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A Review on Marine Ornamental Invertebrates

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Abstract: Enormous data are available on trade, breeding and larval rearing, nutritional and growth studies and aquarium keeping of the ornamental invertebrates from other countries. In India, studies on ornamental invertebrates are not available. The studies related with the biodiversity of ornamental invertebrates are not available from global level. This paper reviewed the research work on marine ornamental invertebrates. Several research papers have published on aspects related to trade, breeding and larval rearing, nutrition and growth. However, studies on resource evaluation and aquarium keeping are very scarce. Little or no information is generated on the ornamental invertebrates of India. Apart from the resource assessment and aquarium keeping, the trade, breeding, larval rearing, nutritional and growth studies are reviewed in detail. This review is a preliminary attempt to assemble background information for future workers on marine ornamental invertebrates.

Key words: Marine ornamental invertebrates % Resources % Trade % Breeding and larval rearing % Nutrition and growth studies and aquarium keeping

INTRODUCTION

Apart from finfishes, wide ranges of invertebrates are found good to be kept in captivity. These include shrimps, sea anemones, starfish and tubeworms that make their home on and around the rocks and corals. A piece of 'living rock' will have minute polyps attached to it that represent extra life-forms introduced into the aquarium, although these are liable to be eaten by fishes or other larger animals. If species for the marine aquarium are carefully chosen, many of them can be kept in association with a vanity of fishes; indeed some fishes enjoy some sort of symbiotic relationship with specific invertebrate groups/species. Alternatively, we can keep invertebrates alone in an aquarium so as to protect them from the unwelcome attentions of predatory fishes, which allow us to study their lifestyles more easily. Most tropical invertebrates are magnanimously beautiful and attract the viewer's attention with intriguing behaviour patterns [1]. In the sea, the invertebrates range from the simplest single celled flagella (Protozoans) to the giants as lobsters, crabs (Crustaceans) and starfishes (Echinoderms). As they progress in development we find more and more specialization in their various organs and increasing degrees of complexity in structure [2].

A well designed and populated invertebrate aquarium can rarely be surpassed for sheer beauty of the most bizarre nature. According to Ravensdale [3] strange creatures and weird shapes are so startling in colour and unbelievable in design that makes it difficult to believe that they are animals at all.

In Philippines, aside from fishes, there are also 66 known species of invertebrates being exported for aquarium purpose, which includes: Anemones (12), Crabs (6), Lobsters (3), Shrimps (9), Sponges (2), Starfishes (8), Urchins (2), Feather dusters (3), Live Shells (7), Sea slugs (4), Octopus (2), other invertebrates (5) species each.

Calado *et al*. [4] describes an easy to operate recirculated maturation system for different types of marine ornamental decapods that: i) demands shorter periods of time to perform routine tasks, while allowing better water quality for brood stock keeping,

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ii) eliminates the need to capture ovigerous females (or euhermaphrodites) before larval release, minimizing the risks of disrupting reproductive pairs, iii) separates newly hatched larvae from the reproductive pair, impairing adults from preying on larvae and iv) allows live prey to be provided to larvae immediately after hatching if needed. Breeding pairs of the following species were used to test the maturation system: cleaner shrimp *Lysmata amboinensis*, fire shrimp *L. debelius*, Monaco shrimp *L. seticaudata*, peppermint shrimp *L. boggesii*, cleaning rock pool shrimp *Urocaridella antonbruunii*, sexy shrimp *Thor amboinensis*, dancing shrimp *Rhynchocinetes durbanensis*, boxer shrimp *Stenopus cyanoscelis*, *S. hispidus*, hermit crabs *Clibanarius tricolor*, *C. erythropus* and the emerald crab *Mithraculus sculptus*. All tested species were able to successfully mate and produce consecutive larval batches during the experimental period. The use of suitable maturation and larviculture systems will play a vital role for the successful development of profitable commercial scale culture protocols for the most heavily collected marine ornamental decapod species.

Research work so far done on ornamental invertebrates is reviewed in this chapter. Several research papers had been published on aspects related to trade, breeding and larval rearing, nutrition and growth. However, studies on resource evaluation and aquarium keeping are very scarce. Little or no information is generated on the ornamental invertebrates of India. Apart from the resource assessment and aquarium keeping, the trade, breeding, larval rearing, nutritional and growth studies are reviewed in detail. Enormous data are available on trade, breeding and larval rearing, nutritional and growth studies and aquarium keeping of the ornamental invertebrates from other countries. In India, studies on ornamental invertebrates are not available. The studies related with the biodiversity of ornamental invertebrates are not available from global level.

Resources: Calado *et al.* [5] studied the resources of Marine ornamental Decapods and its popular, in global ornamental trade. They recorded 128 of the most heavily traded marine ornamental decapods crustacean species. Information was gathered from eight Portuguese aquarium retail stores, seven virtual pet stores on the World Wide Web and two marine aquarium hobby magazines. This preliminary list was complemented with the marine ornamental decapods species listed by Debelius [6], Baensch and Debelius [7], Fossa and Nielsen [8], Dakin [9], Fenner [10] and Sprung [11].

Balaji *et al*. [12] studied the marine ornamental invertebrates resources of Parangipettai coastal waters for the period of March-August 2005, which revealed the occurrence of 28 species of marine ornamental invertebrates belonging to 4 phyla.

Lakshmi Pillai and Thirumilu [13] were described about the potential ornamental marine Stomatopods resources of Tamil Nadu/Chennai Coasts. The authors listed the landings (t) of the Stomatopods along the Indian coast, Tamil Nadu and Chennai from 1981-2006. Further the taxonomical position, common name, vernacular name and identification key characters were also listed for the identified ornamental stomatopod species like *Harpiosquilla annandalei*, *H. arpax*, *H. raphidea*, *Lysiosquilla tredecimdentata*, *Oratosquilla woodmasoni*, *O. gonypetes*, *O. holoschista*, *O. nepa* and *O. quinquedentata*.

Trade: Calado *et al.* [14] overviewed the temperate shrimps as ornamental species. Moffie [15] drafted the aquarium trade in Hawaii, which includes history, status, regulations and environmental impacts of the aquarium fish industry. Global marine aquarium database [16] created by has given the use of common names and scientific names of some aquarium fish and invertebrates in the aquarium industry. Larkin and Adams [17] studied the marine life collection industry in Florida. They found, the volume or value of landings of the top 10 fish and invertebrate species groups increased. The growth is particularly evident in the collection of invertebrate animals (i.e. excluding plants, live rock and live sand). Hair *et al.* [18] studied the capture, catch data, cage culture, jar culture, marketing of postlarval-banded cleaner shrimp, *Stenopus* species from the World Fish Center in Solomon Islands. Gasparini *et al.* [19] has described the marine ornamental reef trade, main harvesting areas, harvesting methods, impacts, conservation and management in Brazil. The most harvested reef invertebrates include about 65 species. The most representative groups are crustaceans with 15 species (23%) and molluscs and stony corals with 10 species (15.4%) each. Lindsay *et al.* [20] report was commissioned by the SPC Aquaculture Section and provides a timely and useful update on the status of the ornamental industry in the Pacific region and the prospects for aquaculture. Specifically six aquaculture commodities were assessed (giant clam, hard coral, soft coral, fish, live rock and shrimp). Corals are cultured commercially in Fiji Islands, Marshall Islands and Vanuatu. A number of recommendations based on the results of this study are represented in the report.

Agri-Food and Veterinary Authority of Singapore (AVA), Food and Veterinary Administration Department, Import and Export Division and Wildlife Regulatory Branch issued the ornamental fish codes and product codes list for year 2005.

Breeding and larval rearing of marine invertebrates: Gateno *et al.* [21] cultured the 3 Red Sea soft coral species (*Clavularia hamra*, *Nephthea* sp., *Litophyton arboreum*) originating from planula larvae collected from gravid colonies growing in the field. Rinkevich and Shafir [22] are discussed *ex situ* culture of colonial marine ornamental invertebrates: concepts for domestication and some benefits and deficiencies associated with the strategy, revealing its importance to the future of the trade. Lin and Zhang [23] studied the social control of sex change in the hermaphroditic shrimp *Lysmata wurdemanni*. Shafir *et al.* [24] discussed the rationale and the applicability of rearing *ex situ* large numbers of nubbins (minute fragments, down to the size of a single polyp) isolated from the Red Sea coral *Stylophora pistillata*. Moss and Argue [25] reviewed these two important advances in penaeid shrimps culture and indicate their applicability to an emerging marine ornamental industry for shrimp and other aquatic organisms. Calado *et al.* [26] described the design and operation procedures of a small research scale and a mass commercial scale larval rearing systems for ornamental decapods. Preliminary results on the captive rearing of the subtropical Mediterranean cleaner shrimp (*Lysmata seticaudata*), blue-white partner shrimp (*Periclimenes sagittifer*), tropical peppermint shrimp (*Lysmata wurdemanni*), sponge crab (*Cryptodromiopsis antillensis*) and green emerald crab (*Mithraculus sculptus*) are presented and compared to previous studies using conventional rearing techniques. Zhang and Lin [27] has been studied about the effects of copulatory rami removal of male-role shrimp (male-phase or euhermaphrodite-phase on mating behaviour of a simultaneous hermaphroditic shrimp, *Lysmata wurdemanni*, were investigated in the laboratory. Zhang and Lin [27] have been studied about the fertilization success without anterior pleopods in *Lysmata wurdemanni* (Decapoda: Caridea), a protandric simultaneous hermaphrodite.

Nutrition and growth studies: Zhang *et al.* [28] studied the effects of three common larval diets, such as *Artemia nauplii*, rotifer, microalgae *Chaetoceros gracilis* on survivorship and development of *S. scutellatus* larvae and undertook the experimental larviculture. Zhang *et al.* [29] studied the effects of four kinds of foods (*Artemia nauplii*, rotifer, *Chaetoceros gracilis* and *Isochrysis galbana*) and four temperature regimes on survival and development of larval *Lysmata wurdemanni* a marine ornamental shrimp. Lin [30] conducted a large-scale study to evaluate the long-term survivorship and growth of juvenile giant clams *Tridacna derasa* cultured in aquacultre effluent. Rhyne *et al.* [31] studied the feeding kinematics involved in prey capture of marine ornamental shrimp by using high-speed videography. These studies have allowed researchers to describe the different feeding mechanisms involved in a single feeding event. The use of high-speed video may lead to the discovery of larval food preferences and allow for the development of appropriate microencapsulated diets. The ability to study specific feeding events with high-speed video allows researchers to target a specific larval stage with a specific prey type. Lin [30] overviewed the marine ornamental shrimp aquaculture. The research and development have largely concentrated on the species of cleaner shrimp *Lysmata* and banded coral shrimp *Stenopus* and complete life cycle culture has been achieved for several species. Calado *et al.* [5] studied the fatty acid composition of *Lysmata seticaudata* eggs during embryonic development, in order to assess the lipid nutritional requirements of the first larval stages. Additionally, possible differences in the fatty acid profile of eggs from different sized females (small, medium and large) are investigated. Lin *et al.* [32] discussed about the several broodstock diets (enriched and regular fresh and frozen *Artemia nauplii* and adults, squids, mussels, clams and polychaetes) and have been tested in different shrimp species, the nutritional suitability of the diet seems to be species dependent. Several larval diets have also been tested (microalgae; rotifers; decapsulated cysts, newly hatched nauplii and enriched metanauplii of *Artemia*; and pellet food). Lin and Shi [33] studied the effects of different types of frozen adult *Artemia* and hard clam *Mercenaria mercenaria* as broodstock diets on the reproductive performance of the golden banded shrimp *Stenopus scutellatus*. Rhyne *et al.* [31] studied the growth, development and survival of the larvae of economically important marine ornamental crabs *Mithraculus sculptus* and *Mithraculus forceps* fed newly hatched *Artemia nauplii* and enriched *Artemia nauplii* with Algamac 3050 and those that were not fed (controls) were compared.

Invertebrates in aquarium keeping: Simkatis [34] described the salt-water aquarium management, data on salt-water aquarium fishes and invertebrates and ideal combination of fishes with hermit crabs. Ravensdale [3]

studied the invertebrate aquarium such as maintenance, behaviour and preferable food items. Sexton and Wilson [35] reported the Plymouth Aquarium from Europe. They described sponges, polyps, sea anemones, corals, sea-worms, lobsters, crabs, shrimps, prawns, molluscs, sea-mats (Bryozoa), starfishes, sea urchins, sea cucumbers and fishes. Riseley [36] experienced in practicing the system for ourselves here in Singapore. The tropical ornamental fishes, ornamental invertebrates (Reef-building (Madreporarian corals, some common hard corals of the Indo-Pacific, Cerianthus, Anemones and Zoanthids, Crustaceans, Echinoderms, Molluscs, Univalves, Bivalves, segmented worms and sponges) plants and algae, their behaviour and maintenance. Jackman [2] explained how to successful in keeping marine ornamental fishes and invertebrates (sponges, jellyfish, corals, anemones, worms, molluscs and crustacea) in aquarium. Mills [1] provide a complete guide to setting up a marine aquarium from selecting and furnishing a tank to choosing and introducing compatible fishes, their feeding, routine maintenance, breeding and health care. This part of the guide is divided into three main sections: tropical marine fishes, tropical invertebrates and coldwater fishes and invertebrates provides basic advice on how to keep them in the aquarium and a brief survey of temperate species suitable for display in a marine aquarium. Jayachandran [37] noted that many of the palaemonid prawns are brilliantly coloured and they are ornamental values. Anderson [38] provides a single comprehensive comparison of the various freshwater shrimp species mentioned in the aquarium hobby. Toonen [39], discussed the reproduction, growth, natural habitat, feeding and aquarium care of blue or green lipped mussels *Perna viridis*.

Toonen [40] discussed the keeping of octopus, biology, housing an octopus, filtration and appropriate water quality, an aside about oxygen concentrations in seawater. Hargreaves [41] described the marine aquarium. This complete guide for marine aquarium covered marine ornamental fishes, ornamental seaweeds and ornamental invertebrates. Ajmal Khan and Lyla [42] described the stomatopods as ornamental animals. Many species of stomatopods are ornately coloured as red, blue, green etc. with deep mottling and are considered as ornamental organisms. They can live in aquarium tanks and the way they swim inside the tank and the way the ovigerous animals roll the eggs on the anterior lower side of the body are a treat to watch. Waikiki Aquarium- Education Department having marine life profile of classification, distribution, behavior and food and feeding on ornamental feather duster worm (*Sabellastarte santijosephi*) (1998), sea anemones (*Actinarians*) (1998), tidepool hermit crabs (*Calcinus* species) (1998), anemone fishes and sea anemones (*Amphiprion* species, *Heteractis*, *Radianthus* and *Stychodactyla* species) (1999), moon jelly (*Aurelia*) (2000) and lagoon jelly (*Mastigias* sp.) (2001), *etc.*

Balaji *et al.* [43] were studied the Marine ornamental invertebrate's aquarium behaviours in the laboratory aquarium. Three different types of tanks such as gravel, sand and *Uca* crab tanks as model habitat were prepared for different types of ornamental invertebrates on choice based. *Uca* crab and land hermit crab are ideal for the *Uca* crab type aquarium. Several diets (Pellet feed and live feed) have been tested in different form of invertebrate species, the feeding behaviour and the suitability of the food preferences to be species dependent. Plankton and newly hatched *Artemia* sp., are suitable for jellyfishes and filter feeders like *Lepas anserifera* and *Perna viridis*. Remaining invertebrates take minced and squashed fish and shrimp meat. Most of the study animals show the maximum longevity period of about more than hundred days and jellyfish *Chrysaora quinquecirrha* and *Rhizostoma* sp. shows the minimum longevity period of about one week. Sponge crab *Dromia dehanni* shows the maximum survival rate of about 90%. *Chrysaora quinquecirrha* and *Rhizostoma* sp. shows the minimum survival rate of 0%. Most of the study animals were compatible with both fishes and invertebrates, apart from angel crab *Charybdis feriata.* Knowledge about aquarium behaviour, feeding, food preference, longevity, survival and compatibility with fishes and among invertebrates are needed to keep and maintain the ornamental invertebrates in the aquarium. These findings will surely enable to keep and maintain the ornamental invertebrates in aquarium.

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REFERENCES

1. Mills, D., 1987. The Practical Encyclopedia of the Marine Aquarium. Ist (Eds). Salamander books Ltd, London, UK, pp: 208.
2. Jackman, L.A.J., 1974. Seawater Aquaria, Ist (Eds). Douglas David and Charles Ltd, Canada, pp: 176.

3. Ravensdale, T., 1968. Coral Fishes-their Care and Maintenance. 2 nd revised edition. Hope printers Ltd, London, pp: 255.
4. Calado, R., A. Vitorino, G. Dionísio and M.T. Dinis, 2007. A recirculated maturation system for marine ornamental decapods. Aquaculture, 263: 68-74.
5. Calado, R., J. Lin, A.L. Rhyne, R. Araujo and L. Narciso, 2003(a). Marine ornamental decapods-popular, pricey and poorly studied. Journal of Crustacean Biol., 23(4): 963-973.
6. Debelius, H., 1984. Armoured Knights of the Sea. Quality Marine, Los Angeles, pp: 120 .
7. Baensch, H. and H. Debelius, 1994. Marine Atlas. Vol. 1 . (Ed). Mergus, Germany, pp: 1215.
8. Fossa, S.A. and A.J. Nielsen, 2000. The Modern Coral Reef Aquarium. Vol. 3. Birgit Schmettkamp Verlag, Bornheim. pp: 448.
9. Dakin, N., 2001. The Marine Aquarium Problem Solver. Tetra Press, Virginia. pp: 208.
10. Fenner, R.M., 2001. The Conscientious Marine Aquarium. I edition. TFH Publication, New Jersey, pp: 430.
11. Sprung, J., 2001. Oceanographic Series TM-Invertebrates, A Quick Reference Guide. Ricordea Publishing, Florida, pp: 240.
12. Balaji, K., G. Thirumaran, R. Arumugam, K.P. Kumaraguru Vasagam and P. Anantharaman, 2007. Marine Ornamental Invertebrate Resources of Parangipettai Coastal Water (South East Coast of India). Journal of Fisheries and Aquatic Sci., 2(5): 328-336.
13. Lakshmi Pillai, S. and P. Thirumilu, 2008. Potential of ornamental marine Stomatopods,Tamil Nadu/Chennai Coasts. Fishing Chimes, 28(3): 34-36.
14. Calado, R., S. Morais and L. Narciso, 2001(b). Fatty acid profile of Mediterranean cleaner shrimp (*Lysmata seticaudata*) (Decapoda: Hippolytidae) Eggs during embryonic development. 2nd International conference on marine ornamentals: Collection, Culture and conservation, LakeBuena Vista, Florida, USA, pp: 95-97.
15. Moffie, K., 2002. The aquarium trade in Hawaii. [Online]. Available: http://www.pacfish.org/ wpapers/ aquarium.html.
16. Global Marine Aquarium Database, 2002. [Online]. Available: http://www.unep_wcmc.org/marine/ GMAD/submit.html.
17. Larkin, S.L. and C.M. Adams, 2003. Marine fisheries review: The marine life fishery in Florida, 1990-98. [Online]. Available:http://www.findarticles.com/ p/articles/mi_m.
18. Hair, C., R. Warren, A. Tewaki, C. Haro and W. Phillips, 2004. Catching and rearing postlarval cleaner shrimp for the aquarium trade: results from a worldfish center project in Solomon Islands. NAGA, World Fish Center Quarterly, 27(1and2): 42-48.
19. Gasparini, J.L., S.R. Floeter, C.E.L. Ferreira and I. Sazima, 2004. Marine ornametal trade in Brazil. Biodiversity Conservation, pp: 1-17.
20. Lindsay, S.R., E. Ledua and J. Stanley, 2004. Regional assessment of the commercial viability for marine ornamental aquaculture within the Pacific islands. SPC Fisheries Newsletter, #108-January/March, pp: 27-29. [Online]. Available: http://www.sps.int/ aquaculture/site/publications/documents/Marine Ornamental.pdf.
21. Gateno, D., Y. Barki and B. Rinkevich, 1998. Aquarium maintenance of reef octocorals raised from field collected larvae. Aquatic Science and Conservation, 2: 227-236.
22. Rinkevich, B. and S. Shafir, 2000. Ex situ culture of colonial marine ornamental invertebrates: concepts for domestication. Aquarium Sciences and Conservation, 2: 237-250.
23. Lin, J. and D. Zhang, 2001. Reproduction in a simultaneous hermaphroditic shrimp, *Lysmata wurdemanni*: any two will do? Marine Biol., 139: 919-922.
24. Shafir, S., J.V. Rijn and B. Rinkevich, 2001. Nubbing of coral colonies: A noval approach for the development of inland broodstocks. Aquatic Science and Conservation, 3: 183-190.
25. Moss, S.M. and B.J. Argue, 2001. Biosecurity and genetic improvement of penaeid shrimp: Applications to the marine ornamental industry. Aquatic Science and Conservation, 3: 231-240.
26. Calado, R., L. Narciso, S. Morais, A.L. Rhyne and J. Lin, 2003(b). A rearing system for the culture of ornamental decapod crustacean larvae. Aquaculture, 218: 329-339.
27. Zhang, D. and J. Lin, 2004(b). Mating without anterior pleopods in a simultaneous hermaphroditit shrimp, *Lysmata wurdemanni* (Decapoda, Caridea). *Crustaceana*, 77(10): 1203-1212.
28. Zhang, D., J. Lin and R.L. Creswell, 1997. Larviculture and effect of food on larval survival and development in golden coral shrimp *Stenopus scutellatus*. Journal of Shellfish Res., 16(2): 367-369.
29. Zhang, D., J. Lin and R.L. Creswell, 1998. Effects of food and temperature on survival and development in the Peppermint shrimp *Lysmata wurdemanni*. Journal of world aquaculture Soci., 29(4): 471-476.

30. Lin, J., 2001. Overview of marine ornamental shrimp aquaculture. 2nd International conference on marine ornamentals: Collection, culture and conservation. Lake Buena Vista, Florida, USA., 63-65.
31. Rhyne, A.L., G.P. Lopes and J. Lin, 2005. Growth, development and survival of larval *Mithraculus sculptus* (Lamark) and *Mithraculus forceps* (A. Milne Edwards) (Decapoda: Brachyura: Majidae): economically important marine ornamental crabs. Aquaculture, 245: 183-191.
32. Lin, J., D. Zhang and A.L. Rhyne, 2002. Brood stock and larval nutrition of marine ornamental shrimp. In: Cruz-Suarez, L.E., Ricque-Marie, D., Tapia-Salazar, M., Gaxiola-Cortes, M. G., Simoes, N. (Eds.). Avances en Nutricion Acuicola VI. Memorias del VI Simposium Internacional de Nutricion Acuicola. 3 al 6 de Septiembre del 2002. Cancun, Quintana Roo, Mexico, pp: 277-280.
33. Lin, J. and P. Shi, 2002. Effect of brood stock diet on reproductive performance of the golden banded coral shrimp *Stenopus scutellatu.* Journal of World Aquaculture Soci., 33(3): 395-398.
34. Simkatis, H., 1958. Salt-water fishes for the home aquarium. Edition I. J. B. Lippincott Company, New York, pp: 254.
35. Sexton, E.W. and D.P. Wilson, 1969. Illustrated guide-The Plymouth Aquarium. Latimer Trend and Co Ltd Plymouth, pp: 36.
36. Riseley, R.A., 1971. Tropical Marine Aquaria-the Natural System. Ist (Eds). George Allen and Unwin Ltd, Fakenham, London, pp: 186.
37. Jeyachandran, K.V., 2001. Palaemonid prawns Biodiversity, Taxonomy, Biology and Management. Ist (Eds). Science publishers, inc. Enfield (NH) USA., pp: 228.
38. Anderson, J., 2002. Freshwater shrimp in the aquarium description and general information for the interested hobbyist. Online]. Available: http://www.thekrib.com/fish/shrimp.
39. Toonen, R.., 2003a. Housing an octopus. [Online]. Available: http://www.advancedaquarist.com/issues/july2003/invert.htm
40. Toonen, R., 2003b. Green-Lipped Mussels. [Online]. Available: http://www.advancedaquarist.com/issues/may2003/invert.htm
41. Hargreaves, V., 2003. The complete book of the Marine Aquarium. Ist ds., Greenwich editions, London, pp. 294.
42. Ajmal Khan, S. and P.S. Lyla, 2004. Stomatopod – The new potential resource. Ocean - Life, Food and Medicine, Exposition, pp: 1-12.
43. Balaji K., G. Thirumaran, R. Arumugam, K.P. Kumaraguruvasagam and P. Anantharaman, 2009. Aquarium Keeping and Maintenance of Marine Ornamental Invertebrates. In: Advances in aquactic ecology, Vol. 3. Daya Publishing House, Tri Nagar, Delhi, India (In Press).