

A field guide to the fishes of
ACANTHURIDAE AND SIGANIDAE
(Surgeonfishes & Rabbitfishes)
of Andaman & Nicobar Islands



KAMLA DEVI
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Zoological Survey of India

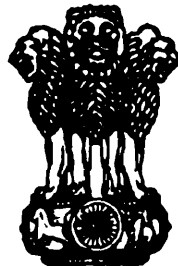
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Edited by the Director, Zoological Survey of India, Kolkata



सत्यमेव जयते

**Zoological Survey of India
Kolkata**

CITATION

Kamla Devi and Rao, D. V. 2003. A Field Guide to the Fishes of Acanthuridae (Surgeonfishes) and Siganidae (Rabbitfishes) of Andaman & Nicobar Islands : 1–42 (Published by the Director, *Zool. Surv. India*, Kolkata)

Published : September, 2003

ISBN 81-8171-017-7

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PRICE

India : Rs. 200.00

Foreign \$ 12; £ 10

Published at the Publication Division by the Director, Zoological Survey of India, 234/4, A. J. C. Bose Road, 2nd MSO Building, 13th Floor, Nizam Palace, Kolkata - 700 020 and printed at Calcutta Repro Graphics, Kolkata - 700 006

PREFACE

The diversity of the ichthyofauna occurring in the varied marine habitats, such as mangroves, creeks, rocky, sandy beaches, muddy shores, coral reefs etc. of Andaman and Nicobar Islands is very fascinating. Fishes like carangids, snappers, groupers, sharks, silverbellies, barracudas, acanthurids, siganids, mugilids etc. are the most important commercial groups. Due to increasing demand for the fish, the siganids and acanthurids are now also becoming an important component in the fish catches, as they are found abundant around the reef and mangrove areas of the islands.

The present field guide on Acanthurids and Siganids of A & N Islands is intended to give basic information on the species of these families along with distinguishing characters and illustrations to aid in easy identification in the field. It is hoped that this field guide will serve as an important tool for the taxonomists and amateurs.

Kamla Devi
D. V. Rao

ACKNOWLEDGEMENTS

The authors wish to thank Dr. J. R. B. Alfred, Director, Zoological Survey of India, Kolkata and Dr. D. R. K. Sastry, Officer-in-charge, Andaman and Nicobar Regional Station, Zoological Survey of India, Port Blair for facilities and encouragement for execution of this project. The assistance rendered by Shri A. Polycap, Collection Tender in the field and laboratory is gratefully acknowledged.

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INTRODUCTION

Fish constitutes one of the largest and important marine living resources of Andaman & Nicobar Islands with a large scope for sustainable commercial exploitation of fisheries in the islands. More than 1200 species of fishes have been reported from the different habitats of these islands (Talwar, 1990; Kamla Devi, 1991; Dorairaj et al, 1994; Rao et al, 2000). The commercial fish catches of these islands, usually constitute sharks, groupers, snappers, sciaenids, silverbellies, anchovies, culpeids, barracuds, mackerels, tunas, pomfrets, mullets, letherinids etc. In addition several other groups like atherinids, mullids, nemipterids, haemulids, labrids, acanthurids, siganids, etc. are also contributing to the fisheries. Most of the species of surgeonfishes (Acanthuridae) like *Acanthurus triostegus*, *A. xanthopterus*, *A. lineatus*, *Naso sp.* and rabbitfishes (Siganidae) like *Siganus vermiculatus*, *S. virgatus*, *S. argenteus*, *S. guttatus*, *S. fuscescens*, *S. spinus* are found in large numbers throughout the year in the fish catches. Species like *S. maculatus*, *S. argenteus*, *S. guttatus* and *S. fuscescens* are ideal for mariculture in these islands and detailed studies on their biology and ecology along with their mariculture potential are needed for sustainable utilization. Lack of relevant information on systematics and field biology of acanthurids and siganids and their commercial as well as aquacultural potential, prompted and authors to prepare a field guide on the families Acanthuridae and Siganids of these islands. For the use of common man as well as taxonomists, a systematic account with key to the species, diagnostic characters and their biology and ecology in brief is presented. Colour photographs for all the species are incorporated to facilitate their easy identification in the field.

Family ACANTHURIDAE Surgeon Fishes

Surgeonfish or tangs are one of the most common marine fishes found around coral reefs and weedy areas in small aggregations. About 81 species comprising 7 genera-*Acanthurus*, *ctenochaetus*, *Naso*, *Acnurus*, *Prionurus* *Paracanthurus* and *Zebrasoma* have so far been recorded from the worldwaters. The largest genus is *Acanthurus* representing 39 species, while the genus *Naso* with 16 species, *Ctenochaetus* with 9 species,

Zebrasoma with 8 species, *Prionurus* with 7 species and the two monotypic genera *Acronurus* and *Paracanthurus*. The systematic studies around the waters of Andaman and Nicobar Islands revealed the presence of 21 species belonging to the genera *Acanthurus*, *Paracanthurus*, *Naso*, *Ctenochaetus*, and *Zebrasoma*. Even though the species representation is poor; their abundance is very high around reef areas.

The fishes of this family are usually deep bodied and compressed with the eye high on head, a terminal mouth and a long singular unnotched dorsal fin. Mouth with a single row of close set numerous comb-like teeth. They are easily recognised by the presence of a sharp scalpel-like spine on either side of the caudal peduncle folds into a horizontal groove which is used by the fish for defensive purpose. They are able to slash other fish or inflict severe painful wounds to the swimmer with their sharp caudal spine by way of rapid movement of tail.

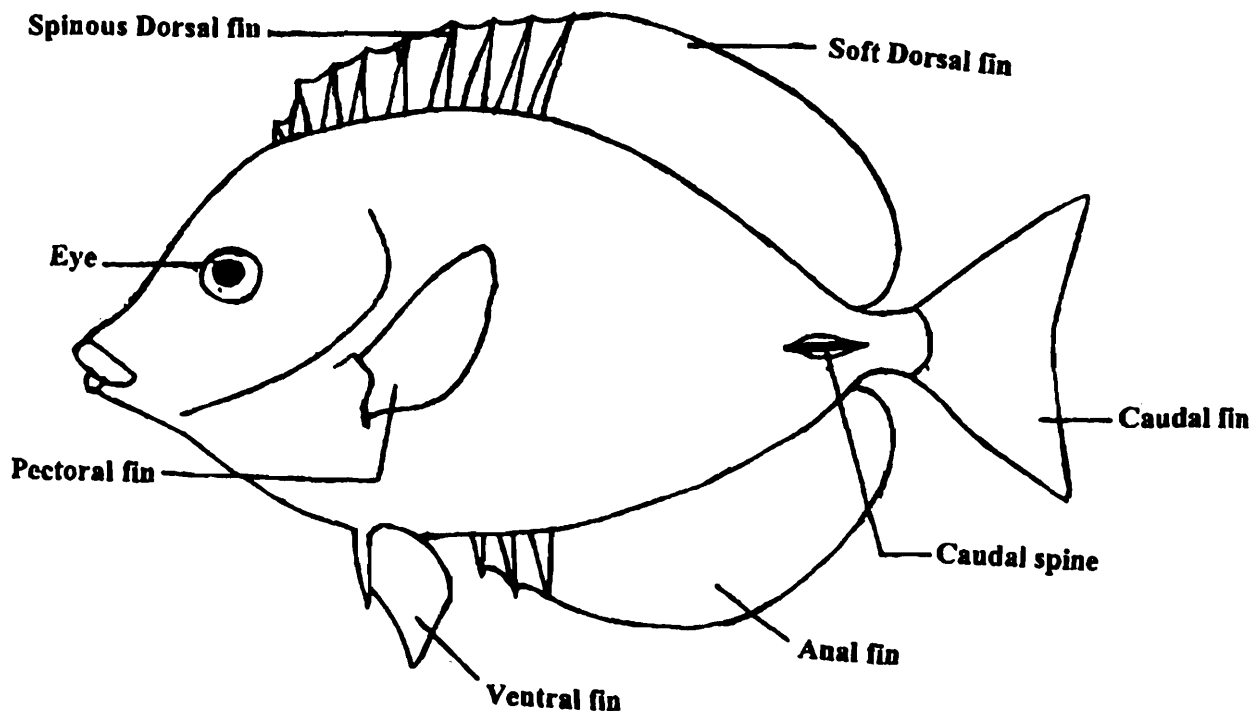


Fig. 1. External features of Acanthurid fish

Some of the species like *Acanthurus leucosternon*, *Acanthurus lineatus*, *Acanthurus triostegus*, *Acanthurus pyroferus*, *Zebrasoma veliferum*, *Paracanthurus hepatus*, *Naso lituratus* are the most colourful fishes found on coral reefs and the adults and juveniles are highly prized as aquarium fishes. The species of *Naso* popularly known as unicornfishes because of

the bony extension that protrudes from the snout and forehead of some species. This structure is well developed in the adults of *Naso brevirostris* and *Naso unicornis*. Because of the presence of well-developed sail-like dorsal fin, the species of the genus *Zebrasoma* are known as sailfintangs. This sail is especially prominent in *Zebrasoma veliferum*.

FIELD BIOLOGY

Many species of surgeonfish inhabit shallow tropical marine waters but a few species are found at depths below 80 meters. All are herbivorous, feed on zooplankton and algae. *Paracanthurus hepatus* and many species of *Acanthurus* feed on zooplankton while species like *Acanthurus triostegus*, *Zebrasoma veliferum*, *Zebrasoma scopas* and species of *Naso* graze on benthic algae. The species of *Ctenochaetus* are detritus feeders. *Naso brevirostris* and *Naso unicornis* feed on benthic algae when young, shifting to zooplankton at adult stage. It is attributed that the change in food habits may be associated with the development of the long horn that impedes grazing on algae. Usually they are active during day, found constantly grazing and take rest at night in small crevices and caves of the reefs. Many species of surgeonfish are often used as a food for human consumption but several species are implicated in ciguatera poisoning. It is suspected that their algal diet is responsible for the poisoning.

REPRODUCTIVE BIOLOGY

Usually spawning is accomplished in schools in late afternoon and early evening. They congregate at twilight, move around continuously, and often a few members of the group break away from the school and swim up in the water to a short distance where they release their eggs and sperm. They produce pelagic eggs approximately 0.8 mm in diameter, each with a tiny drop of oil in it to provide floatation. Hatching time depends on the temperature but is usually just over day. Newly hatched larvae are diamond-shaped and laterally compressed, with a triangular head, blunt mouth, large eyes and prominent pectoral fins. At less than 2mm total length, the dorsal and anal fins are not well developed and the caudal fin appears only as a small flap of skin that merges with the body; between 2 to 6 mm. long even dorsal and anal fins, a distinct caudal fin, pelvic spines and scales develop. The caudal spine appears at about

13mm. The late post-larvae drift to sheltered inshore areas where they undergo a prolonged and pronounced metamorphosis. These metamorphosing individuals are known as "acronurus", lose the silver juvenile coloration and turn brown, their profile rounds markedly, the scalpel enlarges, and the dorsal and anal spines typical of the larvae are markedly reduced. Complete metamorphosis takes about a week and result in juvenile surgeonfish approximately 2 inches long. Growth of newly formed surgeonfish is rapid and sexual maturity is probably reached within 9 months to a year. Spawning, however, probably does not occur until the following season.

AQUARIUM BIOLOGY

Several surgeonfishes can be kept in aquaria but small fishes do well. Usually they can be fed large amounts in several times daily. The juveniles grow rapidly and feed constantly. The combination of these two traits in a single fish results in almost instant starvation if the fish are not fed regularly. Young surgeons are the worst in this respect; even with the proper care, they usually starve to death within a few days of capture. In general, the smaller the surgeonfish the faster it will starve. Small surgeonfish also have tendency to become bullies, especially after they have been established in an aquarium for some time. They threaten other fish of the tank with their scalpel-like spine present on the caudal region. *Paracanthurus hepatus* and *Acanthurus lineatus* are quite attractive for aquarium due to their beautiful colour but, unfortunately, if they do not receive the proper diet they lose their colour and remain much of the time at the bottom of the aquarium.

Key to species of family ACANTHURIDAE

- 1a. Dorsal fin spines 4-5. 2
- 1b. Dorsal fin spines 6-9. 8
- 2a. Dorsal and anal fins elevated; pelvic rays I, 5; snout strongly produced; no bony horn anterior to eye 3 (Genus *Zebrasoma*)
- 2b. Dorsal and anal fins not elevated; pelvic rays I, 3; snout not produced; strong bony horn anterior to eye or a prominent convexity on forehead 4 (Genus *Naso*)

- 3a. Dorsal and anal fins conspicuously elevated; body with alternating broad dark brown and narrow white bars *Z. veliferum*
- 3b. Dorsal and anal fins not much elevated; body dark yellowish-brown with longitudinal narrow blue lines and spots on nape, head and chest *Z. scopas*
- 4a. Forehead without any horn or protuberance; peduncular plates and keels bright orange *N. lituratus*
- 4b. Forehead with or without protuberance or horn; colour of peduncular plates not as in 4a 5
- 5a. Forehead with tapering horn 6
- 5b. Forehead without any horn-like structure 7
- 6a. Horn extending more than half a head length in front of mouth; caudal fin truncate or slightly rounded, without filamentous lobes; caudal peduncular plates and spines not blue *N. brevirostris*
- 6b. Horn extending up to the level of eye but not up to front of mouth; caudal fin truncate with filamentous lobes; peduncular plates and spines blue *N. unicornis*
- 7a. Adults with a prominent convexity on forehead at level of lower edge of eye; caudal fin of adults with a long filament at each corner; dorsal fin elevated; body brown with vertical blue lines *N. vlamingii*
- 7b. Dorsal and ventral profiles of head equally convex; caudal fin corners without filaments; body bluish grey dorsally, shading ventrally to yellowish; tongue black *N. hexacanthus*
- 8a. Pelvic rays I, 3; anal 18-19; body bright blue with a large black area on upper part of body *Paracanthurus hepatus*
- 8b. Pelvic rays I, 5; anal rays 20 or above; body colour not as 8a 9
- 9a. Dorsal fin spines usually 8; teeth in jaws flexible, slender with incurved tips 10 (Genus *Ctenochaetus*)
- 9b. Dorsal fin spines usually 9; teeth in jaws fixed, spatulate with denticulate edges 11 (Genus *Acanthurus*)
- 10a. Caudal fin lunate; body, dorsal and anal fins with longitudinal blue lines *Ctenochaetus striatus*

- 10b. Caudal fin emarginate; only body with longitudinal blue lines
 *Ctenochaetus strigosus*
- 11a. Body pale with vertical black bars; caudal truncate or slightly
 emarginated; caudal spine small..... *A. triostegus*
- 11b. Body not pale and no black bars; caudal fin emarginated or lunate;
 caudal spine not very small..... 12
- 12a. Caudal fin emarginated; body bright blue, chest crossed by a broad
 white band; head black; caudal fin black and white
 *A. leucosternon*
- 12b. Caudal fin strongly lunate; body colour not as in 12a 13
- 13a. Dorsal profile of head convex; body uniformly dark brown ... 14
- 13b. Dorsal profile of head slightly convex or not; body with irregular
 or straight lines or bands 15
- 14a. Caudal fin white; body without any bands *A. thompsoni*
- 14b. Caudal fin brown with white bar across base; a black band at
 upper end of gill opening *A. nigricauda*
- 15a. Body with blue or brownish irregular longitudinal lines 16
- 15b. Body with blue stripes edged in black alternating with yellow
 stripes *A. lineatus*
- 16a. Ground colour of body grey or brown; sheath of caudal spine
 often dark 19
- 16b. Ground colour of body yellowish-brown; sheath of caudal spine
 white 17
- 17a. Body with irregular longitudinal blue lines *A. dussumieri*
- 17b. Body with slightly wavy or irregular lines 18
- 18a. Body dark brown with longitudinal blue lines on head and body
 *A. mata*
- 18b. Body purplish grey or light blue grey with highly irregular dark
 grey lines *A. xanthopterus*
- 19a. Head and thorax with orange spots, dark spot at rear base of
 dorsal and anal fins *A. nigrofuscus*
- 19b. No spots on head and thorax and at dorsal and anal fin bases
 20

20a. Caudal fin with broad posterior yellow border; a large vertically elongate orange spot above pectoral fin base *A. pyroferus*

20b. Posterior caudal fin with large crescentic white area; a horizontal orange band edged in blue at upper end of gill opening
 *A. olivaceus*

SYSTEMATICS

1. *Acanthurus dussumieri* Valenciennes, 1835

Popular Name : Eyestripe Surgeon.

Description : D. IX, 24-27; A. III, 24-26; P. 17; V. I, 5. Body slightly deep, the profile of head strongly convex; sides of caudal peduncle with sharp and large spine; caudal fin lunate. Body yellowish brown with narrow irregular longitudinal and slightly wavy blue lines; head with blue spots and lines; opercular membrane black; interorbital space with a broad yellow band extending anteriorly and a yellow area behind eye; caudal spine white; dorsal and anal fins yellow, the margin and base with blue band; caudal fin blue with small black spots and its base yellow; upper half of pectoral fin yellow. Good aquarium fish.

Length : 50 cm.

Habitat : Found in coral reef areas.

Distribution : Indo-Pacific.

2. *Acanthurus leucosternon* Bennett, 1832

Popular Name : Powder-blue Surgeon.

Description : D. IX, 28-29; A. III, 24-26; P.15-16; V. I, 5. Body is almost ovate; dorsal profile of snout concave; nostrils close together, just before eye; caudal fin emarginate. Body bright blue, chest crossed by broad white band; head black; dorsal fin yellowish, the margin white; caudal peduncle and peduncular spine yellow; caudal fin black with broad crescent white patch in the middle; pectoral fins yellow; anal and ventral fins grey, its edges white.

Length : 20-25 cm.

Habitat : Found on outer reef areas and reef slopes.

Distribution : Indian Ocean.

3. *Acanthurus lineatus* (Linnaeus, 1758)

Popular Name : Bluestriped Surgeon.

Description : D. IX, 25-29; A. III, 26-27; P. 16; V. I, 5. Body slightly oblong; caudal spine long; caudal fin lunate. Upper three fourths of head and body with alternate black edged blue and yellow bands, lower fourth of body light lavender colour; dorsal and anal fins dark blue; caudal fin bluish with a broad black area at base; pectoral fin hyaline; ventral fin yellowish orange.

Length : 35 cm.

Habitat : Found in turbulent outer reef areas in small groups.

Distribution : Indo-Pacific.

4. *Acanthurus mata*, Cuvier, 1829

Popular Name : Elongate Surgeon.

Description : D. IX, 24-26; A. III, 23-24; P. 16; V. I, 5. Body is elongated and slightly deep; dorsal profile of head gradually sloping to snout; mouth small; caudal fin lunate. Dark brown with narrow longitudinal blue lines on head and body; a yellow area behind eye, two yellow bands radiating anteriorly from eye. Capable of change its colour to overall pale blue.

Length : 50 cm.

Habitat : Found in reef areas where waters are turbid.

Distribution : Indo-Pacific.

5. *Acanthurus nigricauda* Duncker & Mohr, 1929

Popular Name : Blackstreak Surgeon.

Description : D. IX, 25-28; A. III, 23-26; P. 16-17; V. I, 5. Ovate and slightly deep bodied; dorsal profile of head convex; caudal peduncular spine sharp and long; caudal fin strongly lunate. Body, head and fins dark brown with a horizontal black band passing posteriorly from upper end of gill opening to above middle of pectoral fin; a lanceolate black line extending along caudal spine; all fins dark brown; margin of median fins white; base of caudal fin with white bar; outer part of pectoral fin pale.

Length : 35-40 cm.

Habitat : Found on sandy bottom near coral reefs and protected reefs.

Distribution : Indo-Pacific.

6. *Acanthurus nigrofuscus* (Forsskal, 1775)

Popular Name : Brown Surgeonfish.

Description : D. IX, 24-26; A.III, 22-24; P. 16-17; V. I, 5. Body ovate; caudal fin lunate. Body brown to reddish brown with numerous orange spots on head and chest, lips blackish, rear end of dorsal and anal fins with prominent black spot, caudal fin with narrow whitish posterior border, edge of caudal fin spine socket narrowly black.

Length : 20 cm.

Habitat : Found near shallow reefs.

Distribution : Indo-Pacific.

7. *Acanthurus olivaceus* Forster, 1801

Popular Name : Orangeband Surgeonfish.

Description : D. IX, 23-24; A. III, 22-23; P. 17; V. I, 5. Body ovate, caudal fin lunate. Body greenish brown or chocolate brown with a horizontal orange band edged in deep blue extending posteriorly from upper end of gill opening; a narrow orange line at the base of dorsal fin; caudal fin with large crescentic white area posteriorly; head and anterior part of body often abruptly paler. Juveniles are yellowish.

Length : 35 cm.

Habitat : Found over sand bottoms near shallow reefs.

Distribution : Indo-West Pacific.

8. *Acanthurus pyroferus* Kittlitz, 1834

Popular Name : Mimic Surgeonfish.

Description : D. IX, 27-28; A. III, 23-26; P. 16; V. I, 5. Body ovate, snout slightly protruding, dorsal profile to eye concave, dorsal fin slightly high, caudal fin truncate with prolonged lobes. Body brown, shading to brownish red on thorax, a vertically elongate orange-red spot above pectoral fin base, a broad black band beginning at upper end of gill opening and extending along the margin of operculum to isthmus, caudal fin with a broad yellow posterior border. Juveniles mimic adults of angelfish *Centropyge vrolikii*.

Length : 25 cm.

Habitat : Usually encountered in reef areas.

Distribution : Indo-Pacific.

9. *Acanthurus thompsoni* (Fowler, 1923)

Popular Name : Thompson's Surgeonfish.

Description : D. IX, 23-26; A. III, 23-26; P. 17; V. I, 5. Body moderately elongate, dorsal profile of head roundish, snout small, teeth small and numerous; caudal fin lunate. Body uniform olive-brown, caudal fin white, a dark brown spot in axil of pectoral fin.

Length : 25 cm.

Habitat : Usually encountered in outer reef areas.

Distribution : Indo-Pacific.

10. *Acanthurus triostegus* (Linnaeus, 1758)

Popular Name : Convict Surgeon.

Description : D. IX, 22-24; A. III, 20-22; P. 14-16; V. I, 5. Body ovate; caudal fin emarginated; caudal peduncular spine small. Colour light greenish grey with six narrow black bars on head and body.

Length : 25 cm.

Habitat : Found around inshore coral reef areas.

Distribution : Indo-Pacific.

11. *Acanthurus xanthopterus* Valenciennes, 1835

Popular Name : Yellowfin Surgeon.

Description : D. IX, 25-26; A. III, 23-24; P. 16; V. I, 5. Caudal fin lunate; caudal peduncular spine small. Body blue grey with irregular dark grey lines; a dull yellow area behind and in front of eye; caudal fin bluish-grey; dorsal and anal fins with alternate yellow and blue stripes; outer third of pectoral yellow.

Length : 50 cm.

Habitat : Sandy areas adjacent to reefs and in protected bays and lagoons.

Distribution : Indo-Pacific.

12. *Ctenochaetus striatus* (Quoy & Gaimard, 1825)

Popular Name : Lined Bristletooth Surgeon.

Description : D. VIII, 29-30; A. III, 25-26; P. 16-17; V. I, 5. Body slightly ovate; teeth movable and comb-like; caudal fin lunate. Body dark brown with numerous narrow blue longitudinal lines; head with small orange red dots dorsally; dorsal and anal fins with 4-5 narrow dark bluish bands; a small black spot at upper base of dorsal fin may disappear with growth.

Length : 25 cm.

Habitat : Around coral reef areas.

Distribution : Indo-Pacific.

13. *Ctenochaetus strigosus* (Bennett, 1828)

Popular Name : Goldring Bristletooth.

Description : D. VIII, 24-27; A. III, 22-25; P.15-16; V.I, 5. Body ovate; upper teeth with 5 denticulations, lower with three lateral denticulations; caudal fin emarginated. Body dark yellowish brown with bluish grey longitudinal lines; head and anterior part of body with yellowish spots; a narrow yellow ring around eye. Juveniles bright yellow.

Length : 18 cm.

Habitat : Around coral reef areas.

Distribution : Indo-Pacific.

14. *Naso brevirostris* (Valenciennes, 1835)

Popular Name : Spotted Unicornfish.

Description : D. VI, 28-29; A.II, 27-29; P. 16-17; V. I, 3. Body oblong and very long; a broad based long tapering horn on forehead; the snout profile between horn and upper lip is very short and vertical; caudal keels sharp; caudal fin truncate. Body olivaceous brown to bluish grey; adults with dark lines on horn and short irregular vertical lines on sides of body; subadults with small dark spots on head and body; caudal fin whitish.

Length : 50 cm.

Habitat : Found around outer reef areas.

Distribution : Indo-Pacific.

15. *Naso hexacanthus* (Bleeker, 1855)

Popular Name : Blacktongue Unicorn.

Description : D. VI, 26-28; A. II, 28-30; P. 17-18; V. I. 3. Body slightly deep and long; dorsal and anal profiles of head equally convex; no horn on head; two caudal peduncular plates with large knife-like keel; caudal fin truncate. Body bluish grey to dark olive grey dorsally and sides, shading to yellow ventrally; tongue black; caudal fin blue shading to green posteriorly; dorsal and anal fins are brownish yellow with light blue longitudinal lines.

Length : 60-70 cm.

Habitat : Found on outer reef slopes in moderate depth zones and some times in small schools.

Distribution : Indo-Pacific.

16. *Naso lituratus* (Forster, 1801)

Popular Name : Orangespine Unicorn Fish.

Description : D. VI, 28-30; A. II, 28-30; P. 15-16; V. I, 3. Body ovate; dorsal profile of head nearly straight; teeth incisor-like and smooth; caudal fin emarginated, the lobes are filamentous in males; caudal peduncular plates are two with sharp keel. Body yellowish brown, front of snout black; a narrow curved yellow band below eye to mouth; peduncular plates deep orange yellow; a light orange yellow area behind eye; lips orange yellow; dorsal fin orange yellow with a black band basally; ventral fins yellow; anal fin yellow with an orange sub-marginal band; caudal fin brownish with a black band.

Length : 40 cm.

Habitat : Outer reef areas.

Distribution : Indo-Pacific.

17. *Naso unicornis* (Forsskal, 1775)

Popular Name : Blue-spine Unicorn Fish.

Description : D. VI, 27-29; A. II, 25-30; P. 17-18; V. I, 3. Dorsal profile of snout straight; a sharp bony horn in front of eye; caudal fin truncate,

the lobes produced; two pairs of bony plates with knife-like spines on caudal peduncle. Body light olivaceous green and light yellowish below; lips and peduncular plates are blue; dorsal and anal fins yellowish with narrow blue longitudinal lines.

Length : 70 cm.

Habitat : Shallow rocky shores and coral reefs.

Distribution : Indo-Pacific.

18. *Naso vlamingii* (Valenciennes, 1835)

Popular Name : Vlaming's Unicorn Fish.

Description : D. VI, 27; A. II, 28-29; P. 17-18; V. I, 3. Body very oblong and long; dorsal profile of head smooth with a hump, a prominent convexity on forehead; bony plates on caudal peduncle with sharp keel; caudal fin truncate, each corner with a long filament. Body yellowish brown with irregular vertical blue lines on sides of body and small blue spots above and below; head with broad blue band extending anteriorly from eye; lips and caudal fin filaments blue.

Length : 55 cm.

Habitat : Outer reef areas in moderately deep waters.

Distribution : Indo-Pacific.

19. *Paracanthurus hepatus* (Linnaeus, 1766)

Popular Name : Flag-Tail Surgeon.

Description : D. IX, 20; A. III, 18; P. 16; V. I, 5. Body slightly ovate; caudal fin truncated; caudal spine folding into a shallow groove; dorsal and anal fin spines are stout. Body and head bright blue with a black band from eye passing along the dorsal fin and back, gradually broadening at caudal peduncle and take a narrow forward extension up to above pectoral; a bright yellow triangle with its apex at caudal spine, extending to end of caudal fin; upper and lower margins of caudal fin black; distal half of pectoral fin yellow; dorsal and anal fins blue, its edges black.

Length : 30 cm.

Habitat : Around rich coral reef areas.

Distribution : Indo-Pacific.

20. *Zebrasoma scopas* (Cuvier, 1829)

Popular Name : Brushtail Tang

Description : D. V, 23-24; A. III, 19-20; P. 14-16; V. I, 5. Body deep; snout pointed; a sharp spine on side of caudal peduncle depressible in to groove; a patch of brush like setae on side of body anterior to caudal spine; dorsal and anal fins elevated; caudal fin slightly rounded. Body dark yellowish-brown with small blue dots on head and body, these dots join into longitudinal lines on body; the sheath of caudal spine white.

Length : 20 cm.

Habitat : Shallow reef areas in pairs or small groups.

Distribution : Indo-Pacific.

21. *Zebrasoma veliferum* (Bloch, 1797)

Popular Name : Sailfin Tang.

Description : D. IV, 28-30; A. III, 22-23; P. 15-16; V. I, 5. Body ovate, snout produced; teeth flat and wide; caudal peduncle compressed; dorsal and anal fins highly elevated; no caudal peduncular depressions. Body white with a 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 curving alternate dark brown and yellow bands; caudal fin light brown with yellow spots. Juveniles yellow with black and white bars, caudal fin white.

Length : 40 cm.

Habitat : Shallow sheltered reef areas.

Distribution : Indo-Pacific.

Family SIGANIDAE Rabbitfishes

The fishes of the family siganidae are essentially marine and occur throughout the tropical Indo-West Pacific Region. About 27 species representing by single genera *Siganus* from the waters of the world; about 13 species are common in the Indian Ocean. Taxonomic studies of the siganids around the reef and mangrove areas of Andaman and Nicobar Islands revealed the occurrence of 12 species, constituting about 45% of the siganid species of the world.

The name rabbit fishes is derived from the way in which they constantly twitch their upper lip. They are unique in having pelvic fins with 2 sharp spines separated by 3 rays. Body oval or compressed, covered with small cycloid scales; mouth terminal, small and not protractile; jaws with a row of small incisiform teeth. A 'prepalatine' bony element is projecting forward from palatine to each maxilla. Vomer, palatine and tongue are edentate; dorsal fin single, spinous part of the spine preceded by a sharp, procumbent spine, usually protruding slightly from its pocket but often imbedded; caudal peduncle very narrow; caudal fin truncate or forked. All fin spines are venomous with a pair of antero-lateral grooves containing venomous glands.

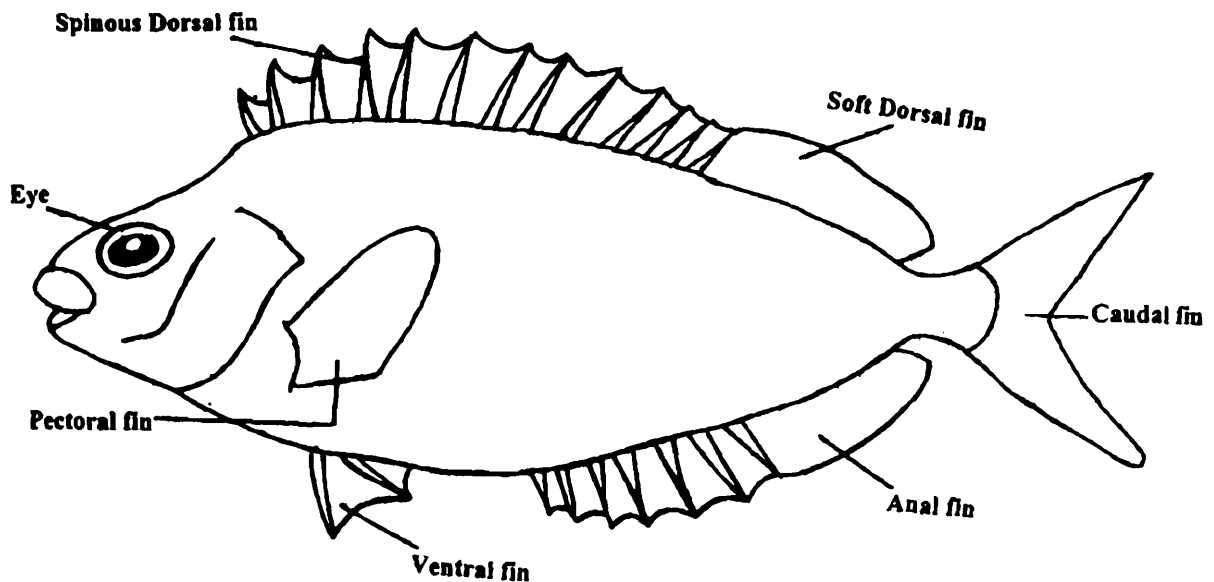


Fig. 2. External features of Siganid fish

FIELD BIOLOGY

Siganids are usually encountered in pairs or in schools around coastal and reef areas from shallow to 15 m depth or more. Usually they are not restricted to a single habitat but move around estuaries,

sea-grass beds, rocky shores, reef areas etc. except *Siganus vermiculatus* which is exclusively estuarine. The smallest species attains 20 cm standard length and the largest almost 50 cm. All species are herbivorous, feed on benthic algae, but *Siganus puelloides* and *Siganus magnificus* feed on small invertebrates also. There is a little variation in colour pattern within species. When they are at rest or threatened, adopt a camouflage pattern. This involves a mottling with dark and light brown pattern, but in the drab species this is not necessarily so, and the normal pattern may be masked. When disturbed, some of the drab species like *Siganus fuscescens* and *Siganus spinus* display a pattern of broad, blackish band running from snout to caudal peduncle, below this band the fish is silvery and above with a slender, horizontal silver band and rest of the part dark grey. The fin spines of siganids associated with poison glands and, therefore, these fishes should be handled with great care. They are capable of inflicting painful wounds that may require special medical treatment.

REPRODUCTIVE BIOLOGY

Mariculture potential and reproductive biology of some siganid species were made by Lam (1974), on life history of *Siganus canaliculatus* by Hasse et al. (1977), and biology and life history of *Siganus vermiculatus* by Gunderman et al (1983) are important. Eggs are demersal and the larvae are pelagic feed on plankton. The average life span of larval stage is about 3-4 weeks. It has been observed that spawning is synchronizing with the lunar cycle. Spawning may occur twice or thrice over two or three consecutive months. The fecundity is about 2.5 to 5 lakh eggs per spawning season (Lam, 1974 and Gunderman et al, 1983). Usually the juveniles live in small schools in seagrass beds, mangroves and creeks and sexually mature after 12 months of growth.

AQUARIUM BIOLOGY

Small sized colourful siganids are good for aquaria. They feed constantly like other herbivorous fish. Their diet consists mainly of algae or higher plants. Species like *Siganus magnificus* can be fed on algae as well as small invertebrates. Only few species of siganids are marketed as food, but they are very important in aquaculture and aquarium trade as they grow very fast in captive environment.

Key to Species of Family SIGANIDAE

- 1a. Snout strongly tubulate; thorax white to very light brown
..... *S. magnificus*
- 1b. Snout not strongly tubulate 2
- 2a. A line projects through anterior and posterior nostrils passing through lower third of posterior margin of eye; head and sides of trunk with small blue ocelli on yellow background
..... *S. corallinus*
- 2b. A line projects through anterior and posterior nostrils passing above mid-point of posterior margin of eye; coloration not as in 2a .. 3
- 3a. Mid-line of thorax scaleless between pelvic ridges, dorsal and anal spines slender or slightly stout 4
- 3b. Mid-line of thorax with scales between pelvic ridges, dorsal and anal spines strong 7
- 4a. Soft parts of dorsal and anal fins tall, 3rd ray of dorsal fin longer than distance from anterior nostril to posterior extremity of orbit, anal and posterior dorsal fin spines stout; head and body marked with blue to cream labyrinthine lines on grey background, narrow whitish bar at base of caudal fin *S. spinus*
- 4b. Soft part of dorsal and anal fins short, the 3rd ray of dorsal fin shorter than distance from anterior nostril to posterior extremity of orbit; dorsal and anal spines slender, colour not as in 4a 5
- 5a. Caudal fin forked; median caudal ray shorter than outer spine of pelvic fin, last anal spine short, less than half length of longest anal spine *S. argenteus*
- 5b. Caudal fin forked, emarginate in young, median caudal ray longer than outer spine of pelvic fin; last anal spine short, but not less than half length of longest anal spine 6
- 6a. About 100 to 200 pearly blue spots on sides of head and body; 2-3 rows of spots between lateral line and base of anterior half of dorsal fin; spots below lateral line mostly ovoid or rod shaped *S. canaliculatus*
- 6b. More than 200 to several hundred pearly spots on sides of head

- and body, 4-6 rows of spots between lateral line and base of anterior half of dorsal fin; spots below lateral line round or rod shaped *S. fuscescens*
- 7a. Body slender, its greatest depth 2.3-2.6 in SL; prominent black spots above and adjacent to orbit, body with numerous close-set, small dark orange-yellow spots on light yellow background *S. puelloides*
- 7b. Body deep, its greatest depth 1.8-2.3 in SL; no prominent black spots near orbit, colour pattern not as in 7a 8
- 8a. Scale-rows between lateral line and base of 2nd to 4th dorsal spines more than 29, shortest distance between bony orbit and upper lip less than half diameter of bony orbit *S. javus*
- 8b. Scale-rows between lateral line and base of 2nd to 4th dorsal spine less than 29; shortest distance between bony orbit and upper lip greater than half diameter of bony orbit. 9
- 9a. A diagonal dark ocular band from chin to nape another band running parallel to it from base of ventral fin to base of dorsal fin, many blue spots of pinhole size on sides of body *S. virgatus*
- 9b. No dark band on head and anterior body 10
- 10a. Head and body completely covered with dark spots on paler background; caudal fin emarginate in young, deeply forked in adults; caudal fin conspicuously marked with large spots *S. stellatus*
- 10b. Head and body not completely covered with spots, vermiculating lines also present; caudal fin emarginates to moderately forked. 11
- 11a. A large yellow spots, about size of orbit, below rear base of soft portion of dorsal fin, sides of body with bronze to orange spots larger than or equal to interspaces, closely packed on nape to form honey-comb pattern *S. guttatus*
- 11b. No large yellow spots below the base of soft portion of dorsal fin; sides of body with an extensive areas of vermiculating lines; caudal fin emarginate, marked with columns of dark spots *S. vermiculatus*

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

Popular Name : Forktail Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P. 18-19; V. II, 3. Body ovate and elongate. Caudal peduncle much longer than deep, fin forked; anterior nostril with a long slender flap, the tip just covering orifice of posterior nostril. Body deep blue above, fading to silvery on belly; sides of body covered by small yellow spots and short bars often fused on lower sides to form undulating stripes; dorsal and caudal fins yellow; pelvic and anal fins silvery; pectoral hyaline yellow; iris silvery yellow. When the fish frightened or at rest the colour pattern becomes mottled with dark and light brown, outer rays of caudal fin barred with dusky; other fins except pectoral become mottled.

Length : 25 to 30 cm.

Habitat : Most common and abundant fish found around outer reefs, but the juveniles found on reef flats. School size decreases with increasing maturity. Adults occur singly, in pairs, or in small schools of about 10 to 20 individuals.

Distribution : Indo-Pacific.

23. *Siganus canaliculatus* (Park, 1797)

Popular Name : Pearlspace Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.16-17; V. II, 3. Body elongate; spines slender and pungent; caudal fin emarginate in juveniles, becoming forked with increasing size; midline of thorax between pelvic ridges scaleless. Body silvery gray above and silvery below; nape and upper surface of head olive green; head and body with pearly white round or oval spots, some are elongate; a black patch below origin of lateral line; soft dorsal and anal fins are slightly dusky.

Length : 25 cm.

Habitat : Around reef slopes in shallow areas and coastal water.

Distribution : Indo-West Pacific.

24. *Siganus corallinus* (Valenciennes, 1835)

Popular Name : Coral Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.16-17; V. I, 5. Body deep and ovate; dorsal and ventral profiles concave; spines stout and pungent; caudal fin deeply forked; cheeks usually covered with scales; midline of thorax including ridges fully scaled. Body, head and fins orange yellow; head and body with small blue spots; juveniles have vertical blue lines which fragment into spots with increasing size; a triangular dark patch behind eye; orange-brown.

Length : 28 cm.

Habitat : Living in pairs amongst coral in deep-water about 6m. depth; juveniles in small schools in shallow reefs and seagrass beds.

Distribution : Indo-West Pacific.

25. *Siganus fuscescens* (Houttuyn, 1782)

Popular Name : Spotted Rabbitfish.

Description : D. XIII, 10; A. II, 9; P.15-17; V. II, 3. Body deep; fin spines slender and pungent; caudal fin emarginate in juveniles, become forked with increasing size; cheeks covered with weak, scattered scales; midline of thorax scaleless between pelvic ridges. Body olive green above, silvery below; head and body covered with pearly blue spots except on snout; the spots on head and above lateral line rounded, middle to lower sides slightly elongated; sometimes a dark patch just behind upper end of gill-opening; pelvic fins, anal fin and spinous part of dorsal fin brownish; soft dorsal fin and caudal fin dusky; pectorals hyaline.

Length : 30 cm.

Habitat : In small schools in shallow waters on the reef flats and reef lagoons.

Distribution : Andaman Islands to Japan and Australia.

26. *Siganus guttatus* (Bloch, 1787)

Popular Name : Yellowspotted Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Spines stout and pungent; caudal fin emarginate in juveniles and forked in adults; cheeks completely covered with strong scales; midline of thorax scaled; pelvic ridges scaleless. Body dusky blue above, silvery below with large round golden yellow spots on body except on thorax and belly; a bright

yellow spot about size of orbit, adjacent to last dorsal fin rays; a pattern of alternating blue and yellow lines radiating from mouth to opercular margin.

Length : 35 cm.

Habitat : Around reef slopes in shallow waters to brackish waters.

Distribution : Andaman Islands to Japan.

27. *Siganus javus* (Linnaeus, 1766)

Popular Name : Java Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.17-18; V. II, 3. Body deep and ovate; spines slender and pungent; anal spines stout; caudal fin emarginate; cheeks covered with strong scales; midline of thorax scaled; pelvic ridges scaleless. Body bluish white above light below on belly and thorax; upper half of body head and nape with numerous blue spots; ventral part of body with narrow irregular bluish-grey wavy stripes form a reticulum; cheeks golden yellow with small blue spots; dorsal and anal fins yellow; pectoral fins hyaline; pelvic fins white; caudal fin dusky with a large dark patch in center.

Length : 50 cm.

Habitat : In small groups from brackish waters to coastal reef areas.

Distribution : Indo-West Pacific.

28. *Siganus puelloides* Woodland and Randall, 1979

Popular Name : Spotted Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.16; V. II, 3. Body oblong; spines stout and pointed; caudal fin forked; cheeks covered with scales; midline of thorax and pelvic ridges fully scaled. Body pale blue above, silvery white below; sides of body and head covered with brownish yellow spots, the spots are larger than interspaces and often coalescing above lateral line; a dark brown patch around eye; 4 to 5 small black spots above eye; dark brown stripe under chin reaching at upper margin of upper lip; brown arc along gill opening; dorsal fin spines and rays yellow; anal fin spines silvery-white, rays yellow; caudal and pectoral fins yellow; pelvic fin spines and rays silvery white, membrane dusky.

Length : 25 cm.

Habitat : In pairs around rocky and coral reefs.

Distribution : Indian Ocean from Maldives to Thailand.

29. *Siganus spinus* (Linnaeus, 1758)

Popular Name : Spiny Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P. 17; V. II, 3. Body moderately elongate; spines stout; anal particularly robust and pungent; caudal fin truncate; cheeks with fine scales; lower two-thirds of pre-opercular region with densely packed scales; midline of thorax and pelvic ridges scaleless. Colour whitish with labyrinth of narrow brown bands on head and body; fins mottled with dark brown.

Length : 22-23 cm.

Habitat : In small schools around the outer reef areas.

Distribution : Indo-West Pacific.

30. *Siganus stellatus* (Forsskal, 1775)

Popular Name : Starspotted Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.16-17; V. II, 3. Spines stout but not pungent; caudal fin forked; its lobe generally rounded at tips, but upper lobe occasionally pointed; cheeks fully covered with scales; midline of thorax fully scaled but pelvic ridges sometimes scaleless. Body yellowish-green with chocolate brown spots on head and body extending onto caudal fin and soft portion of dorsal and anal fins; a dark patch above the gill-opening; dorsal anal and caudal fins are pale yellow; pectoral fins hyaline, small spots across the base of fin. In freshly killed specimens, the pale margins of the dorsal, anal and caudal fins usually disappear.

Length : 30 cm.

Habitat : Juveniles found in schools in creeks, adults live in pairs on coral reef areas.

Distribution : Indo-West Pacific.

31. *Siganus vermiculatus* (Valenciennes, 1835)

Popular Name : Vermiculate Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P. 16; V. II, 3. Body deep and ovate; dorsal profile of snout steep; spines are stout; caudal fin emarginate; cheeks with strong scales, midline of thorax scaly except pelvic ridges. Body bluish white with irregular vermiculate dark spotted with brown bands spreading onto base of caudal except ventrally spotted with brown; head with narrow brown bands; caudal fin with small brown spots; a row of brown spots above base of soft dorsal and anal fins; dorsal and anal fins dusky; iris golden yellow.

Length : 45 cm.

Habitat : In turbid waters of estuaries and shallow reef areas.

Distribution : Indo-West Pacific.

32. *Siganus virgatus* (Valenciennes, 1838)

Popular Name : Barred Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.16-17; V. II, 3. Spine stout and pungent; caudal fin emarginate in juveniles and forked in adults; cheeks with scattered scales; number of scales on posterior part of cheeks are more; midline of thorax fully scaled. Body brownish above; whitish below with blue spots covering upper two-thirds of side and cheeks; two oblique blue spotted and blue edged brown bands one from nape to chin, another from base of 4th to 5th dorsal spines to base of pectoral fin; the area between these bands is silvery; snout and interorbital with alternating blue and brownish-yellow lines; dorsal and anal fins hyaline with orange tint; caudal fin orange.

Length : 25-28 cm.

Habitat : In pairs on coral reefs to murky coastal waters.

Distribution : Indo-West Pacific.

33. *Siganus magnificus* (Burgess, 1977)

Popular Name : Foxface Rabbitfish.

Description : D. XIII, 10; A. VII, 9; P.16-17; V. II, 3. Body ovate; snout tubulate; dorsal and ventral profiles of head are concave; spine stout but not very pungent; cheeks covered with strong overlapping scales; midline of thorax fully scaled; caudal fin truncate. Head and anterior part of body white with a broad diagonal dark ocular band from the

snout through eye to origin of dorsal fin, rest of body brownish yellow; dorsal fin spines light yellow, its membrane light crimson and base of fin rays white; anal fin spines white, its membrane orange yellow, basal half of rays white and distal half orange yellow; caudal fin and pectoral fins orange yellow; ventral fins white.

Length : 19-20 cm.

Habitat : In pairs on coral reef areas.

Distribution : Andaman Islands to Thailand.

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GLOSSARY

Band : an oblique or irregular marking.

Benthic : the fauna and flora of the sea bottom.

Caudal fin : the tail fin. The term tail alone generally refers to that part of a fish posterior to the anus.

Caudal peduncle : the part of the body between the posterior basal parts of the dorsal and anal fins and the base of the caudal fin.

Ciguatera : an illness resulting from eating a fresh fish with ciguatoxin in its tissues.

Compressed : laterally flattened; often used in reference to the shape of the body.-in this case body deeper than wide.

Depth : Vertical measurement of the body of a fish; most often employed for maximum height of body excluding fins.

Dorsal fin : a median fin along the back, which is supported by rays. In some fishes the number varies from 2 or more so the most anterior one is designated the first.

Emarginate : concave; used to describe the posterior border of a caudal fin, which is inwardly curved.

Epipelagic : pertaining to the surface layer of the open sea.

Fusiform : Spindle shaped; used to refer the body shape of a fish, which is cylindrical, and tapers toward both ends.

Herbivore : a plant-feeding animal.

Lateral-line scales : the pored scales of the lateral line between the upper end of the gill opening and the base of the caudal fin.

Paired fins : collective term for the pectoral and pelvic fins.

Palatine : a paired lateral bone on the roof of the mouth lying between the vomer and the upper jaw.

Pelagic : pertaining to the open sea (hence not living inshore or on the bottom).

Plankton : collective term for pelagic animals and plants that drift with ocean current.

Sexual dichromatism : a condition wherein the two sexes of the same species are of different colour.

Zooplankton : the animals of the plankton.



Fig. 3. *Acanthurus dussumieri*

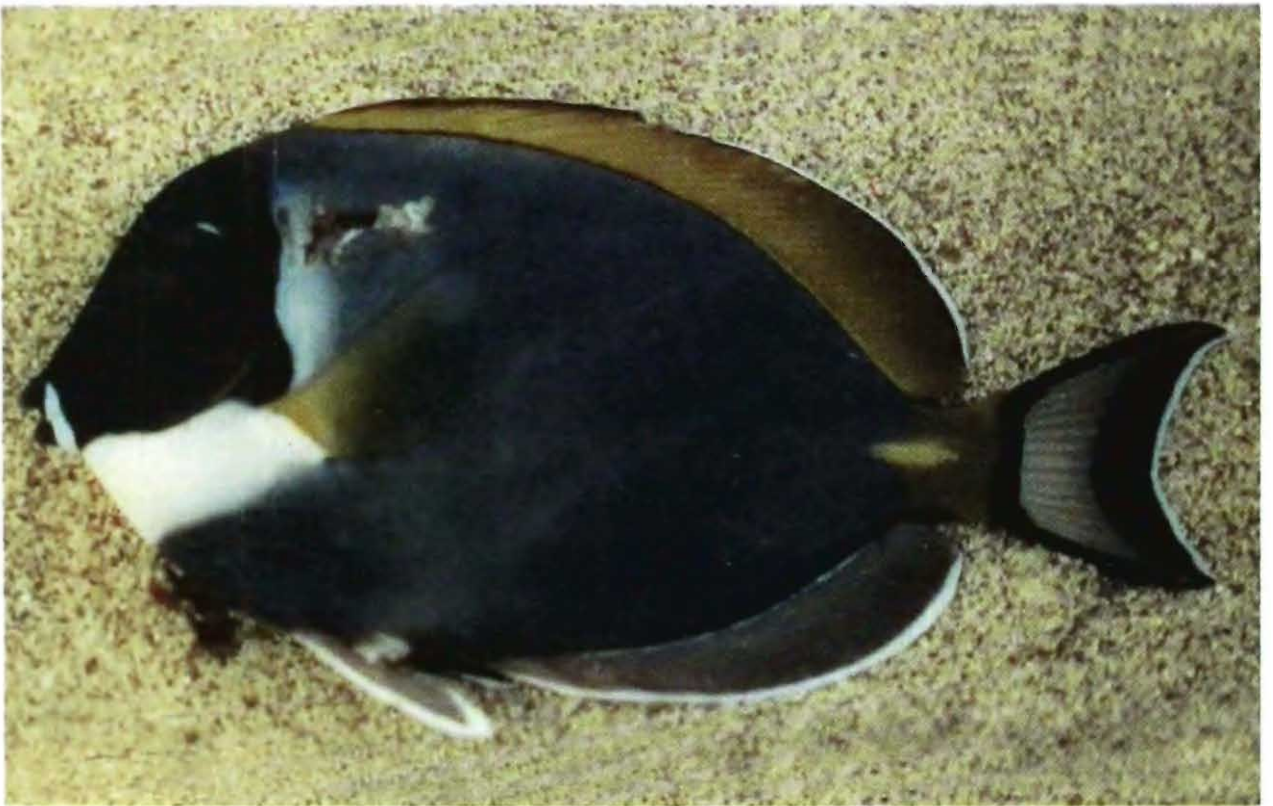


Fig. 4. *Acanthurus leucosternon*



Fig. 5. *Acanthurus lineatus*

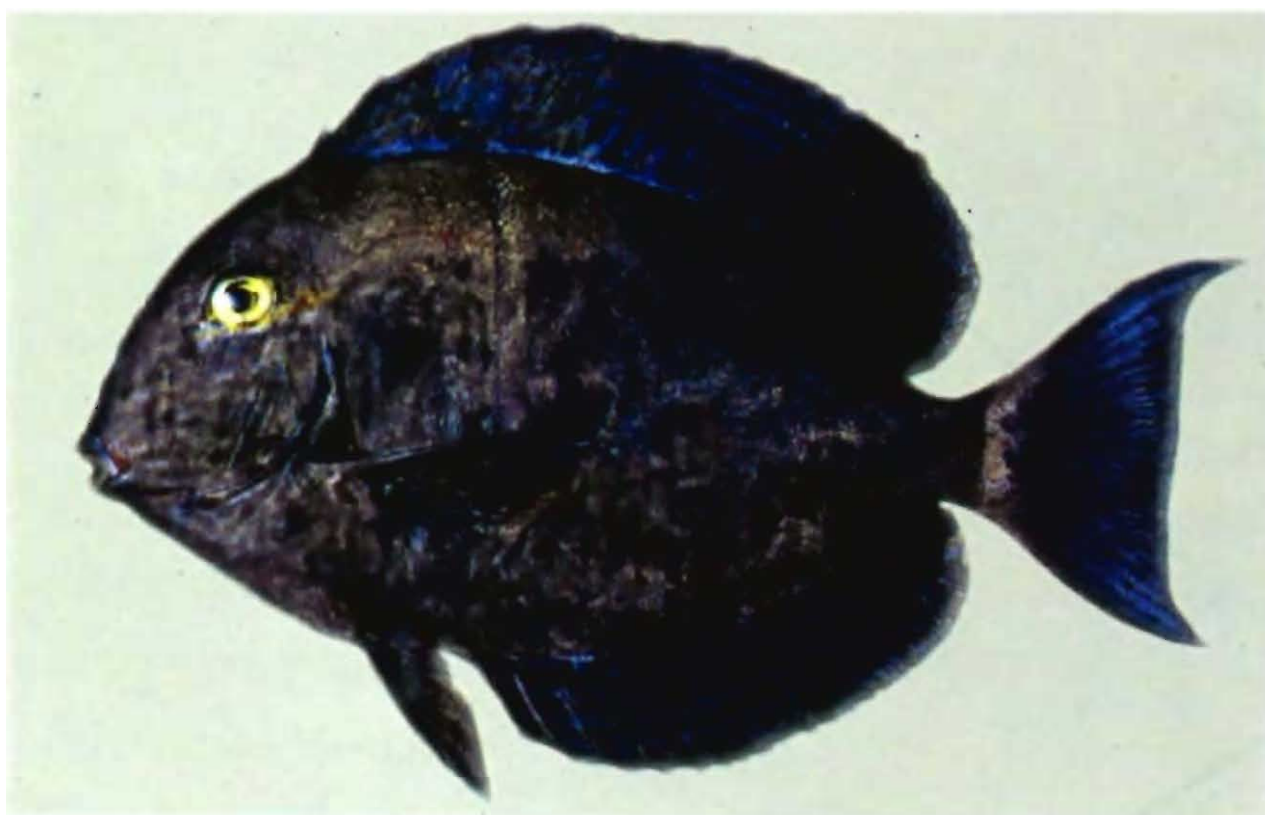


Fig. 6. *Acanthurus mata*



Fig. 7. *Acanthurus nigricauda*



Fig. 8. *Acanthurus nigrofuscus*



Fig. 9. *Acanthurus olivaceus*

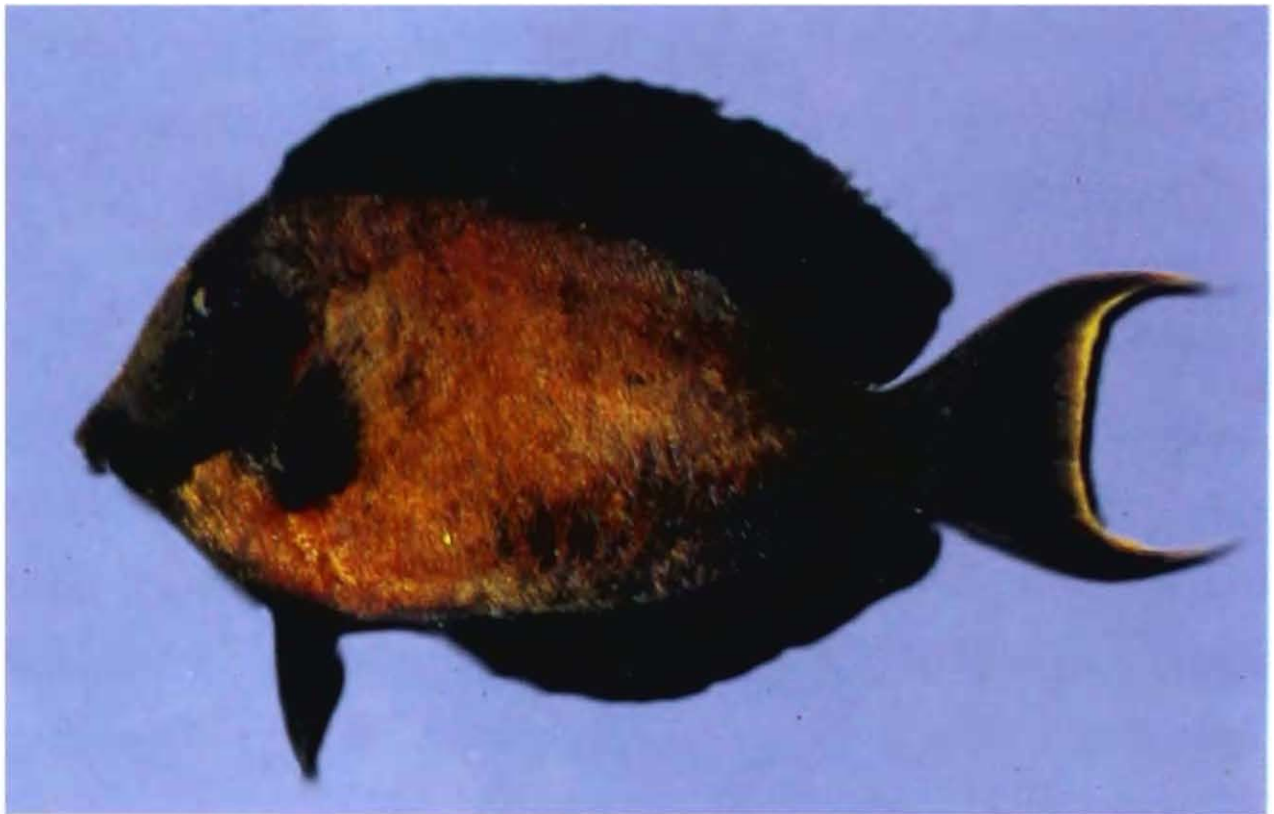


Fig. 10. *Acanthurus pyroferus*



Fig. 11. *Acanthurus thompsoni*



Fig. 12. *Acanthurus triostegus*



Fig. 13. *Acanthurus xanthopterus*



Fig. 14. *Ctenochaetus striatus*



Fig. 15. *Ctenochaetus strigosus*

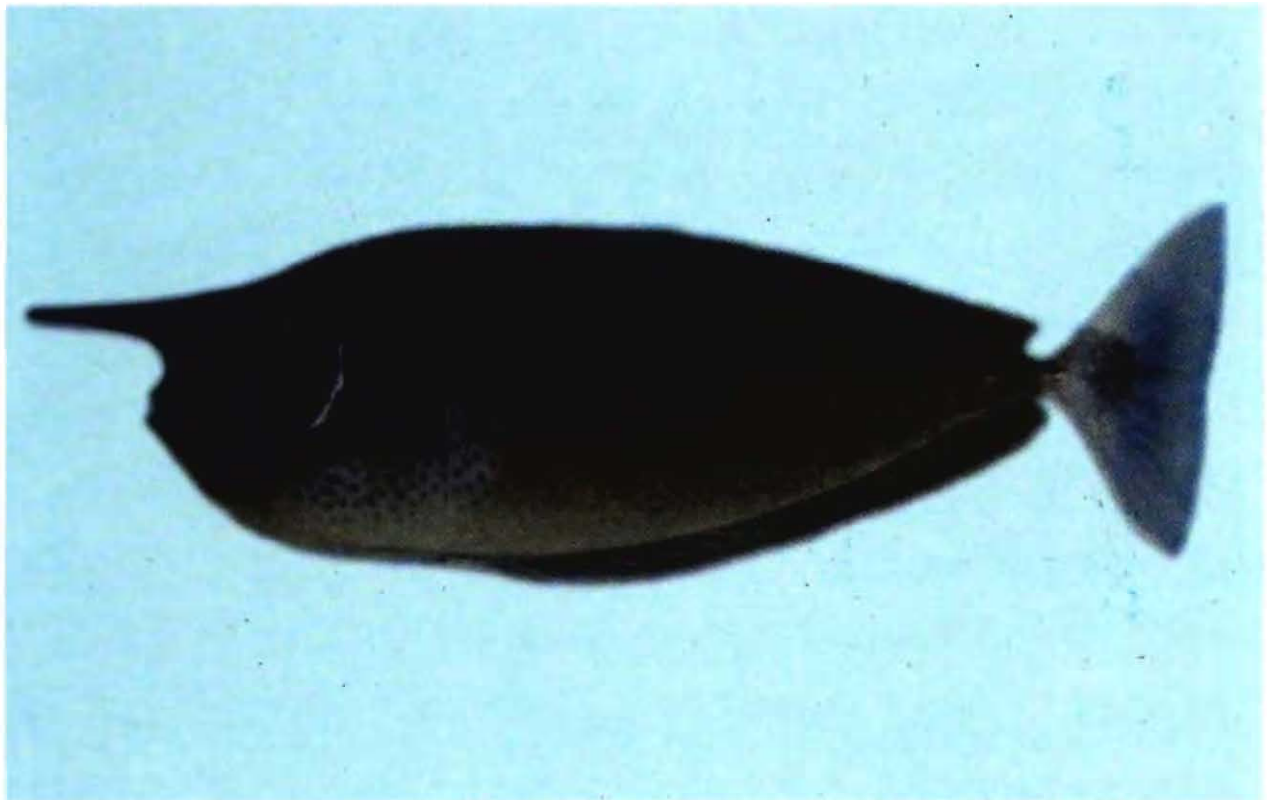


Fig. 16. *Naso brevirostris*



Fig. 17. *Naso hexacanthus*

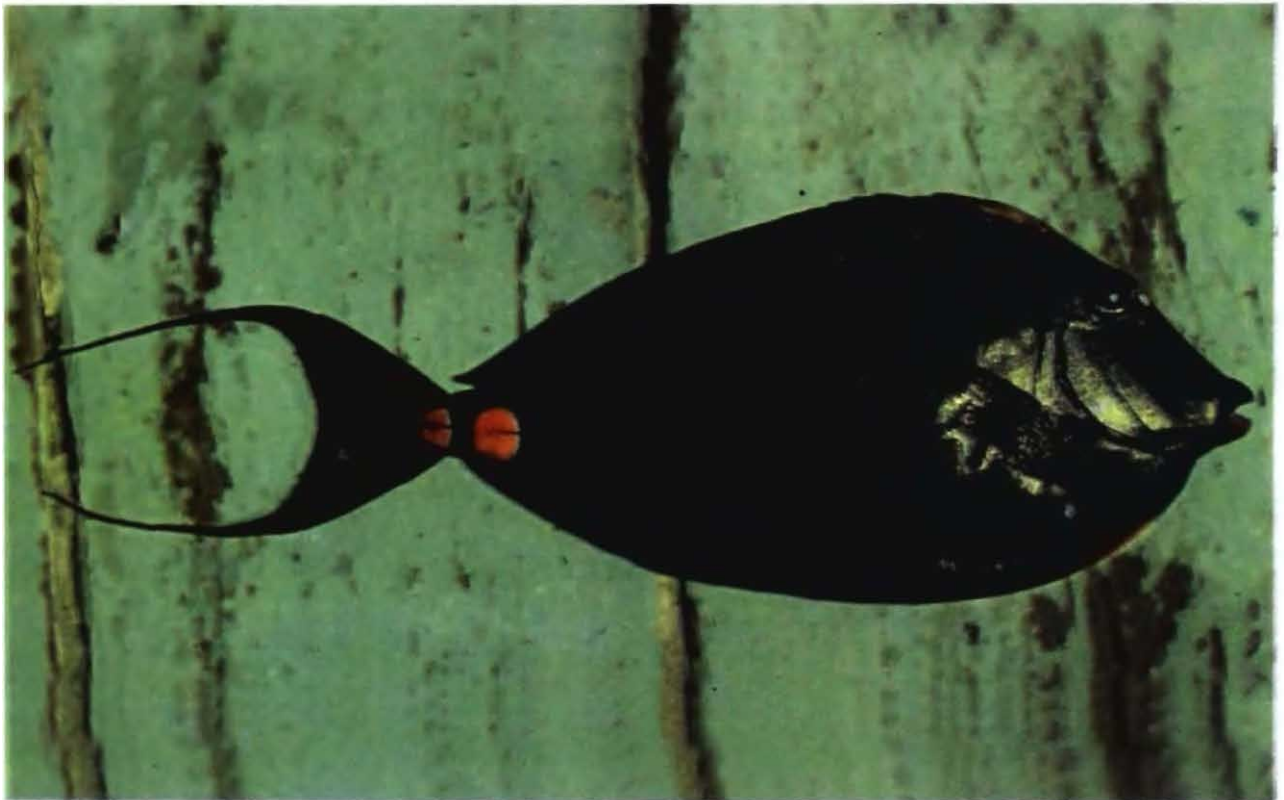


Fig. 18. *Naso lituratus*

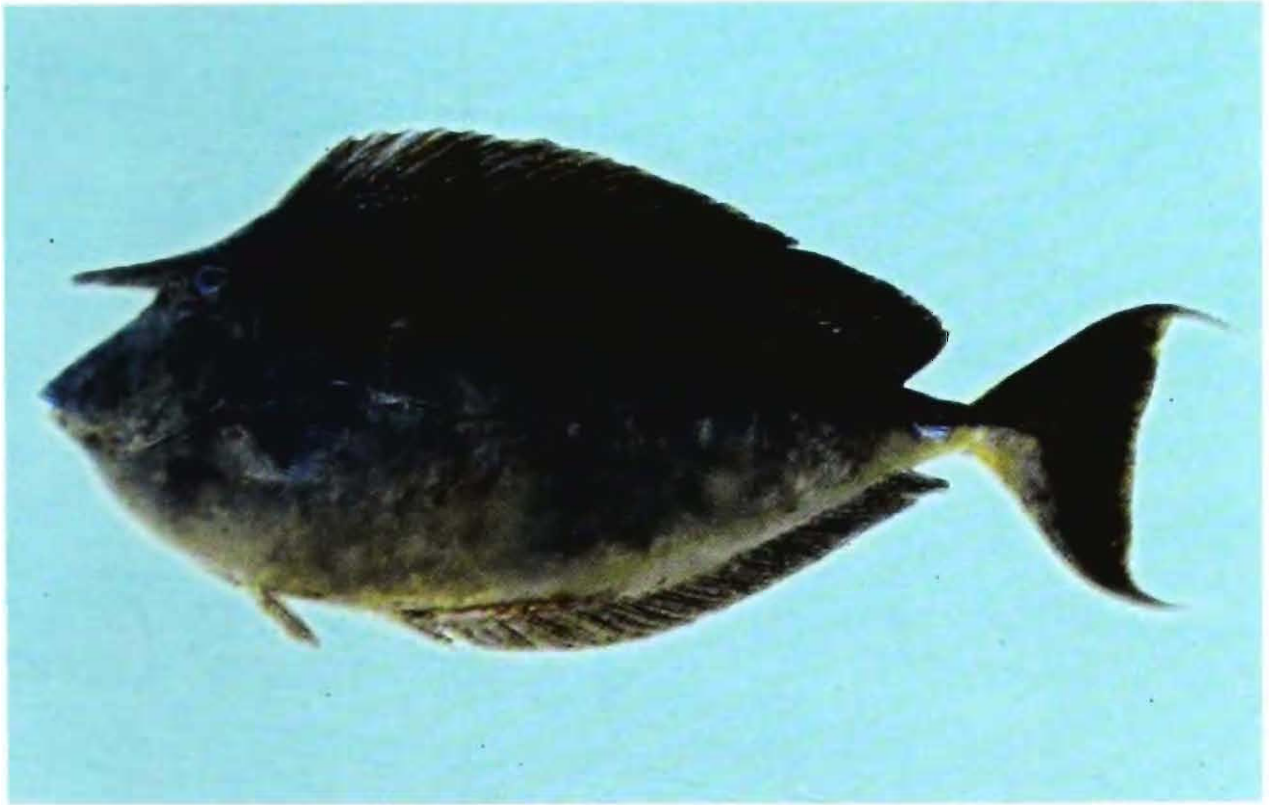


Fig. 19. *Naso unicornis*

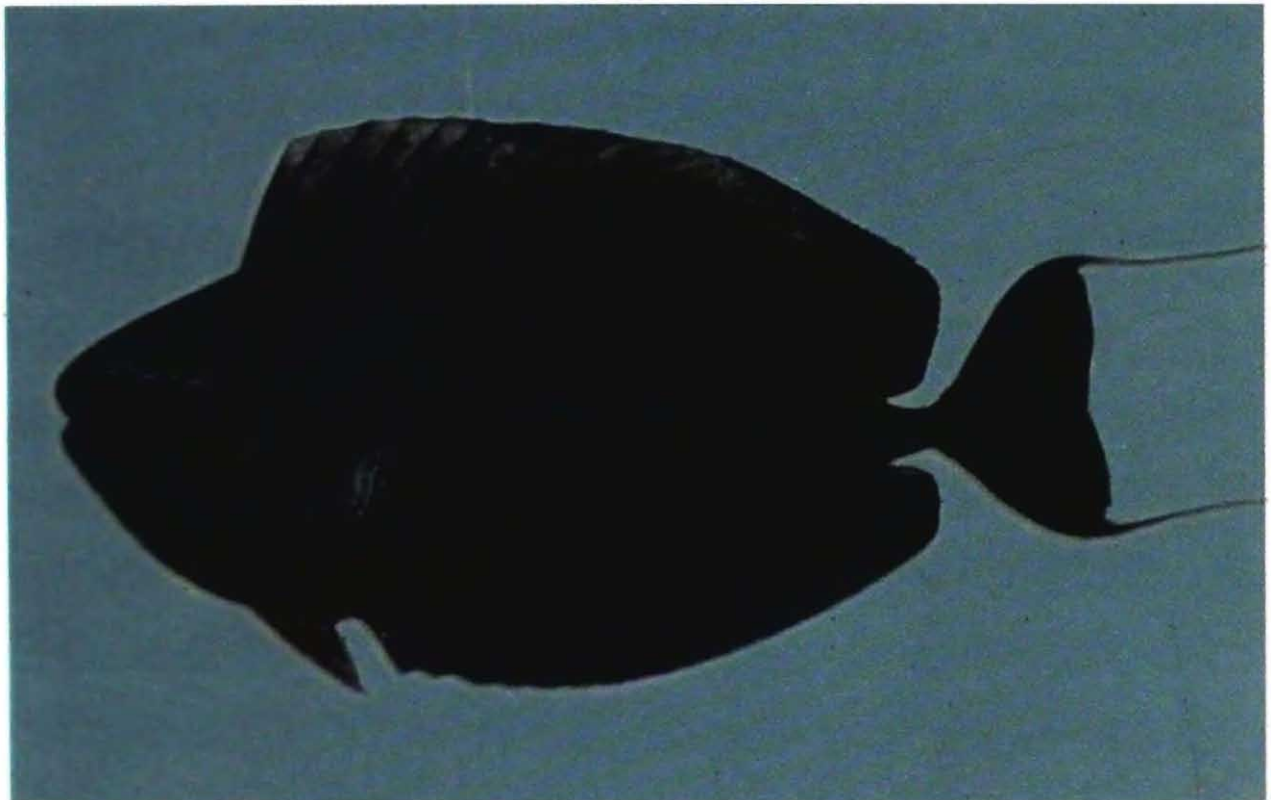


Fig. 20. *Naso vlamingii*

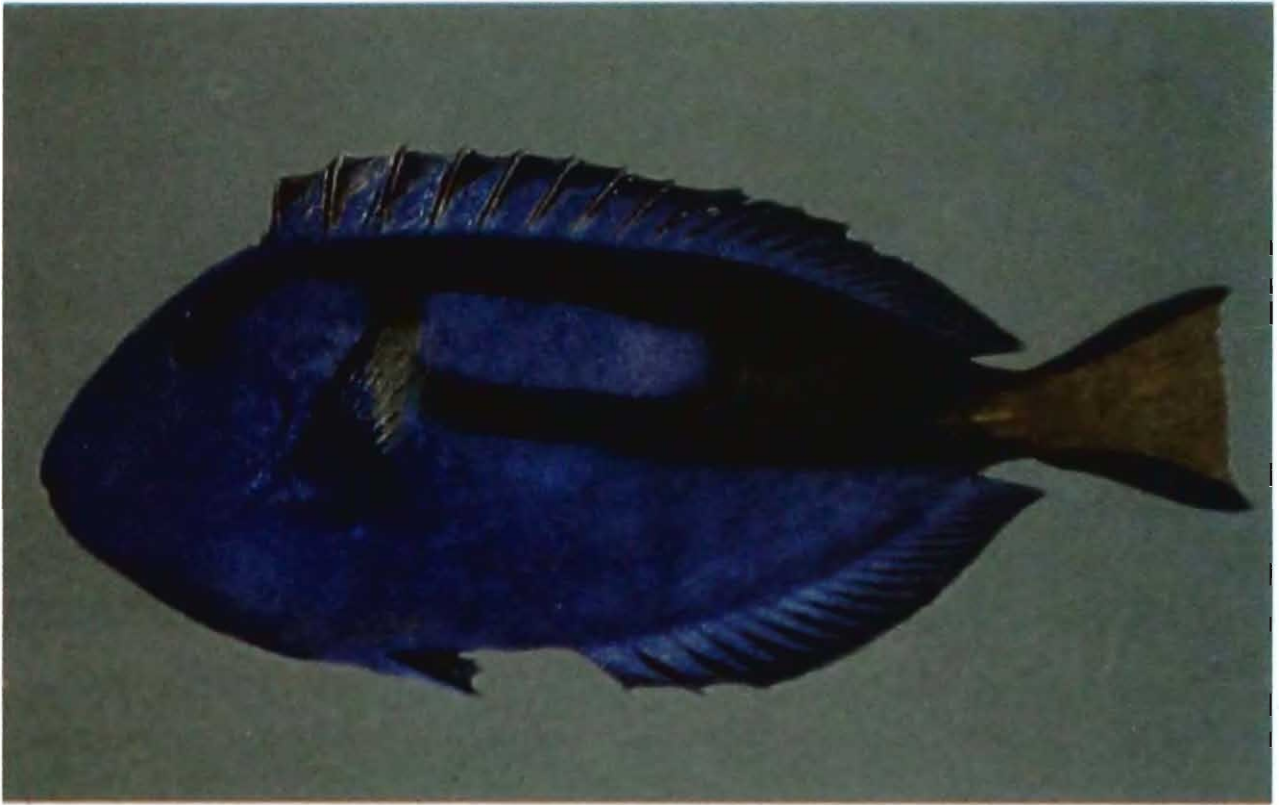


Fig. 21. *Paracanthurus hepatus*



Fig. 22. *Zebrasoma scopas*

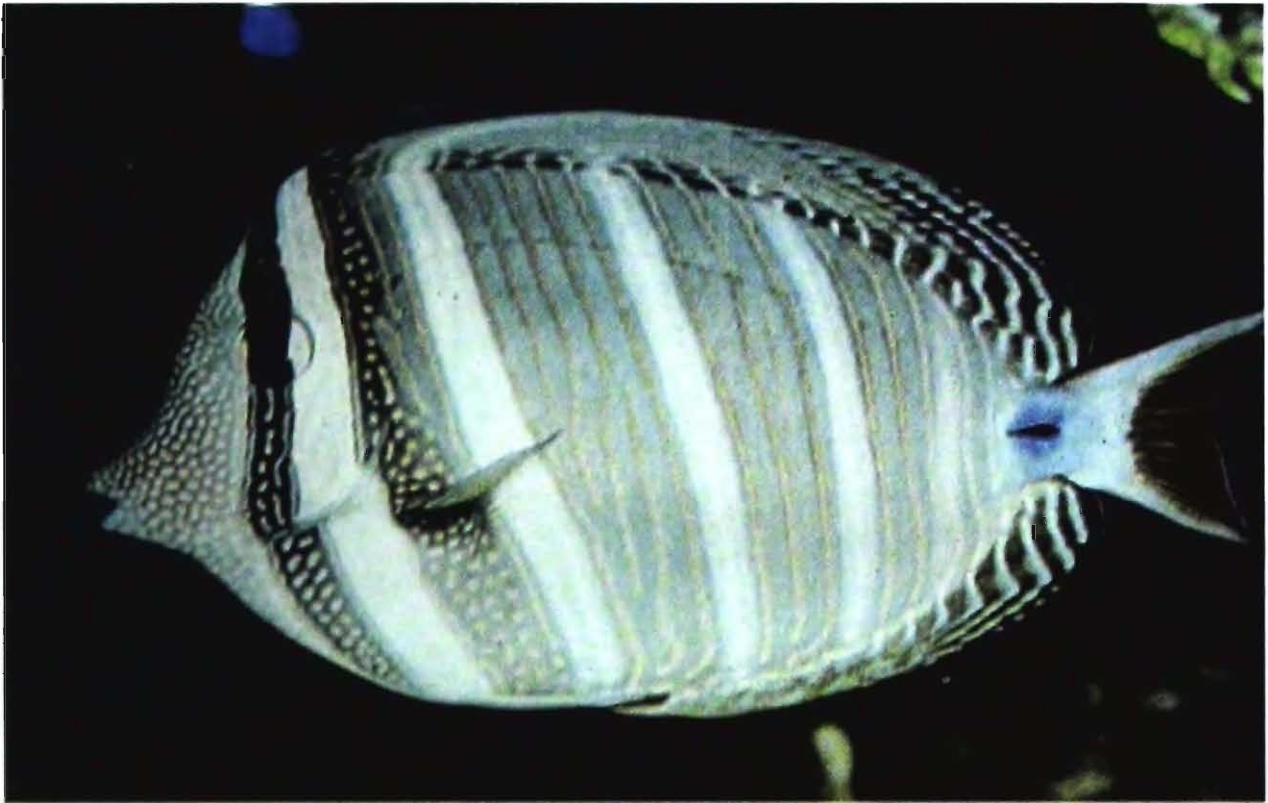


Fig. 23. *Zebrasoma veliferum*

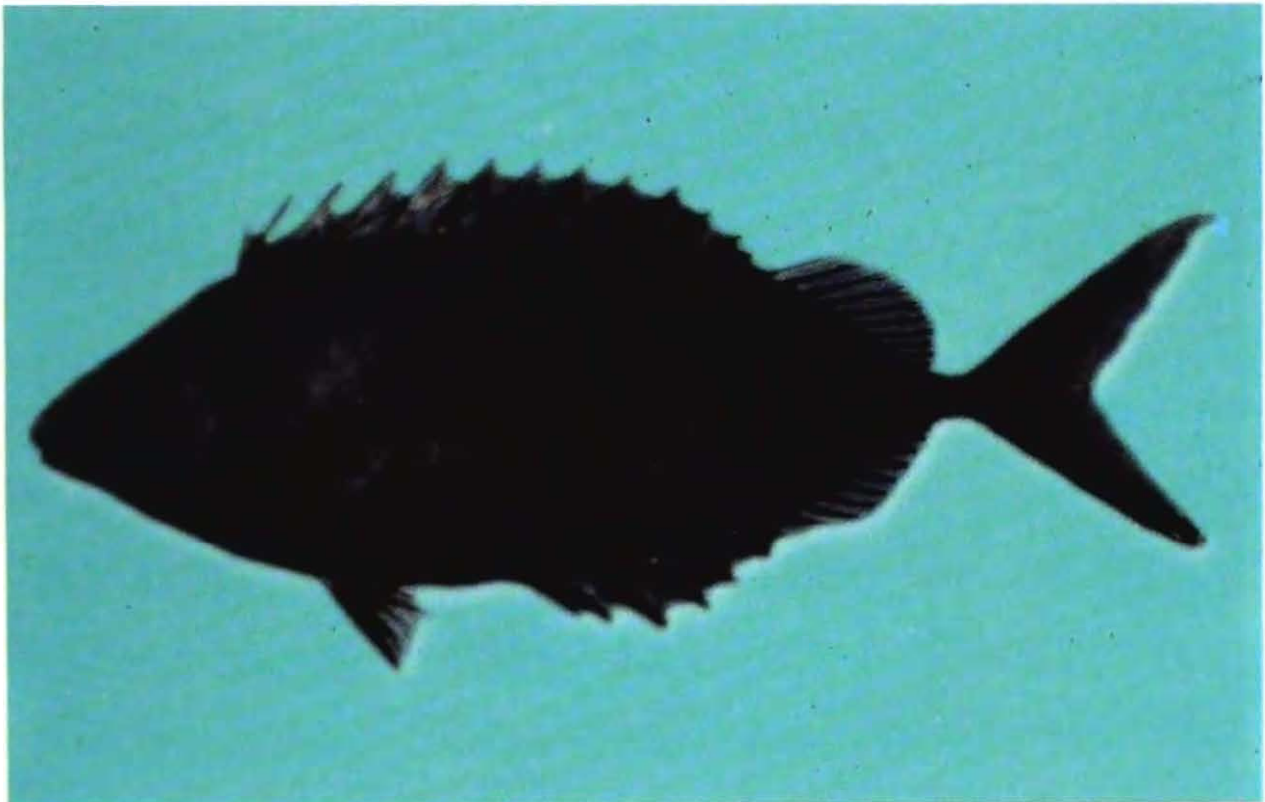


Fig. 24. *Siganus argenteus*

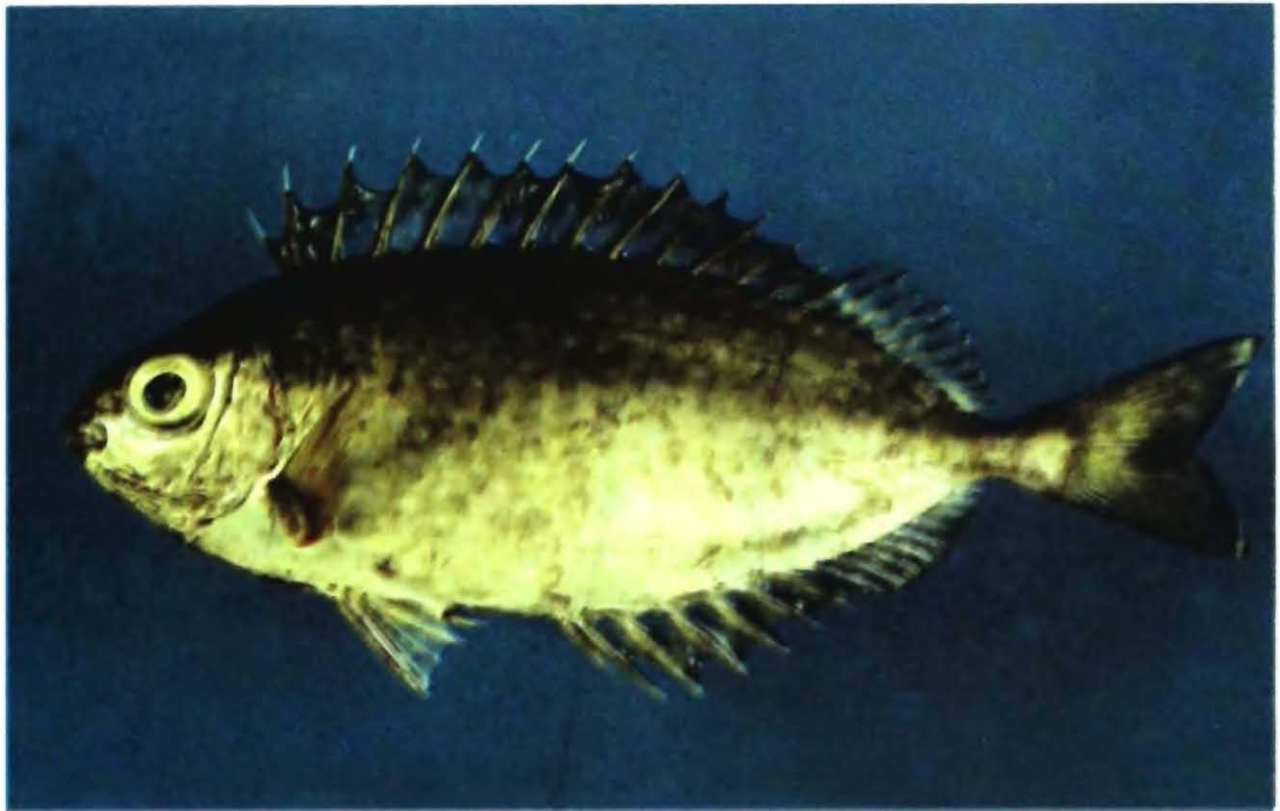


Fig. 25. *Siganus canaliculatus*



Fig. 26. *Siganus corallinus*



Fig. 27. *Siganus fuscescens*



Fig. 28. *Siganus guttatus*



Fig. 29. *Siganus javus*



Fig. 30. *Siganus puelloides*



Fig. 31. *Siganus spinus*



Fig. 32. *Siganus stellatus*

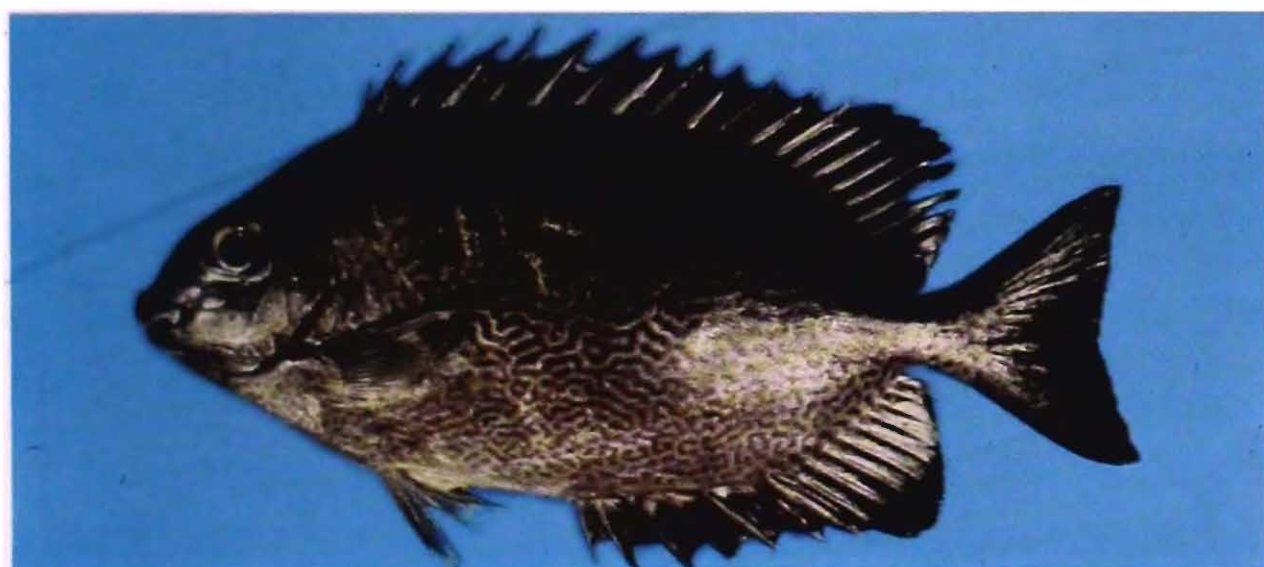


Fig. 33. *Siganus vermiculatus*

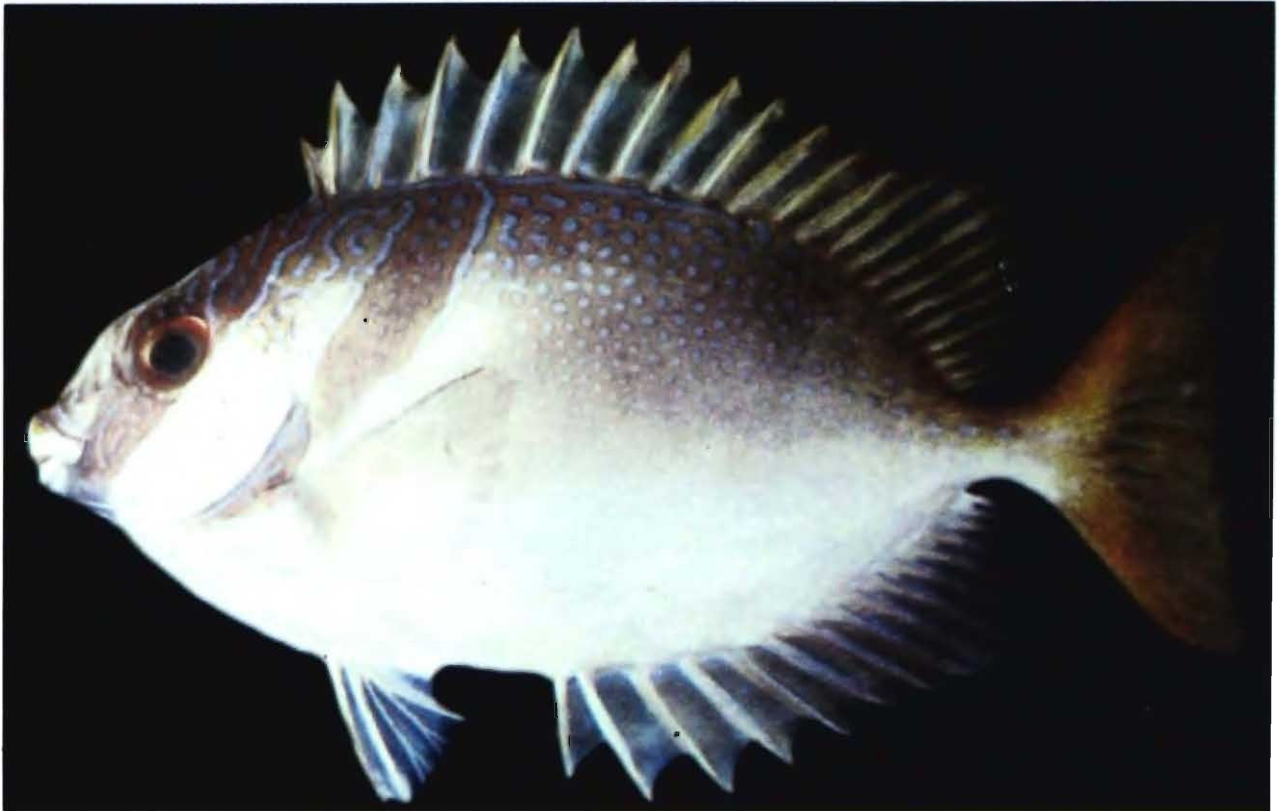


Fig. 34. *Siganus virgatus*



Fig. 35. *Siganus magnificus*

