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Central Inland Fisheries Research Institute
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ENTRIES

1. Abraham, Joice; Manisseri, K. Mary; Sanil, N. K. (Central Marine Fisheries Research Institute, Cochin - 682 018, (India)). **Spermatogenesis and spermatozoal ultrastructure in *Metapenaeus monoceros* (Fabricius, 1798)**. Indian Journal of Fisheries (2007) v. 54(1) p. 1-9.

Spermatogenesis in the 'speckled shrimp' *Metapenaeus monoceros* (Fabricius, 1798) was studied employing histological and transmission electron microscopic techniques. Male specimens of the species were classified into three maturity stages based on gross morphology. Spermatozoa of *M. monoceros* was observed to be unistellate with a spherical main body and a spike. The main body was made up of a central nuclear region, a peripheral cytoplasmic band and an acrosomal cap, which overlaid the nuclear region anteriorly. From the acrosomal cap projected an extended spike towards the anterior of the spermatozoa. The spike and the acrosomal cap together were called the acrosomal vesicle. The average length of the spermatozoa was 6 μm . The main body had a mean diameter of 3.4 μm with the spike measuring 2.6 μm in length.

2. Agarwal, N. K.; Thapliyal, B. L.; Raghuvanshi, S. K. (Fish Reproductive Biology Research Laboratory, Department of Zoology, H. N. B. Garhwal University Campus, Badshahithaul – 249 199, Tehri Garhwal, Uttaranchal (India)). **Induced breeding and artificial fertilization of snowtrout, *Schizothorax richardsonii* through the application of ovaprim**. Journal of Inland Fisheries Society of India. (2007) v. 39(1) p. 12-19.

It is the first report of induced breeding in the snowtrout- *Schizothorax richardsonii* through the use of ovaprim – a synthetic salmon gonadotropin hormone. Induced breeding and there after artificial fertilization were carried on successfully in *Schizothorax richardsonii* by the application of ovaprim. These experiments were conducted in natural as well as laboratory conditions. The minimum effective dose of ovaprim was found to be 1.2 and 1.25 ml/kg body weight for female brooders in two split doses in riverine and hatchery conditions, respectively. On the other hand, two split doses of 0.50 ml/kg body weight are required for male brooders. A good fertilization percentage (85-100%) was achieved in artificial fertilization experiments by dry method. During artificial fertilization, appearance of a jelly like substance is reported when eggs and milt are mixed in the dry pan and water is added. This entangled the eggs within it. This jelly disintegrated after complete water hardening of the eggs. This jelly perhaps prevents the fertilization of eggs by spermatozoa of other species. Moreover, it seems to be helpful in preventing the eggs from being washed away and from mechanical shock.

3. Agrahari, R. K.; Varshney, P. K.; (Central Institute of Fisheries Education (ICAR, Deemed University), Rohtak Centre Lahli, Via Anwal, Rohtak – 124 411); Saxena,

A. (Model Science College, A.P.S. University, Rewa (M.P) (India)). **Phytoplankton pigments in polluted environment of river Gomti in Lucknow.** Aquacult (India). (2007) v. 8(1) p. 27-32.

Phytoplankton pigments in relation to the prevailing environmental conditions of river Gomti in Lucknow studied at four stations viz Maa Chandrika Devi, Daliganj, Ambedkar Park and Aquaduct from June, 2004 to April, 2005. The water quality of river indicate the deteriorated environmental conditions with low DO and high CO₂, COD, PO₄ and NO₃. At upstream station Maa Chandrika Devi, the conditions were comparatively better. The mean chlorophyll 'a' the major pigment was 6.031, 24.413, 6.964 and 19.951 mg m⁻³ at Maa Chandrika Devi, Daliganj, Ambedkar Park and Aquaduct respectively. In general the chlorophyll 'a' 'b' and 'c' values were on higher side at Daliganj and Aquaduct whereas at Maa Chandrika Devi and Ambedkar Park chlorophyll values were comparable and moderate like environmental parameters. Seasonal trend of chlorophyll exhibit uni-modal trend at all the stations with higher values during monsoon or post-monsoon.

4. Ali, S. Ahamad; Gopal C.; Ramana, J. V. (Central Institute of Brackishwater Aquaculture, 75, Santhome High Road, Chennai - 600 028, (India)). **Attractant and growth promoting properties of some feed materials and chemicals incorporated in the diets for *Penaeus monodon* (Fabricius).** Indian Journal of Fisheries. (2007) v. 54(1) p. 67-73.

Three feed materials, fish meat (from oil sardines) paste, squid mantle paste and clam meat (*Meritrix* sp.) paste, and three chemical compounds, trimethyl amine, trimethyl amine oxide, and dimethyl sulphone were evaluated for their attractant and growth promoting properties for *Penaeus monodon*. The materials were individually incorporated in a semi-purified diet consisting of casein (40%) and gelatin (10%), fish oil (6.0%) and bread flour (33%) along with vitamins, minerals, filler and binder at specific levels; while the natural materials were included each at 0.5% (on dry matter basis), the other compounds were incorporated at 0.01% level. The shrimp approached the diet containing dimethylsulphone (DMS) in the quickest time of less than 5 minutes on an average, followed by the diet with trimethylamine oxide (TMO) in 7.2 minutes. These are followed by trimethyl amine (TMA) to which diet the shrimp approached and picked up in 14.2 minutes. Among the natural materials tested, the diets containing fish meat paste (FMP), clam meat paste (CMP) showed better attractant property. The results showed that the materials tested elicited positive response as feed attractants with varying degree. The results also showed that DMS and TMO seem to possess the highest attractant property to the shrimp. Consumption of diet increased with feed additives, compared to the control diet with TMO and DMS diets recording the highest consumption. The feed additives tested also resulted in growth enhancement of shrimp.

5. Akhtar, Romana; Jyoti M. K.; Singh, Rajinder. (Department of Zoology, University of Jammu, Jammu (J&K) - 180 006. (India)). **Comparative account of**

Physico-chemical conditions of two high altitude ponds Sarkoot (Natural earthen) pond and Shalimar (man-made) pond. *Aquacult (India)* (2007) v. 8(1) p. 13-20.

The two high altitude ponds (Sarkoot and Shalimar) located at Kishtwar ($33^{\circ}0' - 34^{\circ}.34.0'N$ latitude and $75^{\circ}.0' - 76^{\circ}.45'$ E longitude) at an altitude of 5300 ft and 4900 ft. and having a maximum depth of 12 feet and 6 feet respectively were investigated as models representing similar water bodies in the area. These ponds were studied for their physico-chemical parameters and assessment was made for their suitability as a medium for the culture of fish and other organisms.

6. Anbarasu, K.; Ramalingam, K. (P.G. and Research Department of Zoology, Government Arts College (Men) (Autonomous), Nandanam, Chennai - 35, (India)). **Studies on the sublethal dosage of mercuric chloride ($HgCl_2$) on tissue GOT and GPT of *Scylla tranquebarica* (Fabricius).** *Aquacult (India)*. (2007) v. 8(1) p. 33-44.

The sublethal dosages of mercuric chloride on the tissue transaminase activity in mud crab *Scylla tranquebarica* revealed that there was an enhancement of GPT activity following exposure to mercuric chloride. GPT enhancement was very much marked in the case of hepatopancreas at all the intervals in all the concentrations. Similarly in muscles also, the GPT increased after 7 and 30 days. The GPT activity in hemolymph in contrast to the other two tissues showed no marked changes. GOT showed an enhancement in the hepatopancreas at all the intervals when compared to initial zero hour. In muscle, GOT showed an enhancement after 7 days and 15 days in 0.001 ppm. In 0.0001 ppm concentration it showed the enhancement only after 15 days. In 0.01 ppm it showed enhancement after 7 days and 30 days. The GOT activity in the hemolymph was enhanced at all the intervals, in 0.001 and 0.0001 ppm concentration, whereas in 0.01 ppm a consistent decrease was noticed. The enhancement of GOT and GPT in the tissues and consequent formation of glutamate may be required in stressed conditions for the conversion of toxic ammonia to its non-toxic storage form viz., glutamine. Transaminase activities suggest that nitrogen metabolism in the mercury exposed crabs turned towards the better utilization of nitrogen source.

7. Athithan, S.; Ramanathan, N.; Ramadhas, V. (Fisheries College and Research Institute, Thoothukudi - 628 008, South India, (India)). **Chemical speciation of nitrogen in integrated fish/pig farming system.** *Indian Journal of Fisheries (India)*. (2007) v. 54(2) p. 171-178.

Experiments were conducted to investigate the temporal variations of different chemical species of nitrogen in water of fish/pig integrated system particularly in hardwater seasonal ponds. Mean values of different chemical species of nitrogen in water viz., soluble inorganic nitrogen, soluble organic nitrogen, total soluble nitrogen, particulate nitrogen and total nitrogen were registered. Two way ANOVA test confirmed that all the chemical species of nitrogen did not show any significant

variation in concentration among the different experimental ponds. However, temporal variations of these parameters exhibited significant difference. Sustained occurrence of nitrite and nitrate in the three experimental ponds affirmed continuous operation of nitrification with the total absence of denitrification.

8. Bala, Goutam; Mukherjee, Ambarish. (Department of Botany, Burdwan University Burdwan 713 104, (India)). **A census of wetland macrophytes in Nadia District, West Bengal.** Environment & Ecology (India). (2007) v. 25S(2) p. 287-290.

This communication attempts to bring out a checklist of wetland macrophytes in Nadia district, West Bengal which includes 112, 4 and 1 species of angiosperms, pteridophytes and algae respectively. Objective of this work was to help wetland managers and ecologists by providing an account of the floral characteristics of the wetland community.

9. Bhaskar N.; Mahendrakar, N.S. (Department of Meat, Fish and Poultry Technology, Central Food Technological Research Institute, Mysore - 570 020, (India)). **Chemical and microbiological changes in acid ensiled visceral waste of Indian major carp *Catla catla* (Hamilton) with emphasis on proteases.** Indian Journal of Fisheries (2007) v. 54(2) p. 217-225.

Processing of fish generates considerable quantities of highly perishable wastes including visceral mass. The present investigation was carried out to evaluate the effect of acid ensilaging on the chemical and microbiological characteristics of the visceral wastes of the Indian major carp, *Catla catla*, with the main objective of stabilizing the proteases. Acidification of visceral mass resulted in significant ($P \leq 0.05$) reduction in pH to 3.3 from the initial value of 6.2, however, it did not change the moisture, fat and ash content significantly ($P \geq 0.05$) during the storage period of 4 weeks at an ambient temperature of $27 \pm 2^\circ\text{C}$. Buffer extractable proteins (BEP), although decreased immediately after acidification ($P \leq 0.05$), showed an increase up to 2 weeks of storage and then decreased later during further storage. Fresh visceral waste of *Catla catla* has considerable protease activity especially neutral proteases. Specific activity (U mg^{-1} protein) of acidic, neutral and alkaline proteases showed marked decrease during storage ($P \leq 0.05$) from the initial values of 4.2, 13.2 and 4.7 respectively. Acid ensilaging negatively affected the proteases present in the fish visceral wastes with alkaline proteases being the most affected.

10. Biswas, S. N. (Deputy Director of Fisheries (Fresh Water Aquaculture). Govt. of West Bengal (India)). **Amar Karmakar of Nadia District, West Bengal - Achieves farmed major carp yield of 14.18 mt/ha/yr.** Fishing Chimes (India) (April 2007) v. 27 (1). p. 44-46.

The success story as narrated conveys the lesson that any sincere person who opts for fish farming can become a good fish farmer achieving a fish yield of 14 mt per ha/annum by adopting MSMH technology. Such an achievement is linked to zeal and devotion and the availability and utilisation of technical support in good

measure, utilising financial assistance in time, available from the Block FEO. The basic requirement, however, is the personal attention of a farmer towards development of the pond fisheries adopting Good Management Practices.

11. Chakraborty, N. M.; Mondal S. C.; Chakrabarty, P. P. (Regional Research Center, Central Institute of Freshwater Aquaculture Kalyani 741 235. (India)). **Captive Breeding, Early Life History and Rearing of Hatchling of *Ompok pabda* (Hamilton)**. Environment & Ecology (India). (2007) v. 25(I) p. 58-61.

Artificial spawning of *Ompok pabda* using ovaprim as inducing agent and fertilization of eggs with milt collected from males were attempted. The embryo hatched out in 23 hours of fertilization, the hatchling reared in fibre glass tank with the supply of natural food organisms, attained the av. size of 30-35 mm/207-245 mg in a period of fortnight with a survival of 61.0%.

12. Datta, A. K.; Dasgupta, S. (Wastewater Aquaculture Division, Central Institute of Freshwater Aquaculture, Rahara, Kolkata - 700 118 (India)). **Preliminary observation on the rearing of *Etroplus suratensis* in freshwater**. Journal of Inland Fisheries Society of India, (2007) v. 39(1) p. 20-25.

Pearlspot, *Etroplus suratensis* is a euryhaline species. An attempt was made to culture it in freshwater. A production of 1 t ha⁻¹ in 11 months were recorded with a survival rate of 82.6%. The harvesting size ranged from 111.4 mm, 45.8 g (stocking size, 26.7 mm, 0.4 g) to 143.8 mm, 73.1 g (stocking size, 65.5 mm, 7.5 g).

13. Dey, S.; Srivastava, P. K.; Maji, S.; Das, M. K.; Mukhopadhyaya, M. K.; Saha, P. K. (Central Inland Fisheries Research Institute, Barrackpore - 700 120 (India)). **Impact of climate change on the breeding of Indian major carps in West Bengal**. Journal of Inland Fisheries Society of India. (2007) v. 39(1) p. 26-34.

In recent years the maturing and breeding of Indian major carps viz., *C. catla*, *L. rohita* and *C. mrigala* in the month (March was observed in fish hatcheries of West Bengal. Investigation was-conducted to ascertain the impact of climate change as evident by enhanced temperature on the breeding of Indian major carps and on the fishers in general in 50 fish hatcheries in four districts (Burdwan, Bankura, Hooghly, North 24 Parganas) of West Bengal. The mean minimum and maximum air temperature increased in the range of 0.19°C - 0.67°C and 0.09°C - 0.37°C in all the four districts during 1985 to 2006. During the time scale period 1951-1952 to 1996-2005 the air temperature in the four districts showed increase of 4.4°C between the months of December to April. This frequent occurrence of 4.4°C showed a percentage shift towards January over the years in all the districts. The mean maximum and minimum water temperatures during the breeding season (March-September) also increased by 1.66°C and 0.31°C respectively during the same period in North 24 Parganas district. Consequently the breeding period of the major carps have advanced in all the four districts by 1-2 months since last twenty years. Structured questionnaire response of hatchery operatives from 50 hatcheries

also indicated temperature rise as a major factor (90-95%) for the advanced breeding of Indian major carps.

14. Doss, P. Jacob; Nagarjuna, A.; Suhasini, N.; Savithri, Y.; Prasad, S. Rajendra (Department of Zoology, Sri Venkateswara University, Tirupati - 517 502. Chittoor Dt. Andhra Pradesh); Ramanaiah, S. (Department of Geology, Sri Venkateswara University, Tirupati - 517 502. Chittoor Dt. Andhra Pradesh (India)). **Effect of Cypermethrin on various tissues of fresh water edible fish *Labeo rohita* with special reference to selected biochemical parameters.** Aquacult (India). (2007) v. 8(1) p. 69-77.

The activity levels of LDH, SOH, ASF, ALT, ACP and ALP were assessed in gill, muscle and intestine of *Labeo rohita* which had been exposed to sublethal concentrations of cypermethrin (0.52 µg/L) for 7 days and 15 days study. The results indicated a steady decrease in SDH activity with a concomitant increase in LDH, AST, ALT, ACP and ALP activities. The decreased SOH activity indicated inhibition of SDH at mitochondrial and increased LDH, AST, ALT, ACP and ALP activities to overcome the toxic stress due to cypermethrin intoxication.

15. Elizabeth, A. H. Priya. (97/G/41, Teacher's Colony, II Street East, Thoothukudi – 628 008) Davies, Simon J. (Faculty of Science, University of Plymouth, U.K. (India)). **Evaluation of the efficacy of poultry by-product meal, feather meal and blood meal in Nile tilapia *Oreochromis niloticus* feed.** Aquacult (India) (2007) v. 8(1) p. 53-62.

Feeding trial was conducted to investigate the potential of poultry by-product meal, blood meal and feather meal, in feed for juvenile tilapia (*Oreochromis niloticus*). A control fish meal feed and four experimental feed where fish meal was replaced at a fixed 66% with poultry by-product meal, blood meal, feather meal and enzyme treated feather meal were formulated. All the feeds were fixed to have a target protein of 30% and 8% fat to make the experimental diets iso-nitrogenous and iso-caloric. At the end of the 10 week feeding trial, poultry by-product meal substitution registered better growth performance and feed utilisation than the other diets and also the control diet with fish meal. Among the feeds with feather meal and enzyme treated feather meal substitution, feed with enzyme treated feather meal substitution performed better than the feather meal substituted feed. Feed with blood meal substitution registered the poorest growth and registered almost negligent-feed intake. Results of the present study indicate that a feed with 66% replacement of fish meal protein by poultry by-product meal can result in better growth and FCR in Nile tilapia.

16. Elizabeth, A. H. Priya (97/G/41, Teacher's Colony, II Street East, Thoothukudi – 628 008); Davies, Simon J. (Faculty of Science, University of Plymouth, UK. (India)). **Growth and feed conversion ratio of juvenile *Oreochromis niloticus* fed with replacement of fishmeal diets by animal by-products.** Indian Journal of Fisheries (2007) v. 54(1) p. 51-58.

Feeding trial was conducted to investigate poultry by-product meal, blood meal and feather meal, in feed for juvenile tilapia (*Oreochromis niloticus*). A control fish meal feed and four experimental feed where fish meal was replaced at a fixed 66% with poultry by-product meal, blood meal, feather meal and enzyme treated feather meal were formulated. All the feeds were fixed to have a target protein of 30% and 8% fat to make the experimental diets iso-nitrogenous and iso-caloric. At the end of the 10 week feeding trial, poultry by-product meal substitution registered better growth performance and feed utilisation than the other diets and also the control diet with fish meal. Among the feeds with feather meal and enzyme treated feather meal substitution, feed with enzyme treated feather meal substitution performed better than the feather meal substituted feed. Feed with blood meal substitution registered the poorest growth with almost negligent feed intake. Results of the present study indicate that a feed with 66% replacement of fish meal protein by poultry by-product meal can result in good production of Nile tilapia.

17. Gandotra, Roopma; Ahmed, Shiraz; Shanker, Ravi. (Department of Zoology, University of Jammu, Jammu - 180 001. (India)). **Food and feeding habit of *Barilius vagra* (Ham.) - a minor carp, in different age groups from Jhajhar stream, Jammu (J&K).** Aquacult (India) (2007) v. 8(1) p. 1-11.

Gut content analysis of *Barilius vagra* (Ham.) in all the four age group viz. 0⁺, 1⁺, 2⁺, 3⁺ size range (2.1-13 cm TL) revealed that the fish is mainly an euryphagic and column feeder. Its food mainly composed of Algae, Insects, Crustaceans, Diatoms, Rotifers, Deteritius and Miscellaneous items. The younger stages i.e. from 0⁺ to 1⁺ age group were found to be carni-omnivorous, as the under yearlings feed mainly on 47.15% of animal matter and, 32.07% of plant matter, whereas in 1⁺ age group the animal and plant matter composition was 32.79% and 23.03% respectively. On the other hand, fishes of 2⁺ and 3⁺ age groups mainly feed on 11.29% and 14.52% of animal matter and 40.4% and 42.02% of plant matter respectively. On this basis, the adult stages can be safely categorized as herbi-omnivorous. Relative Gut length increase from 0.7280 in 0⁺ age group to 1.145 in Y age group and shows significant linear co-relation with length of the fish. The value of "r" was found to be 0.997, 0.983, 0.984, and 0.993 in 0⁺, 1⁺, 2⁺ and 3⁺ age group respectively. Gastrosomatic index shows gradual decline, it was maximum ie. 4.39 in 0⁺ and minimum i.e. 1.95 in 3⁺ age group. In adults, the feeding intensity was maximum in pre-spawning period, moderate in post-spawning period and minimum during spawning phase.

18. Gupta, A. K.; Singh, Rajbir; Kumar, Virendra; Kumar, Naresh. (Environmental Research Laboratory, Department of Zoology, S.S.V. (P.G.) College, Hapur - 245 101(U.P.) (India)). **Religious and pollutional status of river Ganga at Brajghat.** Journal of Nature Conservation (India). (2007) v. 19(1) p. 51-56.

Ganga is the most important river of India. This river is associated with sentiments of every Indian. But today at Brajghat this majestic river is being polluted due to holy activities, cremation activities, discharge of domestic sewage and industrial

wastes. Increasing urbanisation and rural development plays an important role in total sludge, which is being poured in this river. The Ganga collects a large amount of human pollutants as it flows through highly populous areas. These populous areas and other people of down stream are then exposed to these potentially hazardous accumulations. While proposals have been made for remediating this condition, so far no great progress has been achieved. The Ganga remains an economically important waterway and polluting it remains economically advantageous.

19. Gupta, Anigta; Kranz, M.A. (Biocontrol & Biosystematics Laboratory, Department of Entomology, GBPUA&T, Pantnagar 263 145, Uttarakhand, (India)). **A new species of the genus *gastrancistrus* westwood (HYMENOPTERA: PTEROMALIDAE) from India.** Journal of the Bombay Natural History Society (India). (2007) v. 104(1) p. 72-75.

A new species of Pteromalidae, namely *Gastrancistrus pantnagarensis* Gupta and Khan sp. novo from Uttarakhand, India, has been described and illustrated, and a revised key to the species of Indian *Gastrancistrus* given.

20. Jahageerdar, Shrinivas; Krishna, Gopal; Prasad, J. K. (Central Institute of Fisheries Education (Deemed University), ICAR Panch Marg, Yari Road TK, Mumbai-400 061. (India)). **Effective spermatozoa to egg ratio for artificial insemination in *Labeo rohita* (Ham.).** Indian Journal of Fisheries (2007) v. 54(1) p. 107-115.

The present study was carried out to estimate the minimum effective sperm to egg ratio for rohu (*Labeo rohita*) for artificial insemination using cryo-preserved fish semen. The mean body weights of male and female brooders were 1.25 ± 0.002 and 1.48 ± 0.002 kg, respectively. The average quantity of milt produced was 2.18 ± 0.006 ml. and the sperm concentration was $2.58 \pm 0.16 \times 10^{10}$ ml⁻¹. The mean number of eggs was 1225 ± 45 per ml. The average fertilization rate obtained with the sperm to egg ratio of 6000:1 was 26.07 ± 2.48 ; the rates were 48.27 ± 2.77 and 46.55 ± 3.32 for the ratio of 12000:1 and 15000:1, respectively, whereas it was $52.09 \pm 3.18\%$ with neat milt. It was found that the sperm to egg ratio of 12000:1 provides an optimum fertilization rate.

21. James, R.; Sampath K.; Mary, T. Rosline Sheeba (Department of Zoology, V.D. Chidambaram College, Tuticorin-628 008, (India)). **Effect of synthetic feed additives on growth and leucocytes count in koi carp, *Cyprinus carpio* var. *koi* Linnaeus.** Indian Journal of Fisheries (2007) v. 54(2) p. 195-201.

Effect of different levels (0, 1, 3, 6 and 9%) of synthetic feed additives, nutriwin and frankmin on growth and leucocytes count were studied in the ornamental koi carp, *Cyprinus carpio* var. koi for a period of 100 days. The experimental diets were prepared with 40% protein. The mean body weight of koi carp increased with progression of time, however, the rates of feeding, conversion and conversion efficiency gradually decreased with progression of time. The dietary administration

of 6% nutriwin and 3% frankmin elicited the maximum feeding and growth rates, while 9% nutriwin and 6-9% frankmin reduced the feeding and growth rates. It suggests that lower doses (3% frankmin and 6% nutriwin) have anabolic effect stimulating feed intake and growth and catabolic effect at higher doses causing reduction of growth. Similar trend was obtained in feed conversion ratio also. Fish fed with 3% frankmin and 6% nutriwin showed highest number of leucocytes, neutrophils, monocytes and lymphocytes, therefore these are considered as optimum doses. Among the two feed additives, frankmin appears to be more economical for aquaculture production than nutriwin as it is required in less concentration.

22. Jawahar T. Abraham (5- Budherhat Road, Chakgaria, P. O. Panchasayar, Kolkata - 700 094, West Bengal (India)); Sengupta, Tapti; Sasmal, Debasis. (Department of Fishery Pathology and Microbiology, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences. (India)) **Ecology of luminous bacteria in penaeid shrimp grow-out systems of West Bengal, India.** Indian Journal of Fisheries (2007) v. 54(1) p. 37-44.

Occurrence and distribution of luminous bacteria (LB) from improved traditional, stagnant pond, modified extensive and semi-intensive shrimp grow-out systems of West Bengal were studied. About 51% of pond water, 31% of pond sediment and 22% of water samples had detectable level of LB. They were isolated invariably in all the diseased shrimp samples. The highest luminous bacterial counts (LBC) were recorded in the water samples of semi-intensive system ($\log <2.00 - \log 4.70/\text{ml}$) and sediment samples of modified extensive system ($\log <3.00 - \log 5.00/\text{g}$). An increase in the average LBC of water from $\log 2.44 \pm 0.621/\text{ml}$ to $\log 2.91 \pm 0.53/\text{ml}$ up to 60 days of culture was recorded. The counts, however, decreased to $\log 2.30 \pm 0.42/\text{ml}$ towards the end. The total viable bacterial counts were in the range of $\log 3.42 - \log 6.67/\text{ml}$, with the average of above $\log 5.00/\text{ml}$ pond water, the highest being in semi-intensive system ($\log 5.70 \pm 0.72/\text{ml}$). In pond sediment samples, the range of TVC recorded was $\log 3.70 - \log 7.37/\text{g}$, with the average of above $\log 6.00/\text{g}$ sediment. The majority of the LB isolated from various farms was *V. harveyi* (94.86%) followed by *V. splendidus* biotype 1 (4.57%) and *V. fischeri* (0.57%). The preponderance of LB in certain shrimp culture systems and the observed shift in the bacterial profile of water from the day of flooding up to 60 days strongly suggests the imbalance shrimp farming can bring about in autochthonous microflora.

23. Jayanthi, M. (Central Institute of Brackishwater Aquaculture 75, Santhome high road, Chennai-28 (India)). **Engineering aspects of aqua farm design for sustainability of environment and aquaculture.** Indian Journal of Fisheries (2007) v. 54(1) p. 59-65.

Engineering aspects of aqua farm design is an important asset for the development of sustainable aquaculture and environment. The aquaculture map prepared from IRS 1C- LISS III satellite data using Geographic Information System indicated that the

area under aquaculture was 328 ha in and around Pichavaram, Cuddalore district, Tamil Nadu. Farm design details like slope of primary and secondary dikes, seepage control measures, pond bottom slope, pond and water spread area were measured from aquaculture farms located at Pichavaram in Tamil Nadu and compared with standard design parameters. Soil characteristics like pH, electrical conductivity, porosity and water holding capacity of the farms ranged from 7.51 to 8.29, 6.18 to 15.75 dS/m, 15.21 to 29.71 % and 20.7 to 36.8 % respectively. The velocity in the drainage channel varied from 0.32 - 0.73 m/sec. The seepage rate was as high as 5.2-13.1 cm/day in soil due to sandy nature. The texture of the soil varied from loamy sand to sandy loam. Village based drainage network is recommended to facilitate proper drainage of wastewater from aquaculture farm.

24. Jayanthi, M.; Muralidharan, M. (Central Institute of Brackishwater Aquaculture, 75, Santhome High Road, R. A. Puram, Chennai - 600 028, India); Ramachandran, S. (University of Madras, Chennai-600 005, (India)). **Impact of shrimp farming on the soil characteristics of Vellar Coleroon estuary complex, Tamil Nadu.** Indian Journal of Fisheries (2007) v. 54(2) p. 179-187.

Assessment of changes in soil characteristics in and around shrimp farms will be helpful to evaluate the impact of aquaculture on the surrounding environment. Satellite data of IRS-1C, LISS III of 2003 were used to estimate the areal extent and spatial distribution of aquaculture farms in the Vellar Coleroon estuary complex based on satellite image processing softwares such as ERDAS Image and ARC VIEW. Sampling stations were fixed based on the spatial distribution of aquaculture farms using Global Positioning System (GPS). Soil samples were collected in and around the farms at various depths and analyzed. Electrical conductivity which varied from 5.75 to 5.81 dS/m and 8.45 to 9.19 dS/m before and during the culture period respectively indicated the increase in salinity by 46-58 % in shrimp ponds. Soil salinity decreased as the distance from the farm increased up to 100 m. Soil pH (7.85 to 8.37) and organic carbon (0.88 to 1.46%) registered higher values in the shrimp ponds, than surroundings. Shrimp culture did not influence porosity, water retention capacity and texture. There was no significant difference in soil properties of the surrounding environment before and during culture. Surface soil had higher pH, electrical conductivity, organic carbon and porosity than the sub surface soil. The water retention, capacity and clay content increased with the depth of soil. The present study has shown that the development of aquaculture in Vellar Coleroon estuary did not have any adverse impact on the soil quality of the nearby environment.

25. Kadam, M. S.; Gundile, M.G.; Jadhav, S.S. (Department of Zoology, Shivaji Mahavidyalaya, Udgir (M.S.); Wadje, A. D (Department of Zoology, Yeshwant Mahavidyalaya, Nanded (M.S.) (India)). **Quality of Lentic Water of Bhategaon Pond in Parbhani District, Maharashtra.** Aquacult (India). (2007) v. 8(1) p. 147-150.

The major consumptive use of water is for agricultural purpose and particularly for irrigation in the world. But in some areas irrigation is a problem because of scanty water. In some places water must be piped hundreds of kilometres for irrigation requires great deal of energy. The present lake is used for domestic, irrigation purposes and drinking purpose. The present study deal on lake, which is situated at village Bhategaon district Parbhani, at about 32 kms away from Nanded. It is natural lake. It receives rain water from surrounding hills. Hence the present study undertaken to study some physico-chemical parameters of Bhategaon pond water. The samples were collected in plastic bottles already cleaned by 5% nitric acid and redistilled water. They were collected on fixed date at early in the morning, every month. The physico-chemical factors were undertaken to study like dissolved oxygen, hydrogen ion concentration, chlorides, total solids, sodium, calcium, potassium and hardness.

26. Kailasam, M.; Arasu, A.R.T.; Abraham, Mathew; Sultana, Munawar; Shiranee, P.; Balakrishnan, M.; Thiagarajan, G.; Karaiyan K.; Subburaj, R. (Central Institute of Brackishwater Aquaculture, No.75, Santhome High Road, R.A.Puram, Chennai-600 028. (India)). **Induced sex reversal and breeding of greasy grouper *Epinephelus tauvina* (Forsk.)**. Indian Journal of Fisheries (2007) v. 54(1) p. 27-36.

Hormone doses required for induced breeding and induced sex reversal of females to males in the greasy grouper *Epinephelus tauvina* were standardized. Spawning was induced by multiple injection of HCG at doses ranging from 700 and 2400 IU/kg body weight and LHRHa @ 30-40 µg/kg body weight. Females with initial mean ova diameter of 450 µm and above responded well to hormone treatment. The ovulation time ranged from 72 to 144 hrs. The fertilization rate was about 19% and hatching rate was 5-10%. Mortality of larvae was noticed on 4th and 7th days after hatching. Females were converted to oozing males in 6 - 9 months by oral administration of 17α methyl testosterone hormone on alternate days @ 2.0 mg/kg body weight.

27. Kapila, Rajeev; Kapila, Suman; Basade, Yasmeen. (National Research Centre on Coldwater Fisheries, Bhimtal-263 136 (Nainital), Uttaranchal, (India)). **Impact of water pH on haematology and serum enzyme activities in *Schizothorax richardsonii* (Gray)**. Indian Journal of Fisheries (2007) v. 54(2) p. 227-233.

Haematological characteristics in fish changes in response to environmental conditions and thus could serve as indicators of sub lethal environmental stress. Exposure of snow trout, *Schizothorax richardsonii* to different water pH (5.0-9.0) for 24 h resulted in alteration in haematological and enzymological parameters. The fishes showed obvious signs of stress at pH 5.0 as indicated by their behavioural changes. Blood haemoglobin (Hb), red blood cells (RBC) and packed cell volume (PCV) were higher at both extremes of pH, but significantly ($p < 0.05$) higher at lower pH than control group at pH 7.0. Likewise, serum enzymes viz. Lactate

dehydrogenase (LDH), Glutamic oxaloacetic transaminase (GOT), Glutamic pyruvate transaminase (GPT), Acid phosphatase (ACP) and Alkaline phosphatase (ALP) exhibited elevated levels during acid stress. Conversely, protein concentration fell considerably in fishes exposed to low pH.

28. Kasherwani, Deepak; Verma, Ravishanker; Sharma, U. D. (Department of Zoology, University of Lucknow. Lucknow- 226007); Shukla, Sanjive (PG Department of Zoology, BSNV College. Lucknow 226001, (India)), **Cadmium Induced Skeletal Deformities in Freshwater Catfish, *Heteropneustes fossilis* (Bloch)**. Environment & Ecology (India). (2007) v. 25S (2) p. 348-351.

Freshwater catfish, *Heteropneustes fossilis* is exposed to sub-acute, 39.29 mg/litre (10% of 96-hour LC₅₀) concentration of cadmium chloride for 90 days showed various skeletal deformities viz. asymmetric cranium, scoliosis and lordosis of vertebral column, fusion and compression of vertebrae. Possible mechanisms of cadmium toxicity has been discussed.

29. Katiha, K. Pradeep; Dutta, Suman; Ziauddin, Golam. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700 120, West Bengal.); Deyi, Sumanto; Jena, J. K.; Dei, H. K. (Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar - 751 002, Orissa. (India)). **Carp polyculture for fish production in Kalahandi district of Orissa: Economics and constraints**. Journal of Inland Fisheries Society of India (2007) v. 39(1) p. 40-44.

The present communication deals with the economics of technology intervened and constraints of carp culture technology for its diversification and wider adoption. The data were collected through PRA and personal interview methods from the fish farmers using pre-tested schedules and analysed by simple tabular analysis. The results indicated lease amount of the ponds as major component of the fixed cost. Variable cost (85.55% of total cost) included pond preparation, stocking, feeding and a maximum of 40.77% as labour charges. Total cost of culture was estimated as Rs. 49067.44 ha⁻¹ with a net profit of Rs. 5342.73 ha⁻¹. The B:C ratio was calculated as 1.11. Major constraints in adoption and implementation of carp polyculture technology were transportation, availability and cost of fish seed, high cost of feed and fertilisers, repairing of gear, price fluctuation, higher interest rate for credit, poor infrastructural and storage facilities, multiple uses of water and poaching. The fishers were not satisfied with the ownership pattern, leasing policies and state extension services. Limited or no knowledge of soil and water quality affected their aquaculture management capabilities.

30. Kharatmol, B. R. (Department of Fisheries Biology, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, (India)); Kulkarni, G. N. (Department of Fisheries Hydrography College of Fisheries Shirgaon, Ratnagiri – 415 629 (India)). **Integrated fisheries resource management for sustainable inland fish production of Maharashtra**. Aquacult (India). (2007) v. 8(1) p. 109-116.

Fisheries sector plays a pivotal role in the national economy in view of its contribution to food basket. Maharashtra state offers an excellent opportunity in the fisheries sector of the vast natural resources in the form of an aquatic ecosystem such as rivers, natural lakes, estuaries, brackish water, mangroves, floodplain wetland, ponds and tanks and reservoirs. The inland fish production of the state was 50,000 metric tonnes in the year 1985-86 and has now reached to 1,25120 tonnes in the year 2003-04. The fish production from marine waters (upto 90 m) has reached its optimum level and has been stagnant for some years, leading to heavy fishing pressure on the coastal fisheries resources (Yadava *et al.*, 2004). So, it's a right time to concentrate on inland sector. Being primary source of original fish plasm, role of riverine fisheries, estuarine, reservoirs and Hood Plain Lake are crucial for conservation of biodiversity for sustainable fish production. Destruction and fragmentation of aquatic habitats, aquatic pollution, impoundment and channelization of water bodies, improper management of advance scientific technology and irrational fishing practices are affecting fishery resources. These key factors are responsible for the decline in fish production. It is stressed that degradation of aquatic resources and environments is a major threat to existing and future potential fish production from inland waters. The restoration of riverine fisheries would require an integrated approach, which takes into account the requirements of fisheries with the other uses of land and water in the river basins. It would also necessitate regulation of fishing efforts, strict enforcement of closed seasons, and rejuvenation of endangered fish species through stocking programs, protection of natural breeding grounds and setting up of sanctuaries for restoration of depleted germ plasm.

31. Krishna Rao D. S. (Reservoir Fisheries Division of Central Inland Fisheries Research Institute Hessaraghatta Lake Post, Bangalore – 560 089. (India)). **Biology of the catfish, *Mystus cavasius* (ham.), in the Hemavathi reservoir (Cauvery river system, Karnataka).** Journal of Inland Fisheries Society of India (2007) v. 39(1) p. 35-39.

Investigations were made on the biology of the catfish, *Mystus cavasius*, from Hemavathi reservoir, constructed across the river Hemavathi under Cauvery basin. The principal physical features of the reservoir are-latitude: 12° 40' N, area: 8502 ha at FRL, maximum depth: 40.2 m, mean depth: 12.4 m, flushing rate: 3.47 and catchment to reservoir area ratio: 1050.6. The logarithmic regression equation for the length-weight relationship for the pooled samples was $\log W = -1.833 + 2.83 \log L$ ($r = 0.89$). The ratio of males to females was 1 : 1.44. The fish is predominantly an insectivorous predator and feeds in the littoral region. Fish or fish remains did not form part of the diet. In gravid females, the mean (maximum) gonado-somatic index (GSI) was around 10%. The GSI peaked during March to June followed by a precipitous fall in the subsequent month. The spawning season was sharp and well defined and was during June - July (early monsoon). Fecundity varied from 2,550 (TL 17 cm, Wt 50 g) to 71,324 (TL 26.5 cm, Wt 188 g). Relative fecundity was 206. Fecundity was positively correlated with the length and body weight and was highly significant. *Mystus cavasius* contributed 9.6 to 37.7% to the

total commercial fish landings during the period 2001-04 and the fish was transported to Kolkata for marketing.

32. Kumar, Adarsh; Qureshi T. A.; Borana K.; Manohar, S. (Department of Applied Aquaculture, Barkatullah University, Bhopal-242026 (M.P.) (India)); Parashar, A. (Sarojni Naidu Girl's P.G. College, Shivaji Nagar, Bhopal (India)). **Status of fish diversity of Ranjit Sagar reservoir, Jammu and Kashmir**. *Aquacult (India)*. (2007) v. 8(1) p. 147-150.

Ranjit Sagar reservoir is a man made earth cum rock filled reservoir constructed at the junction of three states viz. Jammu and Kashmir, Punjab and Himachal Pradesh on river Ravi. The water spread area of this reservoir is 87 sq. km. Detailed studies have been conducted on the fish diversity of this reservoir from January, 2004 to December, 2005. During this period, 18 species of fishes, belonging to 05 orders, 09 families and 14 genera were recorded. The list also includes fishes stocked by Jammu and Kashmir Fisheries Department. Present investigation revealed the productiveness of this newly constructed reservoir and also the impact of stocked species on the indigenous fauna of the river on which the reservoir is constructed.

33. Kumar, Anup; Singh, A. K.; Singh I. J. ; Ram, R. N. (Department of Fishery Biology, College of Fisheries, G. B. Pant University of Agriculture & Technology, Pantnagar – 236 145, U.S. Nagar, Uttaranchal, (India)). **Advancing gonadal development and maturity by ovaprim in *Labeo rohita* (Ham.)**. *Indian Journal of Fisheries* (2007) v. 54(1) p. 85-92.

Effect of ovaprim on acceleration of developmental and maturational processes in the gonads of *Labeo rohita* has been studied during pre-spawning phase of its annual reproductive cycle. Two intramuscular injections of ovaprim given @ 0.1 ml/kg body weight fortnightly during early pre-spawning phase (April) induced increase in gonadosomatic index (GSI) of both male and female specimens of *L. rohita*. The lipid content in testis and liver decreased significantly in ovaprim treated male fish. Changes in hepatosomatic index (HSI), water content in gonads and liver of both sexes and lipid content in ovary and liver of female treated with ovaprim were not significant. Advance stages of oocyte with vitellogenic activity in female and augmented spermatogenic activity in male specimens were observed after treatment with ovaprim. Increased biosynthetic activities in hepatocytes of both sexes of *L. rohita*, evident by cytoplasmic characteristics and enlarged nuclear size were also apparent. These observations indicate that optimized dose and frequency of ovaprim, widely used for inducing spawning in majority of fishes, has the potential of advancing gonadal development and maturity in *L. rohita* during pre-spawning phase of its annual reproductive cycle.

34. Kumar, Pawan; Sagar, Vidya (Post-graduate Students Division of Fisheries Resource Management); Choudhary, A.K.; Kumar, Niraj (Ph.D. Students Division of Fish Genetics and Biotechnololy, Central Institute of Fisheries Education

Mumbai - 400 061. (India)). **Vermiculture: Boon for Fish Farmers.** Fishing Chimes, (India). (April 2007) v. 27(1). p. 40-42.

Vermicomposting technology is applicable to the rural as well as the urban society. It not only helps in commercial aquafarming but also acts as a convenient source of earthworms for growing ornamental fishes in aquarium. Thus, vermicomposting can be included as a component of sustainable lifestyle. Application of vermiculture and vermicomposting in aquaculture is ecofriendly and bioethically acceptable.

35. Kumaran, M.; Krishnan M.; Ravichandran, P. (Central Institute of Brackishwater Aquaculture, 75, Santhome High Road, Chennai - 28. (India)). **Extension services in coastal aquaculture : need for a public and private partnership.** Indian Journal of Fisheries (2007) v. 54(1) p. 75-83.

Aquaculture extension is an interface between aquaculture research and its end users linking the duo. Two parallel streams of public and private funded fishery extension services operate in the system. The present study conducted among both the extension agents to perform a juxtapose comparison of the above two with respect to personal and operational variants. The study revealed that both the group differ significantly in terms of extension approach and methods, information behaviour, linkage with fishery R&D, frequency of contact, age, education, effectiveness and accessibility. The study suggested that both the extension streams ought to work as partners of extension than running a parallel regime. SWOT analysis of the fishery extension service was also reported.

36. Kushwaha, Yachna (P. G. Department of Zoology, D. A. V. College, Kanpur); Saxena, K. K. (P. G. Department of Zoology, Janta Mahavidyalaya, Ajitmal (Auraiya) U.P. (India)). **Morphological studies of blood cells in a carp, *Cyprinus carpio* (L.).** Aquacult (India) (2007) v. 8(1) p. 143-146.

In the present investigation the morphology of blood cells in a carp, *Cyprinus carpio* was investigated by light and electron microscopy. Erythrocytes, thrombocytes, lymphocytes, granulocytes and monocytes were identified as the peripheral blood cells. Erythrocytes were long oval and some times round to oval erythroblasts, possessing a few mitochondria and endoplasmic reticula were seen. Thrombocytes were round to long oval, each containing vesicular and microtubular structures and an oval nucleus with abundant heterochromatins. Lymphocytes were divided into three types in size, small, medium and large. Some of the small and medium lymphocytes were naphthyl-acetate esterase (ANAE) positive, while large lymphocytes were pyroninophilic. Granulocytes were distinguished into three types (type I, type II and type III) according to the morphology of the nucleus and granules. Type I granulocytes possessed lobulated nuclei and large number of cytoplasmic granules. Type II granulocytes has small eccentric nuclei and type III granulocytes possessed round nuclei and a few large granules. The granules were filled with regularly arranged fibriform materials and some needle-like structures.

Monocytes were morphologically similar to those of mammals.

37. Mandal, Dipak Kumar. (Department of Zoology, Visva-Bharati, Santiniketan -731 235, West Bengal (India)). **Annual histological changes in the testes of a minor carp, *Labeo bata* (Hamilton)**. Journal of Inland Fisheries Society of India (2007) v. 39(1) p.1-6.

Developmental activities in the testes of *Labeo bata* exhibits annual variations which can be divided into five distinguishable phases on the basis of gonadosomatic index (GSI) and histological conditions. Spermatogonial proliferation began in the germinal epithelium during resting phase (October- November) when they appeared as cysts in the lobules and continued till the preparatory phase (December-March). During this period primary spermatocytes are produced in huge quantity. However, secondary spermatocytes, spermatids and spermatozoa appeared subsequently during maturation phase (April to May). Spawning phase (June to August) is characterized by very enlarged lobules with full of spermatozoa, whereas post-spawning phase (September) is the period of regression, when spermatozoa are degenerated by pycnosis leaving the lobules with only a few residual spermatozoa and peripheral spermatogonia. Interstitial Leydig's cells are found throughout the reproductive cycle with peak abundance during maturation phase.

38. Mani, C. (Department of Zoology, FMN College, Kollam. Kerala, India); Prakasam, V. R. (Department of Environmental Sciences, University of Kerala, Thiruvananthapuram – 695 581. (India)). **Scale Morphology and Composition of Fresh Water Zebra Fish in Relation to Size and Habitat**. Environment & Ecology (India). (2007) v. 25S(2) p. 396-398.

Morphological, metric and meristic characteristics of cycloid scales of zebra fish, *Brachydanio rerio* were studied in relation to length of fish by categorizing them into SI and SII. The location of focus and origin of radii were found to be peculiar to the fish. The length-width ratio was different for scales and it was related to the length of the fish. Circuli and radii showed variations in different scales and were positively correlated with length of the fish recalling observations in other fresh water fishes found in similar habitats. Whereas the organic constituents of scales registered decrease in size group II, the inorganic constituents recorded increase in the same group indicating a relationship between length of fish and tissue constituents.

39. Manojkumar, P. P. (Calicut Research Centre of Central Marine Fisheries Research Institute, West Hill, Calicut – 673 005. (India)). **Fishery of sciaenids off Veraval with special reference to growth, mortality and stock assessment of *Otolithes cuvieri* (Trewavas, 1974)**. Indian Journal of Fisheries (2007) v. 54(1) p. 21-26.

Sciaenids form an important demersal finfish resource off Veraval and contribute about 12% to the total marine landings. They are exploited mainly by trawls and

gillnets with an annual average landing of 9086 t and 323 t respectively during 1986-95. Nearly 16 species contribute to the sciaenid fishery of which, *Otolithes cuvieri* and *Johnius glaucus* contributed 52.6% and 13.8% respectively. In gill net seven species contribute to the landings, dominated by *Otolithes cuvieri* and *Protonibea diacanthus*. The peak landing of sciaenids was noticed in September and January. Studies on *O. cuvieri* revealed that there was no significant difference in the length weight relationship between the sexes, and hence a common regression was fitted as $\text{Log } W = - 4.4632 + 2.9701 \text{ Log } L$ ($r = 0.9036$). The asymptotic length (L_{∞}) and growth coefficient (K) were estimated as 382 mm and 0.89 y^{-1} respectively. *O. cuvieri* grows to 225, 317, 354, 371 and 382 mm at the end of 1st, 2nd, 3rd, 4th and 5th years. The fishery mainly consisted of 0 and 1 year classes. The average instantaneous rates of total, natural and fishing mortalities were 2.86 y^{-1} , 0.81 y^{-1} and 2.05 y^{-1} respectively. The length at first capture was 148 mm at which the age works out to be 0.5 year. The exploitation ratio is higher than the E_{max} estimated indicating that the resource is overexploited. In view of the heavy fishing pressure, there is a need for reducing the fishing effort to sustain the fishery.

40. Metar, Y. Santosh; Yadav, S. R.; Wasave, S. M. (College of Fisheries, Shirgaon, Ratnagiri, Maharashtra, 415629); Chakraborty, S. K.; Jaiswar, A. K. (Central Institute of Fisheries Education, Seven Bungalows, Versova, Mumbai- 400061, (India)). **Morphometry, length-weight relationship and relative condition factor of *Saurida tumbil* (Bloch, 1795) from Mumbai waters, India.** Aquacult (India) (2007) v. 8(1) p. 79-83.

High degree of correlation observed among the compared morphometric characters of *Saurida tumbil* from Mumbai waters indicated homogenous population. Based on the meristic study, fin formula can be written as $B_{15-16}, D_{12-14}, P_{14-16}, V_9, A_{9-12}, C_{19-23}, L_{53-57}$. The length- weight relationship was derived as $W = 0.00002553 L^{2.79589}$ (Male); $W = 0.00000838 L^{2.99264}$ (Female) and $W = 0.00001525 L^{2.88665}$ (pooled). The seasonal variation observed in the condition factor for both the sexes could be related to the reproductive cycle.

41. Muralidhar, M.; Gupta, B. P. (Central Institute of Brackishwater Aquaculture, 75, Santhome High Road, R. A Puram, Chennai - 600 028, (India)). **Quality of water discharge from shrimp hatcheries and its impact on the surrounding coastal environment.** Indian Journal of Fisheries (2007) v. 54(2) p. 189-194.

Availability of quality shrimp seed is a prerequisite for successful shrimp culture. Mass production of post larvae in the hatcheries need large quantities of seawater, which again goes back to the sea/backwaters as wastewater. In order to assess the quality of discharge water from the hatchery and its impact on the surrounding environment, water samples from two commercial shrimp hatcheries located along the coast of Tamil Nadu and Andhra Pradesh were analysed for various physico-chemical parameters, pesticides and heavy metals. Though there was some increase in values of some of the parameters in discharge water as compared to filtered

seawater, levels of all parameters were well within the permissible limits as prescribed by the Ministry of Environment and Forests. Practically, there was no significant increase in the levels of pesticides and heavy metals in the outfall regions compared to intake water.

42. Nath, D.; Misra, R. N.; Jha, B. C.; Mukhopadhyay, M. K. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700 120. (India)). **Hydrobiological investigation in river damodar with special reference to aquatic pollution.** Journal of Inland Fisheries Society of India (2007) v. 39(1) p. 45-50.

The physico-chemical characteristics of water, primary production and plankton levels in river Damodar during the four seasons of 2003-04 are presented. The samples were collected from 39 centres of Damodar between Kalyaneswari and Shyampur in West Bengal. The physico-chemical data revealed stressed aquatic environment in river Damodar due to indiscriminate discharge of industrial and domestic effluents. Low water depth, high temperature of effluents, high BOD, total alkalinity, hardness, salinity, nitrate, phosphate and silicate and low dissolved oxygen indicated a stressed condition. The stress was maximum at the outfall zones, which were gradually recovered downstream, below 5 to 10 km. relatively high organic loads were recorded at Kalyaneswari to Manbera, Cinakuri Thermal, Dishergarh, Bumpur, Gagalpuri, Asansol Nuna, Raniganj E and Durgapur. The river stretch receiving industrial effluents showed lower primary production as well as poor plankton community structure.

43. Ojha, Praveen; Mandloi, A. K. (Department of Fishery Science, College of Veterinary Science and A. H. Jawahar Lal Nehru Krishi Vishva Vidyalaya, Jabalpur - 482 004 (M.P.). (India)). **Fisheries of Barnoo reservoir and impact of stocking advanced fingerlings of major carps on the fish productivity.** Aquacult (India) (2007) v. 8(1) p. 95-100.

Barnoo, a small irrigation reservoir of 75.6 ha. water spread area, situated at Sihora tehsil of Jabalpur district, Madhya Pradesh. The reservoir has positive morphometric and drainage characteristics, such as low mean depth, extensive catchments with forest cover and moderately flushing rate, which entitle to place it under productive category. Fisheries of Barnoo reservoir were controlled by fisheries co-operative society and stocked with 1-1.5 lakh poor quality spawn. The fish catch during 1999-2000 was contributed by native fishes by 61.5% with unmanaged populations and the fish yield was 45.63 kg/ha. The introduction of advance size (90-150 mm) fingerlings of major carps seed for the year 2000-2001 has changed the fish productivity and fishery structure of the reservoir. The fish yield jumped to 94.27 kg/ha during 2000-2001, 116.56 kg/ha in 2001-2002, 129.11 kg/ha during 2002-2003 and 161.28 kg/ha in 2003-Oct. 2003. The stocking of advanced fingerlings of carps under scientific line contributes 82% in 2000-2001, 62.8% in 2001-2002, 64.7% in 2002-2003 and 84.3% in 2003- Oct.2003. The present study revealed that the sustainable development of fish production requires

scientific management practices i.e. stocking of reservoir with advance size quality fish seed.

44. Ojha, Praveen; Mandloi, A. K. (Department of Fishery Science, College of Veterinary Science and Animal Husbandry, Jawahar Lal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.); Dube, K. K. (Department of Zoology, Government Autonomous College, Jabalpur (M.P.) (India)). **Seasonal fluctuation of dentine fauna and macrophytes in a small irrigation reservoir Barnoo (Jabalpur, M. P).** Journal of Nature Conservation (India). (2007) v. 19(1) p. 75-81.

Present study reveals that in Barnoo reservoir under zoobenthos population consisted 3-families of annelids; 4-families of Gastropods; 3-families of Bivalves and aquatic insects consisted of 4 - orders; where as macrophytes consisted of four groups viz. marginal consisted of 4 - species; floating 6 - species; rooted submerged 5 - species and rooted floating consisted of 2 - species.

45. Palit, Debnath; Mukherjee, Ambarish (Department of Botany, Burdwan University Burdwan 713 104, (India)). **An inventory of wetlands in Birbhum District, West Bengal and their successional characteristics.** Environment & Ecology (India). (2007) v. 25(I) p. 173-176.

Of the several water bodies observed in this district as many as 25 wetlands, each with an area exceeding 5 acres, are enumerated and marked in the map in this communication. These freshwater wetlands occur in 15 out of 19 Blocks of the district. From 4 Blocks viz. Illambazar, Khayrasole, Naihati II and Rajnagar no wetlands with an area of 5 acres or more could be identified. On the basis of successional stages these wetlands have been put into six categories.

46. Pathak, Renu; Sadhu, D. N. (Department of Zoology. St. Columba's College Hazaribag. Jharkhand. India); Alam, Md. Noor; Sadhu, Sukant (Department of Zoology. Giridih College. Giridih - 815301 Jharkhand. (India)). **Toxicity of Pesticide Cartriz to the Fish *Channa punctatus*.** Environment & Ecology (India) (2007) v. 25S(2) p. 369-372.

The study deals with the toxic effect of a carbamate pesticide cartriz on the fresh water fish, *Channa punctatus*. The LC₅₀, value of the pesticide was 34 ppm whereas 25 and 38 ppm were LC₀ and LC₁₀₀ values for 96 hours. The pesticide also changed physico-chemical characters of the diluent water and behaviour of the fish.

47. Punit K. Srivastava; Roy, D. (Department of Zoology, S. M. M. Town (P. G.) College, Ballia - 277 001, Uttar Pradesh. (India)). **Effects of preservation on biochemical composition of *Ceriodaphnia cornuta*.** Journal of Inland Fisheries Society of India (2007) v. 39(1) p. 7-11.

Zooplankton are valuable source of energy, protein, lipids and minerals. Because of their limited availability throughout the year, their preservation is necessary which

may lead to nutritional devaluation. Preservation of *Ceriodaphnia cornuta* in the present study at two different temperatures, 4°C and -20°C showed that there was decrease in nutritional quality in both the cases. Preservation for various periods (24 h, 48 h and 72 h) at 4°C led to decrease in protein content by 45-57% while at -20°C the protein contents were lowered only by 4-8%. The carbohydrate contents decreased by 34-61% at 4°C but at -20°C the decrease was limited to 20-29%. Similarly, the lipid contents too were reduced by 42-83% following different hours of preservation at 4°C and by 35-57% following preservation for different periods at -20°C. Obviously, the rate of decrease in total lipid content at 4°C and -20°C temperature was much higher than that of protein and carbohydrate. However, preservation at -20°C is comparatively better as it exerts limited effect on protein and carbohydrate contents.

48. Radhika, D.; Veerabalu, C.; Kumar, D. (Department of Zoology and Research Laboratory, V.O. Chidambaram College, Tuticorin - 628 008. (India)). **Growth assessment of red swordtails *Xiphophorus helleri* (Poeciliidae) fed on three different diets.** Aquacult (India) (2007) v. 8(1) p. 21-26.

The swordtails *Xiphophorus helleri* were selected for the present investigation. The uniform sizes of 10 individual fishes were selected for each one of the cement tank (2.5"x3" circular tank) with the water capacity level of 30 lt. The experimental duration was 42 days. Three types of feed were fed for the experimental fish viz; Chironomus larvae (D1) Animal protein 4% (D2) and Plant protein 40% (D3). The best specific growth rate were observed in those fed on chironomus larvae (D1) 3.84 ± 0.008 followed by other diets 3.356 ± 0.004 , 3.23 ± 0.008 . The best survival 100% were observed in D1 followed by other parameters such as ADG, RGR, and weight gain.

49. Rath, S. C.; Sarkar, S. K.; Gupta S. D.; Mondal, B. (Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar - 751 002 (India)). **Gonadal development and induced spawning in spontaneously bred *Labeo rohita* (Ham.).** Indian Journal of Fisheries (India) (2007) v. 54(2) p. 163-170.

Mass spontaneous spawning of *Catla catla*, *Labeo rohita*, *L. calbasu* and *Cirrhinus mrigala* in selected ponds of the Orissa state fish farm at Kausalyaganga was recorded. Of the above four species, spent brood of *L. rohita* was studied further for subsequent gonadal development and second breeding. GSI (ovary) of spent *L. rohita* after spontaneous spawning was recorded as 2.04 ± 0.093 , whereas the same in non-bred brood of the adjacent pond was recorded as 17.56 ± 1.35 . GSI of the spent female increased to 8.26 ± 0.391 after 15 days of spontaneous spawning and the same after 45 days was 14.1 ± 0.2 . Histomorphology of ovary on the first day after spontaneous spawning exhibited 74 % empty follicles and 26% unspawned oocytes of different stages. After 15 days of spontaneous spawning, the spent ovary showed many newly recruited oogonia, some developing oocytes and few atretic follicles. Ovary after 45 days of spontaneous spawning had mostly maturing and matured oocytes along with some traces of resorbing atretic follicles. The spent

brood could be induced bred second time in eco-hatchery system after 60 days. The spontaneously bred *L. rohita* on its second breeding produced 0.92×10^5 spawn per kg body weight, whereas non-bred (control) brood produced 0.71×10^5 spawn per kg body weight. The fecundity and fertilization rate in second breeding were higher, 1.2×10^5 and 94-96 % respectively than 0.91×10^5 and 88-90% of the control.

50. Rathore, Gaurav; Kumar, Gokhlesh; Swaminathan, T. Raja; Sood, Neeraj; Singh, Vijai; Abidi, Rehana; Lakra, W.S. (National Bureau of Fish Genetic Resources, Canal Ring Road, P.O. Dilkusha, Telibagh, Lucknow 226002, (India)). **Primary cell culture from fin explants of *Labeo rohita* (Ham.)**. Indian Journal of Fisheries. (2007) v. 54(1) p. 93-97.

The study reports a successful development of primary cell culture from fin explants of *Labeo rohita* and subsequent subculture up to eight passages. Explant tissues of fin were seeded and incubated at 30°C in DMEM supplemented with 10% FCS. On day 5 of seeding, the differentiation of the cells was visible and a complete monolayer was obtained on day 20. A cell count of 2×10^6 cells was sufficient to produce monolayer in 5 days on 8th passage. These encouraging results are indicative of a high probability of developing a cell line from the fin tissue of *L. rohita*.

51. Saba, D. I.; Zubair, S. M.; Sharma K. K.; Jyoti, M. K. (Department of Zoology, University of Jammu, Jammu - 180006. (India)). **Planktonological assessment of river Chenab and its tributaries in J&K**. Journal of Nature Conservation (India) (2007) v. 19(1) p. 101-113.

River Chenab, one of the important vibrant tributaries of Indus drainage system while traversing 328 kms in the territorial jurisdiction of J& K receives a number of tributaries that add to its flowing water mass besides the planktonic organisms which enhance its productivity. So a survey was carried out to determine the planktonic composition of river Chenab and its tributaries. As a consequence of the present survey, phytoplanktons belonging to Chlorophyceae (11 species), Bacillariophyceae (7 species) and Cyanophyceae (2 species) were recorded which exhibited uniform distributional pattern. The zooplanktons were represented by 17 species belonging to three major groups viz., Rotifera (10 species), Cladocera (5 spp.) and Copepoda (2 spp.). The present paper provides an insight into the Phyto- and Zooplanktonic composition of river Chenab and its tributaries.

52. Sahoo, P. K.; Dash, H. K.; Sadangi, B. N. (National Research Centre for Women in Agriculture (ICAR) P. O. Baramunda, Bhubaneswar -751003, Orissa. (India)). **Traditional prawn fishing by women in chilika lake: a case study**. Journal of Inland Fisheries Society of India (2007) v. 39(1) p. 55-59.

Fishing of non-penaeid prawns, locally known as *Sridhar*, is an age-old activity exclusively undertaken by women belonging to *Keot* sub-caste of fishing community around Chilika lake. Importantly, processing of these prawns and marketing of processed products constitute an important means of livelihood for these women and their family who are steeped in abject poverty. Despite hard work, they end the day with a meager amount which is not just enough for family maintenance. Besides its economic significance, the activity is said to have some bearing on ecology of Chilika.

53. Sahoo, Sankarsan; Jameson, James Daniel. (Department of Fisheries Environment, Fisheries College and Research Institute, TANUVAS, Thoothukudi-628 008, Tamilnadu, (India)). **Effects of cow shed washings on the C : N ratio in carp fish pond.** *Aquacult (India)* (2007) v. 8(1) p. 117-123.

The influence of cattle shed washings upon the nutrient mineralization and its impact on the C:N ratio and fish biomass production was investigated and compared to highlight the importance of an integrated fish culture systems against a semi-intensive fish culture system. The soluble total C:N ratio (457.6) and soluble organic C:N ratio (300.1) were significantly low ($P < 0.001$) in the integrated fish pond than in composite fish culture pond (1587.29 and 1281.07). The sedimentary C:N ratio was significantly higher ($P < 0.001$) in the integrated fish pond (9.57 -30.15) than in the composite fish culture pond (7.5 - 24.0). The C:N ratio has accelerated autotrophy and heterotrophy and as a result they enhanced the fish growth and production. Fish yield of 6250 kg/ha/yr was recorded in the cattle shed washings fed fish pond. The dosages and frequencies of organic manures application in the integrated fish pond and semi-intensive fish pond have been discussed to highlight the importance of C:N ratio in fish culture operation.

54. Sankaraiyah, K.; Latha, P. Madhavee, (Lecturer in Zoology, Dr. S. R. K. Govt. Arts College, Yanam - 533 464. (India)). **Effect of Antibiotics (Oxytetracyclin and tetracyclin) on gut bacterial flora of Tilapia (*Oreochromis mossambicus*) peters.** *Aquacult (India)* (2007) v. 8(1) p. 125-132.

Usage of antibiotics is inevitable in aquaculture practices. Oxytetracycline and tetracycline are most frequently used. Tilapia shows decreased gut flora for 48 hours and gradually increases up to 120 hours when treated with both the antibiotics. The antibiotic resistant bacteria slowly stabilize and help the growth of fish. Fish show significant growth difference during the treatment period with antibiotics. Amylase producing bacteria are found maximum compared to protease and lipase producing bacteria during treatment period.

55. Santoshing, Jamadar (Department of Zoology, M. U. College, Udgir – 413 517): Gupta, S. R. (Department of Zoology, Shivaji Mahavidyalaya, Udgir – 413 517. (India)). **Studies on Maturation and Spawning of tropical fresh water catfish *Mystus cavasius* from Marathwada region (M.S.).** *Aquacult (India)*. (2007) v. 8(1) p. 101-107.

Maturation and spawning of *Mystus cavasius* from Marathwada was studied from January to December 2002. The spawning season extend from late July to October with intense spawning activity during August and September. Individual fish spawn only once in a season the specific gonodal cycle and the presence of distinctly separate mode of maturation ova in the ripe ova are indicates of synchronous and short spawning *Mystus cavasius* on set on intensity of spawning are directly dependent on the monsoon, length of first maturity in female is 9.5 cm and 8.2 cm in male. The sex ratio was significantly different in 2002. The sex ratio was 1:1.60. The female is dominant in the sample.

56. Sarkar, U. K.; Kapoor, D.; Paul, S. K.; Pathak, A. K.; Basheer, V. S.; Deepak, P. K.; Srivastava, S. M. ; Tyagi, L. K. (Endangered Fish Biology and Systematics Lab, National Bureau of Fish Genetic Resources, Canal Ring Road, Dilkusha, Lucknow 226 002, Uttar Pradesh, (India)). **Fish biodiversity in the water bodies of Samaspur bird sanctuary, Uttar Pradesh: towards developing a freshwater aquatic sanctuary.** Journal of the Bombay Natural History Society (India) (2007) v. 104(1) p. 51-54.

Extensive surveys were conducted in Samaspur Bird Sanctuary (799.37 ha), Uttar Pradesh during June 2000 to December 2004, to explore the status of fish germplasm resources in the water bodies. A total of 3,444 fish were collected and classified into 7 orders, 19 families, 33 genera and 46 species. One exotic species (n=2) *Aristichthys nobilis* was collected. This is the first ichthyofaunal report of this Sanctuary. The dominant species was *Gudusia chapra* (relative abundance, 7.25%) and the subdominant species were *Labeo bata* (RA, 6.67%), *Salmostoma bacaila* (RA, 5.51 %), *Amblypharyngodon mola* (RA, 5.08%), *Notopterus notopterus* (RA, 4.50%) and *Eutropiichthys vacha* (RA, 3.91 %). The analysis showed that 28.26% of fish species, which are reported to be threatened as per IUCN, had a stable population in the Sanctuary. Apart from the major Indian carps and the above-mentioned species, the important species recorded were *Chitala chitala*, *Clupisoma garua*, *Ailia coila*, *Aorichthys aor*, *Wallago attu*, *Labeo gonius*, *Labeo pangusia*, *Puntius sarana*, *Rhinomugil corsula*, *Channa marulius*, *Channa striatus*, *Ompok pabda* and *Ompok pabo*. The study confirms that protected freshwater areas are important for conservation of regional fish biodiversity, especially for local and endangered fish species.

57. Sarma D. (Deptt. of Zoology, Goalpara College; Goalpara, Assam); Dutta, A. (Deptt. of Zoology, Gauhati University, Guwahati, Assam); Choudhury, M. (CIFRI, N.E. Regional Office, Housefed Complex; Guwahati, Assam. (India)). **Limnology and fisheries of Urpod beel, Goalpara, Assam.** Journal of Inland Fisheries Society of India (2007) v. 39(1) p. 51-54.

The limnology, hydrobiology and fisheries of Urpod *beel*, Goalpara (Assam) was assessed from 1999 to 2001 to evaluate their roles in the fish yield. Physico-

chemical parameters of the *beel* were observed favorable for fishery. Biological parameters such as plankton populations and primary productivity level fluctuated within the permissible limit.

58. Saxena, Shriparna; Shukla, K. Gyanesh; Dutta, Sumana (Department of Limnology, Barkatullah University, Bhopal - 462 026 (M.P.) (India)). **Observations on the status of morphometric phenology of Tor Mahseer in different habitats of Narmada waters.** Aquacult (India) (2007) v. 8(1) p. 63-67.

Observations on the morphometric phenology of Tor mahseer from different habitats of river Narmada have been made. Head length, length of caudal fin, length of dorsal fin, length of anal fin, length of pelvic fin and maximum body depth in proportion to total length differed, while standard length and predorsal distance were found to be similar. In proportion to head length, Post orbital distance and pre orbital distance differed while head depth was found to be similar in specimen collected from different habitats. Minimum body depth proportion to total length and eye diameter in proportion to head length were found to comparatively dissimilar in these specimens.

59. Sebastian, Simimole; Shukla, N. Arvind (School of Studies in Zoology & Biotechnology, Vikram University, Ujjain - 456 010 (M.P.) (India)). **Observations on the condition factor of *Aorichthys seenghala* from Kshipra River, Ujjain (M.P).** Aquacult (India) (2007) v. 8(1) p. 139-142.

To determine the index of condition during different months, 137 fish species of *Aorichthys seenghala* were analysed, conditioning of fish were calculated by cubic law showed fluctuating trend which were correlated with feeding and gonad development.

60. Sethuramalingam, T. A.; Hariharan, M.; Vadivammal, P. Shanmuga (Centre for Aquafeed and Nutrition (CAFeN), Department of Advanced Zoology and Biotechnology, St. Xavier's College, (autonomous), Palayamkottai - 627 002. (India)). **Replacement of soybean meal with *Spirulina maxima* in the diets for *Cirrhinus mrigala* (Hamilton) fry.** Aquacult (India) (2007) v. 8(1) p. 47-52.

Fresh water microalgae *Spirulina maxima* (SM) was substituted for soybean meal (SBM) in the isonitrogenous (40% CP) and isocaloric (425-429 Kcal/100g) diets for *Cirrhinus mrigala* fry (420 ± 0.81 mg). The heat treated (processed) SBM was replaced at various levels (i.e., 25, 50, 75 and 100%) with *Spirulina maxima* along with a fish meal based control diet and fed to mrigal fry for 41 days, The control diet fed fish showed a better growth response and nutrient utilization than in other test diets. Diet 1 and 2 (25 and 50%) substituted with SM fed fish showed elevated specific growth rate (SGR) with low food conversion ratio (FCR) like the fish which consumed the control diet. A decreased growth and low nutrient utilization were observed at 75 and 100% substituted SM diet fed fry. The protein intake (PI), protein efficiency ratio (PER) and protein productive value (PPV) of

fish were higher in control, 25 and 50% SM and decreased there after at 75 and 100% diets, The result revealed that adequate supply of nutrients from diets 1 and 2 are essential for mrigal fries. A significant increase in the body protein, lipid and energy at the above inclusion levels supported the view that essential nutrients present in the particular diets have enhanced the growth of fries.

61. Suresh, V. R. (ICAR Research Complex for NEB Region Manipur Center, Imphal-795 004, (India)). **Giant African snail meat as dietary animal protein source for common carp (*Cyprinus carpio* var. *communis* Linn.)**. Indian Journal of Fisheries (2007) v. 54(2) p. 203-210.

A laboratory growth trial was conducted to evaluate the suitability of the meat of African snail, *Achatina fulica*, as dietary protein source for common carp, *Cyprinus carpio*. Four diets were formulated with varying levels of snail meat and fish meal as animal protein source along with mustard oil cake and a conventional diet containing only mustard oil cake as principal protein source. The diet with fish meal and mustard oil cake produced 345.9% weight gain, followed by the diet in which 25% of the fish meal was substituted with snail meat (337.5%). Complete substitution of fish meal with snail meat resulted in higher feed conversion and 52.4% higher weight gain over conventional feed. Inclusion of snail meat improved the protein efficiency ratio and protein digestibility. Meat of African snail could be a cheap and effective protein source in carp supplementary feeds.

62. Suresh, V. R.; Biswas, B. K.; Vinci, G. K.; Mitra, K.; Mukherjee, A. (Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120, West Bengal, (India)). **Biology of *Amblypharyngodon mola* (Hamilton) from a floodplain wetland, West Bengal**. Indian Journal of Fisheries (2007) v. 54(2) p. 155-161.

Biology of *Amblypharyngodon mola* from a floodplain wetland was studied during May 2003 to April 2004. The length-weight relationship of the fish suggested isometric growth. The regression models obtained was $\log W = 2.9819 X - 4.9826 \log L$, $R^2 = 0.7278$ for male and $\log W = 3.0579 X - 5.0873 \log L$, $R^2 = 0.9213$ for female. The fish is an herbivore, feeding mainly on species belonging to the orders Myxophyceae, Bacillariophyceae, Chlorophyceae and Euglenophyceae. November-February was the most active feeding period. The sex ratio was 1:7.7. The fecundity ranged from 21 to 16867; while the relative fecundity ranged from 7 to 2122. The length at first maturity was 51-56 mm for males and 39-44 mm for females. The ova diameter ranged from 0.05 to 0.7 mm. The fish breed once for a definite period during April-October in the wetland.

63. Thomas, Sujitha; Rohit, Prathiba (Mangalore Research Centre of Central Marine Fisheries Research Institute, Mangalore - 573 001, (India)). **A new record of the stromateoid fish *Psenopsis intermedia* (Piontrovskiy, 1987) from Indian waters.** Indian Journal of Fisheries (2007) v. 54(1) p. 127-130.

The occurrence of *Psenopsis intermedia* of Malpe, in the Arabian Sea, which is not recorded so far from the Indian waters is reported. The comparison of the mersitic and morphometric characters of the specimens with the holotype and paratype of the species is presented.



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Taxonomic terms of the fishes, frogs, prawns and crabs occurring in the title, also in the body of the paper are included. The names of other groups appear as per their taxonomic status in the animal kingdom. Name of the authorities omitted.

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