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INDIAN FISHERIES ABSTRACTS



Central Inland Fisheries Research Institute
(Indian Council of Agricultural Research)
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ENTRIES

1. Baghel, K. K.; Behera, M. K.; (Fisheries & Toxicology Laboratory, Post Graduate Department of Zoology, G M. (Autonomous) College, Sambalpur 768004, (India)); Behera, Rajesh (Department of Zoology, Stewart Science College, Cuttack 753001, (India)). **Copper substitution in the bone mineral of a fish *Oreochromis mossambicus* (Peter)**. Environment & Ecology (2010) v. 28(3) p. 1466-1468.

The inorganic part of the bone, which is made up of crystalline hydroxylapatite, constitute 40% of the total weight of the bone. The principal inorganic component of the hard tissue is closely related to the basic calcium phosphate, $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$, known by its mineralogical name of hydroxyapatite (Hap). Cu^{2+} undergoes cationic substitution and isomorphically substituted into the hydroxylapatite. Synthetic and natural apatite exchange calcium with copper and the exchange rate increases with increase in Cu^{2+} concentration, decreases with increase in particle size of apatite, and increases with increase in period of equilibration.

2. Baghel, K. K.; Behera, M. K. (Fisheries & Toxicology Laboratory, Post Graduate Department of Zoology, G M. (Autonomous) College, Sambalpur 768004, (India)); Behera, Rajesh (Department of Zoology, Stewart Science College, Cuttack 753001, (India)). **Alterations in the protein, cholesterol, ascorbic acid and lipid contents of brain in the copper exposed fresh water fish *Oreochromis mossambicus* (Peters)**. Environment & Ecology (2010) v. 28(3) p. 1469-1472.

Toxic effects of copper in chronic, sublethal concentration of 10 ppm copper and different concentrations of copper (5, 10, 15 and 20 ppm) on the brain of *Oreochromis mossambicus* were studied. There were significant changes in the protein, cholesterol, ascorbic acid and lipid contents of the brain on exposure to chronic dose of 10 ppm copper for 60 days. The protein, ascorbic acid and lipid content steadily decreased with an increase in the duration, whereas the cholesterol content showed a steady increase with an increase in the duration of exposure time. The protein, cholesterol, ascorbic acid and lipid content of the brain showed significant changes on exposure to 5, 10, 15 and 20 ppm copper concentrations for 30 days. The protein, ascorbic acid and lipid contents decreased with an increase in the concentration. Where as the cholesterol level steadily increased with an increase in the concentration of copper.

3. Baghel, K. K.; Behera, M. K. (Fisheries & Toxicology Laboratory, Post Graduate Department of Zoology, G M. (Autonomous) College, Sambalpur 768004, (India)); Behera, Rajesh (Department of Zoology, Stewart Science College, Cuttack 753001, (India)). **Effect of copper on the behavior, morphology and skeletal abnormalities in the fish, *Oreochromis mossambicus* (Peters)**. Environment & Ecology (2010) v. 28(3) p. 1473-1476.

The LC_{50} dose of copper was worked out to be 26.74 ppm. The fish did not show any abnormal behavior at 5 ppm concentration of copper. The fish showed pronounced fright reactions when exposed to doses more than 100 ppm of copper. There was erratic opercular movement, respiration became deep and more frequent, elevated muscle tone, raised fins and loss of sensitivity. The swimming becomes jerky and erratic, copious mucous secretion and titanic coma sets in. Disturbances in pigmentation occurs causing lightening of body coloration. Frequent hemorrhages occurred near the caudal region, bases of pectoral fins and near the mouth. Necrosis of fin regions was observed. Body deformities were noted only after 15 days of treatment. Bending of vertebral column, fracture in some vertebrae with peri-vertebral accumulation and

mass formations at the caudal region were noted. Loss of fin rays of dorsal fin and caudal fin was observed.

4. Baishya, Sangipran; Shingare, E. Prakash; Dhaker, Hukam Singh; Patel, D. Hitesh. (Department of Aquaculture, College of Fisheries, Dr. Balashaeb Sawant Konkan Krishi Vldyapeeth, Ratnagiri, Maharashtra, (India)). **Greenwater rearing improved the growth and survival of spawn of Pearl Gourami, *Trichogaster leeri* (Bleeker 1852).** Environment & Ecology (2010) v. 28(3) p.1580-1582.

Proper nourishment at the first feeding stage of any cultured variety of ornamental fish species results in successful seed production. Growth and survival of spawn of pearl gourami, *Trichogaster leeri* by using different regimes of live food was evaluated during the study. The aim of the study was to find an appropriate feeding regime for the spawn of *T. leeri* since the initiation of feeding. The spawn fed with the feeding regime of greenwater-decapsulated *Artemia cysts-Artemia nauplii-mixed* zooplankton showed the higher growth and survival when compared to other feeding regimes of live food. Pearl gourami spawn (average initial length = 3.6 ± 0.03 mm, average initial weight = 69.82 ± 0.005 mg) were stocked and showed increased growth and survival at the end of the study. The feeding regime of greenwater-decapsulated *Artemia cysts-Artemia nauplii-mixed* zooplankton showed significant difference compared to the rest of the feeding regimes indicating that green water is the most favored feed by the first feeding larvae of *T. leeri*.

5. Barat, A.; Sharma, S.; Matura, R.; Mahanta, P. C; (Fish Genetics and Breeding Laboratory, Directorate of Cold water Fisheries Research, (ICAR), Bhimtal-263 136, Nainital, Uttarakhand, (India)). **Development of eight EST-derived microsatellite markers in Indian snow trout (*Schizothorax richardsonii* Gray 1832)** Journal of Inland Fisheries Society of India (2010) v. 42(2) p. 21-24.

Indian snow trout, *Schizothorax richardsonii* is distributed in fast flowing torrential snow-fed streams, river and lakes in various altitudes of the Himalayas. Developed fifteen microsatellite markers from approximately 32923-expressed sequence tags (ESTs) of common carp and evaluated eight of them in 42 unrelated specimens of *S. richardsonii*. The number of alleles per locus ranged from 3 to 6. The observed heterozygosity (H_o) ranged from 0.0999-0.937 and the expected heterozygosity (H_e) ranged from 0.675-0.755. Because of high level of polymorphism the microsatellite markers reported here would be useful to study population genetics and linkage mapping of Indian snow trout.

6. Bhattacharyya, Subhrabikash; Panigrahi, Akshaya (Kakdwip Research Centre of the Central Institute of Brackishwater Aquaculture, Kakdwip South 24 parganas - 743 123, West Bengal, (India)); Mitra, Abhijit (Department of Marine Sciences, University of Calcutta, 35 Ballygunge Circular Road Kolkata -700019, West Bengal, (India)); Mukherjee, Jaydeep (Environmental Science Programme, Jadavpur University, Kolkala - 700032, West Bengal, (India)). **Effect of physico-chemical variables on the growth and condition index of the rock oyster, *Saccostrea cucullata* (Born) in the Sundarbans, India.** Indian Journal of Fisheries (2010) v. 57(3) p. 13-17.

The effect of physico-chemical variables on the growth of the edible oyster, *Saccostrea cucullata* in the Sundarbans, India was investigated in a culture experiment. The results of the study indicate that the oysters grow better in high saline and pH conditions. High phytoplankton density is needed as feed for the oysters. The region of rich mangrove vegetation contributes substantial nutrients in the aquatic subsystem through litter and detritus and thereby enhancing the

phytoplankton density and diversity. The aquatic subsystem of Ganges estuary is highly turbid due to the influx of river discharge and runoff into the system. Such a condition is not favorable for the growth and survival of the oysters. The condition index of oysters showed a unique seasonal variation with highest value during pre-monsoon and lowest during monsoon. There is an effect on the spawning process in which the gametes are released during the period of high salinity, pH and water temperature. This study demonstrated that the culture of *S. cucullata* can be accepted as an alternative sustainable livelihood in the Sundarbans as no external addition of chemical nutrients to enhance the growth of the oysters is required.

7. Bhaumik, Utpal; Saha, S. K.; Mitra, A. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata 700120 (India)); Paria, T. (Department of Fisheries, Aquaculture, Aquatic Resource & Fishing Harbors, Government of West Bengal, Kolkata 700001, (India)); Saha, Suman; Gupta, A. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata 700120. (India)). **Aqua-ecosystem analysis of floodplain wetlands of West Bengal for evolving desirable management options.** Environment & Ecology (2010) v. 28(3A) p. 1927-1932.

Floodplain wetlands are the most valuable natural ecosystems as they are vital to the existence of man and human civilization on earth. Floodplain wetlands locally known as *Beels*, *Jheels*, *Chaur*, *Maun*, *Diara* and *Pats* in different parts of the country. West Bengal has more than 150 *beels* covering an area of 42,000 ha, constituting 22% of total freshwater area of the state. They are related to the rivers viz., Bhagirathi, Hooghly, Ichhamati, Jalangi, Churni, Kalindi, Dharala, Pagla, Behula, Torsha, Punornava. Scientific management techniques developed over the years have shown that fish yields from West Bengal *beels* can be raised to 1,000-1,500 kg/ha per year from its present level of only 200-400 kg/ha per year. There has been a shift in recent years from the traditional approach to a more scientific management system where option on resource management in appropriate manner has been given thrust for sustainable production. This vision reflects the importance of providing basic human needs to ensure better livelihoods of the fishers. To identify the components desirable for resource management, aqua-ecosystem analysis of floodplain wetlands of West Bengal depicts that 31 bio-physical factors and 14 socio-economical factors are responsible for sustainable production. The identified interventions towards sustainability are proper management and people's participation.

8. Borah, Bibha Chetia; Gogoi, Rimzhim; Kakati, Bipul Kumar; (Fisheries Research Centre, Assam Agricultural University, Jorhat, Assam, (India)). **Breeding of *Amblyphaygodon mola* (HAM) in small homestead ponds.** Journal of Inland Fisheries Society of India (2010) v. 42(2) p. 42-47

The breeding period of the fish *Amblypharyngodon mola* was found to extend from March to October with three peaks, during March-April, June-July and September-October. The age at first maturity was found to be at average length of 6.5 cm. The ova diameter ranged from 0.15-0.62 mm during the development period. The fecundity ranged from 1562-2362. In female *A. mola*, mean Gonado Somatic Ratio varied from 3.2 to 15.12 in different months with peaks in March (13.41), June (15.12) and September (14.0). *A. mola* is prolific breeder, breeding thrice in a year. Proper gonadal development and successful breeding in the experimental environment also indicated that the prevailing environment of the small pond is congenial for culture of the species.

9. Chalkoo, Salman Rauoof (Farm Manager, Department of Fisheries, Government of Jammu and Kashmir, (India)); Mir, Showkat Ali (Joint Director, Department of Fisheries, Govt. of Jammu and Kashmir (India)); Najjar, A. M. (Asst. Professor cum Junior Scientist, Division of Fisheries, Sher - Kashmir University of Agriculture Sciences and Technology, Shuhama, Alusteng, Srinagar. (India)); Bhat, Shabir Ahmed (Research Scholar, Department of Zoology, Govt. N.M.V.

College, Hoshangabad, (India)). **Furunculosis in Snow trout (Schizothoracinae) in Kashmir First Report.** Aquacult (2010) v. 11(2) p. 155-164.

Incidences of furunculosis were reported in *Schizothorax* spp. (*Schizothorax niger*, *S. esocinus*, *S. curvifrons* and *S. labiatus*) in Wular Lake, Kashmir from 2003 to 2005. The disease was reported during summer and winter months, but percentage of infection was maximum during winter. Mortality rate ranged from 8 to 15%. Artificial challenge of *Schizothorax* with *Aeromonas salmonicida* produced symptoms pertinent to furunculosis. The incidence of disease was highest (13.87%) in December and lowest (0.40%) in May and October. *Schizothorax esocinus* exhibited the maximum (44.48%) percentage of infection, while as *Schizothorax labiotus* exhibited minimum (14.28%) percentage of infection throughout the study period. Hematological investigations revealed devastating changes in various blood parameters. Chemotherapeutic tests revealed complete recovery of the disease using 20 ppm oxytetracycline and 30 ppm streptomycin.

10. Chalkoo, Salman Rauoof (Farm Manager, Department of Fisheries, Government of Jammu and Kashmir, (India)). Mir, Showkat Ali (Joint Director, Department of Fisheries, Govt. of Jammu and Kashmir (India)). Bhat, Shabir Ahmed (Research Scholar, Department of Zoology, Govt. N.M.V. College, Hoshangabad, (India)). Najar, A. M. (Associate Professor, Division of Fisheries, Sher - Kashmir University of Agriculture Sciences and Technology, Shuhama, Alusteng, Srinagar. (India)); Manohar, Susan (Lecturer, Department of Applied Aquaculture, Barkatullah University, Bhopal - 462024 (India)). **Bacterial coldwater disease in Schizothoracinae (Snow trout) - cause, nature & control.** Aquacult (2010) v. 11(2) p. 181-186.

Incidences of bacterial coldwater disease were reported in *Schizothorax* spp. (*Schizothorax niger*, *S. esocinus*, *S. curvifrons* and *S. labiatus*) in Wular Lake, Kashmir. The disease was reported only during winter months. Mortality rate ranged from 8 to 15%. Artificial challenge of *Schizothorax* with *Cytophaga psychrophila* produced symptoms pertinent to bacterial coldwater diseases. The incidence of disease was highest (25%) in January and lowest (10% and 7%) in March and October. *Schizothorax niger* exhibited the maximum (42.70%) percentage of infection, while as *Schizothorax curvifrons* exhibited minimum (14.58%) percentage of infection throughout the study period. Hematological investigations revealed devastating changes in various blood parameters. Antibiotic sensitivity tests revealed varying response of *Cytophaga psychrophila* to seventeen antibiotics tested. Chemotherapeutic tests revealed complete recovery of the disease using 10 ppm methylene blue and 30 ppm ciprofloxacin.

11. Chalkoo, Salman Rauoof (Department of Fisheries, Government of Jammu and Kashmir, (India)); Charoo, Samina (Research Scholar, Department of Aquaculture & Zoology, Barkatullah University, Bhopal (India)); Mir, Showkat Ali (Joint Director, Department of Fisheries, Govt. of Jammu and Kashmir (India)); Najar, A. M. (Associate Professor, Division of Fisheries, Sher - Kashmir University of Agriculture Sciences and Technology, Shuhama, Alusteng, Srinagar. (India)); Manohar, Susan (Lecturer, Department of Applied Aquaculture, Barkatullah University, Bhopal - 462024 (India)); Shammi, Q. J. (Asst. Professor, Govt. N.M.V. College, Hoshangabad, (India)). **Hematology and Plasma Chemistry Values of Rainbow trout (*Onchorhynchus mykiss*).** Aquacult (2010) v. 11(2) p. 197-205. Rainbow trout (*Onchorhynchus mykiss*) are an important aquaculture species yet there are few diagnostic tools available to assess their health. Hematology and clinical chemistry analyses are not used extensively in fish medicine due to the lack of reference intervals for various fish species, and because factors such as age can affect blood values. There is little published information regarding age-related changes in blood values of juvenile fish. It is important to evaluate juvenile fish, as this is the time they are raised in aquaculture settings. Determining age related changes in the blood values of fishes would further

develop clinical pathology as a diagnostic tool, enhancing both fish medicine and the aquaculture industry. The results of standard hematology and clinical chemistry analysis were evaluated in juvenile rainbow trout at 4, 6, 9, 15 and 19 months of age. Values for PCV and RBC indices were significantly lower, and plasma protein concentration was significantly higher in younger fish. Total WBC and lymphocyte counts were significantly higher in fish at 6 and 9 months of age, while neutrophil and monocyte counts were higher at 6, 9 and 15 months. Eosinophil counts were significantly higher in 9-month-old fish. The majority of hematologic values fell within previously established reference intervals, indicating that only slight modification to the intervals is necessary for evaluating hematologic results of rainbow trout at different ages. The following analytes deviated sufficiently from adult reference intervals to warrant separate reference values: plasma protein concentration at 4 months, WBC and lymphocyte counts at 15 and 19 months, and thrombocyte like-cells at 9 months of age. Values for most biochemical analytes were significantly different among age groups except for creatinine and potassium concentrations. Comparisons with reference intervals were not made for biochemical analytes, because established reference intervals were not available.

12. Chalkoo, Salman Rauoof (Farm Manager, Department of Fisheries, Government of Jammu and Kashmir, (India)); Mir, Showkat Ali (Joint Director, Department of Fisheries, Govt. of Jammu and Kashmir (India)); Najjar, A. M. (Asst. Professor cum Junior Scientist, EV.Sc. & AH, Division of Fisheries, Sher - Kashmir University of Agriculture Sciences and Technology, Shuhama, Alusteng, Srinagar. (India)); Manohar, Susan (Asst. Professor, Department of Aquaculture and Zoology, Barkatullah University, Bhopal, (India)). **Relative resistance of four species of *Schizothorax* (Snow trout) and their hematological and histochemical response to bacterial kidney disease.** *Aquacult* (2010) v. 11(2) p. 127-134

Bacterial kidney disease (BKD) is of frequent occurrence in fishes of Wular Lake, Kashmir. There are many predisposing factors for the onset of the disease. The statistical data revealed 60% mortalities in *Schizothorax* species including *Schizothorax niger*, *S. esocinus*, *S. curvifrons*, and *S. labiatus*. The present study aimed at ascertaining the relative degree of resistance of *Schizothorax* species to bacterial kidney disease, on exposure to cell and cell fractionates of *R. salmoninarum*. The degree of infection and damage was further investigated by hematological and histochemical findings. The results revealed the remarkable resistance of *Schizothorax curvifrons* and *S. labiatus* & susceptibility of *S. niger* and *S. esocinus* to varying concentrations of different bacterial antigens at different temperatures. The observations revealed fascinating results and a connotation of predisposing factors for the occurrence of BKD in *Schizothoracinae* (Snow trout) in Wular Lake, Kashmir.

13. Das, Arindam (Department of Zoology, North Bengal University, Siliguri 734013. West Bengal. (India)); Bagchi, Sumanta; Saha, Dipanwita (Department of Biotechnology, North Bengal University, Siliguri, (India)); Pal, Joydeb (Department of Zoology, North Bengal University, Siliguri 734013, West Bengal. (India)). **Virulence potentials and plasmid profiles in *Aeromonas* bacteria isolated from EUS affected fish.** *Environment & Ecology* (2010) v. 28(3) p. 1607-1610.

Ten pathogenic *Aeromonas* bacterial strains previously isolated from the lesions of epizootic ulcerative syndrome (EUS) affected fish *Catla catla* and *Puntius* sp. from an affected pond in Jalpaiguri district of West Bengal were studied to determine the presence of extracellular lytic enzymes. All pathogenic isolates were found to exhibit proteolytic, hemolytic amyolytic and lipolytic activities. Lecithinase was secreted by all the isolates and all of them were able to hydrolyze gelatin. Plasmid profiles of these bacteria were also investigated and it was found that

all isolates contained plasmids, ranging in sizes from 23 to 64 kilobase pair (kb), with a 23 kb plasmid in common.

14. Das, Debabrata; Bandopadhyay, M. K.; (Central Inland Fisheries Research Institute (ICAR) Barrackpore, Barrackpore, Kolkata- 700 120. (India)); **An updated database of Indian species of planktivorous genus *Puntius***. Fishing Chimes (India). (2010). v. 30(9) p. 22-23.

An updated database of freshwater *puntius* sp. is developed using data from various sources with the aim to conserve such planktivorous species in fishers biodiversity. This updated database may help to fish lovers get an initial idea in selecting suitable species for culture fisheries development besides understanding its importance in capture fisheries. Since few species like *Puntius javanicus*, *Puntius sarana*, *Puntius kolus* etc are having food value, besides having promising growth rate; these can be brought under farming along with the promotion of their capture fisheries in a sustainable way. The database may help fish lovers and environmentalists since only few species of *Puntius* are becoming endangered.

15. Desai, V. R.; 273, Saket Nagar, Indore – 452 018, M. P. (India). Shrivastava, N. P.; (Central Inland Fisheries Research Institute, Barrackpore – 700 120, W. B. (India)); **Major carps in Ravishanker Sagar Reservoir, Chhattisgarh State – study on their growth trend and fishery status**. Fishing Chimes (India). (2010). v. 30(7) p. 9-11.

Ravishanker Sagar in Chhattisgarh was studied to understand its fisheries status in relation to its ecology during 1986-1993. It was expected to yield 160 tones of fish per annum, while the present annual yield is 53t/annum. The authors bring out the various aspects of fish production from the reservoir in this contribution, with a focus on the results of the growth studies of major carps in the reservoir and the present status of production of major carps from the reservoir.

16. Dutta, A.; Bhattacharya, D. K. (Department of Zoology, University of Kalyani, Kalyani 741235, (India)). **Diversity and seasonal abundance of macroinvertebrate in some fresh water wetlands of West Bengal**. Environment & Ecology (2010) v. 28(3) p. 1544-1549.

Diversity and seasonal abundance of macro invertebrate in some fresh water wetlands of West Bengal namely Mathura beel (North 24 Parganas), Kulia beel (Nadia) and MudiALLY Fishermen's Co-operative Society (Kolkata) studied for January 2005-December 2005, reveals a total of 127 species belonging to 11 major groups, namely Oligochaeta (2 species), Hirudinea (3 species), Crustacea (5 species), Arachnida (13 species), Ephemeroptera (1 species), Odonata (20 species), Hemiptera (28 species), Coleoptera (31 species), Diptera (6 species), Gastropoda (14 species), Bivalvia (4 species). The population density of Oligochaeta, Crustacea, Diptera and Gastropoda was highest in post-monsoon but density of Bivalvia and Coleoptera was more in pre-monsoon in three wetlands surveyed. However, in MB (Mathura beel) and KB (Kulia beel) gastropod density was highest followed by oligochaetes and bivalves. In MFCS (MudiALLY Fishermen's Co-operative Society), Oligochaeta density was found to be higher than gastropods in all seasons indicating organic pollution.

17. Dutta, Pranab ; Choudhury Subrata (Krishi Vigyan Kendra, West Tripura, Chebri, Tripura – 799 207 (India)). **Success story of composite fish farming**. Fishing Chimes (2010) v. 30 (5) p. 55-56.

Fish is the staple diet of majority of the population (95%) of Tripura. While the open aqua resources of the State are seasonal in nature, it is bestowed with vast natural water resources

endowed with congenial climate conditions suitable for fish farming. Efforts are therefore made to popularise composite fish farming individually or on cooperative basis, or by way of formation of self help groups at village level, in such resources. An attempt has been made in this direction in the village of Cerma of Uttar Chebri by the dynamic team of Krishi Vigyan Kendra, West Tripura and its fisheries personnel. An average fish of 18.75 q/ha was recorded in demonstration pond as against 11.62 q/ha in farmers practice.

18. Gaikwad, J. M. (Department of Zoology, Shri Shivaji College, Parbhani (M.S.) (India)). Khole, A. M. (Department of Zoology, B. Raghunath College, Parbhani (M.S.) (India)). Baig, M. A. (Dr. Zakir Hussain High School, Parbhani (M.S.) (India)). **Physico-chemical evaluation of Jamb reservoir in Parbhani District-M.S.** Aquacult (2010) v. 11(2) p. 187-190.

The study consisted assessment of environmental parameters as an index of aquatic productivity has helped to highly fertile zones in reservoirs, which is based on analysis of different limnological parameters. The aim was to ascertain the quality of reservoir water. The limnological parameters, such as atmospheric temperature, water temperature, Dissolved oxygen, Turbidity, TDS, Sulphate, pH, Alkalinity, Total hardness. The results indicate that the reservoir is a suitable for pisciculture. The reservoir is not polluted and water can be used for irrigation, drinking purpose.

19. Goswami, Soma; Ghosh, Apurba Ratan; (Department of Environmental Sciences, The University of Burdwan, Golapbag, Burdwan-713 104, West Bengal, (India)). **Scanning electron microscopic examination of mucosal epithelium of the alimentary canal of *Nadus Nadus* (Hamilton).** Journal of Inland Fisheries Society of India. (2010) v. 42(2) p. 14-20.

The mucosal epithelium of the oesophagus, stomach, intestine and rectum of *Nandas nandas* (Hamilton) have been systematically studied with the help of scanning electron microscope (SEM). The buccopharyngeal mucosa is devoid of any prominent mucosal folds and consisted of closely connected pentagonal and/ or hexagonal stratified epithelial cells arranged in concentric whorls sometimes interfaced with prominent taste buds. The mucosal surface of the esophagus was consisted of prominent longitudinal mucosal folds typified into a series of round or oval epithelial cells with short and stubby microvilli. Prominent gastric pits were surrounded by epithelial cells. Irregular and zig-zag type of infoldings are the characteristic feature of the intestine and each infolding is supported by columnar epithelial cells with densely packed microvilli at the cell apices. The rectal folds anastomosed with each other forming shallow irregular depressions. The inter mucosal surface of the rectum is closely packed with columnar cells with short microvilli.

20. Jagadis, I. (Tuticorin Research Centre of Central Marine Fisheries Research Institute, Tuticorin - 628 001, Tamil Nadu, (India)); Syda Rao, G; Joshi, K. K. (Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, (India)); Kandan, P. (Tuticorin Research Centre of Central Marine Fisheries Research Institute, Tuticorin - 628 001, Tamil Nadu, (India)). **Fishery and population dynamics of the sacred chank *Turbinella pyrum* (= *Xancus pyrum* Linnaeus, 1758) off Kayalpattinam in the Gulf of Mannar.** Indian Journal of Fisheries (India). (2010). v. 57(3) p. 1-5.

The fishery and population dynamics of the sacred chank, *Turbinella pyrum* exploited by bottom-set gillnet off Kayalpattinam, Gulf of Mannar were studied during 2004-2006. The size/weight range was between 80-290 mm / 60 to 1600 g. The age of the chanks was estimated to be 20+ years and it reaches 94/135, 154/453, 197/833 and 227 mm/1195 g in 1st, 2nd, 3rd and 4th year of life. The length-weight relationship (L-W) of *T. pyrum* was $W = 0.001728 * L^{(2.47087)}$, length-

maximum shell diameter (L-MSD) was $W = 0.0011749 * MSD^{(2.851393)}$. The VBGF parameters estimated are $L_{\infty} = 306.1$ mm, $K = 0.33$ yr⁻¹ and $W_{\infty} = 2.5$ kg. Estimated total mortality, natural mortality and the fishing mortality are 1.6913 yr⁻¹, 0.45909 yr⁻¹ and 1.2322 yr⁻¹ respectively. From the estimates arrived at, the fishing pressure on chanks in the fishing ground is evident and about 30% reduction from the present effort of 5,943 units operated from Kayalpattinam is required to sustain the stock and return to the maximum sustainable yield (MSY) of 48.5 t.

21. Joseph, Imelda; Joseph, Shoji; Ignatius, Bobby; Syda Rao, G.; Sobhana, K. S.; Prema, D.; Varghese, Molly (Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, (India)). **A pilot study on culture of Asian seabass *Lates calcarifer* (Bloch) in open sea cage at Munambam, Cochin coast, India.** Indian Journal of Fisheries (2010) v. 57(3) p. 29-33.

India ranks third in global fish production with 6.4 million metric t, but mariculture in the Indian seas is yet to be popularised. The limited availability of protected sites and the probable conflicts with other activities such as fishing, tourism and navigation are factors likely to influence mariculture development in India, besides finance, technology, expertise and government policy. A pilot scale inshore marine cage culture experiment has been undertaken since 2007 at Visakhapatnam coast of India in the Bay of Bengal. A similar cage was launched at Munambam for the culture of Asian sea bass *Lates calcarifer* Asian sea bass seed (3.5 ± 1.5 g) reared in hapa installed in ponds for a period of 30 days were stocked in the cage and cultured for a period of 120 days and harvested at an average weight of 315.5 g. Analysis of nutrient levels in seawater near the cage, revealed no noticeable accumulation of solid particulate wastes indicating that water current (0.5 to 1.0 m sec⁻¹) was adequate in the site to prevent accumulation of wastes in the cage as well as in the premises. The cage culture activity was found to influence the planktonic and benthic fauna.

22. Joshi, K.D.; (Regional Centre, Central Inland Fisheries Research Institute (ICAR), Allahabad-211 002 (India)). Biswas, B.K.; (Central Inland Fisheries Research Institute (ICAR), Barrackpore, West Bengal, (India)). **Piscine diversity and fisheries in the river Ken, proposed for inter-river linking.** Journal of Inland Fisheries Society of India (2010) v. 42(2) p. 25-31.

The river Ken originates from Ahirgawan village on the north-west slopes of the Kashmir hills in Jabalpur district in Madhya Pradesh and debouches into the river Yamuna at Chilla in Banda district of Uttar Pradesh. It is perennial river with high discharge during active monsoon but comparatively low during summers. As a result of construction of a series of barrages, the river has lost its pristine habitats though the river holds moderate piscine diversity and fishery. The list comprises 53 fish species classified under 40 genera, 19 families and 7 orders. Out of these, 51 species are native and 2 exotic. The river comprises some highly important threatened species including 4 endangered and 9 vulnerable species.

23. Jadhav, R. R.; Mohite, A. S.; Kazi, T. G. (College of Fisheries, Shirgaon, Ratnagiri- 415 612, Maharashtra, (India)). **Design aspects of large meshed purse seine nets (*Sapat*) with pocket of Ratnagiri, Maharashtra.** Aquacult (2010) v. 11(2) p. 191-196.

The design, construction and operational details of the large meshed purse seine nets (*Sapat*) with pocket operated from Ratnagiri, for oil sardine and mackerel are reported briefly. The nets were predominantly made of nylon polyamide (PA) with knotted netting having large mesh size of 49 mm for sardine and mackerel. The average length of this type of nets was 521.5 m with depth of 45.75 m. The hanging coefficient along the floatline was 0.74 to 0.81 while along the lead line was 0.79 to 0.86.

24. Jithendran, P.; Poornima, M.; Balasubramanian, C. P.; Kulasekarapandian, S. (Central Institute of Brackishwater Aquaculture, 75 Santhome High Road A. Puram, Chennai - 600028, Tamil Nadu, (India)). **Diseases of mud crabs (*Scylla* spp.): an overview.** Indian Journal of Fisheries (2010) v. 57(3) p. 55-63.

Mud crabs (*Scylla* spp.) are the most promising group for diversification of coastal aquaculture. However, the health management *vis-a-vis* diseases of mud crabs attracted less attention of researchers, and therefore, there is distinct lack of description of their pathogens as compared to other commercially exploited crustacean and finfish species. Culture of mud crab is largely extensive with extremely low input; hence diseases with potential economic impact have not been widely observed and caused problems. However, intensification of mud crab culture is likely to result in occurrences of known or previously unreported or even exotic diseases. Many new pathogens and diseases are being reported with significant pathogenicity and adverse effect on the production of mud crabs across the world. In the present review, the viral, bacterial, fungal, protozoan and metazoan pathogens of mud crabs and their impact on the health of individuals and aquaculture are discussed.

25. Jyoti, M. K.; Gupta, Kadambri (Department of Zoology, University of Jammu and Kashmir-180 006, (India)). Vohra, Alpana; (Department of Zoology, G.G. M.Sc. College Jammu, (India)). **Induction of spawning in *Esomus danricus* (HAM) using ovatide.** Journal of Inland Fisheries Society of India (2010) v. 42(2) p. 32-34.

An attempt was made to optimize the dose of Ovatide, a GnRh analogue with dopamine antagonist, in spawning induction of ornamental fish *Esomus danricus*. Various doses (0.4 ml, 0.5 ml, 0.6 ml and 1 ml kg⁻¹ body wt.) of Ovatide were injected intramuscularly to the spawners. A dose of 1 ml kg⁻¹ body wt. of the hormone was found optimum for obtaining eggs and milt by stripping method in *E. danricus*.

26. Kar, Devashish; (Division of Wetlands, Fishery Science and Aquaculture, Department of Life Science, Assam (Central) University, Silchar 11(India)). **Fish diversity in rivers of Mizoram.** Fishing Chimes (India). (2010) v. 30(7) p. 18-22.

The present communication reveals the occurrence of 9 species of fishes in river Tuinni and 14 species of fishes in river Serlui in the largely unexplored State of Mizoram in North-East India. This piece of work portrays the present status of the rivers with regard to its physical habitat characteristics, physico-chemical features of water of the rivers and ichthyo diversity in them. Management and Conservation of fishes get high priority under the changing circumstances of habitat degradation and loss of biodiversity in the rivers.

27. Kazi, T. G.; Mohite, A. S.; Jadhav, R. R. (College of Fisheries, Shirgaon, Ratnagiri- 415 612, Maharashtra, (India)). **Design specifications of shark gill nets of Ratnagiri, Maharashtra.** Aquacult (2010) v. 11(2) p. 135-139.

Gill net fishing is one of the popular fishing methods along the west coast of India. However, there are regional variations in their design, construction and operation. The paper deals with design and general characteristics of shark gill nets operated from Ratnagiri, Maharashtra. In Ratnagiri, the shark gill nets were operated as set gill nets very near to the shore. Webbing of the nets were fabricated with polyamide (PA) monofilament of 0.50 to 1 mm diameter with the mesh size ranging from 120 to 200 mm. Expanded polyvinyl chloride (PVC) floats and stone sinkers were used for Shark gill nets in Ratnagiri.

28. Kumar, Kuldeep; Mohanty, Utkal Laxmi; Sahu, Ashok Kumar (Aquaculture Production and Environment Division, Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar-751 002, (India)). Dasgupta, Subrata (Fish Nutrition, Biochemistry and Physiology Division, Central Institute of Fisheries Education, Panch Marg, Versova, Andheri (W), Mumbai-400 061, (India)). **Induced spawning of Anabas (*Anabas Testudineus*, Bloch) under captivity in pre-monsoon and monsoon month.** Journal of Inland Fisheries Society of India (2010) v. 42(2) p. 8-13.

Absence of standardized method for induced spawning and production of spawn remain constraints for desirable supply of fingerlings to develop culture practices for climbing perch, *Anabas testudineus*. Induced spawning experiments conducted during pre-monsoon and monsoon months showed that the fish could be induced for spawning from February through August. However, in spite of higher breeding response (80-100%) and egg production ($295.7-374.2 \text{ g}^{-1}$) recorded during March to June, the higher larvae production ($186.0-233.8 \text{ g}^{-1}$) could be obtained only during May to July. This study revealed that Ovaprim at the rate of 1.5 ml kg^{-1} body weight efficiently induced Anabas female for early and extended normal spawning. The period between May and July has been found most suitable for induced spawning and spawn production of captive reared Anabas.

29. Latha, N.; Mohan, Ramachandra (Lake Management & Water Quality Research Unit, Department of Zoology, Bangalore University, Bangalore 560056, (India)). **Chemical and microbial quality of Thippasandra Lake water located at Bangalore, Karnataka.** Environment & Ecology (2010) v. 28(3) p. 1528-1530.

An examination of certain chemical and microbial parameter of lake water sample of Thippasandra lake located in Bangalore, Karnataka was carried out to assess their hygienic quality and impact in human health. The lake is encroached and inhabited by human population. The inhabitants discharge their sewage water directly into the lake. It was observed that chemical components like nitrate and phosphate had a direct effect on the bacterial and fungal population of the water samples. Consuming the lake water containing more number of bacteria led to dysentery and diarrhea. The fungal contamination of water led to the throat, ear and scalp infections in the local population after this consumption.

30. Latha, N.; Mohan, M. Ramachandra. (Lake Management and Water Quality Research Unit, Department of Zoology, Bangalore University, Bangalore 560056, (India)). **Water quality of the Lake Kommaghatta, Bangalore.** Environment & Ecology (2010) v. 28(3A) p. 1901-1905.

Annual survey of Kommaghatta lake was conducted for 2005, to determine physico-chemical character of water. The parameters studied comprised temperature, pH, total hardness, total alkalinity, TDS, electrical, conductivity, dissolved oxygen, biological oxygen demand, chemical oxygen demand, nitrates, phosphates, sulfates and potassium. It was found that while the quality had no difference, the level of nutrients in water was low. It was concluded that the water in Kommaghatta lake is oligotrophic.

31. Latha, N.; Mohan, M. Ramachandra (Lake Management & Water Quality Research Unit, Department of Zoology, Bangalore University, Bangalore 560056, (India)). **Water quality and pollution status of Madivala Lake, Bangalore.** Environment & Ecology (2010) v. 28(3A) p. 1906-1908.

The aim of this study was to assess physico-chemical characteristics pollution studies and macrophytic community of Madivala lake from January 2005 to December 2005. The physico-

chemical parameters of lake water exhibited monthly as well as seasonal fluctuations. The nutrients phosphates, nitrates are in sufficient quantities for the growth of aquatic plants in the lake. Macrophytic diversity was higher this was due to allocthonous nutrients brought into the lake from the surrounding catchments area. The study indicated that the Madivala lake is under the category of eutrophic water body. Therefore, the conservation and management of this water body are much required.

32. Mandal, R. N.; Datta, A. K. (Wastewater Aquaculture Division, Central Institute of Freshwater Aquaculture, P O. Rahara Kolkata-700 118, West Bengal, (India)); Sarangi, N. (Central Institute of Freshwater Aquaculture, P O. Kausalyaganga, Bhubaneswar, Orissa - 751 002, (India)); Mukhopadhyay, P. K. (Wastewater Aquaculture Division, Central Institute of Freshwater Aquaculture, P O. Rahara Kolkata-700 118, West Bengal, (India)). **Diversity of aquatic macrophytes as food and feed components to herbivorous fish - a review.** Indian Journal of Fisheries (2010) v. 57(3) p. 65-73.

About 50 species of aquatic macrophytes are recorded as food to herbivorous fish either directly or indirectly. These macrophytes represent several families of which major ones are Amaranthaceae, Araceae, Azollaceae, Cabombaceae, Ceratophyllaceae, Characeae, Convolvulaceae, Haloragaceae, Hydrocharitaceae, Lemnaceae, Lentibulariaceae, Menyanthaceae, Najadaceae, Nymphaeaceae, Polygonaceae, Pontederiaceae, Potamogetonaceae, Salvinaceae, Trapaceae, and Typhaceae. In tropical and sub-tropical countries, there are about 40 numbers of fish species belonging to two major families viz., Cyprinidae and Chichlidae, which directly feed on macrophytes. Importantly, these macrophytes may be used as fish food components and replace costly commercial feed owing to their potential nutrients profile: moisture ranges between 84.1-95.9%, dry matter 4.1-15.9%, crude protein 8.7-26.8%, crude fat 2.2-5.1%, carbohydrate 9.3-35.6%, ash 8.0-25.3%, and crude fibre 15.0- 28.1%, with caloric content of 2.47- 4.2 kcal g⁻¹. For this substantial nutrients status, they are blended with feedstuffs and fed to fish. Consequently, herbivores have shown satisfactory growth in respect of food intake, feed conversion ratio and relative growth rate. About 50% of plant protein has been converted to fish protein and even 30% inclusion of macrophytes into prepared feeds has shown better balance of amino acid. With tremendous potentiality as fish food components, utilisation of macrophytes in preparation of fish feed is an opportunity of livelihood to rural people; since aquaculture is one of the fastest growing sectors in agriculture.

33. Mishra, Ashutosh (College of Fisheries, G B. Pant University of Agriculture and Technology, Pantnagar - 263 145 U. S. Nagar, Uttarakhand, (India)); Chakraborty, S. K. ; Jaiswar, A. K. (Central Institute of Fisheries Education, Seven Bungalows, Versova, Mumbai - 400 061, Maharashtra, (India)); Sharma, A. P. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120, West Bengal, (India)); Deshmukhe, Geetanjali (Central Institute of Fisheries Education, Seven Bungalows, Versova, Mumbai - 400 061, Maharashtra, (India)); Mohan, Madan (Krishi Anusandhan Bhawan -11, Pusa, New Delhi- 110012, (India)). **Plankton diversity in Dhaura and Baigul reservoirs of Uttarakhand.** Indian Journal of Fisheries (2010) v. 57(3) p. 19-27.

Studies conducted for one year from June 2006 to May 2007 in two reservoirs of Uttarakhand viz., Dhaura and Baigul, revealed moderate plankton biodiversity. There were 30 species of phytoplankton and 15 species of zooplankton. The average plankton population was 28,201-2,18,229 units l⁻¹ in terms of phytoplankton and 952-11581 units l⁻¹ in terms of zooplankton throughout the study. *Microcystis* spp. belonging to the group cyanophyceae was the most dominant among phytoplankton. The range of Shannon and Simpson diversity indices (2.006-2.947 and 0.8019-0.9215 respectively) indicate moderate diversity of plankton in these water

bodies. The values of diversity indices indicate less disturbance level and medium productivity. Study of various physico-chemical and biological parameters revealed that these reservoirs have medium productivity and if managed properly, production at all the tropic levels can be enhanced.

34. Nimisha, P; Sheeba, S; (Department of Zoology Sree Narayana College, Nattika, Thrissur, Kerala, (India)). **Effect of homoeopathic drugs on the growth and survival rate of *catla catla***. Fishing Chimes. 2010 v. 30 (6) p. 56.

An experiment was carried out with two homeopathic medicines Nat. mur. 30 and cale. Phos. 30 to see their effect on growth and survival rate of *catla catla*. Observation revealed that survival rate of *catla* was higher in cale. Phos. Treatment, but growth rate was higher in Nat. mur 30 treatment.

35. Palpandi, C; Vairamani, S.; Shanmugam, A. (Centre of Advanced study in Marine Biology, Annamalai University, Parangipettai - 608502, Tamil Nadu, (India)). **Proximate composition and fatty acid profile of different tissues of the arine neogastropod *Cymbium melo* (Solander, 1786)**. Indian Journal of Fisheries (2010) v. 57(3) p. 35-39.

The neogastropod *Cymbium melo* was collected from Cuddalore landing centre (along south-east coast of India) to analyse the biochemical constituents such as total protein, carbohydrate, lipid, water content and fatty acids in foot, mantle and remaining body tissues. The total protein content was found to be varying from 20.78±1.90% (body tissues) to 30.19±2.02% (mantle) on dry weight basis (DWB). The carbohydrate content was higher in mantle (5.140±1.01 % on DWB) and lower in foot (2.59±1.03% on DWB); whereas the lipid content was maximum in mantle (3.390±0.76% DWB) and minimum in foot (2.76±0.92% on DWB). The water content ranged from 76.59 to 83.69%. The order of water content was recorded as 83.48±1.84% in body tissues, 80.53±2.33% in mantle and 76.55±2.26% in foot. The saturated fatty acids were estimated as 32.44% in body tissues followed by 50.96% in foot and 33% in mantle. The monounsaturated fatty acids were recorded only from body tissues (41.06%) whereas the polyunsaturated fatty acids were not recorded in the body tissues and they were estimated as 22.60% in foot and 24.97% in mantle. The fatty acids such as palmitic acid, myristic acid, nonadecylic acid and lauric acid were also reported at varying levels in the different tissues analysed.

36. Paul, R. K.; Das, M. K. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120 (India)). **Statistical modeling of inland fish production in India**. Journal of Inland Fisheries Society of India (2010) v. (42) p. 1-7.

Fish Production in India has increased at a higher rate compared to food grains, milk, egg and other food items. The most widely used time series model *i.e.* autoregressive integrated moving average (ARIMA) model is applied for modeling and forecasting of total inland fish production in India. The annual fish production data from 1951 to 2000 were used for building the model and data from 2001 to 2008 were used for validation of the model. To this end, evaluation of forecasting of inland fish production was carried out with dynamic one step ahead forecast error variance along with mean absolute error (MAE), mean absolute prediction error (MAPE) and relative mean absolute prediction error (RMPAE). The forecast of inland fish production in India for the year 2009 and 2010 have been found out as 4360 and 4610 thousand tones.

37. Paul, B. N; Das, S.; Giri, S. S. (Regional Research Centre, Rahara, Central Institute of Freshwater Aquaculture, Kolkata – 700 118 (India)). Mohanty, S. N.; (Central Instiute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar – 251 002 (India)); **Water soluble vitamins in aquaculture nutrition**. Fishing Chimes (India). (2010). v. 30(9) p. 13-15.

The water soluble vitamins are dietarily essential for normal growth and physiological activity. Role of different water soluble vitamins in aquaculture nutrition has been discussed in the present communication. Ascorbic acid is the most unstable one; so it should be added in fish diet as it is water soluble, but not L- ascorbic acid. There is also an inter-relationship among ascorbic acid, vitamin-E and selenium. They also play an important role as antioxidants. To enhance fish production in the farming system one should add these vitamins in fish feed.

38. Puinyabati, H.; Shomorendra, M. (Fish Disease Research Laboratory, Department of Zoology, Thambal Marik College, Oinam 795134, Manipur, (India)); Kar, Devashis (Division of Wetlands, Fishery Science & Aquaculture, Department of Life Sciences, Assam (Central) University, Silchar, (India)). **Helminth parasites of fishes of Chatla Haor, Silchar, Assam.** Environment & Ecology (2010) v. 28(3A) p. 1852-1854.

Present communication deals with helminth parasites of fishes found in Chatla Haor, Silchar, Assam. In the course of routine examination nine species of helminth parasites were collected. They belong to four diverse groups comprising four species of nematode, one species of trematode, one species of cestode, and three species of acanthocephala. The percentage of abundance was found to be maximum in *Clinostomum complanatum* (60.28%) and *Channa punctatus* harbors maximum number of parasite species.

39. Pawar, N. A. (Central Institute of fisheries Education. Verova, Andheri (W), Mumbai) ; Shelke, S. T. (College of Fisheries Science, Nagpur – 400 001); Chandra, Prakash (Central Institute of Fisheries Education, Versova, Andheri (W)) Mumbai – 400- 061(India)). **An overview on chlorination and dechlorination in aquaculture and aqua hatchery practices.** Fishing Chimes (2010) v.30 (9), p.10-12.

Chlorine in its various forms is invariably and almost universally used for disinfecting shrimp and fish hatcheries. It is also sometimes used to disinfect the fish production ponds before stocking with fish seed. Product that generate chlorine are reliable, and easily available. The chlorine that is applied is measurable and above all, it is capable of providing residual disinfecting effects for a longer period, thereby providing complete protection against future recontamination of water in the concerned systems. It is widely accepted as a water disinfectant for the following reasons: 1) It is readily available in all the three states, as gas, liquid and powder form; 2) It is cheaper; 3) It is easy to apply due to relatively high solubility (7000 ppm) at 20⁰ C; 4) It leaves a residual; 5) it is highly toxic to most of the microorganisms; and its best oxidizing power is at 7.2 to 7.6 pH.

40. Ravisankar, T.; Thirunavukkarasu, A. R. (Central Institute of Brackishwater Aquaculture, 75 Santhome High Road Raja Annamalai Puram, Chennai - 600 028, Tamil Nadu, (India)). **Market prospects of farmed Asian seabass *Lates calcarifer* (Bloch).** Indian Journal of Fisheries (2010) v. 57(3) p. 49-53.

Asian sea bass (barramundi) is one of the ideal species for diversification of Indian brackish water aquaculture sector which has a good domestic market potential in India. The financial profitability of sea bass farming works out to 29.18% of Return on Investment (ROI). On comparison with tiger shrimp in a planning horizon of 10 years, with inclusion of 0.49 estimated probability of risk of crop failures for shrimp, yielded Internal Rate of Return (IRR) values of 29.18% and 23.72% for sea bass and shrimp respectively. Interestingly if a 10 % increase in revenue (either by increase of output quantum/price) or a 10 % decrease in costs would make both sea bass and shrimp culture to return IRR values over 40%. In addition to this long term financial soundness, eco-biological and other risks associated with sea bass farming are less

compared to shrimp farming. Efforts on marketing of live sea bass in domestic as well as middle and south-east Asian countries markets as well as on export of frozen sea bass and fillets to northern European countries could help sea bass farmers. Asian sea bass culture could help in ensuring livelihood security to the coastal poor, nutritional security to Indian public and export earnings to the country.

41. Sahoo, S. K.; Giri, S. S.; Sahu, A. K. (Central Institute of Freshwater Aquaculture, Kausalyaganga Bhubaneswar - 751 002, Orissa, (India)). **Evaluation of human chorionic gonadotropin (HCG) dose and latency period combinations on the weight of stripped eggs during induced spawning of *Clarias batrachus* (Linn.)**. Indian Journal of Fisheries (2010) v. 57(3) p. 83-85.

The weight of stripped eggs was evaluated as breeding performance of *Clarias batrachus*, administered with five doses of human chorionic gonadotropin (HCG) (1000, 2000, 3000, 4000 and 5000 IU kg⁻¹ body weight of female) in combination with five latency periods (11, 14, 17, 20 and 23 h). The females did not respond to stripping at 1000-3000 IU dose in combination with 11 h latency. The weight of stripped eggs significantly ($p < 0.05$) increased while prolonging the latency period to 20 or 23 h at 1000 IU dose compared to other latencies. The females were stripped and free flow of eggs was observed at 3000 and 4000 IU dose with 14-23 h latency combinations. The stripped egg weight at those combinations was significantly ($p < 0.05$) higher compared to other dose and latency combinations. It was also observed that lower weight of eggs could be collected at 5000 IU dose in combination with 17-23 h post-injection. So it is wise to strip *C. batrachus* female while injecting 3000-4000 IU kg⁻¹ body weight and latency period of 14-23 h to get highest weight of stripped eggs.

42. Sanwal, Suman; Samardan, Debjit; Singh, Okendro (Directorate of Coldwater Fisheries Research, Bhimtal – 263 136, Nainital, Uttarakhand. (India)). **Effect of stage and Seasonal differences on length-weight relationship and condition factor of chocolate Mahseer (*Neolissochilus hexagonolepis*)**. Journal Inland Fisheries Society of India (2010). v. 42(2) p. 52-56.

The present study attempts to develop comprehensive length-weight relationship of chocolate mahseer *Neolissochilus hexagonolepis* considering its different stages of life and various seasons. Accordingly, the length-weight relationship of chocolate mahseer has been developed from culture system at Directorate of Coldwater Fisheries research, Bhimtal. ANCOVA results suggested that the length-weight relationship of this fish species is not affected by different seasons and various stages of its life cycle. Nonlinear model fitted to dataset has shown appropriateness, which follows isometric growth. The condition of the fish is found to be progressively better in the advanced stages whereas the maximum average condition and relative condition factors are observed during spring season.

43. Saravanan, R. (Department of Zoology, Arignar Anna Government Arts College, Villupuram – 605602. (India)). **Effect of Lambda Cyhalothrin on lipid profiles in Reproductive tissues of freshwater catfish, *Clarias batrachus* (Linn.)**. Geobios (2010) v. 37 (2-3) p. 171-175.

Pyrethroids cause acute toxicity to a broad spectrum of aquatic organisms and thus it is imperative to understand its ecotoxicological implications. An attempt was made to decipher the impact of synthetic pyrethroid lambda cyhalothrin on the lipid profiles in the reproductive tissues of sediment dwelling catfish, *Clarias batrachus*. A significant increase was observed in the cholesterol and triglyceride levels, whereas triglyceride and phospholipid levels showed a marked decline in testis and seminal vesicle.

44. Sarma, Debajit; Mahanta, P.C.; (Directorate of Cold water Fisheries Research (ICAR), Bhimtal, Nainital District, Uttarakhand, (India)); Baruah, D. (Krishi Vigyan Kendra, Dirang, West Kameng District, Arunachal Pradesh, (India)). **Performance of three pronged Chinese carp farming in Mid Himalayas of West Kameng district, Arunachal Pradesh.** Journal of Inland Fisheries Society of India (2010) v. 42(2) p.48-51.

The performance of three pronged carp farming was evaluated in 10 mid Himalayan fish ponds located at 1450-1500 m asl in the West Kameng District of Arunachal Pradesh. The fishes were stocked with a density 3 fishes/m³. The performance of three fish species (Silver carp-*Hypophthalmichthys molitrix*, Grasscarp-*Ctenopharyngodon idella* and Common carp-*Cyprinus carpio*) in terms of growth, survival and contribution to total biomass were studied and analyzed. The achieved average production was 78.6 kg, 76.5 kg and 137.9 kg for silver carp, grass carp and common carp, respectively. Among the 3 species the production was higher for common carp (47.1%) followed by silver carp (26.8%) and grass carp (26.1%). The production figures indicated that culture of Chinese carps in mid Himalaya can be suitably adopted and can contribute substantial income to the tribal fishers of hilly region.

45. Singh, Gajender; Bhatnagar, Anita (Department of Zoology, Kurukshetra University, Kurukshetra 136119, (India)). **Water quality characteristics and yields in small scale fish culture ponds in Yamunanagar, Haryana, India.** Environment & Ecology (2010) v. 28(3) p. 1615-1619.

Present paper deals with the study of village fish culture ponds (two wild and one managed ponds) from district Yamunanagar of Haryana, India, undertaken to correlate the water quality with fish production. Studies revealed that chlorides, total hardness, calcium, magnesium, biochemical oxygen demand (BOD), phosphates (O-PO₄) and ammonia were high whereas dissolved oxygen and fish growth/yield was low in wild ponds compared to managed ponds. This may be due to high organic load because of excess entry of cattle and domestic sewage from the non-point sources in wild ponds. The net primary productivity (mg C/liter/day) was high in the wild ponds compared to the managed ponds. Thus high fish growth/yield is not directly related with net primary productivity. The deterioration of water quality, as indicated by high ammonia and BOD in wild ponds might have decreased the fish growth in wild ponds. Thus, fish production appear to depend to lesser degree on the magnitude of primary production and therefore, universal relation between primary productivity and fish production could not be established and a variety of factors like organic load, ammonia production, nature/quantity of fertilizer's influence such correlations.

46. Srikanth, K.; Benarjee, G. (Fisheries Research Lab, Kakatiya University, Warangal. (India)). **Study on seasonal variation of zooplanktonic population in pakhal lake of Warangal District, Andhra Pradesh.** Aquacult (2010) v. 11(2) p. 165-173.

The present study was carried out on the seasonal variation of zooplanktonic population i.e. Rotifera, Cladocera, Copepoda and Ostracoda collected from four different stations of the lake during the period of three years of study from October 2003 to September 2006. The lake is situated at Pakhal 50 kms away from Warangal town.

47. Srivastava, S. M.; Srivastava, P. P.; Dayal, R.; Pandey, P. K. (National Bureau of Fish Genetic Resources, Canal Ring Road, P. O. Dilkusha, Teliabagh, Lucknow – 226 002 (India)). **Threatened bronze featherback *Notopterus notopterus*.** Fishing Chimes (2010) v. 30(6) p. 62-63.

The bronze featherback *Notopterus notopterus* is known for its delicacy and nutritional value. This being a very hardy fish, can be comfortably reared in aquarium, stagnant water and even in farm pond on a variety of feeds. Bronze featherback breeds naturally doing June to August in rivers and in ponds also. There is a report on natural breeding of the fish in India under captive conditions too (Hanifa *et al.*, 2004). Due to reduced abundance of *N. notopterus* in the wild, the fish has now been categorized in the list of the threatened fish species of the country (CAMP, 1998; Sarkar *et al.*, 2010) Artificial fecundation and ranching are the envisaged strategies for conservation and rehabilitation of endangered species (Minkley and Deacon, 1991; Maitland 1993; Jensen 1994; Pandey and Das, 2002; Ayyappan *et al.*, 2006). Hence, the present work was carried out to induce breeding by the bronze featherback by using synthetic gonadotropin release hormone (sGnRH) Ovaprim.

48. Sunitha Devi, G. (Department of Zoology, P. G. College of Science (O.U.), Saifabad, India). **A major effort to explore protein levels in fish (*Labeo rohita*) by triiodothyronine.** Aquacult (2010) v. 11(2) p. 175-180.

The effect of Triiodothyronine (L-T₃) on protein and nucleic acid levels were observed under constant temperature (28±1°C), nutritional state and same age group of *Labeo rohita*. The hormone treatment was given by injection (intraperitoneal) route for 4,24,48 hours (short term effect) and one week, two weeks (cumulative effect). Two dosages of hormone were selected for injection study (2 µg/10 g and 5 µg/10 g body weight of fish). Skeletal muscle protein and RNA levels showed a positive response to T₃ up to 14 days of injection route and DNA levels were unaltered.

49. T. Jawahar, Abraham ; Sil S. K.; Vineetha, P. (Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences Chakgaria, Panchasayar PO., Kolkata - 700 094, West Bengal, (India)). **A comparative study of the aquaculture practices adopted by fish farmers in Andhra Pradesh and West Bengal.** Indian Journal of Fisheries (2010) v. 57(3) p. 41-48.

Carp culture has proved sustainable over the years in India. Freshwater aquaculture depends mainly on carp culture that accounts for around 80% of the total inland fish production. The present study compares the socio-economic profile of the fish farmers and the aquaculture practices of the two leading fish producing states of India, namely Andhra Pradesh and West Bengal. Majority of the respondent farmers of Andhra Pradesh and West Bengal practiced aquaculture in owned (84%) and leased (67%) ponds, respectively. Although the farmers of both the states cultured carps, differences in farm holdings, size of the pond/farm, species cultured, stocking and stocking density, fish seed procurement, nursery management, feed and feeding management, pond fertilization, harvesting frequency, mode of fish marketing, source of information on aquaculture, fish seeds and disease treatment, perception on aquaculture were noticed. Majority of the farmers in West Bengal (68%) had undergone short-term training in aquaculture and few among them (15%) were graduates. Disease is the major problem faced by Andhra Pradesh and West Bengal fish farmers. The magnitude of other problems was, however, found to be different among the farmers of both the states. The survey revealed that the Government organisations, non-governmental organisations, educational institutions and other agencies failed to influence the farmers on aquaculture development.

50. Trivedi, R. K.; Das, Papri R.; Das, B. K.; Rout, S. K.; Mukhopadhyay, K.; (Department of Fisheries Environment, West Bengal University of Animal and Fishery Sciences, 5, Budherhat Road, Panchasayar, Kolkata-700 094, (India)). **Social impact assessment (SIA) of certain coastal aquaculture projects of West Bengal.** Journal of Inland Fisheries Society of India (2010) v. 42(2) p. 35-41.

There have been substantial socio-economic benefits as well as social and environmental conflicts due to expansion of coastal aquaculture in the country. The present study was carried out in three coastal agricultural projects in the two blocks in the East Midnapore district of West Bengal to assess the social impacts of those projects. The information was obtained based on participatory approach and qualitative interview techniques. Some of the adverse impacts reported by the people were decline in respect to elderly persons, increase in the vulnerability to hazards and increase in frequency of damage to agriculture and fishery crops. However some positive impacts like better community infrastructure, improvement in sense of security, increase in household income and availability of better infrastructure and transportation facilities due to these projects were also reported.

51. Varadaraju, S. (College of Fisheries, Mangalore - 575 002, Karnataka, India)); Nagaraj, M. K. (Department of Applied Mechanics and Hydraulics, National Institute of Technology Surathkal - 575025, Karnataka, (India)); Badami, H. Shashidhar (College of Fisheries, Mangalore - 575 002, Karnataka, India)). **Changes in soil and water quality parameters in selected shrimp culture ponds and its influence on shrimp production** Indian Journal of Fisheries (2010) v. 57(3) p. 79-82.

Changes in soil and water quality parameters during culture and its influence on growth of shrimps were studied in five shrimp culture ponds along the coastline of Udupi District of Karnataka. Water and soil properties of the ponds were within the permissible limits required for shrimp culture during the study period. An attempt made to correlate soil and water quality parameters with growth of shrimps revealed that water quality parameters namely pH, dissolved oxygen and temperature were found to be significantly affecting the shrimp production. Soil parameters viz., pH and electrical conductivity were found to be significantly influencing the growth of shrimps.

52. Varadaraju, S.; Hanumanthappa, B.; Shashidhar, H. Badami (College of Fisheries, Mangalore 575001, (India)). **Changes in soil and water quality during shrimp culture and its influence on shrimp production-an overview.** Environment & Ecology (2010) v. 28(3) p. 1592-1597.

Fishery sector occupies an important place in the socio-economic development of India. Successful shrimp culture depends on two essential ingredients of aquaculture, namely good bottom soil conditions and good quality water. Presence of nutrients in adequate amount in pond water is essential for successful aquaculture. This paper highlights the developments and present status of shrimp culture in the state of Karnataka and in India as a whole. It emphasizes the importance of soil and water quality required for brackishwater shrimp culture. The smooth operation, maintenance and productivity of the shrimp farms depend on the management of these parameters during the culture period. It has been observed that in number of case studies that the changes in soil and water quality during shrimp farming has effect on the productivity of the shrimp.

53. Varghese, Molly; Joseph, Shoji; Joseph, Imelda; Ignatius, Boby; Manisseri, K. Mary; Thomas, V. J.; Syda Rao, G. (Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, (India)). **Preliminary studies on the impact of open sea cage culture of *Lates calcarifer* (Bloch) on the planktonic and benthic fauna off Cochin, Kerala.** Indian Journal of Fisheries (2010) v. 57(3) p. 75-77.

The plankton and benthic macrofauna in relation to the open sea cage culture of *Lates calcarifer* during the period from October 2008 to March 2009 off Munambam near Cochin were studied.

The cage site and a reference site were selected for simultaneous sampling. During the study, the cage culture activity was not found to influence the plankton population but there is an indication of its influence on the benthic macrofauna.

54. Varshney, P. K. (National Bureau of Fish Genetic Resources (ICAR,), Aquaculture Research & Training Unit, Chinhat, Lucknow - 227 105, (India)); R. K. Agrahari (CIFE, Rohtak Centre, Lahti, Via Anwal, Rohtak-124 411. (India)); Singh, P, S. K.; Yadav, A. K. (National Bureau of Fish Genetic Resources (ICAR,), Aquaculture Research & Training Unit, Chinhat, Lucknow - 227 105, (India)). **Zooplankton Diversity in Changing Environment of River Gomti in Lucknow.** Aquacult (2010) v. 11(2) p. 141-153.

To evaluate the zooplankton diversity of river Gomti in relation to the prevailing environmental conditions four stations Maa Chandrika Devi, Daliganj, Ambedkar Park and Aquaduct were identified from upstream to downstream along the course of river in Lucknow. DO was low on many occasions at all the stations except Maa Chandrika Devi and COD values were high. There was a gradual increase in mean nitrite and phosphate values from up to down stream. Planktonic density was poor. Copepoda and cladocera were the most pre dominant groups followed by rotifers, planktonic oligochaetes, diptera, ostracoda, protozoa and hydra at all the stations. Relatively low density of zooplankton in spite of high nutrients budget may be a function of great infestation of water quality. Seasonally high density was reported during monsoon while low in post-monsoon. Increasing number of rotifers next to copepods and cladocerans indicate an aquatic regime with substantial load of organic matter. Planktonic diversity was poor. Abundance of a particular group of organisms in a deteriorated and polluted environment may not culminate the energy at higher trophic level. Filthy condition with foul smell through the length of the river coupled with poor water quality and appearance of indicator organisms.



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