Marine Poisonous Echinoderms

D.B. James
Principal Scientist (Retd), Central Marine Fisheries Research Institute
37, Sadasiva Metha Street, Metha Nagar, Chennai-600 029

Generally, the echinoderms are harmless animals. However, while some species of echinoderms are poisonous, some of them are venomous. Besides echinoderms, there are other marine invertebrates, some of which are poisonous / venomous. These are species of sea stars (Asteroids), brittle stars (Ophiuroids), sea urchins (Echinoids), sea lilies/feathers (Crinoids) and sea cucumbers (Holothuroids). The venomous species inject their toxin into the victim through spines or other similar structures. The poisonous species contain poison within their tissues which affect the victim when consumed. The venomous species can be consumed after being cooked, but poisonous species should never be consumed as the poison will not be inactivated even by the high temperature of cooking also. The author, while engaged in his doctoral research programme on taxonomy and ecology of Indian echinoderms during 1960s, there were some instances, in which, he was affected by handling some of the echinoderms. A brief account of the painful experience of the author in handling some of the echinoderms unknowingly and also a restricted review of published information on toxicity of echinoderms are given here as a lesson for those who are engaged in echinoderm research and trade. In order to create an awareness on some of the tested poisonous echinoderms, a plate containing colour photographs (source: author's own collection as well as from the internet) is provided for guidance of the readership.

On sea stars: *Acanthaster planci* is popularly known as "Crown of Thorns". The species has been reported from the Islands of Andaman, Nicobar and Lakshadweep. However, there is a single record of the species from Sri Lanka by Clark of British Museum, London in 1915. Afterwards, there is no record of the species from Gulf of Mannar and Palk Bay. As *A. planci* is known to devour live corals, a lot of interest was shown on the species world-wide and nearly 1,000 papers were published since the 1960s. In 1989, there was a false alarm that *A. planci* was destroying coral beds in Andaman. To investigate the fact, P.S.B.R. James, the then Director of CMFRI deputed a team of scientists to the place. The author was one of the team members who could collect only some specimens of *A. planci* from Labyrinth Island near Wandoor in Port Blair area. Moreover, the author could examine only a single speciman of *A. planci* collected by Mr Ali Manikfan from Agathi Island, Lakshadweep in 1966. This speciman bore a hole in the centre of the body since the animal was collected by using a spear instead of using bare hands, as the islanders knew about the presence of poison on its spines. *A. planci* is the only venomous starfish and it is found among coral reefs in the Indo-Pacific. Its upper surface is covered with many long, sharp and venomous spines, which can inflict painful wounds, if handled with bare hands (Heiskanen *et al.*, 1973). No serious injuries from *Acanthaster* have been recorded (WHO, 2003). The toxin from three star fishes (*Pentacaster regulus*, *Astropecten indicus* and *Goniodiscaster scaber*) did not have lethal effect on the experimental fingerlings of fish (*Chanos chanos* and *Oreochromis mossambicus*) and on the juveniles of cuttlefish (*Sepia* sp.), while those treated mice died after 1 hour due to toxic effect (Rao *et al.*,1985 & 1991).

On brittle stars: Some of the brittle stars do possess toxins, which are used in capturing small organisms, as part of their feeding strategy. *Ophiomastix annulosa* caused paralysis and death in small animals. Hence, care should be taken in handling such brittle star (Marsh *et al.*, 1956).

On sea urchins: Two sea urchins (*Diadema savigni* and *Diadema setosum*) are distributed in Andaman, Nicobar and Lakshadweep Islands, Gulf of Mannar and Palk Bay. In 1965, when the author directly picked up live specimens of both the species for the first time by bare hand at Port Blair, Andaman, the field assistant who was assisting the author shouted and said that I should not pick up those specimens by hand. It was too late, as the sharp spines of sea urchin had already pierced my hand and blood started dripping giving severe pain. The pain was due to the poison injected into the flesh by those sharp and thin spines. As the spines had backwardly directed barbs, it was not easy to remove those spines. However, the spines were removed with the help of a needle, but that was a painful experience. In later collections, the author used a hand glove to avoid the piercing by those spines of sea urchins. During the 1990s, one doctor from Kozhikode in Kerala sought the advice of the author in treating those divers who got wounds from the spines of sea urchins while collecting green mussels (*Perna viridis*) from the rocky shore areas. Based on his Port Blair experience, the author advised the doctor how to remove those barbed spines from the affected site of the victim. The human contact with pedicellariae of sea urchin *Tripneustes gratilla* was responsible in Japan for swellings of the lips or mouth and the ovaries of this sea urchin also produced the same reaction when they were not sufficiently washed before consuming (Hashimoto, 1979). The roe or gonad of sea urchins are consumed as a delicacy in European and Indo-Pacific regions. During the reproductive season, generally in spring and summer months, the ovaries of certain sea urchins are reported to develop toxic properties injurious to humans (Halstead, 1988).. Another coral reef dwelling sea urchin, *Echinothrix calamaris* is possessed with banded, slightly thicker and shorter spines. In between, there are slender reddish-brown spines ensheathed by a thin membrane with a sac-like venom gland at the tip; the pain is immediate but it does not last as long as that caused by *Diadema* spp. In the short-spine/toxic sea urchin, *Toxopneustes pileolus*, though the spines are not so harmful, numerous tiny jaw-like structures known as pedicellariae present in between the spines carry the venom, which can cause paralysis. The first aid and subsequent treatment for those wounds caused by sharp spines of sea urchin is a difficult process. A rinsing with methylated spirit and hot water may help in providing relief

from the pain and also immobilise the affected area of the body. If the spines are small, filling the affected area with a firm object would break up the spine into smaller pieces and help in rapid absorption. Further, application of local anaesthetic may also relieve pain. If the spines can be located by x-ray, surgical removal is another option. To avoid the secondary infection, local and systemic antibiotics should be given (Ming *et al.*, 1990).

On sea lilies/feather stars: The toxin present in the sea lily, *Tropimetra carinata* was not lethal in the treated fingerlings of milk fish, *Chanos chanos* and tilapia, *Oreochromis mossambicus* (Rao *et al.*, 1985).

On sea cucumbers: The sea cucumbers are sluggish animals found in the coral reef areas of Gulf of Mannar, Palk Bay and the Islands of Andaman and Nicobar and Lakshadweep. One of the sea cucumbers, namely, *Bohadschia argus* grows to a large size of 300-500 mm in length. It possesses a thick body wall and a copious number of white coloured cuvierian tubules (sticky threads). On exposure to air, they become like chewing gum and stick to the captor's arms. It is difficult to extricate the arms without pulling of the hairs present on victim's hand, which is a painful experience. The shooting of cuvierian thread is a defensive mechanism for the animal. If small prey animals like fish and crab come nearer to it, the sea cucumber will shoot out the cuvierian threads around the prey, to first immobilise and soon kill them. The cuvierian tubules contain a toxin which can cause blindness if it comes into contact with the human eyes. In 1975, I had a bitter and painful experience while handling the white coloured cuvierian threads of *B. argus* at Andaman. After handling the speciman, the author scratched one of his eyes with his hand unknowingly, the eyelids had swollen immediately and gave severe pain. The toxin may also be present on the skin, so one should thoroughly wash his hands after handling these creatures. The toxicity in holothurians are dealt with by Bakus (1974), Bakus and Green (1974), Rao *et al.* (1985, 1985a & 1991) and James (1986). Among the ten echinoderms studied (three star fishes, *Pentacaster regulus*, *Astropecten indicus* and *Goniodiscaster scaber*), one sea urchin, *Stomopneustes variolaris*, one sea feather, *Trophiametra carinata* and five holothurians, *Actinocucumis typicus*, *Bohadschia marmorata, Holothuria atra, H. scabra* and *H. spinifera*), the toxin from *Bohadschia marmorata* is the most lethal in respect of the experimented fingerlings of fish (*Chanos chanos* and *Oreochromis mossambicus* (Rao *et al.*, 1985) . All large sea cucumbers were processed for consumption. Fortunately, all the toxicity was removed during the process of cooking. The animals were boiled repeatedly to remove the poison. Clark of British Museum has informed the author that on consuming the *Beche-de-mer* in Sri Lanka, people experienced vomiting and giddiness. Fortunately, there were no fatalities reported due to the consumption of echinoderms.

General Remarks

A wealth of information is available on the toxicity in marine animals including echinoderms and the challenges faced by the medical community in the effective treatment of those affected by marine poisoning (Williamson *et al.*, 1996). WHO (2003) included those species possessing toxins either in some apparatus or in their body tissue, in respect of Porifera (sponges), Cnidarians (sea anemones, hydroids, corals and jellyfish), Mollusca (marine snails and octopi), Annelida (bristleworms) and Echinodermata (sea urchins and sea stars) and suggested the following preventive measures such as : a) wearing suitable footwear when exploring the intertidal area or wading in shallow water, b) avoiding handling of sponges, cnidarians, cone shells, blue-ringed octopus, bristleworms or the flower sea urchin, c) avoiding brushing against hydroids, true corals and anemones, and d) avoiding bathing in waters where the medusa of Portuguese man-of-war are concentrated.

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Fig 1: *Acanthaster planci*

Fig 2: *Astropecten indicus*

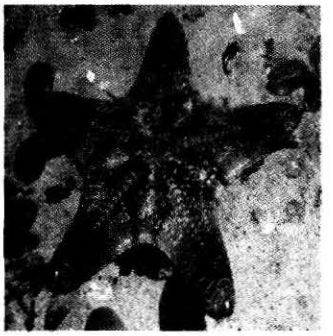

Fig 3: *Goniodiscaster scaber*

Fig 4: *Luidia maculata*

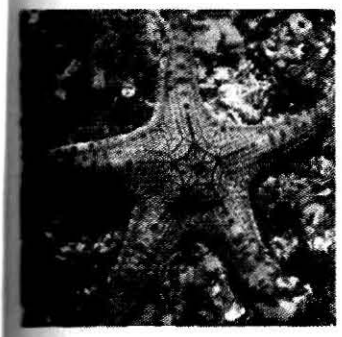

Fig 5: *Pentaceraster regulus*

Fig 6: *Diadema savignyi*

Fig 7: *Diadema setosum*

Fig 8: *Echinothrix calamaris*

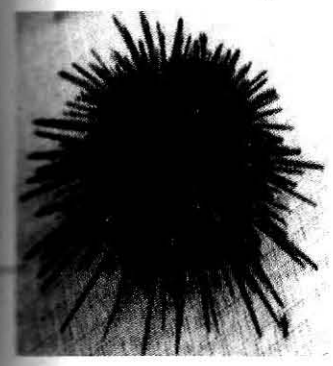

Fig 9: *Stomopneustes varialaris*

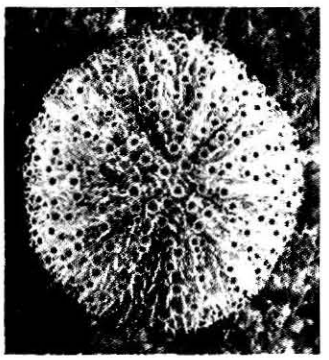

Fig 10: *Toxopneustes pileolus*

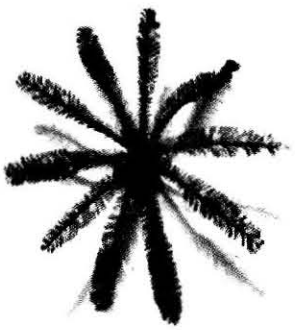

Fig 11: *Tropiometra carinata*

Fig 12: *Bohadschia marmorata*

Fig 13: *Holothuria spinifera*

Fig 14: *Holothuria atra*

Fig 15: *Holothuria leucospilota*

Fig 16: *Holthuria scabra*

Fig 17: *Stichopus horrens*

Union Minister of State for HRD Visits CIFT exhibition stall, at Visakhapatnam

A State level workshop on "Shelf life : Emerging trends in nutrition and food microbiology" was organised by V.S . Krishna Government College at Visakhapatnam from 31st January to 1st February, 2010. In this workshop, CIFT Visakhapatnam research Centre actively participated by exhibiting different harvesting and post harvest technologies developed at CIFT. Sensory evaluation assessment was also carried out through the visitors on the acceptability of Tuna pickle. It was a huge success. A large number of students, academicians and public have thronged the CIFT stall. The highlight was the visit of Chief Guest of the function, Mrs. Purandeswari, Minister of State for HRD, Govt. of India to CIFT Stall. Mrs. Purandeswari evinced keen interest on various technologies developed at CIFT. Dr. G. Rajeswari, Senior Scientist,CIFT explained about the different eco-friendly gear technologies developed,relating to processing and value addition to fish.These were also explained by Dr. M.M. Prasad, Principal Scientist and SIC of the Centre. Mr. K.V.S.S.K. Harnath, Tech. Officer (T6) and Mr. M. Venkata Rao, Tech. Officer (T5) also explained the various exhibits at the stall.