

OCCASIONAL PAPER NO. 211

POISONOUS AND VENOMOUS FISHES
of
ANDAMAN ISLANDS, BAY OF BENGAL

**KAMLA DEVI
D. V. RAO**

Zoological Survey of India

OCCASIONAL PAPER No. 211

RECORDS OF THE
ZOOLOGICAL SURVEY OF INDIA

Poisonous and Venomous Fishes
of
Andaman Islands, Bay of Bengal

KAMLA DEVI
and
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INTRODUCTION

The temperate and tropical marine waters harbour a large number of dangerous aquatic animals which cause poisoning in man by ingestion as food or wounds by their stings. More than one thousand marine organisms are known to be venomous or poisonous (Russell, 1971). Of these, the fish component constitutes a major biological hazard to man when invading their habitats while diving, snorkeling, fishing or by consumption. These fishes are found distributed in all Seas and Oceans but they are usually found in large numbers around islands and coral reefs than along continental shores. The venomous and poisonous fishes are most abundant in terms of variety and number of species in the Indo-Pacific belt due to rich coral reefs. Most fishes can be consumed without any fear of ill effect but certain fishes have long been known to cause illness or on occasions death when eaten by man. The terms *poisonous* and *venomous* are generally used synonymously, but it is defined that those whose body tissues either in part or entirely toxic causing illness or even death if consumed "poisonous fishes" while those fishes having venom glands and possessing a mechanism for envenomation with an apparatus *viz.* spines and stings with which inflict wounds are "venomous fishes. In reality all venomous fishes are poisonous but all poisonous fishes are not venomous.

Due to rapid advances in studies of Marine Biotoxicity in recent years extensive works are being made in the taxonomy, pharmacology and chemistry of such biotoxins produced by many poisonous and venomous fishes around the world. The studies made by Halstead and Schall (1958), Randall (1958), Saunders and Taylor (1959), Saunders (1960), Halstead and Mitchell (1963), Whitley (1963), Halstead and Courville (1970), Russell (1971), Edmonds (1976), Hashimoto (1979), Halstead (1988), Russell and Egen (1991) etc. significantly contributed to the field of poisonous and venomous fishes. The studies on these fishes of Indian waters are however very meagre except the taxonomic studies made by Khora and Rama Rao (1986).

The Andaman and Nicobar Islands with extensive fringing reefs offer an ideal habitat for a large number of fish species comprising commercial, ornamental, poisonous and venomous nature. Several recent taxonomic studies revealed the existence of more than 1200 species of marine fishes around A & N Islands (Talwar, 1990; Kamla Devi, 1991; Dorairaj *et. al.*, 1994; Rao *et. al.*, 2000). The occurrence of large number of fish species, high dependency of local population on the fish resources and paucity of information on the poisonous and venomous fishes encouraged the authors to study and update the knowledge of these fishes of A & N islands.

The rich collections made by the authors from different localities of Andaman Islands and reference collections of Zoological Survey of India, Port Blair comprising 406 examples revealed the occurrence of 147 species belonging to 33 families, known

to be harmful due to poisonous and venomous nature when eaten or pose danger while handling them carelessly or catching them by ignorance. The present report includes their taxonomic account along with information on habitat, distribution and the manner in which these fishes are believed to become poisonous or venomous. A brief account on the structure of venom apparatus, toxicity, symptoms and prevention of some poisonous and venomous fishes is given at the end.. All the material studied was deposited in the reference collections of Zoological Survey of India, Port Blair.

SYSTEMATIC ACCOUNT

Class	CHONDRICHTHYES
Subclass	ELASMOBRANCHII
Order	LAMNIFORMES
Family	CARCHARHINIDAE

1. *Carcharhinus melanopterus* (Quoy & Gaimard, 1824) (Fig. 1)

1824. *Squalus melanopterus* Quoy & Gaimard, Voy. *Uraire. Zool.*, p. 194, pl. 43, fig. 1 & 2.

1986. *Carcharhinus melanopterus* : Bass *et. al.*, in Smith & Heemstra, *Smith's Sea Fishes*, p. 75, fig. 9.13.

Diagnostic features : Body fusiform, snout moderately pointed; spiracles absent; dorsal fin origin behind base of pectoral fin; anal fin origin below the origin of second dorsal; anal fin separated from caudal fin; no keels on caudal peduncle and lateral ridge; caudal fin with distinct lobe; no barbels on snout. Body pale-brown to lemon-brown on back and ventral side paler; tips of all fins black.

Habitat : Scavenger of coral reef areas. Found in shallow to moderate depths.

Distribution : Indo-West Pacific.

Remarks : Sometimes aggressive and attack skindivers. Implicated in ciguatera poisoning. Consumption of liver causes nausea, vomiting and abdominal pain.

2. *Carcharhinus wheeleri* Garrick, 1982

1982. *Carcharhinus wheeleri* Garrick, *Sharks of the Genus Carcharhinus*, NOAA Tech. Rep., NMFS Circ. No. 445, p. 111, figs. 50, 51.

1986. *Carcharhinus wheeleri*: Bass *et. al.*, in Smith & Heemstra, *Smith's Sea Fishes*, p. 77, fig. 9.18.

Diagnostic features : Body fusiform, snout moderately pointed; spiracles absent; anal fin origin below the origin of second dorsal; anal fin separated from caudal fin; no keels and lateral ridge on caudal peduncle; caudal fin with distinct lobe; no

barbels on snout. Dorsal side of body light brown and paler on ventral side; a broad black trailing edge on caudal fin; tip of first dorsal fin white.

Habitat : Found in deeper waters but juveniles roam in shallow coastal waters.

Distribution : Indian Ocean.

Remarks : Often aggressive towards skindivers and attacks without provocation. Consumption of liver causes ciguatera poisoning.

Family SPHYRNIDAE

3. *Sphyrna zygaena* (Linnaeus, 1758) (Fig. 2)

1758. *Squalus zygaena* Linnaeus, *Systema Naturae* (ed.10), 1 : 234.

1986. *Sphyrna zygaena* : Bass, in Smith & Heemstra, *Smith's Sea Fishes*, p. 97, pl. 2, fig. 13.3.

Diagnostic features : Body elongated and laterally compressed; head flattened and greatly expanded laterally like hammer; nares present near eyes. Body deep olive to brownish grey dorsally, shading to white ventrally; tip of ventral surface of pectoral fin faintly grey black.

Habitat : Found around coastal waters and coral reefs.

Distribution : Circumtropical.

Remarks : Sometimes consumption of flesh and liver causes ciguatera poisoning.

Order RAJIFORMES

Family DASYATIDAE

4. *Dasyatis kuhlii* (Muller & Henle, 1841) (Fig. 3)

1841. *Trygon kuhlii* Muller & Henle, *Syst. Besch. Plagiost.*, p. 164, pl. 51. fig. 2.

1986. *Dasyatis kuhlii* : Compagno, in Smith & Heemstra, *Smith's Sea Fishes*. p. 137, pl. 6.

Diagnostic features : Disc kite-like, wider than long; body naked except few dorsal denticles; snout short and gently rounded; two oral papillae; tail about as long as disc with upper and lower cutaneous folds; a pair of sharp spines on upper surface of middle part of tail. Body pale brown with small bright ocelli with blue centers and scattered black spots; under side of disc white; tail with black and white bands behind sting.

Habitat : Found on sandy areas adjacent to reefs.

Distribution : Indo-West Pacific.

Remarks : Wounds caused by the sting are large and severely lacerated, some times required surgical closure. The venom injected by sting causes nausea, weakness and sometimes the wounds become septic.

5. *Dasyatis thetidis* Ogilby, 1899 (Fig. 4)

1899. *Dasyatis thetidis* Ogilby, in Waite, *Aust. Mus. Mem.* 4 : 46.

1986. *Dasyatis thetidis* : Compagno, in Smith & Heemstra, *Smith's Sea Fishes.* p. 137, fig. 30.4.

Diagnostic features : Body disc-like, snout broadly angular; disc slightly wider than long; tail longer than disc length; dorsal surface of the disc with sharp scattered denticles, a mid-dorsal row of strong thorns from snout to sting; no dorsal skin fold on tail; tail covered with sharp denticles and a strong serrated spine on its dorsal surface. Body dark grey-black above and light ventrally.

Habitat : Found around coral reefs in shallow areas.

Distribution : Indo-West Pacific.

Remarks : Wounds caused by the sting are large and severely lacerated, sometimes required surgical closure. The venom injected by sting causes nausea, weakness and sometimes the wounds become septic.

6. *Himantura gerrardi* (Gray, 1851)

1851. *Trygon gerrardi* Gray, *Cat. Fish. Brit. Mus.*, pt. 1, p. 116.

1986. *Himantura gerrardi* : Compagno, in Smith & Heemstra, *Smith's Sea Fishes.* p.139, fig. 30.9.

Diagnostic features : Disc wider than long; snout forming widely obtuse angle; mid-line of back with 3 enlarged tubercles; disc naked; tail very long and whip-like with pointed spine, no cutaneous folds. Body light brown dorsally, white ventrally; tail with numerous transverse dark and light brown bands.

Habitat : Found on shallow reef areas.

Distribution : Indo-West Pacific.

Remark : Wounds caused by the tail sting are extremely painful and sometimes fatal; injected venom causes swelling around the wound, nausea and vomiting.

7. *Himantura uranak* (Forsskal, 1775) (Fig. 5)

1775. *Raja uranak* Forsskal, *Descript. Animal.*, p. 18.

1986. *Himantura uranak* : Compagno, in Smith & Heemstra, *Smith's Sea Fishes.* p. 139, fig. 30.10.

Diagnostic features : Body flat and disc-like, the disc wider than long and rhomboidal; snout angular with a sharp point; tail narrow and bear a sharp serrated sting. Body brown to blackish above, white below with white to yellow lines on dorsal side forming a marbled or reticulated pattern; tail striped with brown and white.

Habitat : Common on sandy bottoms adjacent to reefs.

Distribution : Indo-West Pacific.

Remarks : Causes severe lacerated wounds by its poisonous sting.

8. *Hypolophus sephen* (Forsskal, 1775) (Fig. 6)

1775. *Raja sephen* Forsskal, *Descript. Animal.*, p.17.

1986. *Hypolophus sephen* : Compagno, in Smith & Heemstra, *Smith's Sea Fishes*. p. 140, fig. 30.12

Diagnostic features : Disc somewhat quadrangular; mouth undulated; tail depressed with broad lower cutaneous fold and extends more than halfway to its tip; serrated pointed spine on its second quarter of tail; dorsal surface of disc granular with three central flattened tubercles in a vertical row. Body dark grey on dorsal surface, paler towards sides; ventral surface white; caudal fold and filamentous part of tail black.

Habitat : Found on sandy bottoms of shallow coastal areas.

Distribution : Indo-West Pacific.

Remarks : The sharp poisonous spine on the tail causes severe painful wounds.

Family MYLIOBATIDAE.

9. *Aetobatus narinari* (Euphrasen, 1790) (Fig. 7)

1790. *Raja narinari* Euphrasen, *Kon. Vet. Acad. Nija Handi, Stockholm*. 11 : 217, p1.10.

1986. *Aetobatus narinari* : Compagno, in Smith & Heemstra, *Smith's Sea Fishes*, p. 132. fig. 28.1.

Diagnostic features : Head, body and pectoral fins together form a strong angular disc; snout elongate and narrow; one row of tooth plates in each jaw; tail whip-like; dorsal fin situated posterior to base of ventral fins; tail narrow and elongate with a stinging spine near its base. The dorsal surface of body bluish black with numerous scattered white spots, ventral surface is white; tail black.

Habitat : Found around inshore reef areas.

Distribution : Wide spread in Atlantic and Indo-Pacific region.

Remarks : Less dangerous than stingrays, sometimes the wounds caused by the sting are very painful.

Class OSTEICHTHYES
 Order ELOPIFORMES
 Family ALBULIDAE

10. *Albula vulpes* (Linnaeus, 1758)

1758. *Esox vulpes* Linnaeus, *Syst. Nat.*, ed. 10, 1 : 313.

1986. *Albula vulpes* : Smith, in Smith and Heemstra, *Smith's Sea Fishes*, p. 157, fig. 38.1.

Diagnostic features : D.17; A.8; P.17; V.10. Body elongated and fusiform; snout conical, projecting beyond lower jaw; mouth inferior; single dorsal fin; ventral fins located in the middle region of the body; scales small; caudal fin forked. Body silvery with narrow dark horizontal lines on sides; all fins are dusky, base of pectoral fin yellow.

Habitat : Found in creeks and shallow coastal waters.

Distribution : All tropical Seas.

Remarks : Sometimes causes ciguatera poisoning which is derived from food web of the fish.

Order ANGUILLIFORMES
 Family MURAENIDAE

11. *Echidna nebulosa* Ahl. 1789
 (Fig. 8)

1789. *Echidna nebulosa* Ahl. *Dissert. De Muraena et Ophichtho* p. 5, pl. 1, fig. 2

1986. *Echidna nebulosa* : Castle & Cosker, in Smith & Heemstra, *Smith's Sea Fishes*, p. 167. p1. 7, fig.41.3

Diagnostic features : Body snake-like and elongated; teeth broadly conical and sharp; origin of dorsal fin slightly anterior to the gill openings. Body yellowish-white with 26-30 brownish black vertical reticulated blotches with pale centers and broken blackish lines and spots, these blotches extending onto dorsal and anal fins; numerous black spots between black blotches.

Habitat : Found in reef crevices and under rocks.

Distribution : Indo-Pacific.

Remarks : Consumption of the fish sometimes causes ciguatera poisoning. Larger fishes cause nasty lacerated wounds with their sharp teeth but the bites are not venomous.

12. *Gymnothorax flavimarginatus* (Ruppell, 1830)

1830. *Muraena flavimarginatus* Ruppell, *Atals. Reise. Nordl. Africa. Fishes. Rothen Meeres* p. 119, pl. 30. fig. 3.

1986. *Gymnothorax flavimarginatus* : Castle & Mc Cosker, in Smith & Heemstra, *Smith's Sea Fishes*, p. 170. pl. 7. fig. 451.12.

Diagnostic features : Body snake-like and stout; teeth sharp and uniserial in jaw, few canines on inter-maxillary; dorsal fin origin nearer to gill opening. Body yellowish-brown with dense brownish mottling; the edges of median fins are green; gill opening with a black blotch.

Habitat : Found around coral rubble and weedy areas of reefs.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning. Bites cause painful wounds.

13. *Gymnothorax undulatus* (Lacepede, 1803)

1803. *Muraenophis undulatus* Lacepede, *Hist. nat. Poiss.*, 5 : 229 & 644, p1.64, fig. 2.

1986. *Gymnothorax undulates* : Castle & Mc Cosker, in Smith & Heemstra, *Smith's Sea Fishes*, p.173, p1.8, fig. 41. 24

Diagnostic features : Body snake-like. A single row of sharp teeth on jaws; middle of the pre-maxillaries with two canines; lower jaw slightly hooked; dorsal fin origin ahead of the level of gill openings. Body light yellow with large close-set irregular dark reddish brown blotches and spots; the blotches merged to form irregular bars posteriorly and the narrow pale interspaces forming a very irregular reticulum.

Habitat : Found in rock and reef crevices.

Distribution : Indo- Pacific.

Remarks : Implicated in ciguatera poisoning.

14. *Gymnothorax javanicus* Bleeker, 1864 (Fig. 9)

1864. *Gymnothorax javanicus* Bleeker, *Atl. Ichth.*, 4, p.95.

1997. *Gymnothorax javanicus* : Kamla Devi and Rao, New records of reef fishes from Andaman waters. *J. Andaman Sci. Assoc.*, 13(1&2) : 104.

Diagnostic features : Body elongate and deep; dorsal fin originate before gill openings; jaws with sharp canine teeth; head and trunk shorter than tail. Body light brown with three rows of irregular dark brown spots; head and fins with smaller spots; gill opening in a black blotch; margin of dorsal fin pale.

Habitat : Found on coral reefs.

Distribution : Indo-Pacific.

Remarks : Often consumption of flesh causes ciguatera poisoning.

Family ENGRAULIDAE

15. *Thryssa baelama* (Forsskal, 1775)

1775. *Clupea baelama* Forsskal, *Descript. Animal.*, p. 72.

1972. *Thryssa baelama* : Whitehead, A synopsis of the chupeoid fishes of India. *J. mar. biol. Assoc. India*, 14(1) : 227.

Diagnostic features : D. 16; A. 28-31, P.12-13; V.7. Body sub-cylindrical; snout prominent projecting in front of lower jaw; origin of anal fin behind dorsal fin; fins without spines; abdomen with sharp scutes. Body silvery, its back dark; a dark patch on the shoulder; fins hyaline.

Habitat : Found in shallow coastal waters.

Distribution : Indo-West Pacific.

Remarks : Good food fish but implicated in ciguatera poisoning.

Order SILURIFORMES

Family CLARIIDAE

16. *Clarias batrachus* (Linnaeus, 1758)

1758. *Silurus batrachus* Linnaeus, *Syst. Nat.*, ed.1. 10. p. 305.

1991. *Clarias batrachus* : Talwar & Jhingran, *Inland Fishes of India and Adjacent Countries*, 2, p. 685, fig. 218.

Diagnostic features : D.70-76; A.45-58; P. 1, 8-11; V.7. Body elongated and cylindrical; head compressed, mouth terminal; four pairs of barbels, the maxillary pair extending beyond base of pectoral fin; first dorsal fin spine and pectoral spine are strong and serrated on both edges. Body greenish blue, flanks and belly pinkish with numerous pale to white spots on flanks; dorsal fin yellowish with red margin.

Habitat : Found in pools, ponds and rivers.

Distribution : Pakistan to the Philippines.

Remarks : Dangerous fish, its dorsal and pectoral spines covered by venomous mucus inflicts painful and lacerated wounds. The flesh is very tasty and good food fish.

Family ARIIDAE

17. *Arius thalassinus* (Ruppell, 1837)

1837. *Bagrus thalassinus* Ruppell, *Neue. Wirbelth. Fische Rothen Meeres.*, p. 75, pl. 20, fig. 2.

1984. *Arius thalassinus* : Talwar, *Commercial Sea Fishes of India*, Handbook, Zool. Surv. India, p. 271, fig. 111.

Diagnostic features : Body elongate and slightly robust; snout obtuse; dorsal profile of head straight and steep; three pairs of barbels around mouth; second dorsal fin adipose; dorsal fin short with pungent spine prolonged into a filament; pectoral fin spine sharp and long; caudal fin forked. Body reddish brown above with silvery luster and numerous narrow parallel transverse cross bands; dorsal, adipose and caudal fins dark terminally.

Habitat : Found in coastal and estuarine waters.

Distribution : Indo-West Pacific.

Remarks : No poisonous glands in the spines but the mucus on the spines are toxic. The sharp serrated dorsal and pectoral spines inflict dangerous painful wounds, in extreme cases the wounds leads to death.

18. *Arius macronotacanthus* (Bleeker, 1846)

1846. *Arius macronotacanthus* Bleeker, *Nat. Gen. Arch. Ned.* 3(2) : 159.

1876. *Arius macronotacanthus* : Day, *Fishes of India*, p. 465, pl. CXIII, fig. 1.

Diagnostic features : D. I, 7; A. 18-19; P. I, 9; V. 6; C. 15. Body elongate; snout obtuse; dorsal profile of head straight and gradually sloped; maxillary barbels reaches to the middle of pectoral spine, the mandibular barbels up to its base; dorsal fin spine strong and serrated; second dorsal fin adipose, pectoral spine strongly serrated, caudal fin forked. Body dark on back and greyish on sides and ventrally, a large black blotch on the adipose fin.

Habitat : Found in coastal and brackish waters.

Distribution : Indo-West Pacific.

Remarks : No poisonous glands in the spines but the mucus on the spines are toxic. The sharp serrated dorsal and pectoral spines inflict dangerous painful wounds, the wounds become septic if untreated.

19. *Arius sumatranus* (Bennett, 1830)

1830. *Bagrus sumatranus* Bennett, *Life Raffles.* p. 631.

1889. *Arius sumatranus* : Day, *Fish India*, 1, p. 460, pl. 107, fig. 6.

Diagnostic features : D. I, 7; A.18-19; P. I, 10; V. 6; C. 17. Body elongated and head depressed; snout obtuse; surface of head with granulations; maxillary barbels reaching end of head; dorsal and pectoral fin spines are strong and serrated; caudal fin forked. Body bluish green above, lighter on sides and ventrally; fins edged grey.

Habitat : Found in coastal and brackish waters.

Distribution : Pakistan to Philippines.

Remarks : No poisonous glands in the spines but the mucus on the spines are toxic. The sharp serrated dorsal and pectoral spines inflict dangerous painful wounds, the wounds sometimes becomes septic.

20. *Ketengus typus* Bleeker, 1847

1847. *Ketengus typus* Bleeker, *Verh. Bat. Gen.*, 21 : 9.

1876. *Ketengus typus* : Day, *Fishes of India*, p. 468. pl. CVIII, fig.2.

Diagnostic features : D. I, 7; A. 19-20; P. I, 7-8; V. 6; C. 15. Body slightly elongated and robust; snout obtuse; dorsal profile of head straight and gradually sloped; dorsal spine strong and serrated; base of adipose fin as long as that of rayed fin; caudal fin forked; barbels small. Body silvery above and lighter below.

Habitat : Found in coastal and brackish waters.

Distribution : Andamans to Malay Archipelago.

Remarks : Dorsal and pectoral spines cause severe lacerated and painful wounds.

Family HETEROPNEUSTIDAE

21. *Heteropneustes fossilis* (Bloch, 1794)

1794. *Silurus fossilis* Bloch, *Nat. Ausland.Fische.*, 8 : 46, pl. 370, fig. 2.

1991. *Heteropneustes fossilis* : Talwar & Jhingran, *Inland Fishes of India and Adjacent Countries*, 2 : 689, fig. 219.

Diagnostic features : D. 6-7; A. 65-68; P. I, 7; V. 6. Body elongated and compressed, head flat; four pairs of barbels; adipose fin absent; dorsal fin without spine; pectoral spine strong and serrated; anal fin extremely long and separated by a distinct notch from caudal fin; body naked. Body dark purplish brown dorsally and lighter below with two lateral yellow bands on sides.

Habitat : Found in ponds, swamps and rivers.

Distribution : Pakistan to Thailand.

Remarks : The pectoral fin spines are enveloped in a sheath containing the venomous glands. Wounds caused by these spines are very painful and lacerated, leads to the secondary infection. Usually the severity of pain depends on the amount of venom received by the wound.

Family PLOTOSIDAE

22. *Plotosus lineatus* (Thunberg, 1787)
(Fig. 10)

1787. *Silurus lineatus* Thunberg, *Museum Nat. Acad. Upsaliensis*, p. 31.

1986. *Plotosus lineatus* : Goman, in Smith & Heemstra, *Smith's Sea Fishes*, p. 213, pl. 10.

Diagnostic features : D.1, 4+ procurrent C 84-109: A. 63 – 79; P. I, 10-12: V.10-12. Body elongated, tapering to a point posteriorly; no scales on body; 4 pairs of barbels around mouth, the nasal barbels do not reach hind border of eye. Body brownish black dorsally and whitish below; 2-3 light yellowish stripes on sides.

Habitat : Found in shallow reef areas and tide pools in packed groups.

Distribution : Indo-Pacific.

Remarks : The pectoral and dorsal fin spines are venomous and produce very painful and some times fatal wounds.

23. *Plotosus canius* Ham.- Buch., 1822

1822. *Plotosus canius* Hamilton and Buchanan, *Fishes of Ganges*, p. 142, 374, pl. 15 fig. 44.

1984. *Plotosus canius* : Talwar, *Commercial Sea Fishes of India*, Hand Book, Zool. Surv. India, p. 278, fig. 140.

Diagnostic features : D. I, 4+ procurrent C 130-140; A. 106-130; P. I, 10-11; V. 10-12. Body elongated, tapering to a point posteriorly; no scales on body; four pairs of barbels around mouth, nasal barbels extending beyond eyes; dorsal, anal and caudal fins confluent; 1st dorsal fin and pectoral fins with strong serrated spine. Body dark green above, light yellowish below; fins grey, first dorsal and pectoral fins dark.

Habitat : Found in small groups in shallow coastal waters and estuaries.

Distribution : Pakistan to New Guinea.

Remarks : Wounds caused by the dorsal and pectoral fin spines are very painful, leads to quick secondary infection.

Order BERCIFORMES

Family HOLOCENTRIDAE

24. *Neoniphon sammara* (Forsskal, 1775)

1775. *Sciaena sammara* Forsskal, *Descript. Animal.* p. 48.

1980. *Holocentrum sammara* : Jones & Kumaran, *Fishes of Laccadive Archipelago*, p. 172, fig. 148.

1986. *Neoniphon sammara* : Randall & Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 416, pl. 19.

Diagnostic features : D. XI, 12; A. IV, 8; P.14; V. I. 7; LI. 41-42, Ltr.2½ +1+7. Body slender and oblong, moderately compressed; snout pointed, lower jaw strongly projecting; dorsal and anal fin spines are very strong and pointed; corner of preopercle with large pointed spine; caudal fin forked. Body pinkish silvery, silvery below with a dark reddish black spot on each scale and a light reddish stripe along lateral line scales; large reddish black spot on anterior part of spinous dorsal fin membrane; anterior soft rays of dorsal, anal and margin of caudal fin lobes reddish.

Habitat : Found around coral reefs in shallow areas.

Distribution : Indo-Pacific.

Remarks : The pointed preopercle spine is venomous and causes sever painful wounds.

25. *Sargocentron caudimaculatum* (Ruppell, 1838)

1838. *Holocentrum caudimaculatum* Ruppell, *Fishes des rothen Meeres*. p. 103.

1986. *Sargocentron caudimaculatum* : Randall & Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 418, pl. 19.

Diagnostic features : D. XI, 15; A. IV, 9; p. 14; V.I.7; LI. 42. Body oblong and slightly compressed; dorsal profile of head nearly straight; snout pointed; pre-opercular spine is strong and long equal to eye diameter. Head and dorso-lateral part of body red, edges of scales silvery; ventro-lateral side silvery with light red shade; outer part of the dorsal membrane dark red.

Habitat : Found around reefs in shallow areas.

Distribution : Indo-Pacific.

Remarks : The pointed preopercle spine is venomous and inflict sever painful wounds.

26. *Sargocentron ittodai* (Jordan & Fowler, 1903)

1903. *Homocentrus ittodai* Jordan & Fowler, *Proc. U.S. nat. Mus.*, 26.16, fig. 4.

1986. *Sargocentron ittodai* : Randall & Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 419, pl. 19.

Diagnostic features : D. XI, 13; A.IV,8; P.15; V.I,7; LI. 47. Body ovate and compressed; snout pointed; no spines are between nasal fossa and premaxillary groove. Body with red and silvery white stripes along scale rows; spinous dorsal fin bright red with white spots; a series of white spots on inter-spinous membrane in lower part of fin; other fins white.

Habitat : Found around reef slopes in shallow areas.

Distribution : Indo-West Pacific.

Remarks : The preopercle spine is venomous and inflicts very painful wounds.

27. *Sargocentron praslin* (Lacepede, 1802)
(Fig. 11)

1802. *Perca praslin* Lacepede, *Hist. nat. Poiss.* 4 : 397, 418.

1986. *Sargocentron praslin* : Randall & Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 420, pl. 21.

Diagnostic features : D. XI, 13; A. IV, 9; p.13; V. I, 7; LI.34-36. Body ovate and slightly compressed; no spinules along the margin of nasal fossa; pre-orbital has a laterally projecting spine followed by small retrose spinules. Body silvery white with longitudinal brownish red stripes; tips of spinous dorsal white, below a dark red sub marginal band, followed by broad whitish zone and dark red at base of fin; dark brown blotch at base of soft dorsal.

Habitat : Found in shallow reef areas and rocky bottoms.

Distribution : Indo-West Pacific.

Remarks : The pointed preopercle spine is venomous and causes sever painful wounds.

28. *Sargocentron rubrum* (Forsskal, 1775)
(Fig. 12)

1775. *Sciaena rubra* Forsskal, *Descript. Animal.*, p. 48.

1986. *Sargocentron rubrum* : Randall & Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p.420, pl. 20.

Diagnostic features : D. XI, 13; A. IV, 8; P.14; V. I. 7; Ll. 36. Body ovate and slender; snout pointed; a large spine is below front edge of orbit; nasal fossa without spinules; pre-opercular spine pointed and long. Body with alternating brownish red and silvery white stripes; spinous dorsal dark red with white tipped spines and a whitish blotch in the middle of each membrane except the first; 6th ray of ventral fin with dark pigment; upper and lower margins of caudal fin dark.

Habitat : Found near reefs and rocky areas in shallow waters.

Distribution : Indo-West Pacific.

Remarks : The pointed preopercle spine is venomous and causes sever painful wounds.

29. *Sargocentron spiniferum* (Forsskal, 1775)

1775. *Sciaena spinifera* Forsskal, *Descript. Animal.*, p. 49.

1986. *Sargocentron spiniferum* : Randall & Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 421, pl. 20.

Diagnostic features : D. XI, 15; A. IV, 10; P.15; V. I, 7; LI. 43. Body deep, oblong and moderately compressed; dorsal profile of head is nearly straight; lower jaw projecting; pre-opercular spine strong and longer; anterior end of nasal bone with two short spines; caudal fin forked. Body red, the edges of scales silvery white; spinous part of dorsal fin dark red, other fins light orange; oblong crimson red spot on preopercle and a blotch on pectoral axil.

Habitat : Found in sheltered areas of coral reefs.

Distribution : Indo-West Pacific.

Remarks : The pointed preopercle spine is venomous and causes sever painful wounds.

Order SCORPAENIFORMES

Family SCORPAENIDAE

30. *Dendrochirus brachypterus* (Cuvier, 1829)

1829. *Pterois brachypterus* Cuvier, *Hist. nat. Poiss.*, 4 : 368.

1986. *Dendrochirus brachypterus* : Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*. p. 465, pl. 26.

Diagnostic features : D. XIII, 9-10; A. III, 5; P. 18; V. I, 5. The mid-dorsal spine is almost equal to body depth; filaments on snout, eye and on margin of opercle; a flap at posterior nostril. Body reddish with broad black bars on head and body; prominent dark bands on paired fins; dorsal, anal and caudal fins are with dark spots.

Habitat : Found on coral reefs.

Distribution : Indo-West Pacific.

Remarks : All the dorsal, anal, and pectoral fin spines are very sharp and venomous. The glandular tissue located in the grooves of the spine produces poison. Wounds caused by these spines are very painful.

31. *Dendrochirus zebra* (Cuvier, 1829).

(Fig. 13)

1829. *Pterois zebra* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.*, 6 : 270.

1986. *Dendrochirus zebra* : Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*. p. 466. fig. 149.5

Diagnostic features : D. XIII, 10-11; A. III, 6; P.17; V.I.5. Orbital tentacles are long; short spines between nostrils; mid-dorsal spine longer than body depth; upper pectoral rays simple, rays are not filamentous. Body reddish brown with alternate dark brown and narrow white bars; a T-shaped red band on caudal peduncle; all fins dark spotted; dark black blotch on lower edge of opercle.

Habitat : Found around coral reefs.

Distribution : Indo-West Pacific.

Remarks : All the dorsal, anal, and pectoral fin spines are very sharp and venomous. The glandular tissue located in the grooves of the spines produces poison. Wounds by these spines are very painful.

32. *Parascorpaena picta* (Cuvier, 1829)

1829. *Scorpaena picta* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.*, 4 : 321.

1980. *Parascorpaena picta*: Jones & Kumaran, *Fishes of Laccadive Archipelago*, p. 623, fig. 533.

Diagnostic features : D. XII, 9; A. III, 5; P.16; V.I.5. Head spines are well developed; lachrymal bone with 2 spines over maxillary; palatine teeth present; long denticulate supra-orbital tentacle and small filaments on lateral line; upper rays of pectoral fin divided; body scales cycloid. Body marbled with brown; indistinct oblique bands and markings on the dorsal and anal fins; caudal fin with dark band at base and center of fin; ventral fins with indistinct bars.

Habitat : Found on coral rubble.

Distribution : Indo-West Pacific.

Remarks : All the dorsal, anal and pectoral fin spines are very sharp and venomous. Wounds caused by these spines are very painful.

33. *Pterois antennata* (Bloch, 1787)

(Fig. 14)

1787. *Scorpaena antennata* Bloch, *Nat. Ausland. Fische.*, 3 : 21, pl. 185.

1986. *Pterois antennata* : Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*, p. 466, pl. 25. Fig. 149.7.

Diagnostic features : D. XII, 11; A. III, 6; P. 16; V. I. 5. Tips of pectoral rays are long and filamentous; supra-orbital tentacle with black lateral flaps. Body reddish brown with dark brown and narrow white bars on head and body, the dark band from eye to angle of preopercle more prominent; caudal peduncle with thin diagonal bars; pectoral fins with large dark blotches; dorsal, anal and caudal fins with black spots and supra-orbital tentacle with dark cross bands.

Habitat : Found in protected reef areas.

Distribution : Indo- Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines are very painful and the pain is unbearable tend to radiate rapidly from injured area. Sometimes weakness and dizziness may

be developed, occasionally cardiac failure, nervous disturbances, low blood pressure, respiratory distress, etc. are also reported.

34. *Pterois radiata* Cuvier, 1829

1929. *Pterois radiata* Cuvier, in Cuv, & Val., *Hist. nat. Poiss.*, 4 : 359

1986. *Pterois radiata*: Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*, p. 476, pl. 25. fig. 149.10

Diagnostic features : D. XII.11; A. III, 6; P.16; V. 1,5. The supra orbital tentacles smooth without appendages or bars. Body reddish brown with 5-6 broad dark bars separated by thin white lines; caudal peduncle with horizontal dark areas.

Habitat : Found around coral reefs and coral rubble.

Distribution : Indo-Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines are very painful; sometimes weakness and dizziness may occur; occasionally cardiac failure, nervous disturbances, low blood pressure, respiratory distress, etc. may be developed.

35. *Pterois russelli* Bennett, 1831

1831. *Pterois russelli* Bennett, *Proc. Comm. Zool. Soc.*, London, 1 : 128.

1997. *Pterois russelli*: Kamla Devi and Rao, New records of reef fishes from Andaman Waters. *J Andaman Sci. Assoc.*, 13(1&2) : 104-105.

Diagnostic features : D. XII, 11; A. III, 7; P. 13; V. I, 5. Body reddish, numerous thin dark vertical bars are present on head and body; a black spot on the shoulder behind the opercle; dorsal, anal and caudal fins without spots.

Habitat : Found around reef and rocky areas.

Distribution : Indo-West Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines are very painful and unbearable. Sometimes weakness and dizziness may occur; occasionally nervous disturbances, low blood pressure, respiratory distress etc. may be developed.

36. *Pterois volitans* (Linnaeus, 1758)

(Fig. 15)

1758. *Gasterosteus volitans* Linnaeus, *Syst. nat.*, ed. 10. p. 296.

1980. *Pterois volitans* : Jones & Kumaran, *Fishes of Laccadive Archipelago*, p. 635, fig. 543.

Diagnostic features : D. XIII, 10-11; A. III, 7; P. 14; V.I.5. Small dermal filaments

are on snout, pre-orbital and pre-opercular margin; supra-orbital tentacle long, longer than orbit; outer half of pectoral rays free with feather-like membranes. Body reddish with numerous dark brown cross bars and narrow pale interspaces; head with similar bands; dorsal, anal and caudal fins with black spots; ventral fins with small pearly spots and black margin.

Habitat : Found around coral reefs in shallow areas.

Distribution : Indo-Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines are very painful and often unbearable. Sometimes weakness and dizziness may occur; occasionally nervous disturbances, low blood pressure, respiratory distress, etc. may be developed.

37. *Scorpaenodes guamensis* (Quoy & Gaimard, 1824)
(Fig. 16)

1824. *Scorpaena guamensis* Quoy & Gaimard, *Voy. Uranie, Zoologie*, p. 326.

1986. *Scorpaenodes guamensis*: Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*, p. 472, fig. 149. 23.

Diagnostic features : D. XIII, 8-9; A. III, 4-5; P.19; V.1.5; Lss. 43-44. Body scales ctenoid; nasal spine present; few spines in a row under eye. Body dark brown with dark and light mottling; fins with brown and white spots in rows; a prominent black spot on upper edge of operculum surrounded by whitish areas.

Habitat : Found on shallow reef and rocky bottoms.

Distribution : Indo-West Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines produce throbbing pain. Sometimes weakness, dizziness, vomiting, nausea, restlessness, headache and diarrhea may be developed.

38. *Scorpaenopsis cirrhosa* (Thunberg, 1793)

1793. *Perca cirrhosa* Thunberg, *Sevenska Vet. Akad. Hamindgar, Stockholm*, 14 : 119, pl.7.

1980. *Scorpaenopsis cirrhosa*: Jones & Kumaran, *Fishes of Laccadive Archipelago*, p. 627, fig. 535.

Diagnostic features : D. XII, 9; A. III, 5; P.16; V. I. 5; Lss. 49. Membranous flaps present on jaws, opercular region, on head and body; first three dorsal spines increase in length evenly. Body brownish green, strongly mottled with pattern of dark brown and whitish blotches; all fins with dark spots in rows and marbled.

Habitat : Found on coral reefs and rocky areas.

Distribution : Indo-West Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines produce throbbing pain. Some times weakness, dizziness, vomiting, nausea, restlessness, headache and diarrhea may occur; occasionally low blood pressure and respiratory distress may be developed.

39. *Scorpaenopsis gibbosa* Bloch & Schneider, 1801

1801. *Scorpaenopsis gibbosa* Bloch & Schneider, *Syst. Ichthyol.* p. 192.

1986. *Scorpaenopsis gibbosa*: Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*, p. 474, pl.26.

Diagnostic features : D. XII, 9; A, III, 5; P. 17; V.I.5; Lss. 39. Body high behind head, hump backed; no palatine teeth; rear lachrymal spine not strongly hooked forward; head with ridges and spines; pre-pelvic region scaled; a deep groove below eye; head and body scales with small membranous flaps. Body brownish with a broad brownish area from base of median dorsal spine, obliquely downwards to pectoral, and a narrow dusky band on caudal peduncle; dorsal and anal fins with dark markings; ventral with broad dark band in the middle, margin yellowish.

Habitat : Found under coral rubble.

Distribution : Indo-Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines produce throbbing pain. Sometimes weakness, dizziness, vomiting, nausea, restlessness, headache and diarrhea may occur; occasionally low blood pressure and respiratory distress may be developed.

40. *Scorpaenopsis venosa* (Cuvier, 1829)

1829. *Scorpaenopsis venosa* Cuvier in Cuv. Val. *Hist. nat. Poiss.*, 4 : 317.

1986. *Scorpaenopsis venosa* Heckel, in Smith & Heemstra, *Smith's Sea Fishes*. p. 475, pl. 25, fig. 149.36.

Diagnostic features : D. XII, 9; A. III, 5; P. 16-18; V. I, 5. Head, body and fins with branched skin flaps; palatine teeth absent; first three dorsal fin spines increase in length evenly; ridges between eyes nearly straight, ending abruptly behind eyes. Body strongly mottled pattern of dark brown with whitish blotches; dark spots on fins arranged in rows.

Habitat : Found on shallow reef and rocky bottoms.

Distribution : Indo-Pacific.

Remarks : Dorsal, anal and pectoral fin spines are very strong and venomous. The wounds caused by these spines produce throbbing pain.

41. *Sebastapistes rhodochrous* (Gunther, 1871)

1871. *Sebastes rhodochrous* Gunther, *Proc. Zool. Soc., London*, p. 659.

1962. *Sebastapistes rhodochrous*: Weber, *Fishes of Indo-Australian Archipelago*, **11** : 26-27.

Diagnostic features : D. XII, 10; A. III, 5; P. 16; V. I, 5. Head with spines and ridges; pre-operculum with well-developed spines; soft dorsal slightly rounded; caudal fin rounded. Body brownish mottled; a dark blotch at base in the middle of dorsal fin.

Habitat : Found on rocky and coral reefs in shallow waters.

Distribution : Indian Ocean.

Remarks : Dorsal, anal and pectoral fin spines are very strong and venomous. The wounds caused by these spines produce throbbing pain.

**42. *Sebastapistes strongia* (Cuvier, 1829)
(Fig. 17)**

1829. *Scorpaena strongia* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.*, **4** : 323.

1986. *Sebastapistes strongia* : Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*, p. 476. fig. 149.39.

Diagnostic features : D. XII.9; A. III, 5; P.17; V.I.5; Lss.42. Pre-orbital with two spines; no flaps on body except a long supra-orbital tentacles. Body reddish brown, mottled with dark bars on lower jaw; a dark area at anterior most three dorsal spines; head and anterior body with yellowish spots.

Habitat : Found around coral reefs and rocky areas.

Distribution : Indo-Pacific.

Remarks : Dorsal, anal and pectoral fin spines are venomous containing venom glands. The wounds caused by these spines produce throbbing pain. Sometimes weakness, dizziness, vomiting, nausea, restlessness, and headache may occur.

43. *Vespicula depressiformis* (Richardson, 1848)

1848. *Apistus depressiformis* Richardson, *Zool. Voy. Samarang Fishes*. p.1.

1962. *Vespicula depressiformis* : De Beaufort and Briggs, *Fishes of Indo-Australian Archipelago*, **11** : 74, fig. 17.

Diagnostic features : D. XIII, 7; A. III, 5; P.11; V. I.5 Pre-orbital with two spines; origin of dorsal above hind border of pre-operculum. Body brownish; fins are mottled; caudal fin with dark transverse bands.

Habitat : Found in coastal silty areas with coral rubble.

Distribution : Indo-West Pacific.

Remarks : Dorsal and anal fin spines are venomous. The wounds caused by these spines produce severe pain and sometimes weakness, dizziness and headache may occur.

44. *Vespicula trachinoides* (Cuvier, 1829)

1829. *Apistus trachinoides* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.*, 4 : 410.

1962. *Vespicula trachinoides* : De Beaufort and Briggs, *Fishes of Indo-Australian Archipelago*, 11 : 73.

Diagnostic features : D. XV, 4; A. III, 4; P. 12; V. 1.4. The origin of dorsal fin is at hind border of preopercle; caudal fin rounded. Body reddish brown, light-brown narrow bands on median fins; pectoral fins with light brown spots.

Habitat : Found in silt-sand and near coral rubble areas.

Distribution : Indo-West Pacific.

Remarks : Fin spines are venomous containing venom glands. The wounds caused by these spines produce severe pain, dizziness and headache.

45. *Tetraroge barbata* (Cuvier, 1829) (Fig. 18)

1829. *Apistus barbatus* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.*, 4 : 413.

1984. *Tetraroge barbata*: Shimizu, in Masuda et. al., *Fishes of Japanese Archipelago*, p. 317, pl. 283 E.

Diagnostic features : D. XIII, 7-8; A. III, 5; P. 12; V. I, 5. Body moderately compressed; two small barbels on anterior tip of lower jaw; pre-orbital spine long and directed backwards; origin of dorsal above middle of eye; skin naked covered with papillae; caudal fin rounded. Body dark brown with small-scattered black spots; dorsal fin brown with a narrow white border; caudal fin with light brown transverse band.

Habitat : Found in inshore shallow silty sand and coral rubble areas.

Distribution : Indo-West Pacific.

Remarks : Pre-orbital spine and dorsal fin spines are strong and poisonous. Wounds caused by these spines are very painful.

46. *Tetraroge niger* (Cuvier, 1829)

1829. *Apistus niger* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.*, p. 415.

1962. *Tetraroge niger* : De Beaufort and Briggs, *Fishes of Indo-Australian Archipelago*, 11 : 70, fig. 16.

Diagnostic features : D. XIII, 7; A. III, 5; P. 12; V. I, 5; Body moderately compressed no barbels on lower jaw; anterior preorbital spine short, posterior one long; origin of dorsal fin above posterior part of eye; skin covered with small papillae. Body dark brown with irregular dark blotches; all fins are with narrow white border and dark broad sub- marginal band; caudal fin white.

Habitat : Found in shallow inshore waters and coral rubble areas.

Distribution : Indo-Pacific.

Remarks : Pre-orbital spine and dorsal fin spines are strong and poisonous. Wounds caused by these spines are very painful.

Family SYNANCEIIDAE

47. *Inimicus didactylus* (Pallas, 1769)

1769. *Scorpaena didactyla* Pallas, *Special. Zool.* 7 : 26.

1962. *Inimicus didactylus*: De Beaufort and Briggs, *Fishes of Indo-Australian Archipelago.* 11 : 104, fig. 30

Diagnostic features : D. XVII, 7; A. II, 10; P.10 + 2; V.1, 5. Body elongate, no scales on body; head somewhat depressed; mouth vertical; dorsal origin between first spine of superior postorbital ridge; dorsal membranes deeply incised behind fourth spine; last ray of dorsal and anal fins connected to caudal peduncle; skin and fins with papillae, caudal fin rounded. Body brown with variegated light and dark brown; head whitish; black blotch between 2nd and 3rd dorsal spine membrane; soft dorsal with broad dark terminal border; edge of anal fin dark; distal part of ventral fin reddish; caudal fin with a basal and sub-terminal dark band.

Habitat : Found on coral rubble.

Distribution : Indo-West Pacific.

Remarks : Most dangerous venomous fishes. Wounds caused by the spines are very painful and respiratory distress; necrosis of wounds and loss of consciousness are the symptoms.

48. *Polycaulus uranoscopus* Bloch & Schneider, 1801

(Fig. 19)

1801. *Polycaulus uranoscopus* Bloch & Schneider, *Syst. Ichth.* p. 195

1993. *Polycaulus uranoscopus*: Rajan *et. al.*, *J. Andaman Sci. Assoc.*, 9(1&2) : 105-106.

Diagnostic features : D. XII, 12; A. 14; P.14; V.1. 5. Body elongate, head flattened with spines and ridges; no scales on body; lateral line near dorsal profile; pre-orbital with two downward directed spines; caudal fin slightly rounded. Body light brown; pectoral fins dark brown with small white spots; other fins dark brown, tip of rays white; caudal fin with white spots.

Habitat : Found in muddy areas under stones.

Distribution : Indo-West Pacific, from Andaman Islands to China.

Remarks : Most dangerous fishes. Wounds caused by the spines are very painful and cause respiratory distress, necrosis of wounds, loss of consciousness and sometimes cardiac arrest.

49. *Synanceia verrucosa* Bloch & Schneider, 1801
(Fig. 20)

1801. *Synanceia verrucosa* Bloch & Schneider, *Syst. Ichth.*, p. 145, pl. 45

1986. *Synanceia verrucosa*: Eschmeyer, in Smith & Heemstra, *Smith's Sea Fishes*. p. 478, pl. 27, fig. 149.46.

Diagnostic features : D. XIII, 7; A. III, 6; P.19; V.I. 5. Body globular, covered with warts; head large and monstrous, body gradually tapering to tail; eyes far apart; a deep pit behind each eye; no scales on body but skin thick; mouth vertical, directed upwards, lower jaw projecting; origin of dorsal above hind border of preopercle; pectoral fin very large and fan like. Body grey with irregular red and orange patches.

Habitat : Found on coral rubble and coral reef areas.

Distribution : Indo-West Pacific.

Remarks : Most dangerous fish. The venom injected through the spines causes necrosis, paralysis, respiratory distress and loss of corneal reflexes; cardiac arrest and death may also occur.

Order PERCIFORMES

Family SERRANIDAE

50. *Cephalopholis argus* Schneider, 1801
(Fig. 21)

1801. *Cephalopholis argus* Schneider, in Bloch & Sch., *Syst. Ichth.*, p. 311, pl. 61.

1991. *Cephalopholis argus*: Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 33. pl. D, fig. 7.

Diagnostic features : D. IX, 15-16; A. III, 9; P. 17; V. I. 5; LI. 48- 51. Auxiliary scales present on body; snout and maxilla scaled. Body dark brown, numerous small black edged blue spots on body, head and fins; 5-6 pale bars on posterior half of body; margin of median and pectoral fins narrowly white.

Habitat : Found in shallow reef areas.

Distribution : Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are gastrointestinal disorders, weakness and fever.

51. *Cephalopholis leopardus* (Lacepede, 1801)

1801. *Labrus leopardus* Lacepede, *Hist. nat. Poiss.*, 3 : 450, 517, pl. 30, fig. 1.

1991. *Cephalopholis leopardus*: Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 49-52, pl. III-D, XXX-E, fig. 18, 19.

Diagnostic features : D. IX, 13-15; A. III, 10; P. 16-18; V. I, 5. Body moderately deep; caudal fin rounded. Body reddish brown, numerous ornagish red spots on head and lower half of body; a large dark spot on dorsal side of caudal peduncle; a large dark brown spot between upper two opercular spines; an oblique reddish black streak at upper posterior part of caudal fin.

Habitat : Found in shallow reef areas.

Distribution : Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are gastrointestinal disorders, weakness and fever.

52. *Epinephelus fasciatus* (Forsskal, 1775)

1775. *Perca fasciatus* Forsskal, *Descript. Animal.*, p. 40.

1991. *Epinephelus fasciatus*: Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 146-152, pl. XIICD, fig. 71, 73.

Diagnostic features : D. XI, 15-16; A. III, 7; P. 20; V. I, 5. Caudal and pectoral fins rounded. Body light yellowish red with 5 ornagish red bars on dorsal half of the body; head with large irregular dark red blotches; fins reddish, the outer triangular part of inter-spinus membrane of dorsal fin black; margin of soft dorsal, anal and posterior edge of caudal fins whitish.

Habitat : Found on reefs in protected areas.

Distribution : Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are abdominal pain, vomiting, weakness and fever.

53. *Epinephelus fuscoguttatus* (Forsskal, 1775)

1775. *Perca summana fuscogutta* Forsskal, *Descript. Animal.*, p. 42.

1991. *Epinephelus fuscoguttatus*: Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 157, pl. 13D, fig. 77.

Diagnostic features : D. XI, 15; A. III, 8; P. 19; V. I, 5; LI. 56. Body oblong and laterally compressed, dorsal profile of head indented at inter-orbital region and distinctly convex from there to dorsal origin; inter-orbital space flat; maxillary extending beyond posterior border of eye; preopercle obtusely rounded and upper

edge finely serrated; spinous dorsal incised; caudal fin rounded. Body light yellowish brown with irregular brown blotches of variable size on head and body; the blotches along back are dark; a black saddle-like spot on caudal peduncle; head, body and fins with numerous close-set small brown spots.

Habitat : Found around coral reef areas.

Distribution : Widespread in Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are gastrointestinal disorders, weakness and fever.

54. *Epinephelus hexagonatus* (Forster, 1801)

1801. *Holocentrus hexagonatus* Forster, in Bloch & Schneider, *Syst. Ichth.*, p. 323.

1991. *Epinephelus hexagonatus*: Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 166, pl. 14C, fig. 80, 81.

Diagnostic features : D. XI, 15-16; A. III, 8; P. 17; V. I, 5. Body oblong and laterally compressed; caudal fin rounded. Head and body densely covered with round to polygonal brown spots; five groups of darker spots dorsally on body and extend into the base of dorsal fin; a small blotch on caudal peduncle; a large yellowish brown spot behind eye; all fins with close-set dark brown spots and white dots except on the outer half of pectoral fin.

Habitat : Found in shallow outer reef areas.

Distribution : Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are abdominal pain, vomiting, weakness and fever.

55. *Epinephelus merra* Bloch, 1793 (Fig. 22)

1793. *Epinephelus merra* Bloch, *Nat. Ausland Fische*. 7 : 17. pl. 239.

1991. *Epinephelus merra* : Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 205, pl. 38A, fig. 106.

Diagnostic features : D. XI, 15-16; A. III, 8; P.16-17; V. I. 5. Maxillary reaches past eye; flank scales ctenoid; caudal fin rounded. Body light brown with close-set round to hexagonal dark brown spots, the spots on head progressively smaller anteriorly; spots on ventral side of body more widely separated; all fins spotted.

Habitat : Found in shallow reef and rocky areas.

Distribution : Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are abdominal pain, vomiting, weakness and fever.

56. *Variola louti* (Forsskal, 1775)

1775. *Perca louti* Forsskal, *Descript Animal.*, p. 40.

1991. *Variola louti* : Randall & Heemstra, *Indo-Pacific Fishes*, (20) : 305, pl. 28 E, fig. 168.

Diagnostic features : D. IX, 14; A, III, 8; P. 18; V. I. 5; LI. 72. A pair of large canines on mid side of lower jaw, inter-spinous membrane of dorsal fin not incised; posterior part of dorsal and anal fins prolonged; caudal fin strongly lunate. Body orange-red; numerous irregular small spots and dashes of pale blue on head, body and median fins; pectoral and median fins are with broad yellow margin.

Habitat : Found around coral reef areas.

Distribution : Indo-Pacific.

Remarks : Often causes ciguatera poisoning. The common complaints are abdominal pain, vomiting, weakness and fever.

57. *Grammistes sexlineatus* (Thunberg, 1792) (Fig. 23))

1792. *Perca sexlineata* Thunberg, *Vet. Akad. Nya Handlinger, Stockholm*, 13 : 142, pl.5.

2000. *Grammistes sexlineatus*: Rao *et. al.*, Bay of Bengal. *Rec. Zool. Surv. India, Occ. Paper No. 178*, p. 141.

Diagnostic features : D. VII, 13-14; A. II, 9; P. 17-18, V. I, 5. Body smooth, scales embedded in skin; preopercle with three to four short broad based spines; very small fleshy flap on chin. Body dark brown with 5-6 yellowish stripes; all fins pale.

Habitat : Found around reefs in shallow areas and under rocks.

Distribution : Indo-West Pacific.

Remarks : Skin produces toxic secretion known as "grammistin" which repels predators. This secretion causes skin irritation.

Family CARANGIDAE

58. *Scomberoides lysan* (Forsskal, 1775)

1775. *Scomber lysan* Forsskal, *Descript Animal.*, p.54.

1986. *Scomberoides lysan*: Smith-Vaniz, in Smith & Heemstra, *Smith's Sea Fishes*, p.655, fig. 210.

Diagnostic features : D. VII+I, 21; A. II+I, 19; P.17; V. I, 5. Body compressed and elongated, snout pointed, jaws equal, upper jaw extends to rear margin of eye; no scutes on the body; scales on mid body below lateral line lanceolate; dorsal and anal fin bases are equal in length. Body grey-green above, silvery- white below; double

series of 6-8 dusky roundish blotches above and below lateral line; distal half of dorsal fin lobe heavily pigmented; anal fin with small dusky blotch on anterior part.

Habitat : Found in coastal waters near reef areas.

Distribution : Wide spread in Indo-Pacific region.

Remarks : The dorsal and anal spines are venomous. Large sized fishes, particularly during their reproductive seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders, numbness of lips, tongue, limbs, muscular weakness and joint aches.

59. *Trachinotus baillonii* Lacepede, 1801

1801. *Caesiomorus baillonii* Lacepede, *Hist. nat. Poiss.* 3 : 92, pl. 3, fig. 1.

1986. *Trachinotus baillonii*: Smith-Vaniz, in Smith & Heemstra, *Smith's Sea Fishes*, p .658, fig. 210.48.

Diagnostic features : D. VI+I, 20-22; A. II+I, 20-21; P.18; V. I, 5. Body sub-ovate and strongly compressed snout blunt, the profile from inter-orbital to 2nd dorsal fin origin convex; anterior rays of dorsal, anal and caudal fins produced. Body grey to silvery-blue above, silvery-white below; sides with 3-5 round black spots in longitudinal row on lateral line; dorsal, anal and caudal fins grey to dusky, the lobes dark.

Habitat : Found in coastal waters.

Distribution : Wide spread in Indo-West Pacific region.

Remarks : Usually large sized fishes, particularly during their reproductive seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders, numbness of lips, tongue, limbs, muscular weakness and joint aches.

60. *Caranx carangus* Bloch, 1793

1793. *Scomber carangus* Bloch, *Nat. Ausland Fische*, 7 : 69.

1993. *Caranx carangus* : Rao et. al., *Environment & Ecology*, 11 (4) : 884.

Diagnostic features : D. VIII+I, 22; A. II+I, 16; P.21, V.I.5. Body compressed and deep; lower jaw slightly prominent; breast naked ventrally with a small patch of scales in front of ventral fins; anterior part of lateral line arched; straight part of lateral line commences below 6th soft dorsal fin ray, with 36 scutes; pectoral fin falcate, longer than head. Body silvery, darker above with golden line; small opercular spot present; all fins hyaline; margin of soft dorsal and upper lobe of caudal fin blackish.

Habitat : Found in coastal waters.

Distribution : Wide spread in Indo-Pacific region.

Remarks : Usually large sized fishes during their reproductive seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders, weakness and joint pains.

61. *Caranx ignobilis* (Forsskal, 1775)

1775. *Scomber ignobilis* Forsskal, *Descript. Animal.*, p. 55.

1986. *Caranx ignobilis*: Smith-Vaniz, in Smith and Heemstra, *Smith's Sea Fishes*, p. 647, fig. 210.17.

Diagnostic features : D. VIII+I, 18-22; A. II+I, 15-16; P. V. I, 5; Body robust, deep and slightly compressed; head profile steep and strongly curved above eyes; caudal fin forked. The head and body bluish dusky above, silvery below; dorsal fin dusky; anal fin dusky yellow.

Habitat : Found around rocky and coral reefs.

Distribution : Indo-West Pacific.

Remarks : Usually large sized fishes cause ciguatera poisoning. The common complaints are gastrointestinal disorders, muscular weakness and joint aches.

62. *Caranx melampygus* Cuvier, 1801

1801. *Caranx melampygus* Cuvier, in Cuv. & Val., *Hist. nat. Poiss.* 9 : 16

1986. *Caranx melampygus* : Smith-Vaniz, in Smith & Heemstra, *Smith's Sea Fishes*, p. 647, fig. 210.19

Diagnostic features : D. VIII + I, 23; A. II+I, 19- 20; P. 19-20; V.1.5. Body oblong and head profile fairly steep; breast completely scaled; 36-39 scutes on lateral line. Body greenish-blue, silvery white on lower sides; black spot on upper back and sides; lobes of dorsal and anal fins dark; pectoral fins light yellow.

Habitat : Found in coastal waters.

Distribution : Wide spread in Indo-Pacific region.

Remarks : Usually large sized fishes during their reproductive seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders, muscular weakness and joint aches.

63. *Caranx sexfasciatus* Quoy & Gaimard, 1824

1824. *Caranx sexfasciatus* Quoy & Gaimard, *Voy.Uranie. Physic. Zool.*, p. 358, pl. 65.

1986. *Caranx sexfasciatus*: Smith-Vaniz, in Smith & Heemstra, *Smith's Sea Fishes*, p. 648, fig. 210.22.

Diagnostic features : D. VIII + I, 20-21; A. II + I, 15-16; P. 19-20; V. I, 5. Body oblong, upper and lower profiles equal, nape elevated; maxilla extends to posterior edge of

eye; 32-34 strong scutes on lateral line; breast completely scaled. Body blue-green dorsally and silvery below; a small black spot on the upper edge of opercle.

Habitat : Found in shallow coral reef and coastal areas.

Distribution : Indo-Pacific region.

Remarks : Usually large sized fishes during their reproductive seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders.

64. *Elegatis bipinnulata* (Quoy & Gaimard, 1825)

1825. *Seriola bipinnulata* Quoy and Gaimard, *Voy. Uranie. Psyché, Zool.*, 1 : 363, pl. 60, fig. 3.

1986. *Elegatis bipinnulata*: Smith-Vaniz, in Smith & Heemstra, *Smith's Sea Fishes*, p. 652, fig. 210.31.

Diagnostic features : D. VI+I, 26+2; A. I+I, 20+2; P:18; V.I, 5. Body elongate and fusiform; no scutes are on lateral line; caudal fin forked; first dorsal and pectoral fins very small. Body dark olive green above, silvery below; two narrow pearly blue bands along sides with broad yellow stripe between them; all fins light yellow.

Habitat : Found in shallow coastal waters near reefs.

Distribution : Indo-West Pacific.

Remarks : Usually large sized fishes during certain seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders.

65. *Selar crumenophthalmus* (Bloch, 1739)

1739. *Scomber crumenophthalmus* Bloch, *Nat. Ausland Fische*, 7 : 77, pl. 343.

1986. *Selar crumenophthalmus*: Smith-Vaniz, in Smith & Heemstra, *Smith's Sea Fishes*, p. 656, fig. 210.41.

Diagnostic features : D. VIII+I, 25-26; A. II+I, 21-22; P:19; V.I, 5. Maxillary reaches to front edge of pupil; eye lids well developed; a deep furrow in lower margin of gill opening with a large papillae immediately above it and smaller papillae near upper edge; lateral line slightly curved anteriorly, becoming straight below middle of soft dorsal fin with 33-34 scutes. Body metallic-blue above, shading to white below; operculum with a large black spot; fins pale green; caudal fin lobes dusky.

Habitat : Found in shallow coastal waters.

Distribution : All tropical and sub-tropical waters.

Remarks : Usually large-sized fishes during their reproductive seasons cause ciguatera poisoning. The common complaints are gastrointestinal disorders, muscular weakness and joint aches.

Family LUTJANIDAE

66. *Aprion virescens* Valenciennes, 1830

1830. *Aprion virescens* Valenciennes, *Hist. nat. Poiss.* 6 : 544.

1985. *Aprion virescens* : Allen, *FAO Fish Synop.*, 6(125) : 20, pl. 10. fig.

Diagnostic features : D. X. II; A. III, 8; P. 17; V. I. 5; LI. 40. Body fusiform; a groove present on snout below nostrils; two strong canines in front of jaws; caudal fin deeply forked. Body bluish grey in colour, fins hyaline.

Habitat : Found around outer reef areas.

Distribution : Indo-Pacific.

Remarks : Sometimes causes ciguatera poisoning.

67. *Lutjanus argentimaculatus* (Forsskal, 1775)

1775. *Sciaena argentimaculatus* Forsskal, *Descript. Animal.*, 11 : 47

1985. *Lutjanus argentimaculatus*: Allen, *FAO Fish. Synop.*, Vol. 6(125) : 58, pl. II.

Diagnostic features : D. X. 13; A. III, 8; P. 17; V. 1, 5; LI. 46. Pre-opercular notch and knob poorly developed; scale rows above lateral line parallel; caudal fin emarginated. Body greenish brown, belly silvery; scales with dark centers and white margin; median fins with reddish hue, pectoral and ventral fins dark brown.

Habitat : Found on reefs in deep waters.

Distribution : Indo-West Pacific.

Remarks : Large-sized fishes cause ciguatera poisoning.

68. *Lutjanus bohar* (Forsskal, 1775)

1775. *Sciaena bohar* Forsskal, *Descript. Animal.*, 11 : 46.

1985. *Lutjanus bohar* : Allen, *FAO Fish. Synop.*, 6(125) : 64, pl. 12. fig. 48.

Diagnostic features : D. X, 13; A. III, 8; P. 17: V. I., 5; LI. 48-49. Snout somewhat pointed, nostrils in deep groove; inter-orbital flat; preopercular notch poorly developed; scale rows above lateral line oblique. Body reddish brown dorsally, lower sides and belly reddish; all fins dusky except pectoral fin; pectoral fin pink, the dorsal edge dark.

Habitat : Found around coral reefs and protected lagoons.

Distribution : Indo-West Pacific.

Remarks : Large-sized fishes cause ciguatera poisoning.

69. *Lutjanus fluviflamma* (Forsskal, 1775)

1775. *Sciaena fluviflamma* Forsskal, *Descript. Animal.*, 11 : 45.

1985. *Lutjanus fluviflamma* : Allen, *FAO Fish. Synop.*, 6(125) : 80, pl. 14, fig. 56.

Diagnostic features : D. X. 13; A. III, 8; P. 15-16; V. I, 5; LI. 48-49. Pre-opercular knob and notch poorly developed; vomerine tooth patch triangular, with a medial posterior extension; tongue with a patch of teeth; caudal fin slightly emarginated. Body dark brown on head and back, light brown on sides and yellow on belly; sides of body below lateral line with yellow stripes; an elongate black spot at level of lateral line below base of soft dorsal fin; all fins yellowish.

Habitat : Found around coral reef and rubble areas.

Distribution : Indo-West Pacific.

Remarks : Implicated ciguatera poisoning.

70. *Lutjanus gibbus* (Forsskal, 1775)
(Fig. 24)

1775. *Sciaena gibbus* Forsskal, *Descript. Animal.*, 9 : 46.

1985. *Lutjanus gibbus* : Allen, *FAO Fish. Synop.*, 6(125) : 84, pl. 15, fig. 59.

Diagnostic features : D. X. 14; A. III, 8; P. 17; VI.5. Dorsal profile of head steeply sloped and concave; tongue edentate; pre-opercular notch and knob well developed; posterior profile of dorsal and anal fins pointed; caudal fin forked. Body red, more dark on back and silvery-red below; eye, base of pectoral and its axil orange; fins reddish brown; soft dorsal, anal and caudal fin margins white.

Habitat : Found on coral reefs below 5mt. depth.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

Family LETHRINIDAE

71. *Lethrinus variegates* Valenciennes, 1830

1830. *Lethrinus variegates* Valenciennes, in Cuv. & Val., *Hist. nat. Poiss.*, 6 : 287.

1989. *Lethrinus variegates* : Carpenter & Allen, *FAO Fish. Synopsis*, 9(125) : 88-89, fig. 151, pl. VIII, 45.

Diagnostic features : D. X, 9; A. III, 8; P. 13; V. I, 5. Body slender; mouth terminal, lips relatively thick; caudal fin slightly forked to emarginated. Body brownish grey,

lighter ventrally with scattered irregular dark spots and mottling on sides; some times two dark bands below eye; fins translucent; caudal fin with light dark stripes.

Habitat : Found in weedy and sandy areas near reefs.

Distribution : Indo-West Pacific.

Remarks : Sometimes causes ciguatera poisoning.

72. *Monotaxis grandoculis* (Forsskal, 1775)

1775. *Sciaena grandoculis* Forsskal, *Descript. Animal.*, xi, 53.

1989. *Monotaxis grandoculis*: Carpenter & Allen, *FAO Fish. Synopsis*, 9(125) : 91-92, fig. 155, pl. VIII, 47-49.

Diagnostic features : D. X, 10; A. III, 9; P. 14; V. I, 5. Body oblong; head profile strongly convex in front of eye; snout sloping steeply; eyes large; caudal fin forked. Body bluish grey dorsally, silvery on sides, whitish ventrally; four black bars on dorsal side of body; pectoral axil black; caudal fin margins with black streak. Lips of sub-adults are yellow to pinkish.

Habitat : Found in the vicinity of coral reefs and on sandy areas.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

Family SCATOPHAGIDAE

73. *Scatophagus argus* Linnaeus, 1766 (Fig. 25)

1766. *Chaetodon argus* Linnaeus, *Syst. Nat.*, ed. 12, 1 : 464.

1984. *Scatophagus argus*: Talwar, *Commercial Sea Fishes of India*, p. 704, fig. 286.

Diagnostic features : D. XI, 16-18; A. IV, 14; P.16; V. I,5. Body deep and angular; compressed and squarish in outline with triangular head projecting anteriorly, mouth very small; scales ctenoid. Colour bluish or greenish-grey to dusky brown above, silvery ventrally; numerous irregular large round brown spots on body except on breast and belly, these spots may extend onto the soft dorsal fin; all fins slightly dusky.

Habitat : Found in creeks and backwaters.

Distribution : Indo-West Pacific.

Remarks : Dorsal, anal and ventral fin spines are equipped with venom glands; wounds caused by the spines are painful with throbbing and shooting sensation.

Family CHAETODONTIDAE

74. *Chaetodon auriga* Forsskal, 1775
(Fig. 26)

1775. *Chaetodon auriga* Forsskal, *Descript. Animal.*, p. 60.

1986. *Chaetodon auriga* : Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 628, pl. 74.

Diagnostic features : D. XIII, 24; A. III, 21; P.16; V I, 5; Ll. 31-32. Body deep and compressed, mouth small and protractile with brush-like teeth; caudal fin slightly emarginated; anterior dorsal rays prolonged into a filament. Body silvery blue with pattern of chevron markings on sides; posterior part of body yellow with a large black spot on soft dorsal; a black band through eye; caudal and posterior anal fins yellow.

Habitat : Found in protected coral reefs and outer reefs in shallow waters.

Distribution : Indo-West Pacific.

Remarks : Implicated in ciguatera poisoning.

75. *Chaetodon ephippium* Cuvier, 1831
(Fig. 27)

1831. *Chaetodon ephippium* Cuvier, *Hist. nat. Poiss.*, 7 : 80.

1992. *Chaetodon ephippium* : Rajan *et. al.*, New records of butterfly-fishes from Andaman and Nicobar Islands. *J. Andaman Sci. Assoc.*, 8(2) : 172, fig. 1.

Diagnostic features : D. XIII, 24; A. III, 21; P.16; V. I, 5; Ll. 38. Body oval and compressed; rostro-dorsal profile strongly concave before eye; snout long, conical and pointed; pre-operculum finely denticulate at its angle; lateral line strongly arched; dorsal and anal rounded posteriorly; 4th and 5th ray of dorsal fin extending posteriorly into a filament. Upper half of body yellowish-grey and lower half with diffuse violet longitudinal stripes running parallel to scale rows; a large black area posteriorly on back adjacent to dorsal fin, broadly bordered below by white area; a short narrow black bar through eye; posterior margin of dorsal and anal fins yellowish with light thin brownish sub-marginal band; edge of caudal peduncle with narrow brown band.

Habitat : Found in sheltered shallow reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning.

76. *Chaetodon triangulum* Cuvier, 1831
(Fig. 28)

1831. *Chaetodon triangulum* Cuvier, *Hist. nat. Poiss.*, 7 : 44.

2000. *Chaetodon triangulum* : Rao *et. al.*, An account of Ichthyofauna of Andamana and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 233, fig. 188.

Diagnostic features : D. XI, 25-27; A. III, 22-23; P. 14; V. I, 5. Body deep, compressed and disc like; mouth protractile, snout short; caudal fin rounded. Body purplish brown with narrow cream coloured angularly bent bars on sides; three dark bars on head, dark purplish bar with pale edge across caudal fin; edge of soft dorsal black; ventral fins light yellow.

Habitat : Found around shallow coral reef areas.

Distribution : Indian Ocean.

Remarks : Implicated in ciguatera poisoning.

77. *Chaetodon trifasciatus* Mungo Park, 1797
(Fig. 29)

1797. *Chaetodon trifasciatus* Mungo Park, *Trans. Linn. Soc., London.*, 3 : 34.

1992. *Chaetodon trifasciatus*: Rajan *et. al.*, New records of butterfly-fishes from Andaman and Nicobar Islands, Bay of Bengal. *J. Andaman Sci. Assoc.*, 8(2) : 173, fig.2.

Diagnostic features : D. XIII, 21-23; A. III, 19; P.15; V. I, 5; Ll. 31-33. Body ovate and highly compressed. Head and body golden orange with slightly oblique, narrow purplish stripes on body; broad yellow edged black bar through eye; snout black; a narrow bluish-black curved stripe along pre-opercular margin; broad reddish stripe in soft part of dorsal, anal and caudal fins; pectoral and ventral fins whitish.

Habitat : Found around protected coral reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning.

78. *Heniochus acuminatus* (Linnaeus, 1758)

1758. *Chaetodon acuminatus* Linnaeus, *Syst. Nat.*, ed. 10, p. 272.

1986. *Heniochus acuminatus* : Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p.631, pl.74.

Diagnostic features : D. XI, 26; A. III, 18; P.18; V. I, 5. Body discoidal; lateral line strongly arched; the 4th dorsal spine and its membrane greatly prolonged; ventral fin longer than pectoral. Body pearly white with broad oblique black bands on sides, the 1st continues with black ventral fins and 2nd band ending on posterior half of anal fin; soft dorsal and caudal fins yellow; a black bar above eye; dorsal filament white.

Habitat : Found in reef areas in pairs.

Distribution : Indo-West Pacific.

Remarks : Implicated in ciguatera poisoning.

Family POMACANTHIDAE

79. *Pomacanthus annularis* (Bloch, 1787) (Fig. 30)

1787. *Chaetodon annularis* Bloch, *Nat. Ausland Fische*, 3 : 114, pl.215, fig. 2.

2000. *Pomacanthus annularis*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper No. 178* : 237, fig. 191.

Diagnostic features : D. XIII, 20; A. III, 20; P. 19; V. I, 5. Body compressed and disc like, rostro-dorsal profile straight to nape; preopercle with a strong pointed spine. Body yellowish brown with seven curved bluish lines radiating from pectoral fin to soft dorsal fin rays; two horizontal lines on opercle; base of pectoral with transverse lines; a conspicuous blue ring above opercle margin; pectoral and caudal fins yellow, ventral fins are grey.

Habitat : Found around sheltered reef slope areas.

Distribution : Indo-West Pacific.

Remarks : The opercular spine is very sharp and long capable of inflicting painful wounds.

80. *Pomacanthus imperator* (Bloch, 1787) (Fig. 31)

1787. *Chaetodon imperator* Bloch, *Nat. Ausland Fische*, 3 : 51.

1986. *Pomacanthus imperator*: Smith & Heemstra, *Smith's Sea Fishes.*, p. 626, pl. 73.

Diagnostic features : D. XIV, 20; A. III, 20; P.19; V. I, 5; Ll. 78. Body compressed, mouth small, pre-opercular spine longer than eye. Colour purplish-blue with narrow yellow stripes; snout and cheek bluish-white; a curved blue-edged black bar through eye with a greenish yellow bar just behind that, confluent with yellow colour on forehead; a broad black bar at the level of pectoral; soft dorsal, anal and caudal fins with numerous yellow bands; pectoral and pelvic fins yellowish.

Habitat : Found on coral reef areas.

Distribution : Indo-West Pacific.

Remarks : Implicated in ciguatera poisoning.

81. *Pomacanthus semicirculatus* (Cuvier, 1831)
(Fig. 32)

1831. *Holacanthus semicirculatus* Cuvier, *Hist. Nat. Poiss.*, 7 : 191.

2000. *Pomacanthus semicirculatus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper No. 178* : 238, fig. 193, 194.

Diagnostic features : D. XIII, 21-22; A. III, 20; P. 20; V. I, 5. Body compressed and deep; rostro-dorsal profile obliquely ascending with slight concavity on snout; preopercular spine is strong and pointed; caudal fin rounded; soft dorsal and anal fins are acute and prolonged as a filament. Body brownish, but the middle portion yellowish grey; edges of operculum, pre-operculum and fins except pectorals with blue margin; numerous bluish spots on body and fins. Juveniles are black with alternating blue and white bars on head, body and caudal fin.

Habitat : Found around coral reef areas at intermediate depths.

Distribution : Indo-West Pacific.

Remarks : The pointed preopercular spine causes severe painful wounds.

82. *Pygoplites diacanthus* (Boddaert, 1772)
(Fig. 33)

1772. *Chaetodon diacanthus* Boddaert, *Epistola de chaetodonti diacantho Anstelodami*, pl. 9.

1986. *Pygoplites diacanthus* : Smith & Heemstra, *Smith's Sea Fishes*, p. 626, pl. 72.

Diagnostic features : D. XIV, 18; A. III, 18; P.16; V. I, 5; Ll. 52. Body ovate; mouth small; rostro-dorsal profile of head obliquely ascending; preopercular spine is strong; snout longer and pointed. Body with alternating brilliant dark edged bluish-white and orange stripes which narrow and angled backward in dorsal fin; posterior part of dorsal fin dark with blue spots; anal fin yellowish orange with blue stripes; caudal and ventral fins yellow.

Habitat : Found near caves in reef areas.

Distribution : Indo-west pacific.

Remarks : Implicated in ciguatera poisoning.

Family SPHYRAENIDAE

83. *Sphyraena barracuda* (Walbaum, 1792)
(Fig. 34)

1792. *Esox barracuda* Walbaum, *Ichthyologie*, p. 94.

2000. *Sphyraena barracuda*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper No. 178* : 255.

Diagnostic features : D. V+I, 9; A. I, 9; P.14; V. I, 5. Body elongated and slightly compressed; snout long and pointed; edge of operculum rounded; caudal fin bilobed. Body deep green to steel grey above, silvery below; sides above lateral line with a series of 18-20 faint cross bars angled backwards.

Habitat : Found around outer reef areas.

Distribution : Indo-Pacific.

Remarks : Eating flesh of large-sized fishes causes ciguatera poisoning.

84. *Sphyraena jello* Cuvier, 1829

1829. *Sphyraena jello* Cuvier, *Hist. nat. Poiss.*, 3 : 258.

1984. *Sphyraena jello*: Talwar, *Commercial Fishes of India*, p. 741.

Diagnostic features : D. V+I, 9; A. II, 8; P. 13-14, V. I, 5. Body slightly compressed, elongated and fusiform; head large with long pointed snout; mouth large. Head and body dusky yellow green above, silvery below with 10-20 vertical dusky cross bars; all fins dusky except pelvic fins.

Habitat : Found around outer reef areas.

Distribution : Indo-West Pacific.

Remarks : Eating flesh of large-sized fishes causes ciguatera poisoning.

Family LABRIDAE

85. *Cheilinus fasciatus* (Bloch, 1791) (Fig. 35)

1791. *Sparus fasciatus* Bloch, *Nat. Ausland Fische*, 5 : 257.

2000. *Cheilinus fasciatus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper No. 178* : 262.

Diagnostic features : D. IX, 10; A. III, 8; P. 12; V. I, 5. Body robust, posterior rays of dorsal and anal fins are elongate; caudal fin truncate, the lobes are slightly prolonged; anterior part of the body pale yellow or reddish brown; six to seven dark transverse bars on sides; lower sides of head and belly lighter; narrow white streaks radiating from eye and below eye they are breaking into spots; dark brown spots on upper part of operculum and on sides; a black streak at base of pectoral fin; caudal fin yellowish with dark basal and marginal bands; pectoral yellowish.

Habitat : Found in sheltered reef areas.

Distribution : Indo-Pacific.

Remarks : Large sized fishes cause ciguatera poisoning.

86. *Cheilinus undulatus* Ruppell, 1835

1835. *Cheilinus undulatus* Ruppell, *Neue. Wirb. Fische*, p.20.

2000. *Cheilinus undulatus* : Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. Zool. Surv. India, Occ. Paper No. 178* : 263.

Diagnostic features : D. IX, 10; A. III, 8; P. 12; V. I, 5. Dorsal profile of head straight to eye then becoming convex; single row of conical teeth in jaws; rear of dorsal and anal fins elongate; ventral fins reaching to anus. Body olive green with vertical dark lines on scales; head with two black lines extending upwards from eye and two diagonally downward on snout from eye; median fins yellowish with oblique green bars and spots; posterior margin of caudal fin pale yellow.

Habitat : Found in outer reef areas in shallow waters.

Distribution : Indo-Pacific.

Remarks : Large sized fishes cause ciguatera poisoning.

87. *Epibulus insidiator* (Pallas, 1770) (Fig. 36)

1770. *Sparus insidiator* Pallas, *Spicilegia. Zoologica*, 8 : 41, pl.5.

2000. *Epibulus insidiator*: Rao *et. al.*, An Ichthyofauna of Andaman and Nicobar Islands, *Rec. zool. Surv. India, Occ. Paper No. 178* : 264.

Diagnostic features : D. IX, 10; A. III, 8; P. 12; V. I, 5. Body compressed, mouth oblique and highly protractile; lower jaw extending posteriorly to lower edge of opercle; posterior rays of dorsal and anal fins prolonged; caudal fin truncate, the lobes are prolonged. Body dark bluish red with dark green edges on scales; broad yellow bar on sides at tip of pectoral fin; all fins dark brown; a dark blotch between first three dorsal spines. The other phase of the fish is yellowish including all fins.

Habitat : Found in sheltered reef areas.

Distribution : Indo-Pacific.

Remarks : Some times large sized fishes causes ciguatera poisoning.

Family SCARIDAE

88. *Scarus ghobban* Forsskal, 1775 (Fig. 37)

1775. *Scarus ghobban* Forsskal, *Descript Animal.*, p. 28.

1993. *Scarus ghobban*: Rao *et. al.*, An Ichthyofauna of Andaman and Nicobar Islands, *Rec. zool. Surv. India, Occ. Paper No. 178* : 276.

Diagnostic features : D. IX, 10; A. III, 9; P. 15; V. I, 5; Ll. 18+7. Body covered with large ctenoid scales; lips covered more than half of dental plates; caudal fin lunate.

Body and head green dorsally, the scales narrowly edged with reddish orange; sides and ventral part of head pinkish; 3 narrow green bands extending from eye posteriorly; dorsal and anal fins orange-red, the base and margin with blue band; caudal fin bluish-green with orange band in each lobe.

Habitat : Found on shallow reef areas.

Distribution : Indo-pacific.

Remarks : Implicated in ciguatera poisoning.

89. *Scarus globiceps* Valenciennes, 1840

1840. *Scarus globiceps* Valenciennes, *Hist. nat. Poiss.*, 242.

1986. *Scarus globiceps*: Randall, in Smith and Heemstra, *Smith's Sea Fishes*, p. 713, pl. 108.

Diagnostic feature : D .IX, 10; A. III, 9; p.14; V. I, 5; Ll. 24. Body elongated; snout rounded; dental plates covered by lips; caudal fin emarginated. Body green, the edge of the scales pink; numerous small spots and short lines on head and antero-dorsal part of body; a green-bordered pink band from snout through eye to end of opercle; a small dark spot at base of fourth dorsal spine; caudal fin green with pink band in each lobe.

Habitat : Found in outer reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning.

90. *Scarus rubroviolaceus* Bleeker, 1847

1849. *Scarus rubroviolaceus* Bleeker, *Verh. batav. Genoot. Kunst. Wet.*, 22 : 52.

1986. *Scarus rubroviolaceus*: Randall, in Smith & Heemstra, *Smith's Sea Fishes*, p. 713, pl. 106.

Diagnostic features : D. IX, 10; A. III, 9; P. 15; V. I, 5; Ll. 26. Body moderately elongate; dorsal profile rising steeply from mouth to level of eye; caudal fin strongly lunate, the lobes produced. Body greenish-blue, the scale edges narrowly pinkish; upper lip with pink band, above this a broad band; lower lip and chin with two blue bands, pink band in between; dental plates blue-green; median fins bluish with pink band in the middle.

Habitat : Found on coral reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning.

91. *Scarus sordidus* Forsskal, 1775

1775. *Scarus sordidus* Forsskal, *Descript Animal.*, p. 30.

1986. *Scarus sordidus*: Randall, in Smith & Heemstra, *Smith's Sea Fishes*, p. 714 , pl. 111.

Diagnostic feature : D. IX, 10; A .III, 9; P. 14 ; V. I, 5; Ll. 23. Body elongate; dental plate not covered by lips; caudal fin truncate to slightly rounded. Two strikingly colour patterns, initial phase is dark brown, red around mouth and lower part of chin; dorsal side of head and anterior part of body white. Terminal phase green; the edges of scales pink except caudal peduncle; thorax and abdomen pink with indistinct green stripes; sides of body yellow; snout bordered by blue-green bands; dental plates blue-green

Habitat : Found on coral reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning.

Family TERAPONIDAE

92. *Terapon jarbua* (Forsskal, 1775)

1775. *Sciaena jarbua* Forsskal, *Descript. Animal.*, p. 50.

1986. *Terapon jarbua*: Heemstra, in Smith & Heemstra, *Smith's Sea Fishes*, p. 544, pl. 47.

Diagnostic features : D. XII, 9-10; A. III, 8-10; P. 13-14; V. I, 5. Body oblong, slightly compressed; mouth moderate, pre-operculum serrated with 3-5 large spines at its angle. Body silvery grey with 3-4 curved dark brown stripes; spinous dorsal fin with black blotch between 3rd and 6th spine; anterior and posterior tips of soft dorsal black; caudal fin with three horizontal stripes, the tips dark.

Habitat : Found in creeks and coastal waters.

Distribution : Indo-West Pacific.

Remarks : The dorsal and anal fin spines are stout and pointed causes painful wounds. The venomous nature of the spines is not much known.

Family ACANTHURIDAE

93. *Acanthurus lineatus* (Linnaeus, 1758) (Fig. 38)

1758. *Chaetodon lineatus* Linnaeus, *Syst. Nat.*, p. 274.

1986. *Acanthurus lineatus* : Randall, in Smith & Heemstra, *Smith's Sea Fishes*, p. 813, pl. 129.

Diagnostic features : D. IX, 27-28; A. III, 25-26; P. 16; V. I, 5. Body deep and compressed; mouth small and terminal; un-notched single dorsal fin; caudal fin lunate; sides of caudal peduncle with long sharp spine. Upper three-fourths of head and body with alternate black edged blue and yellow bands; lower fourth light

lavender colour; dorsal and anal fins dark blue; caudal fin bluish with broad black area at base; pectoral fin hyaline; ventral fin yellowish-orange.

Habitat : Found in outer reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning. Caudal spine causes severe painful wounds.

94. *Acanthurus nigricauda* Duncker & Mohr, 1939
(Fig. 39)

1939. *Acanthurus gahm nigricauda* Duncker and Mohr, *Zool. Mus. Zool. Anz.*, **110** : 138.

2000. *Acanthurus nigricauda* : Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper No.* **178** : 318.

Diagnostic features : D. IX, 25-26; A. III, 23; P. 17; V. I, 5. Body compressed and slightly ovate; caudal fin strongly lunate. Body dark brown without any spots or lines; a horizontal black band from upper end of gill opening to above middle of pectoral fin; a lanceolate black line extending anteriorly from caudal spine; all fins are dark brown; outer third of pectoral fin yellow; base of caudal fin white and margin of median fins white.

Habitat : Found in shallow sandy bottom near coral heads.

Distribution : Indo-Pacific.

Remarks : Caudal spine causes severe painful wounds.

95. *Acanthurus triostegus* (Linnaeus, 1758)

1758. *Chaetodon triostegus* Linnaeus, *Syst. Nat.* ed. 10, p. 274.

1986. *Acanthurus triostegus*: Randall, in Smith & Heemstra, *Smith's Sea Fishes*, p. 816, pl. 127.

Diagnostic features : D. IX, 22-24; A. III, 20-21; P.14-16; V. I, 5. Body deep and compressed; mouth small and terminal; caudal fin emarginated, caudal peduncular spine are small. Body light greenish grey, six narrow black bars on head and body.

Habitat : Found around inshore coral reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning. Caudal spine causes severe painful wounds.

96. *Acanthurus xanthopterus* Valenciennes, 1835
(Fig. 40)

1835. *Acanthurus xanthopterus* Valenciennes, *Hist. nat. Poiss.*, **10** : 215.

1986. *Acanthurus xanthopterus*: Randall, in Smith & Heemstra, *Smith's Sea Fishes*, p. 816.

Diagnostic features : D. IX, 25-26; A. III, 23-24; P. 16; V. I, 5. Body deep, slightly elongated and compressed; caudal fin lunate, caudal peduncle spines are small. Body blue-grey with irregular dark grey lines; a dull yellow area behind and in front of eye; caudal fin bluish grey, often with a faint whitish bar at its base; dorsal and anal fins with alternating yellow and blue stripes; outer third of pectoral fin yellow.

Habitat : Found on sandy areas adjacent to reefs.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning. Caudal spine causes wounds.

97. *Ctenochaetus striatus* (Quoy and Gaimard, 1825)
(Fig. 41)

1825. *Acanthurus striatus* Quoy and Gaimard, *Voy. Uranie. et Physic., Zool.* p.373, pl. 63, fig.3.

1993. *Ctenochaetus striatus*: Rao et. al., *Environment & Ecology*, 11(4) : 885.

Diagnostic features : D. VIII, 29-30; A. III, 25-26; P. 16; V. I, 5. Body slightly deep and compressed; caudal fin is lunate. Body dark brownish with numerous blue longitudinal lines; dorsal side of head and nape with small orange red dots; dorsal and anal fins with dark narrow bluish bands.

Habitat : Found around coral reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning. Caudal spine causes painful wounds.

98. *Ctenochaetus strigosus* (Bennett, 1828)

1828. *Acanthurus strigosus* Bennett, *Zool. Jour.*, 4 : 41.

1984. *Ctenochaetus strigosus*: Talwar, *Commercial Sea Fishes of India*, zool. Surv. India. p. 771, fig. 313.

Diagnostic features : D. VIII, 25-27; A. III, 22-24; P. 15-16; V. I, 5. Body slightly deep and compressed; caudal fin emarginated. Body yellowish brown with narrow blue grey longitudinal lines; small yellow dots on head and anterior part of body.

Habitat : Found on reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning. Caudal spine causes painful wounds.

99. *Zebrasoma veliferum* (Bloch, 1797)

1797. *Acanthurus velifer* Bloch, *Nat. Ausland Fische*, 3 : 106.

1986. *Zebrasoma veliferum*: Randall, in Smith & Heemstra, *Smith's Sea Fishes*, p. 818, pl. 130.

Diagnostic features : D. IV, 28-30; A. III, 22; P. 15-16; V. I, 5. Anterior part of body deep and posterior part gradually narrowed; dorsal and anal fins elevated; snout produced. Body white with broad brown bars containing yellowish lines; the last bar black and covers caudal peduncle; head whitish with yellow dots and vertical lines; a black bar through eye; dorsal and anal fins dark brown with broadly curved alternate dark brown and yellow bands; Caudal fin light brown with yellow spots.

Habitat : Found in reef areas.

Distribution : Indo-Pacific.

Remarks : Implicated in ciguatera poisoning.

Family SIGANIDAE

100. *Siganus argenteus* (Quoy & Gaimard, 1825)

1825. *Amplacanthus argenteus* Quoy and Gaimard, *Voy. Uranie. et Physic., Zool.* : 368 , pl. 62, fig. 3.

1990. *Siganus argenteus*: Woodland, *Indo-Pacific Fishes*, (19) : 39, pl. II B.

Diagnostic features : D. XIII, 10; A. VII, 9; p. 18; V. I, 3. Body slightly elongate; fin spines slender and pungent; caudal peduncle much longer, its fin deeply forked. Body bluish grey above fading to silvery on sides and belly; small yellow spots often fused to form undulating stripes mostly on lower part of body; when the fish removed from the water the colour pattern become mottled with dark and light brown and few scattered brown spots on sides; dorsal fin rays and outer rays of caudal fin with dusky cross bars.

Habitat : Found on outer reef areas.

Distribution : Indo-West Pacific.

Remarks : The dorsal and anal spines are venomous; wounds caused by these spines are very painful. Sometimes eating flesh causes ciguatera poisoning.

101. *Siganus canaliculatus* (Park, 1797)

(Fig. 42)

1797. *Chaetodon canaliculatus* Park, *Linn. Trans.*, 3 : 33.

1990. *Siganus canaliculatus* : Woodland, *Indo-Pacific Fishes*, (19) : 51, pl.III B.

2000. *Siganus cancellatus* : Rao et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper No. 178* : 318.

Diagnostic features : D. XIII, 10; A. V. II, 9; P. 16; V. II, 3. Body elongate; dorsal fin spines slender and pungent; few embedded scales on lower third of cheek; middle of thorax scaleless between ventral ridge; caudal slightly emarginated. Body silvery

gray above, silvery below; nape and upper surface of head olive green; head and body with pearly white spots, some are elongate; a dark patch below origin of lateral line; soft dorsal and anal fins dusky.

Habitat : Found around reef slopes in shallow area.

Distribution : Indo-West Pacific.

Remarks : The dorsal and anal spines are venomous; wounds from these spines are very painful.

102. *Siganus corallinus* (Valenciennes, 1835)

1835. *Amphacanthus corallinus* Valenciennes, *Hist. nat. Poiss.*, p. 139.

1990. *Siganus corallinus* : Woodland, *Indo-Pacific Fishes*, (19) : 23, pl. I A.

Diagnostic features : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Body deep and ovate; spines stout and pungent; cheeks usually covered with overlapping scales; thorax including ridges fully scaled; caudal fin deeply forked. Body, head and fins are orange yellow; numerous small dark edged pale blue spots on head and body; a triangular dark patch above and behind eye.

Habitat : Found on coral reef areas.

Distribution : Indo-West Pacific.

Remarks : The dorsal and anal spines are venomous; wounds from these spines are very painful.

103. *Siganus fuscescens* (Houttuyn, 1782)

1782. *Centrogaster fuscescens* Houttuyn, *Verh. Holland. Mattsch. Wet. Haarlem*, 20(2) : 333.

1990. *Siganus fuscescens* : Woodland, *Indo-Pacific Fishes*, (19) : 55, pl.III C.

Diagnostic features : D. XIII, 10; A. VII, 9; P. 15-17; V. II, 3. Body slightly ovate, covered by small embedded scales; dorsal and anal fins low and rounded; caudal fin slightly forked; Body uniform dusky brown, with small dark spots on sides and on head; a dark blotch equal to eye present just behind upper end of gill opening; caudal fin dusky brown with indistinct vertical bands.

Habitat : Found in shallow reef areas.

Distribution : Indo-West Pacific.

Remarks : The spines are venomous; wounds from these spines are very painful. Implicated in ciguatera poisoning also.

104. *Siganus guttatus* (Bloch, 1787)
(Fig. 43)

1787. *Chaetodon guttatus* Bloch, *Ausland Fische*, 3 : 35.

1990. *Siganus guttatus*: Woodland, *Indo-Pacific Fishes*, No. 19 : 93, pl. 7C.

Diagnostic Features : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Fin spines are stout and pungent; cheek covered with scales; mid-line of thorax scaled; ventral ridge scaleless; caudal fin emarginated in juvenile and forked in adult. Body dusky blue above, silvery below with large round golden yellow spots on body except on thorax and belly; a bright yellow spot on back adjacent to last dorsal ray; head with vermiculated yellow lines; iris pale yellow.

Habitat : Found around reef slopes in shallow waters.

Distribution : Indo-West Pacific.

Remarks : The dorsal and anal spines are venomous; wounds from these spines are very painful.

105. *Siganus javus* (Linnaeus, 1766)
(Fig. 44)

1766. *Teuthis javus* Linnaeus, *Syst. nat.*, ed. 12, p. 507.

1990. *Siganus javus*: Woodland, *Indo-Pacific Fishes*, No. 19 : 67, pl. IV-c.

Diagnostic features : D. XIII, 10; A. VII, 9; P. 18; V. II, 3. Cheek and mid-line of thorax scaled; ventral ridge scaleless; dorsal fin spines slender; caudal fin emarginated. Body bluish-white above, light below with numerous blue spots on head, nape and upper half of body; ventral part of body with narrow irregular bluish-grey stripes form a reticulum; sides of head, dorsal and anal fins yellow; caudal fin dusky with a large black patch in the middle.

Habitat : Found in thick coral reef areas.

Distribution : Indo-West Pacific.

Remarks : The spines are venomous; wounds from these spines are very painful.

106. *Siganus labyrinthodes* (Bleeker, 1853)

1853. *Amphacanthus labyrinthodes* Bleeker, *Nat.Tijdschr. Neder. Indie*. 4 : 471.

1990. *Siganus labyrinthodes*: Woodland, *Indo-Pacific Fishes*, No. 19 : 104, pl. VIII C.

Diagnostic features : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Body deep and ovate; spines stout and pungent; caudal fin forked. Body pale yellow above, gradually become bronze yellow sides and below with light blue vermiculations; base of pectoral fin

with bronze crescent; dorsal fin yellowish; anal fin hyaline with light yellow tint, caudal fin yellowish, pectoral and ventral fins hyaline to silvery.

Habitat : Found near coral reefs and shallow brackish areas.

Distribution : Andaman Islands to Philippines.

Remarks : The venomous spines cause very painful wounds.

107. *Siganus puelloides* Woodland & Randall, 1979

1979. *Siganus puelloides* Woodland and Randall, *Copeia*, (3) : 391.

1990. *Siganus puelloides* : Woodland, *Indo-Pacific Fishes*, No. 19 : 66. pl. 4B, fig. 13.

Diagnostic features : D. XIII, 10; A. VII, 9; P.16-17; V. II, 3. Body slightly ovate and compressed; fin spines are pointed and stout; caudal fin forked. Body bluish above and silvery white below; sides of body with brownish yellow close-set spots, the spots are larger in size on dorsal side and gradually smaller towards ventral side; a dark brown patch surrounding the eye and few black spots above the orbit; dorsal fin spines and rays, anal fin rays, pectoral fin rays and caudal fin yellow; pelvic fins silvery.

Habitat : Found around rocky and coral reef areas.

Distribution : Maldives to Thailand.

Remarks : Fin spines are sharp, stout and venomous. Wounds caused by the spines are very painful.

108. *Siganus spinus* (Linnaeus, 1758)

(Fig. 45)

1758. *Sparus spinus* Linnaeus, *Syst. Nat.*, ed. 10, p. 281.

1990. *Siganus spinus*: Woodland, *Indo-Pacific Fishes*, No. 19 : 34, pl. II A.

Diagnostic features : D. XIII, 10; A. VII, 9; P. 17; V. II, 3. Cheek scales small and densely arranged; mid-line of thorax scaleless; caudal fin truncate. Body whitish with labyrinth of narrow brown bands on head and body; fins mottled with dark brown.

Habitat : Found on reef areas.

Distribution : Indo-West Pacific.

Remarks : The venomous spines cause very painful wounds.

109. *Siganus vermiculatus* (Valenciennes, 1835)

(Fig. 46)

1835. *Amphacanthus vermiculatus* Valenciennes, *Hist. nat. Poiss.*, p. 126.

1990. *Siganus vermiculatus* : Woodland, *Indo-Pacific Fishes*, No. 19 : 98, pl.VIII A.

Diagnostic feature : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Body compressed, cheek and thorax scaleless; caudal fin emarginated. Body bluish-white with irregular vermiculate pattern of dark brown bands on body except ventrally spotted with brown; head with narrow brown bands; caudal fin with small brown spots.

Habitat : Found on coral reef areas.

Distribution : Indo-West Pacific.

Remarks : The venomous spines cause very painful wounds.

110. *Siganus virgatus* (Valenciennes, 1838)
(Fig. 47)

1838. *Amphacanthus virgatus* Valenciennes, *Hist. nat. Poiss.*, p. 133.

1990. *Siganus virgatus*: Woodland, *Indo Pacific Fishes*, No. 19 : 86, pl. VII,A.

Diagnostic features : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Body ovate and compressed with narrow caudal peduncle; fin spines stout and pointed; caudal fin forked. Body brownish above, whitish below with two oblique blue edged brownish red bands, one from nape to chin and the other from mid base of spinous dorsal fin to base of pectoral fin; inter-orbital and snout with alternating blue and yellow lines; dorsal and anal fins hyaline with orange tint; caudal fin yellowish orange.

Habitat : Found around coral reefs in shallow waters.

Distribution : Indo-West Pacific.

Remarks : The venomous spines cause very painful wounds.

Order TETRAODONTIFORMES

Family TRIACANTHIDAE

111. *Triacanthus biaculeatus* (Bloch, 1786)

1786. *Balistes biaculeatus* Bloch, *Nat. Ausland Fische*, 2 : 19, pl. 148.

1980. *Triacanthus biaculeatus* : Jones and Kumaran, *Fishes of Laccadive Archipelago*, p. 660, fig. 562.

Diagnostic features : D.V+23; A.21; P.14; V. I. Body oblong and compressed; snout concave; second dorsal spine much smaller than half the length of first spine; narrow pelvis between ventrals; ventral of only one strong long spine; caudal peduncle depressed; caudal fin deeply forked. Body silvery-brown on snout and back, white below; membrane between first and second dorsal spines black; dorsal, anal and pectoral fins light yellow; caudal fin yellowish-orange.

Habitat : Found on reef areas.

Distribution : Indo-West Pacific.

Remarks : Strong dorsal and ventral spines are poisonous and cause severe wounds.

112. *Pseudotriacanthus strigilifer* (Cantor, 1850)
(Fig. 48)

1850. *Triacanthus strigilifer* Cantor, *J. Asiatic Soc. Bengal*, 18(2) : 1345.

1962. *Pseudotriacanthus strigilifer*: De Beaufort & Briggs, *Fishes of Indo-Australian Archipelago*, 11 : 276, fig. 73.

Diagnostic features : D. V+I, 22; A.17; P.13; V. I. Body compressed; snout elongate; first dorsal spine strong, longer than head length; ventral of only one strong long spine; caudal peduncle tapering to base of caudal; caudal fin forked. Body silvery brown above, lighter below; yellowish blotches on the dorso-lateral body; fins light yellow; edges of first and second dorsal spines and membrane dusky.

Habitat : Found around coral reefs in shallow water.

Distribution : Indo-West Pacific.

Remarks : Strong dorsal and ventral spines are poisonous and cause severe wounds.

Family MONACANTHIDAE

113. *Aluterus scriptus* (Osbeck, 1765)
(Fig. 49)

1765. *Balistes scriptus* Osbeck, *Iter. Chinensis*, 1 : 14.

1986. *Aluterus scriptus* : Hutchins, *In Smith & Heemstra, Smith's Sea Fishes*, p. 883, pl. 137.

Diagnostic features : D.II+45-46; A.48; P. 14. Body elongate and compressed; snout long; 1st dorsal spine originate over eye; ventral fins rudimentary; caudal fin long and rounded, the edge ragged. Body olive-brown with irregular blue spots, short lines and small black spots; dorsal and anal fins light yellow; caudal fin light blue.

Habitat : Found on reef areas.

Distribution : All Tropical and Sub-tropical Seas.

Remarks : Causes ciguatera poisoning.

114. *Cantherhines pardalis* (Ruppell, 1837)
(Fig. 50)

1837. *Monacanthus pardalis* Ruppell, *Neu. Wir. Fische, Rothen Meeres*, p. 57.

1986. *Cantherhines pardalis*: Hutchins, in Smith & Heemstra, *Smith's Sea Fishes*, p.884, pl.138.

Diagnostic Features : D. II+34-35; A. 30-31; P.13; V.I. Body covered with minute rough scale; dorsal profile of snout slightly concave; first dorsal spine origin over eye; no spine on caudal peduncle. Body greenish, light reticulations on sides producing a honeycomb pattern; faint narrow brownish lines on head; dorsal and anal fins are orangish-yellow.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

115. *Monacanthus nematophorus* (Gunther, 1870)
(Fig. 51)

1870. *Monacanthus nematophorus* Gunther, *Cat. Fish. Brit. Mus.*, 8 : 241.

1962. *Monacanthus nematophorus*; De Beaufort and Briggs, *Fishes of Indo-Australian Archipelago*, 11 : 326.

Diagnostic features : D. II+ 26; A.27; P. 11; V. I. Skin with long, fringed filaments, scattered over body and tail; profile of snout slightly concave; origin of first dorsal above hind-margin of eye; pectoral rounded; pelvic spine with strong spinules; caudal rounded. Body uniform brown, the filaments dark or light; caudal often with two or three transverse bands.

Habitat : Found on reef areas in shallow waters.

Distribution : Indian Ocean, from Andaman Is. to Borneo.

Remarks : Causes ciguatera poisoning.

Family TETRAODONTIDAE

116. *Arothron immaculatus* (Bloch & Schneider, 1801)

1801. *Tetrodon immaculatus* Bloch and Schneider, *Syst. Ichth.*, p. 507.

2000. *Arothron immaculatus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper No. 178* : 346, fig. 244.

Diagnostic features : D. 10; A. 9; P. 16. Body with small spines except lips and caudal peduncle; caudal fin rounded. Body dark brown above, lighter below; upper and lower edge and margin of caudal fin black; a black blotch at pectoral fin base.

Habitat : Found in shallow silt-sand areas near reefs.

Distribution : Indo-West Pacific.

Remarks : The viscera of the fish are highly poisonous. Produce violent poison known as 'tetrodotoxin'

117. *Arothron mappa* (Lesson, 1827)

1827. *Tetrodon mappa* Lesson, *Duperrey Voy. Zool.*, p. 102, pl. 5.

2000. *Arothron mappa*: Rao, *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper*, No. 178 : 347, fig. 245.

Diagnostic features : D. 11; A. 11; P. 19. Body robust and heavy; small bifid tentacles before eye; head and body covered with small, pointed spinules except for the region around mouth, base of fins and caudal peduncle; caudal peduncle slightly depressed. Body yellowish grey with highly irregular black bands may forming a reticulum; a large black blotch around gill opening and pectoral fin base; lower third of body white with faint yellow reticulations and small irregular black blotches below pectoral fin; irregular black lines radiating from eye; a black area around anus.

Habitat : Found on coral reefs in shallow areas.

Distribution : Indo-Pacific.

Remarks : The viscera of the fish are highly poisonous. Produce violent poison known as 'tetrodotoxin'

**118. *Arothron nigropunctatus* (Bloch & Schneider, 1801)
(Fig. 52)**

1801. *Tetrodon nigropunctatus* Bloch and Schneider, *Syst. Ichth.*, p. 507.

2000. *Arothron nigropunctatus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper*, No. 178 : 347, fig. 246.

Diagnostic features : D. 10; A. 10; P.18. Head and body covered with small spinules except middle of back, around mouth and sides of caudal peduncle; caudal fin slightly rounded. Body brownish above, paler below with widely scattered black spots of different sizes; snout and anus black.

Habitat : Found around coral reefs.

Distribution : Indo-West Pacific.

Remarks : The viscera of the fish are highly poisonous. Produce violent poison known as 'tetrodotoxin'

**119. *Arothron reticularis* (Bloch & Schneider, 1785)
(Fig. 53)**

1785. *Tetrodon testudineus* Bloch and Schneider, *Syst. Ichth.*, p. 502.

2000. *Arothron reticularis* : Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper*, No. 178 : 348.

Diagnostic features : D. 10; A. 10; P.16. Body stout; nostrils with two tentacles on each side; small spines covered the entire body except around mouth; dorsal and caudal fins rounded. Body brownish above, white below; back, sides, caudal peduncle and caudal fin with small white spots; belly with dark longitudinal bands and ascending to cheeks and snout.

Habitat : Found on coral reefs in sheltered areas.

Distribution : Indo-West Pacific.

Remarks : The viscera of the fish are highly poisonous. Produce violent poison known as 'tetrodotoxin'

120. *Arothron stellatus* (Bloch & Schneider, 1801)
(Fig. 54)

1801. *Tetrodon stellatus* Bloch and Schneider, *Syst. Nat.*, p. 503.

2000. *Arothron stellatus* : Rao, *et al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool.Surv. India Occ. Paper*, No. 178 : 348.

Diagnostic features : D. 11; A. 11; P. 17. Body robust; small spinules on head and body except on top of snout, base of fins and sides of caudal; caudal fin slightly rounded. Colour whitish with small black spots on head, body and median fins; abdomen with few broad irregular black bands.

Habitat : Found around coral reefs.

Distribution : Indo-Pacific.

Remarks: The viscera of the fish are highly poisonous. Produce violent poison known as 'tetrodotoxin'

121. *Arothron hispidus* (Linnaeus, 1758)

1758. *Tetraodon hispidus* Linnaeus, *Syst. Nat.*, ed. 10, p. 333.

1982. *Arothron hispidus*: Munro, *The Marine and Fresh Water Fishes of Ceylon*. p. 283.

Diagnostic features : D. 10; A. 10; P. 17. Body flabby and short; lateral line single; spinules on body except on caudal peduncle; dorsal and anal fins rounded; caudal fin truncate. Body brown above, lighter below with small bluish white spots on upper half of head and body and 4 -5 irregular dark bars on sides from snout to above anal; caudal fin brownish; other fins lighter.

Habitat : Found in murky waters near reefs.

Distribution : Indo-Pacific.

Remarks : The viscera of the fish are highly poisonous. Produce violent poison known as 'tetrodotoxin'

122. *Canthigaster bennetti* (Bleeker, 1854)

1854. *Tropidichthys bennetti* Bleeker, *Nat. Tijd. Ned. Indie*, 6 : 504.

2000. *Canthigaster bennetti*: Rao, *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper*, No. 178 : 349.

Diagnostic features : D. 10; A. 9; P. 15. Body small and compressed; nose sharp; caudal peduncle longer than deep; caudal fin slightly rounded. Body greenish brown above with numerous orange yellow spots and small blue spots and lines; lower side of body white with red and blue spots; several blue lines radiate from eye and behind mouth; a blue edged ocellus at the base of dorsal fin; a bluish band ventrally from chin to anus.

Habitat : Found on sandy bottom adjacent to coral reefs and protected areas.

Distribution : Indo-West Pacific.

Remarks : The viscera of the fish are highly poisonous.

123. *Canthigaster solandri* (Richardson, 1844)

1844. *Tetrodon solandri* Richardson, *Ichthyology*, p. 125, pl. 57.

2000. *Canthigaster solandri* : Rao, *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper*, No. 178 : 349.

Diagnostic features : D. 9; A. 9; P. 16. Caudal peduncle deeper than long; dorsal ridge well developed. Body orange brown, lighter on abdomen with numerous small dark edged pale blue spots on head, body and caudal fin; dark edged blue lines radiating from eye; a blue edged dark spot at base of dorsal fin; dorsal, anal and pectoral fins light yellow.

Habitat : Found around rich coral reef areas.

Distribution : Indo-Pacific.

Remarks : The viscera of the fish are highly poisonous.

124. *Chelonodon patoca* (Hamilton, 1822)
(Fig. 55)

1822. *Tetrodon patoca* Hamilton-Buchanan, *Fishes of Ganges*, p. 7, pl.18, fig.2

2000. *Chelonodon patoca*: Rao, *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper*, No. 178 : 350.

Diagnostic features : D. 10; A. 8; P. 16. Stout and small sized fishes. Body covered with small spinules on back, abdomen and throat; caudal fin rounded. Body brownish grey on back with large round to ovate white spots; ventral side of body white; a broad yellow streak on lower side; three narrow dark bars on back.

Habitat : Found in inshore reef areas and coastal waters.

Distribution : Indo-West Pacific.

Remarks : The viscera of the fish are highly poisonous.

125. *Tetrodon fluviatilis* (Ham.-Buch.,1822)

1822. *Tetrodon fluviatilis* Hamilton- Buchanan, *Fishes of Ganges*, p. 6.

1875-78. *Tetrodon fluviatilis* : Day, *The Fishes of India being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma and Ceylon*. p. 707. pl. 183, fig. 1.

Diagnostic features : D. 14-16; A. 12-13; P. 22. Body small and flabby; eyes rather large; spinules on body except on posterior part of body from vent; caudal fin truncated. Body greenish olive above, white on sides and below; back and sides with large black blotches; irregular light cross bands between eyes and on back; abdomen with black blotches and spots, much wider than interspaces; fins yellowish; edges of caudal fin dark.

Habitat : Found in murky waters of coastal and brackish areas.

Distribution : Indian Ocean.

Remarks : The viscera of the fish are highly poisonous.

126. *Lagocephalus guentheri* Ribeiro, 1915

1915. *Lagocephalus guentheri* Ribeiro, *Arch. Mus. Nac. Rio de Janeiro*, 17 : 5.

2000. *Lagocephalus guentheri*: Rao, et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India Occ. Paper No. 178* : 351.

Diagnostic features : D. 12-13; A. 13; P. 16-18. Body small and elongated; caudal peduncle compressed, caudal fin slightly forked. Body greenish black dorsally, sides silvery and belly whitish; dorsal fin dusky; anal fin white and caudal fin yellowish, its margin dark and the tip of lobes white; a pair of dark narrow bands across dorsum just behind eyes and another band half way to dorsal fin; a black blotch at caudal fin base.

Habitat : Found on sandy rubble bottom near reefs.

Distribution : Indian Ocean.

Remarks : Flesh and viscera is known to be poisonous.

127. *Lagocephalus lunaris* (Bloch & Schneider, 1801) (Fig. 56)

1801. *Tetrodon lunaris* Bloch & Schneider, *Syst. Ichth.*, p. 505.

1986. *Lagocephalus lunaris* : Smith & Heemstra, *Smith's Sea Fishes*. p. 901, pl. 144, fig. 268.22.

Diagnostic features : D. 11-13; A. 10-12; P. 18. Body slightly elongated, snout blunt, inter-orbital space flat; two lateral lines on body; spinules cover inter-orbital space to origin of dorsal; snout, sides of body and caudal peduncle smooth. Body yellowish green above, silvery below; dorsal, pectoral and upper half of caudal fin white.

Habitat : Found on sandy and rubble areas of the reefs in shallow waters.

Distribution : Indo-West Pacific.

Remarks : Flesh and viscera is known to be very poisonous.

128. *Lagocephalus scleratus* (Forster, 1788)

1788. *Tetrodon scleratus* Forster, In. Gmelin, *Linn. Syst. Nat.*, p.1444.

2000. *Lagocephalus scleratus*: Rao, et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 350.

Diagnostic features : D. 10; A. 8; P. 16. Body narrow and elongate; snout blunt, inter-orbital space flat; two lateral lines on body; small spinules on the body except around the mouth and caudal peduncle; caudal peduncle depressed, fin slightly forked. Body brownish green with dark spots; a brown ring around eye; a broad silvery band from mouth to middle of caudal peduncle; belly white; a silvery blotch before eye; pectoral base and inside of gill opening black.

Habitat : Found on sandy and coral rubble bottom.

Distribution : Indo-West Pacific.

Remarks : Flesh and viscera is known to be highly poisonous.

Family BALISTIDAE

129. *Abalistes stellatus* (Lacepede, 1798)

1798. *Balistes stellatus* Lacepede, *Allg. Lit. Zeitung.*, 3 : 682.

2000. *Abalistes stellatus*: Rao, et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 339.

Diagnostic features : D. III+26-27; A. 24-25; P. 15. Body relatively deep and compressed, eyes set high on the head; snout long and tapering, mouth small; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; caudal peduncle very narrow and long; caudal fin double emarginated. Body grey brown above, pale below with pale yellow spots on back and large spots ventrally; three whitish blotches on back.

Habitat : Found on silt bottoms near reefs.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

130. *Balistapus undulates* (Park, 1797)
(Fig. 57)

1797. *Balistes undulates* Mungo Park, *Trans. Linn. Soc. London*, 3 : 37.

2000. *Balistapus undulates*: Rao, et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 339.

Diagnostic features : D. III-24-26; A. 20-22; P.12-13. Body relatively deep and compressed; snout long and tapering, mouth small; no groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; two rows of strong forward-curved spines on caudal peduncle; caudal fin slightly rounded. Body dark green or brown with numerous diagonal curved orange lines on head and body; a black area around peduncular spines; caudal fin orange yellow.

Habitat : Found in coral reef caves and protected areas.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

131. *Balistoides viridescens* (Bloch & Schneider, 1801)
(Fig. 58)

1801. *Balistes viridescens* Bloch and Schneider, *Syst. Ichth.*, p. 477.

2000. *Balistoides viridescens*: Rao, et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 340.

Diagnostic features : D. III+25-26; A.22-24; P.15. Body relatively deep and compressed; snout long and tapering; a deep groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; five rows of strong forward-curved spines on caudal peduncle; second dorsal anal fins slightly elevated; caudal fin slightly rounded. Body yellowish and pale posteriorly; the centers of body scales dark brown; a broad black area with yellow spots extending from dorsal part of head to pectoral fin base; a black band from above mouth to cheeks; second dorsal, anal and caudal fins with broad black borders.

Habitat : Found on outer reef areas.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

132. *Canthidermis maculatus* (Bloch, 1786)
(Fig. 59)

1786. *Balistes maculatus* Bloch, *Nat. Ausland Fische*. 2 : 25.

2000. *Canthidermis maculatus*: Rao, et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper, No. 178* : 340, fig. 238.

Diagnostic features : D. III+24; A. 22; P. 14. Body relatively deep and compressed; snout long and tapering, mouth small; a deep groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; no spines on caudal peduncle; body scales with small spines; caudal fin slightly rounded. Body dark bluish brown with white spots; dorsal and anal fins with grey spots.

Habitat : Found on coral reef areas and in sheltered rocky areas.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

133. *Melichthys indicus* Randall & Klausewitz, 1973 (Fig. 60)

1973. *Melichthys indicus* Randall and Klausewitz, *Sneckenberg. Biol.*, **54** (1-3) : 64, fig. 4-6.

2000. *Melichthys indicus*: Rao et. al., An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper, No. 178* : 340-34s1.

Diagnostic features : D. III-30-32; A. 28-30; P. 15-16. Body relatively deep and compressed; snout long and tapering, mouth small; a deep groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; no spines on caudal peduncle; caudal fin slightly rounded. Body and fins are dark brownish black; base of dorsal and anal fins with white line; groove on cheek violet.

Habitat : Found adjacent to outer reef areas.

Distribution : Indian Ocean.

Remarks : Causes ciguatera poisoning.

134. *Odonus niger* (Ruppell, 1836)

1836. *Xenodon (Balistes) niger* Ruppell, *Fische des Rothen Meeres* : 53, pl.14.

1986. *Odonus niger*: Smith & Heemstra, *Smith's Sea Fishes*, p. 879, fig. 263.10.

Diagnostic features : D.III+34-36; A.28-30; P.15. Body deep and compressed; front of snout rounded, mouth small and upturned, the chin protruding; teeth are chisel-like, upper teeth visible when mouth is closed; a deep groove before eye; gill openings are a small slit in front of pectoral fin base; skin rough and tough; first dorsal spine very stout; seven rows of spines on posterior part of body; anterior part of second dorsal and anal fins are very elevated; caudal fin deeply lunate. Body and fins purplish blue, head greenish yellow, dark blue lines radiating from eye and corner

of mouth; margin of second dorsal and anal fins and posterior margin of caudal fin light blue; teeth red.

Habitat : Found on outer reef areas.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

135. *Pseudobalistes flavimarginatus* (Ruppell, 1828)

1828. *Balistes flavimarginatus* Ruppell, *Atlas Reise Nordl. Afrika*, p. 33

1980. *Pseudobalistes flavimarginatus*: Jones and Kumaran, *Fishes of Laccadive Archipelago*, p. 671, fig. 571.

Diagnostic features : D. III+ 25-27; A. 23-25; P. 15. Body relatively deep and compressed; mouth small; a deep groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; five rows of small spines on posterior part of body; caudal fin emarginated. Body light grayish yellow, scale centers dark; anterior and ventral part of head orange yellow; margin of second dorsal, anal and caudal fins orange yellow.

Habitat : Found in sheltered reef areas.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

136. *Pseudobalistes fuscus* (Bloch & Schneider, 1801) (Fig. 61)

1801. *Balistes fuscus* Bloch and Schneider, *Syst. Ichth.* p. 471.

1986. *Pseudobalistes fuscus*: Smith & Heemstra, *Smith's Sea Fishes*, p. 880, pl.137, 139.

Diagnostic features : D.III+ 26; A. 22; P. 14. Body compressed, mouth terminal; shallow horizontal grooves on lower cheek; caudal fin rounded in young, lobes produced in adults. Body yellowish brown covered with bluish grey spots and blotches; pectoral, soft dorsal, anal and caudal fins with pale margin.

Habitat : Found in reef and rocky areas in shallow waters.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

137. *Rhinecanthus aculeatus* (Linnaeus, 1758) (Fig. 62)

1758. *Balistes aculeatus* Linnaeus, *Syst. Nat.* ed. 10, p. 328.

2000. *Rhinecanthus aculeatus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 341, fig. 239.

Diagnostic features : Body relatively deep and compressed; dorsal and ventral profile of head nearly straight; snout long and tapering, mouth small; no deep groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; three rows of antrose spines on caudal peduncle; caudal fin rounded. Body white with a large blackish area on sides with four diagonal bluish white bands from mid-side to anal fin; four blue lines across Interorbital and three from eye to pectoral base; an orange yellow area around mouth; a yellow band continuing from mouth to below pectoral base; peduncular spines and anus black; all fins hyaline.

Habitat : Found on sandy, rocky and reef areas.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

138. *Rhinecanthus rectangulus* (Bloch & Schneider, 1801)
(Fig. 63)

1801. *Balistes rectangulus* Bloch and Schneider, *Syst. Ichth.* p.465.

2000. *Rhinecanthus rectangulus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 342, fig. 240.

Diagnostic features : D. III+ 23-25; A. 20-22; P. 13-14. Body relatively deep and compressed; dorsal and ventral profile of head nearly straight; snout long and tapering, mouth small; no deep groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; four rows of antrose spines on caudal peduncle; caudal fin rounded. Body orange brown above, head and belly bluish white; a broad diagonal black band from eye through pectoral base to anal fin base; four narrow blue bands with dark interspaces crossing interorbital; wedge shaped black area posteriorly on body covering caudal peduncle, its edge with golden yellow and preceded by a parallel golden yellow band.

Habitat : Found in shallow sheltered reef areas and inside crevices.

Distribution : Indo-Pacific.

Remarks : Causes ciguatera poisoning.

139. *Rhinecanthus verrucosus* (Linnaeus, 1758)

1758. *Balistes verrucosus* Linnaeus, *Syst. Nat.* ed. 10, p. 328.

2000. *Rhinecanthus verrucosus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 342.

Diagnostic features : Body relatively deep and compressed; dorsal and ventral profile of head nearly straight; snout long and tapering, mouth small; a groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; three rows of antrorse spines on caudal peduncle; caudal fin rounded. Body grayish brown dorsally, white ventrally with a large black patch on lower side of body above anus; a broad brownish band with four bluish lines across interorbital space, continuing with three bluish lines to pectoral base; a red line from mouth to lower pectoral fin rays.

Habitat : Found in shallow turbid areas of the reefs.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

140. *Sufflamen chrysopterus* (Bloch & Schneider, 1801)

1801. *Balistes chrysopterus* Bloch and Schneider, *Syst. Ichth.*, p. 466.

2000. *Sufflamen chrysopterus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 342.

Diagnostic features : D.III+26-28; A, 24-26; P. 13-14. Body relatively deep and compressed; dorsal and ventral profile of head nearly straight; snout long and tapering, mouth small; a groove before eye; gill openings are a small slit in front of pectoral fin base; teeth are chisel-like; skin rough and tough; first dorsal spine very stout; seven rows of small spines along scale rows on anterior part of body; caudal fin truncated. Body dark brown with greenish yellow streak from lower edge of eye to pectoral base; lower part of head and abdomen purplish; caudal fin yellowish brown, posterior border and margins with broad white.

Habitat : Found in sheltered reef areas and lagoons.

Distribution : Indo-West Pacific.

Remarks : Causes ciguatera poisoning.

Family OSTRACIIDAE

141. *Lactoria cornuta* (Linnaeus, 1758) (Fig. 64)

1758. *Ostracion cornutus* Linnaeus, *Syst. Nat.*, ed. 10, p. 331.

2000. *Lactoria cornuta*: Rao, *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 343, fig. 241, 242.

Diagnostic features : D. 9; A. 9; P. 10; C. 9-10. Head and body encased in a four ridged carapace formed by large hexagonal plates with a feeble spine on middle of

back; sides of body concave, ventral surface somewhat rounded; profile of snout almost vertical; lateral and pelvic ridges rounded; frontal spine horn like, long and slender directed forward; pelvic ridge terminating posteriorly in a backwardly directed spine. Body yellowish brown, with rounded bluish spots except on ventral side; all fins light yellow; caudal fin with small scattered bluish spots.

Habitat : Found in weedy areas near reefs.

Distribution : Indo-Pacific.

Remarks : Skin secretes a toxin called 'ostracitoxin' which is highly poisonous.

142. *Ostracion cubicus* Linnaeus, 1758
(Fig. 65)

1758. *Ostracion cubicus* Linnaeus, *Syst. Nat.*, ed. 10, p. 892.

2000. *Ostracion cubicus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 344, fig. 243.

Diagnostic features : D. 9; A. 9; P. 10; C. 8. Carapace quadrangular; dorsal mid line without ridge; snout not projecting; lateral and pelvic ridges rounded; caudal fin rounded. Body light brownish yellow with white spots edged in black; dark spots on caudal peduncle; all fins light yellow. Juveniles are dark yellow with black spots.

Habitat : Found on sheltered reef areas and lagoons.

Distribution : Indo-Pacific.

Remarks : Skin secretes a toxin called 'ostracitoxin' which is highly poisonous.

143. *Ostracion meleagris* Shaw, 1796
(Fig. 66)

1796. *Ostracion meleagris* Shaw, In Shaw and Nodder, *Nat. Misc.*, p. 7, pl. 253.

2000. *Ostracion meleagris* : Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 344.

Diagnostic features : D. 9; A. 9; P. 10; C. 10. Body ridges and back gently rounded; no horn-like spines; body four ridged, pelvic ridge more prominent. Body brownish black with numerous small white spots, the spots extending on to caudal fin; other fins pale.

Habitat : Found in shallow reef areas.

Distribution : Indo-Pacific.

Remarks : Skin secretes a toxin called 'ostracitoxin' which is highly poisonous.

144. *Tetrosomus gibbosus* (Linnaeus, 1758)

1758. *Ostracion gibbosus* Linnaeus, *Syst. Nat.*, ed. 10, p. 332.

1985. *Tetrosomus gibbosus*: Masuda *et. al.*, *The Fishes of the Japanese Archipelago*, p. 362, pl. 328-I

Diagnostic features : D. 9; A. 9-10; P. 10-11. Carapace triangular with sharp ridges; median dorsal ridge strongly elevated in middle of body ending in a strong large thorn-like spine, ventro-lateral ridges with 4-5 spines along the edge; the ridge above eye with small spine; caudal fin slightly rounded. Head and body greyish brown with pale blue spots.

Habitat : Found in weed areas adjacent to reefs.

Distribution : Indo-West Pacific.

Remarks : Skin secretes a toxin called 'ostracitoxin' which is highly poisonous.

Family DIODONTIDAE

145. *Diodon histrix* Linnaeus, 1758

1758. *Diodon histrix* Linnaeus, *Hist. Nat.*, ed. 10, 1: 335.

2000. *Diodon histrix*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 352.

Diagnostic features : D. 16; A.14; P. 23. Body flabby; eyes large; head and body with long pointed spines; no downward pointed spine below eye; no barbels on chin; teeth fused into dental plates; pectoral fins broad; caudal fin rounded. Body brownish dorsally with small black spots; fins yellowish with small black spots.

Habitat : Found on coral reefs in sheltered areas.

Distribution : Circumtropical.

Remarks : They inflict severe bites and venomous pointed body spines cause painful wounds.

146. *Diodon holocanthus* Linnaeus, 1758

(Fig. 67)

1758. *Diodon holocanthus* Linnaeus, *Syst. Nat.*, p.335.

2000. *Diodon holocanthus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper*, No. 178 : 352.

Diagnostic features : D. 14; A. 14; P. 23-24. Body flabby covered with long pointed spines except caudal peduncle; two small barbels on chin. Body light brown above, whitish below; dorsal side of body with small black spots; a large black blotch runs from above eye to cheek, broad band on occipital region of head and another band

on middle of the back; above each pectoral fin with brown blotch and one around dorsal fin base; fins without spots.

Habitat : Found on coral reef areas.

Distribution : Circumtropical.

Remarks : Inflict severe bites and the venomous pointed body spines cause painful wounds.

147. *Diodon liturosus* Shaw, 1804

(Fig. 68)

1804. *Dodon liturosus* Shaw, *General Zoology*, 2 : 436.

2000. *Diodon liturosus*: Rao *et. al.*, An account of Ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. Zool. Surv. India, Occ. Paper*, No. 178 : 352.

Diagnostic features : D. 14 -15; A. 15-16; P. 22-25. Head and body covered with long and pointed spines, except on caudal peduncle; a short downward pointed spine below front of eye; two small barbels on chin. Body light brown with small black spots on upper part; large white edged blotches across back and sides, one blotch above and passing ventrally from eye; fins yellowish.

Habitat : Found on coral reefs in shallow areas.

Distribution : Indo-West Pacific.

Remarks : They inflict severe bites and the venomous pointed body spines cause painful wounds; all spines are venomous.

ICHTHYOTOXISM- SYMPTOMS AND PREVENTION

Approximately 500 species of marine fishes are known to be venomous or may on consumption be poisonous to man and other organisms. Usually these toxic fishes are found in greater number around islands than along the continental shores. The term venomous is usually applied to those fishes which are having a definite venom apparatus capable of producing a poison, by secretory organs or glands and can deliver the toxin during stinging or a biting act, whereas the term poisonous fishes is defined as those fish which are either in part or their tissues are entirely toxic and cause biotoxication when ingested. In reality, all venomous fishes are poisonous but all poisonous fishes are not venomous. The term fish poisoning is synonymus with ichthyotoxism. Halstead (1964) has divided ichthyotoxic (Poisonous) fishes into three categories: a) Ichthyosarcotoxic fishes-those fishes which contain a toxin within their musculature, viscera or skin, which when consumed produce ill effects; b) Ichthyootoxic fishes-those fishes which produce a toxin that is generally confined to the gonads; and c) Ichthyohemotoxic fishes-those fishes which have toxin in their blood.

ICHTHYOSARCOTOXIC FISHES

Ichthyosarcotoxism is caused by the ingestion of fishes containing a poison within their flesh, viscera, skin or slime. This type of poisoning is generally denoted with the kind of fish involved like Ciguatera, Clupeoid, Elasmobranch, Tetraodon, etc.

CIGUATERA POISONING

Some fishes harbour one of the most serious and widespread forms of ichthyosarcotoxism known as ciguatoxic poisoning. A complex nerve poison known as 'Ciguatoxin' causes the intoxication. Large number of fishes is incriminated in ciguatera poisoning. Halstead (1967) listed more than 400 species of fishes that have been reported to produce ciguatera. Since many of the poisonous species are usually regarded as valuable food, ciguatoxic fishes become a serious threat to the tropical shore fishes. One of the interesting characteristics of the disease is its ecology, for the same group of species of fish varies in toxicity in both space and time. In many occasions important food fishes suddenly become poisonous within a short time and remain toxic for a short period to years to decades. This form of poisoning is associated with the food-chain relationship of the fish. Fishes become poisonous when they feed upon noxious material such as toxic algae, dinoflagellates, fungus, invertebrates and other fishes. Randall (1958) has studied the possible role of algae in the poisoning and concluded that blue-green alga is the most probable source of ciguatera toxin.

The common and immediate symptoms of the ciguatera poisoning are gastrointestinal disorders, diarrhea, nausea, and neurological and muscular weakness. Tingling of mouth, lips and tongue, itching of skin, visual disturbances, inversion of senses, profuse sweating, rapid pulse are common complaints. Sometimes patients become comatose and possibility of death due to respiratory failure is not uncommon. The severity of the attack depends upon the amount of toxin ingested. In many cases eating viscera (intestine, liver and gonads) cause more damage than eating flesh. Most of the fishes implicated in ciguatera poisoning are reef or shore species and a few are open-water species. These are either carnivorous or benthic algal feeders. Here is also a tendency for the large fish of species to be more toxic than the smaller fishes of the same species. One cannot detect a poisonous fish by seeing the fish and there are no simple chemical tests to detect the poison. The only reliable method involves the feeding samples of flesh, liver and intestine to cats or dogs and observing the animal for development of toxic symptoms. Generally eating liver and intestine should be avoided. Fishes usually large for their size like barracudas (*Sphyraena*), snappers (*Lutjanus*), groupers (*Epinephelus*), surgeonfishes, parrotfishes, wrasses, jacks (*Caranx*) should not be eaten during reproductive seasons.

ELASMOBRANCH FISH POISONING

Many of the tropical reef fish species contain most violent poisons. Elasmobranch fish poisoning is caused by consumption of liver and flesh of some sharks. *Carcharhinus melanopterus* Q & G, *Sphyrna zygaena* L. are reported to be poisonous. The severe form of poisoning usually results from eating the liver. The flesh in many cases is only mildly toxic with diarrhoea and gastrointestinal upset. Symptoms from the toxic shark liver usually consist of nausea, vomiting, abdominal pain, headache muscle cramps and respiratory distress, tingling about the mouth. Sometimes the patients may go into coma. Generally eating the shark liver should be avoided.

CLUPEOID FISH POISONING

Many clupeoid fishes cause a form of ichthyosarcotoxism by ingestion. Clupeotoxism occurs sporadically and is an unpredictable public health problem in many areas of the world. The viscera of these fishes are regarded as the most toxic part of fish. But there is no information available on nature and source of poison. The symptoms are distinct and usually violent. Severe gastrointestinal upsets accompanied by a drop in blood pressure, vascular collapse. Within a short period neurological disturbance like nervousness, numbness, muscular cramps, hypersalivation, paralysis may develop.

TETRODON FISH POISONING

It is one of the most violent forms of ichthyosarcotoxism found in certain puffers, porcupine fishes and sunfishes. These fishes are universally regarded as poisonous. More than 50 species of puffers are found to be involved in poisoning to man or toxic under certain conditions (Russell, 1965). The liver, gonads intestine and skin usually contain a powerful nerve poison known as tetrodotoxin, which may produce instant and violent death. The flesh is usually free of poison and edible. In Japan the puffers known as 'Fugu' are very highly esteemed, the specially trained and licensed chefs will prepare dishes. The tetrodotoxin poisoning is characterised by the rapid weakness, dizziness, numbness of lips and tongue. The poison acts as a nerve conduction inhibitor. During acute stage of poisoning sweating, hypersalivation, changes in oral temperature, rapid heartbeats are the prominent clinical symptoms. In the more serious cases convulsions, paralysis and respiratory failure are common.

ICHTHYOCRINOTOXIC FISHES

These fishes are another major category of toxic fishes. Ichthyocrinotoxic fishes release their poisons through their skin by means of specialized secretory organs.

These secretory organs are not associated with spines, teeth or any other mechanical devices to inject toxic substances into the victim. The toxic contents are directly secreted into the water. These toxic substances assist in the defensive mechanism of the fish as warning or repellent substances. When the trunkfish species of *Ostracion* are alarmed under stress secrete a foamy toxic substance from their mouth and the skin. These substances are toxic to other fish and said to be toxic when ingested by humans (Brown, 1945). The soapfish *Grammistes sexlineatus* produce a skin toxin known as 'grammistin' which makes them unpalatable to predators.

ICHTHYOHEMOTOXIC FISHES

Some eel fishes belong to the families of Muraenidae and Anguillidae possess ichthyohemotoxins or serum poisoning in their blood. Very little is known about the chemistry of the toxins. By drinking fresh and uncooked fish blood causes diarrhea, nausea, vomiting, skin eruptions, irregular pulse paralysis and respiratory distress.

VENOMOUS FISHES

Venomous fishes form a biological hazard to any one probing the fish environment. More than 200 species of marine fishes are including the sting rays, scorpionfishes, zebrafishes, stonefishes, stargazers, catfishes, surgeon fishes, etc. are known to be venomous. Many of them are shallow water reef or inshore fishes and majority of them are slow swimming and tend to live in a protected habitat in or around rocks. These fish inject venom into victim's body through stings or spines. The ability of the stingray to inflict wounds varies according to the structure of the caudal appendage and location of spine (fig. 69a, b). The sting of the ray is a bilaterally serrated dental spine located on the dorsum of the animal's tail. These sharp serrations are responsible for causing lacerating wounds as the sting is withdrawn from the victim's flesh. The spine is encased in an integument sheath. The ventro-lateral grooves contain venom-produced tissue. The sting wound cause sharp, spasmodic or throbbing pain. The general symptoms are fall in blood pressure, diarrhea, vomiting, sweating, muscular paralysis, rapid heart beat and occasionally cause death of the victim.

Almost all the scorpion fishes are extremely venomous. The zebra fishes (*Pterois* and *Dendrochirus*) possess long, slender and pointed and almost straight dorsal, anal and pelvic spines (fig. 70a). The ventro-lateral grooves originate just above the base of the spine and extend the entire length of the sting. The spine is enveloped in a thin layer of fibrous connecting tissue within the ventro-lateral grooves. Fusiform shaped venom glands, which may occupy the upper part of the spine. The venom gland does not have ducts through which the venom is secreted or discharged. Envenomation occurs through mechanical pressure on the spine. Detailed studies on

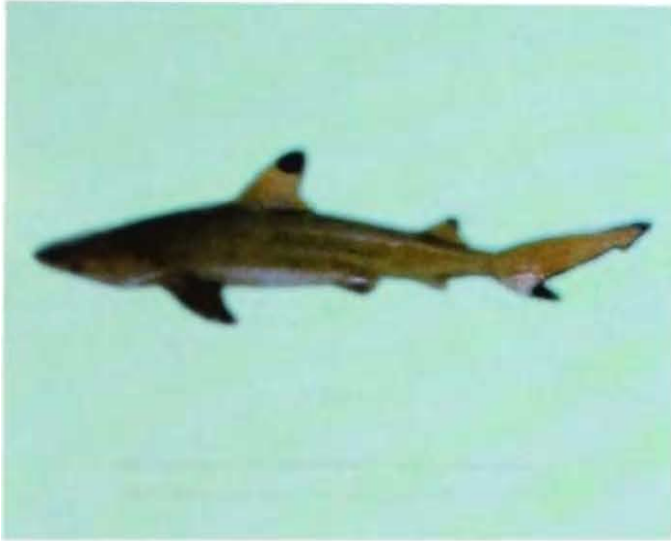


Fig. 1. *Carcharhinus melanopterus* (Quoy & Gaimard)

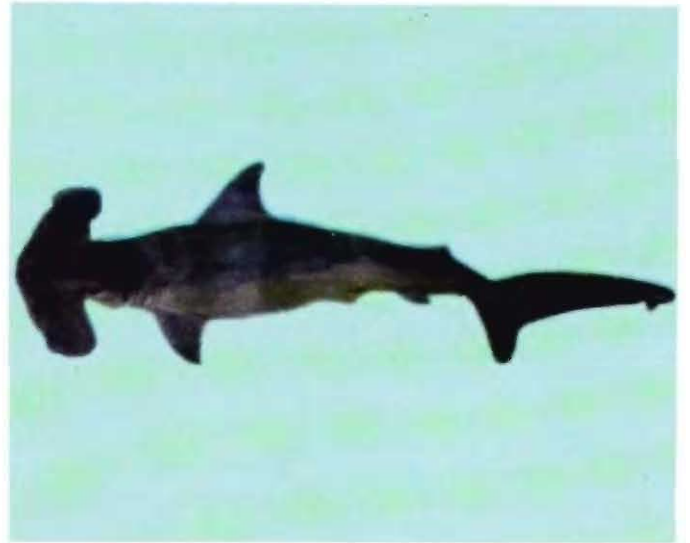


Fig. 2. *Sphyrna zygaena* Linnaeus



Fig. 3. *Dasyatis kuhlii* (Muller & Henle)



Fig. 4. *Dasyatis thetidis* Ogilby



Fig. 5. *Himantura uranak* (Forsskal)



Fig. 6. *Hypolophus sephen* (Forsskal)



Fig. 7. *Aetobatus narinari* (Euphrasen)



Fig. 8. *Echidna nebulosa* Ahl.



Fig. 9. *Gymnothorax javanicus* Bleeker



Fig. 10. *Plotosus lineatus* (Thunberg)



Fig. 11. *Sargocentron praslin* (Lacepede)



Fig. 12. *Sargocentron rubrum* (Forsskal)

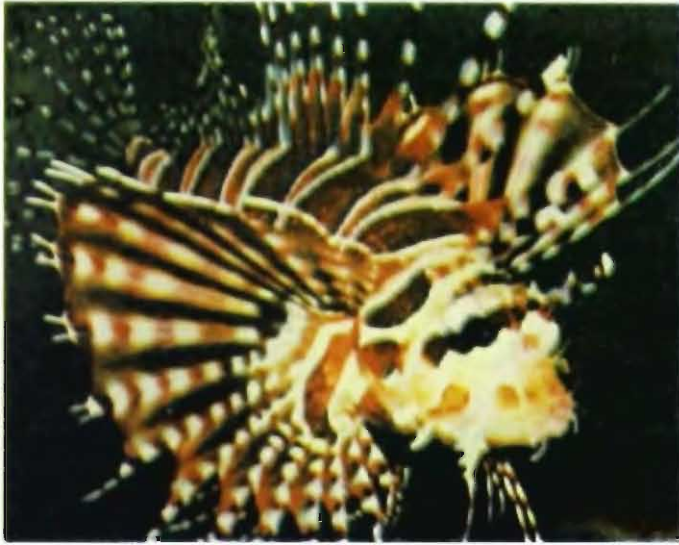


Fig. 13. *Dendrochirus zebra* (Cuvier)



Fig. 14. *Pterois antennata* (Bloch)



Fig. 15. *Pterois volitans* (Linnaeus)



Fig. 16. *Scorpaenoides guamensis* (Quoy & Gaimard)



Fig. 17. *Sebastapistes strongia* (Cuvier)

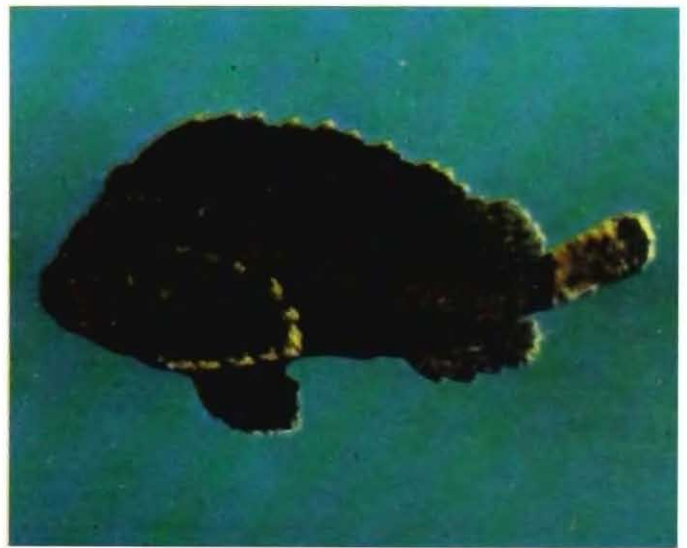


Fig. 18. *Tetraroge barbata* (Cuvier)



Fig. 19. *Polycaulus uranoscopus* Bloch & Schneider



Fig. 20. *Synanceia verrucosa* Bloch & Schneider



Fig. 21. *Cephalopholis argus* Schneider



Fig. 22. *Epinephelus merra* Bloch



Fig. 23. *Grammistes sexlineatus* (Thunberg)



Fig. 24. *Lutjanus gibbus* (Forsskal)



Fig. 25. *Scatophagus argus* Linnaeus

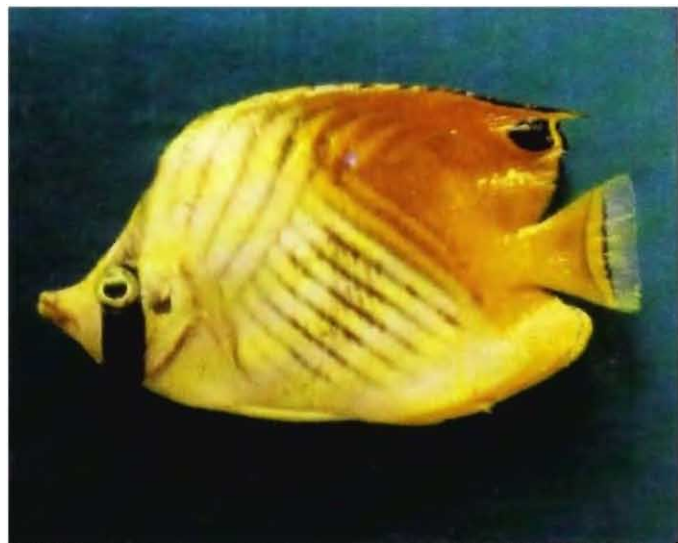


Fig. 26. *Chaetodon auriga* Forsskal



Fig. 27. *Chaetodon ephippium* Cuvier



Fig. 28. *Chaetodon triangulum* Cuvier



Fig. 29. *Chaetodon trifasciatus* Mungo Park



Fig. 30. *Pomacanthus annularis* (Bloch)



Fig. 31. *Pomacanthus imperator* (Bloch)



Fig. 32. *Pomacanthus semicirculatus* (Cuvier)



Fig. 33. *Pygoplites diacanthus* (Boddaert)



Fig. 34. *Sphyræna barracuda* (Walbaum)



Fig. 35. *Cheilinus fasciatus* (Bloch)



Fig. 36. *Epibulus insidiator* Pallas



Fig. 37. *Scarus ghobban* Forsskal



Fig. 38. *Acanthurus lineatus* Linnaeus



Fig. 39. *Acanthurus nigricauda* Dunker & Mohr



Fig. 40. *Acanthurus xanthopterus* Valenciennes



Fig. 41. *Ctenochaetus striatus* (Quoy and Gaimard)



Fig. 42. *Siganus canaliculatus* (Park)



Fig. 43. *Siganus guttatus* (Bloch)



Fig. 44. *Siganus javus* (Linnaeus)



Fig. 45. *Siganus spinus* (Linnaeus)



Fig. 46. *Siganus vermiculatus* (Valenciennes)



Fig. 47. *Siganus virgatus* (Valenciennes)



Fig. 48. *Pseudotriacanthus strigilifer* (Cantor)



Fig. 49. *Aluterus scriptus* (Osbeck)



Fig. 50. *Cantherhines pardalis* (Ruppell)



Fig. 51. *Monacanthus nematophorus* (Gunther)



Fig. 52. *Arothron nigropunctatus* (Bloch & Sch.)



Fig. 53. *Arothron reticularis* (Bloch & Schneider)



Fig. 54. *Arothron stellatus* (Bloch & Sch.)

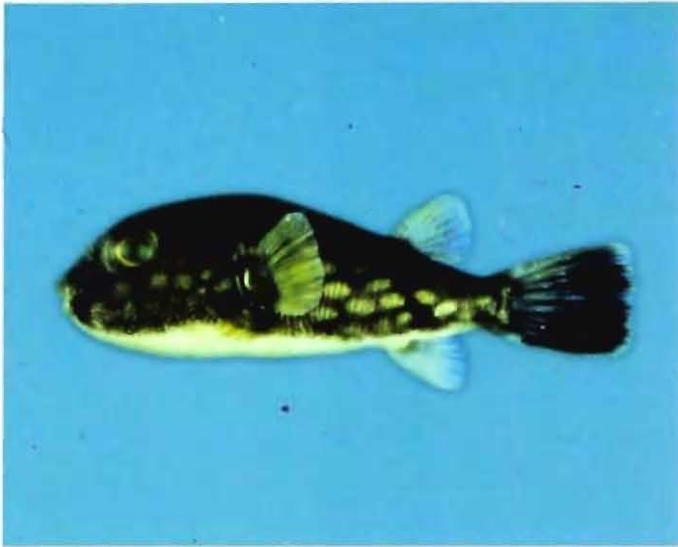


Fig. 55. *Chelonodon patoca* (Hamilton)



Fig. 56. *Lagocephalus lunaris* (Bloch & Schneider)



Fig. 57. *Balistapus undulates* (Park)



Fig. 58. *Balistoides viridescens* (Bloch & Schneider)



Fig. 59. *Canthidermis maculatus* (Bloch)

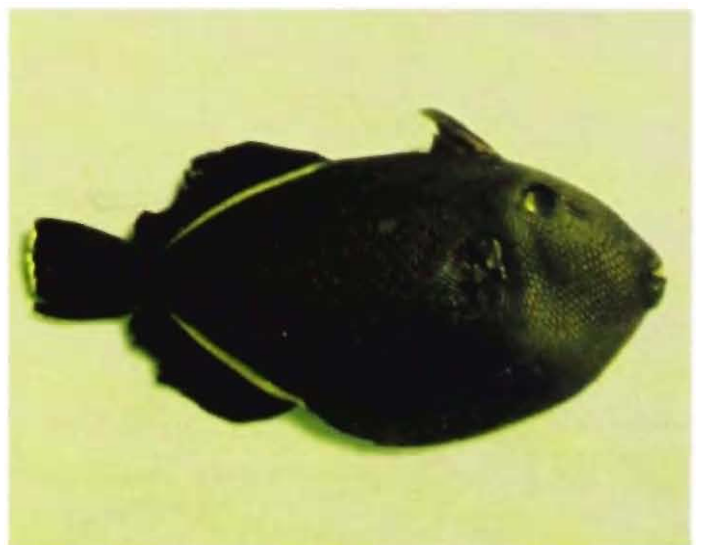


Fig. 60. *Melichthys indicus* Randall & Klauswitz



Fig. 61. *Pseudobalistes fuscus* (Bloch & Schneider)



Fig. 62. *Rhinecanthus aculeatus* (Linnaeus)



Fig. 63. *Rhinecanthus rectangularus* (Bloch & Sch.)



Fig. 64. *Lactoria cornuta* (Linnaeus)



Fig. 65. *Ostracion cubicus* Linnaeus



Fig. 66. *Ostracion meleagris* Shaw



Fig. 67. *Diodon holocanthus* Linnaeus



Fig. 68. *Diodon liturosus* Shaw

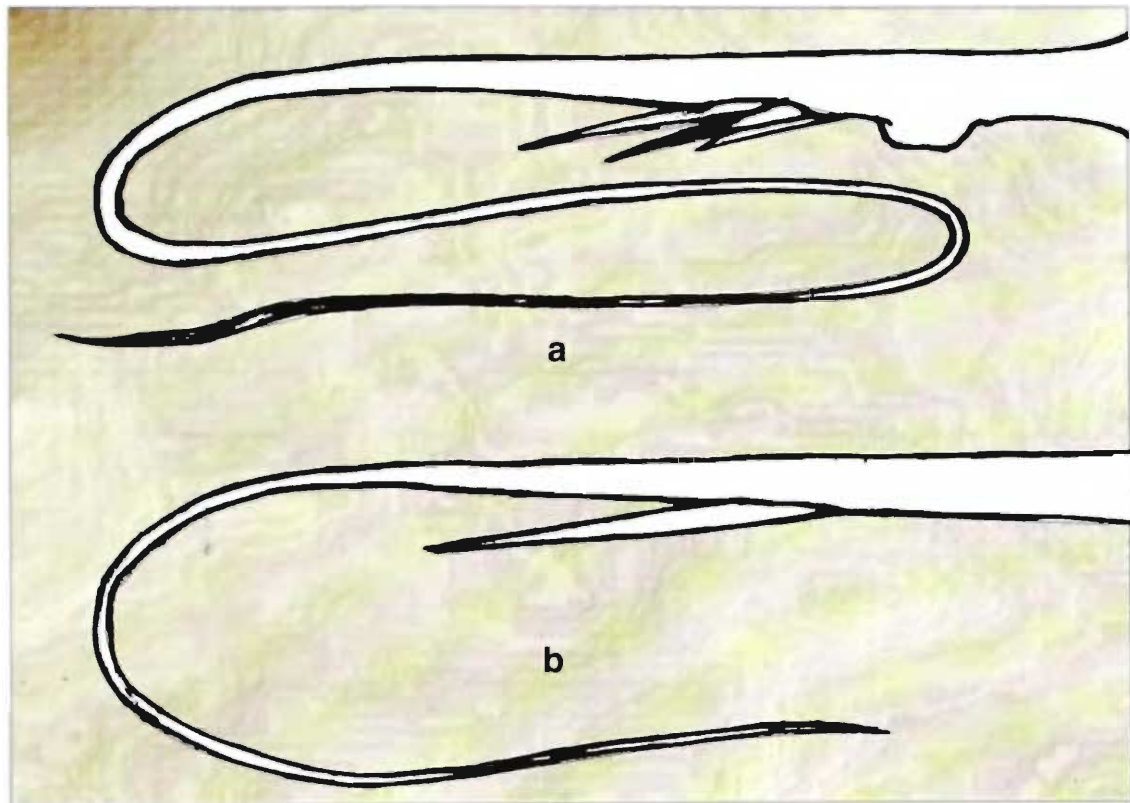


Fig. 69. Sting of ray (a) multiple stings of Myliobatidae (*Aetobatus narinari*)
(b) Dasyatidae (Halstead, 1992)

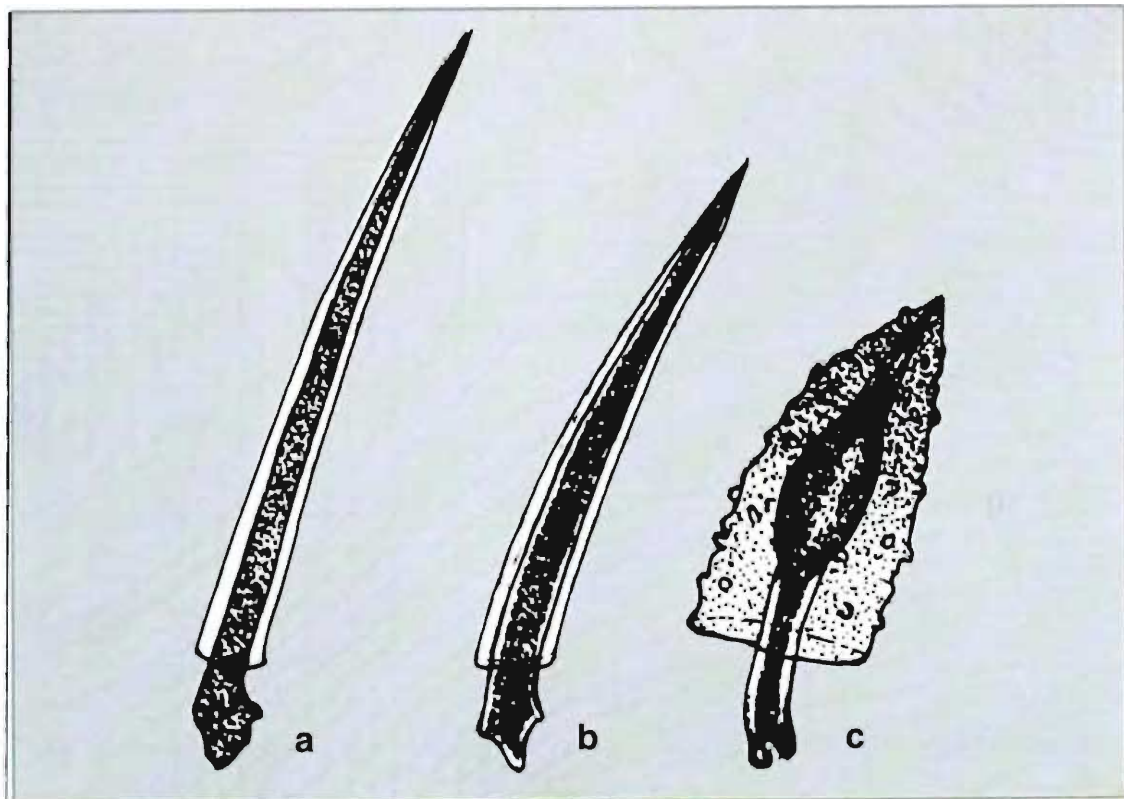


Fig. 70. Structure of the spine and venom organ (a) *Pterois*, (b) *Scorpaena*,
(c) *Synanceia* (Halstead, 1992)

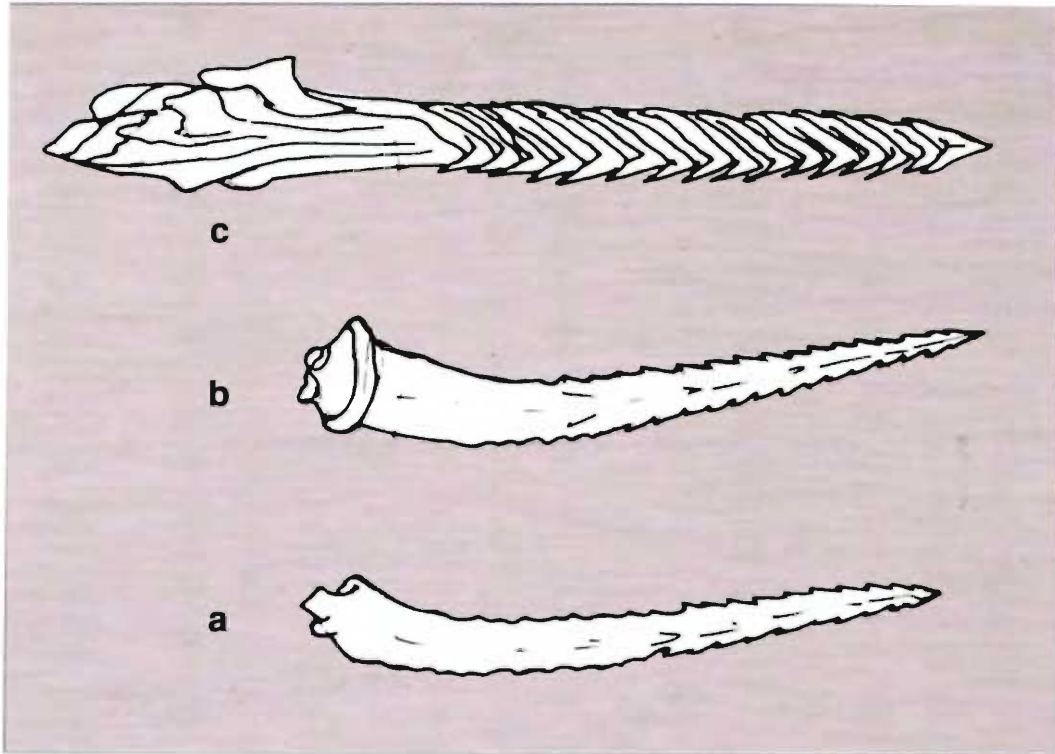


Fig. 71. Spines of a catfish (a) dorsal fin, (b) pectoral fin, (c) Dorsal spine of *Plotosus lineatus* showing retrose dentition (Halstead, 1992)

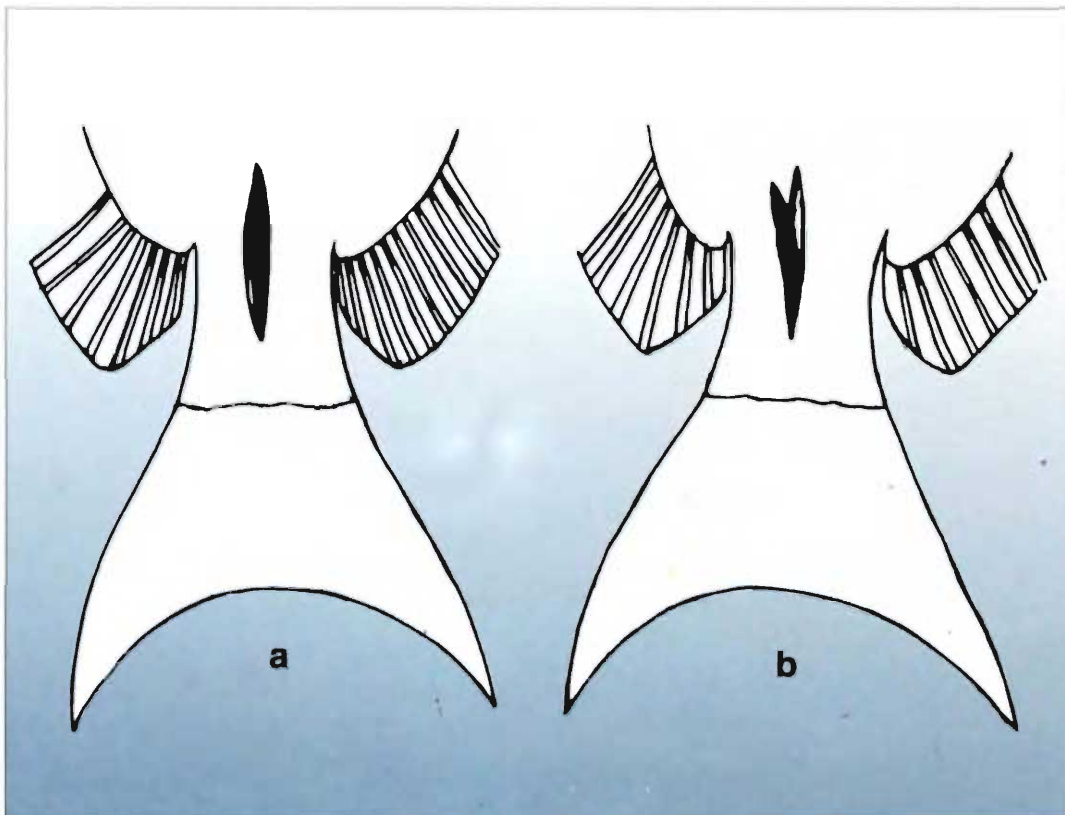


Fig. 72. Caudal spine of a surgeonfish *Acanthurus* (a) contracted position, (b) extended position

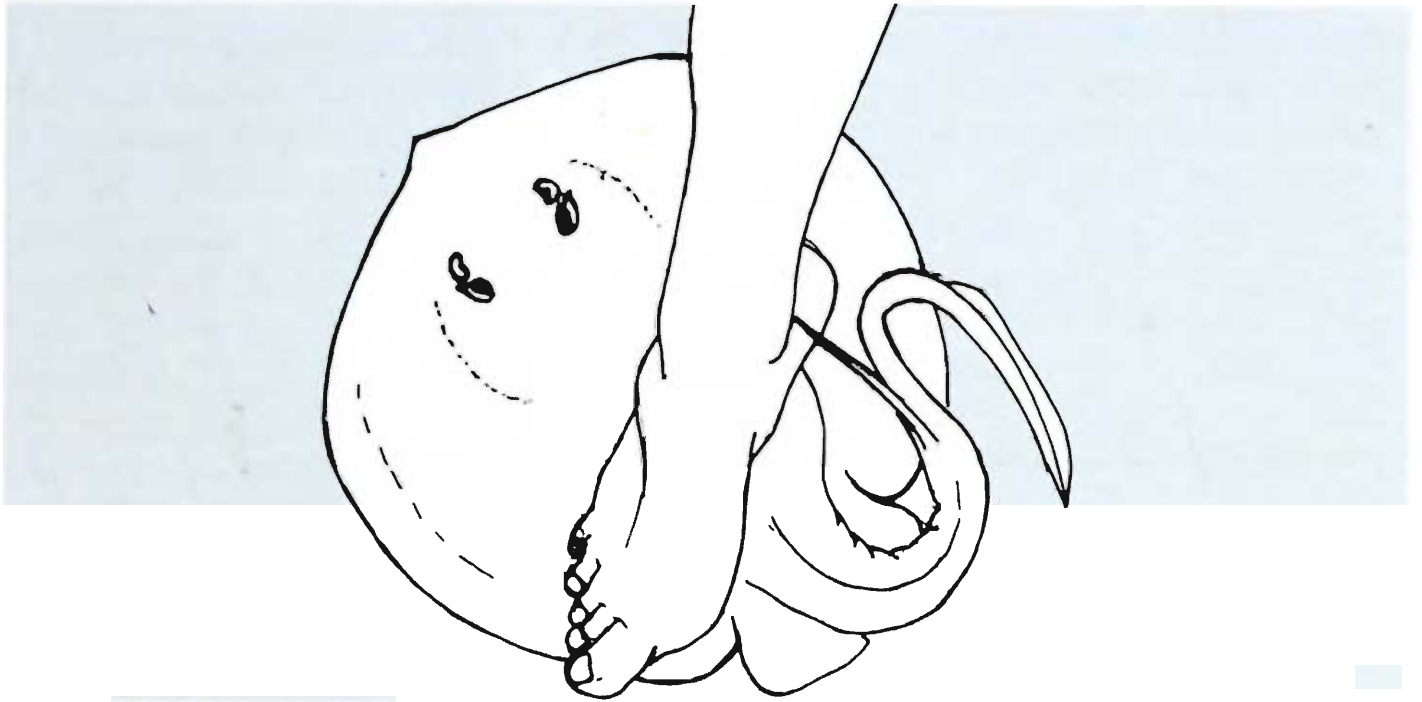


Fig. 73. How a stingray inflicts its sting (Halstead, 1992)



Fig. 74. How a catfish *Heteropneustes fossilis* inflicts spine wounds (Halstead, 1992)

the venom apparatus of the genera like *Apistus*, *Scorpaena*, *Scorpaenodes*, *Scorpaenopsis*, *Sebastapistes* were made by Pawlowsky (1927) and Halstead *et al* (1955b). The dorsal, anal and pelvic spines are shorter and heavier and the integumentary sheath of the spine is moderately thick, distal two-third of the spine groove contains glandular tissue produce venom (fig. 70 b). The stargazers belong to the genera *Polycaulus* are very small bottom dwelling fishes. Their fin spines are not poisonous but the two shoulder spines are associated with venom apparatus. The stonefishes belong to the genera *Ininicus* and *Synancea* are the most venomous fishes known. Detailed studies on the venom apparatus of the *Synancea* were made by Gail and Rageau (1956); Halstead *et al* (1956). The dorsal, anal and pelvic spines are venomous, covered by thick warty integumentary sheath (fig. 70 c). Two glandular grooves in each spine contain venom gland and their ducts. During the act of stinging the spines penetrate the flesh and the integumentary sheaths are compressed towards the base of spines. The pressure exerted on integumentary sheath and on venom glands forces the venom to be expelled through the venom ducts, which open at the distal tip of the spine. Wounds produced by stonefishes are extremely painful, may persist for a few days and in many cases fatalities have been reported all over the world. Necrosis of the tissue at the site of injury is common. In some cases area around the wound gradually becomes red, swells and may become numb; some times the limb paralyses. The other symptoms like cardiac failure, convulsions, swelling of lymph nodes, respiratory distress and even death reported in many cases. Symptoms caused by the stinging of different species of scorpion fishes are almost similar with vary in degree. The pain is immediate, intense, throbbing, shooting, and slowly spread from the affected part. The pain produced by many of the species is generally continuous for a few hours. Sometimes nausea, vomiting, weakness, conjunctivitis, headache, diarrhea and sweating may cause.

Most of the catfishes are found in fresh water but a few are marine species. The ability of catfishes to inflict severe wounds with their dorsal and pectoral spines is well known from many decades. Bottard (1889) first described the venom apparatus of the catfish *Plotosus lineatus*. The venomous catfishes have a sharp and stout dorsal and pectoral fin spines, some species with a series of sharp recurved teeth on the spines (fig. 71 a,b,c). A thin layer of integument envelops these spines. The venom cells are concentrated at the lateral margins of the sting. Some catfishes are also equipped with axillary glands; the outlet of these glands appears as a small orifice in the shoulder region behind the gill opening and above the pectoral fin. The envenomation from catfishes may cause as a result of handling the fish. When the sharp spines penetrate through the skin of the victim, absorption of the venom takes place by the flesh. During the process of inflicting the wounds the delicate integument sheath of the sting is damaged, the venom glands are exposed, and the toxic secretions of the venom gland enter into the flesh of the victim. The severity of the symptoms

varies with the amount of venom received. The pain is generally instantaneous stinging, throbbing sensation may be localized or affect the entire limb. In extreme cases there may be a massive edema of the limb and numbness. Sometimes faintness, nausea, rapid weak pulse low blood pressure and respiratory distress also noticed. Untreated wounds may leads to secondary bacterial infections.

The surgeon fishes belong to the genera *Acanthurus*, *Zebrasoma*, *Ctenochaetus* possesses movable sharp scalpel like spine on either side of caudal peduncle in a deep fusiform depression (fig. 72). The spine enveloped in an integument sheath and the spine depression lined with epithelium, which is believed to secrete mucus and venom. When the fish is disturbed, it swims rapidly and lashes out with tail and inflicts very painful lacerated wounds. The pain is immediate, intense and throbbing and gradually radiates to entire appendage and shortly followed by swelling. Sometimes feeling of nausea also reported (Randall, 1959).

The rabbit fishes belonging to the family Siganidae are usually valued food fishes. They possess very sharp, strong and venomous dorsal, anal, and pelvic spines. A narrow groove extends along both sides of the mid-line of the spine. These grooves are deep and contain the venom glands near the tips. Wounds from these spines are very painful but not as serious as the wounds caused by the Scorpion fishes.

PRECAUTIONS

It is well known fact that many fish species are poisonous and venomous but knowledge of the pharmacology and chemistry of these fish venoms are not well known. Moreover the basic chemical structure has however been determined for a single fish venom. The fish toxins are quite different in their pharmacological and chemical properties from the toxins of other venomous animals. Studies of the fish toxins are difficult because of their instability. The intensity of the toxicity of venoms may vary within the individual fish at different seasons of the year. Within the past couple of decades there has been an increased awareness on the part of fisheries experts, biologists and public health workers about the implications of fish toxins. Some of the pioneer works on the studies of fish poisons made by Gail and Rageau (1956), Saunders and Taylor (1959), Wiever (1959a), Austin *et al* (1961), Russell and Bohr (1962), and Saunders *et al.* (1962).

Aboriginal people used to differentiate poisonous from non-poisonous fishes on the basis of their colour, conditions of the gills, position of the scales and the staining affects of various organs on metals to detect the poisonous nature of the fish. The fish was often fed to a dog or a cat to check whether it is poisonous or not by many tribal communities around the world. If the animal does not show any symptoms of toxicity for a number of hours the fish was considered safe to eat. Many other testing

methods like "silver coin test", 'ant test', 'fly test' and the 'copper test' are also used. But none of these, however, are satisfactory methods. Field tests are being studied by several investigators (Banner *et. al.*, 1963 a, b and Halstead, 1964) at present time and hoped that more reliable testing method for fish toxins will be developed.

The symptoms and signs of fish poisoning is evident within four hours following ingestion of the fish. The common symptoms are nausea, numbness of mouth, tongue and throat, distal part of the fingers and toes, weakness, gastrointestinal disorders, vomiting, diarrhoea are the common complaints. Increased sweating, dizziness, headache, dilation of pupils may occur if the poisoning is severe. In fatal poisonings the above symptoms become progressively worsen and severe muscular weakness, neurological disturbances developed. As such there is no specific treatment for fish-poisoning prevention is always better. The viscera of the many tropical marine fishes including sharks should never be eaten; even the row of many fishes is potentially dangerous. Even the fishes that are normally considered to be safe mat at times be violently poisonous. One should be cautious while taking fishes that are usually large size especially barracudas and groupers should not be taken. Sometimes the fish can become toxic in a matter of hours so a fish that was safe yesterday may be poisonous today. Therefore, it is advisable to cut the fish into fillets and soak it in several changes either fresh or salt waters for at least 30 minutes. The only best suggestion for prevention is to check with the local people or local authority about the edibility of the fish.

The venomous fishes are more dangerous than the poisonous fishes. The stings, spines or skin of many fishes produce venom and induced in to the victim's body by inflecting wounds. The fishermen, divers and people who walk along the shore during low tides usually become the victims. The stingrays are one of the important groups of the venomous fishes. They are found lying on the bottom of the bays, lagoons, and river mouth or on sandy areas of the coral reefs. Therefore, they are hazard to any one who invades water inhabited by them and it is recommended that one should shuffle along the sand or mud in order to chase away the stingrays. It is also advisable that a stick be used to probe along the bottom to rid the rays. The stingray wounds occur most frequently around ankle and foot as a result of stepping on the rays (fig. 73). These wounds are either of the laceration or punctured type. Withdrawal of the sting from the wound may result in tissue damage due to backwardly directed serrations of the spine. Treatment should be promptly given to reduce the pain, effect of the venom and secondary infection. The wounds should be washed immediately with cold saltwater. Pieces of integumentary sheath must be removed and the wound area should be soaked in tolerable hot water for a period of 30-60 minutes. Magnesiumsulphate can also be added to the water as it has a mild anesthetic property. After soaking, the wound should be cleaned and if necessary

close with dermal sutures. The use of anti tetanus and antibiotic agents is recommended.

The dorsal and pectoral spines of catfishes are sharp and poisonous inflicting severe wounds on the victims skin (fig. 74). The wounds generally incurred as a result of handling of the fish such as removing the fish from net or taking a hook out of its mouth. The treatment for envenomation is similar to that of stingray wounds. Improperly treated wounds frequently resulting secondary bacterial infection. Some species of catfishes may produce wounds that may take week to heal. Avoiding contact with spines of the fish may prevent catfish stinging. When handling a catfish one should grasp the animal firmly with one hand immediately behind the dorsal and pectoral fins. Usually catfish envenomation is not a major public health problem.

The fin spines of zebra fish (*Pterois*), scorpion fish (*Scorpaena*) and stonefish (*Synancea*) are extremely venomous. Most of the wounds by these fishes are due to careless handling of the fish in removing them from a net or a hook. Stonefish wounds are usually caused by stepping on the fish that is partially buried in the sand or coral rubbles. The wounds should be thoroughly clean to remove as much of the venom as possible. A little bleeding should be encouraged. The effected part should be soaked in hot water for about 30-60 minutes; addition of Magnesiumsulphate to the water is desirable. The treatment should be directed toward maintaining cardio-vascular tone and preventing any secondary infections. As the stonefish poisoning is severe immediate intensive care is required. Stonefish anti-venom should be administered immediately. Special anti-venom has been developed by the Common Wealth Serum Laboratories in Melbourne, Australia for the treatment of stonefish stings. The scorpion fish envenomations are not considered to be a public health problem, but around the reef areas where these fish are found abundant may constitute a public menace. The divers should not be tempted to grab beautiful and slow swimming zebra fishes. Placing one's hands in crevices or holes inhabited by these fishes must be done with caution. The fin spines of siganids, scatophagids, opercular spine of pomacanthids and caudal peduncular spine of acanthurids are venomous and cause puncture type wounds and lacerations. These wounds should be thoroughly washed and antibiotics are to be administered. Care should be taken while handling these fishes to avoid stinging.

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