Singhada).

Kavyanjali Shukla, Tabrez Ahmad, Newton Paul and A.K. Sharma.

Protozoology Research Laboratory,
Department of Zoology,
University of Lucknow.
Lucknow-226007.

Key words: *Free-living, pathogenic, non pathogenic, Amphizoic, Naegleria, Acanthamoeba, Trapa ponds, Lucknow city.*

The purpose of this study was to find out the occurrence of Free living pathogenic and non pathogenic amoebae in *Trapa bispinosa* (Singhada). These are generally cultivated in ponds and marshes and are mostly consumed raw by human beings.

A total of 8 strains were isolated and identified as *Acanthamoeba culbertsoni*, *N. gruberi*, *N. fowleri*, *A. rhyodes*, *Thecamoeba* and *Amoeba proteus*. The biological characterization of amoebic isolates were carried out. Of these 5 amoebic isolates *N fowleri* has been found to be pathogenic in experimental *Albino* mice.

Occurrence of amphizoic amoebae in the edible parts of *Trapa bispinosa* has been a matter of concern for the rural dwellers, who are employed as farmers and vendors of these commercially significant crop of India which are often consumed in raw condition. They may pose a threat to the consumers as well. Thus hands should be properly washed after collecting the crops and these vegetables should be properly washed and boiled before consumption.

25. Influence of dietary phosphorus on the development of nephrocalcinosis in Indian Major carp, Catla (*Catla catla*)

Krishna Sukumaran¹, Asim Kumar Pal², Subhash Chandra Mukherjee³,
Narottam Prasad Sahu⁴ and Dipesh Debnath⁵

¹Central Institute of Brackishwater Aquaculture,
75 Santhome High Road, Raja Annamalai Puram,
Chennai-600 028, Tamil Nadu, India

²Fish Nutrition, Biochemistry and Physiology Division,
Central Institute of Fisheries Education, Fisheries University Road,
Versova, Mumbai-400 061, India

³Central Institute of Fisheries Education,
Fisheries University Road, Versova,
Mumbai-400 061, India

⁴Fish Nutrition, Biochemistry and Physiology Division,
Central Institute of Fisheries Education, Fisheries University Road,
Versova, Mumbai-400 061, India

⁵Central Inland Fisheries Research Institute,
Regional Centre, HOUSEFED Complex, Dispur,
Guwahati-781 006, Assam, India

Key words : *Catla · Feed · Indian major carp · nephrocalcinosis · Phosphorus · vonKossa*

The present study was conducted to investigate the influence of dietary phosphorus on nephrocalcinosis in Indian major carp, Catla (*Catla catla*). The experiment was conducted in triplicates using nine 150 L capacity plastic tanks stocked with 20 fingerlings each (av. wt. 4.23 ± 0.87 g) for a period of 120 days. Three isonitrogenous and isocaloric semi-purified diets (crude protein 35%, crude lipid 8.5%) were formulated at three levels of phosphorus (T₁- 0.7%-control; T₂-1.1%; T₃-1.5%) using KH₂PO₄ and fed to the fish to satiation. At the end of the feeding trial, histopathological analysis of brain and liver tissue appeared normal. Nephrocalcinosis was detected at higher levels of dietary phosphorus, in both T₂ (1.1%) and T₃(1.5%) using histological as well as histochemical staining. High dietary phosphorus levels seems to affect nephrocalcinosis directly through high urinary calcium concentrations and indirectly via. reduced urinary magnesium concentrations.

26. Identification of pathogenic bacteria from fresh seafood (tuna and sardine)

*M. Mahalakshmi, K. Indira and M. Srinivasan

Centre of Advanced Study in Marine Biology,
Faculty of Marine Sciences
Annamalai University, Parangipettai – 608 502
Tamil Nadu – India
E. mail: micromaha10@yahoo.in

Key words : Tuna, Sardine, Pathogens, Parangipettai

Two marine fish species (tuna and sardine) were collected from Parangipettai landing centre and were evaluated for bacteriological quality using aerobic plate count method. Totally 25 strains were isolated from both samples and five strains were selected based on the growth which were identified upto species level. They are *E. coli*, *Vibrio* spp, *Salmonella* spp, *Yersinia* spp, and *Listeria* spp. The total numbers of colonies ranged from 10^2 - 10^5 . Bacterial populations were expressed as colony forming units (CFU/g). The population density of pathogenic bacteria was recorded as maximum values of *E. coli* (5.9×10^4 CFU/g in tuna and 4.7×10^4 CFU/g in sardine), *Vibrio* spp (6.3×10^4 CFU/g, 5.7×10^4 CFU/g) *salmonella* spp (6.2×10^4 CFU/g, 7.3×10^4 CFU/g). *Yersinia* spp (2.9×10^4 CFU/g, 3.5×10^4 CFU/g), *Listeria* spp (1.7×10^4 CFU/g, 2.93×10^4 CFU/g) respectively. The population densities varied from species to species.

27. Ultrastructural investigation of airsac of an air-breathing catfish *Heteropneustes fossilis*

M. Sengar¹, L. Yadav², A. Gopesh¹

¹Department of Zoology, University of Allahabad,
Allahabad (U.P.)

²Department of Zoology, Smt. Indira Gandhi Govt. P.G. College,
Lalganj, Mirzapur-211003 (U.P.)

Email addresses: anita_gopesh@yahoo.co.in (Anita Gopesh)

Various morpho-functional modifications have gone in the structure of gill of air-breathing fishes which not only help them to obtain O₂ required for their survival but also

to physiologically manifest the problem imposed by the low oxygen concentration, hypoxia or presence of pollutants in the surrounding water. Hence suprabranchial organs, developed in these air-breathing fishes, make them suitable candidate for surviving in oxygen deficient environment.

Heteropneustes fossilis, a known air-breathing fish, has tremendous capacity of tolerating low oxygen concentration in the water. A pair of sac-like backward extension from the suprabranchial chamber (derived from embryonic gill mass), embedded deeply into body myotomes, on each side of the body, are the main parts of the air-breathing organs (accessory respiratory organ, ARO) in the fish, which unlike the gills does not come under the direct contact of the external medium. Ascertaining the notion of their exceptional tolerance to oxygen deficient milieu in the surrounding, an ultrastructural investigation was undertaken through ESEM and TEM to deal with principal cellular structures, which are probable candidates in the *modus operandi* of the dual mode of respiration. The observations are reported and discussed in the light of structural modifications in these structures to cope with higher osmolarity and water deprived ambient medium on one hand and its suitability in commercial aquaculture in swamps and marshes, and in derelict water bodies, on the other.

28. Lordosis (deformities in vertebral column) in Indian Cat fish *Clarius batrachus* under different photoperiods

**Miss Shweta Agniwanshi*, Dr. R K Agrawal,
Dr. R. Maheshwari and Dr. K. Das**

* Research scholar, Department of Zoology and Biotechnology
Govt. N.P.G. College of Science,
Raipur C.G. 492010

Keywords: *Lordosis, photoperiods*

Lordosis meaning abnormal curvature of vertebral column is one of the most severe deformities developed due to many factors. The skeletal deformities may have been caused either by environmental disturbances, nutritional deficiency in the feeds, a genetic mutation, or a combination of the three factors. In this experiment lordosis is examined in the

Clarius batrachus under different photoperiod LD (natural light condition), LL (continuous light) and DD (continuous darkness). For this experiment 60 fishes were divided into three groups and were subjected separately to above mentioned photoperiod for 60 days. 5 fishes were sacrificed at the interval of 15 days to examine the process of lordosis and we found lordosis in fishes which were maintained in DD condition. The skeletal deformity was “U” shaped and occurred in trunk region of the vertebral column.

29. Comparative Study of Synthetic Hormones Ovaprim and Carp Pituitary Extract used in Induced Breeding of Indian Major Carps

More P.R.*, Bhandare R.Y*, Shinde S.E*, Pathan T.S**
and Sonawane D.L*.

*Department of Zoology,
Dr. Babasaheb Ambedkar Marathwada University
Aurangabad. 431004(M.S.) India.

** Department of Zoology, Kalikadevi Arts,
Commerce and Science College,
Shirur (KA) Tq. Shirur Dist. Beed
E-mail :- purushottam.more @redif mail. Com.

Key words: *Synthetic hormone ovaprim, carp pituitary extract, Indian major carps and fish breeding.*

In present study during 2008- 2009 observed the spawning response of ovaprim compared with pituitary extract in Indian major carps, at fish breeding center at Jaikwadi, Paithan Dist. Aurangabad (M.S) India. Total ten trial doses of ovaprim were used in induced breeding and ten trial doses of Carp Pituitary Extract (CPE) used for induced breeding in Indian major carps i.e *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*. The percentage of fertilization ranged (88.11 - 97.94%) was found with ovaprim treatment. and (53.19 - 85.48%) with pituitary extract treatment. The percentage hatchling ranged (74.70 - 95.92%) with ovaprim treatment and (60 - 58.82%) with pituitary extract treatment.

30. Ecological Management of Fish Farming of East Kolkata Wetland (EKW) : Application of Probiotics in Fish Health & Production upliftment

Mousumi Saha¹, Agniswar Sarkar², B. Bandyopadhyay¹
and S.S. Mishra³

¹Oriental Institute of Science and Technology,
Vidyasagar University, Midnapore (W.B)

²Department of Biotechnology, The University of Burdwan, Burdwan, (W.B)

³Central Inland Fisheries Research Institute (ICAR), Barrackpore, (W.B)

E.mail : mou.cute@gmail.com

Keywords: East Kolkata Wetland, Bheries, Probiotics, Fish Farming.

Fish Farming or Aquaculture is a major industry in our country contributing significantly to food security, livelihood and the economy. East Kolkata Wetland is the best example of wastewater fisheries utilizing the industrial and domestic sewage. East Kolkata Wetland was declared as a Ramsar site on 2002 as per Ramsar Guidelines. “Bheries” is a local term used for sewage fed fisheries system in EKW. In this recent year disease outbreaks have significantly reduces fish health quality which is a major area of constraint on aquaculture production and trade, affecting the economic development of the fisher(s) involved in East Kolkata Wetland. So, to improve the fish farming in the different bheries of EKW, a new approach have been adopted which involve the use of beneficial microbes or bacteria in the bheries termed as “PROBIOTIC THERAPY”.

The major aim of using probiotics is to maintain a favourable relationship between friendly and pathogenic microorganisms that constitute the flora of intestinal or skin mucus of fish. Probiotics must be non-pathogenic and non-toxic to aquatic animals, environment as well as human health. In present days most probiotics used as biological control agents in aquaculture belong to the lactic acid bacteria (*Lactobacillus*, *Carnobacterium*, etc.), to the genus *Vibrio* (*Vibrio alginolyticus*, etc.), to the genus *Bacillus*, to the genus *Nitrosomonas* and *Nitrobacter* or to the genus *Pseudomonas*. Some present day study reveals that the use of probiotics in fish farming shows signs of success. However, much more study and research in this new technology is required to determine the appropriate probiotic for specific conditions or diseases, to determine the best method of administration and dosage level and to improve the shelf life or viability of probiotic bacteria. Thus the aim of our study is to focus on use of probiotics and to give a details idea about its application and beneficial role in fish farming in the bheries of East Kolkata Wetland.

31. Utilization of Marigold flower as Natural Carotenoid Source in Colour Enhancement of an Indigenous Ornamental Fish, Rosy Barb (*Puntius conchoni*)

Mrinal kumar*, G.H. Pailan, Aniket Borkar and S.K. Prabhakar

Central Institute of Fisheries Education (Deemed University),

Kolkata Center

32 GN Block, Sector-V, Salt Lake City, Kolkata

*mrinalaqua@gmail.com

Key words: *Natural carotenoid source, marigold flower, colour enhancement ornamental fish, Puntius conchoni*

A study was conducted to see the effect of supplemental feeding of marigold flower meal as natural carotenoids sources on skin colouration in rosy barb (*Puntius conchoni*). The control diet was prepared by selected ingredients viz. fish meal 25%, soybean meal 22%, groundnut oil cake 15%, rice bran 20%, wheat flour 12%, starch powder 3%, soya oil 2% and vitamins and minerals 1%. Ten experimental diets were prepared by supplementing either marigold powder at five concentrations viz. 1%, 2%, 4%, 6% and 8% of the control diet replacing the same amount of rice bran. Two experimental feeding trials each for 45 days duration has been conducted in rosy barb using the experimental feeds. At the start of the experiment the total carotenoids concentration in the muscle and skin of rosy barb was 1.32 μ g/g wet weight. Total carotenoids concentration in the muscle and skin of rosy barb after 7 week of experimental feeding trial clearly showed that the total carotenoids concentration increased with the supplementation of marigold meals in the diet, highest being in 4% levels and beyond that no further increase in carotenoids content was found in the fish. The carotenoids concentration increased to 3.74 μ g/g wet weights, respectively with the feeding of marigold meal supplementation diets. The statistical analysis of data showed the total carotenoids content in fish fed diet with 4% marigold was significantly higher ($P < 0.05$) than in other groups. The weight gain and increase in length was significantly higher in 4% marigold meal supplemented diets. The feed conversion efficiency was significantly lower in 4% marigold meal supplemented diets. The survivality of fish was not affected due to incorporation of various level of marigold in the experimental diets. The results showed that marigold meal can safely be supplemented at 4% levels in the diets of rosy barb to increase their skin coloration.

32. Parasitic investigation on *Cyprinus carpio* (common carp) captured from River Gomti, Lucknow.

N.Fariya

*National Bureau of Fish Genetic Resources,
Exotic & Health Management Division, Lucknow.*

Correspondence: Naireen Fariya, Fish Health Management Division,
National Bureau of Fish Genetic Resources,
Canal Ring Road, P.O.Dilkusha, Lucknow.
Email address: n_fariya@yahoo.com

Keywords : *Parasites, Cyprinus carpio, River Gomti.*

The research was carried out to determine ecto and endo parasites of 25 common carp (*Cyprinus carpio*) caught from Gomti River between December, 2009 and July, 2010. During this period six of the sampled carps were infested with monogenean and protozoan. Ecto parasite such as monogenean trematodes; *Dactylogyrus extensus*, Muller et Van Cleave, 1932, Crustacean parasites; *Argulus sp.* and protozoan parasites; *Ichthyophthirius multifiliis*, Fouquet, 1876, *Vorticella*, *Trichodina sp.* and *Pleistophora sp.* was found as endo parasites. Protozoan, Trematoda and Crustacean parasite caused serious disease both on cultured and wild fish species. These parasites can cause mortality and low growth rate of fishes.

33. Morphometric Changes in Freshwater female Catfish *C.batrachus* after exposure to Fluoride

Nalini Tripathi and Madhu Tripathi*

Aquatic toxicology Research Lab
Department of Zoology,
University of Lucknow, Lucknow-226 007.
Corresponding Author : drmtripathi@gmail.com

Keywords : *Clarias batrachus, Fluoride, GSI, HSI , CF, SCF*

Fluoride problem is now a global issue. From the recent reports of ATSDR, it is clear that increased level of fluoride is imposing a great health hazards on population inhibiting

fluoride endemic areas. Naturally, the aquatic inhabitants are being exposed to the excess amount of fluoride. Keeping in view this fact, the present study has been planned to observe the effect of fluoride exposure in fishes, which inhabits aquatic habitat. In the present study the *C.batrachus* were exposed for two sub lethal concentrations of fluoride (35 mg/l and 70 mg/l) of water for 45 and 90 days. After completion of exposure, weight of all fishes was recorded. Afterwards they were sacrificed and their gonads as well as liver were dissected out to record their weight. GSI, HIS, CF and SCF were calculated. These parameters were compared with the control values obtained from the control group of fishes. It was found that there was decrease in body weight, liver weight, gonad weight, GSI, HSI, CF and SCF of fishes after exposure to fluoride. These observations indicate that fluoride interferes with general health condition of fishes as well as it affects the reproductive system adversely.

34. Effect of asphyxiation on glyceimic levels of a catfish, *Heteropneustes fossilis* (Bloch)

Neerja Kapoor

Department of Zoology

CMP College,

Allahabad

ISCA Membership No. L16210

Asphyxiation is a kind of environmental stress. In the present investigation, the influence of induced asphyxiation upon the blood glucose level of a common catfish, *Heteropneustes fossilis* has been studied. Induced asphyxiation elicits a hyperglycemic response. The hyperglycemia of the asphyxiated fish subsides gradually and a euglycemic state is achieved, if the asphyxiated fish is replaced in water. Glycemic level is under strict hormonal regulation with the pancreatic and adrenal hormones playing an important role in the homeostatic mechanism.

35. Decline in the major carp fishery in the middle stretch of the Ganga river system

P. R. Singh

Department of Zoology
University of Allahabad
Allahabad
Email-drprsingh@rediffmail.com

Key words: *Ganga river, Exotic fishes, major carps, fish landings*

Ganga river system is the best known fishery resource in India. A variety of valuable indigenous fishes are found in this system. The main contributors during 1970s were recorded as Indian major carps (mrigal, catla, rohu), cat fishes (*Aorichthys seenghala*, *A. aor*, *Wallago attu*, *Rita rita*) and at many places hilsa was also an important component of the catch. *Labeo calbasu* also emerged as principal component of riverine catch in 1998. During the past 20-25 years the riverine fisheries has suffered on account of pollution and other anthropogenic factors. In the recent years the trends in fisheries have been quite different; all the Indian major carps, *W. attu*, calbasu have declined. Hilsa landings have become negligible. About 8 years ago various exotic fishes (common carp, tilapia, silver carp etc.) have invaded the Ganga river system. These exotic fishes have become dominant and well established in the system. The percent contribution of these invasive alien species has increased greatly (> 40 % at few landing sites). The impact on indigenous fishes will be discussed.

36. Parasitic Diseases of Ornamental Fishes

Dr. Rehana Abidi*, Naireen Fariya# and Gazala Eram#

*- Principal Scientist, #-Research Scholar,
Fish Health Management Division,
National Bureau of Fish Genetic Resources, Lucknow.

Keywords: *Ornamental, Parasites, Diseases.*

Ornamental fish keeping is one of the most popular hobbies in the world today. The growing interest in aquarium fishes has resulted in steady increase in aquarium fish trade

globally. The trade with a turnover of US \$ 5 Billion and an annual growth rate of 8 percent offers a lot of scope for development. Estimates place the value of the marine ornamental trade at US\$ 200-330 million per year and the overall value of the marine fish trade, accounts for about 10 percent of the international ornamental fish trade (marine and freshwater included). India's share in ornamental fish trade is estimated to be Rs 158.23 lakh which is only 0.008% of the global trade.

It is widely recognized that ornamental fishes have caused the spread of pathogens and diseases such as fish lice, anchor worms, *Ichthyophthirius multifiliis*, *Cryptobia*, etc (Mc Cann et al., 1996; Langdon, 1990; Humphrey and Ashburner, 1993; Thilakaratne et al., 2003). It is evident that ornamental fishes and the water used to transport them, can act as vector for viruses and other pathogens of national and international significance. Nowak et al (2004) reported trichodinids, monogenean gill flukes and metacercariae of digenean trematodes, epitheliocystis and cysts of unknown origin in wild marine fishes from Tasmania. Fish health certification is fast becoming a prerequisite for international movement of aquatic animals and a means of facilitating trade among countries. To safeguard our native aquatic fish fauna from exotic diseases, we need the checklist and all the records of the parasitic fauna of our ornamental fishes. In this backdrop we studied the parasitic diseases of some freshwater and marine ornamental fishes which are described in the present paper.

37. Oxidative stress biomarkers of exposure to sodium arsenite in fresh water fish *Channa punctatus* (Bloch.)

Richa Mishra and Madhu Tripathi*

Aquatic Toxicology Research Laboratory, Department of Zoology,
University of Lucknow, Lucknow-226 007,
Uttar Pradesh, India
*email: drmtipathi@gmail.com

Key words: *Sodium arsenite, Channa punctatus, Total protein, Total lipid, Glycogen, Chronic exposure.*

Contamination of water by arsenicals and consequent toxicity in aquatic organisms has now emerged as global environmental problem. *Channa punctatus* is a widely available fish in many parts of the India and world wide. Fish are the major source of protein for

human consumption. They are also a source of contamination, because of amounts of heavy elements they can contain, some of which are highly toxic. In natural and anthropogenic interventions like mining, smelting, modern agrochemicals etc have created a lot of stress to the aquatic environment. The impact of sodium arsenite on the some biochemical profiles of fresh water fish *Channa punctatus* have been studied. The LC₅₀ (96 hrs) of sodium arsenite for fish have been calculated as 48.65 mg/L. The selected sub lethal concentration in the experimental protocol were 1/5th and 1/10th of LC₅₀. The healthy fishes were acclimatized for 15 days and then exposed to the different concentration of toxicants for 90 days and observations were made. The parameters selected were total protein, total lipid and glycogen. The results of the present study indicate that arsenic exposure induces significant reduction on the biochemical content of *Channa punctatus*. At the lower sub lethal doses of arsenic protein content was decreased significantly while at its higher sub lethal dose the decrease was much significant. Decrease in the total lipid as well as glycogen were also significant for both the higher concentrations of toxicant to the fish. In conclusion the present study shows that the exposure of arsenic greatly hampers the nutritional status of this commercial group of fish.

38. Prospects for the Integrated Fisheries in the Lakes of Madhya Pradesh

Ritesh Mandal, P.N.Panday, Rakesh Kumar Singh and Kamal Jaiswal

Fisheries Consultant, Shahdol.

E-Mail:- hrishi708@gmail.com

The objective and aims of scientists should be to made relevant research contribution by simplifying and modifying the indigenous technologies of different employment oriented disciplines specially in the third world countries. Technology is the main driver and tool for faster economic growth and rural development in changing global scenario in new millennium facing unprecedented-daunting challenges in open market economy. Aquaculture shares a major contribution in providing employment in the fisheries industries, which is a very growing sector globally. India is the number of water reservoir is abundant but the major problem which had been arising due to the global warming and climatic changes is the availability of water in the reservoirs for the whole years. In such condition utilization of water along with new technology is very much necessary. Integrated Fisheries is one of such gate way for such condition because it dose not requires the whole year for the

harvesting. The farmers of such area where water dose not remain for the whole year specially like in Madhya Pradesh. The paper will discuses more about the prospective of Integrated Fisheries in those areas with the better management of technology for encouragement of aquaculture to the fisherman in the way to self-employment.

39. Melatonin changes the body weight and GSI of a cichlid fish, *Oreochromis niloticus* (Linn.)

Ruchi Singh¹, A.K Singh¹ and Madhu Tripathi²

¹ Exotic Germplasm Section of Fish Health Management Division
National Bureau of Fish Genetic Resources,
Canal Ring Road, O. Dilkusha
Lucknow-226002, Uttar Pradesh (India).

² Departments of Zoology, University of Lucknow,
Lucknow-226010, Uttar Pradesh (India).

Correspondence: Ruchi Singh C/O Dr. A.K Singh (Pr. Scientist),
Exotic Germplasm Section of Fish Health Management Division,
National Bureau of Fish Genetic Resources, Canal ring road,
P.O. Dilkusha. Lucknow-226002, Uttar Pradesh (India).
Email: ruchi.nbfg@gmail.com

Key words: Melatonin, GSI, Body weight, Locomotion, *Oreochromis niloticus*.

Melatonin (MLT) is a hormone released by pineal organ of fish brain, effecting the fish reproduction. The present study showed the effect of melatonin on fish growth and gonad development of *Oreochromis niloticus*. MLT in the dose of 25µg/l gave to the 150 fingerlings of *O. niloticus* (2.8±1.58 g weight, and 3.13±1.22 cm length) through immersion method for three month under normal photoperiod of 12:12 h day light condition. Experimental results showed changes in the body weight and gonadosomatic index (GSI) of fish. After three months, final weight of fish obtained 21.3±1.88 g and length was 15.67±0.51 cm in control condition but under the effect of MLT treatment both weight and length of fish decreased. The reason for decline in the body weight and GSI was understood to be due to low food intake by fish. The final weight of the treated fish was 18.5±1.90 g and length was 13.39 ± 1.35 cm after three months. GSI value was also found to remain depressed in experimental condition (4.78±0.48) in comparison to control condition (4.87 ± 0.35).

40. Spatial Analysis of Anthropogenic Impact on Paiswani River

S. K. Chaturvedi and Ashok Kumar Tiwari

Department of Biological Science,
Faculty of Science & Environment
Mahatma Gandhi Chitrakoot Gramodaya Vishvidyalaya Chitrakoot,
Satna, (M.P.)
Email:surkantmgcgv@gmail.com

Keyword: *Physico-chemical, GIS, Anthropogenic, Impact*

Paiswani River has been studied for physico-chemical, biological characteristics and social survey. Present work flings an effort to delineate diffuse activities along the 20 km stretch of river coast and study the resulting degradation. Water quality at different sites and the whole stretch analyses with the help of GIS software, mitigations are also suggested to control the water quality in future.

41. Sustainable aqua food production with species diversification and cost effective feeding regime having gender centric approach

S.K. Das, Professor

Department of Fishery Resources Management,
W.B. University of Animal & Fishery Sciences,
Chakgaria, Panchasayer, Kolkata-700 094
Email: dassudhir123@rediffmail.com

Key words: sustainable aquaculture, species diversification, low cost feed

The vast and varied aquatic resource potential of India provide ample scope for its development to sustainable aquaculture and thus strengthens nutrition security, livelihood security and ecological security. Now, Indian major carps form mainstay of country's farmed fish production and there is need for its diversification with other species. Supplementary feeding accounts for more than sixty percent of total operational cost and its decline with use of locally available resources suitable for diversified candidate species are analysed. Sustainable aquaculture with gender centric approach is discussed as it is needed for inclusive growth in the country.

42. Zooplankton Community Structure of Two Freshwater Habitats in Dist. Washim (M.S.), India

S.M. Yeole*, G.P. Patil and R.M. Yewale

*Deptt. of Zoology, Shri Shivaji College,

Parbhani, Dist. Parbhani

E-mail : sm_yeole@rediff.com

Deptt. of Zoolgy,

S.S.S.K.R. Innani Mahavidyalaya,

Karanja (Lad), Dist. Washim.

E-mail : ssskrimv@gmail.com

Key words : Zooplankton, Quali-Quantitative Enumeration, Sarsi-Both Lake, Yedshi Lake.

Zooplankton are microscopic free swimming animalcule components of an aquatic ecosystem and are primary consumers of phytoplankton. Quali-quantitative enumeration of zooplankton two freshwater habitats i.e. Sarsi-Both Lake and Yedshi Lake. Tq. Mangrulpir, Dist. Washim (MS) was carried out for a period of one year from October 2008 to September 2009. In Sarsi-Both Lake 34 species were recorded, of which 03 were Protozoa, 12 Rotifera, 05 Ostracoda, 06 Copepoda and 08 were Cladocera, while in Yedshi Lake 42 species were recorded, of which 04 were Protozoa, 20 Rotifera, 04 Ostracoda, 06 Copepoda and 08 Cladocera. During quantitative studies of zooplankton of both the lakes, Sarsi-Both showed presence of 763.03 Ind/L out of which Rotifer were 628.51 Ind/L (82.37%), Protozoa 6.62 Ind/L (0.87%), Ostracoda 20.18 Ind/L (2.64%), Copepoda 31.52 Ind/L (4.10%) and Cladocera 76.40 Ind/L (10.02%) while Yedshi Lake showed higher values of various groups of zooplankton. In quali-quantitative enumeration studies rotifer dominated both the freshwater habitats throughout the study period. Zooplankton abundance of Yedshi Lake was found dominant over Sarsi-Both Lake in both the respects.

43. Morphological and Behavioural Alterations In Freshwater Catfish, *Heteropneustes fossilis* (Bloch) after Chronic Fluoride Toxicity

Sandeep Bajpai, Nalini Tripathi, Seema Tewari
and Madhu Tripathi*

Aquatic Toxicology Research Laboratory,
Department of Zoology,
University of Lucknow, Lucknow-226 007,
Uttar Pradesh, India.

*For Correspondence E-mail: drmtripathi@gmail.com

Key words: *Catfish, Fluoride, Chronic toxicity, Behaviour, Morphology.*

Chronic fluoride exposure is known to cause a variety of manifestations including alterations in morphology and behaviour of aquatic organisms including fish due to direct contact to contaminated medium. In the present study, the effect of fluoride, a chemical contaminant was observed on morphology and behaviour of catfish, *Heteropneustes fossilis* after chronic exposure to different sub-lethal concentrations for a period of three months. The fish were divided into three groups having ten fish in each. Group one served as control and group two and three were exposed to low, 38.60 mg F/L as well as high, 77.20 mg F/L concentration of fluoride (1/10th and 1/5th of 96 hour LC₅₀ value) for 45 and 90 days. Morphological alterations included colour fading, thick mucous deposition all over the body, appearance of skin rashes, ulcerative tubercles, damaged fins and hemorrhages. Significant (p<0.001) increase in opercular beats after 45 and 90 days was observed in lower concentration exposed fishes whereas it was found decreased (p<0.001) in higher concentration after same durations. Similarly, significant (p<0.05; p<0.001) increase in surfacing activity was observed in lower concentration after 45 and 90 days of fluoride exposure respectively, whereas it was found decreased (p<0.01; p<0.05) in higher concentration after same durations. Along with this, reduced feeding intensity, loss of schooling, vertical hanging, abnormal swimming, bending of the body and complete loss of equilibrium were marked as chief behavioural alterations. All the changes were found to be 'duration and dose' dependent i.e. the results were more prominent and severe in higher concentration exposed fishes after longer duration. Thus it can be inferred that fluoride can cause duration and dose specific alterations in the morphology and can induce behavioural toxicity in fishes after chronic exposure.

44. A study of Pseudobranch in Mastacembelus armatus**Shri Prakash**

Department of Zoology,
Bhavan's Mehta P.G. College,
Bharwari, Kaushambi, U.P.

Key words : *Meta arteriole, arteriole, secondary lamellae.*

The structure of the Pseudobranch of the non-catfish *Mastacembelus armatus* is described using light microscopy. It was found that the Pseudobranch has the normal distribution of secondary lamellae in the lobe of the Pseudobranch. The curvilinear profiles of the secondary lamellae is also shown. The secondary lamellae is a "hair pin loop" type. The secondary lamellae associated with a arteriole, meta arteriole, pre-capillary and capillary in the medullary portion and cortical point.

45. Studies on pathogenic free-living amoebae from Municipal water supply of Lucknow city".

**Tabrez Ahmad, Newton Paul, Kavyanjali Shukla,
Dileep Kumar, Shashi Bala and A. K. Sharma***

Protozoology Research Laboratory,
Department of Zoology, University of Lucknow,
Lucknow (U.P.) 226 007, India.

Key words: *Amphizoic, Domestic water, Water purifier, Lucknow.*

Water is called 'elixir' of life but occasionally life is threatened because of contaminated water. Survival of all living forms depends solely on the quality of water. Due to rapid urbanization, industrialization and indiscriminate use of water bodies, no source of water such as lakes, rivers, ponds, tanks and ground water are absolutely safe for consumption. About two billion people in developing countries have no access to pure and safe drinking water and about 6000 children die everyday from diseases correlated with lack of access to safe drinking water, inadequate sanitation and poor hygiene. Though municipal department treat the water collected from local stream, river or ground water before supply; but the

water distributed to the customers by their supply is still not absolutely free from contaminants. The reason is that there are chances of contamination in the water supply at several places right from the distribution point to the end point of the domestic supply. The condition of water supply pipes is also poor at places and at certain points water pipes are in close proximity of sewer line pipes, which are occasionally open and water may be intermingling. With the advent of modern science and technology, various types of water purifier equipments have been developed, which are readily available in the market.

A study was planned to screen the domestic water supply of municipal water from the old as well as new areas of Lucknow city. Samples were collected from both the areas as below :- (a) from municipal water supply without any water purifier attachment and (b) from municipal supply with water purifier attachment. The samples were screened for microbiological analysis with special reference to protozoans. The biological characterization of amoebic isolates was carried out and it was found that a total no of 5 strains of amoebae (1 each of *Acanthamoeba culbertsoni*, *Acanthamoeba rhyodes* and *Naegleria gruberi* from water supply of old Lucknow without any water purifier attachment and one each of *Acanthamoeba rhyodes* and *Naegleria gruberi* from water supply of new Lucknow without any water purifier attachment) were isolated. Presence of Amphizoic amoebae in domestic water supply devoid of any water purifier attachment is a signal alarming for proper preventive measures before various uses at home, because some of the species of Amphizoic amoebae (*A. culbertsoni*, *A. rhyodes* and *N. fowleri*) are known to cause Meningitis affecting CNS and Keratitis affecting eyes.

46. Mopho-Taxonomic Study of a New Species from *Clarias Batrachus* (Linn.) from District Tikamgarh (M.P.) India

V.K. Sahu*, A.K. Srivastav and R.K. Khare****

*Deptt. of Zoology, D.V. (P.G.) College,
Orai, Dist. Jalaun (U.P.) India

**Parasitological Laboratory, Deptt. of Zoology,
Bipin Bihari (P.G.) College, Jhansi (U.P.) India

Ten cat fishes, *Clarias batrachus* (Linn.) were collected from local fisherman of Orchha, district Tikamgarh (M.P.) India. Eight specimens were obtained from intestines of two fishes. Morphological studies of the cestodes revealed them to the genus

Pseudoauricularia Khare, 2006 of the family Capingentidae Hunter, 1930, order Caryophyllidea Beneden in Olsson, 1893. The present form differs from all known species in having arrow shaped scolex, internal and external seminal vesicle, receptaculum seminis and operculate eggs.

47. Ambient salinity modulates hypoxia in the climbing perch *Anabas testudineus*

Valsa S. Peter

Department of Zoology

University of Kerala

Kariavattom, Thiruvananthapuram 695 581

Key words: *Anabas testudineus*, salinity, hypoxia, osmoregulation, fish

The effects of hypoxia and its recovery on physiologic indices were examined in freshwater (FW) and seawater acclimated (SA) climbing perch *Anabas testudineus*, to understand the mechanism of stress tolerance in this fish. Both FW and SA climbing perch were subjected to hypoxia and recovery (1 and 4 days) and the indices of metabolic (glucose, lactate, and urea) and osmoregulatory (Na^+ , K^+ -ATPase and H^+ -ATPase activities) function were quantified. Na^+ , K^+ ATPase activity, a measure of cellular osmotic competence, failed to respond to 20 min. hypoxia in the gills of both FW and SA fish. A decrease in gill Na^+ , K^+ ATPase activity was found in the FW fish kept for recovery (1 and 4 days) but not in the SA fish. Intestinal Na^+ , K^+ ATPase activity of FW fish on the other hand, decreased after immersion and this effect was recovered after recovery. On the contrary, H^+ -ATPase activity showed an upregulation after hypoxia in FW fish, but produced a downregulation in SA fish. However, these changes were reversed when these fish were kept for recovery after immersion, suggesting an important role of this enzyme in stress acclimation. Metabolites like glucose, lactate, and urea in the plasma responded to hypoxia induction and also to recovery pointing to the direct involvement of these metabolites in hypoxia-induced stress response and its acclimation. Overall, the data suggest that ambient salinity modifies the pattern of stress response of climbing perch during and after hypoxia induction. (Funded by UGC, New Delhi as Research Award).

II. Cytogenetics, Cancer Biology and Immunology

48. Induction of Chromosomal Aberrations by methomyl in Fresh Water Fish

Renu Chaudhari, Rupali Rana and Neelam Panwar

Pest and parasite Research Laboratory
Deptt. of Zoology, Barcilly College, Bareilly-243 005

Keywords : *Methomyl, Chromosomal aberrations, Genotoxicity, gill cells, Kidney cell, Channa punctatus*

The genotoxicity of methomyl was evaluated through induction of chromosomal aberrations in gill and kidney cells of *Channa punctatus*. After acclimatization the fishes were divided into two groups, control and experimental. Experimental fishes were exposed to two sub lethal concentrations (.005, 0.02 ppm) of this compound. Different types of aberrations were observed in the cells of both kidney and gills. The aberrations were chromatid separation, break, fragment and sticky plates. There was significant increase in number of chromosomal aberrations in comparison to th cells in control group fishes. The percentage of abnormalities was more in gill cells in comparison to kidney cells.

49. Genotoxic evaluation of Doramectin in fresh water fish *Channa punctatus* using Micronucleus Test and SCGE

Kamal Kumar Saxena, Trapti Saxena and Priyam Sachdeva

Pest and parasite Research Laboratory,
Department of of Zoology,
Bareilly College, Bareilly

Key words : *Channa punctatus, Micronucleus test, SCGE, Blood, Doramectin and Genotoxicity*

In present study induction of DNA damage by doramectin was evaluated in *Channa punctatus* using Micronucleus test (MNT) and Single Cell Gel Eletrophoresis (SCGE). the fish were exposed to sub lethal concentrations (0.008, 0.012, 0.016 ppm) of doramectin for

144h and sampling was done at regular intervals i.e. 24, 48, 72, 96, 120 and 144 hrs. The highest micronucleus induction and DNA damage were found after 120h at highest concentration of doramectin used. these results indicate that both micronuclei induction and DnA tail length increase with the increase in exposure period and concentration of doramecting but it has been found that after 120 hrs both the micronuclei induction and DNA damage decreases which indicates DNA repair.

50. Study of Genotoxicity caused by λ -cyhalothrin in the fresh water fish *Channa punctatus*

Kamal Kumar Saxena, Rupali Rana and Renu Chaudhary

Pest and Parasite Research Laboratory
Deptt. of Zoology, Bareilly College,
Bareilly

Key words : *Genotoxicity, synthetic pyrethroids, λ -cyhalothrin, chromosomal aberration test, metaphase spreads, chromosomal abnormalities, Channa punctatus.*

Genotoxicity of λ -cyhalothrin, a synthetic pyrethroids was investigated in kidney of *Channa punctatus* by using the structural chromosomal aberration (SCA) test system. The fishes were exposed to various concentrations of λ -cyhalothrin for 144 hours.

To study the genotoxic effect of this compounds fishes were exposed to 0.00024, 0.00048, and 0.00096 ppm of λ -cyhalothrin and were sacrificed after 48, 96 and 144 hours. Kidney tissues were taken out from sacrificed fishes and Chromosomal spreads were prepared by standard techniques. All the doses of λ -cyhalothrin used developed structural chromosomal aberration (SCA) in exposed fishes. The results obtained indicate that λ -cyhalothrin has a genotoxic potential as measured by the SCA in kidney of *Channa punctatus*. In the present study λ -cyhalothrin induced structural chromosomal aberrations like chromatid breaks, fragments, gap, chromatid separation, acentric fragment, deletion and ring type chromosomes. the frequency of aberrations was concentration and time dependent.

51. Cytomorphometric Analysis of Keratinized Round Cells in Oral Squamous Cell Carcinoma (OSCC)

Abhimanyu Mohanta¹, Prafulla K. Mohanty² and Gadadhar Parida³

¹UGC Research Fellow, P. G. Department of Zoology,
Utkal University, Vani Vihar, Bhubaneswar,
Odisha, India-751 004,
E-mail : amohanta01@gmail.com

²Professor, P. G. Department of Zoology,
Utkal University, Vani Vihar, Bhubaneswar,
Odisha, India-751 004,
E-mail : prafulla.mohanty3@gmail.com

³Former Professor and Head, Department of Oncopathology,
Acharya Harihar Regional Cancer Center (AHRCC),
Cuttack, Odisha, India-753 007

Key words : *Oral squamous cell carcinoma (OSCC), cytopathology, exfoliated scrape smears, large keratinized round cells (LKRCs), small keratinized round cells (SKRCs), cytomorphometric analysis. Nuclear–Cytoplasmic (N/C) ratio.*

Cytological pleomorphism is a distinguishing feature in the cytopathology of oral squamous cell carcinoma (OSCC). During the present investigation, two types of keratinized round cells (KRCs), such as large keratinized round cells (LKRCs) and small keratinized round cells (SKRCs) were observed in the exfoliated buccal smears of the oral cancer patients. The patients were mostly addicted to tobacco (khaini) chewing and snuff-dipping. In both cases, cytoplasm was observed to be keratinized and nucleus was deeply stained and enlarged. Cytomorphometrically, the N/C ratio of the LKRCs was 1: 4.7 in males and 1:4.3 in females and in SKRCs, it was calculated to be 1: 4.6 in males and 1: 5.2 in females. Cellular keratinization, hyperchromasia and increased N/C ratios in both sexes indicate the state of malignancy and thus, the present finding has a practical value in early detection and diagnosis of the OSCC patients.

52. Puffing activity response to lead nitrate stress in *Sarcophaga ruficornis* (Fab.) (Sarcophagidae: Diptera)

Akanksha Singh¹ and Uma Rani Agrawal²

¹Department of Zoology, University of Allahabad,
Allahabad- 211002

²Department of Zoology CMP Degree College,
University of Allahabad,
Allahabad- 211002

Key words: *Sarcophaga ruficornis*, foot pad, polytene chromosome, stress response

In the present study, chromosomal response to lead nitrate stress was studied in polytene chromosomes of the pupal foot pad cells of *Sarcophaga ruficornis*. The stress was given at 0.02 mM concentration for 20, 40, 60, 70 and 90 minutes. These treatments induce only a single large puff in chromosome arm II L at the region 12 A. This puff is known to be induced in several sarcophagid species by heat shock, 2-4 dinitrophenol, benzamide, sodium azide and thiourea. These findings suggest that a common set of gene loci is responsive to diverse stress regimens.

53. Trends in Diagnosis and Treatment of Cancer in Dogs

Dr R V Suresh Kumar, Dr P Veena, Dr N Dhanalakshmi,
Dr Ch Sreelatha, Dr P Sankar and Dr. S Kokila

College of Veterinary Science
Sri Venkateswara Veterinary Science,
Tirupathi 517502

A total of 12,269 clinical cases of dogs attended to the college hospital formed the material for the study.(from 2005-2010). Among the cases presented 433 cases of dogs were found to be having tumors which constitute to 3.53% based on screening and preliminary examination . Tumors were located at mouth, oral cavity, skin, mammary gland, tail, limbs, ear, eyes, vagina, rectum and anus. The cases were diagnosed by clinical examination , fine needle aspiration biopsy, cytological examination, radiological, ultrasonographic, and

histological examinations. Ag NOR staining and immunohisto chemical techniques were done to differentiate between benign and malignant cases. Based on the preliminary report medical treatment or surgical excision was done along with antibiotic administration . Blood samples collected from the affected animals did not show any significant changes in hematological parameters studied. C-reactive protein values were found to be elevated in malignant conditions. Chemotherapy was restricted to few types of tumors where as surgical excision was found to give satisfactory results in majority of the cases. Death was recorded in few cases which was attributed to malignancy. The findings , complications and outcome was discussed.

54. Karyotype analysis, Banding and Fluorescent in-situ hybridization in *Wallago attu* from family: Siluridae

Jyoti Verma¹, M. Serajuddin², W.S. Lakra¹, Basdeo Kushwaha¹

¹Molecular biology and Biotechnology Division
National Bureau of Fish Genetic Resources, Canal Ring Road,
O. Dilkusha, Lucknow–226002, Uttar Pradesh (India).

² Departments of Zoology, University of Lucknow,
Lucknow-226010, Uttar Pradesh (India).

Correspondence: Basdeo Kushwaha (Sr. Scientist),
Molecular biology and Biotechnology Division,
National Bureau of Fish Genetic Resources, Canal ring road,
P.O. Dilkusha. Lucknow–226002, Uttar Pradesh (India).

Email: jyoti.capricorn@gmail.com, basdeo.scientist@gmail.com

Key-words: *Karyotype, Ag-NO₃, CMA₃, C-banding, FISH, Wallago attu*

Conventional staining, differential banding and insitu hybridization with both major and minor ribosomal DNA to mitotic chromosomes of *Wallago attu* are described. The karyotype of *W. attu* possessed 84 chromosome with karyotype of 5 pair metacentric, 5 pair submetacentric, 4 pair subtelocentric and 28 pair telocentric. In the subject species, the NOR, detected by AgNO₃ and CMA₃, and constitutive heterochromatic block, detected by C-banding, were present on p arm of single pair of chromosome. NOR localization in *W. attu* was on 1 pair submetacentric chromosome. In case of fluorescent insitu

hybridization (FISH) also detected 18S signals on one pair of chromosome in *W. attu* the species that was identical to NOR. This suggest that the NOR was active in the species. The FISH also detected 5S r DNA loci on single pair of chromosome and the position was near to centromere in *W. attu*.

55. By-pass desert cooler- A Preventive tool against Dengue and Chikungunya

M. Tripathi¹, N. Kumar² and A.F. Rizvi¹

¹The Institute of Applied Sciences,
Camp Office- 21 MIG, Mumfordganj,
Allahabad- 211002 (India)

²The National Academy of Sciences, India,
5, Lajpatrai Road, Allahabad- 211002 (India)

Aedes aegypti, vector of Dengue and Chikungunya- arboviral diseases, is a fresh water container breeder and day biter. Due to conducive environment, in summer-monsoon seasons for vector, the occurrence of diseases is escalating. It was found in our control experiments that the desert coolers are maximally positive for *Aedes*. The installation of By-pass desert coolers (A prototype developed by Prof. V.P. Sharma, formerly Additional DG, ICMR & Director, MRC) proved to be very effective in the elimination of one of the potential breeding sites, thus curbing the menace of Dengue and Chikungunya up to maximum possible extent. In the year 2009, eight By-pass desert coolers were installed at eight different sites of Allahabad city and found that these By-pass coolers were 100% mosquito proof. To create awareness, A national symposium on Health and Sanitation – A rural perspective, as well as press conference were organized under the guidance of Prof. V.P. Sharma, at Allahabad. The effectiveness of these By-pass desert coolers were explained to the general mass and media. As well as opinions were invited from Allahabad Medical Association, PSM Department of Medical College, Allahabad and various medico public health professionals. All of them agreed to this very fact that the By-pass desert coolers are effective measures for preventing the spread of these dreaded diseases.

56. Spatial genetic variation in house fly populations *Musca domestica* L. (Diptera: Muscidae)

Manisha Tripathi and Jaya Tripathi

Cytogenetics Research Laboratory,
Department of Zoology, University of Allahabad,
Allahabad-211 002
E-mail: manisha_tripathi22@rediffmail.com

Key words : *Musca*, *electrophoresis*, *allozyme*, *genetic identity*, *inbreeding*

Spatial genetic variation was assessed using allozyme markers among four populations of common house fly *Musca domestica* L. House flies were collected from four different locations with qualitative difference in food resources i.e., dairy farm, meat shop, vegetable market and solid food waste. Six gene enzyme systems viz., ACPH, EST, ME, AO, G6PD and XDH were analyzed which unraveled fourteen loci with twenty six alleles. F-statistics analysis has been used to calculate the genetic variation. It revealed that except ACPH-1, EST-3 and XDH-1 all other loci show inbreeding ($F_{is} > F_{st}$). A persistent excess of heterozygosity was observed only in ACPH-1 ($F_{is} = -0.140$). Nei's genetic index shows very high value of genetic identity between samples collected from meat shop and dairy farm.

57. MT transcript analysis in Indian freshwater teleost

Mohit Tiwari^{1,2}, N. S. Nagpure¹, D. N. Saxena² and W. S. Lakra¹

¹National Bureau of Fish Genetic Resources,
Lucknow- 226 002, U.P., India
²S.O.S. Zoology, Jiwaji University,
Gwalior-474 011, M.P., India
E-mail: mohittiwari2002@yahoo.com

Keywords: *Cadmium chloride*, *Channa punctata*, *Heavy metal*, *Kidney*, *Metallothionein*.

Metallothionein (MT) gene transcription is induced by heavy metals through metal response elements (MRE) that are present in multiple copies in the proximal promoters of

MT genes. MREs were shown to mediate transcriptional response of MT to oxidative stress, hypoxia and various heavy metals e.g., mercury, zinc and cadmium. In the present study a quantitative real-time reverse-transcriptase polymerase chain reaction experiment was performed for 14 days using freshwater teleost, *Channa punctata* (Bloch). Animals were exposed to $\frac{1}{4}$ of 96 h LC₅₀ of cadmium chloride. After semi-static exposure MT transcript level was measured in different tissues of the organisms. In contaminated kidney, it was found to be down-regulated on the first day, whereas on the last day level was found to be up-regulated. Thus, it may be concluded that MT gene expression occurs in duration dependent manner.

58. Cytochrome b (Cyt b) region based genetic relationship of flesh flies (Diptera: Sarcophagidae)

Neelam Bajpai and R. R. Tewari

Department of Zoology,
University of Allahabad,
Allahabad-211 002

Key words: *Cytochrome b, flesh flies, sequence divergence, molecular markers.*

Flesh flies belonging to the family Sarcophagidae (Diptera) constitute a group of medical, veterinary and forensic important flies. Although many studies have been carried out on the cytogenetics and biochemical genetics of these flies, only a few studies involving DNA based molecular markers have been reported in flesh flies from India. In the present study, partial mitochondrial Cytochrome b (Cyt b) region was amplified and sequenced with a view to characterize five sympatric species of the genus *Sarcophaga*, namely, *Sarcophaga ruficornis* (Fab.), *S. argyrostoma* (R.- D.), *S. dux* (Walker), *S. albiceps* Meigen and *S. knabi* (Parker). The sequences were aligned using Clustal X software and analyzed using Molecular Evolution Genetic Analysis 4 (MEGA4) software. The value of sequence divergence ranges from 0.084 to 0.146 and the average was found to be 0.111 indicating close association among five species. The phylogenetic tree derived from Neighbor Joining (NJ) and Maximum Parsimony (MP) methods, using *Drosophila yakuba* as an out group, revealed two clusters-one a cluster of *S. dux*, *S. albiceps* and *S. knabi* and the other of *S. ruficornis* and *S. argyrostoma*.

59. Testing of genotoxic potential of mercury in housefly *Musca domestica* L. (Diptera: Muscidae) by using cytogenetic end points

Nidhi Mishra, Rashmi Singh and R.R. Tewari

Department of Zoology,
University of Allahabad, Allahabad

Key words: Chromosomal aberration, nuclear anomalies, house fly

The present investigation was carried out to assess genotoxic potential of mercury, in house fly *Musca domestica* L. by using chromosomal aberrations and nuclear anomalies as cytogenetic end points. The late third instar larvae of house fly were exposed to < LC₅₀ doses (0.1 ppm, 1 ppm) and < LC₉₀ dose (10 ppm) and >LC₉₀ (100 ppm) dose of mercury for different time intervals (1hr., 2hrs. and 4 hrs). The results suggest that even the lowest dose induces significant increase in chromosomal aberrations and nuclear anomalies in comparison to control. The relative frequencies of chromosomal aberrations and nuclear anomalies increase in a dose and time dependent manner.

60. Clastogenic action of Nifedipine on meiotic chromosomes of *Poeciloceris pictus* F. (Insecta: Orthoptera: Acridiidae)

Prafulla K. Mohanty^{1(*)}, Nivedita Das¹ and Sanjaya Narayan Otta²

^{1*}P.G. Department of Zoology, Utkal University,
Vani Vihar, Bhubaneswar-751004, India

²Department of Zoology, Biju pattnaik College of Science and Education,
Jayadev Vihar, Bhubaneswar-751013, India

Key words: Nifedipine, *Poeciloceris pictus* F. and chromosomal aberrations.

Environmental mutagens are a matter of serious concern. Many drugs have been reported to have mutagenic in nature. The long term exposure of humans to different man made drugs leads to several health hazards, of which genotoxicity is of prime importance. The investigation on the effect of dihydropyridine compound namely Nifedipine on grasshoppers shows that this compound has induced chromosomal aberrations significantly with increase in concentration and duration of exposure to these compounds. Hence, restricted use of the stated drug is suggested.

61. Genetic characterization of fruit fly *Dacus dorsalis* (Diptera: Tephritidae)**Rashmi Singh and Nidhi Mishra**Department of Zoology,
University of Allahabad, Allahabad**Key words:** *Genetic characterization, PAGE, Dacus dorsalis, Hardy-Weinberg equilibrium*

Electrophoretic variation at three gene-enzyme systems viz., esterase (EST), malic enzyme (ME) and aldehyde oxidase (AO) from larval homogenates was analyzed using polyacrylamide gel electrophoresis (PAGE). A single zone of activity was found for the enzyme ME, indicating that it is encoded at a single locus. Multiple zones of activities were found for EST and AO i.e. five zones for EST (EST-1, EST-2, EST-3, EST-4 and EST-5) and two zones for AO (AO-1 and AO-2). However, the enzyme activity at EST-2, EST-4 and EST-5 and AO-1 loci was not consistent in all the individuals, therefore, they have not been considered. The enzyme activity at EST-1, EST-3, AO-2 and ME loci was found to be polymorphic. Eight loci were resolved, out of which only four (50%) were found to be polymorphic. The amount of observed and expected heterozygosity was found to be 0.40 and 0.49, respectively. The distribution of genotype frequencies at EST-1, EST-3 and ME loci were found to be in accordance with the Hardy-Weinberg equilibrium. However, significant deviation was observed at AO-2 locus.

62. Evaluation of genotoxicity in cyprinid fish, *Puntius sophore*, collected from polluted sites of river Ganga**Rashmi Srivastava, Anurag Dabas, Pavan Kumar, Ravindra Kumar,
Basdeo Kushwaha and N S Nagpure**National Bureau of fish Genetic Resource
Canal Ring Road, P.O- Dilkusha, Lucknow- 226002 (UP)**Keywords:** *Ganga; Genotoxicity; Puntius sophore; Tannery effluents.*

River Ganga receives a colossal amount of discharges of industrial and domestic wastes resulting from industrialization and urbanization activities in Kanpur city. Especially,

the direct discharge of effluents from leather tanning industries into water bodies has become a growing environmental predicament as these industrial units release heavy metals like chromium, copper etc. The chromium can damage DNA in several ways, including single- and double-DNA strand breaks, chromosomal aberrations, micronucleus formation, sister chromatid exchange, formation of DNA adducts and alterations in DNA replication and transcription.

Fishes are the most susceptible organisms to aquatic pollution and they are being utilized as bio-indicators of any change in the water quality. In the present study, erythrocytes of the cyprinid fish *Puntius sophore* (Hamilton, 1822), collected from three different sites of river Ganga near Kanpur in Uttar Pradesh, were subjected to comet assay and micronucleus test to assess the genotoxicity. Chemical analyses were also carried out in the water samples to assess the presence of major pollutants particularly some heavy metals like chromium, cadmium, lead etc. The amount of DNA damage, expressed in terms of % tail DNA, and micronuclei frequencies were significantly elevated in specimens collected from polluted site (*i.e.* tannery effluents discharge site), as compared to the upstream and downstream sites. In addition to micronuclei, other nuclear abnormalities such as bi-nuclei and cells with blebbed, notched and lobed nuclei were also assessed in the erythrocytes which probably occurred due to genotoxic chromium compounds. The results of this study indicate that river Ganga is contaminated with potential genotoxic chemicals and its genotoxicity is possibly related with the leather tanning industries apart from industrial, agricultural and domestic activities.

63. Aldehyde oxidase allozyme variation in three population of common house fly *Musca domestica* (Diptera: Muscidae)

Saumya Srivastava

Department of Zoology, University of Allahabad,
Allahabad -211002, India

Key words: *Musca domestica*, Aldehyde oxidase, Electrophoresis, Allele frequency.

Aldehyde oxidase allozyme gene diversity was estimated in house flies *Musca domestica* L. The house flies were sampled from three different places viz., Mirzapur, Varanasi and Phaphamau (Allahabad) of Uttar Pradesh. Electrophoretic banding patterns

of aldehyde oxidase (AO) were analyzed by polyacrylamide gel electrophoresis in *Musca domestica*. AO was polymorphic with three alleles in Mirzapur and Varanasi population but it showed monomorphic character for Phaphamau population. Comparison of genomic allelic frequencies among the three population indicate small difference between Mirzapur and Varanasi population but a little large difference in Varanasi and Phaphamau and Mirzapur and Phaphamau population.

64. Caspase dependent apoptotic loss of astrocytes and motor activity deficits in rats following Lipopolysaccharide induced neuroinflammation

Sharma A.¹, Patro N.¹, Tiwari S.¹, Patro I.K.^{1,2}

¹School of Studies in Neuroscience,
Jiwaji University, Gwalior 474011

²School of Studies in Zoology,
Jiwaji University, Gwalior 474011

Cellular degeneration is a phenomenon to which hippocampal and cortical tissue are susceptible in response to inflammation. However, differential rate of degeneration consequent upon neuroinflammation amongst varied cell type is yet to be fully understood. The present work was designed to evaluate quantitatively the apoptotic loss of astrocytes, microglia and neurons as also the associated behavioral alterations following intracerebroventricular infusion of Lipopolysaccharide (LPS; 50µg/ Kg body weight). LPS a bacterial endotoxin induces neuroinflammatory responses in the central nervous system. Rats were perfused transcardially with 2% paraformaldehyde at 7, 14, 21 and 28 days post infusion (DPI) and the brains were further processed for cryotomy. Immunohistochemical studies were performed for microglial activity (Iba 1, OX 6, ED 2), astrocytic activity (GFAP) and caspase dependent cell death (Caspase 3). Colabelling of microglia, astrocytes and neurons with caspase 3 was performed. Cell count was done using Leica Q win software. Treated animals along with controls were subjected to behavioral tests for motor activity, motor coordination and neuromuscular coordination just before perfusion. The results showed a significant increase ($p < 0.02$) in microglial activity at 7 DPI while astrocytic activity and cell death was significantly high ($p < 0.03$) at 14 DPI in the CA 3 region of hippocampus. In the DG region microglial activity, astrocytic activity

and cell death were significantly high ($p < 0.02$) at 7DPI and 14DPI. At other time points no significant difference was observed. Colabelling studies evidenced significantly more ($p < 0.02$) number of astrocytes undergoing apoptosis than microglia or neurons. A significant increase ($p < 0.001$) in motor activity at 7DPI was observed while no significant change was noticed at other time points as compared to control. The motor coordination showed significant decrease ($p < 0.05$) from 7DPI to 28DPI with respect to control. A significant decrease ($p < 0.01$) in neuromuscular coordination was evident at 7 DPI with no significant change at any other time points. Our finding concludes that the proinflammatory response triggered by LPS at early time points leading to hypertrophy of the astrocytes and programmed cell death of activated astrocytes via caspase dependent apoptotic pathway thereby negatively influencing the functionality of neurons resulting in the behavioral alterations.

65. Genetic relationships among some myiasis causing flies using RAPD-PCR

Shubhra Malviya and Neelam Bajpai

Department of Zoology,
University of Allahabad,
Allahabad-211 002

Keywords: *Genetic relationship, calliphorids, myiasis, RAPD-PCR*

Members of the family Calliphoridae are of great medical and veterinary importance as these cause animal tissue myiasis. In the present study, Random Amplified Polymorphic DNA –Polymerase Chain Reaction (RAPD-PCR) has been used to unravel genetic relationships among flies belonging to the family Calliphoridae namely, *Chrysomya megacephala* (Fabricius), *Hemipyrellia pulchra* (Weidmann) and *Lucilia cuprina* (Weidmann). Genomic DNA from individual flies was extracted. Six arbitrary decamer primers were used for amplification of DNA, which produced 46 reproducible and scorable bands ranging from 192 bp to 1726 bp in calliphorids. Genetic identity among these flies was calculated using Tools for population genetic analysis (TFPGA) software. Genetic identity ranges from 0.596 to 0.911 suggesting a close genetic relationship among them. The data obtained is compared with that of the members of family Sarcophagidae.

66. Development of an experimental double adjuvant vaccine for caprine pleuropneumonia in goats: Humoral immune response**Somya Mehra¹ and Rajneesh Rana²**¹Central Institute for Research on Goats,
Makhdoom, Farah, MATHURA, U.P.²Division of Bacteriology and Mycology,
Indian Veterinary Research Institute,
Izatnagar, Bareilly, U.P.

Caprine pleuropneumonia, a severe disease of goats is caused by *Mycoplasma mycoides* subsp. *capri*. Several experimental vaccines using single adjuvants have been tried and obtained shorter antibody response. Therefore, the present study was conducted to evaluate the efficacy of combined adjuvant (Saponin-Algel) to that of single adjuvant (Saponin) using Latex agglutination (LAT) and Indirect Haemagglutination (IHA) tests. The sensitivity and specificity of both tests were also compared. The results revealed that animal vaccinated with Saponin-Algel vaccine exhibited higher antibody titre than the animal vaccinated with saponin. Both the tests were found to be equally specific while LAT was more sensitive.

67. Immunoprophylactic potential of gp63 and Hsp70 in combination with different adjuvants against murine visceral leishmaniasis**Tejinder Kaur, Ankita Thakur and Sukhbir Kaur**Department of Zoology, Panjab University,
Chandigarh, India
puzoology@yahoo.com.**Keywords:** *gp63, Hsp70, MPL-A, ALD, VL*

VL is a serious problem worldwide and development of effective vaccines represents one of the most promising approaches for the control of the disease. We tested the protective efficacy of two proteins gp63 and Hsp70 in combination with two different adjuvants (MPL-A and ALD) against murine visceral leishmaniasis. The immunized animals revealed a significant reduction in hepatic parasite burden as compared to the infected controls.

These animals also showed heightened DTH response, increased levels of IgG2a, IFN-g and IL-2. This was also accompanied by a decrease in the levels of IgG1 and IL-10. In comparison to ALD, MPL-A was more effective in increasing the protective efficacy of the two proteins.

68. Population study of MTHFR C677T and MTRR A66G polymorphism in Jaunpur District

U Yadav, Kumar P, V Rai

Human Molecular Genetics Laboratory,
Department of Biotechnology,
VBS Purvanchal University, Jaunpur-222001 (UP)

Methylenetetrahydrofolate reductase (MTHFR) and methionine synthase reductase (MTRR) are the key enzymes of folate/homocysteine metabolic pathway and required for the conversion of homocysteine to methionine. The frequency of 677T (MTHFR) and 66G (MTRR) mutant alleles are subject to considerable ethnic and geographical variation. These SNPs reduces the catalytic activity of enzymes about 30-40% and consequently increase the homocysteine plasma concentration in individuals. The present study was designed to carryout screening of MTHFR C677T and MTRR A66G polymorphism in Yadav population of Jaunpur district.

For genomic DNA extraction, 3 ml blood samples were collected from unrelated randomly selected individuals (30 females and 20 males) from local population and PCR-RFLP method was used for MTHFR and MTRR mutation analysis. Informed written consent was taken from each subject. In total 50 samples the CC, and CT genotypes were found in 41 and 9 individuals, homozygous TT genotype was not found in any subject. The genotypic frequencies were found to be 0.82 for CC, 0.18 for CT. The allelic frequency of C and T were 0.91 and 0.09. The frequencies of genotypes in the present study were also assessed with the expected distribution (that is in Hardy –Weinberg equilibrium) by using the X^2 test. In case of MTRR analysis number of AA, AG and GG genotypes was 6, 30 and 14. The allelic frequencies of A and G were 0.42 and 0.58. In Yadav population of Jaunpur the highest genotypes was AG. The mutant (G) allele frequency is quite high in the target population which might be due to the small sample size of the present study.

69. Male meiosis in *Sarcophaga melanura* (Sarcophagidae:Diptera)**Uma Rani Agrawal**

Department of Zoology, CMP Degree College,
Allahabad-211002, U.P., India
E-mail: umar_agrawal@rediffmail.com

Keywords: *Achiasmata, Meiosis, Sarcophaga, Supernumerary chromosomes, Testicular cells.*

The basic chromosome complement of *Sarcophaga melanura* comprises 5 pairs of large euchromatic meta/submetacentric autosomes designated II-VI and a pair of Sex chromosomes- XX in the females and XY in the males. The X is a large telocentric chromosome while the Y is a small metacentric chromosome. Besides, the complement also includes two or three small telocentric elements which represent supernumerary chromosomes. Meiosis was examined in the testicular cells. Both autosomal and sex bivalents are achiasmata. All the autosomes as well as the X and Y chromosomes pair completely. The supernumerary chromosomes are also closely paired from prophase I to metaphase I. They behave as univalent at Ist anaphase.

70. Methylenetetrahydrofolate reductase polymorphism and its association with Bipolar disorder: a meta-analysis**Vandana Rai**

Human Molecular Genetics Laboratory,
Department of Biotechnology,
VBS Purvanchal University,
Jaunpur-222001 (UP)

Bipolar disorder (manic depressive illness) is much less common than other psychiatric disorders like unipolar depression, schizophrenia etc., with an annual incidence of 0.5 percent. It is characterized by alternating and severe disorders of mood (elation and depression), with accompanying shifts in energy and volition. 5,10- methylenetetrahydrofolate reductase enzyme (MTHFR) plays a central role in folate metabolism an approximately 40 variants of MTHFR have been reported so far, out of which C677T polymorphism is clinically

important and reported as risk factor for several disease and disorders. Studies investigating the association between gene polymorphism involved in folate metabolism and bipolar disorder have reported contradictory or inconclusive results. In order to review the contradictory results a meta-analysis of all available studies relating the MTHFR C677T with bipolar disorder was carried out. All statistical analyses were carried out on meta-disc (version 1.4). Total 5 case-control studies was found suitable for the inclusion in the present meta-analysis and total number of cases was 667 and control was 1275. In cases the number of CC, CT and T genotypes were 321, 276 and 70 respectively, whereas in controls highest genotype number was of CC (619) followed by CT (531) and TT (125). In both cases and controls the highest genotypic frequency was of CC genotype. The pooled Odd Ratio (OR) was estimated using both fixed effect (Mantel-Haenszel) and random effect (DerSimonian and Laird) models. The meta-analysis with fixed effects showed that there was 70.4% heterogeneity between the five studies. The fixed effect pooled OR was 1.27 (95% CI; 1.11 to 1.46) and Cochran Q was 13.51 (df = 4; p=0.00090). The study is significant. The random effect pooled OR was 1.22 (95% CI; 0.91 to 1.64) and Cochran Q was 13.51 (df = 4; p=0.00090). The random effect pooled OR was significant and showed association between MTHFR C677T genotype and bipolar disorder.

III. Ecology, Environmental Biology, Wildlife Biology and Animal Behavior

71. Effects of Circadian Rhythm on Aquatic and Aerial Oxygen Consumption in Fresh Water Teleost, *Channa Gachua*

D. N. Sadhu and Qaisur Rahman

Department of Zoology,
St. Columba's College,

Hazaribag-825301, Jharkhand, India

E-mail : dus_hzb@yahoo.co.in, qaisur.rahman@gmail.com

Keywords : *Circadian rhythm, oxygen consumption, Channa gachua*

Usually behaviour and physiology of organism are rhythmic in nature. The biological rhythm in oxygen consumption in air breathing fish is interesting. The circadian rhythm has now become an inherent property of the system which they transmit even under artificial

conditions of the laboratory. An attempt has been made to study the effect of circadian rhythm on aquatic and aerial oxygen consumption in fresh water teleost. *Channa gachua*. The maximum oxygen uptake from aquatic route was recorded in the early morning with moderately higher at noon and evening i.e. 54.74, 52.8, and 50.76 (ml/kg/hr) respectively. The highest rate of oxygen consumption from aerial route was observed in the morning and noted as 85.61, 60.27 and 51.78 (ml/kg/hr) at noon and during evening period minimum oxygen uptake was recorded at mid night was 40.20 (ml/kg/hr) respectively.

The total oxygen consumption i.e. 140.35, 112.06 & 101.68 (ml/kg/hr) were recorded in the morning, afternoon & evening hours respectively. However the minimum value of 85.54 (ml/kg/hr) was noted at mid night. It was found that percentage of aerial oxygen uptake in the morning, midday, evening & midnight was recorded as 60.985%, 53.41%, 52.92% and 46.9%. Organismic physiology and behaviour are often rhythmic and these rhythms will persist in the laboratory in the absence of photoperiod and various physicochemical factors of the environment in which organisms live under natural conditions. Circadian rhythm of the oxygen consumption has been correlated with diurnal fluctuation of metabolism of the ecosystem. The details have been discussed in this paper.

72. Turtles and Tortoises of Manipur in Northeast India

Naorem Linthoi and D. K. Sharma

Department of Zoology,
Gauhati University, Assam, India
E-mail : naoremlinthoi@gmail.com

Turtles and tortoises have been in the world since time immemorial. They have managed to survive the last 200 million years including the great extinction episode that eliminated the dinosaurs. However, human rapacity coupled with official apathy have proved to be a deathblow for these rare and precious creatures. Due to lack of awareness, these turtles are being constantly preyed upon by the people for their meat which is considered a delicacy in Assam. If this trend continues, these creatures will soon be a thing of the past. Northeast India has the highest diversity of turtles and tortoises. Freshwater turtles

play an important part in cleaning the waters of polluted rivers and mindless exploitation of these gentle creatures have continued over the years. Compared to the other Northeastern states very few survey and conservational works have been taken in the state of Manipur.

73. On the Ecological, Behavioural and Identification of Varied Threats to Brahminy Kite in and Around Kurukshetra, Haryana, India

Rohtash Chand Gupta

Kurukshetra University,

Kurukshetra, Haryana

E-mail : rohtashehandgupta@rediffmail.com

Brahminy Kite is seen in Kurukshetra around BRAHAMSAROVAR in addition to other satellite SAROVARS in the vicinity of small JHEELS, PONDS, CHAPPARS, LAKES etc. It has always been observed sky borne over the vast water sheet of BRAHAMSAROVAR—a perennial water body having religious and historical significance. Similarly, it has been spotted frequently on the margins of Chilchilla Bird Sanctuary nearby Kurukshetra city. In this Sanctuary, Brahminy Kite has been observed ground borne in shallow marshy waters. In BRAHAMSAROVAR, it has been observed preying on fish by initiating repeated dives into water at the surface only. More often than not, it has shown a strong tendency to perch on a thickly canopied BANYAN tree while flying at low heights in a royal style; it reveals its copper brown upper attractive surface in a majestic way. Brahminy Kite seems to define poetic parameters of beauty and grace while in buoyant positions and postures. The populations of Brahminy Kites in Kurukshetra are extremely depleted as has been observed in the last 25 years or so. It has never been seen in pairs; leave alone, in a group or community. The present trend foretells its phasing into still difficult times in future. To rehabilitate the Brahminy Kite, rejuvenation of wetlands is a primary condition. Also, protection of BANYAN trees in the vicinity of JHEELS should be assisted through intervention of society, non-government organizations and law. Its nest lodging tree should be implanted nearby wetlands.

74. Species Diversity of Family Unionidae in the River Dulong and Their uses by Local People

S. R. Pal¹, M. C. mahata

¹Deptt of Biology, S. P. College, Jamshedpur-831002, Jharkhand

²H.O.D. Zoology (PG) Ranchi University,
Ranchi, Jharkhand

E-mail : satyaranjan_pal@yahoo.com

Keywords : *Freshwater, pH, Temperature, Moderate, Food value*

A survey of fresh water beivalves of family unionidae in the Dulong river during January 2008 to July 2008 showed the occurrence of five species such as *Lamellidens marginalis* (Lamarck), *L. corrianus* (Lea), *Perreysia corrugata* (Mueller), *P. favidense* (Benson), *Indonaia coerulea* (Lea). Among these species *Lamellidens marginalis* was moderately present in high water temperature range 27.5⁰C to 34.5⁰C and pH 7.6 to 8.5 while *L. corrianus* was scarcely present at same temperature and pH at the same sites of the river. *P. corrugate*, *P. favidense* and *Indonaia coerulea* were moderately present in the water temperature range 24⁰C to 24⁰8C and pH 7.0 to 7.5 where from samples were taken. The flesh of these species are valued as food in the form of currey and shell powder of *Lamellidens spp.* mixing with honey is used for the remedy of giddiness, nervousness and dehydration.

75. *Trophurus clavicaudatus* sp. n. (Tylenchida : Belonolaimidae) from West Bengal, India

**Debabrata Sen, Amalendu Chatterjee, Asok Kanti Sanyal
and Buddhadeb Manna***

Zoological Survey of India, M – Block, New Alipore,
Kolkata-700 053, West Bengal, India

* Parasitology Laboratory, Department of Zoology,
University of Calcutta, 35, Ballygunge Circular Road, Kolkata-700 019

Key words : *New species; First report, litchi, South 24-Parganas district, West Bengal.*

A few specimens of *Trophurus clavicaudatus* sp. n. were collected from soil around

the roots of litchi at South 24-Parganas district, West Bengal, India. The new species has been characterized by its club-shaped tail and can be differentiated from other species of the genus. It comes closer to *T. similis* Khan and Nanjappa, 1971, *T. lomus* Saha, Chawla & Khan, 1973 and *T. impar* Ganguly and Khan, 1983 among the species described from India. Apart from these, *T. clavicaudatus* sp. n. also shows remarkable resemblance with *T. minnesotensis* (Caveness, 1958) Caveness, 1958 described from outside India having some clear differences. This is the first report of the genus from the state of West Bengal, India.

76. Collembola (Hexapoda) Fauna From Bhibhuti Bhushan Wild Life Sanctuary, Parmadan, North 24 Pgs, West Bengal

G. P. Mandal & K. K. Suman

Zoological Survey of India
M Block, New Alipore,
Kolkata 700 053

Key words : *Collembola*, *Hexapoda*, *B.B.W.L.S*

The collembolans commonly called “spring-tails” are small, entognathous, wingless hexapods possessing a spring-like forked jumping organ, the furcula underneath the fourth abdominal segment. They are minute in size (less than 6 mm in length); antennae primarily with 4 segments. The presence of antennae and absence of cerci distinguish them from the other entognathous hexapods. The collembolans have very diverse distribution occurring in all Zoo-geographical regions of the world inhabiting a wide range of ecological niche and climate. The greatest diversity and density are seen in soil rich organic matter. There are about 8000 species described worldwide (Frans Janessens, 2010) and from India 313 species under 104 genera of 19 subfamilies and 18 families were recorded (Mandal, 2010).

The first Indian species of collembolan from Malabar hill regions was described by Ritter (1911). Thereafter, Imms (1912), Carpenter (1917 & 1924), Handschin (1920), Bonet (1930), Mukherjee (1932), Brown (1932), Denis (1936), Baijal (1955-58), Salmon (1956-70). Choudhuri and Roy (1965), Yosii (1966), Prabhoo (1971), Mitra (1966-2064), Hazar

(1995-2007) and Mandal (2001-till date) contributed to the knowledge of Indian Collembola.

This was the first consolidated report of Collembolan fauna from Bhibhuti Bhushan Wild life Sanctuary, Parmadan, North 24 pgs, West Bengal. The present analysis of the composition of the species of Collembola is based on a collection made by Apterygota section of Zoological Survey of India during 2007-2010 from Bhibhuti Bhushan Wild life Sanetuary. The work also provides key to families, genera and species. The classification followed in the present study is after Christiansen, K. A. and Bellinger, P. (1998).

**77. *Neoattractic unicornensis* n. gen., n.sp. (Cosmocerrocoidea : Atractidae)
From captive Indian one horned Rhinoceros (*Rhinoceros unicornis*)
from Alipore Zoological Garden, Kolkata, West Bengal, India**

Sagata Mondal* and Buddhadeb Manna

Department of Zoology, University of Calcutta,
35 Ballygunge Circular Road,
Kolkata 700 019, India
E-mail : sagata.mondal@rediffmail.com

Key words : *Nematode, Neoattractic unicornensis* n.gen., n.sp., *Rhinoceros*,
Alipore Zoological Garden, Kolkata, West Bengal, India

Nematodes collected from the faeces of the Indian one homed Rhinoceros (*Rhinoceros unicornis*) in the Alipore Zoological Garden, Kolkata, India are assigned as a new genus the *Neoattractis*, under the superfamily Cosmocerrocoidea and family Atractidae. The new genus and the species differs from all the other genera under the family Atractidae in the presence of a cup-shaped buccal cavity with a pair of subventral teeth, non cosmoceroid oesophagus, coarsely transversely striated body is up to the beginning of the tail.

78. Report of Bird Census at Nalaban Wildlife Sanctuary, Chilika Lagoon – at a glance

Tamal Mondal^{1*} and S. S. Panigrahi²

¹Zoological Survey of India,
Andaman & Nicobar Regional Centre
National Coral Reef Research Institute,
Port Blair-744102, India

²Post Graduate Department of Zoology,
Vidyasagar College,
Kolkata-700 006, India

*Corresponding email : t_genetics@yahoo.com

Key words : Birds, Chilika Lagoon, Nalaban, Census

Nalaban Sanctuary is one of the diversified bird sanctuaries with variety and variability of different types of birds through out the year with different frequencies. the presence of different type birds at Nalaban Sanctuary in Chilika Lagoon has raised global importance of this sanctuary in frontiers of saturated habitat of residential as well as migratory birds. Migratory and residential birds use to colonize at this place every year during winter season. In this present study an early winter census was conducted on migratory waterfowl and waders at Nalaban Sanctuary to get the quantitative cumulative data on bird species diversity on the basis of overall observation. On the basis of census sixty two (62) species of migratory and residential waterfowl of Eighteen (18) families were reported from the study area on that particular period. The increased percentage of the dabbling ducks infers the increase rate of siltation. the data showed that the number is stable but there is increase of dubling duck species and wader. This observation may be correlated with the increase of siltation of the lagoon.

79. On a New Geographical Distribution of a White Spotted Green Jumping Spider : *Epeus indicus* Prószyński, 1992 (Arachnida: Araneae: Salticidae) from West Bengal

Sankar Talukdar and Asoke Kanti Sanyal

Zoological Survey of India,
Pranivignan Bhavan,
M-Block, New Alipore, Kolkata-700 053

Key words : *Intertidal, geographical distribution, diagnostic characters, Cephalothorax, Chelicerae, ocular quadrangle.*

Spider fauna from the West Bengal of India has been described by Biswas. And Biswas (1992). Although there are several published record on the spiders of coastal regions of this state (Tikader 1977, 1977 & 1980, Tikader & Malhotra 1980; Tikader & Biswas 1981; Tikader 1982; Tikader & Gojbe 1982; Majumder & Tikader 1991; Biswas 1985. Talukdar, S. & Majumder, S. C. (2008). The updated checklist of Indian spider was published by Silwal and Molur (2006). In their account there is no mention of the Green Jumping Spider *Epeus indicus* Prószyński, 1992 from West Bengal which are only known from Souther states of India (Sebastian and Pater, 2009).

In recent years the authors had surveyed the whole area of this wetland in different seasons during 2004-2010 for studying the habitats, behavior and diversity of spider along with other arthropods to prepare a faunal inventory from this environment towards the goal of conservation. During their surveys, the authors came across some 0.8 cm – 1.0 cm long female and 0.6 – 0.7 cm long male *Epeus indicus* spiders belonging to the family Salticidae Blackwall, 1841 on a Croton bush at an altitude of 68 ft. between the GPS coordinate of 23⁰11' 18.26" E and 88⁰45' 53.45"N of the state of West Bengal and conducted taxonomic studies on this fauna.

The present study deals with the details of taxonomic description along with the Systematic Position, Synonyms, Diagnostic Characters, Coloration, Distribution, Habit and Habitat and Economic Importance of the fauna of *Epeus indius* Prószyński, 1992 from Beauty Bhutan Wild life Sanctuary, parmadan, Bongaon in the district North 24 Parganas of West Bengal.

Description an nomic record of this spider species highlighted in this paper. Occurrence of this spider is significant from the view point of biodiversity and distributional pattern as hither to unrecorded from the same habitat of this geographical area.

80. On the Natural History of Indian Marsh Mugger in a Crocodile Sannctuary in Haryana

Rohtash Chand Gupta

Ex. Chairman and Professor of Zoology,
Kurukshetra University, Kurukshetra, Haryana,
(Sr. Visiting Faculty, Institute of Environment Studies,
Kurukshetra University, Kurukshetra, Haryana)

Address of Correspondence :
H. No-566/3, Urban Estate, Kurukshetra, Haryana, India

Haryana state was carved out in 1966 out of post independence East-Punjab. It is principally an agrarian state with lush green fields all throughout the year with no natural marshy wetlands whatsoever. Yet it has a crocodile Sanctuary. This Sanctuary is located in Kurukshetra District near “BHOR SAINDA” village and hence its name “Bhor Sainda Crocodile Sanctuary”. This Sanctuary is actually a “Temple-Complex” spread over an area of 50 Acres or so, having a perfect marshy wetland. According to one view, a PRIEST around 250 years ago introduced few Muggers solely with the purpose “Worship”. Since then, these muggers have succeeded in perpetuating in the wetland with the full attention and care imported by the villagers who have always held these crocodiles in high esteem. In global context, crocodiles are available in most parts of the earth, albeit in a very restricted sense. In all there are about 21-23 species of crocodiles in the world.

In India, there are only three species of crocodiles available viz. (1) Gharial (*Gaxialis gangetius*) (2) marsh Mugger (*Crocodylus palustris*) (3) Saltwater Crocodile (*Crocodylus porosus*). Gharial is found in deep and fast running river like Ganga River, Brahmaputra River, Mahanadi River, Yamuna River, Chambal River, although in immensely depleted numbers. Saltwater crocodile is actually a man eater species and once found throughout the east coast of Indian-Peninsula, is now restricted to the mouth of Mahanadi River in Orissa in conjunction with the sea-water – hence the name “Saltwater Crocodile”. Indian MARSH MUGGER is restricted, in the first place, to few rivers like YAMUNA, CHAMBAL, in addition to innumerable holy TANKS in TEMPLES in Southern India and Sri-Lanka.

In the present studies, efforts have been made to understand the behavioral patterns concerning TUNNEL-BEHAVIOUR, BASKING MANNERISM, DAILY LIFE SCHEDULE, FEEDING SPECTRUM and BREEDING EXERCISE in respect of Indian Marsh Mugger available in BHOR SAINDA CROCODILE SANCTUARY in Kurukshetra District in Haryana India. This crocodile Sanctuary is located at a distance of merely 17-

18 KMS from Kurukshetra University Campus on Kurukshetra Pehowa Road. In so far as TUNNEL-Residency in context of Marsh Mugger is concerned, it is pertinent to point out that this reptile is, a sort of, habitual of returning to so called TUNNELS during the night time, under whatever seasons, circumstances or conditions, Owing to the fact that these specific tunnels have, although, just one and only one “entry” and “exit” point, yet are called TUNNELS and not BURROWS. These tunnels are necessarily to be located near the main WETLAND and on certainly on a mound of earth. The time spect in tunnels during night, is regulated by the seasons in Toto.

Basking patterns. made explicit in the last 25 years of studies, hints towards the fact that this phenomenon, in the true sense, is specific to winter season beginning from October and lasting upto early March. Moreover, in a limited sense, these muggers were observed to bask in “large” groups in October-November followed by indistinct splitting into “sub-groups” and finally culminating in “pair” formation, if at all, in late December and early January, Basies about daily life Schedule reveal that the 24 hours are approtioned into feeding activity in the early morning and late evening while seeking food in the wetland, alongwith basking in sun or shadow, and stay in tunnels duirng the night. The appropriate duration of time devoted to each section is guided by the seasons. In so far as feeding spectrum is concerned, Mugger faecal matter on examination revealed that BIVALVES (*Lamellidens branchiate*) is a popular feeding item which is available in abundance in the wetland. In addition, regular stock of variety of fish is maintained by Govt. of Haryana. Occasional engulfing of FAWNS of buffaloes and Cows has been observed. Breeding behavior is limited to much secrete mounting in water in late January following by laying of eggs in tunnels. The female guard the eggs zealously by lying on the entry point of tunnels in a ferocious manner.

81. Intensity of Anar Butterfly *Virachola isocrates* (Fabr.) with period and crop means in guava

Sunita Singh, S. Sinha and A. Prasad

Department of Zoology
D.S.N. (P.G.) College, Unnao

Key words : *Infestation, Guava fruit.*

Gauva is a popular fruit crop but several insect pests easily damage to crop. Guava is mainly a crop of U.P. where it is used in large amount by all classes of the society. The

experiment have been carried out at D.G. College, Kanpur during 2003 and 2004. Anar butterfly (*Virachola isocrates* Fabr.) is found throughout the year except May and June. Data recorded on the population of oriental fruit fly larvae in period, period x crops, mouths, crops and month x crops were summarized. Among the 40 periods of population of *Virachola isocrates* was found the highest (35.600 per unit) in 3rd week of September and it was followed by 32.219 in the 3rd week of August, 28.285 in the 2nd week of September and 27.180 in the 4th week of August, 28.285 in the 2nd week of September and 27.180 in the 4th week of December. The minimum population was observed in the 4th week of November i.e. of population 10,794 per unit, respectively. In fact this showed a great range of variation. It was very apparent that population fluctuation varied from September to November.

82. Mineral status of soil and water in different seasons of Meerut District of Uttar Pradesh

A. S. Mishra¹, Rajendra Prasad and Naresh Girdhar

Project Directorate on cattle,
Grass farm Road, P. Box-17,
Meerut Cantt (UP)

Key words: *Soil pH, Water pH, micro and macro minerals*

Forty five villages of Meerut district of Uttar Pradesh were selected to collect samples of soil and water used for growing feed and fodders for dairy animals. The samples collected were dried in hot air oven and 2 gm samples were ashed in Muffle furnace. HCl extract of ash was prepared in 200 ml of distilled water for estimation of minerals by AAS. The analysis indicated that the soil pH in different soil type and seasons ranged from 6.68 – 6.98 and 6.77 – 6.95, respectively and did not show any specific trend. Similarly pH of water collected from different soils in various seasons ranged from 8.19-8.34 and 8.22-8.27 respectively and towards alkalinity without any specific trend. The mineral contents of water collected from different soils of the region in different seasons did not show any specific trend with respect to soil type or seasons. But in general water pH was higher to soil pH in all the region and seasons.

83. Prevalence of Entomopathogenic Nematodes in Western Uttar Pradesh

A.K. Chaubey*, Tanu Vats, Vidhi Tyagi, Chhavi Kaushik

Nematology Laboratory, Department of Zoology

CCS University, Meerut.-250004

*e-mail: akc.nema@gmail.com

A survey of the agricultural fields in four districts of Meerut region was laid down to search for the presence of entomopathogenic nematodes (EPN). A total of 597 samples were collected from 65 villages of Meerut, Ghaziabad, Baghpat and Saharanpur districts. The soil samples were brought to laboratory and processed for determination of EPN from the soil samples by using the soil trap method as given by Bedding and Akhrust (1975). Out of the total collected soil samples, 8.5% samples were found positive. The prevalence of EPN was estimated highest in Baghpat (35.2%) followed by Meerut (31.3%), Ghaziabad (25.4%) and Saharanpur (7.8%).

Interestingly *Steinernema* spp. was recovered from all the studied districts and showed highest prevalence (82.3%) while *Heterorhabdits* (17.6%) was found only in the soil of Meerut and Baghpat districts. *Steinernema* spp. was prevalent in Ghaziabad and Saharanpur (100%) followed by Baghpat (88%) and Meerut (56.2%) whereas *Heterorhabditis* was recorded highest in Meerut (43.7%) followed by Baghpat (11.1%) samples. The extracted nematode was reared *in vivo* using the *Galleria mellonella* larvae and culture is maintained in the laboratory in B.O.D at temperature 15±1°C.

84. A Study On Effect of Environmental Changes, Unavailability Of Food And Habitat Destruction On Vultures (*Gyps Indicus*) In Orchha, Madhya Pradesh, India

Amita Kanaujia ^{1*} and Sonika Kushwaha ²

^{1,2} Department of Zoology, University of Lucknow, Lucknow-226007, India

*kanaujia.amita@gmail.com

Key words: Juvenile; vulture; *Gyps indicus*; heat stroke; diclofenac

Presently sudden decline of vultures due to various reasons is in spotlight. A study

was done on the population of *Gyps indicus* at Orchha, Madhya Pradesh, India. An exhaustive survey was done with the help of binoculars for three years. Four deaths were reported in successive years of 2008 and 2009. An exhaustive study was conducted on the dead vultures to find out the reasons for their deaths. A rescue operation was also conducted in the month of June 2009. It was found that the four vultures died due to fighting behaviour either for food or territory. No poisoning was reported. In an another rescue operation a case study was done on a juvenile of *Gyps indicus* which was found in almost unconscious state in Cenotaphs at Orchha, Madhya Pradesh, India, during the month of June 2009. The vulture was restless, breathed heavily and showed neck dropping symptoms. After seven days of hospitality and nursing with electrol, water and proper food, finally the juvenile recovered and flew away. This case study reveals that vultures in Bundelkhand Region are suffering from heat strokes because of extremely high and intolerable temperatures (that may be an effect of global warming), lack of proper habitat and food availability.

85. Influence of Leaf Litter (*Polyalthia Longifolia*) and *Rosa Centifolia* Petals Vermicomposted by *Eudrilus Eugeniae* Kinberg. on NPK levels and Growth in *Phaseolus Radiatus* linn

Balamurugan, A., Aruna, D and Vasanthakumar, D.

Post-Graduate and Research Department of Zoology,
Government Arts College (Autonomous),
Coimbatore- 641 018, Tamil Nadu, India.

Key words: *Rosa centifolia*, *Eudrilus euginea*, *Phaseolus radiatus*, *vermicompost*, *NPK level*.

The modern day world is full of chemicals; of particular concern are the chemical fertilizers that are applied to the fields, to enhance the agriculture yield in order to meet the ever increasing demand for food by the increasing population. Dumping of solid waste from agriculture, market waste, flower waste and wastes from animal husbandry cause serious problems which are faced by the corporation authorities who have to find methods of disposal of these solid wastes. Application of organic fertilizers obtained by the composting of solid wastes by using earthworms will solve both these problems of solid waste disposal

and ill effects of chemical accumulation of fertilizers. Further, the worm casts produced are rich in essential nutrients and plant growth promoting hormones. In the present study *Eudrilus euginea* were cultured in *Polyalthia longifolia* leaf litter and rose petals. The vermicompost was collected, dried and used for NPK analysis. The vermicompost was used for growing *Phaseolus radiatus* and the height of the plant, length of leaves and pod production at 15, 30 and 45 days were measured. Our results revealed that in rose petals (*Rosa centifolia*) added vermicompost, the nitrogen level was 85%, phosphorus 28% and potassium 60% as compared to 70%, 35% and 55% in leaf litter. The rose petal compost added plants showed better growth and pod production. The results are discussed in the light of vermicompost efficacy in promoting plant growth.

86. Modulation of electron transport chain enzyme activities and mitochondrial respiration in gill of the mud crab (*Scylla serrata*) by altered environmental salinity.

Biswaranjan Paital^a and Gagan B. N. Chainy^{ab}

Department of Zoology^a and Biotechnology^b
Utkal University, Bhubaneswar, India - 751 004.
Email: biswaranjanpaital@gmail.com

Key words: *Mitochondria, internal respiration, complex enzyme and Scylla serrata*

Generation of super oxide radicals due to electron at leakage at different complex enzymes of electron transport chain (ETC) and its consequence to generate other reactive oxygen species is prevalent but not well explored in case of invertebrates. Such studies are also lacking in response to different ecophysiological conditions. In this connection the present study was under taken to have an idea about the mitochondrial coupling activities for ATP generation with external ADP source in mud crabs *Scylla serrata*. It may lead to explore more about the energetic engineering inside mitochondria of the marine invertebrates. For characterization of mitochondrial respiratory activities, mud crab *Scylla serrata* of 80.83 ± 10.21 g body weight were collected from Arakhakuda region of Chilika

lagoon and acclimatized in laboratory at 17 ppt artificially made saline water. To observe the impact of salinity on the mitochondrial respiratory activities three separate groups of male crabs were treated with 10, 17 and 35 ppt salinities. The gill tissues were collected after sacrificing the animals, washed in pre-cooled phosphate buffer and mitochondria and cytoplasmic fractions were isolated by subjecting the homogenate to differential centrifugations. Complex I and II mediated respiration were measured in the isolated mitochondria by using Clark type electrode at 25 °C with sodium salts of glutamate, malate, pyruvate and succinate (5 mM each) as substrates, respectively in 1 ml of oxygen saturated respiration buffer. ADP were added (62 nmol to 125 nmol per ml) to initiate state III respiration. State I, II and III respirations were recorded with mitochondria (M), (M + substrate) and (M + substrate + ADP), respectively. State IV respiration was achieved after completion of state III respiration. ADP molecules utilized to oxygen uptake (P/O) ratio was calculated manually from the oxygraph. Effect of environmental salinity on mitochondrial LPx (lipid peroxidation) and H₂O₂ content was also investigated. Effect of salinity on the antioxidant molecules and oxidative stress markers were determined in the gill tissues in both the laboratory and field conditions. It was noticed that a good coupling ratio of more than three (3-4) (normal range for intact mitochondria 3-10) was obtained via complex I mediated respiration where as it was slightly less than three (2.63) via complex II mediated respiration. Similarly the ATP anabolism via succinate with respect to per oxygen atom consumption was lowest than that of other substrates used. But, the rate of respiration both at state III and IV was lower via other substrates than succinate. Both complex I and II mediated respirations were significantly higher at 10 ppt salinity. But RCI was higher at 17 ppt salinity via complex I respiration. Complex I, II and II-III enzyme activities were increased from 10 ppt to 35 ppt salinity. But complex IV activity was found to be the highest at 17 ppt salinity and the lowest at 10 ppt salinity. LPx and H₂O₂ were significantly increased as salinity increased from 10 ppt to 35 ppt salinity in the mitochondria. The antioxidant molecules and oxidative stress markers also varied significantly and specifically in gill cytoplasmic fraction of the mud crabs with respect to altered salinity in both laboratory and field conditions. The results of the present study clearly indicate that environmental salinity influences the oxidative metabolism of the mud crabs which may have implications in their aquaculture.

87. Sex Differential Play Behaviour in Hanuman Langur, *Semnopithecus entellus* around Jodhpur, Rajasthan (India)

Deepak Soni and Lal Singh Rajpurohit

Animal Behaviour Unit, Department of Zoology,
Faculty of Science, J.N.V. University,
Jodhpur-342005, Rajasthan (India)
E.mail: drlsrajpurohit@yahoo.in

Key words: *Semnopithecus entellus*, *play behaviour*, *sex- differences*, *Jodhpur*

Play may function in the establishment of social bonds of dominance relationships. Innovative nature may lead to the discovery and establishment of beneficial novel behaviours. It may provide practice for adult behaviours that have significant goals for increase fitness. Male infants in all respects were more playful. Sex differences were also obvious in terms of interactional patterns. Male infants exhibited overdue preference for same-sexed peers and juveniles, whereas among females this pattern was not evident. Certainly, the majority of interactions were restricted to infants and juveniles. Immature infant spend much of their nonfeeding time engaged in social play. For example, young juvenile langur, engaged in 5 to 10 play bouts per hour, whereas adults rarely played. The present study shows, play begins in infancy, which becomes much more frequent during the juvenile period, and then declines steadily during adolescence. As in many other species, play is an important feature of the behavior of immature primates. Every reader has a reasonable idea of what is meant by the term play and most, without prior experience, could recognize and distinguish it from nonplay.

88. Annual Distribution of Daily Activities in Hanuman Langur, *Semnopithecus entellus* around Jodhpur, Rajasthan (India)

Devi Lal and Lal Singh Rajpurohit

Animal Behaviour Unit, Department of Zoology,
Faculty of Science, J.N.V. University, Jodhpur-342005, Rajasthan (India)
E-mail: drlsrajpurohit@yahoo.in

Key words: *Semnopithecus entellus*, *Daily activity*, *Annual distribution*, *Jodhpur*

The ecology and behaviour of langurs have received considerable attention in the last

4 decades, little quantitative information exists concerning the ways langurs distribute their time performing different activities. In present study, data gathered during the systematic focal-animal sampling of study troop B-19 and B-20 have been presented. The study shows annual distribution and diurnal variabilities and the amount of time spent in each of the five main activities (feeding, locomotion, monitoring, dozing and grooming) have been examined. The total activity budget, langurs spend one third of the active period in monitoring i.e. 33.11%, followed by dozing 22.29%, feeding 22.11%, locomotion 8.0%, grooming 11.19% and sexual and other social activities 2.30% in 2006. In 2007 langurs spend one third of the active period in monitoring i.e. 32.10% followed by dozing 23.90%, feeding 22.11%, locomotion 9.0%, grooming 10.19% and sexual and other social activities 3.70% and in 2008 langurs spend one third of the active period in monitoring i.e. 30.10% followed by dozing 21.10%, feeding 22.90%, locomotion 9.70%, grooming 13.80% and sexual and other social activities 2.40%. That the langurs of Jodhpur spend about one third of their total feeding time in provisioning. And the competition for artificial food is much higher than for natural food.

89. Studies on the reproductive behaviour of dragonfly, *Pantala flavescens* (Fabricius) (Libellulidae: Odonata: Insecta) around Mount Abu Wildlife Sanctuary (Rajasthan: India)

Gaurav Sharma

Desert Regional Centre, Zoological Survey of India
(Ministry of Environment and Forests),
Post-Jhalamand, Pali Road, Jodhpur-342005,
Rajasthan, India.
E-mail: drgaurav.zsi.india@gmail.com

Keywords : *Odonata, Pantala flavescens, Reproductive behaviour, Mount Abu Wildlife Sanctuary.*

For about 270 million years, Odonates (Damsel flies & Dragonflies) with their four long independent membranous wings and long bodies have remained unchanged in their essential form. They are amphibious hemimetabolous insects having the aquatic egg and larval (nymph) stages, while the adults are terrestrial. Approximately 6,000 species and subspecies belonging to 630 genera in 28 families of Odonata are known from all over the world, out of which 499 species and subspecies of Odonata under 139 genera belonging to

17 families are reported from India. The swarms of dragonfly, *Pantala flavescens* (Fabricius) a migratory species in India, recorded maximum in May to October during 2008-10. As the dragonflies are beneficial insects, acts as biological control agent and never damage crops, but their swarms in the agricultural fields sometime mistaken by farmers in Rajasthan with outbreak of Desert Locust, *Schistocerca gregaria* (Forsk.) as their swarms enormously destroy agricultural, horticultural crops and forestry plantation.

The reproductive behaviour of *Pantala flavescens* (Fabricius) was studied eight times around Mount Abu Wildlife Sanctuary, Jodhpur, Rajasthan, India during May, 2008 to August, 2010. Courtship is well marked and male demonstrate a circular territory with a radius of about 1-15 meters, guarded or defended by the resident male from the intruding conspecific males. As female entered into the territory, the male started following her and got success to bind in tandem link, catching hold her prothorax by its anal appendages. Before wheel tandem lasted for 4-11 seconds. After that the female tried to interlock its vulvar region with the secondary copulatory apparatus of male to form the copulatory wheel. The courtship wheel lasts for about 3-6 minutes and is performed in arial position within territory. After completion of copulation, the male in tandem position hold the female, hovers around and guarded female from the intruding conspecific males during oviposition. Oviposition is exophytic, the eggs are laid by dripping the tip of the abdomen several times on the surface of water and lasts for 2-5 minutes. The duration of reproductive behaviour lasts for 8-12 minutes. The study reveals that there is variation in reproductive behaviours of *Pantala flavescens* (Fabricius) with the other dragonflies species.

90. Feeding ecology and Population status of the striped hyena (*Hyaena hyaena*) in South Western Rajasthan (India)

Goutam Sharma, Prateek Vijay, Devi Lal and Lal Singh Rajpurohit

Animal Behaviour Unit, Department of Zoology

Jai Narain Vyas University Jodhpur (Rajasthan)

Email- gautam_234746@yahoo.co.in

Key words: *Striped hyena, Feeding ecology, Population status, Rajasthan*

The striped hyena (*Hyaena hyaena*) is one of the large carnivore species. Densities of striped hyenas appear to vary greatly across their range and factors driving this variation are poorly understood because of paucity of rigorous studies. Measuring densities of hyenas

under ecologically different conditions would thus help assess the factors that determine hyena distribution and abundance as well as their ability to survive in human dominated landscapes under severe anthropogenic pressures. This study has been conducted South Western Rajasthan, human impacts as well as management status.

Striped hyenas will supplement their carnivorous diet with vegetation. Seasonal abundance of oil willow fruits is an important contribution to their diet in this area. In sanctuary hyenas feed on fruits, particularly dates and melons. Striped hyena are able to drink varying qualities of water, from fresh water, soda and salt water. A diet of melons may also fulfill its liquid requirements. Striped hyenas have been observed feeding at landfills. The striped hyenas habit of feasting on the kills of other predators inevitably results in some form of confrontation, ranging from threatening posturing to downright violence. In this study area the striped hyena is invariably dominated in feeding disputes against the larger apex carnivores.

The striped hyena is listed as “near threatened”. Although it seems to be rather compatible with human populations. It is often hunted or poisoned throughout its range, and although it has a fairly large population, it is scattered over a wide area and often isolated from other populations. No, estimate of the striped hyena population in Thar desert of Rajasthan is available. However as per literature and recent observation in this region indicate that a viable population of the striped hyena is present there.

91. Study the Impact of Indira Gandhi Canal Irrigation on the present status of Mammals in Thar Desert of Rajasthan

**Goutam Sharma, Prateek Vijay, Devi Lal, Chena Ram
and L.S. Rajpurohit**

Animal Behaviour Unit, Department of Zoology,
Faculty of Science, J.N.V. University, Jodhpur (India)
Email- gautam_234746@yahoo.co.in

Key words: *Impact, Extensive irrigation, Thar desert, Mammals*

The ecology of Western Thar desert in Rajasthan is fast changing due to availability of good quality water through the Indira Gandhi Canal. The man made conducive ecological condition created due to irrigation have not only transformed the desert grass land into an agro eco system but is also affecting the fauna of the region. It is proposed to carry out

intensive research work to assess the impact of irrigation on the status of carnivorous mammals in the IGNP region. The Thar desert is the most populous deserts of the world. Presently with arrival of very good quality water through Indira Gandhi Canal the region has opened up for colonization.

Due to flood irrigation in sandy and saline soils the farmers are facing water logging as well as the assemblage of water in smaller as well as larger tanks. Probably the mightiest ecological change in the Indira Gandhi Canal region is the enhancement of soil moisture. Most of the mammals are fossorial and the typical desert elements do not find high humidity environment in their burrows quite conducive to their existence. It is worth mentioning that when the canal water was not available in 150 mm rainfall zone maintained moisture within 10-20 cm depth for a week or so. But now the humid conditions are prevailing throughout the year. One of the important causative agent of impact on the biodiversity in this desertic region is sand dune transformation from desert grassland to irrigated crop land. The increase in soil moisture has also affected the grassland and composition of shrubs like *Lasiurus indicus*, *Calligonum polygonoides*, *Ziziphus nummularia*, *Haloxicon* and others.

The mammal species namely; wolf, *Canis lupus pallipes*; Jackal, *Canis aureus aureus*; Desert fox, *Vulpes vulpes pusilla*; Bengal fox, *Vulpes bengalensis*; Desert cat, *Felis silvestris*; Wild boar, *Sus scrofa cristatus*; Black buck, *Antelope cervicapra*; Chinkara, *Gazella bennetti*; Blue bull, *Boselaphus tragocamelus*; Desert hare, *Lepus nigricollis dayanus*; and Porcupine, *Hystrix indica*, were studied in Sri Gandhinagar, Hanumangarh, Bikaner and Jaisalmer districts.

92. Comparative Studies of the Taxonomy and Biology of Eel-Like Species of Freshwater Habitat

KimneilaChangsan and Umesh C. Goswami

Department of Zoology ,(DST-FIST-Govt. of India) & UGC-SAP Sponsored Department
Centre for Aquaculture & Aquatic Resources Monitoring Centre ,
Biodiversity and Bioinformatics Centre
North East Aquaculture Network :e-mail-ucgoswami@rediffmail.com
Gauhati University , Guwahati _ 781014 , Assam , India

Keywords: *Freshwater eel, Taxonomy, Detritus feeder.*

Freshwater habitats provide the occurrence of various species of freshwater eel – a

fish with an elongated snake like structure. In the present investigation, an attempt has been made to study the various eel shaped fishes belonging to the families Anguillidae (*Anguilla bengalensis*), Mastacembelidae (*Mastacembelus armatus*, *Macrognathus pancalus*, *Macrognathus aral*, *Macrognathus morehensis*) and Synbranchidae (*Monopterus albus* and *Monopterus cuchia*). From the above families, a comparative study has been made on the habitat, meristic characteristics, food and feeding habits, length-weight relationship, reproductive strategy, sexual dimorphism and metamorphosis of the gonad.

From the comparative morphological studies differences in their meristic characters fins, body shaped, colour pattern, gill cleft have been found. The present study provides a comparative account of the taxonomic differences of eel like species of freshwater habitats.

93. Estimation of Green Fodder Availability and Requirement for Livestock in Tamil Nadu

M.Thirunavukkarasu¹, V.M.Sankaran², R.Karunakaran³ and G.Kathiravan⁴

Madras Veterinary College, Chennai 600 007, Tamil Nadu, India

¹Professor and Head, Dept. of Animal Husbandry Statistics and Computer Applications

²Associate Professor and Head, Dept. of Agronomy

³Associate Professor, Dept. of Animal Nutrition

⁴Associate Professor, Dept. of Animal Husbandry Statistics and Computer Applications

Key words: *Fodder deficit, Green fodder, Livestock demand, ACU*

With the Indian livestock and poultry surviving solely on the output of grains, crop residues, pasture land, forest cover, common property resources, etc., there is only less adequate information available on how much of them are really available for the livestock to survive, sustain and support, in relation to what is really needed. The present study was made with an attempt to develop a suitable methodology to estimate the livestock feed and fodder availability in the State of Tamil Nadu. The total availability of green fodder was estimated to be 32.86 million tons, of which the largest quantity was produced in Western zone, followed by North-eastern, North-western and Southern zones. With regard to the estimation of requirement of green fodder, two methods were adopted, and compared with the availability in each districts. One method showed green fodder surplus of 3.12 million tons and the other showing an overall deficit of 50.40 million tons.

94. Studies on the microbial population in the vermiwash of *Lampito mauritii* and *Eudrilus eugeniae* Kinberg.

Maheshkumar. P, Dhanalakshmi. B, Jayanthirani. P and Sathyapriya.N

PG & Research Department of Zoology,
Government Arts College,
Coimbatore – 641018, Tamil Nadu, India.

Keywords: *Vermiwash, Lampito mauritii, Eudrilus eugeniae, Microbes.*

Vermiwash is an organic, brown coloured liquid fertilizer produced from the excretory products and excess secretions of the earthworms (*Lampito mauritii* and *Eudrilus eugeniae*). Vermiwash stimulates the growth of micro - organisms, thereby increases the microbial population particularly the free living nitrogen fixing and phosphate solublizing bacteria in the soil, especially at the root of the crops. Vermiwash is very useful as a foliar spray for all crops which can solve the problem of using high cost fertilizers and saving the expenditure in agriculture. Further, vermiwash has no harmful effects and is also eco-friendly. The results are discussed in the light of improvement of microbial population by vermiwash application.

95. Seasonal Variation in Silver Pheasant

Padma Saxena, A. K. Saxena and Vijay Laxmi Saxena *

Department of Zoology, D. A.V.College,
Kanpur, U.P. India

* Department of Zoology, D.G. College,
Kanpur, U.P. India.

Key words : *Silver Pheasant , Feeding behaviour , Body weight*

Indian avifauna is very rich in number and variety and not much paid attention to experimental species to investigate the behaviour of silver pheasant found in Zoological garden of Kanpur. It was decided to investigate experimentally feeding behaviour and effect of photoperiod; in body weight of silver pheasant. It was found that the diet of

pheasants were more in winter season. Maximum feeding was recorded in the month of November and February where as minimum feeding was observed in June. It is evident that the two sexes in silver pheasant differ in their body weight seasonally and male were found more in weight than in females in all months except September and October. The body weight of male birds increased in December, July and August but the body weight of female birds decreased from September onward except in October when it showed maximum weight.

95. Population status and Conservation strategy of Golden Jackal (*Canis aureus*) in South Western Rajasthan (India)

Prateek Vijay, Goutam Sharma and Lal Singh Rajpurohit

Animal Behaviour Unit, Department of Zoology,
Faculty of Science, J.N.V. University,
Jodhpur-342005, Rajasthan (India)
E-mail : drlsrajpurohit@yahoo.in

Key words: *Canis aureus, Population, Conservation, strategy, Rajasthan*

Rajasthan, one of the vibrant states of India and is popular for its rich tradition, culture and architectural monuments. Besides, the state is also known for its rich contents of biodiversity and large number of endemic species are found in the south-western region. Although having these enormous biological resources, this region has a very poor conservative approach. The golden Jackal is one of the common carnivores in India. No accurate number of the Jackal population in this region are available. However, they are estimated 8-10 per Km animals within this isolated habitat. Jackal prey on sheep, goats and calves. It also eats vegetables and fruits. There has been an intense human pressure on the Jackal in recent years.. Golden Jackal is regarded rare and kept under schedule III of the Wildlife (Protection) Act-1972. The jackals are opportunistic foragers and not persistent hunters. They like easy human-produced food and in areas near human habitation have been known to subsist almost entirely on garbage and human waste. Conservation of this species depends on developing a better understanding of the resources that are necessary to sustain populations in agro-ecosystems. Three resources seem necessary for jackals to become established under these conditions: (1) daytime cover, (2) a diet that is predominantly

of rodents and does not seriously compete with humans for food (e.g., poultry and livestock), and (3) access to areas that do not flood annually for establishing territories and breeding. These resources are not mutually exclusive.

96. Recent observation on Population dynamics of free-ranging Hanuman langur (*Semnopithecus entellus*) in and around Jodhpur Rajasthan (India)

Rajpurohit, L.S.; G. Sharma; Devi Lal; P.Vijay; B. Swami; Chena Ram; Dinesh vaishnav and Deepak soni

Animal Behaviour Unit, Department of Zoology,
J.N.V. University, Jodhpur-342001 (Rajasthan)
E-mail: drlsrajpurohit@yahoo.in

Key words: *Semnopithecus entellus*, Recent, Population dynamics, Jodhpur

The city of Jodhpur (26° 18'N, 73° 08'E and 241m MSL) supports a pocket population of about 2100 Hanuman langurs (*Semnopithecus entellus*) divided into 37 bisexual troops and 15 all male bands in an area of about 150 km². Recent observation of this langur population during May-June, 2010 revealed that there are total 2147 animals in the bisexual troops and all male bands. There are two rhesus macaque females in Bheembhark langur troop. The bisexual troop size varied from 6 to 155, average 49.7 individuals and the all male band size ranged from 3 to 68, average 19.8 male langurs of different age group (excluding infants). The male-female sex ratio (at adults) found 1:4.7 and the population density is 14.2 langurs per km². The Jodhpur pocket population of langurs is under investigation for last 4 decades by various Indian and foreign researchers. There is a gradual increase in the number of animals since 1968-1969 census, when there were about 900 animals in this langur population. And with time some demographic changes took place in the group size and age-sex composition. Such changes might have influenced by several complex factors including animal fertility, infant mortality, emigration/death of group members, the social dynamics such as group fission, environment condition such as food resources (natural) and climate changes, habitat destruction/degradation and human interventions.

97. Analysis of seasonal variations in microbes and their diversity in selected open water ecosystems in West Bengal

S.S.Mishra and Mitali Dhiman

Regional Centre,
Central Inland Fisheries Research Institute,
24, Panna Lal Road, Allahabad – 211 002 (UP)
E.mail : ss_mishra60@yahoo.co.uk

Key words: *Open waters, Pollution, Microbial Diversity, Beels, West Bengal, Molecular typing*

Open water aquatic ecosystem is rich in microbes, most of which have still remained unexplored. Diversity of microbial communities in this natural aquatic systems and their metabolic functions have remained largely unexplored. Besides being involved in eco-management, these may also be a potential source of human and animal diseases. Much interest has developed in recent years to study the impact and potential of such open water ecosystems in removing contaminants from water, whether it is effluent from municipal or private waste systems, industrial or agricultural wastewater. Studies of microbial communities in wetland aquatic ecosystems provides important insights into relations between various aspects of ecosystem functioning and changes in biodiversity.

In the present study, ecological studies on microbiological load and water quality parameters variations in selected beels of West Bengal at different time interval were carried out. Microbiological load in terms of total cultivable bacterial count, *E.coli*, total coliforms, total *Vibrios*, *Aeromonas* and *Pseudomonas* from selected sites were estimated. Microbiological analysis of soil/ water/fish samples from Pachida Beel, Kole Beel, Kulti Beel, and Kulia Beel indicated variable degree of microbial pollution. Bacterial belonging to different species like *Aeromonas* spp., *Pesudomonas* spp., *Bacillus* sp, *Enterbacter*, *E.coli*, *Salmonella*, *Vibrios*, *Micrococcus* etc. were isolated. Seasonal fluctuation and abundance of microbes at different time intervals was also studied. The data indicated high microbial load in Kulia Beel compared to other beels. Different microbiological and molecular methods used in the present study have been elaborated in the present paper.

98. Survey of Distribution and Habitat tracking of the Grey Slender Loris (*Loris lydekkerianus malabaricus*) at Aralam Wildlife Sanctuary, Kerala

Sanil R. and Shameer T.T.

Department of Zoology & Wildlife Biology,
Government Arts College,
Udhagamandalam -643 002,
The Nilgiris.

Key words: *Loris, Aralam, Habitat*

Loris are a group of organisms which gets more attention in the current scenario due to the diminishing number and dwindling habitat. A study was conducted at Aralam Wildlife Sanctuary to assess the habitat and distribution of the grey slender Loris (*Loris lydekkerianus malabaricus*) as it is the major area of loris citation. The study was conducted from December to March. The sanctuary is divided into three sections for the administrative reasons. A preliminary survey was conducted to collect the distribution of Loris based on sightings, as the survey inside deep forest in night is a difficult task. A detailed habitat study was conducted in these areas and identified as Loris crucial habitats. In the day time a detailed survey was conducted in all sections for the Loris crucial habitats and was identified. Line transects were laid in these habitats of varying length and surveys were conducted through this transects. The distance traveled, efforts taken and the time taken were noted and predicted the possibility of occurrence in each area. The detailed vegetation analysis also shows that the loris prefer habitats which have more climbers. The Loris seems to appear to a height based on the height to which climber is seen. The climbers which have thorns were seemed to be the preferred habit, since it offers protection from predators. The study also shows the animal prefer near human habitation and are more insectivores. Because in any of the study area berries or wild fruits were found, but have good percentage of insect larva. Based on the raw observations, the study raises a significant doubt that the hauling sound produced by the animal may be an echolocation or a method to detect the prey.

99. Redescription of *Steinernema Mansoodi* from the Soil of Western Uttar Pradesh

Tanu Vats, Vidhi Tyagi, Chhavi Kaushik and A.K. Chaubey

Nematology Laboratory,
Department of Zoology
CCS University, Meerut.-250004

Two of the Entomopathogenic nematode genera i.e. *Steniennema* & *Heterorhabditis* are ecofriendly, efficacious bio-agents for controlling the insect pests. The decomposed body of the nematodes is recycled in the environment, and at the same time the application of EPN is quite safe for the human health, environment and the non target organisms. Agricultural fields of district Meerut were explored for the presence of Entomopathogenic nematodes. A total of 118 samples were collected, of which 7.26% samples were found positive for *Steinernema spp.* The nematodes were collected from the soil samples adopting the method of Soil Trap as given by Bedding and Akhrust (1975). Specimens were kept in fixative for 5-7 days and were processed for permanent mounting by applying the standard method as given by Sienhorst (1959). The Morphometrical data of the present specimen was statistically analyzed and was compared with the available data of the other *Steinernema* species. All the morphometrical data was found close to that of *Steinernema masoodi* (Ali, 2005). However some significant ($P < 0.05$) variations were observed viz. longer tail of IJs, posterior located excretory pore of 1st generation male, longer female body. Further the biochemical and molecular analysis is needed to confirm the validity of *Steinernema masoodi*.

100. Ethanobotanical Knowledge of Plants used by Rural Community of Darna region of Nashik District in Maharashtra

V.R.Kakulte & Mrs. Shobha Jadhav*

Programme Officer, National Service Scheme,

*Department of Botany,

S.V.K.T. College, Deolali Camp, Nashik-422401.

Keywords : Baidya, Herbal medicines, Indigenous knowledge, Ojhas.

An ethano botanical survey on medicinal plants and their indigenous uses was carried

out in Darna region of Nashik District in Maharashtra. These areas are floristically rich areas where plants of various categories are growing spontaneously in their natural habitat. The rural community of these region uses some of the plants as medicine for the treatment of human ailments. In a floristic survey 31 ethno medicinal plants species belonging to 25 families were recorded from this region. These medicinal plants are listed in alphabetically order of Latin names, local names along with family & part used as medicine.

IV. Entomology

101. Intensity of Anar Butterfly *Virachola isocrates* (Fabr.) with period and crop means in guava

Sunita Singh, S. Sinha and A. Prasad

Department of Zoology
D.S.N. (P.G.) College, Unnao

Key words : Infestation, Guava fruit.

Guava is a popular fruit crop but several insect pests easily damage the crop. Guava is mainly a crop of U.P. where it is used in large amount by all classes of the society. The experiment have been carried out at D.G. College, Kanpur during 2003 and 2004. Anar butterfly (*Virachola isocrates* Fabr.) is found throughout the year except May and June. Data recorded on the population of oriental fruit fly larvae in period, period x crops, months, crops and month x crops were summarized. Among the 40 period of population of *Virachola isocrates* was found the highest (35,600 per unit) in 3rd week of September and it was followed by 32.219 in the 3rd week of August, 28.285 in the 2nd week of September and 27.180 in the 4th Week of August, 28.285 in the 2nd week of september and 27.180 in the 4th week of December. The minimum population was observed in the 4th week of November i.e. of population 10.794 per unit, respectively. In fact this showed a great range if variation. it was very apparent that population fluctuation varied from September to November.

102. Effect of foliar spray of ethanolic extract of *Adhatoda vasica* on nymphs and adults of *Aphis gossypii* Glover infesting okra crop in Bareilly District U.P.

Sunita Sharma and Kavita Vidyarthi

Pest and Parasite Research Laboratory
Post Graduate Department of Zoology
Bareilly College, Bareilly-243005 (U.P)

Key words : *Aphis gossypii*, insecticidal activity, *Adhatoda vasica* and *Abelmoschus esculentus*

Insecticidal activity of ethanolic extract of leaves of *Adhatoda vasica* Nees. was tested against cotton aphid *Aphis gossypii* Glover on okra crop (*abelmoschus esculentus*). This extract was found to have the potential for controlling the population of this aphid as well as fecundity of adult apterous viviparous females of this aphid *Aphis gossypii* Glover. 4.5% concentration of the extract resulted in 100% mortality in nymphs and adults after 48hrs and 96hrs respectively. The lower concentration of 3.5% also provided 100% and 96.86% mortality in nymphs and adults of this aphid but required more time of 96hrs respectively. The LT_{50} values were recorded to be as 20.53, 11.92 and 9.79hrs. for 3rd instar nymphs of this aphid at 3.5, 4.0 and 4.0% concentration of the extract and 41.03, 21.69 and 14.11 hrs. for adult females at the same concentrations respectively.

103. Role of Antennae and maxillary palpi in food selection by *Antheraea assama* larvae

B. Deka¹, D.S. Bora², A. Sen³ and A. Kasav⁴

Department of Life Sciences, Dibrugarh University^{1,2},
Dibrugarh, Department of Entomology, National Chemical Laboratory^{3,4}, Pune.

Key words : *Antheraea assama*, chemosensory organ, acceptable host, unacceptable host

Chemosensory organs play important role in host plant selection by phytophagous insects. *Antheraea assama* being oligophagous might use complements of chemosensory organs for host plant selection. In this investigation attempts were made to determine the

role of antennae and maxillary palpi , olfactory organs around buccal cavity of the insect. Fifth instar larvae having only antennae or maxillary palpi after microsurgery were subjected to food choice test using normal host, acceptable non host, unacceptable non host and neutral media (water). Considering percent consumption, rate of percent consumption and food choice as parameters, the competence of antennae and maxillary palpi in food preference was evaluated.

Both antennae and maxillary palpi were fully competent in preference for normal host plants *Persea bombycina* and *Litsea polyantha* over the acceptable nonhost *L. grandifolia*. Both were solely competent in rejecting the acceptable nonhost. But none of the organs were competent in rejecting neutral media. Both antennae and maxillary palpi were competent in rejecting the unacceptable host, *Ziziphus jujube*. But since the larvae having none of the chemosensory organ also rejected the unacceptable host, antennae and maxillary palpi were not the sole organs responsible for rejecting unacceptable host .

104. The Seasonal Incidence of Parasitic Mite (Arachnida ; Acarinidae) on *Apis Dorsata* F. In Mysore, Karnataka

Basavarajappa, S. and K.S. Raghunandan

Dos in Zoology, University of Mysore,
Manasagangotri, Mysore-570 006,
E-mail: apiraj09@gmail.com

Key Words : *Mite infestation, Apis dorsata, Mysore, Karnataka*

The mite infestation was recorded on the Asian giant honeybee, *Apis dorsata* F. in Mysore, Karnataka during different seasons of the year 2008-2010. The study revealed that, mites were infested to the foraging worker bees, hive bees and to the dead bees nearby *A. dorsata* colonies during monsoon, post-monsoon and winter seasons. The mite's density ranged between three and seventeen and was found on different parts of the body. Interestingly, thoracic region had recorded highest density of mites that was followed by the abdomen and there existed a significant variation ($X^2 = 7.80$; $P < 0.05$). Among parasites, mites form an important component of the natural enemy complex of *A. dorsata*, the rate of prevalence and seasonal incidence of mites are discussed.

105. Estimating leaf infestation of Pea (*Pisum sativum* L.) by *Chromatomyia horticola*(Gour) and its population build up in Allahabad district (U.P.)

¹Deepti Mondol and ²Ashwani Kumar

¹Department of Biological Sciences,
School of Basic Sciences.

²Department of Plant Protection,
Allahabad School of Agriculture.

Sam Higginbottom Institute of Agriculture,
Technology and Sciences (Deemed to be University)
Allahabad, Uttar Pradesh, India.

Keywords : *Chromatomyia horticola* (Gour), *Pisum sativum*, leaf infestation. Adult emergence. Parasites emergence.

Chromatomyia horticola (Goureau, 1851) (Diptera Agromyzidae) is a polyphagous species and is very common worldwide. It is a major pest of Pea (*Pisum Sativum* L.) in India causing massive damage to the crop. Studies were conducted to assess the leaf infestation by *Chromatomyia horticola* (Gour) on Pea (*Pisum sativum* L.) variety Arpana in Allahabad district (U.P.) during rabbi season of 2009-10. Infested leaves were sampled weekly and kept in the laboratory to observe and count emerging adult leafminers and its parasites. It were observed that around 6.7% of leaves of pea were infested with in the rabbi season by *Chromatomyia horticola* (Gour) 2009-2010. The pupae were observed for percentage of adult emergence which were found to be 80.5%. The parasites emerged were found to be 11-15%. An integrated pest management approach is suggested that emphasizes IPM training for vegetable farmers and includes reduction of broad spectrum chemicals that would adversely affect parasitoids that may already be present as well as those that may be introduced.

106. Description of one new Species of the Genus *Stegodyphus* Simon from Outscrit of Amravati, Maharashtra, India. (Arachnida : Araneae : Eresidae)

Deshmukh Ujjwala Shivaji

Department of Zoology
Govt. Vidarbha Institute of Science and Humanities,
Amravati, (M.S.)
e-mail: ujjwaladeshmukh@rediffmail.com

Key words: *Spiders, Eresidae, Stegodyphus semadohensis*

The spiders of the family Eresidae are represented poorly in Indian fauna. All over the world about hundred species in ten genera are known and about 29 species have been studied under the genus *Stegodyphus*. The genus *Stegodyphus* was established by Simon 1873, with the type species *S. lineatus* Latneille. Pocock (1900) described five species of *Stegodyphus*. Tikader (1963) illustrated Pococks *Stegodyphus pacificus socialis* for easy identification. Gajbe (2007) rediscrined and reillustrated *Stegodyphus sarasinorum* Karsch including male.

The study examines species in a relatively diverse lineage of genus *Stegodyphus*, where they undergone adaptive radiation. One new species of spider from family Eresidae, genus *Stegodyphus* (*Stegodyphus semadohensis* **sp. nov. female**) is recorded from outskirts of Amravati city (Maharashtra State) India, during 2008.

107. The haemolymph protein pattern and Qualitative changes in the larvae and pupae of *Spodoptera litura*, treated with *Acorus calamus* and *Econeem*

M.Muthusamy, *S.Muthuraja, K.Samsiya Bagam and R. Sathish kumar.

Post- Graduate and Research Department of Zoology,
Government Arts College (Autonomous),
Coimbatore- 640 017, Tamil Nadu, India.

Key words: *Protein profile, Protein fraction, Spodoptera litura , Econeem, Piper longum.*

The study has been undertaken to evaluate the Qualitative and Quantitative heamolymph

protein pattern in the larvae and pupae of *Spodoptera litura*, treated with *Acorus calamus* and Econeem the protein profiling was done by SDS-PAGE and the total protein has been estimated by the method of Lowry *et al.*, 1951. The present work revealed that the protein content was increased upto 0.05 ± 0.3 mg/ml in the Econeem treated larvae after 48 h. Moreover the protein content of the treated pupae was elevated to 0.02 ± 0.03 mg/ml after 25% treatment. Both the plant products raised the protein content in the larvae (all life stages) and pupae of *S. litura* over 48h exposure period. The disappearance and reappearance of new protein fractions (25Kdal to 50Kdal) have been detected in the haemolymph protein profile of Econeem and *Acorus calamus*. Treated a larvae and pupae of *S. litura*. The toxicity of plant products made this significant alteration in the quantities of protein level. Therefore the results of the present study inferred that the Econeem, *Piper longum* extract might be the potential agents to altered the insect physiology to some extent and they could be used in the insect Management programs.

108. Intraguild predation: An important survival strategy among aphidophagous ladybird beetles (Coleoptera: Coccinellidae)

Navodita Maurice*, Ashwani Kumar and P.W.Ramteke

*Department of Biological Sciences,
Sam Higginbottom Institute of Agriculture,
Technology & Sciences, Naini, Allahabad
Department of Plant Protection, SHIATS, Allahabad
Email- robin.navodita@gmail.com

Key words: *Intraguild predation*, *Cheilomenes sexmaculata*, *Coccinella septempunctata*, *C. transversalis*.

Inter and intraspecific predations are important interactions among organisms that share common food. Intraguild predation has attracted much attention in the ecology of ladybird beetles. *Cheilomenes sexmaculata* Fab., *Coccinella septempunctata* Linn. and *C. transversalis* Fab. are the most common ladybird beetles populating the environment. When all the three species are present together in the field they create an intrapredatory guild. Our study emphasizes that *Cheilomenes sexmaculata* appears to be the top most intraguild predator by consuming the larvae of both *C. septempunctata* and *C. transversalis* along with aphids. *C. transversalis* appears to be the weakest one. The order of intraguild predation among the three species is: *Cheilomenes sexmaculata* > *Coccinella septempunctata* > *Coccinella transversalis*.

109. Effect of administration of a non-steroidal MH agonist, tebufenozide to penultimate and last larval instar of *Spodoptera litura***Pankaj Singh and Krishna Kumar**Department of Zoology,
University of Allahabad,
Allahabad, 211001, UP, India**Key words:** *Tebufenozide* , *Spodoptera litura*, *larval-larval ecdysis* and *larval-pupal ecdysis*, *double head capsule*.

Administration of different doses of a non-steroidal moulting hormone agonist tebufenozide to Penultimate and last instar larvae of tobacco cutworm, *Spodoptera litura* caused toxicity, significant delay in larval-larval and larval-pupal ecdysis followed by death of the treated larvae. The treated larvae exhibited symptoms of precocious moulting within 24 hours of treatment, leading to development of double head capsule and cessation of feeding along with loss of haemolymph from the body. At higher doses of tebufenozide larval-larval and larval-pupal and pupal-adult moulting was completely suppressed. The treatment also resulted into formation of larval-pupal intermediates of various grades having rectal prolapse. The compound tebufenozide mimics the action of 20-hydroxyecdysone (20E) in *S. litura* and has potential as IGR against this polyphagous lepidopteran pest.

110. Pigeonpea (*Cajanus cajan*) pod infestation and population build up of *Melanagromyza obtusa* (Malloch) in Allahabad district (U.P.)***Priyanka Vini Lall, **Ashwani Kumar and *P.W. Ramteke***Department of Biological Sciences, School of Basic Sciences
**Department of Plant Protection, Allahabad School of Agriculture
Sam Higginbottom Institute of Agriculture,
Technology and Sciences (Deemed to be University)
(Formerly Allahabad Agricultural Institute),
Allahabad, Uttar Pradesh, India

Melanagromyza obtusa (Malloch) is a serious pest of pigeonpea. The damage caused by *Melanagromyza obtusa* on the pods of pigeonpea (variety Bahar) was studied in Allahabad district of U.P. during the year 2009-10. The percentage of pod infestation was

recorded to be 28.61%. The population build up of this insect revealed 41.5% of adult emergence and 13.91% of hymenopteran parasites. These parasites acted as biological control agents in reducing the incidence of *Melanagromyza obtusa*.

111. Study of seasonal variation in sandfly species found in Bihar, with respect to kala-azar in India.

***Ragini Mishra**

State Entomologist
(State Health Society, Bihar)

Keywords: *Kala-azar, Visceral leishmaniasis, seasonal variation*

Kala-azar i.e. Visceral Leishmaniasis is a dreaded disease caused by *Leishmania donovani* and transmitted by vector sandflies *Phlebotomus argentipes*. Kala-azar is now a global problem. Bihar has been in the grip of Kala-azar since 1976 [Sanya et al, 1979]. According to WHO, 0.5 Million case of VL is recorded annually worldwide, out of which one third cases are reported from Bihar, India. New endemic foci have emerged over the past decades, epidemics are not controlled and endemic areas are spreading due to development and population shifts [Desjeux, 1999]. Until now the control programmes against this vector has not achieved complete success because of lack of knowledge of endemic foci of the sandflies.¹ Study of seasonal variation in sandflies may help to recognize the correct time for the spray activities and other control programmes. Sandflies have been caught by suction tube method from 4 endemic districts for Kala-azar viz, Patna, Vaishali, Muzzafarpur and Darbhanga.

112. Morphology and Life Cycle of Venegar Fly, *Drosophila Melanogaster* (Meigen) an Experimental Insect on Artificial Diet

S.A. CHOUDHARY

Dept. of Zoology, G.C.W. Gandhi Nagar
Jammu (J&K)

The life cycle of Venegar fly, *Drosophila melanogaster* was studied on artificial diet

during 2001 under laboratory conditions (25c°; 81% RH) in the department of Zoology, Dr. B.R. Ambedkar University Agra. The eggs were laid as minute, oblong, with reticulated surface and two appendages as long as the egg on the surface of food medium. The incubation period varied from 0-1 day and hatchability ranged from 28.5 to 94.9% (av. 65.7%). The larval stage passed through three instars. The average duration of 1st, 2nd and 3rd instar larvae were 1.2, 2.2 and 4 days, respectively. The average larval duration was 7.4 days. The larva food primarily on artificial diet. The pre-pupal and pupal period lasted for 2-3 days. The whole lifecycle was completed in 10-11 days

113. Effect of a juvenile hormone analog, pyriproxyfen on the metamorphosis of citrus swallowtail, *Papilio demoleus* L. (Lepidoptera: Papilionidae)

Satya Singh and Krishna Kumar

Department of Zoology,
University of Allahabad,
Allahabad - 211002, India.
E-mail: satya27singh@gmail.com

Key words: *Metamorphosis, JHA, pyriproxyfen, ecdysial stasis, imperfect pupation, larval – pupal mosaics, emergence inhibition, Papilio demoleus*

The Citrus swallowtail, *Papilio demoleus* is a serious pest of citrus all over the world. Pyriproxyfen, a potent JHA, was used to evaluate its effect on the metamorphosis by treating freshly ecdysed last and penultimate larval instars as well as freshly formed prepupae.

The results included prolongation of larval duration, delay in larval-larval and larval-pupal ecdysis, mortality, formation of intermediates or mosaics having larval, pupal and adult characters, decreased and imperfect pupation and complete inhibition of emergence. These results clearly demonstrate that pyriproxyfen has caused adverse effect on the metamorphosis and can be used for successful control of *Papilio demoleus* in IPM programs.

V. Environmental Biology and Biotechnology

114. Effect of higher does of *Momordica dioica* on Sedative activity

Bhavna Bawra and Dinesh Kumar Saraf

Department of Zoology,
Dr. H. S. Gour Vishwavidyalya,
Sagar-470 003 (M.P.), India

Key words : *Momordica dioica* Roxb. ex. Willd. : Sleeping time; exploratory behavior; motor coordination; GABA_A receptors; sedative.

Momordica dioica Roxb. ex. Willd. is a well known medicinal plant which possesses analgesic and anti-inflammatory activities. The ethanolic extract of fruits of *Momordica dioica* Roxb. ex. Willd. has been evaluated for sedative and behavioral effects in albino rats at a dose of 100 mg/kg body weight. Sleeping time, exploratory behavior and motor coordination in rats were studied with the plant extract and compared with pentobarbitone used as a standard drug. The sedative property of ethanolic extract was not much effective at higher dose of the extract as it increased the behavioral parameters of the treated animals. 100 mg/kg of the extract was found to reduce sedation and brings litharginess while the lower does of the plant extract is found to be more effective. It was observed that the though drug does not cause appreciable sedation at the higher dose but it reduces the appetite of the treated animals, thereby causing loss of weight. Many important phytoconstituent, phytosterols and vitamins etc were detected in ethanol extract. The results of experiments suggest the probably any of the components viz. alkaloids, flavonoids and/ or triterpenoids may induce sedation and affect the centre of appetite. It is concluded that the higher does (100 mg/kg) of fruit ethanolic extract brings litharginess (mild sedative effect), drowsiness and affect the appetite in animal as compared to control. The authors are of opinion that sedative effect of the plant has been demonstrated for the first time, as no literature is available about its sedative properties.

115. Effect of Phosphorus on the Induction of Cyclicity in Frieswal heifers*

A. K .Mathur, Sukhbir Sharma and S. K. Tiwari**

Physiology Lab.

Project Directorate on Cattle, P.O Box-17, G. F. Road, Meerut Cantt.

**Military Dairy Farm, Meerut, U.P.

Key words: Frieswal heifers, Anestrous, Phosphorus

Sixteen Frieswal heifers having mean body weight 295.12 ± 8.08 Kg and age 22.39 ± 50.37 months, not exhibited oestrus since last 60 days, divided into two groups. In the first group 11 heifers were administered three injection Sodium Acid phosphate (Urimin: GlaxoSmithKline Pharmaceuticals Limited) @ 0.8 gm/animal at alternate days parentally. Where as animals of second group were kept as control. Oestrus was observed in morning and evening for 90 days post treatment with the help of a teaser bull. All the animals were kept under normal management and feeding practices of Military Farm, Meerut. It was observed that 7 animals exhibited oestrus at 27.5 ± 5.53 days during the first 45 days of treatment and the remaining four after 90 days of treatment at 78.0 ± 6.94 days. In the control group also five animals exhibited oestrus at 55.6 ± 7.90 days. All these animals were inseminated with frozen thawed semen after 12h of exhibition of oestrus, 72.72% of heifer in the first group and 20% in the control group conceived. Although we could not estimate the level of phosphorus in blood. However these results indicate that concentration of phosphorus was not optimum in the feed. Hence the heifers have responded with the phosphorus treatment. This is further supported by the higher conception rate in exhibited experimental group.

116. Fluctuation in Brain electrolytes in albino rats (*Rattus norvegicus*) under stress of beta-cyfluthrin, a type II pyrethroid

Amit Kumar Singh* and Prabhu N. Saxena

Toxicology Laboratory, Department of Zoology,

School of Life Sciences, Khandari Campus,

Dr. B.R. Ambedkar University, Agra-282002 (U.P.), India.

E-mail: aks_8480@yahoo.co.in

Electrolytes play a vital role in neuronal function through maintenance of membrane

potential and impulse propagation, which require expenditure of energy coupled with ionic pumps. Deleterious effects of acute (1 day) and sub acute (7, 14, 21 and 28 days) treatment of beta-cyfluthrin, a type-II pyrethroid has been observed on brain electrolytes viz. sodium, potassium, calcium and magnesium. The present study reveal hyponatremia (inhibition range 31 to 20%), hypokalemia (inhibition range 19.75 to 14%) along with hypocalcemia (inhibition range 30 to 20%) and hypomagnesemia (inhibition range 34 to 11%) significantly in brain of after acute and sub acute treatment of beta-cyfluthrin at the doses of 35.48 and 5.06, 2.53, 1.68, 1.27 mg/kg b. wt. respectively. The value of correlation coefficient between Na^+ and K^+ has been observed to be 0.94 for acute (1d); 0.91, 0.87, 0.95, 0.88 respectively for sub-acute (7, 14, 21, 28ds). The value of correlation coefficient between Ca^{++} and Mg^{++} has been observed to be 0.80 for acute (1d); 0.85, 0.94, 0.92, 0.81 respectively for sub-acute (7, 14, 21, 28ds). Positive correlation between various electrolytes of brain, sodium and potassium, calcium and magnesium indicate a relationship between all these ions and impairment in the ions channels at their gate by the beta-cyfluthrin molecules, leads to imbalance between these cations. Regarding these aspects the observed behavioural changes viz tremors, convulsions, ataxia, excitation, salivation; muscles twisting leading to paresis and lethargyness have been correlated with the brain electrolytes.

117. Efficacy of Homeopathic Drug China Against Plasmodium Berghei Infection in Balb/c Mice

Aswathy Rajan and Upma Bagai

Parasitology Laboratory, Department of Zoology,
Panjab University, Sector 14,
Chandigarh-160014, India
E.mail: upmabagai@yahoo.co.in

Key words : Homeopathy, *P. berghei*, *china*

Homeopathic drugs have been claimed for their efficacy, no side effects and low cost, moreover, they are being used by humans. Thus they could be evaluated for their suitable candidature as potent antimalarials in the present scenario of increasing drug resistance. Antiplasmodial efficacy of mother tincture (ϕ) and different potencies (6, 30 and 200) of homeopathic drug china (*cinchona officinalis*) were checked in monotherapy against *Plasmodium berghei* infection in Balb/C mice. China ϕ and 30 potency alone

were capable of inhibiting the blood stage infection significantly ($p < 0.0005$) and also enhanced the survival time upto one month follow up period with 50% survival rate. Whereas ,6 and 200 potency were not able to clear *P. berghei* infection.

118. Efficacy of the Probiotic *Lactobacillus sporogenes* and EM (Essential microbes) on Reproduction ABILITY of Earthworm *Eudrilus eugeniae* Kinberg

Balamurugan, A., Vasanthakumar, D. and D.Aruna

Post-Graduate and Research Department of Zoology,
Government Arts College (Autonomous),
Coimbatore- 641 018, Tamil Nadu, India.

Key words: *Lactobacillus sporogenes*, *Eudrilus eugeniae*, Essential Microbes, Methomyl.

Environmental pollution is a serious problem throughout the world. Pesticides applied in the field to control insect pests causes serious damage to non-target organisms such as earthworms and microbes in the soil. Through the run-off they also affect the aquatic organisms. Earthworms are known as farmer's friend since they enrich the soil fertility by decomposing the organic materials found in the soil. Earthworms are used in the vermiculture industry to produce organic fertilizer called vermicompost. In the present study experiments were carried out to evaluate the efficacy of the probiotic *Lactobacillus sporogenes* and Essential microbes on reproduction of *Eudrilus eugeniae* exposed to sub-lethal concentration of methomyl.

Six groups of earthworms, were maintained in predigestion mixture of cow dung and leaf litter. The six groups were, control, methomyl exposed, EM exposed, *L. sporogenes* exposed, methomyl + EM exposed and methomyl + *L. sporogenes*. EM consists of the lactic acid bacterium *Lactobacillus casei* the photosynthetic bacterium *Rhodospseudomonas palustris* and the yeast *Saccharomyces cerevisiae*. They were allowed to vermicompost in leaf litter (*Polyalthia longifolia*). Weight, number of cocoons, juveniles and adults were counted after 30, 60 and 90 days of vermicomposting. The results proved that methomyl

exposed worms showed reduction in reproduction. *L. sporogenes* and EM alone exposed earthworms shows significant ($p < 0.01$) increase in the number of cocoons, juveniles and adults worms. Methomyl along with *L. sporogenes* and EM exposed worms showed better reproduction than the methomyl alone exposed worms. From the present study it is evident that addition of probiotics microbes like *L. sporogenes* and EM can beneficially stimulate better vermicomposting, which in turn enhances reproduction even under toxic stress.

119. Development of DNA Based Passport of Ornamental Fishes from North East India

**Bijoya Khomdram, Maloyjo Joyraj Bhattacharjee, Kshetrimayum Miranda,
Monika Ahanthem and Sankar K Ghosh**

Department of Biotechnology,
Assam (Central) University, Silchar-788011,
Assam, India
Email: drsankarghosh@gmail.com

Keywords: *Ornamental Fish, DNA passport, DNA barcoding, fish industry, Conservation, coxI*

The North Eastern states contribute around 85% of the total ornamental fish market. DNA barcoding is an efficient method for species level identifications using an array of species specific molecular tags derived from the 5' region of the mitochondrial *cytochrome c oxidase* (COI) gene. The present study aims to make identifications more accessible by assembling a DNA barcode reference sequence library for the ornamental fishes found in North east India. For this purpose, fish samples were collected, genomic DNA was isolated either from blood or tissue samples. Then COI region were amplified using specific primers and then after purification they were sequenced. COI genes of around 40 species were amplified on large scale and out of these 5 were sequenced and analyzed. This will provide a new species identification tool for the ornamental fish industry and many applications related to collection practices, conservation and will help to explore the relationship with other ornamental fishes found in other parts of the world.

120. Nutraceutical (Functional food): Effect of Conjugated Linoleic Acid enriched ghee feeding on plasma lipid profile in Male Wistar rats**C.Kathirvelan**

Department of Animal Nutrition
Veterinary College and Research Institute
(TamilNadu Veterinary and Animal Sciences University)
Namakkal - 637 002

Key words: *Conjugated linoleic acid, Milk Fat, plasma lipid, bad cholesterol, Human health*

The effect of conjugated linoleic acid (CLA) enriched ghee feeding on plasma lipid profile was studied in male Wistar rats of 8-9 weeks old assigned to soybean oil and CLA ghee based diet. The experiment was conducted for 120 days. CLA enhanced ghee feeding resulted in significant ($P<0.05$) reduction in plasma total cholesterol, triglycerides, LDL-cholesterol and increased level of HDL-cholesterol. The CLA ghee based diet narrowed ($P<0.05$) the Atherogenic Index (AI) from 0.410 to 0.244. Therefore, results of present study show that CLA feeding reduced bad plasma lipid profile and thus, lower risk of cardiovascular disease.

121. Effect of post methanated distillery spentwash in crops on ground water quality using piezometers**D. Janaki* and V. Velu****

*Horticultural Research Station, Kodaikanal -624 103

** Department of Soil Science & Agricultural Chemistry,
Tamil Nadu Agricultural University, Coimbatore -641 003

Keywords : *Piezometer, leachate, cations, anions, distillery spentwash*

In the piezometer study, the EC of the leachate was found to decrease with increase in the number of leachings and it got reduced from 2.81 to 1.56 dS m⁻¹, 2.96 to 1.93 dS m⁻¹ and 1.75 to 1.35 dS m⁻¹ in turmeric, sugarcane and cassava field experiments where the distillery effluent was applied @ 1.0 lakh litres ha⁻¹. The pH values of the leachate within the range of 7.51 to 8.24, 7.50 to 7.82 and 7.57 to 8.36 in the three test crops respectively.

Application of distillery spentwash resulted in a build up of considerable amounts of cations like Ca, Mg, Na and K in the leachate. However, there was a marked decrease in the levels of anions with increasing number of leachings. The SAR values of the leachate were within the safer limits of <3. The RSC values of the leachate collected in all the leachings were found to be negative indicating that the application of spentwash would not induce sodium hazard in the groundwater.

122. Biostatistical Parameters Ofhelminth Parasites in a Murrel, *Channa Striatus* (Bloch)

D. N. Pandit*, P. Kumari and D. Kumar

Department of Zoology
VKS University, Arrah-802 301

Key words. *Incidence, Prevalence, Density and Index of infection; helminth parasites, Channa striatus*

The present paper reports various bio-statistical parameters namely, incidence, prevalence, density and index of infection of helminth parasites in *Channa striatus*. Their average values were 46.74%, 3.47, 1.66 and 0.87 respectively, The difference between incidence of infection during various months ($p < 0.001$) and seasons ($p < 0.001$) was found highly significant. When incidence of infection and intensity of infection was compared, a reverse relationship was observed. The density of infection and index of infection followed roughly same trend from February to November.

123. Impact of hexavalent chromium on morphological and behavioural changes in teleost fish *Channa punctatus*

Deepali Saxena and Madhu Tripathi

Department of Zoology, University of Lucknow, Lucknow-226007
Aquatic Toxicology Laboratory

Key words: *Chromium(VI), Channa punctatus, morphological and behavioural changes*

Chromium (Cr) is a naturally occurring element found in rocks, animals, plants, and

soil, predominantly in its insoluble trivalent form [Cr(III)]. Intense industrialization and other anthropogenic activities have led to the global occurrence of soluble Cr(VI), which is readily leached from soil to groundwater or surface water, in concentrations above permissible levels, which induces a variety of adverse effects in biologic systems, including fish. In aquatic ecosystems, Cr(VI) exposure poses a significant threat to aquatic life. This paper reviews the adverse effects of Cr(VI) on morphology and behaviour of widely consumed fish, *Channa punctatus*. Such data are extremely useful to the scientific community and public officials involved in health risk assessment and management of environmental contaminants as a guide to the best course of action to restore ecosystems and, in turn, to preserve human health.

For it, fishes were exposed to Cr(VI) in two sublethal concentrations (2.5 mg/L and 5 mg/L) which are 1/20th and 1/10th of LC₅₀ of hexavalent chromium in laboratory conditions. The source of hexavalent chromium is Potassium di-chromate (K₂Cr₂O₇, Ranbaxy Laboratories Limited, Punjab, India). Fish were exposed to these two concentrations and a control group was maintained throughout the experiment. After 60 days exposure morphological and behavioural changes were observed in *Channa punctatus*.

124. Detection of negatively charged protein fractions in testes of *Spodoptera exigua* by sds-page.

Deepti Tomar* and Mangla Bhide

Department of Zoology

Dr. H. S. Gour University, Sagar – 470003 [M. P.]

Key words: *Trigonella foenum-graecum*, *Abrus precatorius*, *quercitrin glycoside*, *flavonol glycoside*, *Spodoptera exigua* (*Hubner*).

The potential insecticidal activity of *Trigonella foenum-graecum* and *Abrus precatorius* seed glycoside was assessed in the present investigation. The quercitrin glycoside and flavonol glycoside show knock-down toxicity against male *Spodoptera exigua* (*Hubner*) and time in hrs for KD₁₀₀, KD₅₀ and KD₀ for each separate group of *Spodoptera exigua* were summarized in table 1-2. In the present investigation depletion in number and intensity of negatively charged protein fractions was observed by SDS-PAGE in testes of control and treated *Spodoptera exigua* insects. Testicular samples of male *Spodoptera exigua* consists of variable protein fractions ranging from 14.4 kDa of weak intensity in 2

day, 24 kDa of weak intensity in 4 day, 26 kDa of high intensity in 6 day, 94 kDa of weak intensity in 8 day flavonol glycoside treated insects and 14.4 kDa of high intensity in 2 day, 24 kDa of high intensity in 4 day, 26 – 67 kDa among which 26 kDa of high intensity and 67 kDa of very weak intensity in 6 day, 94 kDa of high intensity in 8 day quercitrin glycoside treated insects. Results indicate that flavonol glycoside had strong toxicity than quercitrin glycoside treated adult male of *Spodoptera exigua*. Results indicated arrested testicular development directly while affecting the fecundity of experimental insects, so these extracts act as an antitesticular agent and should be used to control the population density and fecundity of pest insects. So, treated insects confirm the antitesticular activity of this glycoside.

125. Isolation and cloning of transcription factor genes for reprogramming of adult goat fibroblast cells for production of induced pluripotent stem (iPS) cells

**Dinesh Kumar*, Dhruba Malakar, Rahul Dutta, Shailendra Sahu,
Shweta Garg, Jai Kumar Kaushik, Surender Kumar
and Ashok Kumar Mohanty**

Animal Biotechnology Center,
National Dairy Research Institute,
Karnal-132001, India
Email: dhrubamalakar@gmail.com

Key words : *iPS cells, Nanog, Oct4, pluripotency and Sox2*

Embryonic stem cells are derived from the inner cell mass of blastocyst and proliferate extensively while maintaining pluripotency. They can be used for the treatment of juvenile diabetes, Parkinson's disease, heart failure, spinal cord injury, somatic cell cloning and transgenesis. However, the use of embryo and tissue rejection remains concern for ESCs transplantation. Reprogramming of the somatic cells may be done by different methods such as somatic cell nuclear transfer, fusion of somatic cells, treatment with the extract of the pluripotent stem cells and the stable ectopic expression of defined transcription factors in the somatic cells. Several transcription factors, including Oct4, Sox2 and Nanog maintain pluripotency in both early embryos and ES cells. Oct4, Sox2, c-Myc, Lin28, Nanog and Klf4 have been used to reprogramme the mouse embryonic and adult fibroblasts (Takahashi

and Yamanaka 2006). In the present investigation the point of concentration is generation of induced pluripotent stem cells using Oct4, Sox2, Nanog and Lin28 transcription factors responsible for maintenance of pluripotency in embryonic stem cells. Oocytes were collected from slaughterhouse ovaries and in vitro matured for 27 h. Then oocytes were in vitro fertilized with capacitated spermatozoa. In vitro fertilized oocytes were cultured in embryo development medium. Blastocysts were observed on 8th day. Inner cell masses were isolated from blastocysts and cultured to get embryonic stem cells. RNAs were isolated from the ES cells and cDNAs were prepared. Oct4, Nanog and Sox2 genes were amplified using specific primers for all genes. ORF of Oct4 and Nanog were cloned in a pJET cloning vector and confirmed by their sequencing. Similarity of these genes was analyzed using BLAST. Homology of these genes was observed using ClustalW software with other mammals. It may be concluded that the most important genes Oct4 and Nanog were cloned for iPS cells production.

126. Environmental Issues in Prawn Culture

Farah Zaidi

Department of Zoology,
Isabella Thoburn P.G College
Lucknow (U.P) India

Keywords : *Economic, prawn culture, tidal ban, export, pollutants.*

Prawn farming in India has taken a new dimension in recent years. India is recognized as one of the world leaders in shrimp production and export. Among the marine products, prawn is the dominant item. Prawn culture brings sizeable export earnings and also supplies good nutritive food to the population. Though one cannot completely wish away the environmental implications, it would be economically unwise to suggest a tidal ban on prawn culture. An objective environmental approach dictated by macro-economic considerations would suggest a way for transfer of income from the prawn farmers to those who are environmentally affected, by way of compensation.

127. Use of Antimycotic Agents for Extending the Shelf Life in Khoa

G. Rajarajan*, G. Kumaresan and A. Elango

Department Of Dairy Science
Veterinary College and Research Institute, Namakkal- 637002
Tamilnadu, India
rajarajanvet@gmail.com

Keywords: *Khoa samples, storage, antifungal agents, keeping quality.*

Khoa samples were collected aseptically from the organized dairies and analysed for the yeast and mould in the laboratory. The samples treated with Natamycin (0.5%) and Potassium sorbate (0.3%) as antifungal agents, showed significantly ($P < 0.01$) lower yeast and mould count during storage at 30°C and 5°C for 30 days. These findings were supported by chemical and organoleptic evaluation of khoa samples treated with antifungal agents during storage.

128. Genotoxic evaluation of Doramectin in fresh water fish *Channa punctatus* using Micronucleus Test and SCGE

Kamal Kumar Saxena, Trapti Saxena and Priyam Sachdeva

Pest and parasite research laboratory,
Department of Zoology, Bareilly College, Bareilly

Key words : *Channa punctatus, Micronucleus test, SCGE, Blood, Doramectin and Genotoxicity.*

In present study induction of DNA damage by doramectin was evaluated in *Channa punctatus* using Micronucleus test (MNT) and Single Cell Gel Electrophoresis (SCGE). The fish were exposed to sub lethal concentrations (0.008, 0.012, 0.016ppm) of doramectin for 144h and sampling was done at regular intervals i.e. 24, 48, 72, 96, 120 and 144 hrs. The highest micronucleus induction and DNA damage were found after 120h at highest concentration of doramectin used. These results indicate that both micronuclei induction and DNA tail length increase with the increase in exposure period and concentration of doramectin but it has been found that after 120 hrs both the micronuclei induction and DNA damage decreases which indicates DNA repair.

129. Bait Shyness Studies in *Meriones Hurrianae* to Zinc Phosphide and Bromadiolone

Kavita Sahni, Chandra Prabha and Pooja Silotia

Vedic Kanya PG College Raja Park,
Jaipur, 302004.

Key words: *Bait shyness, Meriones hurrianae, bromadiolone, zinc phosphide*

Bait shyness studies were conducted in the laboratory against *Meriones hurrianae*. Consumption of bromadiolone bait was more as compared to zinc phosphide. In case of zinc phosphide, poison bait intake was significantly lower to that of plain bait while it was non significantly lower to that of plain bait in case of bromadiolone.

It shows that braomadiolone bait is palatable while animals show bait shyness for zinc phosphide bait.

130. Development of DNA barcode of Manipuri pony (*Equus caballus*) using universal bird forward and fish reverse primer as cross species primer

Kshetrimayum Miranda, Ranadhir Thiyam and Sankar Kumar Ghosh

Department of Biotechnology, Assam University,
Silchar-788011, Assam
drsankarghosh@gmail.com.

Keywords: *Manipuri pony, COI, Equidae, DNA barcode, Primer design, Cross species primer*

DNA barcoding is an important step allowing preservation of the breed integrity and is prerequisite for efficient management of genetic resources. Manipuri pony is a unique indigenous horse breed of Manipur, India. Here, we analyzed a PCR-amplified DNA barcode sequence of the mitochondrial cytochrome c oxidase gene (*COI*), of Manipuri Pony. Different primer combinations were studied by *in silico* methods for their feasibility to generate the targeted fragment of *COI* gene. Using a combination of forward primer

for bird DNA barcoding (BirdAF) and reverse primer for fish DNA barcoding (FishR), *in silico* analysis and an *in vitro* PCR amplification based on the total DNA extracted from hair samples of Manipuri pony gave same amplification product. After PCR amplification followed by sequencing, a similarity and homology search using NCBI-BLAST and GenBank database revealed that it lies within the barcode region of *COI* gene of the mitochondrial genome, which is considered as the universal DNA barcode region. *COI* sequence divergence for conspecific individuals of *Equus caballus* was 1.58% whereas those for congeneric species averaged 13.46% (range 6.77%-17.2%).

131. The Phylogenetic Analysis and Evolutionary Ecology of the Freshwater Turtles in Northeast India

Kulendra Ch.Das, Shantanu Kundu and Sankar K. Ghosh

Department of Biotechnology,
Assam University, Silchar-788 011,
Assam, India.

kulendradas2002@yahoo.co.in ; drsankarghosh@gmail.com

Key words: *Mitochondrial DNA, evolutionary ecology, conservation genetics, phylogenetic analysis and COI.*

Turtles are one of Earth's most instantly recognizable life forms, distinguished for over 200 million years in the fossil record. However, the subsequent evolution of turtles has been a matter of much speculation and debate, as is reflected in uncertainties about evolutionary relationships at taxonomic levels ranging from subspecies to suborders. To address this issue, we sequenced 17 samples of the mitochondrial DNA for 10 species representing all freshwater turtle. Findings of special relevance to conservation biology include discovery of a distant relationship among chelonian species. A longstanding debate in evolutionary ecology was resolved by phylogenetic analysis. Here we provide an independent assessment of evolutionary relationships among all ten extant species, based on a 650 bp region of nucleotide sequences from the cytochrome oxidase subunit-I (COI) gene of mitochondrial DNA (mtDNA). One motivation for this study is to clarify freshwater turtle phylogeny in problematic areas that are relevant to the fields of both evolutionary ecology and conservation genetics.

132. Pathomorphological Alterations in Gills of Freshwater Prawn, *Macrobrachium Dayanum* (Crustacea – Decapoda) After Acute and Sub-Acute Exposure of Lead Nitrate

Kunwer Ji Tiwari, Harnam Singh Lodhi, Sanjive Shukla
and U. D. Sharma***

Department of Zoology,
BSNV P.G. College,
Lucknow – 226001 (U.P.) India.
Email: sanjiveshukla@gmail.com

* Prawn Research Centre, Department Of Zoology,
University of Lucknow, Lucknow – 226007 (U.P.) India.

**Present Address- Department Of Zoology,
Shia P.G. College, Lucknow (U.P.) India.

Key words: *Macrobrachium dayanum*, *Lead toxicity*, *Histopathology*, *Gills*.

Lead is a nonessential “grey listed” heavy metal, used in fuels, ceramics, paints and glass wares in industries and vehicles. It is toxic and cause serious problems to plant and animals, haematological, neurological, nephrological and histopathological effects of lead are well known. Fresh water prawn, *Macrobrachium dayanum*, a potential animal for freshwater aquaculture, were subjected to acute and sub-acute concentration of Lead nitrate (116.46 mg/l; 96h LC₅₀ & 29.12 mg/l; 25% of 96h LC₅₀) showed severe histopathological alterations in gills after 24, 48, 72 & 96h and 10, 20, & 30 day exposure. Chief alterations during acute exposure were thickening of gill plates, reduction in inter lamellar spaces, cuticular irruption, inflammation and necrosis where as clumping of gill plates, hyperplasia, hypertrophied haemocytes with nuclear pycnosis and leakage of haemocytes in inter lamellar spaces as well as deposition of broken tissue debris near gill base were observed during sub-acute exposure. The severity of pathomorphological alterations were found duration dependant.

133. DNA Barcoding an Approach to Enrich Fish Systematic of Northeast India : Validating Its Significance by Emphasizing the Cryptic Fish Genus *Mystus* and *Eutropiichthys*

Maloyjo Joyraj Bhattacharjee¹ and Sankar K Ghosh*

Department of Biotechnology,
Assam (Central) University, Silchar-788011, Assam, India
Email: drsankarghosh@gmail.com

Keywords: *Cryptic Fish, Systematic, DNA barcoding, Nucleotide, coxI, Mystus, Eutropiichthys*

The Northeast India is a megabiodiversity hotspot and homeland of several indigeneous species of fishes. Systematic and ecological classification of the fishes of this region can be enriched and accentuated by DNA barcoding. However, recent work by some researchers provoked some pitfalls of the process, explaining speciation is not a linear process and the single distance based study of the nucleotide sequences is not sufficient enough to discriminate the species. In our present study DNA barcoding was emphasized on the cryptic species within the fish genus *Mystus* and *Eutropiichthys* to reassess its efficacy before undergoing large scale barcoding of the fishes of this zone. The DNA is isolated; PCR amplified for their barcode segment using the universal fish primer and sequenced bidirectional. The interspecific variation is found to be 45 times higher than the intraspecific one. Thus barcoding unambiguously classified the fishes and can be introduced in a large scale to reveal the actual level of diversity of the fishes of this region.

134. Species Differentiation Among Farm Animals using DNA Barcode

Monika Ahanthem, Basant Kumar Tiwary and Sankar Kumar Ghosh

Department of Biotechnology,
Assam University, Silchar-788011, Assam
drsankarghosh@gmail.com

Keywords: *DNA barcode, COI, species identification, meat and milk identification, PCR-RFLP*

Species identification of farm animals is a difficult task when they have lost the

morphological characters (shape, size, appearance, etc.) due to food processing. Animal's identification can be done by either protein or DNA based method. DNA barcoding is a new taxonomic tool for identifying biological specimens and managing species diversity. The studies suggest approx 648 bp region of the mitochondrial gene for *cytochrome c oxidase I (COI)*, may serve as a DNA barcode for the identification of animal species. We used five economic animals (*Bubalus bubalis*, *Ovis aries*, *Capra hircus*, *Sus scrofa* and *Bos indicus*) and developed farm animals specific DNA barcode sequences using universal primers. Sequence variation of the fragments from the barcode region was analyzed. The sequences generated from DNA barcode were used for *in-silico* RFLP that will help in identification of their meats and milk products.

135. Antimicrobial and antifungal activities of the tissue extracts of *Babylonia spirata* Linnaeus, 1758 (Mollusca: Gastropoda) from Thazhanguda, Southeast cost of India

N. Periyasamy*, S. Balakrishnan and M. Srinivasan

Centre of Advanced Study in Marine Biology,
Faculty of Marine Sciences,
Annamalai University, Parangipettai – 608 502
Tamil Nadu – India
E. mail: marugalbalu82@gmail.com

Key words: *Gastropod*, *Babylonia spirata*, *antimicrobial activity*, *SDS PAGE*, *Thazhanguda*

Many cytotoxic compounds have been isolated from marine organisms. In the present study, tissue extract compounds of a species of *Babylonia spirata* (gastropod) assayed for the antimicrobial and antifungal activities against nine bacterial and three fungal pathogens. The antimicrobial activity of the crude ethanol extract of gastropod showed inhibitory activity against almost all the nine strains and the range of inhibition of the bacteria varied from (3-12mm) with an average of (8mm). The maximum inhibition zone (12mm) was observed against *Pseudomonas aeruginosa* and the minimum inhibition zone (3mm) was noticed against seven pathogens (*Pseudomonas aeruginosa*, *Vibrio cholerae*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus pneumoniae*, *Salmonella typhi*, *V. parahaemolyticus* and *Proteus mirabilis*). Hence 100% ethanol fraction of the tissue extract of *Babylonia spirata* was deemed as potent

antimicrobial compounds against those pathogens (*Aspergillus flavus*, *Candida albicans* and *Mucor* sp). Biochemically it was partial protein moiety and its molecular weight was 2 kDa.

136. Oxidative stress response in fingerlings of *Cyprinus carpio* exposed to hexavalent chromium

Pavan Kumar, Anurag Dabas, Rashmi Srivastava, Ravindra Kumar, N S Nagpure, Prakash Nautiyal and Basdeo Kushwaha

National Bureau of Fish Genetic Resources
Canal Ring Road, P.O. Dilkusha, Lucknow – 226002

Keyword : *Acute toxicity, Chromium, Cyprinus carpio, Oxidative stress.*

Chromium is regarded as one of the most toxic heavy metals and is widely used in various industrial processes such as the production of stainless steel, manufacture of pigments or dyes, and the preservation of wood. During these processes as a result of release chromium, in aquatic environment causes severe health problems to aquatic animals and man. Hexavalent chromium is highly toxic, carcinogenic and its toxicity is related to the generation of reactive oxygen species (ROS) as a result of cellular reduction of Cr (VI) to Cr (V/IV/III). The present study aimed to assess oxidative stress due hexavalent chromium by using certain biomarkers in various tissues of *Cyprinus carpio* fingerlings. The 96 h LC₅₀, estimated by probit analysis in a semi-static bioassay experiment was 273 ppm. Malondialdehyde (MDA), reduced glutathione (GSH), glutathione peroxidase (GSH-PX), catalase (CAT) and superoxide dismutase (SOD) activities selected as biomarkers for stress monitoring in the liver, gills and kidney of fishes exposed to 1/4th, 1/2th and 3/4th dosages of LC₅₀ value of potassium dichromate for 24, 48, 72 and 96 hr. The present results reveal that exposure of sublethal dosages of potassium dichromate promotes Malondialdehyde (MDA) SOD, content in the various tissues of fishes during the exposure, whereas, the GSH, GSH-Px, SOD, and CAT activities levels were fluctuating after 24, 48, 72 and 96 hr in all the treatment groups compared with control. The CAT activities levels were decreased with the increase in concentration and duration of exposure. The results also indicated that liver is highly sensitive among all the three tissues. This study highlighted the anti-oxidant enzymes can be used as effect biomarkers for assessment of adverse effect of heavy metals in aquatic animals.

137. A Plea of Scientist to Man

Pooja Gagdani

MSc. Zoology, Isabella Thoburn College, Lucknow

The 'why of things' gave birth to the field of "Science" and the person who found the solution was named "Scientist". Different needs around man regarding comfort, production, defense, health made scientists to make new discoveries. But it has been rightly quoted, "There is enough on Earth for everyone's need but not for everyone's greed." Today's 'Man' is so greedy and selfish that 'he' has made existence of other living organisms difficult. 'Man' is trying to mould all blessings of 'Science' to fulfill his own comfort and has ruined the planet Earth. *Twenty percent* of world's population (developing countries) consume *eighty percent of world's natural resources*, generates seventy five percent of all solid waste, and are responsible for seventy percent of *global environmental damage*. Scientists have realized the coming hazards & are framing different environmental laws for global concern & reviving legal-framework.

GIVE UP GREED & ENJOY BOUNTIES OF NATURE.

A Plea of Scientist to save the human race and the elegant wildlife decorating the planet Earth.

138. A Monogenean Genus *Lamellodiscus* (Monogenea : Diplectanidae) Revisited Using insilico Tools for Phylogenetic Studies

P. V. Arya¹ and H. S. Singh²

¹Dept. of Zoology, D. S. College (University of Delhi), New Delhi-3

²Dept. of Zoology, C.C. University, Meerut-4

Key words : *Monogenea, Diplectanidae, Phylogeny, Lamellodiscus & Bioinformatic*

Monogenean genus *Lamellodiscus* (Monogenea : Diplectanidae) has been so far recorded with about 50 species around the world reported from time to time latest being in 2009 i.e., *L. donatellae* Giovanni *et al.*, 2009. A combination of different Phylogenetic tools of Bioinformatic softwares/algorithm were employed in inferring relationship between

some species of genus *Lamellodiscus* Johnston and Tiegs, 1922 viz., *L. Japonicus*; *L. spari*; *L. pagrosomi*; *L. acanthopagri*; *L. ergensi*; *L. baeri*; *L. elegans*; *L. erythrini*; *L. ignoratus*; *L. drummondi*; *L. obeliae* and *L. virgula*. *Dactylogyrus extensus* was used as outgroup taxa. Sequence alignment was done using Clustal-X, Phylogenetic Tree preparation was done using NJ as well UPGMA. Findings bring about molecular evidences of the relationship among different members of genus *Lamellodiscus* Johnston and Tiegs, 1922.

139. Phylogenetic *in-silico* studies on plant root nematodes from few members of family Anguinidae

P. V. Arya¹ and Vinita

¹Dept. of Zoology, D.S. College, Delhi-3

Key words : *Bioinformatics, In-Silico, Phylogeny, Anguinidae and Nematoda*

A combination of different Phylogenetic tools of Bioinformatic softwares/algorithm were employed in inferring phylogenetic relationship between selected five genus viz. *Anguina*, *Ditylenchus*, *Mesoanguina*, *Heteroanguina* & *Subanguia* were used in the present phylogenetic investigation. Preferred sequences such as ribosomal RNA, COX, ITS, HOX etc. representing selected species of these genus have been examined. Sequence alignment was done using Clustal-X. Phylogenetic Tree give molecular evidences of the phylogenetic relationships among the selected genus.

140. Study of Oxygen Consumption in Male and Female of “Red Pumpkin Beetle” *Aulacophora Foveicollis* (Family-Chrysomellidae; Order-Coleoptera)

Reena Bahan*, Anita kumari, Renuka Sharan and Shashidhar Singh **

Deptt. of Zoology, College of Commerce, Patna-20

Key-words : *Aulacophora foveicollis, O₂ consumption, water displacement method.*

Aulacophora foveicollis is a common pest of vegetables, belonging to the family

Cucurbitaceae, namely kaddu or pumpkin, cucumber, bitter gourd, tinda, etc. The oxygen consumption in adult male and female insects of this species were investigated by water displacement method. It was found that in adult stages O₂ consumption in female is greater than in male, showing sexual difference in oxygen consumption. The result was obtained after repeating the experiments thrice on 20-25 male and female insects separately.

141. Development of DNA Barcode of Royal Bengal Tiger (*Panthera tigris*) and Domestic Cat (*Felis sylvestris catus*) using own designed Primers for COI Gene

**S K Ghosh¹, P Mahadani¹, A Chetry², C S Chakraborty
and P R Ghosh**

West Bengal University of Animal and Fishery Sciences,
Kolkata-37

¹Department of Biotechnology, Assam University,
Silchar-788011

²College of Veterinary Science, Khanapara,
Guwahati, Assam

Keywords: *DNA barcoding, COI, Royal Bengal Tiger, Domestic cat, Felidae, Universal primer design.*

The DNA barcoding of animal species using mitochondrial *Cytochrome Oxidase subunit-I (COI)* gene opens a new vista for molecular identification of different life forms on our planet and caters a boon for cataloguing of taxa. In the present study, an attempt is made to develop a set of universal primer (forward-COIF1 & reverse COIR1) for PCR amplification of COI gene for higher mammals and validated by successful amplification and subsequent sequencing of the gene in Royal Bengal tiger and domestic cat. The sequenced data are submitted in GenBank (Accession No - FJ171914, FJ171915, FJ185309 & FJ185310) as DNA barcode of the species. The obtained sequences along with other relevant sequences already existed in global database are analyzed to determine phylogenetic relationship and discussed.

142. Haemogrammic Alterations under Cobalt Chloride Stress in *Rattus norvegicus*

Shilpi Gupta and Prabhu N. Saxena*

Toxicology Laboratory, Department of Zoology,
School of Life Sciences, Khandari Campus,
Dr. B.R. Ambedkar University, Agra-282002, U.P., India
gshilpigupta@gmail.com , *dr_pnsaxena@yahoo.co.in

Keywords: *Cobalt chloride, Toxicity, Haematology, correlation.*

Cobalt chloride (COCl₂) when given orally to acutely (1day) (116.6mg/kg body weight) and sub-acutely (7,14,21,28days) (16.65, 8.32,5.55 and 4.16mg/kg body weight) treated albino rats after LD₅₀ (1166.80mg/kg body weight)determination ,brought about significant enhancement in Red blood cells (RBCs), Haemoglobin concentration (Hb. Conc.), Haematocrit value (Hct or PCV), Mean cell volume (MCV), Mean cell hemoglobin (MCH), Mean cell haemoglobin concentration (MCHC),Total Leucocyte count(TLC), Differential leucocyte count (DLC) and Platelets counts, whereas decline in Erythrocyte sedimentation rate (ESR) *vide supra*. Cobalt has also been observed to increased erythropoietin which results in the increase production of erthyrocytes and also stimulates megakaryocytes and leucocyte precursors in bone marrow, due to which thrombocytosis and leucocytosis takes place. Erythrocytosis leads to increase in Hb concentration, PCV and erythrocyte indices, while decrease in ESR due to rouleux formation. Correlation analysis also proves the relationship between these hematological parameters.

143. Effect of Electromagnetic Radiations Emitted from Video Display unit of Computer Monitor Based on Cathode Ray Tube Technology on Red Blood Cells of Balb/c Mice

Upma Bagai and VP Sharma,

Department of Zoology, Panjab University, Chandigarh-1600014
upmabagai@yahoo.co.in

Key words : *VDU, EMF, RBC*

The present study has been designed to assess the effect of EMF emitted by CRT

technology based computer VDU on red blood cells of BALB/c mice. Twenty four (n=6X4) BALB/c mice (6-8 weeks) weighing 16-22 g were exposed to EMF 8-10 h/d by placing 20 cm away from VDU (17" digital colour monitor) for 7, 15, 30 and 45 days. Power density ($\mu\text{W}/\text{cm}^2$) was measured with RF field strength meter. 45 days of exposure exhibited 12% decline in total RBC count as well as hemoglobin percentage of exposed mice. SEM of exposed group exhibited distortion in RBC shape and reduction in size of red cells due to exposure. Deleterious effect is enhanced with increase in exposure time.

144. Efficacy of *Lactobacillus sporogenes* and Rose Petal Extract on the Fish *Cirrhinus mrigala* (Hamilton)

Vasanthakumar, D., Balamurugan, A. and D.aruna

Post-Graduate and Research Department of Zoology,
Government Arts College (Autonomus), Coimbatore- 641 018, Tamil Nadu, India.

Key words: *Rosa centifolia*, *Lactobacillus sporogenes*, probiotics, antibiotic drugs.

Aquaculture industry in one of the most expanding industry as fish protein is looked upon as a replacement of fat rich meat. So, the quality of fish is to be maintained by careful management of fish culture. Fishes are vulnerable to several pathological diseases. Antibiotic drugs are used largely to control the fish diseases. Excessive use of these drugs leads to the development of resistance in the pathogens against the antibiotics. So there is an urgent need for alternatives to the antibiotic drugs. Probiotics are the beneficial microbes which have the potential of immune stimulation and increased feed utilization property without having any harmful effects. Similarly herbal extracts are encouraged to be used in aquaculture industry to prevent the fishes form diseases. So, an investigation was made to determine the growth promoting and immune stimulating property of *Lactobacillus sporogenes* (4 mg/ litre of water) and aqueous extract (10mg/litre of water) of petals of *Rosa centifolia* in the fish *Cirrhinus mrigala*. Our results showed significant increase ($P<0.01$) in the weight of fish, enhanced feed utilization, feed conversion efficiency and WBC counts in the *L. sporogenes* and rose petal extract exposed fishes than in the control fish. Thus, it is concluded that the use of probiotics and herbal extracts can be adopted as an alternative to the antibiotic drugs and other chemical treatments in the aquaculture industry, thereby improving and increasing fish production at low cost.

VI. Neurobiology and Endocrinology

145. Social Complexity and Architecture of bird brain

Shubha Srivastava* and Sudhi Shrivastava

Govt. Degree College, Mant Mathura UP

Shubhasri20032003@yahoo.com

Telencephalic volume fraction may be an anatomical substrate for social complexity, and perhaps cognitive ability that can be generalized across a range of vertebrate. In birds the telencephalic volume fraction is strongly correlated with social complexity. Birds have large brains relative to body weight, present an attractive comparison group relative to mammals. Telencephalic volume fractions (*Ftel*) were defined as the telencephalic volume fractions (*Ftel*) were defined as the telencephalic volume divided by the total brain volume. While the underlying brain structures of birds and mammals are remarkably similar in many respects, including high brain-body ratios and many aspects of brain circuitry, the architectural arrangements of neurons, particularly in the pallium, show marked dissimilarity. The neural substrate for complex cognitive functions that are associated with higher-level consciousness of birds has been studied by Nissl and Golgi impregnation method to find out architectural constraints responsible for social complexity in birds.

We have discussed the evolution of intelligence and higher-level cognitive functions in birds in the context of the similarities in neural connectional patterns and associational pallial areas with mammals. The present paper is an attempt to explore in much greater detail the possible shared neural features of birds and mammals that may generate such higher levels of consciousness.

146. Natural Products Modulate Eicosanoid Mediated Nodulation in *Poeciloceris pictus* Feb. (acrididae) Orthoptera

Ajay Pratap Singh and Smita Banerjee

Department of Zoology,

Dr. H. S. Gour University, Sagar-470 003 (M.P.)

Key words : *Azadirachtin, Juglone, Plumbagin, Eicosanoid, Nodulation*

The present work was an attempt to explore immuno-modulatory activity of some

natural products taking into account the major cellular immune reaction- nodulation, in the short horned grasshopper *Poekilocerus pictus*. It has been shown that two different groups of natural products i.e. azadirachtins, Neemazal and TN MP-100 and quinones Juglone and Plumbagin inhibit the nodulation reaction against four different species of bacteria, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and bacteria isolated from the gut of *P. pictus* itself ('self bacteria'), used to artificially infect the grasshopper. Role of eicosanoid in mediation of nodule formation postulated by earlier workers has been studied by observations on effects of eicosanoid inhibitor dexamethasone and rescue experiments using the precursor, arachidonic acid. Significant reduction in the number of nodules by dexamethasone and their restoration by arachidonic acid has shown that eicosanoids function for nodulation in *P. pictus*. Most interesting result of the present work has been revealed by the fact that all the four natural products inhibit nodule formation which is not restored even by arachidonic acid administration, leading to immunodeficiency. These results can be exploited in insect pest management.

147. Cytoarchitecture of the Optic Tectum in Teleosts

Sreekala. S*; Manju V. Raj** and Sherly. P. S.***

*Lect. Sel, Grade, D. B. Pampa College, Parumala

**Research Scholar, Dept. of Zoology, S. N. College, Kollam

*** Associate Professor, Dept. of Zoology, S. N. College, Kollam

Key words : *Optic tectum, Optic lobes, Olfactory lobes, Facial lobes*

The cytoarchitecture of the optic tectum of fishes presents some interesting features. The optic tectum consists of different layers and the number of layers vary by species. The tectum shows variation of size and shape among fishes of different habits and habitats. The fishes selected for the study are *Ophiocephalus striatus* and *Nemacheilus- rupecola*. These fishes have different feeding habits i.e., *O. striatus* is surface feeder and *N. rupecola* is a bottom feeder. *O. striatus* primarily rely on vision for feeding and is possessed with well developed optic lobes and correspondingly highly developed optic tectum whereas *N. rupecola* dwells in the bottom waters and mainly depend on taste for feeding and have well developed olfactory bulbs and facial lobes. The serial section of the brain was stained with Haematoxylin-Eosin and silver impregnation method to reveal different tectal layers in these fishes to find out their feeding habits.

148. Effects of Habitats on the Structure of the Vagal Lobe in Two Teleosts

P. S. Sherly

Associate Professor of Zoology
PG and Research Department of Zoology,
Sree Narayana College, Kollam, Kerala, S. India

Key words : *Myelencephalon, vagal lobe, gustation, nucleus ambiguus, neurons, gustatory tracts*

Comparative studies on the hindbrain was analysed for getting scientific information on the morphological and histological aspects of brain in two teleost, namely *Etroplus Suratensis* and *Mystus gulio*. The former, an omnivorous surface feeder and the latter an omnivorous bottom feeder. Different types of feeding brings out changes in the structure of the myelencephalic area representing the vagal lobe. Histology of the brain was carried to trace the gustatory tracts and neuronal differences exist in these fishes. Feeding reflects the brain structure. These two fishes depend on gustation during feeding and hence vagal lobes were well developed. In *E. Suratensis* the length of the vagal lobe represents 11.6% of the total brain length whereas in *M. gulio* it 9.24%. The origin and development of neurons and gustatory tracts were traced and it differs in these two fishes. In *Etroplus suratensis* the neurons arise from nucleus ambiguus, which is a gustatory centre. In *Mystus gulio*, the origin of gustatory neuron is near the gustatory tracts indicating some other mechanisms than gustation in *Mystus gulio*.

149. Neuroarchitectural mapping of brain of *Rhinolophus lapidus*

Abhinav

Department of Zoology
D.B.S. (P.G.) College, Kanpur

The echo locating bat has served as a valuable model in neuroscience to elucidate mechanisms of auditory processing and adaptive behavior in biological sonar. The topology of brain which includes location, organization, division and cytoarchitecture pattern of different nuclei of brain has been studied by Nissl stained method and it has been observed that

neocortex of bat shows a typical mammalian six-layered organization. It is poorly laminated, also has a low density of granular elements. Frontal, parietal, temporal and occipital regions are distinguishable. Auditory cortex which is an important region of the cerebral hemisphere, and involved in perception of sensory information, occupies a larger area of the bat's neocortex. This part process sensory input connected to hearing and spatial memory, but not for olfaction. It has also been observed that the size of the inferior colliculus was much larger in Micro chiropterans than in Mega- chiropterans. The size of the inferior colliculi reflects the hearing capacity of species better than any other brain structure. Bats also have the larger hippocampus responsible for spatial memory which shows the enhanced ability of bats to memorize structures by remembering the location of unpredictable but stationary food.

Our study on the evolution of brain regions reveals a differentiated pattern of size increase in brain regions in relation to habitat complexity. These findings suggest that Neuro-cognitive centers are under specific selection pressure.

150. A qualitative study on acetylcholinesterase distribution in the cortical centres of Indian wall lizard *Hemidactylus flaviviridis*

Anurag Tripathi

Post Graduate Department of Zoology
Ranchi College, Ranchi University,
Ranchi-834008

Cerebral cortex of the Indian wall lizard is differentiated in to medial,dorsomedial,dorsal and lateral cortices, each consisting of three distinct layers. A detailed histochemical study of various cortical centers has been done by employing a modified technique to visualize acetylcholinesterase containing neurons described by Hedreen, J. C. et.al.(1985).Medial cortex varies in position at different rostrocaudal levels. Layer I and layer III of medial cortex exhibited moderate intensity for acetylcholinesterase activity at all levels while layer II demonstrated total negativity.Dorsomedial cortex showed almost intense reaction for acetylcholinesterase at all levels. Pars medialis part of dorsal cortex also demonstrated intense activity in all layers while lateral cortex exhibited moderate reaction in layer I and

layer II but interestingly intense activity in layer III. The significance of varying enzyme distribution has been discussed from functional point of view. Key words: Cerebral cortex, acetylcholinesterase, reptile.

151. The cytoarchitecture of torus semicircularis of the mid brain of an electroreceptive cat fish, *Clarias batrachus*

Atul Trivedi and Anita Gopesh

Department of Zoology,
University of Allahabad,
Allahabad-211002

Keywords : *Torus semicircularis, cytoarchitecture, electroreceptive and cat fish.*

The torus semicircularis is the part of mid brain of teleosts which has been treated as a structural entity and principal mid brain integration centre of acoustico-lateral system. The cat fishes are group of teleosts which are known to have well developed acoustico-lateral system which includes a large electroreceptive component in addition to the ordinary mechanoreceptive, auditory and vestibular component.

Indian catfish *Clarias batrachus* was of much interest keeping in view the fact that it is a known electroreceptive fish. With an aim to study the structure and organization of torus semicircularis in the electroreceptive fish, present investigation has been undertaken. The study was based on neurohistological Nissl-staining technique and Golgi-Colonnier method to focus and investigate the cytoarchitecture of the torus semicircularis in *Clarias batrachus*.

The torus semicircularis in this fish was observed to have consisted of two major nuclei, nucleus centralis and nucleus lateralis. The nucleus centralis is divided in to four cell layers, differentiated on the basis of density of cells. In the second layer density of cells was observed to be highest. The nucleus lateralis is also divided in to four cell layers. Different types of neurons observed are discussed along with the cytoarchitectonic organization of mid brain of this electroreceptive fish.

152. Neuroendocrine Regulation of Glucose Levels in the Tissues of Snail (*Pila globosa*) with Reference to Aestivation

P. Hanumantha Raju^{1*}, P. Sudarsanam¹ and P. Reddenna²

¹ Department of Zoology, PVKN Govt. College, Chittoor, Dr. P. Sudarsanam

² Department of Molecular Biology, University of Hyderabad.

Key words : *Neuroendocrinal Regulation, Energy Metabolism, Aestivation, Snail*

The present investigation has been made to know the influence of different ganglionic extracts on the glucose content of the tissues and body fluids of snail. More amount of glucose was observed in the foot, mantle, hepatopancreas and body fluids of active snails than those of aestivated snails. An elevated levels of glucose was observed in the tissues of aestivated snails administered with the ganglionic extracts of active snails and more was observed in hepatopancreas and it was reversed in aestivated snails. It seems to have greater role in the regulation of aestivation metabolism.

Cerebral ganglionic extract of aestivated snail showed more influence in the decrease of glucose levels in all the tissues except mantle, which was influenced more by visceral ganglion. In view of the above results energy metabolism is under the control of neuro

153. Seasonal variation encountered in morphology of Multipolar neurons in Parahippocampal region of male koel (*Eudynamys scolopaceus*)

Durgesj Singh and U.C. Srivastava

Department of Zoology, University of Allahabad,
Allahabad- 211002.

Keywords: *Parahippocampal region, multipolar neurons, soma diameter, dendritic thickness.*

Golgi-Colonnier method, a neurohistological technique to analyze the seasonal variation in multipolar neurons of Parahippocampal region of male koel (*Eudynamys scolopaceus*) has been applied. Parahippocampal region (a field of hippocampal complex) lies just above medial hippocampus. It extends from rostral to caudal portion of hippocampal complex and

is located lateral to the hippocampus in thin dorsal roof of hemisphere at the caudal telencephalon.

Among the four types (Multipolar, Pyramidal, Unipolar and Bipolar neurons) identified in Parahippocampal region multipolar forms the bulk of neurons, they accounted for **63.64%** in non-breeding and **73.91%** in breeding season. The differences were clearly observed in multipolar neurons during breeding and non-breeding season in terms of soma size, soma diameter and dendritic thickness.

The above mentioned characters were found to increase in breeding season like soma diameter increased from **14-21 μ m** in non breeding period to **17-26 μ m** in breeding period. Similarly both dendritic thickness and soma size were found to increase during breeding season.

Present study support the view that during the breeding period birds are more active, the neurons tend to increase in soma size, dendritic thickness to cope with changing conditions.

154. Neuroprotective effect of ginger against the STZ modulation of lipidmetabolic profiles in adult rat brain

K.R.Shanmugam^{ab} and K. Sathyavelu Reddy^a

^a Department of Nutrition and Dietetics, Faculty of Allied and Health Sciences,
University of Kebangsaan Malaysia, Jalan Raja Muda Aziz,
50300 Kuala Lumpur, Malaysia.

^bDivision of Molecular Biology and Exercise Physiology,
Department of Zoology, Sri Venkateswara University,
Tirupati – 517 502, A. P, India
E-mail : krshanmugam@yahoo.co.in

Keywords: *Diabetes, ginger, lipid metabolic profiles, rats*

Effect of ginger treatment on blood glucose, lipid peroxidation, phospholipids and triglycerides in the brain parts (cerebral cortex (CC), cerebellum (CB), hippocampus (HC) and hypothalamus (HT)) of streptozotocin (STZ)-induced diabetic rats was studied.

Male rats of Wistar strain, weighing 180 to 200 g, were randomized into control and experimental groups. Experiment group rats were induced diabetes by administration of STZ (50 mg/kg b.wt.) intraperitoneally. The diabetic rats were treated with ginger (200 mg/kg b.wt.) for 30 days. In diabetic rats we observed elevated levels of lipid peroxidation phospholipids and triglycerides in CC, CB, HC and HT. Increased level of blood glucose (BG) were observed in the untreated diabetic control rats. However ginger treatment significantly and dose-dependently decreased the lipid metabolic profiles and blood glucose levels in STZ-diabetic rats. From the current study, it can be concluded that ginger can be considered as potent antihypolipidemic drug.

155. Prenatal developmental neurotoxicity of deltamethrin: A behavioral and immunohistochemical study

Kumar K. ¹, Patro N.¹, Patro I.K.^{1,2}

¹School of Studies in Neuroscience, Jiwaji University,
Gwalior 474011

²School of Studies in Zoology, Jiwaji University,
Gwalior 474011

Deltamethrin (DLT), is a α -cyano group containing type-II pyrethroid insecticide and has long been considered safe to humans. We have evaluated the prenatal neurotoxicity of deltamethrin (DLT) in rats. Timed pregnant female rats were treated with DLT (0.75mg/kg body weight, intraperitoneally, dissolved in dimethylsulfoxide) during two different gestational time periods, i.e., gestational day 7-10 and 11-14. Results showed occurrence of astrogliosis in the granule cell layer and white matter along with disorganized and hypertrophied morphology of Bergmann glial fibers, impaired granule cell proliferation and migration due to decreased expression of reelin alongwith distortion of the monolayer arrangement of Purkinje neurons. A significant decrease in motor coordination, neuromuscular strength and exploratory behavior were observed due to impaired cerebellar cortex morphogenesis and such decline was not recovered till 365 postnatal days of age.

156. Paraneuronal pseudobranchial neurosecretory cells in scorpion catfish *Heteropneustes fossilis*: a ESEM and TEM study

L.Yadav¹, M. Sengar² and A. Gopesh²

¹Department of Zoology, Smt. Indira Gandhi Govt. P.G. College,
Lalganj, Mirzapur-211003U.P., India .

²Department of Zoology, University of Allahabad,
Allahabad-211002

Keywords : *Pseudobranchial neurosecretory cells, DNES, Hypoxia, Air-breathing Ultrastructure*

Pseudobranchial neurosecretory cells, found in the gill region of certain group of fishes belong to a system of neurosecretion that falls under the category of the diffuse neuroendocrine system (DNES) and the cells belonging to the system share several morpho-functional features similar with the paraneuronal cells observed in the respiratory tract and other parts of body of higher vertebrates. It is found in several groups of teleosts and is uniformly present in catfishes, both in marine and freshwater. Based on the experimental observations, a role in condition of hypoxia has been recorded for the system. Preliminary immunocytochemical investigations have revealed presence of more than one bioactive substances, associated with the paraneuronal cells of this neuroendocrine system of fish gill. With the objective of elucidating the ultrastructure of the cells of the pseudobranchial neurosecretory system (PNS) the present work was undertaken by environmental scanning electron microscopy (ESEM) and transmission electron microscopy (TEM) in an air-breathing catfish *Heteropneustes fossilis*.

157. Studies on the Torus Longitudinalis in Teleosts

Manju V.Raj, Sreekala S. and Sherly P.S.

PG & Research Department of Zoology
S.N.College, Kollam, Kerala, India
E-mail: ma.manjuanikumar@yahoo.com

Key words : *Torus longitudinalis, optic tectum, midbrain, mesencephalic, ventricle, valvula.*

Torus longitudinalis (TL) is a characteristic structure of the brain of higher bony

fishes and shows many structural variations. It is the extension of medial part of the tectal grey matter into the mesencephalic ventricle. The present study deals with the structural variations of TL in four teleosts namely *Carassius auratus* (surface feeder) *Ophiocephalus striatus* (surface feeder), *Aplocheilichthys lineatus* (surface feeder) and *Noemacheilus rupicola* (bottom feeder). The structure of TL was studied with double staining and silver staining methods. The size of the torus is not always directly proportional to the size of the optic tectum and its spatial relations depends upon those of the tectal lobes and of the valvula. It may be regarded as the correlation centre between the photostatic and the gravistatic impulses of the mid brain and only gravistatic or photostatic role does not appear to be sufficient for it.

158. Neuroendocrine control of stress hormone; cortisol.

N. Venkat Appa Rao*, and M. Firoz Ahmad,**

*Department of Zoology,
St. Xavier's College, Ranchi

**Pro-Vice Chancellor,
Neelambar-Pitamber University,
Medininagar, Palamau.

Various lines of evidence now converged towards the neuroendocrine regulation of adrenal gland since gamut of intra-glandular neuropeptides have been localized in the nerve endings innervating the adrenal gland. Insulin-like growth factor-I (IGF-I) and neuropeptide-Y (NPY) are the major neuropeptides in these nerve endings. We have investigated the role of these peptides in the secretion of cortisol, a parameter of stress and a potent glucocorticoid from zona-fasciculata of mammals. The IGF-I and NPY @ 1mg/kg body-weight were injected to intact and pharmacologically altered Hypothalmo-Pituitary-Adrenal axis (HPA) as well Renin-Angiotensin -System (RAS) guinea pigs. The alteration of HPA and RAS was achieved by injecting dexamethasone @ 2.5 mg/kg body weight and captopril 8.3 mg/kg body weight respectively. It was observed that IGF-I acts as potent stimulator while NPY is an inhibitor of cortisol secretion. In pharmacologically annulled guinea pigs the injection of IGF-I causes the increase in cortisol level by five folds while in intact animals it is only by more than two folds. On the other hand in NPY injected guinea pigs the cortisol level decreased from 16.88µg/ml to 3.6 µg/ml in pharmacologically annulled

animals and 36.86µg/ml to 4.08 µg/ml in intact animals. The results so obtained were statistically evaluated by paired sample t-test found to be significant ($p < 0.0001$). We conclude that the IGF-I and NPY are involved in the regulation of cortisol secretion as tuners. However, the mode of action of these two intra glandular hormones seems to be different.

159. Seasonal Oscillations in Dendritic Spine Density in Multipolar Neurons in APH region in Male Baya Weaver (*Ploceus philippinus*)

Parul Gaur, Neeta Srivastava and U.C. Srivastava

Department of Zoology,
University of Allahabad,
Allahabad-211002

Keywords: *Multipolar neurons, Parahippocampal area, spines, spine density.*

Our present investigation involved Golgi-Colonnier method to study the morphology and cytoarchitecture of multipolar neurons in APH in the Male Weaver bird (*Ploceus philippinus*) during breeding (B) and non-breeding (NB) seasons. On the dorsomedial surface in the telencephalon of the bird was located a narrow curved strip of tissues, the hippocampal complex (HCC). Medial (HCm) and lateral (HC1) hippocampus, parahippocampal area (APH), crescent field (CF) and central field of parahippocampus (PHc) together constitute the complex structure of HCC. Four types of neurons, viz. multipolar, pyramidal, bipolar and unipolar, were distinguished on the basis of the characteristics such as soma shape, size, number of dendrites originating from the soma, dendritic arbor size etc. The APH was found to be mainly populated with multipolar neurons.

Seasonal volumetric changes in the neuron size, dendritic arborisation and also increase in synaptic traits in telencephalon was reported. The dendritic spines are the key elements in neuronal physiology connecting axons with dendrites and affecting memory storage. Commonly spines are characterized by the presence of a head and a neck. Out of the various sizes and morphologies described, pedunculated (thin and fungiform) and the stubby or sessile were the most common subtypes.

This investigation described mainly quantitative analysis of Golgi-impregnated dendrite from the multipolar neurons in the APH region which revealed dendritic spine density increase in both apical and basal dendrite from 5.81 ± 3.67 [NB, apical] to 12.63 ± 3.67 [B, apical] and 4.74 ± 1 [NB, basal] to 9.94 ± 1.96 [B, basal]. Variations in spine head size and spine neck length were also observed in addition to fluctuations in dendritic arbor size during both seasons in male Baya Weaver. Further investigations in this field are under progress.

160. Phenotypic variations among pyramidal neurons in occipital lobe of Indian Mongoose, *Herpestes edwardsii*

Prashant Chauhan and U.C.Srivastava

Department of Zoology,
University of Allahabad,
Allahabad-211002.

Keywords : *Occipital lobe, Pyramidal neurons, phenotypic variations and dendrites.*

The main objective of this study is to elucidate phenotypic variations encountered among pyramidal neurons in occipital lobe of mongoose. Occipital lobe harbors visual cortex, responsible for ocular process which in an essential part of mongoose's predatory life in scanning its environment for prey.

Pyramidal neurons constitute well above three-fourths of total neuronal types found in our preparations of Golgi-Colonnier & Valverde's modification of Golgi technique of occipital lobe in mongoose. Most of these pyramidal neurons were of 'typical' type characterized by a prominent apical dendrite; a skirt of basal dendrites and presence of dendritic spines. The percentage, soma size, dendritic tree extent and density of spines vary considerably among the five isocortical layers found in occipital isocortex.

The general inference, we can draw is that the different cortical layers and pyramidal neurons therein contribute differentially to the functional aspects of the occipital region.

161. Neuronal classification in the visual wulst of the strawberry finch, *Estrilda amandava*

Prem Chand and U. C. Srivastava

Department of Zoology,
University of Allahabad
Allahabad – 211002, India

E-mail – ucsrivastava@rediffmail.com, premcpatel@gmail.com

Key words : *Wulst, Visual cortex, Dorsal cortex, Neuronal types, Aves*

The study of neuronal diversity of the visual wulst was described by neurohistochemical techniques such as Golgi Colonnier and Rapid Golgi method. The wulst have been categorized into four laminae; the most superficial, hyperpallium apicale (HA), intermediate interstitial nucleus of the hyperpallium apicale (IHA) and hyperpallium intercalatum (HI), and innermost laminae hyperpallium densocellulare (HD). The wulst neurons can be classified into four main cell types: projection neurons having spinous dendrites and their axons project widely within same or different region; local circuit neurons having aspinous dendrites, with local axon arborization; stellate neurons are small and having sparsely spinous thin dendrites and granule cells are small sized and their axons locally arborize. The projection neurons further subclassified into pyramidal (moderately and sparsely spinous) and multipolar neurons (highly, moderately and sparsely spinous). Moderately spinous pyramidal neurons are present in the HA whereas sparsely spinous pyramidal neurons in the HD. The highly and moderately spinous multipolar neurons encounter in the HA, HI and HD whereas moderately and sparsely spinous multipolar neurons found in the IHA and HD respectively. The granule cells are two types spinous and aspinous, restricted only in the IHA. Local circuit neurons are present in the all laminae except IHA. Stellate neurons take place in the all four laminae. The dendrites have spines (synaptic knob) with small stalk which bear a knob like structure which provide space for synapse. The synaptic morphology of the dendrites varies in the different neurons as well as regions. These neurons are comparable with the reptilian dorsal cortex and mammalian visual cortex. In conclusion, visual wulst of the birds seems to be homologous with the reptilian dorsal cortex and mammalian visual cortex.

162. Neuronal morphology of the dorsomedial cerebral cortex of the common Indian wall lizard, *Hemidactylus flaviviridis***R. C. Maurya**

Department of Zoology
University of Allahabad,
Allahabad – 211002 (INDIA)
Email: rcmaurya@rediffmail.com

Key words: lizard/ medial cortex /bitufted neuron/ spinous/Golgi study

The cyto-architecture and morphology of the neuronal types of the dorsomedial cortex of the lizard, *Hemidactylus flaviviridis* has been studied with the help of Cresyl violet staining and Golgi impregnation method. The dorsomedial cerebral cortex displayed three neuronal layers. Layer-I contains only few neuronal somas and also the dendrites ascending from the subjacent layers. Layer-II is characterized by two to three cell thick densely packed neuronal somas. Layer-III contains loosely packed neuronal somas and the dendrites and axon descending from layer-I and II. Below the layer-III an ependymal layer is observed just above the ventricle. Six classes of neurons were distinguished in the cellular layer of dorsomedial cortex of *Hemidactylus flaviviridis*: Bitufted neurons, pyramidal neurons, inverted pyramidal neurons, bipyramidal neurons, multipolar neurons, and pyramidal-like candelabra neurons. The pyramidal cells were large showing more or less single type present in the cellular layer. The multipolar neurons have mostly intracortical dendritic branching and connections. Bipyramidal neurons showed pyramidal appearance of their soma and send dendritic branches towards the superficial plexiform layer and deep plexiform layer. The pyramidal-like candelabra neurons have very high dendritic branching. The comparison of the neuronal types of dorsomedial cortex of reptiles with the parahippocampal area of birds and CA3 region of mammalian hippocampus suggests possibility of their homology.

163. Minocycline: variability in its mode of action on cellular damage in the hippocampus of rat brain following LPS induced neuroinflammation

Sharma A.¹, Patro N.¹, Patro I.K.^{1,2}

¹School of Studies in Neuroscience, Jiwaji University, Gwalior 474011

²School of Studies in Zoology, Jiwaji University, Gwalior 474011

Minocycline, a second generation tetracycline with anti inflammatory properties, is considered to have robust neuroprotective effects. The present study has been designed to evaluate the protective effects of minocycline (i.p., 50mg/Kg b.wt) on varied cell types of brain. Adult female wistar rats were sacrificed at different time points following intracerebroventricular (i.c.v) infusion of bacterial endotoxin Lipopolysaccharide (LPS; 50µg/Kg body weight). Immunohistochemical results along with quantification using Leica Q win software, illustrate a significant decrease in microglial activity and neuronal death at almost all time points in the various hippocampal subfields of rat brain while astrogliosis seems to remain unaffected from the protective effect of minocycline. The study supports the role of minocycline in modulating inflammatory response, neurodegeneration and suggests its ineffectiveness in influencing astrogliosis, subsequent to LPS induced neuroinflammation.

164. Histology of the Olfactory Organ of *Pristolepis Malabaricus*, (Perciformes; Teleostei)

Sherly P. Anand

Department of Zoology,
SN College, Kollam, Kerala

Keywords : *Olfactory lamella, receptor cells, bipolar neurone, sustentacular cells*

The olfactory epithelium of *Pristolepis malabaricus* has been studied with conventional histological techniques. The study describes the structure of olfactory organ *P. malabaricus*. The olfactory rosette of *P. malabaricus* is circular in shape and formed from the epithelial lining of the mesial wall of the olfactory chamber. The epithelium is pushed inward into crescentic folds called olfactory lamellae arranged around median

raphe. The number of lamellae varies between 9 and 12 depending upon the age and size of the fish. Each olfactory lamella has a central lamellar core lined by columnar epithelium. The olfactory epithelium is stratified and consists of three types of cells, the receptor cells (bipolar neurons), supporting (sustentacular) cells and basal cells. A few goblet cells are seen concentrated towards the free end of the olfactory lamellae. The well developed olfactory organs assist the fish to detect chemical cues that help in navigating towards and selecting appropriate food and habitat.

165. Plasticity in Spine density of neurons of APH in female Indian ringneck parrot (*Psittacula krameri*)

Sippy Singh and U.C. Srivastava

Department of Zoology,
University of Allahabad,
Allahabad- 211002.

Keywords: *Neurons, Spines, Spine density, dendritic thickness.*

The neuronal morphology and cellular organization in APH (Parahippocampal region) of female Indian ringneck parrot, *Psittacula krameri* have been studied using Golgi-Colonnier technique.

Four classes of neurons viz- Multipolar, Pyramidal, Bipolar and Unipolar were studied and the results of both breeding and non-breeding seasons of *P. krameri* were compared. We encountered an interesting variation in dendritic thickness and Spine density during breeding season.

Dendritic spines are morphological specializations that receive synaptic inputs and compartmentalize calcium. Spines enhance dendritic surface areas for making synaptic contacts; they have much higher input resistances than those of parent dendrites. Spines have potential for modulating a host of biochemical and biophysical processes that might regulate efficacy.

During breeding season the spine density was observed to increase in all 4 classes of neurons. Similar was the case of dendritic thickness.

The above result suggests that as with change in behavioral ecology there are changes in neuroanatomy. Therefore during breeding season to adjust with these changes in behavior the neurons show plasticity in terms of spine density indicating more active condition during breeding period and increase in dendritic thickness probably to support more spines.

166. Variability of Cortical Organization Among Four Regions of an Indian Bat (*Cynopterus sphinx*) Neocortex

U. C. Srivastava, Suchi Vrata Pathak

Department of Zoology,
University of Allahabad
Allahabad – 211002, India

In bat (*C. sphinx*) a comparative analysis of cortical organization among four regions has been done with the use of Nissl and Golgi-Colonnier technique. The lissencephalic type brain found in *C. sphinx* was of 36mm x 18mm size. Four regions of neocortex in bat followed a typical six-layered mammalian cortical structure. In all the four regions, thick layer I had no somata, however some fibres were visible. Thin accentuated layer II had high packing density in all the regions. Layer III in four regions had sparsely spaced medium and small sized somata. In all the four regions boundaries between layer II and III were clear but that of layer III/IV, it was unclear. Layer IV had comparatively densely packed somata, which were mainly small in size. Layer V in four regions formed a prominent thick lamina with scattered somata. Relatively densely packed somata containing layer VI contained medium and small sized somata. The boundary between layer VI and white matter was quite clear in parietal and temporal regions, while not much clear in other two regions. Horizontal cells were also visible in the inner portion (i.e. adjacent to white matter) of this lamina. An analysis of variance (ANOVA) has also been done on this comparative study to test the level of significance.

The present study is a detailed study on the variability of cortical organization in a megachiropterid i.e. *Cynopterus sphinx*. Thus, the aim of present study is to throw light on the variability of cortical organization among the four regions (frontal, temporal, parietal and occipital) of a species and to compare it with other species and orders.

167. The cytoarchitectonic organization and neuronal morphology of the hippocampal complex of the spotted munia (*Lonchura punctulata*).

U.C. Srivastava and I.D. Sakar

Department of Zoology,
University of Allahabad,
Allahabad- 211002.

Keywords: *Neurons, Spines, Spine density, multipolar, pyramidal.*

Nissl and Golgi-Colonnier methods were employed to study the cytoarchitecture and neuronal morphology of the hippocampal complex of the spotted munia *Lonchura punctulata*. Five fields were recognized in the hippocampal complex: medial and lateral hippocampus, parahippocampal area, central field of the parahippocampal area and crescent field. In the medial hippocampus three layers have been observed: suprapyramidal towards the pial surface, pyramidal at the central and infrapyramidal adjacent to the ventricle. Neurons of the hippocampal complex were classified into two main cell types: predominant projection neurons and local circuit neurons. Projection neurons were further sub classified into three main types: pyramidal, pyramidal like, and multipolar neurons. In addition to these neurons monotufted, monotufted bipolar and bitufted neurons were also observed in the medial, lateral hippocampus and crescent field with low frequency. The pyramidal neurons were dominant neuronal types in the pyramidal layer-II of the medial hippocampus, mixed with pyramidal like and multipolar neurons. Pyramidal neurons were found restricted in the pyramidal layer II of the medial hippocampus and lateral hippocampus while the multipolar neurons were uniformly distributed in all subfields of the hippocampal complex. Second type of neuron i.e. local circuit neurons were present in the medial hippocampus and in lateral hippocampus. The corrected spine density per 10 μm apical dendritic shaft of pyramidal, multipolar and local circuit neurons were found to be different in all fields of hippocampal complex. ANOVA analysis (at $p > 0.5$) revealed the differences to be significant. In the lateral hippocampus radial glial cells were present near the ventricular wall and projecting their dendrites towards the pia.

168. Effect of walking stress on endocrine responses in Malpura ewes under semi-arid environment

V.Sejian, V.P.Maurya, K. Kumar and S.M.K.Naqvi

Division of Physiology & Biochemistry
Central Sheep & Wool Research Institute, Avikanagar,
via-Jaipur, Rajsthan-304501
E-mail address: drsejian@gmail.com

Key words : *Sheep, walking stress, cortisol, thyroxin, tri-iodo-thyronine, estradiol, progesterone*

Sheep under hot semi-arid environment are mostly reared on extensive system. In addition to thermal stress and feed scarcity, the animals need to walk a long distance for grazing under this ecological zone. A study was conducted to assess the effect of long distance walking on adaptive capability in terms of endocrine response in Malpura ewes. Fourteen adult Malpura non-pregnant ewes weighing between 33 to 35 kg were used in the present study. The ewes were randomly allocated into two groups of seven animals each viz., GI (n=7; Control), and GII (n=7; walking stress). The animals were stall fed with a diet consisting of 70% roughage and 30 % concentrate. Both GI and GII ewes were provided with *ad libitum* feeding. The walking stress group ewes were allowed for walking daily for 14 km from 9:00 AM to 3:00 PM. Walking stress group ewes were prevented from grazing by applying a face mask made up of thread. Prior to start of experiment the animals were acclimatized to these face masks in order to avoid any undue restraining stress. The study was conducted for a period of two estrous cycles (35 days) during autumn season (September-October). Blood samples were collected from jugular vein at weekly intervals to study the effects of walking stress on the endocrine parameters. The parameters studied were plasma T₃, T₄, cortisol, estradiol, and progesterone. The results indicate that walking stress had significant (P < 0.05) influence on T₃, T₄, and cortisol. However walking stress did not influence the reproductive hormone levels. From the study it can be concluded that adrenal and thyroid gland hormones play a significant role to adapt to long distance walking. In addition, the study revealed that reproductive hormone status is not compromised while trying to adapt to the walking stress under semi-arid environment.

VII. Phsiology, Biochemistry and Reproductive Biology

169. Uptake and Distribution of Cadmium in Tissue of *Lebistes Reticulatus*

Sabiha Khan, Dooj Bhagel and Neelam

Department of Zoology,
Govt. College Ajmer (India)

Key word : *Cadmium, acute, chronic, necrosis, equilibrium*

Total cadmium concentration in the sample of tap water, pond water, tissue of control and metal exposed fish and aqnaria water in acute and chronic types of exposure was estimated in the present study. Result show that 0.02 ppm concentration of cadmium in tap water samples is below the toxic limit of cadmium concentration recommended by W.H.O while concentration exceed the recommended upper limit in case of pond water. Significant uptake of cadmium by fish and fall in the concentration of cadmium in the selected fish tissue was in order kidney> gills> liver> muscles. Accumulation in muscles was higher after 96 hr, 15 and 30 days of exposure but the value were lower than in other tissues. On the other hand, in liver cadmium accumulated significantly only after 45 day of exposure. Equilibrium was established between cadmium concentration in water and fish tissues after 45 day of exposure.

170. Oxidative Stress on Spermatozoa and its Prevention during Cryopreservation

Gulab Chandra, Joydip Mukherjee, Anjali Aggarwal
and Muneendra Kumar

Dairy Cattle Physiology Division
National Dairy Research Institute
Karnal, Haryana-132001

“Oxidative stress” (OS) is a condition associated with an increased rate of cellular damage induced by oxygen and oxygen-derived free radical (an oxygen molecule

containing one or more unpaired electrons in atomic or molecular orbitals), not balance by antioxidants.

Free radicals and reactive oxygen species (ROS) seek to participate in chemical reactions that relieve of their unpaired electron, resulting in the oxidation of lipids in membranes, amino acids in proteins and carbohydrates within nucleic acids which in turn down regulates the steroidogenic activity leading to altered testicular function, cause infertility in males.

Spermatozoa are under a continuous influence of OS because of excessive generation of ROS, cause infertility in males. Spermatozoa possess an inherent but limited capacity to generate ROS which may help the fertilization process. Antioxidants improve the motility and fertilizing ability of spermatozoa. A balance between the benefits and risks from ROS and antioxidants appears to be necessary for the survival and normal functioning of spermatozoa. Antioxidants in extender may improve the quality of frozen-thawed spermatozoa.

171. Influence of *Rosa centifolia* Petal Extract on Protein Metabolism of *Cirrhinus mrigala* (Hamilton)

**V. Kirubanandhini¹, M. Umadevi², D. Aruna², P. Saravanabhavan¹
and K. Krishnamoorthy²**

¹Department of Zoology, Bharathiyar University,
Coimbatore-641 046

²PG & Research Department of Zoology,
Government Arts College, Coimbatore-641 018,
Tamil Nadu, India

E-mail : krishnamoorthy1974@yahoo.com

Key words : *Cirrhinus mrigala*, *Rosa centifolia*, protein metabolism, extract

The activity levels of acid phosphatase, alkaline phosphatase and amylase were assessed in muscles of teleost fish *Channa punctatus* which had been exposed to sublethal concentrations (0.0005, 0.001, 0.005 ppm) of ivermectin for a period of 30 days. The results indicate a steady decrease in the activity levels of acid phosphatase and amylase

activity but alkaline phosphatase level showed least alterations in comparison to control value. Acid phosphatase, alkaline phosphatase and amylase activities to overcome the toxic stress due to ivermectin intoxication. The results obtained were statistically significant for concentrations and exposure period on 0.05 level, acid phosphatase showed statistically insignificant for dose concentration of ivermectin and exposure period and alkaline phosphatase showed statistically insignificant at 0.05 level.

172. Retinoids as morphogens and Teratogens and their Effect on Regeneration

Rashmi Sharma and Rakesh Baser

Department of Zoology,
Govt. College Ajmer,
Rajasthan

Retinoids affect morphogenesis of cells, tissues and organ systems including epithelial appendages. Embryonic development of limb and hind brain is influenced by retinoic acid (RA) RA also regulates hair cell development. RA stimulates regeneration of mammalian hair cells in postnatal life in vitro. The developing hair cells contain both RA binding protein and endogenous RA. RA also leads to formation of supernumerary hair cells. RA changes morphogenetic expression of skin from formation of scales to construction of feathers. Certain organ system including myotome require RA during development. Retinoids are teratogens when administered exogenously they cause defects of morphogenesis and embryonic development. Treatment of amphibian larvae at early stages of limb development with excess RA results in limb defects. RA causes abnormalities in cerebral and mouth region in the toad larvae. RA retards differentiation of rods, cones in developing retina of young *Rana breviceps* larvae. Excess vitamin A causes hyperplasia of mucous cells of intestinal epithelium, changes in connective tissue, dropping of tentacles and haemorrhage in skin. Excess vitamin A given to frog tadpole causes disappearance of keratinized structures of mouth parts. *Xenopus* embryos showed loss of anterior ectodermal structures when, immersed in RA. When RA injected in presumptive head region. The showed inhibition of development of eye cement gland, hatchne gland functory pits and expression of engrained proteins. When RA given to mice it gave differential sensitivity response to heart and skin.

173. Influence of Novel Exopolysaccharides Producing *Lactobacillus fermentum* Strain on Rheological and Sensory Attributes of Low-Fat Dahi

Behare, P. V.*, Rameshwar, Singh¹, Shendurse, A. M.,
Kele, V. D. and Khedkar, C. D.

College of Dairy Technology, Udgir,
Latur, Maharashtra.

¹National Dairy Research Institute,
Karnal, Haryana.

E-mail : pradip_behare@yahoo.com

Key words : EPS, exopolysaccharides, low-fat, dahi, *Lactobacillus fermentum*

The investigation was undertaken to study effect of new indigenously isolated *Lactobacillus fermentum* strain on technological attributes of low-fat dahi. Several lactobacillus cultures were isolated from dahi and naturally soured milk samples, collected from different villages of Karnal District, Haryana. Initial screening for technotextural properties indicated only one strain of *Lactobacillus fermentum* V10 was promising and selected for further study. The strain was able to produce large capsules surrounding the cell surface and produced maximum quantity of polysaccharides in fermentation medium. The effect on technological properties of low-fat dahi found to be significantly improved for *Lactobacillus fermentum* v10 as compared to control dahi made by EPS⁺ *Lb. delbreuckii* subsp. *bulgaricus* NCDC 285 and EPS⁻ *Lb. delbreuckii* subsp. *bulgaricus* 09 cultures available for commercial use. Low fat dahi prepared by exopolysaccharides producing *Lactobacillus fermentum* V10 exhibited optimum acid production, lesser whey separation, higher viscosity, increased adhesiveness and stickiness values whereas decreased firmness and work of shear values as compared to control batches of dahi. The *Lactobacillus fermentum* V10 strain is recommended for commercial preparation of fat-free, reduced fat and low fat dahi.

174. Impact of Natural Products in Modern Drug Development

Mehvash Ayeshah Hashmi and V. L. Saxena*

Department of Biotechnology & Department of Zoology*
Dayanand Girls' P. G. College, Kanpur

Key words : *Lipid profile Oxidative stress, hyperglycemia, auto oxidation, glycosylated hemoglobin, lipid profile*

Oxidative stress is the major cause and consequence of Type 2 diabetes. In hyperglycemia, auto oxidation of glucose increases the formation of free radicals beyond the capacity of defense system to neutralize it and cause oxidative stress. The study was carried out to see the effect of selected medicinal plant extracts in the diabetic male albino rats. Biochemical parameters like plasma glucose, glycosylated hemoglobin were measured along with the lipid profile in diabetic rats and diabetic rats treated with herbal extracts. In diabetic untreated group the levels of plasma glucose and glycosylated hemoglobin were found to be increased. Increase in the levels of total cholesterol and triglyceride was also observed. Evaluation of the biochemical parameters and lipid profile showed statistically significant reduction in the diabetic animals treated with the herbal extracts. The present study demonstrated that the selected medicinal plant extracts produced favourable results which show their therapeutic potential in preventing the diabetic complications.

175. Annona Squamosa- for Fertility Regulation of Male

S. P. Singh and M. K. Purohit

Deptt. of Zoology, S.G.R.R. (P.G.) College
Dehradun-248001, Uttarakhand

Keywords : *Fertility Control, contraception, Herbal drugs, Animal Reproduction, Genital Organs, Annona Squamosa*

“Population Explosion” is the burning problem before mankind and Scientist are busy to solve this problem. A vigorous search is going on all over the world for raw materials from plants, which may provide chief and sustained supply of the material for further

synthesis of a variety of steroid hormones from plants (Phytohormones or plant based drugs).

Roychaudhury (1966) reported earlier the antispermatogenic effect of *Annona squamosa* seeds and these authors have confirmed antispermatogenic effect in male albino rats. The fruits of this plant are edible. The 50% alcoholic extract of seeds using 'soxhlet apparatus' was prepared and doses of 50, 100 & 200 mg/ day/ rat were fed orally to three groups with first as control group (Vehicle) and remaining experimental groups in two sets (does wise) for 60 days. The body-organ and histopathological changes were recorded after 60 days. The treated rats with different doses of second set were mated with normal female rats. The treated male rats showed mating. The libido was not affected. After mating test done, all the treated rats were killed and their genital organs were taken out and processed for histopathological examination. The organ weights were significantly reduced and spermatogenesis arrested at higher doses. The seminiferous tubules became deshaped and reduced in size. The lumen filled with cellular debris. The Leydig's cells became atrophied. The epididymes and vasa differentia were also devoid of spermatozoa. In the second set of treated rats, the revival of spermatogenesis was noted after 30 days of withdrawal of treatment./ These rats were able to make pregnant the normal female rats. The effect was reversible. It is concluded that *A. squamosa* seeds may be used for male fertility, regulation (This work was supported by U.C.O.S.T. Dehradun. (Uttarakhand).

176. Blood Samples of Sheep Vaccinated with Anthrax Spore Vaccine – FTIR Spectral Study and Statistical Analysis

A. Rajalakshmi¹, T. S. Renugadevi² and S. Gunasekaran³

¹Sri Chandrasekharendra Saraswathi Viswa Maha Vidyalaya,
Enathur, Kanchipuram-636 011, Tamilnadu

²P. G. Dept. of Physics, Women's Christion College, Chennai

³Registrar, Periyar University, Salem
e-mail : rajspectrum@gmail.com

Key words : *Spectroscopy, anthrax spore vaccine, antibody, ELISA*

The application of spectroscopy for the study of biomedical compounds has increased tremendously in recent years. Blood is the chief circulatory medium in human and in animal body which can be subjected to non-invasive technique for testing. Pre and post

vaccinated blood samples of sheep vaccinated with anthrax spore vaccine was studied using spectrometer. The internal standards among the application peaks were calculated. There was a marked difference in the absorption levels of the pre and post vaccinated blood samples. The resultant variation was attributed to the chemical changes happened in the animal blood due to the vaccination. Spectral study can emerge as an alternate and cost effective test for screening the animal. In future this study can be extended and compared with other antibody tests like ELISA (Enzyme-Linked Immuno Sorbent Assay).

177. Diabetes mellitus: Metabolic Disorder of the Century, its Impact and Current Management Strategies

A.M. Saxena and Rahul Gupta

Department of Zoology,
University of Lucknow,
Lucknow-226007,
Uttar Pradesh, India

Keywords: *Diabetes mellitus, Diet, Lifestyle management, Traditional medicinal plants.*

Diabetes mellitus is the deadliest metabolic disorder of current century. The mushrooming growth of diabetes is due to endocrine imbalance, psychic stress, reduction in physical activity, obesity, discriminated social structure and hereditary background. Diabetes associated multiple complications are annoying and difficult to manage. Several advanced drugs and Insulin have been developed for treatment of diabetes, but most of anti-diabetic drugs from modern medicine are very expensive and beyond the reach of a common man, at the same time not able to provide complete cure for diabetes. The rapid growth of diabetes is becoming a major burden upon healthcare facilities in all affected countries and causing considerable socio-economic damage. Due to lack of effective preventative measures of diabetes, we need to be aware of various aspects of this disease and follow a disciplined lifestyle to limit it. In this write-up we have discussed the impact of diabetes on our society, recent development in diabetes management and current preventative measures.

178. Phytohormonal Optimization for Callus Induction in *Phaseolus aureus* Using *in vitro* Grown Explants

*Afrin Jahan, *Sonali Majumdar, *Mohd. Kamran Khan, *Taru Sharma,
@Pragati Misra, #E. P. Lal and #Pradeep K. Shukla

*Department of Molecular and Cellular Engineering,

@Department of Tissue Engineering,

Jacob School of Biotechnology and Bioengineering,

#Department of Biological Sciences, School of Basic Sciences,

Sam Higginbottom Institute of Agriculture,

Technology and Sciences,

Naini, Allahabad 211007

Phaseolus aureus or green gram is one of the important pulse crops in India. It is protein rich staple food. It is particularly rich in leucine, phenylalanine, lysine, valine and isoleucine and contains about 25% proteins. It supplies protein to the vegetarian population of the country. Green gram also plays an important role in sustaining soil fertility by improving soil physical properties and fixing atmospheric nitrogen. *In vitro* culture is used to multiply the plants with novel properties, such as those have been genetically modified or breed through conventional plant breeding approaches. *In vitro* culture is also a part of an economy including pharmaceutical, food and biotechnology industries.

An experiment was conducted to optimize the phytohormone combinations and concentrations for callus induction in *Phaseolus aureus* using *in vitro* grown explants. The results showed that the best calusing was observed in MS media containing 2,4-D (1.5 ppm) + NAA (1 ppm) + Kinetin (0.5 ppm) and GA₃ (0.5 ppm). Callus so obtained was bright green colour, friable and granular in appearance. The MS media supplemented with NAA (2 ppm) + Kinetin (0.5 ppm) and GA₃ (0.5 ppm) showed the poorest callus induction. The good quality calli were further subcultured on different media. The MS media containing 2,4-D (0.5 ppm) + BAP (3 ppm) and GA₃ (0.5 ppm) was found to be the best for subculturing and produced bright green coloured callus which was further selected for somatic embryogenesis.

179. Effect of Promiscuity and Monogamy on the Reproduction of an Aphidophagous Ladybird, *Hippodamia variegata*

Ahmad Pervez

Biocontrol Laboratory,
Department of Zoology, Govt. Degree College,
Talwari, Chamoli – 246482 (Uttarakhand), India
Email: ahmadpervez@yahoo.com

Key words: *Hippodamia variegata*, *Mating*, *Coccinellidae*, *Reproduction*, *fecundity*, *egg viability*.

The effect of promiscuity and monogamy on the reproduction of an aphidophagous ladybird, *Hippodamia variegata* Goeze was studied. Different mating combinations, viz. (i.) virgin female paired with an unmated male, allowing only a single mating per day (monogamous, limited matings), (ii.) virgin female provided daily with a new unmated male for a single mating (promiscuous, no-choice), and (iii.) virgin female kept with five unmated males (promiscuous, mate choice), were made using aphid, *Aphis craccivora* as prey. Promiscuous and free choice female resulted in significantly greater fecundity (585.50 ± 13.80 eggs) and percent egg viability (95.32 ± 1.99 %) followed by promiscuous no choice (495.20 ± 14.25 eggs and 88.81 ± 3.29 %) and monogamous females (405.00 ± 16.20 eggs and 83.13 ± 2.07 %). Thus, female mate choice and multiple mating could be considered advantageous in terms of progeny production. The eggs obtained by these females were further studied for survival, development and fitness of the new generation. The fitness of offspring of promiscuous female (0.4787 ± 0.01) was better than those of promiscuous-no choice (0.4418 ± 0.02) and monogamous (0.4057 ± 0.01) ones. In addition, the offspring of promiscuous with mate choice resulted in greater percent survival and faster development than those obtain from the monogamous and limited mated females. The results reveal that promiscuity with mate choice is beneficial for the reproduction and better offspring production. Hence, promiscuity and multiple matings are recommended for the increased production of *H. variegata*.

180. Assessment of Cadmium induced tissue-specific oxidative stress in Indian major carp. *Labeo rohita*

Anurag Dabas, Rashmi Srivastava, Pavan Kumar, N S Nagpure,
Ravindra Kumar, R M Mishra and Basdeo Kushwaha

National Bureau of Fish Genetic Resources
Canal Ring Road, P.O. Dilkusha,
Lucknow-226 002

Key words : *Acute toxicity, Cadmium, Labeo rohita, Oxidative stress.*

Heavy metals are most deteterious contaminants present in the aquatic environment. Among these cadmium (Cd) is one of the most abundant and ubiquitously distributed environmental toxin in the aquatic system. Cd is released to the aquatic environment from both anthropogenic sources, viz. industrial effluents, and natural sources, such as rocks. The present study was carried out to investigate the tissue-specific extent of lipid peroxidation (LPO) and alterations in the antioxidant enzymes in response to sublethal concentrations of cadmium in the Indian major carp *Labeo rohita*. The 96 h-LC₅₀ value (with 95% confidence limits) of cadmium chloride for freshwater carp *L. rohita* was estimated as 134.18 mg/l (126.80–143.02). Based on the 96 h LC₅₀ value, the three test concentrations of cadmium chloride, viz. sublethal concentration I (SL-I; 1/4th of LC₅₀ = 33.55 mg/l), II (SL-II; 1/2th of LC₅₀ = 67.10 mg/l) and III (SL-III; 3/4th of LC₅₀ = 100.65 mg/l) were estimated for *in vivo* exposure experiment. The fish specimens with average weight 17 ± 3.2 g and length 13 ± 1.4 cm were used for assessing the oxidative stress after 24, 48, 72, and 96 hours exposure. Biomarkers selected for stress monitoring was malondialdehyde (MDA) and antioxidant enzyme; glutathione reductase (GR), glutathione peroxidase (GP_x), glutathione-s-transferase (GST) activities in the liver, kidney and gills of *L. rohita*. The collective results demonstrated that exposure of cadmium to fishes induced elevation in MDA content as well as antioxidant enzymes activities. The findings reflected the potential role of these parameters as useful biomarkers for assessment of Cd pollution in aquatic environment in the aforesaid species.

181. Serobiochemical Alterations in Vanadium Intoxicated Albino Rats and Their Modulation by Liv.52

Aparna Shukla and Prabhu N. Saxena

Toxicology Laboratory, Department of Zoology,
School of Life Sciences, Khandari Campus,
Dr. B.R. Ambedkar University, Agra-282002, U.P., India
aparna.shukla007@gmail.com, dr_pnsaxena@yahoo.co.in

Keywords : *Vanadium pentaoxide, Liv.52, Serobiochemistry.*

The present study highlights modulation in Vanadium pentaoxide induced serobiochemical toxicity by pre and post treatment of Liv.52 in albino rats. LD₅₀ estimated for Vanadium pentaoxide was 69.6 mg/kg b.wt. The administered doses of Vanadium pentaoxide were LD₅₀/10 for acute and 1/7, 1/14, 1/21 and 1/28 of sublethal dose for subacute (7, 14, 21 and 28 ds). Serobiochemical parameters included ALT, AST and ALP assessed after oral administration of Vanadium pentaoxide depicting significant enhanced ALT, AST and ALP. Pre and post treatment of Liv.52 with dose of 0.125 ml/kg b.wt. restored the increased serobiochemical parameters towards normalcy. The results revealed that pre and post treatment of Liv.52 modulates Vanadium pentaoxide toxicity, however, the modulation by pre treatment has an edge over post treatment of Liv.52.

182. Blood- biochemical changes after *Parthenium hysterophorus* Leaf Extract Exposure in *Rattus rattus*

B.K. Gupta* and S.K. Singh

Department of Zoology
M.S.J Govt. P.G. College, Bharatpur, Rajasthan (India)
E mail : bk_gupta60@yahoo.co.in

Key words: *Parthenium hysterophorus acetonc leaf extract, Rattus rattus, Blood glucose, Serum alkaline phosphatase, Serum cholesterol, Serum phospholipids, Serum total proteins.*

Acetonc leaf extract of *Parthenium hysterophorus*., an annual herb of family Asteraceae, was orally administered into *Rattus rattus* at 400 mg/ kg body wt. for acute

(one day) and 13.33 mg / kg body wt. per day for each sub-chronic (3, 7, 15 and 30 days) treatment to study its impact on blood glucose level, serum total proteins, serum cholesterol, serum phospholipids and serum alkaline phosphatase. *Parthenium* extract caused significant changes in blood-glucose level, serum total proteins and serum alkaline phosphatase while a non-significant change in serum cholesterol and serum phospholipids after both acute and sub-chronic treatments. Various clinical manifestations like salivation, alopecia, itching sensation, labored breathing, anorexia, diarrhoea and dermatitic lesions were observed in the treated rats. The observed biochemical changes may be due to hepatic dysfunction caused by *Parthenium* acetonc leaf extract.

183. Optimization of probiotics (Binifit™) for better survival, growth, biochemical constituents and energy utilization on post larvae of the freshwater prawn *Macrobrachium rosenbergii*

C. Seenivasan, P. Saravana Bhavan and S. Radhakrishnan

Department of Zoology, Bharathiar University,
Coimbatore – 641046, Tamilnadu.
E-mail: crustaceanseenu@gmail.com

Key words: *Macrobrachium rosenbergii*, probiotics, growth, protein, amino acids, carbohydrate, lipid, energy utilization.

The present study was conducted to investigate the optimization of probiotics, Binifit™ on the survival, growth, biochemical constituents and energy budget of *M. rosenbergii* PL. The probiotics, Binifit™ (0, 0.5%, 1%, 1.5% and 2%) was incorporated with diet (basal ingredients: fish meal, soya meal, groundnut oil cake, corn flour; binding agents: tapioca flour, egg albumin and guargum; vitamin mix) and fed to *M. rosenbergii* PL for a period of 90 days. Leaching of these diets varies between 14-15% in 8 h duration. The survival rate (90%) was significantly higher ($P \leq 0.05$) in 2% Binifit™ incorporated pellet fed PL when compared with other tested groups. Total weight gain (WG), specific growth rate (SGR), food conversion efficiency (FCE) and protein conversion efficiency (PCE) were also found to significantly higher ($P \leq 0.05$) in 2% Binifit™ incorporated pellet fed PL when compared with other tested groups. The proximate biochemical composition,

such as total protein, amino acid, carbohydrate, lipid and ash content were significantly ($P \leq 0.05$) higher in 2% BinifitTM incorporated pellet fed PL than that of other tested groups. The energy utilization parameters, like the rate of feeding, absorption, conversion and metabolism were significantly higher ($P \leq 0.05$) in 2% BinifitTM incorporated pellet fed PL than the other tested groups. The energy lost through exuvia and ammonia excretion was significantly higher ($P \leq 0.05$) in 2% BinifitTM incorporated pellet fed PL than that of the other tested groups. The energy lost through feces was significantly lower ($P \leq 0.05$) in 2% BinifitTM incorporated pellet fed PL than that of the other tested groups. Therefore, BinifitTM is recommended to supplement with diet at rate of 2% for culture of *M. rosenbergii*.

184. Hematological study of Filaria positive cases (Microfilaria and disease) in District Jalaun, Uttar Pradesh, INDIA

C.L. Baghel, A.K.Srivastav* and V. K. Sahu **

Office of Additional Director Medical Health and Family Welfare
Jhansi (U.P.) India

* Parasitological laboratory, Deptt. Of Zoology,
Bipin Bihari (P.G) College Jhansi (U.P.) India

**Deptt. of Zoology, D.V.(P.G.) College,
Orai District Jalaun (U.P.) India

District Jalaun is endemic for Filariasis and globally located approximately 26° 9' North latitude and 79° 21' East altitude. Govt. of India selected this district under MDA by 2002 Health Policy to Eliminate Filariasis by 2015. During MDA, night blood smears were collected and examined to detect the positive microfilariae and filaria cases. Positive smears were thoroughly examined for hematological purposes and differential leucocytes count. Present study deals with the count of Polymorph, Leucocytes, Eosinophils, Monocytes and Basophils. Our study found that number of polymorph increased while the leucocytes decrease in number.

185. The condition of the freshwater fish, *Notopterus notopterus* in relation to seasonal reproductive cycle

D S Shankar* Sudarshan S † and R S Kulkarni •

* Regional Institute of Education,
Bhopal

† Gulbarga University,
Gulbarga- 585106

(Email: dssrie@gmail.com, sudamalgi@gmail.com, rskgug@gmail.com)

Key words: *Somatic condition factor, gonadosomatic index, reproductive cycle*

In the present investigation the condition of the fresh water fish, *Notopterus notopterus* was studied in relation to seasonal reproductive cycle by considering Fulton's condition and somatic conditions factors along with biochemical contents in the somatic tissue (muscle) during different phases of the reproductive cycle for a period of one year. The phases of reproductive cycle such as Preparatory (February-March), Prespawning (April –June), Spawning (July- September) and post spawning (November-December) phases are identified based on the changes in the morphology of the gonads and gonadosomatic index (GSI) during different months. The results indicate that the condition of the fish improves during preparatory phase in comparison to other phases as the values increase. The biochemical contents such as protein, glycogen, lipid and cholesterol in the muscle tissue also increases during preparatory phase. The muscle weight also increases as the body weight increases.

The results suggest that the improvement in both condition of the fish and biochemical contents in the tissue of the fish during preparatory phase may be because of fish preparing for gonadal growth (Vitellogenesis and spermatogenesis) and also diverting energy towards associated reproductive activities.

186. Response of cassava to graded dilution of liquid distillery effluent on yield, yield attributes and quality var MVD1**D. Janaki* and V. Velu****

*Horticultural Research Station, Kodaikanal -624 103

** Department of Soil Science & Agricultural Chemistry,
Tamil Nadu Agricultural University, Coimbatore -641 003*Key words* : Cassava, spentwash, tuber yield, starch and protein

A field experiment was conducted in Research and Development Farm at M/s Sakthi Sugars Limited, Appakudal in the year 2006-2007. To find out the effect of spentwash application on yield and quality of cassava variety MVD 1. The results revealed that among the doses of spentwash application application of 0.50 lakh litres ha⁻¹ and above was found to increase the top yield as well as tuber yield. Highest B: C ratio was recorded in S₇ wherein this treatment registered 2.49 and 2.66 in M₁ and M₂ respectively. The quality parameters like starch and protein content was found to be higher in the same treatments.

187. Gonadotropin and Growth factor-induced Ovarian Steroidogenesis in *Cyprinus carpio*: Probable Signal Transduction Mechanism**D. Mukherjee**Endocrinology Laboratory, Department of Zoology,
University of Kalyani, Kalyani, Nadia,
West Bengal, India- 741 235**Sudipta Paula, Sourav Kundua, Kousik Pramanicka
and Dhyanendra Kumarb**^a Endocrinology Laboratory, Department of Zoology,
University of Kalyani, Kalyani, Nadia, West Bengal, India- 741 235^b Department of Zoology, Veer Kunwar Singh University,
Ara 802301, Bihar, India

Multiple signal transduction pathways mediating gonadotropins- and growth factor-induced testosterone (T) and 17 β -estradiol (E₂) production were identified in carp ovarian

theca and granulosa cells in short term co-incubation. Both calcium and PKA-dependant pathways are involved in the regulation of gonadotropin-induced steroidogenesis and interaction between these pathways are evident. Involvement of a third signaling pathway, a mitogen-activated protein kinase (MAP kinase) has also been identified in such regulation. Evidence for the presence of cross-talk between calcium-dependant pathways and MAP kinase cascade has also been shown. Results suggest that activation of MAP kinase by gonadotropin as well as other agents may be a key mechanism for the modulation of gonadotropin-induced steroidogenesis in carp ovary. Insulin-like growth factor-I (IGF-I) and insulin were also shown to stimulate carp ovarian steroidogenesis independently. In such stimulation, PI3 kinase was shown to be signal transduction component involved in the process. Activation of MAP kinase in the regulation of IGF-I and insulin-induced ovarian steroidogenesis in such fish has been demonstrated. Results suggest that PI3 kinase is an initial component of the signal transduction pathway which precedes MAP kinase in IGF-I and insulin-induced ovarian steroidogenesis. This review briefly summarizes some recent work from our laboratory and others on both gonadotropin and growth factors in the regulation for ovarian steroidogenesis.

188. Administration of plant growth regulator, IAA on the lipid profiles of silkworm, *Bombyx mori* L.

D.Bharathi

Dept. of Sericulture
SPMVV
Tirupati

Keywords : *Silkworm, Bombyx mori L. midgut, lipid profiles, lipolysis, indole-3-acetic acid (IAA).*

The administration of plant growth regulator, IAA on the lipid profiles in the midgut of silkworm, *Bombyx mori* L were investigated. The pattern of changes in the midgut of experimental larva reflects on the absorption, digestion and transportation of nutrients in midgut of silkworm, *Bombyx mori* L. Hence it can be suggested that an overall reduced mobilization of lipid profiles in midgut can be envisaged.

189. Periconceptional maternal nutrition and its effect on fetal growth and pregnancy outcomes.**Deepti Rai, S. Chandra* and K. P. Singh**

Neurobiology Lab. Department of Zoology,
University of Allahabad, Allahabad-211002;
email:dsrai23@gmail.com

*Director and Gynecologist,
J. C. Maternity Center,
Mumfordganj, Allahabad (U.P.)

Diet is recognized as one of the major environmental factors influencing the development of embryo and fetus, as well as maternal health. Particularly, moderate to severe micronutrient deficiencies have been associated with significantly high reproductive risks, ranging from infertility to fetal structural defects (low birth defects,) and long-term diseases (anemic, congenital malformation, heart diseases etc). The present study was undertaken to assess the status of iron, zinc, magnesium, and folic acid amongst urban pregnant women during their 1st visit to the Gynaecologist. And awareness of subjects about intake of folic acid and multivitamin supplements prior to conception and nutritionally planned pregnancy. The study was conducted in J.C. Maternity Center, Allahabad (U.P.) India. Two hundred pregnant were enrolled who had visited the clinic for first time after conception. Each pregnant woman was interviewed about her socio-demographic and socioeconomic status like age, marital status occupation, education, family income etc and clinical parameters by utilizing a questionnaire. The dietary intake of the individual subject was assessed using 24 hrs dietary recall method. In these subjects nutritional level of micronutrients like folic acid, iron, magnesium and zinc were found substantially reduced in comparison to RDA of ICMR, India. All subjects having unplanned pregnancies in relation to a balanced diet and folic acid supplement around conception. They have lack of knowledge about the low cost nutritional diet. Thus, risk factor for these subjects was higher than subjects of nutritionally planned pregnancies in developed countries. Therefore, present study suggests that nutrition requirement must be maintained before conception through nutrition counseling and education.

190. A Review on Peptides and Proteins of Frog Skin

Prahlad Dube

Biodiversity Research Laboratory
Department of Zoology,
Government College, Kota, Rajasthan
Email: dube_prahlad@rediffmail.com

Key words: *Frog Skin, skin secretions, Peptides, Proteins, Antibacterial, Antifungal.*

Anurans have peculiar kind of skin which has two types of glands: the mucous and the granular glands. Many types of compounds are secreted by these glands. Proteins and peptides are major constituents of secretion by granular glands of frog skin. A wide distribution of proteins in skin especially in epidermis, may greatly facilitate the uptake and accumulation of environmental substances needed for frog survival. Frog skin secretion is a rich source of biologically active compounds in which peptides and proteins plays an important role in innate immunity to protect the organism against invasion by pathogenic bacteria and fungi and may also function to deter ingestion by predators.

The frog skin proteins possess potent therapeutic activities like antibacterial, antifungal, antiprotozoal, antidiabetic, antineoplastic, analgesic and sleep inducing properties. Present paper discusses research work carried out regarding various kinds of peptides and proteins and their importance.

191. Effect of Challenge Feeding during Pregnancy on the Production and Reproduction Performance in Dairy Animals- A Study

S. S. Hiremath

Deputy Director, Karnataka Milk Federation,
Training Center, Rayapur,
Dharwad - 580009, Karnataka
Email : hshivayogi@yahoo.com

Key words: *challenge feeding, body weight, post partum, estrus, milk yield.*

A study was conducted on 100 healthy pregnant average yielding (1500-2000 Ltr/L)

animals of cows and buffalos in Dharwad milk shed area. These animals are randomly divided into four groups (25 each) on basis of age, stage of pregnancy, previous lactation yield, and number of lactation. These animals are provided normal pregnancy ration in the beginning. After 6 and 7 months of pregnancy challenge feed (for 3 months) provided to these animals. The post partum feeding for all animals kept uniform. These animals were hand milked scientifically in farmer's cowshed. The observation made on body weight of the calves 30-40 % increased, milk yield produced 5-10 % more, calf mortality and diseases 15-20 % less and there was an apparent reduction in the interval for first estrus post partum by 35-55 days in animals under challenge feeding. Thus, it was inferred that challenge feeding during pregnancy, after 7 months of pregnancy was beneficial effect towards maintaining production and as well as reproduction in dairy animals of cows and buffaloes, in Dharwad milk shed area.

192. Efficacy of Herbal Extract on The Swollen Hind Gut Affected Black Tiger Shrimp

Elavarasi. A*, G.Sankar, M.Kalaiselvam

Centre of Advance Study in Marine Biology,
Faculty of Marine Sciences
Parangipettai 608502,
Annamalai University

Key words: *Vibrio spp*, *Penaeus monodon*, *herbal plants*, *Ricinus communis*

In recent years, the diseases of shrimp hindered the development of shrimp culture. The present study isolated and identified three species of *Vibrio* such as *V. harveyi*, *V. alginolyticus* and *V. parahaemolyticus* from SHG affected shrimp. This was tested against different types of Acetone, hexane, methanol and chloroform extracts of five different plants viz., *Phyllanthus niruri*, *Ricinus communis*, *Alizzia lebbeck*, *Centella asiatica*, *Tinospora cordifolia*. Among these *R. communis* was showing more activity. The methonolic extract *R. communis* was applied in culture tanks of *P. monodon* with different dosages which is compared with control tank (Group I & V). Rate of survival (94.3%) and growth ($16.9 \text{ mm} \pm 0.31$) was found to be more in the experimental tank Group IV, feed conversion ratio, (FCR 1.95 ± 0.05) and bacterial population decreased (0.14×10^4 CFU/ml) at the end of culture in experimental tanks. With regard to the enzymatic activity, protease ($123.54 \pm 13.44 \text{ Umg}^{-1}$) and amylase ($113.54 \pm 11.51 \text{ Umg}^{-1}$) showed higher activity.

The protein (61.54 ± 7.44 %) and carbohydrate (33.54 ± 4.44 %) were found higher in shrimp collected in the experimental (Group IV) tanks. Hence it is clear that the methanolic extract of *R. communis* played a vital role in the growth, survival and disease resistance in the black tiger shrimp *P. monodon*.

193. Effect of Pesticide on Biochemical Changes in Tissues of Fresh Water Snail *Viviparus Bengalensis* from Darana River of Nashik District (M.S.)

Erande S L, Pagar R S*, Pagar J T.**

Dept. of Zoology, K S K W Arts Science and Commerce College
CIDCO - Nashik 422008

(Indian Sci. Cong. Asso. Life membership No- L 16087)

* Dept. of Chemistry, S.V.K.T college Deolali-camp Nashik-422401

(Indian Sci. Cong. Asso. Life membership No- L 16087)

** Dept. of Zoology, K S K W Arts Science and Commerce College
CIDCO - Nashik 422008

E-mail : soperande@yahoo.com

Keywords: Bioassay, *Viviparus*, *bengalensis*, *Endosulfan*.

Pesticide have unique position among crop protecting chemicals. The Endosulfan an organochloride pesticide has ample application on account of its efficiency against a wide variety of insect pest. However on its entry into aquatic bodies through runoff water, Possibilities of gross alterations in physio-chemical profile of water cannot be ruled out. Blind used of pesticide bound to affect the non target organism like *Viviparus bengalensis* . In present study the toxic potential of endosulfan. is assessed by acute static bioassay. The average LC50 values were determined for 24 hrs, 48 hrs, 72 hrs and 96 hrs. The biochemical changes estimated by standard methods. The glycogen and protein contain were depleted and lipids was found increased. The results can be correlated with the increased consumption of reserve food in the foot, mantle, hepatopancrease and whole body tissues of the snail *Viviparus bengalensis*.

194. Histopathologic damage of Sulphur dioxide on the lung of *Rattus norvegicus*

Firdaus Fatma

Department of Zoology,
University of Allahabad,
Allahabad-211002

Air pollution mainly due to smoke and sulphur dioxide (SO₂) is a major environmental problem of concern. Combustion of fossil fuels is a major source of sulfur oxides worldwide. Sulphur dioxide (SO₂) is one of the dangerous pollutant with a potentiality to form sulphuric acid, when mixed with water vapour. Because of its high solubility in water, sulfur dioxide dissolves readily in epithelial fluids in the nasal area and upper respiratory system. Keeping in view the above facts, the present study was undertaken to find out the toxic effect of SO₂ on the histology of lungs. In an attempt to characterize the development of vascular changes, histopathologically two major vascular components were monitored, namely epithelial lining of alveoli and bronchial epithelial lining in lungs of rats exposed to sulphur dioxide.

Severe injury to bronchiolar epithelium (BE) was observed in histological preparation of transverse section of lung as compared to control. The injury to bronchial epithelial lining resulted into the detachment of BE cells from the basement membrane, disintegration of epithelial lining, and increase in vascular smooth muscle resulting into the flattening of the vessel. SO₂ exposed rats showed sign of epithelial injury, as revealed by denudation in the lungs. The cells partitioning alveoli disintegrates; the effect gradually increases with increase in concentration. The disintegration of epithelial cells of alveoli was more pronounced at 120ppm/30days, which results in the formation of large spaces in comparison to control.

Exposure of sulphur dioxide gas exhibited multiple histological abnormalities in lungs were accompanied by the alteration in the levels of total serum protein. The total serum protein level declines on SO₂ exposure, which shows -63% and -79% inhibition following 30 days exposure to 60 and 120ppm respectively. Inhibition in serum total protein is an indicator of inflammation due to extensive pulmonary injury accompanied with epithelial cell injury which causes leakage of proteins from serum to site of pulmonary injury leading to the decrease in total protein level in albino rats.

Thus, it can be concluded that sulphur dioxide exposure may cause alterations in pulmonary resistance of exposed mammalian system.

195. Antifertility Effect of *Cinnamomum Zeylanicum* on the Testis of Vanaspathi Induced Obesity Rats : A Histological Profile

G. Karthikeyan and K. Sakthi Shree

Post Graduate and Research Department of Zoology,
Government Arts College (Autonomous),
Coimbatore – 641 018, Tamil Nadu, India.

Key words: *Cinnamomum zeylanicum*, *Vanaspathi*, *Testis*, *Histopathology*.

Cinnamon a popular spice has many health benefits of which anti glycemc and anti lipidemic effects are currently being investigated, this study has been undertaken to asses the effect of aqueous extract of *Cinnamomum zeylanicum* on testis structure at two dosages in two durations.

Wistar strain albino rats (150-250g body weight) were divided into ten groups of five animals each. Two groups were maintained as vanaspathi induced control for two durations – short duration of 21 days and long duration of 45 days and given 200mg/100gm BW/day of vanaspathi. Four groups were maintained as cinnamon extract alone treated groups and given low dose (0.1ml/100gm BW/day) and high dose (0.2ml/100gm BW/day) of cinnamon extract for both short and long durations. Like wise, four groups were maintained as cinnamon treated and vanaspathi induced experimental groups and given the respective two dosages of cinnamon extract and vanaspathi for both short and long durations.

Animals were maintained for the respective durations and after weighing sacrificed by decapitation. Testis tissue was dissected out, weighed and preserved in 10% formalin and taken for histopathological processing. Cinnamon is observed to be slightly detrimental to testis tissue as observed by dearrangement of seminiferous tubules and reduction in tubular size. But treatment of vanaspathi induced obese group at longer duration seems to be only mildly damaging to the testis.

196. Use of Antimycotic Agents for Extending the Shelf Life of Khoa**G.Rajarajan*, G.Kumaresan and A.Elango**

Department of Dairy Science
Veterinary College and Research Institute,
Namakkal-637002, Tamilnadu, India.
rajarajanvet@gmail.com

Keywords: *Khoa samples, storage, antifungal agents, keeping quality.*

Khoa samples were collected aseptically from the organized dairies and analysed for the yeast and mould in the laboratory. The samples treated with Natamycin (0.5%) and Potassium sorbate (0.3%) as antifungal agents, showed significantly ($P<0.01$) lower yeast and mould count during storage at 30°C and 5°C for 30 days. These findings were supported by Chemical and Organoleptic evaluation of khoa samples treated with antifungal agents during storage.

197. *Abrus precatorious* induced sperm abnormalities in albino rats**Geeta Bansal, Smriti Sharma and Rashmi Gupta**

Department of Zoology,
D.N.(P.G.) College Meerut (U.P.)

Key words : *Cephalocaudal junction defects, amorphous heads, comet shaped agglutination, sperm motility, epididymis , azoospermia.*

Due to the steadily expanding population in countries, increased cost of living, scarcity of accommodation, a desire for better education for children in present competitive world and overall desire for an improved standard of living. there is a pressing need for limiting the family size at personal level and for the control as population at national level.

Currently men's involvement in regulating family size is negligible, as compared to their female counterparts for regulation of fertility. Men's participation in family planning would increase, if there are wider choices of contraception available to them, which should be safe, effective and economical and that it should provide long term and completely

reversible contraception. The main problems encountered in development of a male contraceptive is the fact that it is necessary to achieve azoospermia or make all the sperm non functional.

In the present research module the sperm dynamics, sperm morphology, sperm count and sperm motility of albino rats treated with eluted methanolic fraction of chloroformic extract of seeds of *Abrus precatorius*, in fixed doses were estimated.

The average epididymal weight of experimental animals treated with 2mg/rat/day eluted methanolic fraction of chloroformic extract decreased after 15 days and 30 days of treatment. The decrease was 19% after 15 days and 10.28% after 30 days of treatment.

The average sperm count of experimental animal's showed mildly significant decrease after 15 and 30 days of treatment. The average sperm motility of experimental animals decreased 60% in 15 days and 73% after 30 days of treatment.

The methanolic fraction caused dose dependent radial as well as comet shaped agglutination which made sperms non functional besides heads and tails defects along with cephalocaudal junction defects. It also caused abnormality in the sperms. The folded sperms and coiled tails were seen in the animals treated with methanolic fraction. The amorphous, hookless, banana shaped or short hooked heads were also seen.

198. Observation on the Maturity Index and Fecundity of *Puntius sophore* (Ham-Buch) From Upper Assam

Hema K. Phukon, S.P. Biswas

Department of Life Sciences
Dibrugarh University,
Assam

Key words: *Fecundity, Puntius sophore, Assam*

50 mature specimens of *Puntius sophore* were examined for maturity index and fecundity studies. The GSR values showed that *Puntius sophore* has a single peak indicating its isochronal breeding habit. The absolute fecundity ranged from 1824 to 7004 with an average of 4026.09+1572.19. A linear regression equation was found between fecundity

and total length (TL); body weight (BW) and ovary weight (OW). The fecundity in relation to different body parameters showed a linear relationship. The correlation coefficient (r) values reveal fecundity was moderately high in relation to body weight and ovary weight but poorly correlated with total length.

199. Influence of *Rosa Centifolia* Petal Extract on Certain Biochemical Parameters in the Earthworm *Eudrillus Euginae* Kinberg

Hendry Joel. Y, Kayalvizhi. J, and Aruna.D.

PG and Research Department of Zoology,
Government Arts College, (Autonomous),
Coimbatore- 18. Tamil Nadu, India.

Key words : *Rosa centifolia*, *Eudrillus euginae*, *biochemical parameters*, *proteins*, *lipids*, *carbohydrates*.

Earthworms are exposed to a variety of pollutants that reach the soil by way of applications as fertilizers, pesticides and weedicides. These chemicals will interfere with several oxidative metabolic pathways which may be reflected by an alternation in the level of several biochemical parameters. Addition of plant extracts are known to have a positive effect on these biochemical components. Our results revealed that addition of *R.centifolia* petal extract increased the level of proteins, carbohydrates and lipids by 25.85%, 49.65% and 39.35% respectively which was a significant increase. Thus the addition of the petal extract builds up the body energy stores after 30 days of exposure. At 90 days of exposure an increase in tissue protein of (+) 11.94% and (+) 31.62% in lipids was noted while the carbohydrate level decreased by (-) 78.29% perhaps due to the decrease in the feed material available. Thus our study indicates that petal extracts can be useful in building up the body energy reserves which may help the animal in facing the toxic challenges of the changing world.

200. Exploration of sex ratio in two bat species inhabiting in District Lakhimpur-Kheri, U.P., India.

Jitendra kumar^{1*}, Amita Kanaujia²

^{1,2} Department of Zoology,
University of Lucknow,
Lucknow-226007, India
*jkumar4683@gmail.com

Key words: *Roosting site, Sex ratio, Megachiroptera, Microchiroptera, Random sampling, Population dynamics.*

Sex ratio is the important feature of an animal population which affects population structure and population dynamics. So, a study on sex ratio of two species of bats, *Pteropus giganteus* (Megachiroptera) and *Pipistrellus pipistrellus* (Microchiroptera) was carried out in concerned area during the year of 2009-10. Random sampling of bats was done from various roosting sites in District Lakhimpur-Kheri, Uttar Pradesh. In case of *Pteropus giganteus*, the random samplings were made in different months of the year. The Indian flying fox *Pteropus giganteus* was found to roost in five roosting sites; Thisora, Paraili, Biharipur, Khargapur, Mitouli. At different roosts, females were found to dominate the population. Out of the 135 individuals of *P. giganteus*, observed at various sites, females were found comprising of 81 individuals (60%) and 54 males (40%) formed the remaining population. It was also observed that there were more adult individuals in the months of January to June while subadults were caught during the months of July to December. In case of common pipistrellus, *Pipistrellus pipistrellus*, only two random samplings were made in Gola Gokaran Nath, one from a roost in the wall of an old house while other samples were collected by deploying the mist-nets in its foraging area. It revealed that males and females shared almost an equal percentage. Out of 40 individuals of *P. pipistrellus*, males dominated with 52.5% of its share. The study reveals an almost balanced population of both sexes of bat species and concerned area appears to be more favourable habitat for their breeding success.

201. Antilipidaemic Effect of *Cinnamomum Zeylanicum* in Vanaspathi Induced Obese Rats

K. Sakthi Shree, G. Karthikeyan and M. Saravanan,

Post Graduate and Research Department of Zoology,
Government Arts College (Autonomous),
Coimbatore – 641 018, Tamil Nadu, India.

Key words: *Cinnamomum zeylanicum*, *Cinnamon extract*, *Vanaspathi*, *Antilipidaemic property*, *Serum cholesterol*, *Serum triglycerides*, *Serum phospholipids*.

Cinnamomum zeylanicum, a spice having antiglycemic properties, has been used to investigate its lipolytic nature in vanaspathi induced obese rats at two different dosages and two different durations.

Wistar strain albino rats (150-250 gm body weight) were divided into ten groups of five rats each. Two groups were administered vanaspathi (200mg/100gm BW/day) to induce obesity and maintained as control groups for two durations – short duration of 21 days and long duration of 45 days. Four groups of rats were treated with aqueous extract of cinnamon alone and given as two dosages – low dose (0.1ml/100gm BW/day) and high dose (0.2ml/100gm BW/day) for both the short and long durations. Four groups were further given vanaspathi (200mg/100gm BW/day) to induce obesity and additionally treated with cinnamon extract at both doses and durations.

After the respective experimental durations, rats were weighed and sacrificed by decapitation. Blood was collected and assayed for various lipid parameters- serum cholesterol, serum triglycerides, HDL, LDL, VLDL and serum phospholipids. A general significant reduction of all the lipid parameters has been observed, thereby unveiling the antilipidaemic property of *Cinnamomum Zeylanicum*.

202. Histopathological and Histochemical Changes in the Kidney of Common Carp *Cyprinus Carpio* Exposed to Carbendazim Fungicide

K. Sridhar, G. Asha Rajendran and P. Esther Joice

Post- Graduate and Research Department of Zoology,
Government Arts College (Autonomus)
(NAAC Accredited-4 stars),
Coimbatore- 641 018, Tamil Nadu, India

Key words: *Cyprinus carpio*, Carbendazim, Histopathology, Histochemical, Kidney.

The various pesticides entering the aquatic ecosystem through human activities, either accidentally or by design may cause adverse effect on the aquatic biota. Carbendazim is a fungicide play an important role in the plant disease control, it is harmful to fishes and change the physiological activities. In the present study histopathological and histochemical changes were made with sub-lethal doses of carbendazim in the kidney tissues of *Cyprinus carpio*. The kidneys are the main excretory organ, it showed various changes compared to control and treated fishes. The increased number of leucocytes and their phagocytic activity, tubular necrosis, sinusoids were observed in the treated fishes. The histochemical results show a decreased level of protein, carbohydrate, lipids and increased level of ALP and ACP depended up on the colour intensity. Since histopathological changes are used widely as biomarkers in the evaluation of health of fish exposed to contaminants, the present study implies on the effect of the fungicide on the kidney tissues.

203. Potential teratogenicity of anticonvulsants Gabapentin and Valproic acid in C-F rats

K.P.Singh*and Kiran Gupta

Neurobiology Lab., Deptt of Zoology
University of Allahabad, Allahabad (U.P.) India
Kps29@rediffmail.com

For treatment of epileptic cases, both first and second generation AEDs are available but physicians always face difficulties to manipulate the drug doses during pregnancy

considering the potential benefits to mother and possible risks to developing fetuses. Among the typical AEDs, most of the drugs are teratogenic in nature but teratogenic safety of the newer AEDs including GBP has not been well established so far. Though, some reports are available but are contradictory and inconclusive and limited to gross teratological observations. Keeping these views in consideration, present study has been planned to evaluate the teratogenic safety of GBP and compare it with VPA. As per study design, pregnant C-F rats of different groups were exposed to GBP (300 & 400 mg/kg/BW) and VPA (50 & 100 mg/kg/BW) from GD0-20. Similarly, vehicle exposed dams were maintained as control. 50% pregnant dams of each group were sacrificed at GD21 and rest of the dams were allowed to deliver naturally and their offspring were reared upto PND 56. These drugs induced fetal toxicity as external gross malformations, skeletal anomalies of limbs and ribs, fetal body weight and brain weight. Histopathological evaluation of AEDs exposed fetal brain revealed significant disturbances of neuroarchitectural pattern of different neuronal layers, reduced neuronal density of different brain regions (Cerebral cortex, Hippocampus and Striatum). Prenatally exposed offspring not only showed neurodevelopment delay and reduced growth pattern from PND1 to 56 but also displayed long-lasting effect of these drugs on neurobehavioural alterations like anxiety, cognition in young-adult rat offspring. This study concludes that GBP is less teratogenic than VPA as gross birth defects but GBP is equally teratogenic at neuroanatomical and neurobehavioral level. It is hypothesized that mechanism of action for inducing teratogenic responses may be due to developmental disturbances of fetal neurotransmitters (NTs), hence role of NTs as trophic factor may not be ruled out.

204. Histopathological Effect of Indosulfan of Swiss Albinomice and BioRemediation Through Ashwagandha

Kailash Kumar* and Bindu Kumari Singh **

College of commerce,
Patna, Bihar

Key word : *Male mice, endosulfan, Testes, withania somnifera.*

Endosulfan is an organ chlorine pesticide, is being extensively used to control pest of different crops. Due to its persistence, it bioaccumulates in the food chain and reaches in

the human body and make cause a wide range of harmful health effect in human including cancer , injury in nervous system , lung damage, reproductive dysfunction and make cause sterility .In my present investigation to illustrate effect of endosulfan on testis of swiss albino mice , mice were administered to male swiss abino mice for 4 weeks @ 3.0mg/kg b.w. per day .After that they sacrificed and their testis tissue were fixed for light microscopic study. The histopathological study of endosulfan administered group for 4 weeks testis showed the number of interstitial cells and spermatogonia decreases , but after the administration of endosulfan followed by withania sommifer shows regeneration of spermatogonia and interstitial cells.

205. Study the Life Span and Mortality Rate Of Free Ranging Hanuman Langur (*Semnopithecus entellus entellus*)

L.S. Rajpurohit and Chena Ram

Animal Behaviour Unit,
Department of Zoology
Jai naraian Vyas University, Jodhpur
E.mail: drlsrajpurohit@yahoo.in

Key words: *Hanuman langur, Life span, electrocutions, habitat destruction, pocket population*

A small pocket population about 2000 Hanuman langur living in and around Jodhpur has been studied for demography. There are 40 bisexual troops and 15 all male bands. This study has been carried out for about one year (May, 2009 to April, 2010). Life span of free ranging is more than captive langur. Many factor like habitat destruction due to anthropological reason and climatic condition, electrocution, urbanization, natural predators and infanticide affects the life span of free ranging langur and leads to artificial death. In our study out of total observed death (2% of total langur population) of langur, 1.3 % was due to only electrocutions and remaining 0.7 deaths due anther factors (0.3 % langur die due to road accident, Out of total death 0.2% langurs are die due to feeding on that crops and plants in nursery which are treated by various type of poisonous pesticides, 0.1% case of infanticide and 0.1% due to natural predator.) In our result we conclude that electrocution is a major cause of death of free ranging langur.

206. Nutrient uptake by wetland plants based on Kinetics

L.S. Rajpurohit and Sanju Borana

Department of Zoology,
Jai Narain Vyas University, Jodhpur.
(Email- drlsrajpurohit@yahoo.in)

Keywords: *Nutrient uptake, kinetics, global change, growing medium, elevated CO₂ concentration*

Roots are the primary organ involved in water and nutrient uptake and are one of the major sinks for assimilated C. They play a key role in determining plant and ecosystem responses to different aspects of global change. The degree to which kinetics of nutrient uptake depend on nutrient availability of growing medium and its factors that determine nutrient transport to the root surface. Active nutrient absorption by roots is an adaptive feature of plants that influences nutrient uptake in response to environmental factors. Rate of nutrient ion uptake by roots increases with increasing ion concentration until a saturation kinetics is reached beyond which uptake rate is independent of ion concentration. The dynamics of nutrient uptake can be quantitatively described using the Michaelis-Menten equation-

$$v = V_{max}[c]/(K_m+[c])$$

In situations where both NH₄-N and NO₃-N ions are present at the root surface, nitrate uptake is severely inhibited. The treatment performance of the wetlands is influenced by Hydraulic retention time and followed a first-order plug-flow kinetic-

$$C_e / C_i = e^{-k_T t}$$

Important factors which promote plant nutrient uptake are temperature of the medium in which wetland plants are growing, N deposition and high CO₂ concentration in the environment. Other factors are root compensatory adjustments which include uptake kinetics of roots and root characteristics such as physiology, growth, morphology, architecture, turn over, life span, symbiotic association as well as nutrient availability at the root surface. This paper explains how kinetics of root nutrient uptake respond variably to different aspects of global change.

207. Effects of the extract of *Rosa centifolia* on the biochemical parameters of the different tissues of *Cirrhinus mrigala* (Hamilton)

M.Umadevi, S.Kirubanandhini, M.Backiyaraj, D.Aruna
and K.Krishnamoorthy*

PG & Research department of zoology,
Government Arts College,
Coimbatore – 641018, Tamil Nadu, India.
*E-mail : krishnamoorthy1974@yahoo.com

Keywords: *Cirrhinus mrigala*, *Rosa centifolia*, proteins, extract

The well known uses of roses are for their perfume production. But their unknown function in growth influence to light by the present work on *Rosa centifolia* in the fish *Cirrhinus mrigala*(Hamilton). The fishes groups were provided with the petal extract for 10 days and 20 days period. The estimation for protein, carbohydrates and lipids were done in liver, muscle and brain tissues. The elevated levels of proteins, carbohydrates and lipid contents proved that the fishes are strong and healthy when fed with rose petals. Hence this study proves that the petals can be used in the fish farm as a supplementary feed for the faster growth of fish.

208. Stimulation of fish muscle protein: A study through natrolite

Meeta Mishra and Subodh Kumar Jain

Department of Biotechnology
Dr. H. S. Gour University
SAGAR – 470 003 M.P.

Key words: Zeolite, Natrolite, Fish, Protein, Muscle.

Zeolites are naturally occurring, fine-grained materials with pronounced ion exchange properties. Small amount of zeolites increase biomass-production and improve nitrogenous efficiency. Zeolites are used as feed additive and corrector of environment conditions. During the present investigation, natural zeolite Natrolite considered for study. For the purpose, the experimental fish *Heteropneustes fossilis* which is an important food fish

have been collected locally and acclimatized for two weeks prior to experimentation. Natrolite samples were collected from nearby hill, washed and crushed to powder form, and used. Fish were exposed to various concentrations of Natrolite for the total period of 180 days. After the interval of 30 days, the fish muscle removed and processed for protein isolation. Protein samples were analysed by SDS-Poly Acrylamide Gel Electrophoresis. The protein bands thus obtained were compared with control. The protein bands ranging between 20.1 kd and 43 kd exhibited increased protein contents significantly, indicating the protein stimulating quality of Natrolite.

209. Protective Role of Chabazite in Mercury Toxicity: A study in Fish

Rakesh Shrivastava* and Subodh Kumar Jain

Department of Zoology,
Dr. H. S. Gour University,
SAGAR – 470 003 M.P.

*Denielson Degree College,
Chhindwara M.P.

Key words: *Zeolite, Chabazite, Fish tissue, Glycogen*

Zeolites are naturally occurring, fine-grained colourless crystals with pronounced ion exchange property. They are porous having interconnected cavities, in which metal cations and water molecules reside. This gives the zeolites the cation exchange and reversible dehydration properties for which they are noted. For study 120 fish were acclimatized prior to experimentation for two weeks and divided in to four equal groups. Group I worked as control while group II, III and IV were exposed to Mercuric Chloride; Mercuric chloride+ Chabazite and only chabazite respectively. T the end of 30 days fish were sacrificed, their liver and kidney were removed and processed for estimation of protein contents. The observations of the study indicates that the addition of chabazite with Mercuric chloride protect the negative effects caused due to mercuric chloride. Exposure of fish to only chabazite caused increased biomass, keeping the other parameters normal, indicating that this natural zeolite can be used safely in animal system.

210. GC-MS analysis of semipurified hexane extract of *Urtica dioica* exhibiting antibacterial activity

Naresh Kumar^{1*} Sabzar Ahmad Dar^{2*} Poonam Sharma²
and Rambir Singh¹

¹Department of Biomedical Sciences,
Bundelkhand University, Kanpur Road,
Jhansi- 284128, INDIA

²Department of Zoology, Institute of Basic Sciences,
Bundelkhand University, Kanpur Road,
Jhansi- 284128, INDIA

* Presenting author: nash_bms@yahoo.co.in and dar.sabzarahmad@gmail.com

Keywords: *Urtica dioica*, antibacterial activity, GC-MS, toxicity, wistar rats.

The present study describes the phytochemical profile and antibacterial activity of *Urtica dioica*. *U. dioica* leaves were subjected to solvent extraction by hexane, ethyl acetate, chloroform, methanol and water and all the extracts were tested for antibacterial activity against five clinical isolates of gram negative and gram positive bacteria. The antibacterial activities were assessed by disc diffusion method by measuring the diameter of the inhibition zones. Hexane extract showed good antibacterial activity against all the five bacterial strains, hence it was further purified using silica column chromatography and MIC of the semipurified fraction was determined by turbidity measurements. The fraction showed MIC of 7.81-250 µg against gram negative bacteria. Semipurified fraction was subjected to GC-MS analysis in search of potent antibacterial compound(s). Neophytadiene(26.97%), butyl tetradecyl ester (9.53%), Dibutyl phthalate (7.45), Bis(2-ethyl hexyl) maleate (8.80%) and 1,2- benzenedicarboxylic acid (9.89%) were the major constituents which may be responsible for the antibacterial activity of hexane extract. To assess the safety index of the semipurified hexane extract, sub-acute toxicity studies were carried out in wister rats at 50,100,200 and 400mg/kgbw. Hematological and other biochemical parametes from serum showed that the extract was safe at tested concentrations.

This is the first report on analysis of antibacterial components from *U.dioica* leaves. The antibacterial hexane extract was safe in sub-acute toxicity studies. Our results confer the utility of this plant extract in developing a novel broad spectrum antimicrobial agent.

211. Impact of *Calotropis procera* ethanol extracts on Lactate dehydrogenase activity of *Musca domestica* L. (Diptera: Muscidae)

Nighat Begum

Biochemistry Laboratory,
Department of Zoology, University of Allahabad.

The housefly, *Musca domestica* L. (Diptera: Muscidae) is an important mechanical vector of several bacterial and pathogenic organisms of humans and animals. There are problems of pesticides resistance and negative impacts on non-target organisms including man and the environment. Botanicals are the most promising source and under extensive trails for their biological activity against various pests. They have been proved to be efficient to overcome many environmental problems such as development of resistance in pests to pesticides, resurgence of target and non-target pests. The ethanol extracts of *Calotropis procera* leaves and seeds were assayed for its insecticidal activity against *Musca domestica* L. and inhibitory effect against Lactate dehydrogenase activity in different developmental stages of housefly. Third instar larvae were treated to 5% and 10% concentrations of the LC₅₀ value of leaf and seed extracts of *C. procera* for 48 hours by dipping method.

The enzyme lactate dehydrogenase (LDH) (EC 1.1.1.28) forms the centre for a delicately balanced equilibrium between catabolism and anabolism of carbohydrates and is associated with cellular metabolic activity. It is involved in the interconversion of pyruvic acid and lactic acid. It serves as a pivotal enzyme between the glycolytic pathway and the tricarboxylic acid cycle.

Calotropis procera leaf extract treatment caused significant inhibition (58%) of the enzyme activity in larval stage at higher dose. In case of pupal and adult stage 50% and 39% reduction in the enzyme activity was recorded respectively. *C. procera* seed extract caused an inhibition of 42%, 35% and 25% in the LDH activity of larva, pupa and adult stages of housefly respectively.

A decrease in LDH activity denotes reduced metabolism in the insect and may be due to the toxic effects of extract derivatives on membrane permeability, especially on the gut epithelium. The effect of both the extracts were concentration dependent. The results of this study raises the possibility that the antiLDH properties of the active compound(s) present in the tested plant extracts could be exploited as an alternate of many synthetic chemical insecticides being indiscriminately used for control of insects pests. These extracts may be useful in the management of *M. domestica* and the transmission of different pathogens associated to it.

212. Influence of Cadmium exposed cumulus cell monolayer on oocyte maturation

P. S. P. Gupta, Nandi, S. and S. Selvaraju

National Institute of Animal Nutrition and Physiology
Bangalore

The present study was undertaken to assess the ability of cumulus cell monolayer exposed with different concentrations of cadmium to support bubaline oocyte maturation. The oocytes and cumulus cells were isolated from ovarian follicles of slaughtered matured buffaloes. The cumulus cell monolayer was formed by standard procedure in control medium [TCM-199+ fetal bovine serum (10%) + gentamicin (50µg/ml)]. The immature oocytes were cultured at 39°C for 24 hr in 5% CO₂ in air on the cumulus cell monolayer exposed with eight different concentrations 0, 0.05, 0.5, 1, 1.5, 2.5, 5.0 and 10.0 mg/ml of cadmium. The ability of cumulus cell monolayer to support maturation of oocytes was tested. Presence of cadmium above 1g/ml did not support maturation of oocytes.

213. Growth performance of *Macrobrachium malcolmsonii* on feeds prepared by using pulses (green gram, horse gram and cow gram) and cereals (pearl millet, ragi and wheat) along with ground nut oil cake and soymeal

P. Saravana Bhavan, G. Prakash, J. Rekha and R. Vivek

Department of Zoology, Bharathiar University,
Coimbatore – 641046, Tamilnadu.
E-mail: bhavanps1967@yahoo.in

Key words: *Macrobrachium malcolmsonii*, cereals, pulses, growth, protein, amino acids, carbohydrate, lipid, energy utilization.

Three types of feeds were prepared using three different pulses (green gram, horse gram, and cow gram) and three different cereals (pearl millet, ragi, and wheat) in two different proportions (Pulse: 25% and 40%; Cereal: 25% and 15%) along with groundnut oil cake (25% and 15%) and soy meal (15% and 20%). Egg albumin and tapioca flour (4% and 5% respectively) were used as binding agents. 1% vitamin B-complex was also

mixed. These feeds were fed to the post larvae of *M. malcolmsonii* for a period of 45 days. The efficacy of these feeds on growth performance, biochemical constituents and energy utilization were assessed and compared with commercially available standard Scampi feed. The overall influence of these feeds on growth, and concentration of protein, amino acid, carbohydrate and lipid of prawn were found to better in scampi feed followed by feed rich in pulse and the feed with equal proportion of cereal and pulse. Statistically insignificant difference was recorded between scampi feed and feed rich in pulse as well as the feed with equal proportion of cereal and pulse. Similarly, the difference arrived between experimental groups was also not statistically significant. The differences in weight gain, specific growth rate and conversion rate between control and experiments and between experiments were not significant. However, significant differences were recorded in feeding, absorption and metabolic rates between control and experiments. Similarly, significant difference was noted in ammonia excretion rate between experiment groups. The results indicate the fact that protein sparing effect was higher in the feed with equal proportion of cereal and pulse. Therefore, it is suggested that in order to reduce total cost on food the expensive pulses can partially be replaced with chiefly available cereals for healthy and sustainable maintenance of *M. malcolmsonii*.

214. Efficacy of Indian Gooseberry (Amla) and Barley in the Management of Cardiovascular Diseases.

Pooja Verma, Neelam Singh, *F.W. Bansode and ** R. K. Singh

Department of Nutrition,

I.T. P.G. College, Lucknow

Divisions of *Endocrinology and **Toxicology,

C.D.R.I., Chattar Manzil Palace, Lucknow

Indian Gooseberry (Amla) and Barley are the two important plant foods which are known to be effective in lowering the cholesterol level in the body and thus beneficial for preventing dyslipidemia, intima thickening and plaque formation. Indian Gooseberry since older times have found to be beneficial for reducing cardiovascular diseases. The reduction has observed due to antioxidant potential of amla which is found to be cardio protective. The first constituent present in amla is tannins which have the highest potential in reducing cholesterol and triglycerides level thereby increasing the HDL (high Density Lipoprotein) level. The another aspect of Indian Gooseberry is its phenol content which helps in

preventing the atherosclerosis and endothelial dysfunction. The flavonoid content of Indian gooseberry have the highest potential in reducing the lipid levels in serum and tissues as well as it is also found to have significant inhibitory effect of hepatic HMG Co-A reductase activity. Vitamin C is the most important constituent of amla. Vitamin C helps in preventing oxidative damage and helps in maintaining the integrity of arteries by preventing oxidative damage.

Barley is another plant food which is known is also found to be cardio protective. Barley is a good source of fiber called barley β -Glucan which helps in lowering LDL (Low Density Lipoprotein) as well as total cholesterol. The barley β -Glucan fiber have a tendency to lower cholesterol level since it absorbs the cholesterol and helps in its excretion. It is also known to be involved in lowering the microbial fermentation of intestinal digestibility yielding products that often alter the biosynthesis of cholesterol. Barley flavonoids are important constituent which helps in preventing detoxification and thus prevents arterial damage. All these factors present in the natural plant foods are found to be helpful in preventing cardiovascular damage. We have experimentally proved in animals.

215. Optimization of Phytohormonal Concentrations for Callus Mediated Regeneration of *Albizia lucida*

***Rajendra Kumar, *O.P. Verma @Pragati Misra ,
#Pradeep K. Shukla, and ^D. Saha**

*Department of Molecular and Cellular Engineering,

@Department of Tissue Engineering,

Jacob School of Biotechnology and Bioengineering,

#Department of Biological Sciences, School of Basic Sciences,

Sam Higginbottom Institute of Agriculture,

Technology and Sciences, Naini, Allahabad 211007

^IINRG, Ranchi Jharkhand

An experiment was performed to study callus mediated *in vitro* regeneration in *A. lucida*, a potential lac insect host plant with an aim to develop a process for mass multiplication and genetic improvement. Nodal and hypocotyl explants were collected from 8-10 days old juvenile seedlings. These explants were inoculated on Murashige and Skoog (MS) medium supplemented with different growth regulators. Maximum callusing percentage was observed on MS medium with 0.5 μ M thiadiazuron (TDZ) using axillary

nodal bud and hypocotyl explants 77.77% and 95.63% respectively. A concentration of 2 mg/l BAP and 1mg/l AgNO₃ with MS medium was effective for shoot proliferation. Shoots elongation was satisfactory on MS media with BAP 5 mg/l and 1 mg/l AgNO₃. Rooting was the most successful on half MS supplemented with 20gm/l sucrose and 2 mg/l IBA on 5 days initially and then transferred on to half MS media supplemented with 20 mg/l sucrose without IBA 75%. Hardening of *in vitro* grown *Albizia* plantlets were done in polythene bag containing soil, sand and powder in the ratio 1:1:1. Attempts have been made for genetic transformation in *Albizia* using *Agrobacterium tumifacian* cells GV 3101 containing pGUS-INT binary vector producing kanamycin resistant plantlets. The kanamycin resistant plantlets were subcultured and rooted under *in vitro* condition using the protocol above as putative transformant.

216. DNA Micro Arrays for Simultaneous Detection of Multiple Fish Pathogens

Rehana Abidi* and M. Abbas#

*- Principal Scientist, Fish Health Management Division,
National Bureau of Fish Genetic Resources (ICAR),
Lucknow

#- Deputy Director & Head,
Biometry and Statistics Division,
Central Drug Research Institute (CSIR), Lucknow

Keywords: DNA Micro Array, Fish, Pathogens, Diagnostics.

The recent molecular diagnostic techniques such as nucleic acid and PCR based diagnostic probes assays and kits are certainly the best option available today to detect specific pathogens in fin fish and shell fish as they are more precise, accurate, specific, sensitive and least time consuming when compared with other diagnostic methods. But the pathogen specificity of these screening techniques negates detection of any other pathogenic or potentially significant organisms in the same specimens. Besides some of these molecular or immuno- diagnostic techniques give a true picture of health or disease profile of the host which is of prime importance specially in the case of pre & post quarantine of live aquatic animals and in the case of epizootics. Hence a non specific but a sensitive and rapid technique is the need of time to give true health profile of fish or any other aquatic

animal. The most exciting solution to all these problems is the DNA micro-arrays . Although the high density oligo-nucleotide micro-arrays technology is in its infancy stage of development but offers enormous potential. Many agencies are developing DNA micro-arrays and DNA chips for simultaneous detection of different kinds of pathogens.

Using data from increasing numbers of whole microbial genomes, thousands of sequences can be selected to probe numerous genes of interest in diseased specimens or host tissues. Thus microarrays can be used simultaneously for detecting various parasites, fungi, virus and bacteria their pathogenic and non pathogenic species, strains, serotypes, and for other purposes like virulence host-parasite relationship etc. by detecting the presence of relevant genes or gene mutants. The details regarding designing DNA micro-arrays, latest developments in micro-array technology, its potentials advantages, limitations in comparison of other molecular techniques and other related issues will be discussed in the paper.

217. Monosex Population of Nile tilapia, with Aromatase Inhibitor Letrozole.

Ruchi Singh* Madhu Tripathi A.K Singh***

*Exotic Germplasm Section of Fish Health Management Division
National Bureau of Fish Genetic Resources, Canal Ring Road,
O. Dilkusha, Lucknow-226002, Uttar Pradesh (India).

**Departments of Zoology, University of Lucknow, Lucknow-226010,
Uttar Pradesh, (India).

Correspondence: Ruchi Singh C/O Dr. A.K Singh (Pr. Scientist),
Exotic Germplasm Section of Fish Health Management Division,
National Bureau of Fish Genetic Resources, Canal ring road,
P.O. Dilkusha. Lucknow-226002, Uttar Pradesh (India).

Email: ruchisingh24march@rediffmail.com

Keywords: *Aromatase inhibitor, Monosex Population, Non steroid, Nile tilapia.*

Aromatase inhibitor (AIs) is a non steroid, using mainly in the sex reversal and gaining monosex population of fish. For this study Letrozole (an AI), using for obtain complete

monosex population. Different dose (50 µg/l, 100 µg/l, and 200 µg/l doses) of letrozole gave to the hatchlings (10th day post hatched) of Nile tilapia (*Oreochromis niloticus*) through the oral administration in normal photoperiod. Male population is high in comparison to the control condition. 200µg/l dose of letrozole gave the 100% male population of fish. The growth of male controlled fish is rapid than female control fish. The gonad development is less in the letrozole treated male fish than the control male. Thus, it is recommended to use Letrozole (AI) for producing all male monosex (sex reversal) Nile tilapia to obtain or controlling the excessive growth of fish population in India.

218. Effect of Ecdysone (IGRS) on female reproduction in *Dydercus similis*

Rupali Tayade, Versha Sharma*

Department of Zoology
Dr. H.S. Gour University,
Sagar (M.P.) 470 003
E-mail: poonam.dabade27@gmail.com

Keywords: *Ecdysone, Neuroendocrine complex chorion, Adipose tissue, ovariole.*

The Ecdysone, Insect Growth Regulator (IGRS) applied topically on virgin females of insects produce various types of ovarian developmental derangements and deformities in the reproductive system and ill developed ovariole. Here an attempt has been made to study the role of ecdysone on the adult female of *Dydercus*. The insects were infected with different concentrations of the 20-hydroxy ecdysone and the tissues studied were neurosecretory complex, ovary and adipose tissue. The experiments were done on newly emerged adults to the period till they laid eggs.

Here in the ovaries the period of vitellogenesis and chorion formation is delayed.

219. Effect of Tannery Effluent on Reproduction and Survival of Fingerlings of Catfish *Clarias Batrachus*

S. Philip Clament*, V. Ramasubramanian** and P. Esther Joice***

* M. Phil scholar, Post- Graduate and research Department of Zoology,
Government Arts College

** Asst. professor Department of Zoology, Bharathiar University

*** Associate professor, Post- Graduate and research Department of Zoology,
Government Arts College (Autonomus), (NAAC Accredited- 4 stars),
Coimbatore- 641 018, Tamil Nadu, India.

Key words: Tannery effluent, LC_{50} , Sperm motility.

The discharge of industrial and communal sewage to rivers and lakes result in the contamination of aquatic environments with toxic substances which are harmful to aquatic animals. Tannery is one such basic unit of leather industry which pollute large amount of water with a number of chemicals which are discharged as effluent. The present study is to find the lethal value of tannery effluent (Finney,. 1964) for the fish *Clarias batrachus* and also to check the sperm motility using Karl Marx (2005) method. The results showed the LC_{50} value for 48 hours is 6.5% concentration of tannery effluent. The tannery effluent shows negative effect to the sperm motility due to the presence of pollutants such as mercuric ions which may cause the death of sperms. Hence it is understood this work, that the tannery effluents have their drastic effects on the natural growth and development of fishes in the fresh waters.

220. Incorporation of certain additives improves the post-thaw quality of frozen semen

Satish Kumar* S. K. Srivastava and R. P. Tripathi

*Principal Scientist (Animal Reproduction)

Animal Reproduction Division, I.V.R.I., Izatnagar- 243122

*- Present address: P.D.C., Grass Farm Road,
P.B.No.17, Meerut Cantt -250 001

Additives are useful to spermatozoa as energy metabolite, metabolic activator, antioxidant, chelating agent and moderator. Although freezing of buffalo semen is not a

problem now days, but there is always scope for improving the quality of frozen semen from this species.

In an attempt to improve the quality of buffalo frozen semen two experiments were undertaken. In one experiment four additives namely; Ascorbic Acid (10 and 15 mM), Caffeine (7 and 10.5mM), chloroquine diphosphate (0.54 and 0.81mM) and Chlorpromazine hydrochloride(10^{-4} and 10^{-5} mM) were added in the Tris dilutor, along with one control dilutor without any additive. Sixteen ejaculates (having initial motility 70%) from two Murrah bulls were diluted in these dilutors and frozen in the liquid nitrogen vapour for this study. The semen quality at the time of semen ejaculation were respectively, per cent intact acrosome 90.61%, per cent HOS positive sperm 73.24% and sperm penetration distance in bovine cervical mucus 54.52mm in 30 min. Evaluation of post-thawed semen revealed a significant improvement in all the seminal parameters (motility, per cent intact acrosomes, and sperm penetration distance and per cent sperm responding to hypo-osmotic solution) after incorporation of these additives. Maximum post-thaw motility (48.50%) and per cent intact acrosome (63.2%) was found in presence of 0.54 mM chloroquine diphosphate. However, vanguard sperm traveled to maximum distance (40.36mm) in cervical mucus in presence of caffeine (7mM) and significantly higher percentage of sperm responded to hypo-osmotic solution when chloroquine diphosphate in the concentration of 0.54mM was present in the diluting media.

221. Rhythmic beating of cardiomyocyte continuing 80 days generated from goat embryonic stem cells

**Shweta Garg, Dhruba Malakar*, Rahul Dutta,
Shailendra Sahu and Dinesh Kumar**

Animal Biotechnology Center,
National Dairy Research Institute,
Karnal-132001, India.
Email: dhrubamalakar@gmail.com

Key words: *Goat Embryonic Stem Cells, LIF, Embryoid Bodies, Activin-A and BMP-4.*

The ability of the putative goat embryonic stem cells to form embryoid bodies and

their directed differentiation to cardiomyocytes was examined in the present investigation. Colonies of goat embryonic stem cells were separated from the feeder layer and mechanically split into smaller 9 clumps of 600-800 cells. When goat embryonic stem (gES) cells were cultured in suspension without the support of LIF and embryonic fibroblast feeder layer, they form 3-dimensional aggregates called 'embryoid bodies' (EBs). For the preparation of EBs, gES cells colonies were removed and were disaggregated into small clumps using 0.25% trypsin-EDTA for 5-6 min at 38°C. The clumps were cultured for two days in hanging drops (20 µl of ES cell culture medium without LIF) in which the cells were dispersed and suspended on the lid of a Petri dish. Third day onwards, the EBs were transferred to bacteriological dishes for further culture. Compact or cystic EBs were formed within 3-7 days. When the embryoid bodies (n = 540) were harvested from the hanging drops on day 3 of suspension culture, 346 (64 ± 3.09%) of them were observed to be in the form of compact mass whereas 191(36 ± 3.12%) were of cystic type. The embryoid bodies were analyzed with molecular markers like Gata, BMP4 and Nestin and found positive. These EBs were placed on tissue culture dishes for adhesion and growth. The cells were fed every alternate day by tilting the plate, allowing them to settle, and carefully replacing the medium. The EBs produced by the hanging drop method were placed in suspension for 3 additional days and were then transferred to non coated 24 well plate culture dish and bacteriological dishes containing stimulating agent. After 2 days, the EBs had adhered and had started to grow. The stimulating agents examined in the present study included 100 ng/ml Activin A and 100 ng/ml BMP4 for directing the differentiation to heart muscle cell-like cells. The cardiac muscle-specific gene expressions were detected by immunocytochemistry and RT-PCR in the differentiated cells on day 30 of culture, which was confirmed by expression of α -actinin, c-troponin and myosin heavy chain genes. The histological study was done by haematoxylin and eosin staining and the contractile nature of heart cells was confirmed by *In vitro* rhythmic beating of cardiomyocytes in culture after 30 days. It may be concluded that rhythmic beating of cardiomyocytes were produced goat embryonic stem cells. To best of our knowledge this is the first time cardiomyocytes beating was observed in goat ESCs in the world. Even the authors have not found any report among the animals like cattle, buffaloes, sheep and pig except mouse, monkey and human being.

222. Comparison of regenerative ability of selected species of earthworms

Subashini, M., Ramaswamy, M* and Aruna, D.

PG & Research Department of Zoology,
Government Arts College,
Coimbatore-641 018, Tamilnadu, India.

*Deputy Director-Research,
Karpagam University,
Coimbatore-641 021, Tamilnadu, India.

Key words: *Earthworm, Regeneration, Eudrilus eugeniae, Perionyx excavatus, Lampito mauritii*

Annelids among invertebrates possess high regeneration capacity. The chances of being damaged and cut into pieces is higher in earthworms (Oligochaetes) due to modern agricultural practices. In the present study, an attempt is made to study the regeneration ability of some selected species of earthworms. Amputation was done between 22nd and 23rd segments (i.e., 5 segments below the clitellum, uniformly in all species) in each worm. Following 5 days after amputation, the anterior cut piece of *Eudrilus eugeniae* showed higher regeneration ability of 26 segments posteriorly. On the other hand, the cut anterior portion of *Perionyx excavatus* showed regeneration of only 3 segments posteriorly after 5 days whereas, no regeneration was observed in the anterior cut portion of *Lampito mauritii* and the cut piece did not survive after 2 days. After 30 days, there was no addition of new segments in *E. eugeniae* and 8 segments were added in *P. excavatus* after 30 days. In both *E. eugeniae* and *P. excavatus*, the anterior portion of the cut piece was capable of regeneration posteriorly while the posterior cut piece did not regenerate anteriorly, probably due to the absence of genital components in it. Further, in *E. eugeniae*, reorganization of the intestine along with definite segmentation occurred after 30 days while in *P. excavatus*, no such reorganization was noted. The presence of higher degree of regeneration ability together with reorganization of the intestine with definite segmentation, particularly in the epigeic earthworm, *E. eugeniae*, could be of adaptive value for the worms as the chance of damage is more for the epigeic worms living on the surface soil.

223. Screening and Isolation of Chitin from Marine Stomatopods (Crustacea)

Thirunavukkarasu. N

Department of Marine Studies & Coastal Resource Management,
Madras Christian College (Autonomous),
Tambaram, Chennai – 600 059, India.

*E-mail : thirush2k3@yahoo.co.in, marinethiru@gmail.com

Keywords: *Stomatopods, shell, chitin, FT-IR*

Many multinational pharmaceutical companies are producing chitin products in a commercial scale. The crustacean (crab and shrimp) shell wastes are also utilized for this production. Only limited works are available about the crustacean stomatopods pertaining to the chitin extraction. Due to the lacunae in this field the present study had been carried out to extract chitin from the marine stomatopods *Orotosquilla quinquedentata* and *O.nepa*. The yield of chitin was more in *Oratosquilla nepa* where 20g of the shell yielded 2.145g of chitin with percentage contribution of 10.725%. The FT-IR spectrum of chitin was also confirming the presence of chitin in the shell of stomatopods. The results of the present investigation paves way and provides concrete information for the utilization of chitin in the development of drugs, artificial bone and raw material for the food industries in the near future.

224. Efficacy of flower extract of *Tagetes erecta* on wild *Drosophila melanogaster*

Vishnu K. Upadhayay and Prabu N. Saxena,

Toxicology lab, Department of Zoology,
School of life science, Khandari campus,
Dr. B. R. Ambedakar University, Agra

Key words : *Growth inhibitor, Tagetes flower extract, wild Drosophila melanogaster.*

Tagetes erecta popularly known as marigold, are grown as ornamental plant and

thrive in varied agro climates. *Tagetes erecta* flower extract exhibit insecticidal activity. *Tagetes erecta* flower extract has shown to exhibited growth and development inhibitor effect on wild *Drosophila melanogaster*, which has been used as a model insect in the present investigation. *Drosophila melanogaster* has been used to observe the sub lethal effect of flower extract of *Tagetes erecta*. The Lc50 of flower extract to wild *Drosophila melanogaster* was 208.5 μ l / 100 ml of food. Adult flies were fed 2 days on prescribed food treated with sub lethal concentration 20.85 μ l (1/10th of calculated Lc50) of flower extract and allowed to fertilize for 3 days and to complete their pre developmental stages. The flower extract has reduced number of the larvae and pupae, as compared to control set. The flower extract exhibits the toxicity against wild *Drosophila melanogaster*.

VIII. Toxicology and Pollution Biology

225. Toxic Effect of Pollutant on Thrombocytes of Fish

P. V. Kolkhede

Dept. of Zoology,
J. D. Patil Sangludkar Mahavidyalaya,
Daryapur, Dist. Amravati-444803 (M.S.)
E-mail : pv-123kolkhede@yahoo.com

Keywords : *Fishes, Pollutant, Thromobocyte count*

In the present paper, an attempt was made to study the effect of Monocrotophos on blood parameter of Freshwater fishes. The comparative effect of pollutant on three fishes reflects the thrombocyte count to a great extent at different time intervals at sublethal concentration of pesticide.

226. Protective Role of Chabazite in Mercury Toxicity : A study is Fish

Rakesh Shrivastava* and Subodh Kumar Jain

Department of Zoology, Dr. H. S. Gour University,
Sagar-470 003, M.P.

*Denielson Degree College, Chhindwara, M.P.

Key words : *Zeolite, Chabazite, Fish tissue, Glycogen*

Zeolites are naturally occurring, fine-grained colourless crystals with pronounced ion exchange property. They are porous having interconnected cavities, in which metal cations and water molecules reside. This gives the zeolites the cation exchange and reversible dehydration properties for which they are noted. I study 120 fish were acclimatized prior to experimentation for two weeks and divided in to four equal groups. Group I worked as control while group II, III and IV were exposed to Mercuric Chloride; Mercuric chloride+ Chabazite and only chabazite respectively. T the end of 30 days fish were sacrificed, their liver and kidney were removed and proceessed for estimation of protein contents. The observations of the study indicates that the addition of chabazite with Mercuric chloride protect the negative effects caused due to mercuric chloride. Exposure of fish to only chabazite caused increased biomass, keeping the other parameters normal, indicating that this natural zeolite can be used safely in animal system.

227. A Biochemical Study in Tilapia Fish (*Tilapia Mossambica*) to Indoxacarb Avaunt

Cannali Christy Deena, J., Dixy, B. A., and Prakash, D. J.

Department of Zoology,
Voorhees College,
Vellore-632001

Key words : *Indoxacarb, Toxicity*

Attempts have been made to investigate the physico-chemical characters of water, biochemical and histopathological changes induced by Indoxacarb (36ppm) on the gill, muscle and skin of the freshwater edible fish *Tilapia mossambica* following short – term exposure for 45 days.

The variations in the biochemical parameters were estimated in $\mu\text{g/g}$ wet weight of the respective tissues. With the various parameters studied, tissues such as gill, muscle and skin showed a gradual reduction at various stages of Indoxacarb exposure.

The total protein content decreased in all the tissues. This is due to the rapid utilization of body protein to meet the extra energy demand during the stress due to the toxicant.

The total carbohydrate content showed a decreasing trend in all the tissues. The reduction was attributed to the increased glycogenolysis to cope with greater energy demand induced.

The total lipid contents were declined steadily in all the tissues. In order to ameliorate the indoxacarb toxicity, the exposed fish need excess amount of energy. Therefore the available lipid sources might have been exploited to derive maximum energy resulting in the deterioration of lipid content.

The histopathological study clearly reveals a considerable damage in the skin and the gill due to direct contact with the pesticide.

228. Studies on Lipid Profiles of Fish Liver of *Gambusia Affinis* on Acclimation to Acidic Medium

Sabiha Khan, Neelam Sharma and Dooj Kumari

Department of Zoology
Govt. College, Ajmer (Raj.) 305001
Email : dr.sabihakhan@yahoo.in

Keywords : *Sub lethal, triglycerides, acidic stress and acclimation*

Freshwater fish *Gambusia affinis* were subjected to acclimation to sub-lethal acidic water (pH 4.0) and hepatic lipid metabolism was studied. Considerable depletion in various lipid reserves like total lipids, triglycerides, free fatty acids and glycerol was noticed with a remarkable increase in the tissue lipase activity. However, increased levels of phospholipids and cholesterol contents in the tissue were recorded. These results could possibly be correlated to the higher energy demands and improvements in the membrane organization induced by the acclimation to acidic water in order to get the positive survival value under the imposed acidic stress. There have been many reports of precipitation contaminated by

atmospheric pollution causing acidification of fresh water lakes and ponds from various parts of the globe. A disastrous consequence of such acid pollution has been the decline and disappearance of several fish populations from water system. The present study was undertaken to investigate the adaptive changes in hepatic lipid metabolism developed by the fish, in order to sustain in the acidified environment. The depletion in free fatty acid content could be due to their increased oxidation in the tissue leading to the formation of acetyl CoA for the release of energy or their active efflux into the blood stream.

229. Role of Mercury in Environmental Pollution and Human Health

Dilip Kumar Keshri

Dept. of Zoology, T. S. College,
Hisua' Nawada (Bihar)

Mercury (Hg) is a naturally occurring, highly volatile heavy metal found in traces throughout the environment ; rocks, soils and the ocean. It is found in three major types in environment like Methyl mercury, elemental and metallic mercury, sources of mercury in the environment are through volcanic eruptions, forest fires, fossil fuels, incinerators, industries, mining as well as from health care waste management. Methyl mercury which is formed by evaporation of Mercury, is very toxic which bioaccumulates and biomagnifies in the food chain. The exposure of mercury can cause pneumonitis, bronchitis, memory loss, weak muscles, gingivitis and symptoms of neurotoxicity.

230. Toxic effect of *Piper longum* extract and Econeem on the Tobacco cutworm *Spodoptera litura* Fab. (Lepidoptera : Noctuidae)

***Dr. M.Muthusamy, K.Samsiya Begam and R.Sathishkumar**

Post-Graduate and Research Department of Zoology
Government Arts College (Autonomous),
Coimbatore-640 018, Tamil Nadu, India.

Key words: Larval mortality, Larval stages, Econeem, Piper longum, Botanical insecticides.

The toxic effect of ethanolic crude extract of *Piper longum* and botanical insecticide

Ecomeem were tested on the Tobacco cutworm *Spodoptera litura* under laboratory conditions. Bioassay preparations were made (5, 10, 15, 20 and 25%) by mixing the emulsifier (Tween-20) and distilled water in the ratio of 1:10 and this was tested on all larval stages of *Spodoptera litura*. The leave disk assay method was followed to evaluate the larval mortality after 24h and 48h exposure period. The present study revealed that the *Piper longum* seed extract showed significant larval mortality ranging from 53.07% to 56.8% on all the larval stages after 48 h exposure period. Likewise the Ecomeem caused highest larval mortality 69.1% in the IV instar larvae after 48 h moderate larval mortality was observed 61.6% when treated with 15% extract after 24 h. The larval mortality decreased when the larval ages increased. Prolonged larval period was observed in the IV, V and VI instar larvae when treated with Ecomeem product. The present study revealed that the Ecomeem caused higher larval mortality when compared to *Piper longum* extract. Therefore it can be inferred from the present study that the lemonoid and alkaloid piperine might be the bioactive agents that promote larval mortality. Further detailed studies are required to investigate the activities of bio-agents. Thus the extracts could be used as Botanical insecticides, the best alternatives to synthetic pesticides in insect management strategies.

231. Sunthrin -25 induced alteration in enzymes activities in the blood serum of fresh water fishes, *Channa punctatus* of Bundelkhand region

K. Zahra and A.K. Vishwakarma

Department of Zoology,
Bipin Bihari (P.G.) College,
Jhansi (U.P.) India

E-mail:- zoology_fish2007@yahoo.com

Key word: *Cypermethrin, Chronic toxicity, Channa punctatus*

The present paper report the chronic effect of cypermethrin (25 % EC) (Trade name – Sunthrin- 25) on enzymes activities in fresh water fishes, *Channa punctatus*. The fishes were collected from Matateela dame. Fishes were acclimatized at room temp. for 8 to 10 days. The acclimatized fishes were divided into control and treated groups and every group contain 30 fishes. Treated group further divided three subgroup A, B, and C. Control group without toxicant treated group were exposed to sublethal concentration (1/10 of 96 hrs. LC₅₀ values) of Sunthrin -25 for 15, 30 and 45 days. After completing the experiment

blood was collected from each groups by severing the caudal peduncle. Serum was separated from the blood with the help of centrifuge. The activity of Serum Glutamate Oxaloacetate Transaminase, Serum Glutamate Pyruvate Transaminase, Serum Alkaline Phosphatases, and Serum Acid Phosphatases were measured. The results showed that the activity of S.G.O.T., S.G.P.T., Serum A.L.P. and Serum A.C.P. gradually increases after 15, 30 and 45 days.

232. Molecular Typing of Aeromonas Isolates from Polluted Water; Methods and Application

Mitali Dhiman and S.S.Mishra*

Regional Centre, Central Inland Fisheries Research Institute (I.C.A.R)
24, Panna Lal Road, Allahabad – 211 002 (U.P)
E.mail : m.dhiman@hotmail.com; ss_mishra60@yahoo.co.uk

Key words : *Aeromonas*, *Molecular typing*, *RAPD*, *PCR*

India has a large number of rivers that are lifelines for the millions living along their banks. There has been a steady deterioration in the quality of water of Indian rivers over several decades, as these receive millions of litres of sewage, industrial and agricultural wastes. Most of these rivers have been rendered to the level of sewage flowing drains. There are serious water quality problems in the cities, towns and villages using these waters. Water borne diseases are rampant, fisheries are on decline, and even cattle are not spared from the onslaught of pollution. Agarwal et.al.(1976) studied the bacteriological population of the river water and concluded that addition of untreated waste and sewage was responsible for the presence of pathogenic organisms posing threat to the residents of the Varanasi city.

The pathogen under investigation is bacteria belonging to the genus *Aeromonas*, family *Aeromonadaceae*, which are widespread in the environment, especially fresh water and have been implicated as pathogens in human and animal diseases. These are widespread in environmental habitats such as soil, freshwater, brackishwater, sewage and waste water, treated and untreated drinking water. They have been implicated in a wide spectrum of diseases of human infections and animals, including fish, frogs, reptiles, birds and cattle (Janda and Abbott, 1998; Pidiyar et al., 2002). This Genus is characterized by broad phenotypic variations; therefore, the taxonomy is constantly evolving. It has been

shown that the identification at species level of aeromonads is very difficult because of the wide variability of these strains. So far fifteen species have been considered, among which, six are considered to be pathogenic for human, while nine are non pathogen or “environmental”. Among *Aeromonas* species, *A.hydrophila*, *A.caviae*, *A.veronii*, *A.eucrenophila*, *A. popoffii* and *A.culicola* are predominating species isolated from human cases where as *A. hydrophila*, *A. sobria*, *A. veronii b.v. sobria* have been found fish samples (Janda and Abbott, 1998; Szczuka and Kaznowski, 2004). Since *A.hydrophila* was first recognized as an important pathogen for aquatic animals and significant opportunistic pathogen for humans having public health significance, many efforts were dedicated to find methods for accurate identification and classification of species belonging to this genus (Cascon et al., 1996). *Aeromonas* spp. are known to be phenotypically, serologically and genetically quite diverse and the conventional methods of identifying these microorganisms like microbiological culture, biochemical tests, protein analysis, serotyping etc. give contradictory results. Alternative specific genomic fingerprints have been proposed as diagnostic tools by means of amplification of interspersed repetitive DNA sequences present in bacterial genomes, referred to as rep-PCR (Rademaker and Bruijin, 1997) or by amplification of random sequences by arbitrary primers, RAPD (Williams et al., 1990). Different methods used for molecular typing of *Aeromonas* species and their application in identification, differentiation and characterization of species have been elaborated in the present paper.

233. Effect of Cypermethrin on Histology of Certain Vital Organs in A Teleost Fish *Ctenopharyngodon Idella*

N. Shettu

PG and Research Department of Zoology,
Pachaiyappa's College, Chennai – 600 030.
Email: nspc65@gmail.com

Key words: *Cypermethrin toxicity, Ctenopharyngodon idella, gill and liver histopathology.*

The histopathological effects of cypermethrin, a synthetic pyrethroid on the gill and liver tissues of the grass carp *Ctenopharyngodon idella* exposed to sublethal concentration was studied. The 96 hours LC₅₀ of cypermethrin for the grass carp was found to be 0.035 mg/l. One-fifth of the LC₅₀, i.e., 0.007 mg/l was used for the experiment, which

was conducted for duration of 15 days. The histopathological changes in the gill and liver of *Ctenopharyngodon idella*, exposed to cypermethrin were observed at regular intervals (1, 4, 8, 12, and 15 days). Appropriate controls were maintained for comparison and evaluation of the extent histopathological changes. The gill of the exposed fish showed less affected gill lamellae, shortening of secondary gill lamellae, disintegration of epithelial cells, curling, bulging and fusion of secondary gill lamellae. The liver of the exposed fish showed slight degeneration of cytoplasm of hepatocytes and formation of vacuoles. Pycnosis of hepatocytes with disintegrating cytoplasm and reduce nuclear size with pressing out of nucleus from the cytoplasm could also be observed. The results suggest that the synthetic pyrethroid cypermethrin even in low concentration might be harmful to the aquatic organisms.

234. Toxicological Impact of Copper Sulfate on Acetylcholine Levels in Various Tissues of Freshwater Fish *Cyprinus Carpio* (L)

N.Balambigai* and D.Aruna

P.G. and Research Department of Zoology,
Government Arts College (Autonomous),
Coimbatore - 641018, Tamil Nadu

Keywords: *Copper sulphate, Acetylcholine, Neurotoxin, fish*

Heavy metals are among one of the significant pollutants of freshwater, with the development of mining, smelting and other industrial activities. Presence of certain trace metals, such as copper and zinc, based on their role as metalloenzymes and as a cofactor of a large number of enzymes, are required for living organisms and their normal physiological activities. Although copper (Cu) is an essential nutrient for normal metabolic functioning it can be an important waterborne toxicant to aquatic organisms, particularly fish, when ambient concentrations exceed physiological thresholds. A high concentration of Cu had been correlated with liver damage. Fish samples can be considered as one of the most significant indicators in freshwater systems for the estimation of metal pollution level. Recent evidence indicates that fish, an extremely valuable resource, are quickly becoming scarce. The commercial and edible species have been widely investigated in order to check for those hazardous to human health. The pollution caused by heavy metals is a long-term and irreversible process. Toxic chemicals can damage the nervous system and brain. Acetylcholine is an essential messenger in neurotransmission in both central and

peripheral nervous system. Synapses are found in between nerve cells or between nerve cells and muscle cells that they innervate. Neurotransmitters are released from the pre synaptic cell, diffuse across the synaptic clefts, and bind to receptors on the postsynaptic cell. The fish *Cyprinus carpio* were exposed in the lethal concentration of copper sulphate for a stipulated period of 15 min, 30 min, and 45 min and subsequently for every one hour up to a period of 24 hours, 48 hours and 72 hours. Tissue samples of liver, brain and muscle were dissected out from control and copper sulphate treated fish and quantitative estimation of Acetylcholine content in the nervous and non-nervous tissues were carried out. Our results indicate that the ACh levels showed variable pattern of increase and decrease, depending on the duration of exposure and the type of tissue involved. It is an essential tool for improving the risk assessment process by understanding the sites and mechanisms of neurotoxicity, and the effects of neurotoxicants.

235. Neurodegenerative changes and behavioural abnormalities in rats exposed to deltamethrin neonatally

Nisha Patro and Ishan K. Patro

School of Studies in Neuroscience,
Jiwaji University, Gwalior 474 011, INDIA
nishapatro@rediffmail.com

There has been an exponential increase in the use of pyrethroids as residential and agricultural insecticides, thus developmental neurotoxicity of pyrethroid insecticides has become a subject of concern. We have assessed the effects of postnatal (P) exposure of a very low dose of deltamethrin (0.7 mg/kg, i.p.; 1/200th of the oral LD50 of rats) on the various aspects of postnatal cerebellar development with a specific focus on proliferation and migration of granule cells, morphogenesis and dendritogenesis of Purkinje neurons, apoptotic and neurodegenerative changes and associated response of the astrocytes and microglia and the development of the motor behaviour and motor coordination. Altered proliferation and migration of granule cells as result of the apoptosis of their progenitors (TUNEL positive) and the delayed appearance of radial glial fibers, reduced dendritic arbor with short primary dendrites and much reduced dendritic branches of the Purkinje cells subsequently showing abnormal aggregation of neurofilaments. S100 β upregulation of the astrocytes surrounding the degenerating Purkinje cells simultaneously expressing caspase-

3 further confirmed astrocytic death as a result of deltamethrin exposure. Deltamethrin has also been found to impair the development of the motor activity and motor coordination in rats.

236. Assessment of Benzene Induced Haematotoxicity in Charles Foster Rats

**R.K. Singh,*F.W. Bansode, Poonam Singh, Rakhi Gupta,
Chetan Dubey and Abhilasha Saxena**

Divisions of Toxicology and *Endocrinology
Central Drug Research Institute,
Lucknow - 226 001, INDIA

Benzene is used as an intermediate in the manufacture of a number of chemicals, including ethylbenzene, cyclohexane, nitrobenzene and in the manufacture of urethanes, chlorobenzene, and maleic anhydride. Benzene is also used in the production of plastics, rubber, resins, nylon, glues, dyes, detergents and pesticides. Benzene was previously used widely as a solvent, but this use has decreased in many countries due to its carcinogenic effects. It naturally occurs in crude oil and is a component of petroleum products and is present in gasoline. Benzene released from automobile exhaust, chemical plants, gasoline spills, and emissions from coke ovens has contaminated the environment (Haley, 1977). Benzene has been known as a haematologic poison since the nineteenth century. Many other haematological diseases have since been reported to be the result of benzene exposure. Many of the haematological disorders related to benzene may not be dose-dependent as the mechanism of these diseases is yet not completely understood. Benzene is haematotoxic and carcinogenic at high concentrations. Epidemiology studies have shown that people develop blood dyscrasias such as pancytopenia, aplastic anemia, polycythemia vera, myelofibrosis, erythroleukemia, lymphomas, myelomonocytic leukemia, acute myelogenous leukemia, chronic myelogenous leukemia, acute lymphocytic leukemia, chronic lymphocytic leukemia, acute promyelocytic leukemia, hairy cell

leukemia, myelodysplastic syndrome, non-Hodgkin's lymphoma, and multiple myeloma. The short term breathing of high levels of benzene can result in death, while low level inhalation can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion,

and unconsciousness. Eating or drinking foods containing high levels of benzene (like seafoods) can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, and death. Death due to acute benzene exposure has also been attributed to asphyxiation, respiratory arrest, CNS depression, or cardiac dysrhythmia. Pathologic findings in fatal cases have included respiratory tract inflammation, lung hemorrhages, kidney congestion, and cerebral edema. Information on the reproductive toxicity of benzene in humans is meager. Some effects on the testis have been noted in animals exposed *via* inhalation. Benzene has not been proven teratogenic in humans. In animals, high levels of benzene have resulted in decreased fetal weights and minor skeletal variants.

It is strongly believed that benzene carcinogenicity is mediated *via* immune suppression and DNA cell changes. It has been hypothesized that metabolism of benzene is required for its toxicity, although administration of benzene metabolites do not duplicates the toxicity of benzene. This study is concerned with the exposure of solvent benzene in Charles Foster rats at the dose levels 0, 0.25 and 0.5 ml/kg of body weight for its assessment on different haematological parameters. In our study, benzene caused significant toxicity in the experimental animals.

237. Toxicity Assessment of Potassium Nitrate in Charles Foster Rats

**R.K. Singh, *F.W. Bansode, Rakhi Gupta, Chetan Dubey
and Abhilasha Saxena**

Divisions of Toxicology and *Endocrinology,
Central Drug Research Institute,
Lucknow-226 001, INDIA

Potassium nitrate is a white, powdery compound that is known for its reactivity and solubility in water. The compound occurs naturally in many leafy, green vegetables and is used in several industrial applications. These include pesticides, food preservatives and fertilizers, to increase nitrogen content in soil, to prevent soil erosion, to increase the thickness of roots by increasing carbon production in plants, which in turn increases biomass (Santamaria, 2006). The majority of mixed fertilizers include potassium nitrate, or other nitrogen-based compounds. The pesticides utilizing potassium nitrate, includes rodenticides (to kill rodents), insecticides (to kill insects and bugs) and predacides (to kill large pests).

Due to the excessive use of potassium nitrate and other mineral fertilizers, its concentration is increasing in vegetables and drinking water, adversely effecting human health. It causes multiple physiological disorders such as methemoglobinemia when accumulated in high concentration in animals (Bensoltane *et al*, 2006).

In the present study, we had investigated the haematotoxicity and histopathological effects of potassium nitrate (KNO_3) on both male and female Charles Foster rats at the doses of 0, 45, 90, 135 mg/kg of body weight. Young albino rats of CF strain weighing 200-250 g each of both sexes, male and female were acclimatized to the laboratory conditions for 7 days prior to experiment. They were fed balanced rodent pellet diet and water *ad libitum* throughout the experimental period. Pure potassium nitrate in the form of powder was obtained from Merck Specialities Private Ltd. Mumbai, India. This chemical fertilizer was dissolved in distilled water at different concentrations according to the dose level and body weight of rats. A total of 32 rats (16 males and 16 females) were divided into 4 groups. Each group contained 4 male and 4 female rats kept in different cages. Group I served as control, group II rats were administered potassium nitrate at a dose of 45 mg / kg of body weight, group III rats received 90 mg / kg and group IV rats received 135 mg / kg of body weight. All the doses were administered orally for 14 days. One rat from each dose level was sacrificed on day 5 and day 10. The rest of the rats were sacrificed on day 14 to investigate the sign of toxicity. Body Weight Measurement: body weights of all the animals of different treated groups along with the control group were monitored weekly. Food & Water Intake: Food and water intake of all the animals of various groups were recorded weekly during the study. Blood samples were collected from the tail of rats in the EDTA vials, analyzed by MS-9 analyzer (Melet Schloesing Ltd., France) for different hematological parameters. The following observations were made while comparing the mean initial, final values of the different blood parameters of treated and control groups of animals. Haemoglobin (Hgb), Haematocrit (Hct), Total Red Blood Count (T-RBC), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC), Total Leucocyte Count (TLC), Differential Leucocyte Count (DLC) and Platelet Count. At the end of the experiment, all the rats belonging to different groups were sacrificed. Different organs (liver, lungs, kidney, trachea, heart, ovary and testis) were removed and preserved in 10% formalin till they were processed for paraffin embedding, sectioning preparation of histopathological slides. The slides were stained by haematoxylin and eosin according to standard methods for microscopic examination. Analysis of the data revealed, no significant adverse effect in animals, at the doses used in the experiment.

238. Assessment of Benzene Induced Haematotoxicity in Charles Foster Rats

Rakhi Gupta, Chetan Dubey, R.K. Singh

Division of Toxicology,
Central Drug Research Institute,
Lucknow - 226 001, India.

Keywords: *Bone marrow suppression, Anemia, Leucopenia, Thrombocytopenia, Benzene*

Benzene is a known haematotoxic compound which frequently effect bone marrow depression leading to anemia, leucopenia and thrombocytopenia. High level of exposure act as an anesthetic and effect central nervous system. National and international scientific and health organizations have considered benzene as a human carcinogen. It is strongly believed that benzene carcinogenicity is mediated *via* immune suppression and DNA cell changes. It has been hypothesized that metabolism of benzene is required for its toxicity, although administration of benzene metabolites do not duplicates the toxicity of benzene. This study is concerned with the exposure of solvent benzene in Charles Foster rats at the dose levels 0, 0.25 and 0.5 ml/kg of body weight for its assessment on different haematological parameters.

239. Effect of Endoparasitoid Cecidomyiids as a biocontrol agent of *Uroleucon gobonis* Mat. on the growth and yield of Safflower crop

Ramesh Chandra and Manoj Kumar

Department of Biological Sciences
Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya
Chitrakoot, Dist. – Satna (MP) – 485780

Keywords: *Endaphis aphidimyza, Safflower, Uroleucon sp., growth parameters*

Safflower, *Carthamus tinctorius* is an important oil crop of Marathwada region of Maharashtra containing 78% linoleic acid, which is responsible for the reduction of cholesterol level in the blood. This crop is being heavily infested by safflower aphids, *Uroleucon gobonis* Mat. Aphids suck the plant sap from the tender part of the plants

causing serious damage. *Endaphis aphidimyza* Shivpuje & Raodeo is one of the natural enemies of aphid, which check its population at moderate density. The present work was carried out in Agricultural Research Farm of Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot, District Satna (MP) during *rabi* season of 2008-2009 and 2009-2010. Safflower cultivar PBNS-12 was shown in random block design including nine treatments with three replications. Recommended agricultural practices were adopted to raise a good crop. The data was analyzed statistically by ANOVA .

Maximum plant height , number of primary branches per plant, secondary branches per plant, number of capitula per plant, number of seeds per capitula, 100 seed weight and seed yield were recorded as 149 cm per plant, 23.33 per plant, 95.56 per plant, 118.46 per plant, 31.26 per capitula, 5.72g and 1418.21 kg per ha respectively. Whereas in control condition these were 69.24 cm per plant, 3.06 per plant, 3.60 per plant, 3.60 per plant, 4.80 per capitula, 2.05g and 510.80 kg per ha respectively.

240. Hepatic changes in albino rat induced by the inhalation of Ammonia gas

Sandeep Asthana

Department of Zoology,
University of Allahabad
Allahabad-211002, India

Key words: *Ammonia, liver, toxicity, serum enzymes, necrosis.*

Pollution is ingredients causing pollution. They May be gases, liquids, solids of different chemical composition. During the process of manufacture, most industries produce pollutants. In many industries, ammonia gas (NH₃) is used as reducing agent. It is a corrosive gas, being highly soluble ion water reaches to the blood and affects various organs including liver. The liver in human is an indispensable organ which performs many functions. In living systems, liver is and considered to be highly sensitive to toxic agents and major detoxifying organ of the body.

In the present study albino rats, were exposed of two different concentrations (25 and 50 ppm) of NH₃ for one hour per day for different time duration (15 and 30 days).

The histopathological studies to assess the ammonia toxicity in terms of developed vascular changes were carried out. The ammonia gas exhibited multiple histological abnormalities in liver which include necrosis and degenerative changes in the liver tissue were accompanied by the alteration in the level of blood enzymatic parameters.

The activity of marker enzymes of liver functions (SGOT and SGPT) was estimated in the blood serum collected from control and exposed rats. A significant elevation in the activity of these enzymes was recorded in serum of treated rats which indicates their involvement in developing necrotic lesions in the liver. The SGOT activity was noted to be relatively higher in comparison to SGPT. Thus, changes in the activities of serum enzymes (SGOT and SGPT) may be a potential biomarker for NH₃ induced hepatotoxicosis ultimately affecting the general health by altering the functional and structural integrity of liver.

241. Copper sulphate induced changes in opercular beat rate and oxygen consumption of fresh water stinging catfish, *Heteropneustes fossilis* (Bloch) during sub-acute and chronic exposure.

Sandeep Shukla and Madhu Tripathi

Aquatic Toxicology Research Laboratory,
Department of Zoology,
University of Lucknow,
Lucknow-226007,
(U.P.) India.

*e-mail: drmtripathi@gmail.com

Key words: *Copper sulphate, Heteropneustes fossilis, Opercular Beat Rate, Oxygen Consumption.*

Copper is a grey listed heavy metal, widely used as algaecide and fungicide in aquaculture. Present study revealed that copper as copper (II) sulphate adversely affects physiology of fish during long term exposure. A gradual decrease were observed in oxygen consumption during sub-acute (10, 20 and 30 day) and chronic (30, 60 and 90 day) exposure. Similarly a significant increase in opercular beat rate were observed during sub-acute (10, 20 and 30 day) and chronic (30, 60 and 90 day) exposure. Fish gills are the primary site of metal exposure that ultimately results respiratory dysfunction. Mucous is a glycoprotein

which get coagulate and precipitated on gill surface in presence of metal leads to asphyxiation and thereby followed by increased opercular beat. Other possible mechanisms like AChE activity, for these changes have also been discussed.

242. Physico-chemical and Microbiological analysis of ground water of Town Deeg (Bharatpur) Rajasthan

Sunder Singh and B.K. Gupta

Department of Zoology
Govt. M.S.J. College,
Bharatpur (Rajasthan) India
Email : sunderbtp@gmail.com

Keywords: *Physico-chemical and microbiological analysis, Groundwater, water borne diseases, management strategies*

The physico-chemical and microbiological analysis along with management of groundwater resources has become a prerequisite to satisfy the need of water for domestic and agriculture purposes. The present study deals with the evaluation of quality of ground water (well and hand pump) of four areas in town Deeg (Bharatpur), Rajasthan during postmonsoon season (October, 2008 to January, 2009) to find out pH, T.D.S., T.H., CaH., Total Alkalinity, F, Cl, Dissolved Oxygen (DO), Phosphorus, Nitrate, Salinity and E coli. A comparison with ISI standards shows that TDS, TH, salinity, chloride, nitrate, and fluoride (all water) and CaH (hand pump) exceeded permissible limits. DO and phosphorus are within the limits. The *E coli* in well water has been recorded very high than the limits. Water borne diseases such as of heart, respiratory, gastric, skeletal deformities, diarrhea, jaundice, amoebiosis, arthritis etc. are prevalent in the area. The groundwater (well and hand pump) of Deeg (Bharatpur) is not fit for drinking purpose. Management strategies such as recharging ground water, registration and regulation of groundwater extraction, collection and disposal of waste water, adoption of traditional conservation methods, defluoridation (food rich in calcium and phosphorus, adoption of an activated alumina adsorption technique), nitrate removal (use of yellow mustard and food with vitamin-C) and awareness of public about the water quality importance and hygienic conditions may be employed.

IX. Veterinary Science

243. Studies on Feeding Guilds of Nematodes in a Banana Plantation of West Bengal

Viswa Venkat Gantait*, Asok Kanti Sanyal, Amalendu Chatterjee and
Tanmay Bhattacharya

Nemathelminthes Section, Zoological Survey of India,
M-Block, New Alipur, Kolkata-700 053, West Bengal, India

¹ Department of Zoology, Vidyasagar University,
Medinipur-721 102, West Bengal, India

*E-mail : v.gantait@rediffmail.com

Key words : *Nematode, Dorylaimida, Tylenchida, feeding guilds, banana, West Bengal.*

An ecological investigation was carried out in a banana plantation of West Bengal, from March 2004 to February 2006 during which 14 species of soil and plant parasitic nematodes were collected and identified. Of these, 8 species belonged to the order Dorylaimida and 6 species to the order Tylenchida. The species are categorized into four feeding guilds viz., plant feeder, bacteria feeder, predator and omnivore. Numerically plant feeders constituted 46%, bacteria feeders 10%, predators 11% and omnivores constituted 33% of nematodes in the field. The study reveals that plant parasitic nematodes predominated in the banana field over others. *Rotylenchulus reniformis*, one of the most serious pests of banana appears to be the most abundant species in the field.

244. *Aporcelaimellus digiticaudatus* sp. nov. (Nematoda ; Aprorcelaimidae) from mosses in India

Papia Das and Buddhadeb Manna

Department of Zoology, University of Calcutta
35, Ballygunge Circular Road, Kolkata 700 019

Key words : *India, epigeous mosses, new species, taxonomy, Aporcelaimellus digiticaudatus sp. nov.*

Aporcelaimellus digiticaudatus sp. nov. is described from epigeous mosses of

Calcutta, West Bengal, India. It is characterized by medium sized comparatively robust body (L = 1.26, 1.41), distinctly offset labial region, strong stylet, 18.75µm long and aperture occupying almost half of the stylet length, heart-shaped vulval lips, short and wide prerectum and 1.0-1.2 anal diameter long, mammillate tail with 15µm long digitate terminal projection. The new species belongs to short-tailed members of the genus *Aporcelaimellus* Henys, 1965, possessing a mammillate tail like *A. gerlachi* (Meyl, 1965) Heyns 1965, *A. kikereensis* Baqri et Coomans, 1973, *a. malagasi* Heyns, 1996, *a. paracentrocercus* (De Coninck, 1935) Baqri et Coomans, 1973 and *A. stilus* (Kirjanova, 1951) Andrassy 1986, *A. insularis* Andrassy 2004 but differs from all of them in having tail with different morphology and size.

245. Bovine Leukocyte Adhesion Deficiency Syndrome (Blad) : A Recessive Disorder in Holstein Cattle

Vijay Kumar

Dairy Cattle Breeding Division
National Dairy Research Institute,
Karnal-132 001, India

Agriculture continues to be the mainstay of the Indian economy. Agriculture and allied sectors contribute nearly 25 per cent of the Gross Domestic Production (GDP), while about 65-70 percent of the population is dependent on agriculture for their livelihood. Animal husbandry output constitutes about 30 per cent of the country's agricultural output. Many heritable mutations and diseases have been traced to autosomal chromosomes of different cattle breeds, most of these mutations are lethal or bring about deficiencies in the defense mechanism. More over due to coverage of wild type allele on mutant allele in heterozygotes, carrier animals may not show any phenotypic abnormality but are most likely to transmit the mutant alleles to the next generation. The same problem may assume catastrophic significance if the carrier is a bull intended to be used in artificial breeding programmes.

246. Study of a new Unsegmented Tapeworm, *Sudhaena Khurdensis* N.G., N.SP. from *Clarias batarachus* (LINN.)

A. K. Srivastav* Reetesh Kumar Khare* ,V. K. Sahu
and Vijay Kumar Yadav***

*Parasitological Laboratory,
Deptt. of Zoology, Bipin Bihari (P.G.) College
Jhansi (U.P.) India

**Deptt. Of Zoology, D.V. (P.G.) College,
Orai district Jalaun (U.P.) India

Seven fishes, *Heteropneustes fossilis* (Bloch) were caught from village, Chirgaon Khurd, district Jhansi (U.P.) India. Two were found infected with three alike cestodes in their intestines. Morphological studies of the cestodes revealed them to belong to a new genus *Sudhaena* n.g. of the family *Capingentidae* Hunter, 1930; Order *Caryophyllidea* Beneden in Carus, 1863. Diagnostic features of the genus are the presence of simple blunt scolex without any groove, cushion or spines, medium sized neck, numerous, oval to round, medullary testes, well developed cirrus pouch with or without internal seminal vesicle, M-shaped ovary with long arms, partly cortical and partly medullary vitellaria and oval to round operculate eggs.

247. Globalization and Dairying in Punjab

APS Dhaliwal¹ and Bharat Singh Bhattu²

¹Associate Professor (Animal Science),
PAU, Krishi Vigyan Kendra, Bathinda

²Incharge, PAU, Krishi Vigyan Kendra,
Sangrur.

Key words : *Dairying, Globalization, Management, Production, Cost, Income*

Animal husbandry occupies an important place in the Indian agrarian economy as the share of dairying in the total farm income continuously increasing. In the era of stagnation of yield in the crop farming, dairy has been adopted as an augmenting subsidiary occupation by the debt-ridden farming community of Punjab. The survey of dairying was conducted

with the objective of accessing the present dairy scenario of Punjab in the wake of globalization to frame the efficient policies and cooperative strategies to reduce the cost of milk production and to increase the income of dairy units. The study showed that despite the comparatively low price of milk in Punjab, globalization will have negative impact on dairy farming community. Therefore, government must develop efficient marketing and infrastructure to compete the global market.

248. Bright Future of Poultry Farming by Rural Women Through Self Help Groups

Bharat Singh Bhattu, Incharge,

PAU, Krishi Vigyan Kendra, Sangrur.

APS Dhaliwal

Associate Professor (Animal Science),

PAU, Krishi Vigyan Kendra, Bathinda

Key words : *Poultry farming, Women empowerment, Self Help Group, Potential*

India's poultry population is 3 per cent of the world population and its share is 0.2 per cent in eggs and negligible in poultry meat. However, the poultry has registered faster annual growth rate (10.68%) in comparison to livestock sector (6.22%), crop production (4.22%) and gross domestic product (7.14%) during the last decade. India is presently exporting poultry products mainly to UAE (62.5%), Oman (17%), Maldives (12.5%) and Bahrain (6%). Industry has the potential to employ 90 lacs persons. The developed countries have reached to provide 250 to 350 eggs and 20 to 25 kg poultry meat/person/year as against 45 to 50 eggs and 1000 gms poultry meat in India. Surveys have shown that as high as 84 percent of all active women are employed in agriculture along with management of poultry. A study of UNICRF- Sponsored Applied Nutritional Programme (ANP) revealed that rural women are better adapted to handle delicate chicks, have traditionally managed poultry and successfully accepted eggs among the vulnerable groups Government has decided to facilitate the setting up of one Self-Help-Group in 14 lacs habitations in the country. Empowering rural women as poultry farmers and making them economically sound through SHG will improve the family status.

249. Newcastle disease in Poultry: Diagnosis and Control

Parimal Roy

Central University Laboratory, Centre for Animal Health Studies
Tamilnadu Veterinary and Animal Sciences University
Madhavaram Milk Colony, Chennai-600051.

Poultry Sector in India has made a quantum jump from backyard Poultry to Poultry Industry but Newcastle disease (ND) is the most important disease poses a significant threat to this Industry. ND is a highly contagious and devastating disease in poultry caused by an avian paramyxovirus serotype 1. Because of severe nature of the disease and the associated consequences, ND is listed as OIE notifiable disease and clinically or sub clinically affects more than 200 different species of birds. The disease in chickens is characterized by a spectrum of clinical conditions which include respiratory distress, diarrhoea, torticollis, drop in egg production and mass mortality in susceptible flocks. Several commercial vaccines are being used in the field to control the disease but outbreaks are continued to be reported. Conventionally the disease is diagnosed at field level based on post mortem lesions and further isolation and Characterization of field isolates. Very often classical lesions could not be seen because of partial immunity. There is a change in the pattern and epizootiology of the disease because of vaccination pressure. Sampling of specimens requires attention. Haemagglutination (HA) and Haemagglutination inhibition (HI) tests with 1% chicken erythrocytes are commonly used for serodiagnosis but not always straight forward. Glutaraldehyde fixed erythrocytes were found advantageous over fresh erythrocytes. Monoclonal antibodies are widely used for identification and characterization of viruses but in some occasions they failed to group the isolates correctly. There is possible variation in surface epitopes. Reverse transcriptase – polymerase chain reaction and sequencing of F₀ cleavage site is an accepted test but the test failed to differentiate NDVs isolated from pigeon panzootic and waterfowl. Recently antigenic variation between Newcastle disease viruses of goose and chicken origin was recorded in China. There is a need for continuous surveillance and validation of the existing vaccines against the epizootic isolates. Because of wide host range it is difficult to eradicate the disease. The disease is mainly controlled by vaccination but efficacy of the vaccine need to be monitored at field level. Filter paper sampling of blood samples from layer flocks is promising for seromonitoring at field level. Vaccination schedule need to be modified according to serology. Yolk serology is another important area. Besides vaccination, hygiene and bio security plays important role for effective control of the disease.

250. Psychrotrops in Processed and Preserved Dairy Products

J.N.Khedkar, R.J.Desale and Rohini V. Darade

Department of Animal Science and Dairy Science

Post Graduate Institute

Mahatma Phule Krishi Vidyapeeth,

Rahuri – 413 722

Dist : Ahmednagar (Maharashtra), Inida

e.mail: jaihind_Khedkar@rediffmail.com

Key words: Contamination, Micro-flora, Milk, Pathogenicity Psychrotrops, Refrigeration, Spoilage

Consumer demands convenience dairy products with high in quality and nutritionally superior. This is possible mainly by refrigeration of dairy products with extended shelf-life. However, refrigeration leads to the emergence of new class trouble makers, the psychrotrophs leading to newer quality problems in processed and preserved dairy products. Such milk products includes, *Butter, Cream, Ice-cream, Paneer, Rabari, Shrikhnad, Basundi, Khoa, Lassi* etc. Manufacture of these products are based on tradition methods, without any regards to the quality of raw material used and / or hygienic conditions of processing. Under such conditions micro-organisms can find access in the products.

Preservation and distribution of these products at low temperature for long time, psychrotrophs get a chance to grow at 2°C to 7°C. If a load of milk contains 10^4 cfu/ml, then within 36 hrs the count reach to 10^5 cfu/ml. Such huge number produce proteases and lipases cause quality problems. Not only that live micro-organisms multiply and reaches to 10^7 cfu/ml leads to pathogenicity to the consumers. Some of the emerging spoilage / pathogenic microflora of this groups are *vibrio spp, Yersinia enterocolitica, Listeria monocytogenes, Salmonella panama, Staph.aureas and Bacillus spp.*

The means to overcome these problem can be possible by i) Preventing or minimizing contamination and ii) inhibition or destroying the contaminants through safety means. It is ideal to incorporate one or more safety factors or barriers in order to limit / prevent the growth of psychrotrophic contaminants. This give attention to GMP, sanitation. Hygienic product formulation, storage temperature and duration of storage. In this way to design high quality processed and preserved dairy products that pose minimum risk to consumers.

251. A Cost-Benefit Analysis of Vaccination Against Foot and Mouth Disease in Bovines

Mukesh Kr. Sinha and Thombare N. N

Directorate of Water Management (ICAR)
Chandrasekharapur, Bhubaneswar-751023
Orissa India

Key word: *Economics, Foot and Mouth Disease and Vaccination. development. Advance in Virus Research 53: 111-126.*

Field survey was conducted to assess economic benefits of vaccination across sample village through personal interview methods. A sample sum of 211 dairy animals were available for economic investigation. The analysis found that the disease incidence rate was quite low in vaccinated dairy animal. The loss due to reduction in milk yield, reduced market value and cost of treatment was also reported less in both cross bred and buffaloes vaccinated animals. The cost indicators show vaccination against Foot-and-mouth disease is profitable. The profitability of vaccination could further be increased, when applied selectively to animals run under increased risk of infections.

252. Genetic and Phenotypic Studies on First Lactation and Lifetime Performance Traits in Red Sindhi Cattle

P.K.Mallick, A.K.Ghosh and Harpal Singh

Krishi Vigyan Kendra,
Central Rice Research Institute,
Cuttack, Orissa

Key words: *Lifetime traits, genotypic and phenotypic correlation, lactation milk yield, herd life and heritability.*

The performance records of 717 Red Sindhi cows, progenies of 58 sires maintained at Central Cattle Breeding Farm, Chiplima, Orissa and Cattle Breeding Farm, Kalshi, Deheradun during 1966-2005 were used to estimate heritabilities, genetic, phenotypic and environmental correlations between the first lactation and lifetime performance traits. Model used for estimation of sire and residual variance and covariance components considering

sire as a random effect and farm, period and season of calving as fixed effects. The averages for age at first calving (AFC), first lactation milk yield (FLMY), first lactation milk yield of 305 days (305dFLY), first lactation period (FLP), first dry period (FDP), first service period (FSP) and first calving interval (FCI) were 1458.31±33.32 days, 1536.35±54.88 kg, 1546.21±37.55 kg, 303.84±5.25 days, 172.75±9.58 days, 191.56±1.45 days and 476.59±10.91 days, respectively. Herd life (HL), number of days of milking (NDM), lifetime milk yield (LTMY) and lifetime milk yield per day of herd life (LTMY/HL) were 1476.75±54.27 days, 1151.26±58.72 days, 6842.17±446.43 kg and 5.13±0.27 kg, respectively. Heritability estimates for AFC, FLMY, 305dFLY, FLP, FDP, FCI and FSP were 0.29±0.07, 0.10±0.05, 0.11±0.05, 0.04±0.04, 0.07±0.04, 0.11±0.05 and 0.09±0.05, respectively. Heritability estimates for lifetime performance traits were higher than heritability estimates for first lactation traits. AFC had negative and non significant phenotypic correlation with FLMY, 305dFLY, FLP, LTMY, LDM and LTYM/HL while positive phenotypic correlation were observed with FDP, FCI, FSP and HL in first lactation and lifetime performance traits. The corresponding genetic correlations had positive to all the first lactation and life time traits except LTMY and LTMY/HL. Among the life time traits the phenotypic correlations were moderate to highly positive and significant it indicates that they might be helpful in indirect selection; therefore, it is desirable to select the animals on the performance of earlier lactations rather than traits expressed later in life.

253. Nutritional aspect of reproduction in cattle-A Review

P.K.Mallick

Krishi Kigyan Kendra,
Central Rice Research Institute
Cuttack-753006

Key words: *Repeat breeding, fertility, puberty, testicular, uterine*

Nutrition is a major management factor to affect the fertility since long it is known that poor nutrition is associated with reduced fertility. Reproductive failure is a major problem in cattle under field condition for research such as hormonal imbalance, reproductive diseases and nutritional deficiencies or imbalance. There are profound interrelationships between the nutritional status of dairy cattle and the reproductive performance. This article reviews a brief discussion of some specific areas where nutrition has been documented to have an effect on reproduction in cattle. Deficiency like Protein, Vitamins, Minerals, Calcium,

Phosphorous, Selenium, Iodine, Copper, Cobalt, Manganese and Zinc causes like delay onset of puberty, prevent the synthesis of tissue, fertility problem, growth of skeletal system, associated with repeat breeding, white muscle disease, synthesis of thyroid hormone, RBC development delayed uterine involution, decreased conception and delayed testicular development, respectively. To identify or prevent nutritional problem it is important that an effective working relationship should exist between dairyman, his veterinarian, and nutritionist. Effective communication of knowledge should serve to minimize problems and maximize fertility and production.

254. Common Bacterial Contamination in Pork Products

S.P.Ghoshal and Amit Kumar Ghoshal

Building no.C-6, Sector –II
Shantinagar ,Mira Road.(E)
Maharashtra-401107.

Meat is an ideal cultural medium for many organisms.

In the most European countries and united states of America suitability for consumption of meat food products is judged largely upon the presence of E.Coli using the specific standard prescribed by the country. However, no national standard appeared to have laid down so far for the pork products in India.

In the present study 120 samples of different pork products viz.ham, bacon, salami, sanges, luncheon meat etc.Were analysed for potential pathogens usually responsible for food poisoning.the significant presence of such organisms highlights the public health hazard in the pork products.

In the present study one strains of E.Coli was isolated from sanges. The typed organisms belong to "O" group which is of great public health importance and may be responsible for fertile diarrhoea .cystitis and poly nephritis.Similar and variable presence of isolation has also been reported by other viz.Kafel(1966) and Sherikar et al.(1980).

STAPHYLOCOCCUS

Out of 120 meat samples,only 2 strains of Staphylococcus were isolated .all were coagulates positive haemolytic and positive for caalage test . Staphylococcus is an organism

which can be found in the body of every animal or man as well as environment.

The present finding corroborates the report of Ghosh(1976) and Hobbs (1965) the Staphylococcus are mostly found in samples of human.

Pseudomonas aeruginosa strains were isolated from processed products (sausages).

The Occurrence of the organisms had been by other workers viz. Ayres(1960); Michezer and Elliot(1964); Sherikar et al (1979) and (1980).

Citrobacter-three(3) strains of Citrobacter were isolated.

255. Production and Reproduction Performances of Exotic Breeds of Rabbits Reared under Tropical Climatic Conditions of Tamil Nadu

Thiruvenkadan, A.K*., Sivakmar, K., Ramesh Saravana Kumar, V**.,
Anandha Prakash Singh, D**., Saravanan, R* , Jayakumar, V
and Muralidharan, R****

*Department of Animal Genetics and Breeding,
Veterinary College and Research Institute,
Namakkal – 637 002, Tamil Nadu, India

**Department of Livestock Production and Management,
Veterinary College and Research Institute,
Namakkal – 637 002, Tamil Nadu, India

Key words: *White Giant, Soviet Chinchilla, litter size, litter weight*

Data on 755 kindling observed in White Giant (n=374) and Soviet Chinchilla (n=381) breeds of rabbits between the year 2005 and 2009 were analyzed to assess the influence of genetic and non-genetic factors on different traits at tropical climatic conditions of Tamil Nadu. The overall least-squares means for litter size at birth and weaning, litter weight at birth and weaning and pre-weaning growth rate were 5.1 ± 0.1 , 3.9 ± 0.1 , 260.5 ± 2.4 , 2537.6 ± 28.7 g, 51.6 ± 0.5 g, 668.4 ± 8.2 g and 14.5 ± 0.2 g, respectively. Breed had highly significant ($P < 0.01$) effect only on litter weight at weaning, individual kit weight at weaning and pre-weaning growth rate. In general, year and season of birth had significant ($P < 0.05$) to highly significant effect ($P < 0.01$) on all the traits studied. The heritability

estimates obtained for litter size at birth and weaning and litter weight at birth and weaning were 0.469 ± 0.141 , 0.493 ± 0.141 , 0.475 ± 0.141 and 0.309 ± 0.131 , respectively. Monsoon season (June to November) were the most favourable season, whereas summer (March to May) proved to be the most unfavourable season for different production traits. Because of higher heritability estimates, mass selection is recommended for genetic improvement of both the production and reproduction traits in White Giant and Soviet Chinchilla breeds of rabbit.

256. Body Growth Characteristics of Holstein Friesian X Sahiwal Crossbred (Frieswal) Bulls

**D. K. Mandal¹, S. K. Tiwari², A. Sharma², B. K. Roy²
and Mahesh Kumar²**

Project Directorate on Cattle
(Indian Council of Agricultural Research),
P Box No. 17, Grass Farm Road,
Meerut Cantt 250 001, U.P., India

Key words : *Body growth, average daily weight gain, Frieswal crossbred Bull, Season*

Knowledge on body weight and growth rate of animals and the factors that influence these is essential for monitoring the body development, designing of management practices, optimization of feeding schedule, ration calculation, drug doseage determination etc. Body weight records of 293 Frieswal (Holstein Friesian x Sahiwal; having 5/8 exotic inheritance) bull calves/ bulls maintained at the Bull rearing Unit of the Directorate was taken. The Data was spread over a period of 4 years (2006-2010). The mean (\pm SE) body weight of bull calves aged 3, 6 and 12 months were 83.45 ± 4.79 , 122.36 ± 2.61 and 206.91 ± 4.56 kg. respectively. At 18 months (age of induction for semen collection) weight of young bulls become 57% of their mature body weight (550 kg). At 2, 3, 4, 5 and 6 years of age the mean (\pm SE) body weight was 411.95 ± 6.01 , 550.24 ± 10.03 , 644.74 ± 10.22 , 657.50 ± 15.28 and 680.23 ± 21.43 kg. respectively. The body weight of Frieswal bulls showed continuous enhancement up to 6½ years, thereafter declined to 663.50 ± 11.50 kg at 7 years of age, which indicated onset of senility in these crossbred bulls between 6 ½ to 7

years. Age of bull significantly influenced the average daily body weight gain (ADG in g/d) and average daily increase in body surface area (BSA in cm^2/d). In young bulls (03-36 months) ADG in g/d and average daily increase in body surface area (BSA in cm^2/d). In young bulls (03.36 months) ADG and daily enhancement of BSA were significantly ($P < 0.01$) higher (440.35 ± 6.64 and 225.17 ± 3.39 , respectively) as compared to adult bulls (173.84 ± 6.39 and 62.76 ± 4.56 , respectively). Body weight and BSA increased with age advancement, however, ratio of BSA to unit body weight (BSA/Kg) gradually decreased. Seasons of feeding and management significantly ($P < 0.05$). The trends of seasonal influence on average daily body weight gain and enhancement in body surface area in mature bulls (37-92 months) were also similar to that of young bulls. Season of birth of bull calves showed no significant impact on growth rate of young bulls. Age of bull showed significant impact on growth rate of young bulls. Age of bull showed significant ($P < 0.01$) positive relationship with body weight and body surface area, however, negative relationship with BSA/kg of body weight. The present study reported baseline information on body weight, growth rate and body development of Frieswal crossbred bulls of different age categories; age of bull and season of rearing had significant influence on average daily gain in body weight and body development, season of birth showed no significant influence on growth traits and probable age for onset of sensility in Frieswal bull was between 6½-7 years.

98th Indian Science Congress

January 3-7, 2011, Chennai

VI

LIST OF PAST SECTIONAL PRESIDENTS

PAST SECTIONAL PRESIDENTS

Animal, Veterinary & Fishery Sciences

G. K. Kulkarni	(2010)	P.M.Hejmadi	(1993)
Dilip Kumar	(2009)	R.Ramamurthi	(1992)
A. L. Bhatia	(2008)	O.P.Mittal	(1991)
U. C. Goswami	(2007)	N.C.Datta	(1990)
Nirupama Agrawal	(2006)	V.C.Shah	(1989)
B.D.Joshi	(2005)	P.K.Sen Sarma	(1988)
R.C.Sobti	(2004)	A.N.Chattoraj	(1987)
R.N.Chatterjee	(2003)	A.S.Mukherji	(1986)

Zoology, Entomology & Fisheries

		S.Khera	(1985)
M.Shamim Jalrajpuri	(2002)	S.B.Singh	(1984)
Geetha Bali	(2001)	C.C.Das	(1983)
Santosh Kumar	(2000)	K.C.Bose	(1982)
M.C.Dash	(1999)	J.P.Thapliyal	(1981)
P.D.Prasada Rao	(1998)	J.Datta	(1980)
Ishwar Prakash	(1997)	ViswaGopal Jhingran	(1979)
B.N.Pandey	(1996)	B.K.Behura	(1978)
K.C.Pandey	(1995)	P.N.Srivastava	(1977)
Vivekananda Banerjee	(1994)	U.S.Srivastava	(1976)

Zoology & Entomology		N.K.Panikkar	(1953)
Ravi Prakash	(1975)	B.R.Seshachar	(1952)
H.S.Chaudhry	(1974)	J.L.Bhaduri	(1951)
Asok Ghosh	(1973)	B.C.Basu	(1950)
T.Ramachandra Rao	(1972)	M.L.Roonwal	(1949)
M. Swarup	(1971)	A.B.Misra	(1948)
A.P.Kapur	(1970)	G.D.Bhalerao	(1947)
G.K.Manna	(1969)	M.A.Moghe	(1946)
M.D.L.Srivastava	(1968)	H.N.Ray	(1945)
Sivatosh Moorkerjee	(1967)	Vishwa Nath	(1944)
G.P.Sharma	(1966)	B.N.Chopra	(1943)
R.V.Seshaiya	(1965-1964)	Purnendu Sen	(1942)
B.S.Chauhan	(1963)	Zoology	
L.S.Ramaswami	(1962)	A. Subba Rau	(1941)
S.P.Ray Chaudhuri	(1961)	B.K.Das	(1940)
H.D.Srivastava	(1960)	C.R.Narayan Rao	(1939)
B.S.Bhimachar	(1959)	G. Matthai	(1938)
P.Bhattacharya	(1958)	G.S.Thapar	(1937)
M.B Lal	(1957)	H.K.Mookerjee	(1936)
M.L.Bhatia	(1956)	Diwan Anand Kumar	(1935)
Purnendu Sen	(1955)	P.R.Awasti	(1934)
D.V.Bal	(1954)	R.Gopala Aiyar	(1933)

D.R.Bhattacharya	(1932)	F.M.Gravely	(1921)
B.L.Bhatia	(1931)	Zoology and Ethnography	
S.L.Hora	(1930)	N.Annandale	(1920)
F.C.Fraser	(1929)	F.M.Howlett	(1919)
B.Sundara Raj	(1928)	B.L.Chaudhuri	(1918)
R.B.S.Sewell	(1927)	K.Ramunni Menon	(1917)
H.R.Mehra	(1926)	W.N.F.Woodland	(1916)
Baini Prasad	(1925)	N. Annandale	(1915)
K.N.Bahl	(1924)	J.R.Henderson	(1914)
N.Annandale	(1922)		

**PROCEEDINGS
OF THE
NINETY EIGHTH SESSION OF THE
INDIAN SCIENCE CONGRESS
CHENNAI, 2011**

**PART II
SECTION OF ANIMAL, VETERINARY & FISHERY SCIENCES**

President : Prof. U. C. Srivastava

CONTENTS

I. Presidential Address	3-24
II. Abstract of Platinum Jubilee Lecture	27
III. Abstract of Award Lecture / Young Scientist Award Programme	31-32
IV. Abstracts of Symposium / Invited Lectures	35-70
V. Abstracts of Oral / Poster Presentations	75-277
VI. List of Past Sectional Presidents	281-283