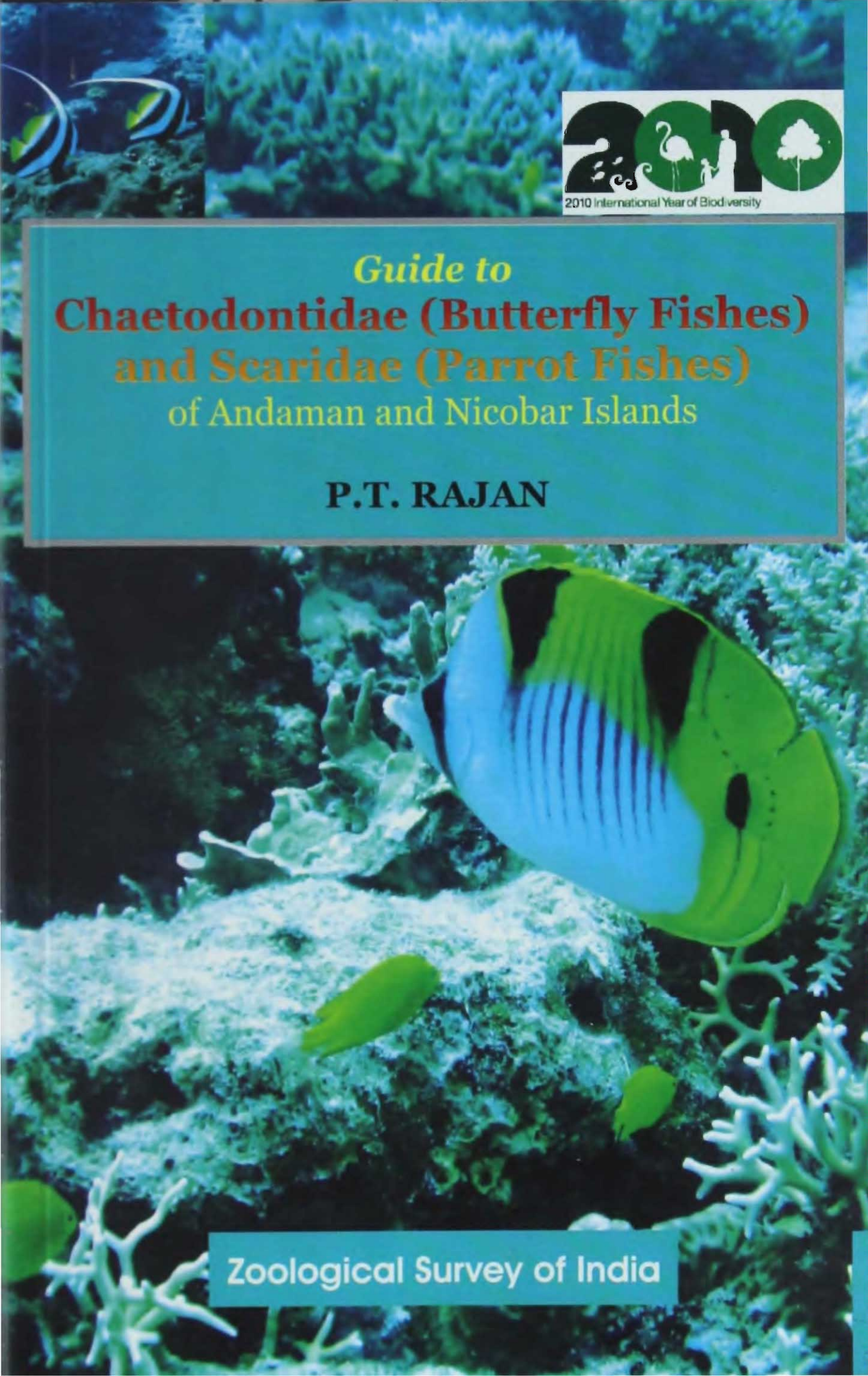

Guide to

Chaetodontidae (Butterfly Fishes) and Scaridae (Parrot Fishes)

of Andaman and Nicobar Islands

P.T. RAJAN

Zoological Survey of India


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Chaetodontidae (Butterfly Fishes) and Scaridae (Parrot Fishes)
of Andaman and Nicobar Islands

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FOREWORD

The Andaman and Nicobar Islands falls within what is the Indo-Pacific realm – the world's richest region of marine biodiversity perspective. Andaman and Nicobar Islands has unique ecological systems mainly contributed by coral reefs (as spawning and feeding grounds), seagrass beds (as nursery grounds) and mangroves (as shelter and feeding grounds) for many species of commercially important finfish and shellfish. There are 572 islands, islets, rocky out crops which extend between 92nd and 94th meridians of East latitude and 6th and 14th parallels of North latitude i.e., these islands form part of a long, irregular chain that seems to continue the Eastern Himalaya ranges though Myanmar's Arakan Yoma Southwards in an arch over 1100 km in the sea into Sumatra. The total coast line of Andaman and Nicobar Islands is 1962 km.

The butterflyfishes under the family Chaetodontidae are one of the most conspicuous elements of the coral reef community. The butterflyfishes are very closely related to angelfishes in their colour pattern. The butterflyfishes gets its name because of its comb shaped teeth. They are brightly coloured, estimated 125 species in 10 genera with *Chaetodon* (90 species) in the world. Among the 750 coral reef fish species recorded from Andaman and Nicobar Islands, Butterfly and Parrot fishes under the family *Chetodontidae* and *Scaridae* show a very rich biodiversity and species richness in a healthy coral reef. Butterflyfishes species richness is greatest in the central Indo- Pacific region. These families occurr widely in tropical, subtropical and temperate coral reef habitats. This study also investigates butterflyfishes as habitat indicators and plays a role as key species for use in coral reef ecosystem monitoring and management, emphasizing knowledge in butterflyfish ecology and systematics. Studies of butterflyfish occurrence and abundance in natural habitats have also been discussed.

The present underwater scientific investigation done by P.T. Rajan of Zoological Survey of India, Port Blair on the diversity of 38 species of butterfly and 23 species of parrot fishes of Andaman and Nicobar Islands. He is an Advanced Water SCUBA Diver and has been studying the faunal diversity of Andaman and Nicobar Islands for the last 23 years.

Dr. Ramakrishna
Director
Zoological Survey of India

PREFACE

Coral reefs throughout the world are highly degraded and subject to an increasing prevalence of disturbances. Degradation of coral reef habitats is likely to lead to a decline in resource availability for many reef fishes. Among the 750 coral reef fish species recorded, butterfly and parrotfishes under the family Chetodontidae and Scaridae show a very rich diversity and species richness in a healthy coral reef. Studies made on the diversity of butterflyfishes of Andaman and Nicobar Islands revealed the occurrence of 38 species of butterflyfishes and 23 species of parrotfishes, the family occurring widely in tropical, subtropical and temperate coral reef habitats. The recorded species have exclusive ornamental value and are not considered as food fishes. Butterflyfishes have been considered as habitat indicators and in the last few years, considerable research on coral reef fishes has been carried out to examine the effects of both naturally varying factors and human induced modifications on habitat utilization at different scales. Today several species of butterflyfishes are used by conservation Zoologists as indicator species to identify habitat that are critical and need to be protected. Butterflyfishes are also monitored to indicate climate change and environmental degradation. Thus, like other animals and birds, butterflyfishes are now studied as living ecological mechanism. Coral reefs are being highly degraded by many types of disturbances such as cyclones, earthquake and tsunami, outbreaks of crown-of-thorns starfish that can vary in their effect at small scales and further increase spatial variability in benthic habitats. The increasing prevalence of disturbances on coral reefs, such as coral bleaching, is leading to worldwide degradation of habitats for reef organisms. This degradation, when combined with naturally occurring habitat variation at small scales, is likely to affect fishes with close links to their habitat, especially fishes with obligate coral feeding requirements, such as butterflyfishes. The distribution patterns of butterflyfishes are often closely related to the distribution of their particular prey resources. For coral-feeding fishes, the composition and quantity of prey resources varies greatly across a range of different spatial and temporal scales. It has been well documented that butterflyfish abundances often vary in accordance with coral cover and often decline following extensive coral depletion, indicating that this family may be useful as an indicator of environmental

quality on coral reefs. Degradation of coral resources may also lead to sublethal stresses in butterflyfishes. Butterflyfish occur mainly in coral reef habitats, mostly close to or near the bottom of the littoral region. They are territorial and daily short-distance movements within and among foraging and resting sites in the reef areas. In Andaman and Nicobar *Chaetodon trifasciatus* species is the most abundant in shallow water, occurring in areas of healthy reef in good numbers. They are usually observed in pairs picking at scleractians. Butterflyfish species are relevant to fisheries in many areas worldwide and several species have high economic importance for aquarium trade. There is least fishing pressure in Andaman and Nicobar Islands and as far as exploitation of butterflyfish is concerned, only small collection are made by Department of Fisheries and Navy for their aquarium use. The obligate butterfly fishes are under threat as these exclusively feed on coral polyp. Today I see a great revival of interest in coral reef studies and there are more university students now studying reef ecosystems. The increased interest in the subject made us all to realise the absence of popular comprehensive guide, which could help amateurs to enjoy and identify butterfly and parrotfishes. For easy identification, all the species are depicted in live colour photographs taken by the author, Sreeraj, Titus and Dr J.E. Randall of Bishop Museum Hawaii in their natural habitats. The text has been kept simple and technical terms used in the text are explained in a glossary. A map showing the distributional range of butterflyfishes in the world has been included.

P.T. RAJAN

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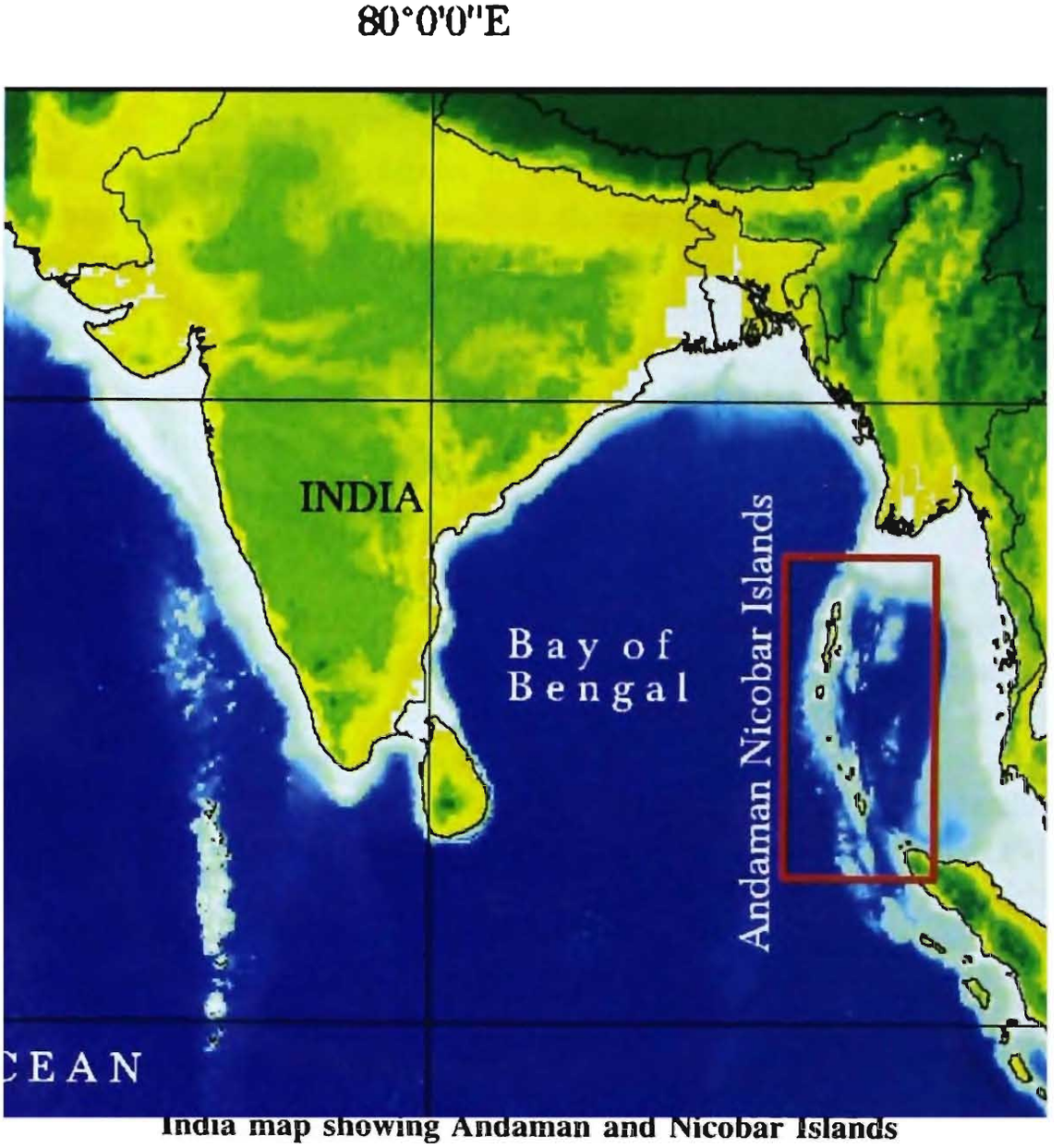
I wish to express my sincere gratitude to Dr. Ramakrishna, Director ZSI and Dr. C. Raghunathan, Officer-in-Charge, ANRS Zoological Survey of India for encouragement and support. I am indeed grateful to Dr. Rajkumar Rajan, Scientist and my buddy in the field and office as he took keen interest in this project. I am especially thankful to the entire Publication team, especially Mr. Rati Ram Verma, Publication Production Officer for his sincere efforts in bringing out this book. Finally I owe my deepest gratitude to Dr. John E. Randall, Emeritus Scientist, Bishop Museum Hawaii who readily gave his excellent images for the book and guidance on reef fishes from the beginning of my service in 1987. I extend my sincerest thanks to Mr. S. Chaudary, Principal Chief Conservator of Forests, Dr. Alok Saxena, Additional Principal Chief Conservator of Forests, Mr. Ajay Saxena and Mrs. Kala, Chief Conservators of Forest, Mr. C.A. Rahman, Director Forest training School and Mr. Rajkumar, Range Officer of Forest Department; Mr. Bajrang Lall, Assistant Commissner Nancowry Island, Mr. Som Naidu Assistant, Commissner Port Blair, Mr. Rishikesh Sinha Science and Technology, Ms. Elrika Dsouza, Mr. Vardhan of Reef Watch, Dr. C. Sivaperuman, Scientist-C, Sreeraj and Titus, Zoological Survey of India, Port Blair for their kind help in many ways. Special thanks are due to Dr. K. Rema Devi, Scientist-E, Marine Biological Station, Zoological Survey of India, Chennai as one of the reviewer and another anonymous reviewer for providing helpful comments. This project took five years to complete, overcoming several hurdles as difficulties in survey the remote islands during dive trips, transfer to Kolkata and found my self as sole runner and an accident took place during a dive trip in Teresa Island , Nicobar group and broken my foot and ligament tear on knee.

CONTENTS

INTRODUCTION

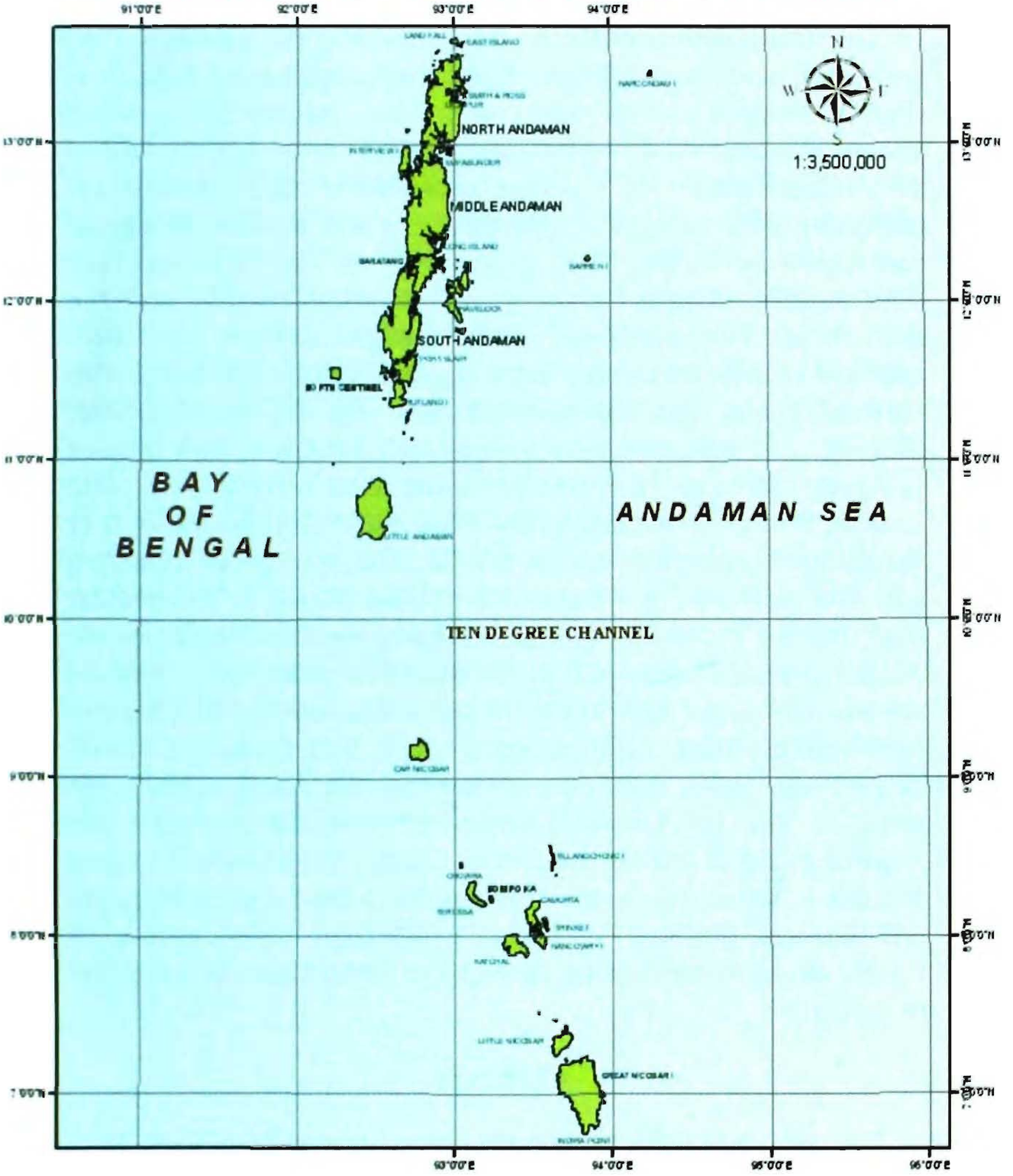
Andaman and Nicobar groups of islands are situated in the Bay of Bengal, mid way between peninsular India and Mayanmar, spreading like a broken necklace in the North-south direction. These islands are located between 6° 45` and 13° 41` North latitudes, and 92° 12` and 93° 57` East longitude. There are in all 572 islands which can be distinguished into two groups geographically. Islands located north of 10° N latitude are known as Andaman group of Islands while islands located south of 10° N latitude are called Nicobar group of islands. Total geographic area of Andaman & Nicobar Islands is 8249 sq km of which Andaman group of islands cover 6408 sq km while Nicobar group cover 1841 sq.km. Out of total 572 islands only 36 islands are inhabited by human beings, 26 in Andaman group and 10 in Nicobar group of islands. These islands are the summits of a submarine mountain range lying on the great tectonic suture zone extending from the eastern Himalayas along the Myanmar border to the Arakan and finally Sumatra and Lesser Sundas. The northern most part of these islands is isolated from cape Negrais in Southern Myanmar by the North Preparis channel and the southern most part is also separated from the Acheen Head of Western Sumatra by the Great channel. There are two more deep channels – (i) the ten degree channel which isolates Andaman islands from Nicobar islands the (ii) the Sombero channel which isolate Great Nicobar from Nicobars and the Nancowrie group. The physiography of these islands is characterised by undulating topography and intervening valleys. There are, however, some flat islands like Car Nicobar and Trinket. There is no major perennial fresh water river in these islands except Kalpong in North Andaman, Alexendra, Dagmar and Galathea river in Great Nicobar. There are several rainfed streams which dry up during summer. The coastal line of these islands is wavy with large number of bays, lagoons and serpentine creeks, and extends to about 1962 km. At several places tidal creeks penetrate far inside the land and form outlets for fresh water streams. A major part of Andaman Islands comes under medium slope category. The lower and higher slopes

occupy second and third place respectively. Except for Interview, Little Andaman and Car Nicobar islands which are more or less flat, other islands have very little flat land. Smaller islands in the Nicobar group of islands have gentle undulating or flat topography. Rock formation in the Andaman is of sedimentary origin made up of non calcareous grey sandstone, limestone and calcareous sandstone. Valley soils of the Andaman are alluvial resulting from deposition of fine material from higher slopes which are leached due to high rainfall.



India map showing Andaman and Nicobar Islands

Andaman & Nicobar Islands



COASTLINE

The total coastline of the Andaman and Nicobar islands is 1962 km which is about one fourth of the total coastline of India. It is rimmed discontinuously with saline and marshy lands which generally extend 1-2 km inland and at places up to 4-5 km. One of the typical features of the long coastline of the islands is the mangrove vegetation. The mangroves of the islands are almost well preserved so far. Their productivity is very high and they form nursery grounds for many coastal species of fin fishes and shell fishes. The islands are mostly grouped and are moderately indented to form numerous bays, lagoons, creeks and inlets with varying depths and different substrata. On the seaward side, fringing coral reefs and in some area atoll formation with lagoons is present. Most of the sea bed near the coast is rocky with coral growth. Within a few kilometers from the shore, the sea is very deep, thus limiting the continental shelf area to about 15000 sq km. The shelf area of western coast of the islands is much wider than the east coast. The Exclusive Economic Zone (EEZ) of the Andaman and Nicobar Islands encompasses about 0.6 million sq km which is about 30% of that of the whole country. In Andaman Sea there are three main channels viz 1. The Preparis Channel divided into North and South portions by the island of the same name. 2. The Ten Degree Channel, between the Andaman and Nicobar group of islands and 3. The Great Channel between Great Nicobar Island and Sumatra. Towards the South between Malaysia and Sumatra, the Strait of Malacca maintains the connection of Pacific Ocean water flowing through the South China Sea and Bay of Bengal.

CLIMATE

The climate is tropical, with the temperature ranging from 18°C to 34°C. The island receives an annual rainfall of 300 cm well spread over 8-9 months with both South West and North East monsoons. Maximum daily sunshine of 8-10 hours is experienced during March-April and the cloudy weather restricts sun shine to 3-8 hours during May-December. Humidity remains high most of the time, being sea locked islands. The islands receive north easterly wind between November and March and south westerly

winds between June and October. Swift winds and cyclonic weather commonly prevail during the change of monsoons.

HYDROGRAPHIC FEATURE

The temperature of the coastal water varies between 27° c and 32° C and salinity between 22 ppt and 32 ppt. During Feb-April (Pre south west monsoon period) the salinity is very high with very little fluctuations. During May to November, low salinity prevails with greater fluctuation influenced by rains during both monsoons. During December and January (post north east monsoon period) the salinity of water tends to rise. The inshore waters particularly the unprotected shores of Andaman and Nicobar Islands are often turbid due to the presence of mud and sand. Large quantity of fine silt from uplands and mangrove soils are washed away by rain water and discharged into sea during monsoon months. Added to this, wind generated waves stir up shore and get them suspended and later deposit in the near shore area. To a depth of 1 m or so and up to a distance of 100 m from the shore, coral growth in general is scarce and the only corals found in this situation are those capable of combating the effects of silting. In protected bays silting effect is comparatively less. One of the major limiting factors to coral growth has been attributed to the deleterious effect of silting.

CHAETODONTIDAE
BUTTERFLY FISHES

The taxonomy of various fish families is constantly undergoing updates. Chaetodontids belong in the "Order Perciformes" and "Suborder Percoidei" as members of the "Family Chaetodontidae" (Butterflyfishes) which contains 13 genera and almost 125 species Kuiter (2002). This is a very large family, probably containing the most colourful fishes to be found in the wild. They are laterally compressed disc-shaped fishes and most donot get overly large, *i.e.*, about six inches. Besides their size and colouration, they make good community fish. Their diet consists mostly of coral polyps, crustaceans, and algae. Distribution is quite extensive as it found in both the west and Central Pacific Ocean, Hawaii, Southern Japan, and the Northwest and East coast of Australia, along with areas in the Atlantic Ocean. Amongst the more common and beautiful fishes on any reef, the butterfly fish are known for their symmetry and the brilliant colours. Butterfly fish mouth is

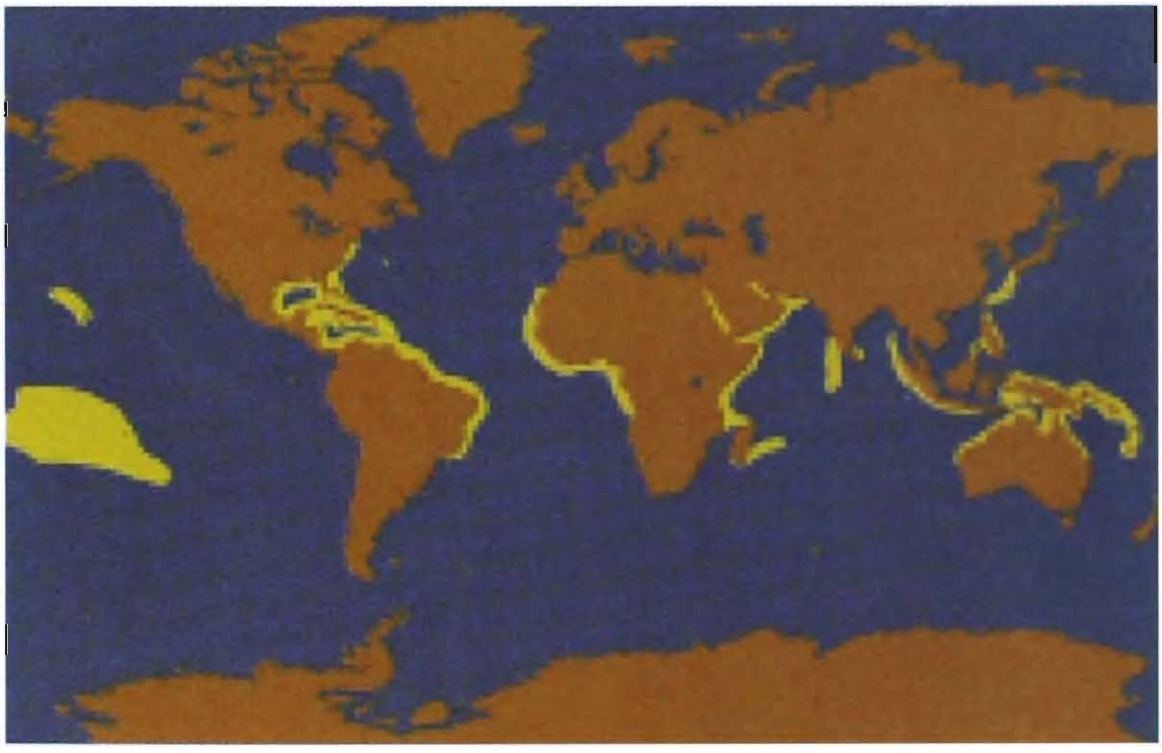
small, snout more or less pointed. Teeth have the shape of a brush, adapted to feed on pieces of soft animals. The body is laterally compressed, to enable swimming between the coral branches in case of danger. Butterfly fishes are slow swimmers but with a very high capability to maneuver for this quality they use caudal fin for propulsion, the highly mobile pectoral fins and the undulating dorsal and anal fins for narrow space maneuver. The maximum diversity of butterfly fish species is in the reef front. Most species are diurnal, and feed on algae, corals, worms and other small invertebrates. Few species feed on plankton and live in schools. Many species are territorial, many live in monogamic pairs, together for life, sharing a feeding territory. Butterfly fishes always lack the spine on the operculum. Butterfly fishes are amongst the more conspicuous reef fishes. Some species feed exclusively on live hard corals. These species are considered as coral reef's Health Indicator Species.

Butterflyfish species richness (the number of species coexisting at a given site or in a given area or region) is greatest in the central Indo-West Pacific region. At least 40 species are known from the Great Barrier Reef (Steene 1977), and perhaps

A Diver monitoring on the reef of North Bay Island, South Andaman

higher numbers may occur somewhat further to the north and west. Proceeding westward species richness declines. Fourteen species are recorded from the Red Sea (Randall 1983). Eastward across the equatorial Pacific numbers drop gradually to 28 in the Society Islands and 14 in the Marquesas (Randall 1985). In the tropical Eastern Pacific only 3-4 species have been reported (Burgess 1978, Thomson *et al.*, 1979). In the Caribbean 5-6 species are known (Randall 1968). In Andaman and Nicobar Islands 38 species are recorded. *Chaetodon trifasciatus* is the most abundant shallow water chaetodontid. They are usually observed in pairs picking at scleractinians. Each pairs appears to forage within a limited area. *Chaetodon trifascialis* is a territorial, diurnal, corallivore found in close association with *Acropora* spp. No other chaetodontoid is known to be so specialized in terms of its prey choice. *Chaetodon andamanensis* is not a valid species and should be treated as a junior synonym of *Chaetodon plebeius* "There are various 'intermediates' from the Maldives, Phuket and the eastern Indian Ocean that are well documented and prove that it is merely a geographical colour variation. (Wm Leo Smith *et. al.* 2003), *Heniochus* species (banner fishes) have a filament on the anterior part of dorsal fin.

Almost all of the research involves direct observation of butterflyfishes on the coral reefs of Andaman and Nicobar Islands



Butterflyfish range in the world (After Tim laman)

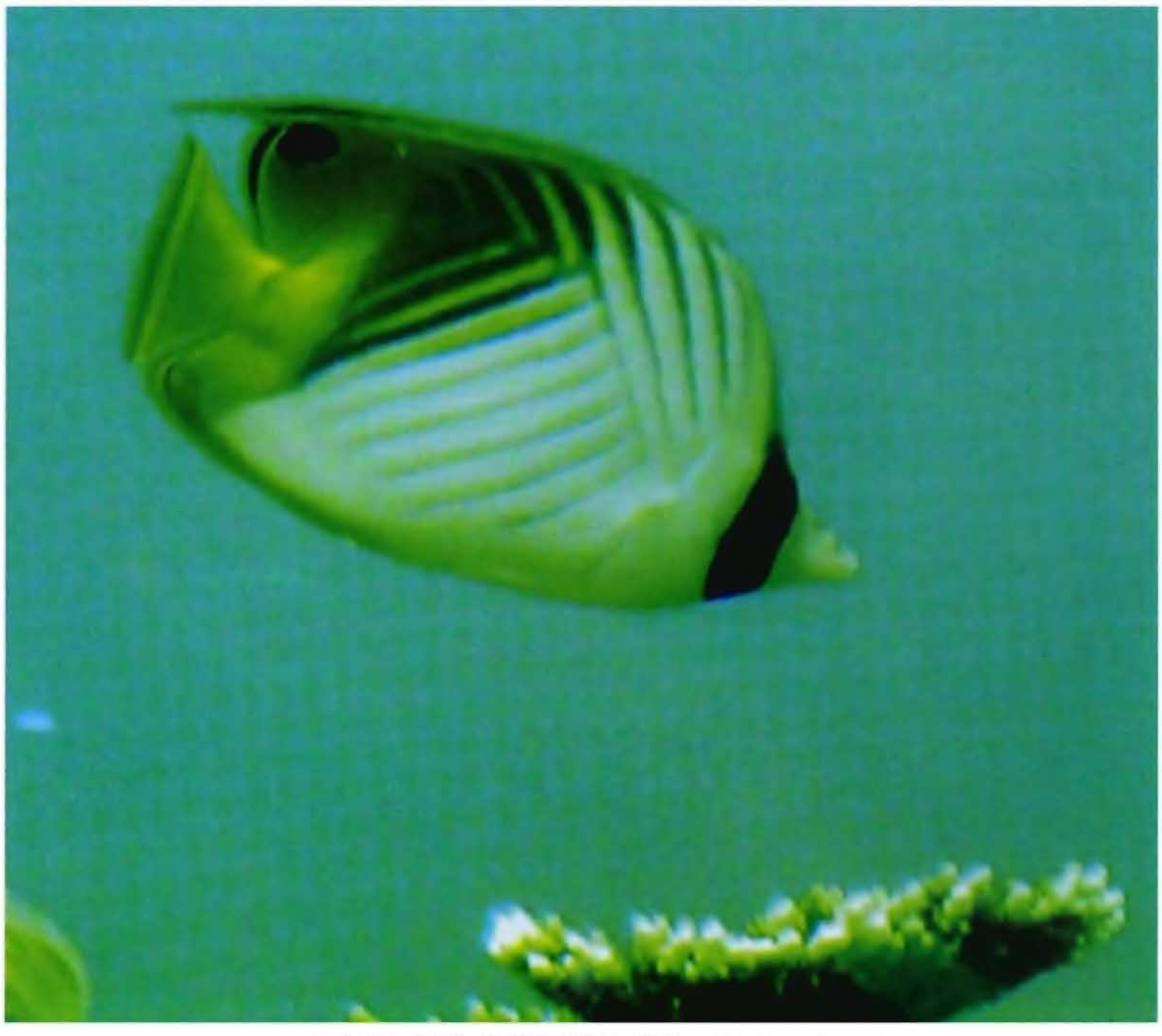
with SCUBA. Butterflyfishes are diurnal so all work is done during daylight hours and favourable weather conditions. In 2004 Nicobar Islands were battered by Earthquake and Tsunami which destroyed the corals, with heavy silting and on a subsequent survey trip very few butterflyfishes were seen as compare to Andaman Islands where its number is more.

1. *Chaetodon auriga* Forsskål, 1775

Common name : Threadfin butterfly fish

1775. Forsskål, P. *Descript. Animal*, p. 60 (Type locality : Red Sea).

Description Medium size butterflyfish, attains 23 cm. Dorsal fin XII–XIII spines, 22-25 rays; Anal fin III spines, 21 rays; Pectoral fin 14-16 rays; Ventral fin I spine and 5 rays. White with diagonal black lines, superimposing with a typical pattern. Vertical black band covering the eye. Yellow dorsal, anal and caudal fins, the dorsal with a short filament heading backward. The thread fin distinguishes it easily from other white and black species, in particular from *Chaetodon vagabundus*, which has the similar colour pattern. There is a pattern of 'chevron' markings on the sides and a prominent black spot at the posterior edge of the soft portion of the dorsal fin. Common in lagoon, back reef, reef front. Often in areas of dead coral. May be seen in a variety of habitats



Threadfin butterfly fish *Chaetodon auriga*

Threadfin butterfly fish *Chaetodon auriga*

ranging from rich coral reefs to weedy and rubble covered. May be found singly, in pairs, and in aggregations that roam over large distances in search of food. Feed on polychaetes, sea anemones, coral polyps and algae.

Distribution Indo-Pacific Red Sea and East Africa, extending to Mossel Bay, South Africa, to the Hawaiian, Marquesan, and Ducie islands, north to southern Japan, south to Lord Howe, Rapa islands and India (Andaman and Nicobar Islands).

2. *Chaetodon bennetti* Cuvier, 1831

Common name Eclypse butterfly fish

1831. Cuvier, G. and Valenciennes A. *Hist. Nat. Poiss.*, **7** : 84 (Type locality : Sumatra).

Description : Medium size butterflyfish, size 18 cm. Dorsal fin XIII–XIV spines, 15-17 rays; Anal III spines, 14-16 rays; Pectoral fin 16-17 rays; Ventral fin I spine and 5 rays. Body yellow and a large black blotch with blue circle on sides. Easily distinguished by the blue lines. Occur in lagoon and seaward reefs in areas with rich coral growth, common along the external reef, to a maximum depth of 30 m. Adults solitary or in pairs, omnivorous. Often found in deep reef, reef external slope areas with a rich cover of *Anthipataria*, its main food, also feeds on coral polyps.

Distribution Indo-Pacific: East Africa to the Pitcairn Group, north to Japan, south to Lord Howe, Rapa islands and India (Andaman and Nicobar Islands).

Eclypse butterfly fish *Chaetodon bennetti* Photo : John E. Randall

3. *Chaetodon citrinellus* Cuvier 1831

Common name Speckled butterflyfish

1831. Cuvier, G. *Hist. Nat. Poiss.*, **7** : 27 (Type locality : Gaum).

Description Small butterflyfish, attains 13 cm. Dorsal fin XIII–XIV spines, 20-22 rays; Anal fin III spines, 16-17 rays; Pectoral fin 16-17 rays; Ventral fin I, 5 rays. Yellowish colour, dotted along the sides. Black bar over head and black margin on anal fin .Common in shallow exposed reef flats, lagoons, and seaward reefs; in relatively open areas with scattered corals and occasionally at depth of 32 m. Feed on small worms, small benthic invertebrates, coral polyps, and filamentous algae.

Distribution Indo-Pacific East Africa to the Hawaiian, Marquesan and Tuamoto islands, north to southern Japan and the Ogasawara Islands, south to New South Wales (Australia), Lord Howe Island and India (Andaman and Nicobar Islands).

Speckled butterflyfish *Chaetodon citrinellus* Photo : Sreeraj

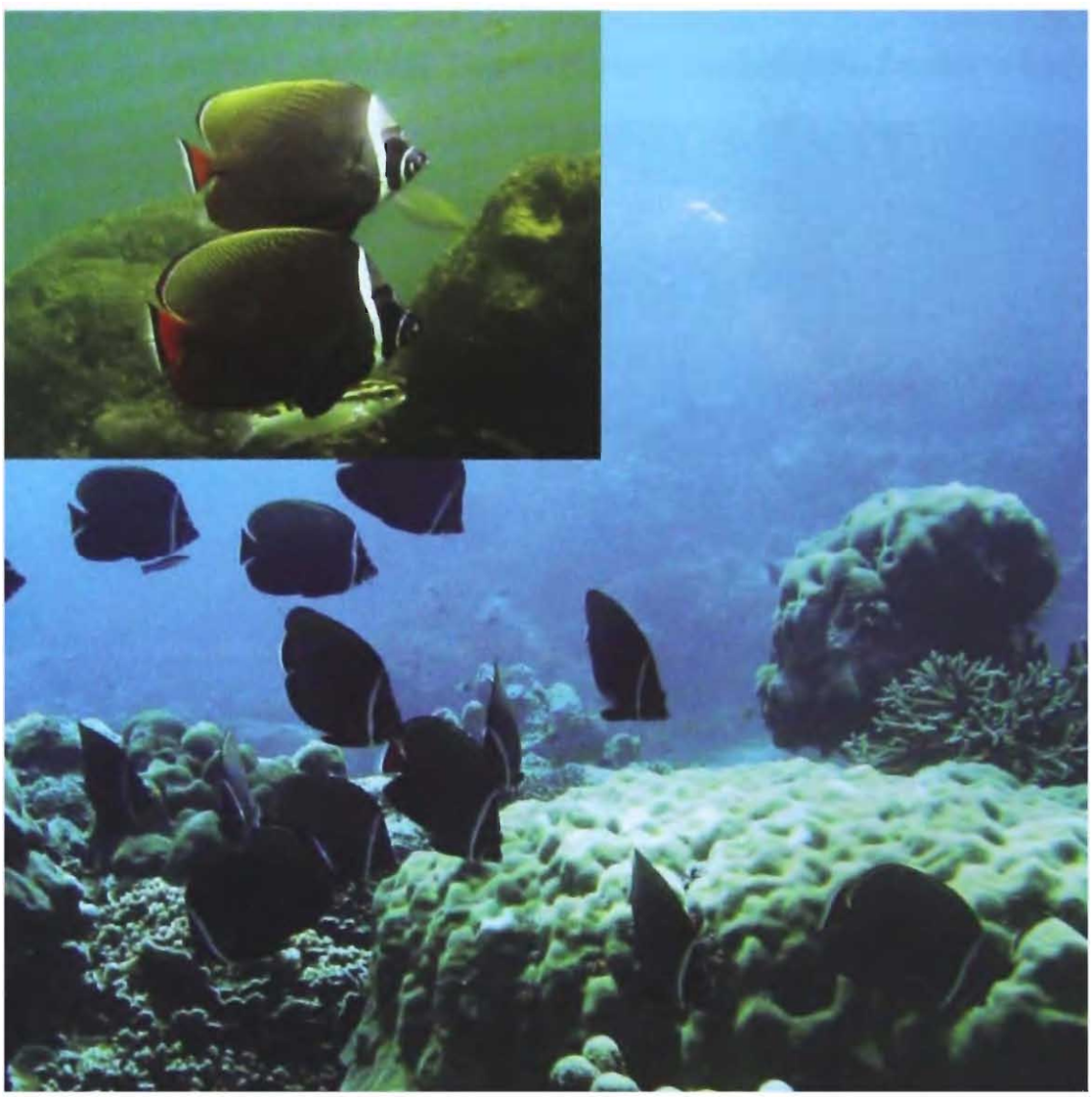
4. *Chaetodon collare* Bloch, 1787

Common name Collared butterflyfish

1787. Bloch, M.E. *Naturg. Ausl. Fische.*, **3** : 116 (Type locality : Japan).

Description Medium size butterflyfish, attains 18.0 cm. Dorsal fin XII spines, 25-28 rays; Anal fin III spines, 20-22 rays; Pectoral fin 16 rays; Ventral fin I, 5 rays. Typical peppered grey colour with an obvious white collar and red tail. Occur in coral reefs in pairs or several aggregations, usually found on reef edge and upper slope. Depth range 3-15 m. feeds primarily on coral polyps.

Distribution Indo-West Pacific Persian Gulf and Maldives to Japan, the Philippines, Indonesia and India (Andaman and Nicobar islands).



Collared butterflyfish *Chaetodon collare*

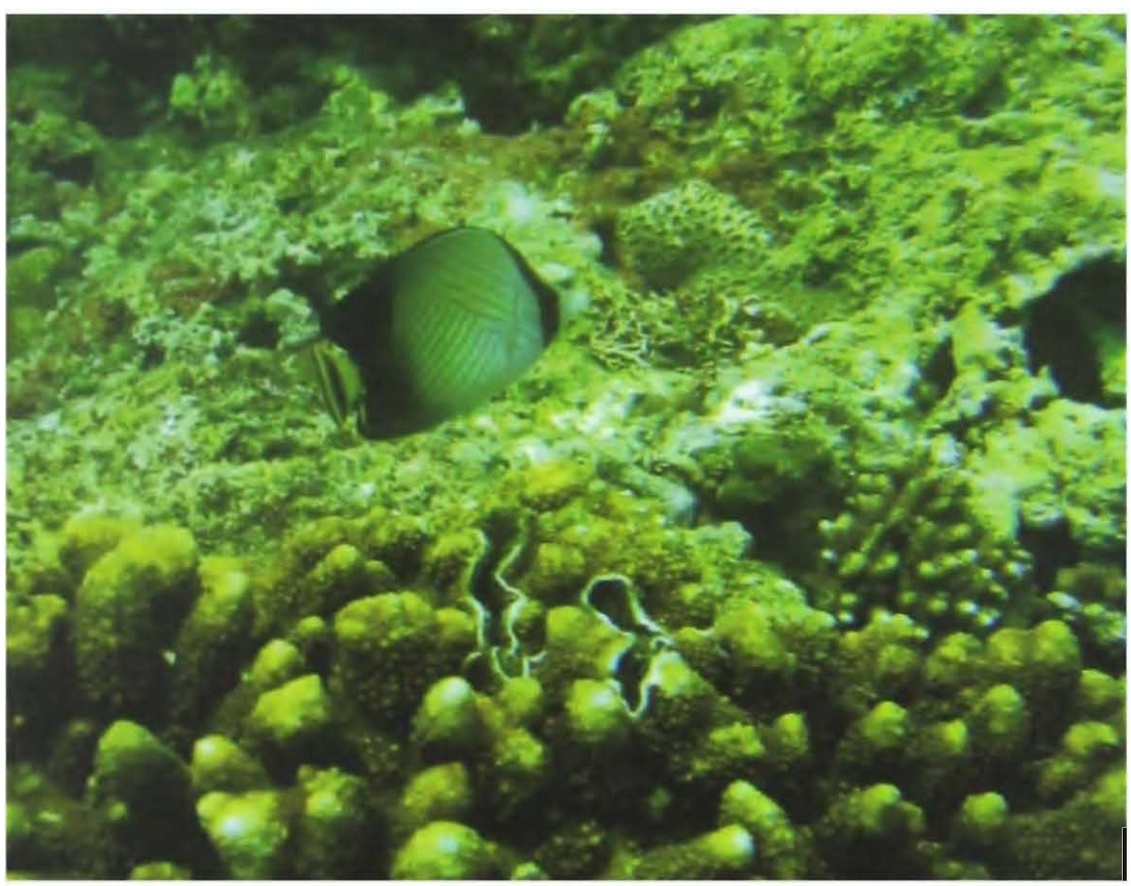
5. *Chaetodon decussutus* Cuvier, 1831

Common name Indian vagabond butterflyfish

1829. Cuvier, G. *Hist. Nat. Poiss.*, **7** : 54 (Type locality : Pondicherry).

Description Large butterflyfish, attains 20 cm. Dorsal fin XIII spines, 24-25 rays; Anal fin III spines, 20 rays; Pectoral fin 15 rays; Ventral fin I spine, 5 rays. Very similar to *Chaetodon vagabundus* but with black dorsal and anal fins. Body whitish with six diagonal lines extending from upper posterior part of head to base of dorsal spines; Eleven similar lines at right angle from previous lines towards anal fin. Most of dorsal fin black and caudal fin with black vertical bands; a black bar through eye. Depth range 1-30 m. Found on rich coral reefs, also on rubble and rocky areas, Coastal bay, Lagoon, Reef external slope, Reef flat, Sand. Common in turbid water. Feeds largely on algae and coral polyps.

Distribution Indo-West Pacific Maldives, India, Sri Lanka, the westernmost portion of the Indo-Malayan Archipelago and India (Andaman and Nicobar Islands).



Indian vagabond butterflyfish *Chaetodon decussatus*

6. *Chaetodon ephippium* Cuvier,1831

Common name Saddled butterflyfish

1831. Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.* **7** : 80 (Type locality : Moluccas).

Description Large and colourful butterfly fish, attains 23 cm. Dorsal fin XI–XIV spines, 21-25 rays; Anal fin III spines, 20-23 rays; Pectoral fin 15-16 rays; Ventral fin I spine, 5 rays. Overall colour is yellowish grey with a large black spot bordered below by a broad white band on the back, and wavy blue lines on the lower sides. Adults have a filament extending posteriorly from the upper part of the soft portion of the dorsal fin. Normally encountered on back reef and external reef, in coral rich areas. Feeds on corals, sponges, other invertebrates, algae and fish eggs. Usually in pairs.

Distribution Indo-Pacific Sri Lanka and Cocos-Keeling Islands to the Hawaiian, Marquesan and Tuamoto islands, north to southern Japan, south to Rowley Shoals, New South Wales, Australia and India (Andaman and Nicobar islands).

Saddled butterfly fish *Chaetodon ephippium*

7 *Chaetodon falcula* Bloch, 1795

Common name : Sickle butterflyfish

1795. Bloch, M.E. *Naturg. Ausl. Fische.*, **9** : 102.

Description Large butterflyfish, attains 20 cm. Dorsal fin XII–XIII spines, 23-25 rays; Anal fin III spines, 20-21 rays; Pectoral fin 15-16 rays; Ventral fin I spine, 5 rays. Depth range 1-15 m. Distinctly marked with bright yellow and orange over the back and tail. Two well-defined black saddles on the back. A broad black band from nape through eye to isthmus. Body with several black vertical lines. Black band around caudal peduncle. Dorsal, anal, and caudal fins yellow with submarginal black band. Found on the reef edge and upper slope. Usually in current-prone habitats; Feed mainly on invertebrates.

Distribution Indian Ocean East Africa, Indonesia and India (Andaman and Nicobar islands).

Sickle butterflyfish *Chaetodon falcula*

Sickle butterflyfish *Chaetodon falcula*

8. *Chaetodon garderi* Norman, 1939

Common name Garder's Butterflyfish

1939. Norman, J.R. *Sci. repts. John Murray Exped.*, 7(1) : 65 (Gulf of Oman).

Description : Medium butterflyfish, attains 17 cm; body oval, deep, strongly compressed. Small protractile mouth with brush-like teeth in the jaws. Dorsal fin with XII spines, no notch between spinous and soft dorsal fin; and 20 to 22 soft rays; Anal fin with III spines and 18 to 19 soft rays; Pectoral fins transparent with 13 to 14 soft rays; Pelvic fins with I stout spine and 5 branched rays; caudal fin rounded. Horizontal lines present in lower portions of body; dorsal fin mostly dark the colour extending across posterior part of body to base of anal fin; broad eye band from nape to chest. Inhabit coastal reefs at depths of 10 to 50 m, primarily on rubble slopes.

Distribution Western Indian Ocean Gulf of Aden to the Gulf of Oman eastward to Sri Lanka.

Garder's Butterflyfish *Chaetodon garderi* - Photo : Sreeraj

9. *Chaetodon guttatisimus* Bennett, 1833

Common name Peppered butterflyfish

1833. Bennett, E.T. *Proc. Zool. Soc.*, London **2** : 183 (Type locality : Ceylon).

Description Small butterflyfish, attains 12 cm. Dorsal fin XII-XIII spines, 22-24 rays; Anal fin III spines, 16-18 rays; Pectoral fin 14 rays; Ventral fin I spine, 5 rays. Depth range 3-25 m. Body pale with close-set dusky spots, forming a vertical pattern on upper sides and horizontal on lower, with a peppered pattern on black points. Yellow margin on dorsal fin with bright orange above the caudal peduncle. Inhabit lagoon and seaward reefs. Feed on polychaetes, coral polyps, and algae.

Distribution Indian Ocean Red Sea south to Durban, South Africa and east to Christmas Island, western Thailand, Indonesia and India (Andaman and Nicobar Islands).

Peppered butterflyfish ***Chaetodon guttatisimus***

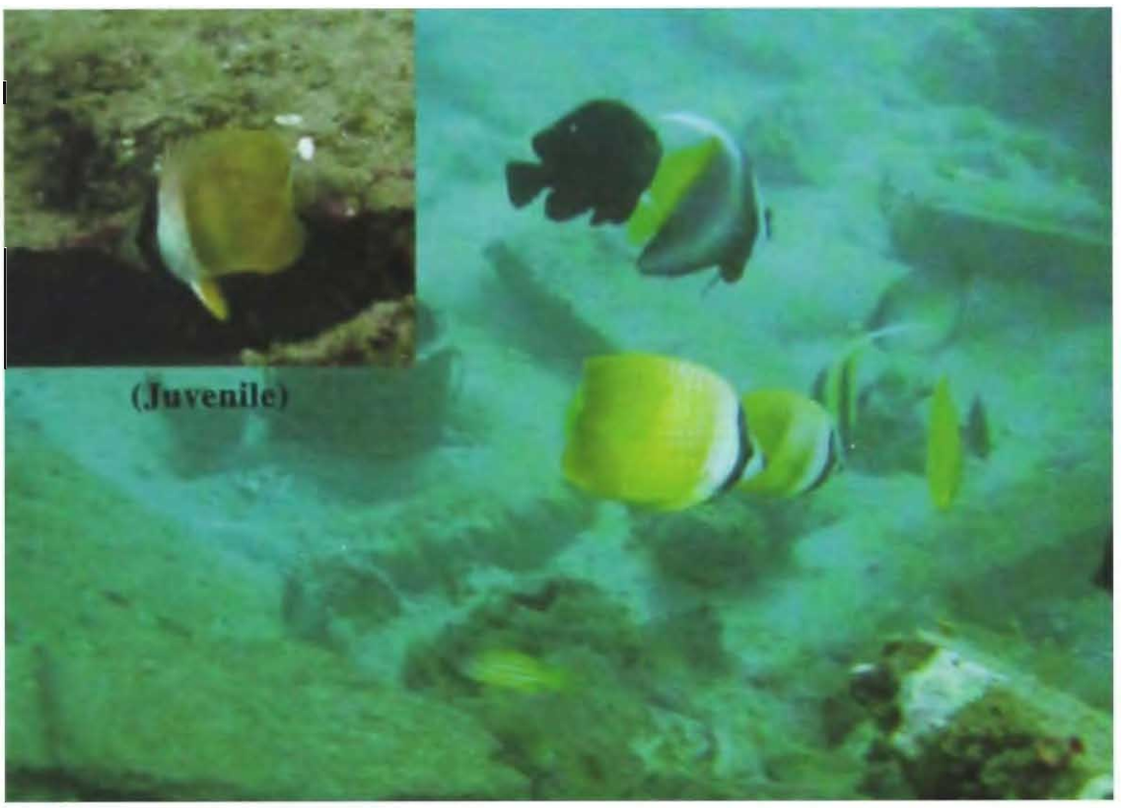
10. *Chaetodon kleinii* Bloch, 1790

Common name Klein's butterflyfish

Bloch, M.E. 1790. *Naturg. Ausl. Fische.*, p. 7 (Type locality : East Indies).

Description Small butterflyfish, attains 15 cm. Dorsal fin XIII-XIV spines, 20-23 rays; Anal fin III spines, 17-20 rays; Pectoral fin 13-14 rays; Ventral fin I spine, 5 rays. Depth range 4-50 m. Easy to identify is one of the few species of butterflyfish with drab colour. Body is yellowish brown with two broad white vertical bars running across the body one from near the origin of the dorsal spine and the other from the middle of the back. A black bar runs vertically across the eye. There are numerous dotted horizontal stripes on the sides. The margin of caudal fin is transparent. Occur in deeper lagoons and channels, and seaward reefs. Common, it lives in pairs or in shoals, feeding on corals, algae, worms, crustaceans, plankton and fish eggs.

Distribution Indo-Pacific : Red Sea and East Africa south to Coffee Bay, South Africa, to the Hawaiian Islands and Samoa, north to southern Japan, south to New South Wales, Australia and New Caledonia. Eastern Pacific Galapagos Islands and India (Andaman and Nicobar islands).



Klein's butterflyfish *Chaetodon kleinii*

11. *Chaetodon lineolatus* Cuvier 1831

Common name Lined butterflyfish

1831. Cuvier, G., *Hist. Nat. Poiss.*, **7** : 40 (Type locality : Mauritius).

Description Large butterflyfish, up to 30 cm long. Dorsal fin XII spines, 24-27 rays; Anal fin III spines, 19-22 rays; Pectoral fin 16 rays; Ventral fin I spine, 5 rays. Body color is white with a black elliptical marking along the edge of the posterior portion of the back extending across the caudal peduncle to the base of the posterior anal fin rays. A series of thin vertical black lines run across the sides, and a prominent vertical black band runs across the eye. The dorsal caudal and anal fins are bright yellow. Occur in lagoon and seaward reefs, usually in pairs in coral rich areas. Feed mainly on coral polyps and anemones, but also on small invertebrates and algae. Largest species in the genus.

Distribution Indo-Pacific Red sea and East Africa to the Hawaiian, Marquesan, and Ducie islands, north to southern Japan, south to the Great Barrier Reef and Lord Howe Island. Throughout Micronesia and India (Andaman and Nicobar islands).

Lined butterfly fish ***Chaetodon lineolatus***

12. *Chaetodon lunula* (Lacepède, 1803)

Common name Racoon butterfly fish

1802. Lacepède, B.G.E. *Hist. Nat. Poiss.*, 507, 511, 513.

Description Medium size butterflyfish, attains 20 cm. Dorsal fin XII-XIV spines, 20-25 rays; Anal fin III spines, 17-20 rays; Ventral fin I spine, 5 rays. Yellow background with diagonal brown stripes and black and white decorations on the head, black spot on caudal peduncle. Usually in pairs or small groups in shallow reef flats of lagoon and seaward reefs to depths of over 30 m. Juvenile occurs among rocks of inner reef flats and in tide pools. Adult feeds mainly on nudibranchs, tubeworm tentacles, and other benthic invertebrates, also feeds on algae and coral polyps. Often seen at day resting underneath coral formations.

Distribution Indo-Pacific East Africa to the Hawaiian, Marquesan, and Ducie islands, north to southern Japan, south to Lord Howe and Rapa islands. Southeast Atlantic: East London, South Africa and India (Andaman and Nicobar islands).

Racoon butterfly fish *Chaetodon lunula* - Photo Sreeraj

13. *Chaetodon melannotus* Schneider, 1801

Common name Black backed butterfly fish

1801. Schneider, J.G., *Systema Ichthyol.*, : 224 (Type locality : Tranquebar).

Description Medium size butterflyfish, attains 15 cm. Dorsal fin XII–XIII spines, 18-21 rays; Anal fin III spines, 16-18 rays. Rounded shape, horizontal black lines, black saddle on caudal peduncle, black spot in the anus area. Usually solitary or in pairs in coral-rich areas of reef flats, lagoons, and seaward reefs to a depth of over 15 m. Feed on octocorallian soft corals such as *Sarcophyton* and *Synularia*,and scleractinian coral polyps. This is another good indicator species, in particular of the health status of leather corals.

Distribution Indo-Pacific, India (Andaman and Nicobar Islands).

Black backed butterfly fish ***Chaetodon melannotus***

14. *Chaetodon meyeri* Bloch and Schneider, 1801

Common name Meyer's butterflyfish

1801. Bloch, M.E. and Schneider, J.G. *Systema Ichthyol.*, : 223. (Type locality : Moluccas).

Description Medium size butterflyfish, attains 18.0 cm. Dorsal fin XII–XIII spines, 23-25 rays; Anal fin III spines, 18-20 rays; Pectoral fin 16-17 rays; Ventral fin I spine, 5 rays. Body is blue- white with curved to oblique black bands on the sides. A yellow edged black bar runs through the eye, another on the snout. The bold black lines are a good diagnostic character to distinguish these from other black and white species. More common on the reef front at depth range 2-25 m., where it feeds only on living coral tissues. Its large and blunt snout is fit for feeding on many species of hard corals. It slightly resembles Chaetodon ornatissimus but the colour difference is obvious. As obligate corallivores it is used as indicator of reef's health.

Distribution : Indo-West Pacific East Africa to the line Islands; north to the Ryukyu Islands; south to the Great Barrier Reef; including Micronesia, the Galapagos Islands and India (Andaman and Nicobar Islands).

Meyer's butterflyfish *Chaetodon meyeri*

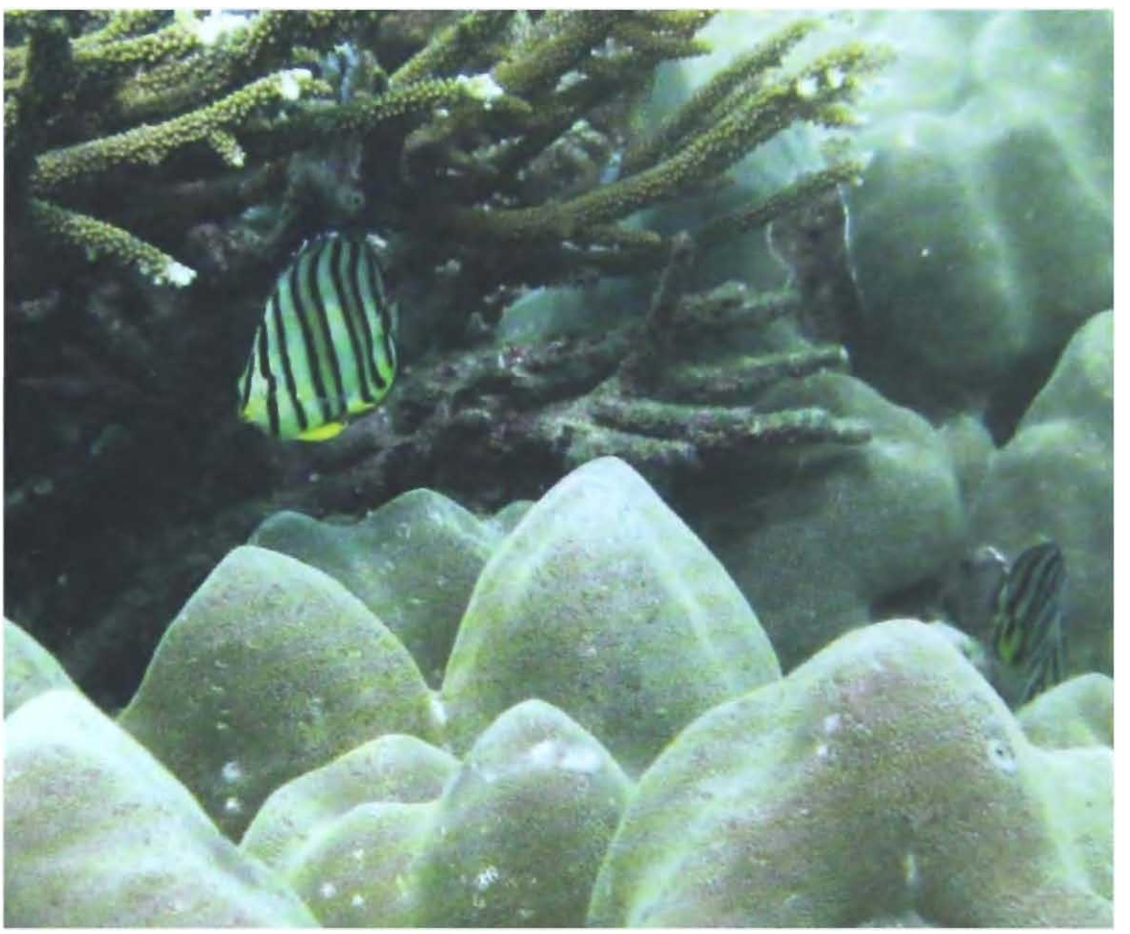
15. *Chaetodon octofasciatus* Bloch, 1787

Common name Eightband butterflyfish

1787. Bloch, M.E. *Naturg. Ausl. Fische.*, **3** : 113 (Type locality : East Indies).

Description Small size butterflyfish, attains 12.0 cm. Dorsal fin XII spines, 17-19 rays; Anal fin III spines, 14-17 rays; Pectoral fin 12-14 rays; Ventral fin I spine, 5 rays. Body high and compressed. White to yellowish below with eight black stripes over head and sides, one centrally on snout and another as a strong black margin on end of dorsal and anal fins. Third line extends onto ventral fin. Swim in pairs in coral rich areas of sheltered lagoon and inshore reefs. Feed exclusively on coral polyps.

Distribution : Indo-West Pacific East Indies and the Philippines, through Papua New Guinea and the Great Barrier Reef to the Solomon Island, Palau, and north to China; extends into the Indian Ocean atleast to the Maldives, Sri Lanka and India (Andaman and Nicobar Islands)



Eightband butterflyfish *Chaetodon octofasciatus*

16. *Chaetodon ornatissimus* Cuvier, 1831

Common name Ornate butterfly fish

1831. Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.*, **7** : 22 (Type locality : Tahiti).

Description Medium size butterfly fish, attains 20 cm. Dorsal fin XII–XIII spines, 24-28 rays; Anal fin III spines, 20-23 rays; Pectoral fin 15-16 rays; Ventral fin I spine, 5 rays. Body is white with orange to orange-brown oblique bands on the sides. Two broad yellow-edged black bars are on the head; one running across the eye and another on the snout. Occur in clear waters and coral-rich areas of lagoon and seaward reefs, depth range 1 – 36 m. The short and blunt snout is good for feeding on many hard coral species. Feed exclusively on coral tissue. As obligate corallivore, it can be used as reef's health indicator. A certain similitude with *Chaetodon meyeri* with which it can occasionally hybridize but different in colour.

Distribution Indo-Pacific Sri Lanka to the Hawaiian, Marquesan and Ducie islands, north to southern Japan, south to Lord Howe, Rapa Islands; throughout Micronesia and India (Andaman and Nicobar Islands)

Ornate butterfly fish ***Chaetodon ornatissimus*** - Photo : John E. Randall

17 *Chaetodon oxycephalus* Bleeker, 1853

Common name Spot nape butterfly fish

1853. Bleeker, P. *Nat.Tijd. Ned. Indie.*, **4** : 603 (Type locality : Ternate).

Description Large butterfly fish, attains 25 cm. Dorsal fin XI–XII spines, 22-24 rays; Anal fin III spines, 18-20 rays; Pectoral fin 16-18 rays; Ventral fin I spine, 5 rays. Body is white with a large black blotch on the upper posterior portion of the trunk and thin vertical lines on the sides. A black bar runs across the eye. The fins are bright yellow. Common in back reef, reef front and along external reef, depth range 10-40 m. Usually in pairs. Feeding mainly on coral polyps and anemones but also on other invertebrates and algae. Possible confusion with *Chaetodon lineolatus*, the main difference being the eye band shape: in *C. lineolatus* the band is expanded on nape, with a white spot in the middle. In *C. oxycephalus* the band is interrupted, and leaves a black spot on nape.

Distribution Indo-Pacific Sri Lanka to Queensland, north to the Philippines and India (Andaman and Nicobar Islands).

Spot nape butterfly fish *Chaetodon oxycephalus*

18. *Chaetodon plebeius* Cuvier, 1831

Common name Blue spot butterflyfish

1831. Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.* v., **7** : 68 (Type locality : Merdu Sud).

Description Medium size butterfly fish, attains 15 cm. Dorsal fin XIII–XV spines, 16-18 rays; Anal fin IV–V spines, 14-17 rays; Ventral fin I spine, 5 rays. Bright yellow body with darker stripes on its sides; a white-edged black bar runs vertically on the head across the eye and a spot can be seen on the caudal peduncle. It also shows a bright blue blotch on its sides. It feeds mainly on coral polyps in lagoons and outer reefs, but can also act as cleaner, eating parasites from other fishes. Depth range 4-10 m.

Distribution Indo-West Pacific Andaman Sea to Fiji, north to Japan, south to Australia. Tonga and India (Andaman and Nicobar Islands).

Blue spot butterflyfish *Chaetodon plebeius*

19. *Chaetodon rafflesi* Bennett, 1830

Common name Latticed butterflyfish

1830. Bennett, E.T. *Memoir Life Raffles* : 689 (Type locality : Sumatra).

Description Medium size butterfly fish, attains 16 cm. Dorsal fin XII–XIII spines, 21-23 rays; Anal fin III spines, 18-20 rays; Pectoral fin14-15 rays; Ventral fin I spine, 5 rays. Body colour is yellow with cross-hatched pattern on the sides. A black bar runs across the eye,the upper part often edged by blue; a spindle shaped dark bar through middle of caudal fin, and a broad submarginal dark band on rear part of dorsal fin. An uncommon species found in areas of rich coral growth of lagoon and protected reef flats and seaward reefs, often in pairs. Depth range 1-15 m. Feed on sea anemones, polychaetes, and octocorallian and scleractinian coral polyps.

Distribution Indo-Pacific Sri Lanka to the Tuamoto Islands, north to southern Japan, south to the Great Barrier Reef; Palau to the eastern Caroline Islands in Micronesia and India (Andaman and Nicobar Islands)

Latticed butterfly fish *Chaetodon rafflesi*

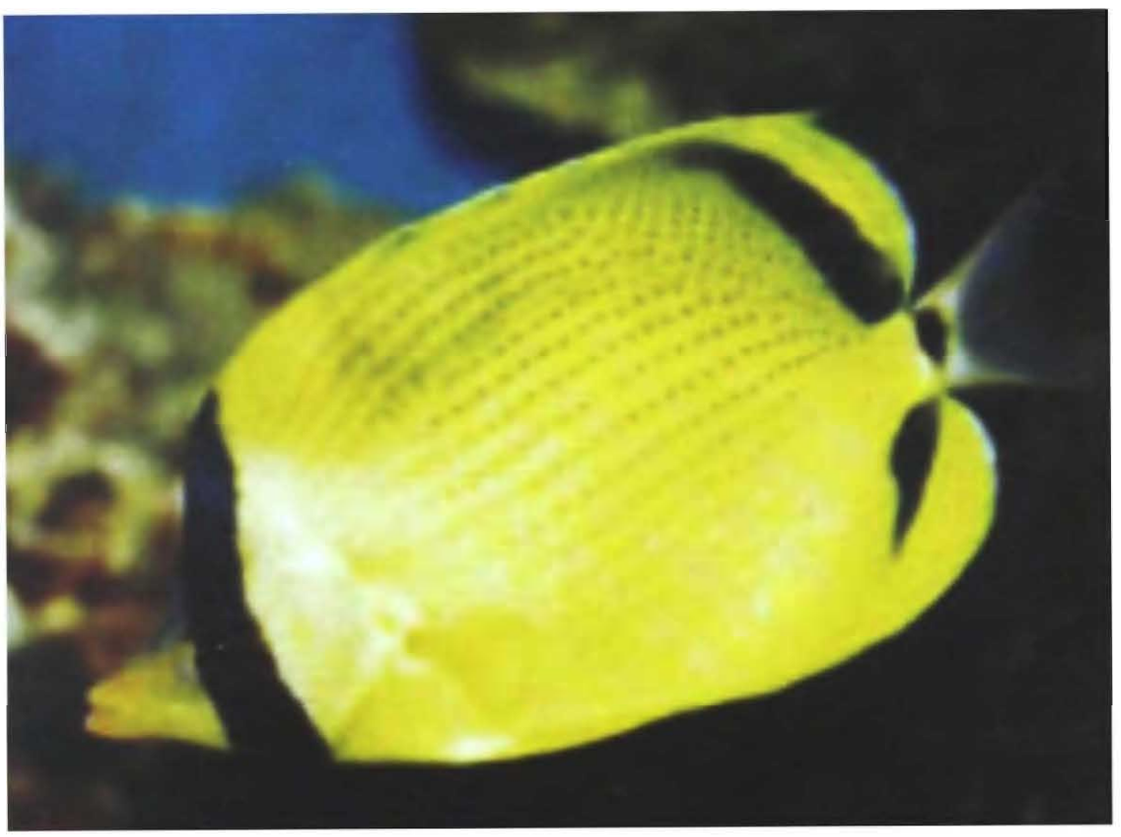
20. *Chaetodon semeion* Bleeker, 1855

Common name Dotted butterflyfish

1855. Bleeker, P. *Nat. Tijd. Ned. Indië.*, **8** : 450 (Type locality : Cocos-Keeling).

Description Large butterfly fish, attains 26 cm. Dorsal fin XIII–XIV spines, 23-26 rays; Anal fin III spines, 19-22 rays, Pectoral fin 15 rays; Ventral fin I spine, 5 rays. Body is golden yellow; base of the posterior portions of the dorsal and anal fins black; a prominent vertical black bar running across the eye; diagonal rows of black dots on the sides. A filament originating from the soft portions of the dorsal fin rays trails posteriorly. The only yellow butterflyfish with dorsal filament. Uncommon species found in coral rich areas of clear water lagoon and semi-protected seaward reefs. Depth range 2-30 m.

Distribution Indo-Pacific Maldives to the Tuamoto Islands, north to Ryukyu Islands, south to the Great Barrier Reef and India (Andaman and Nicobar Islands)



Dotted butterfly fish *Chaetodon semeion* - Photo : John E. Randall

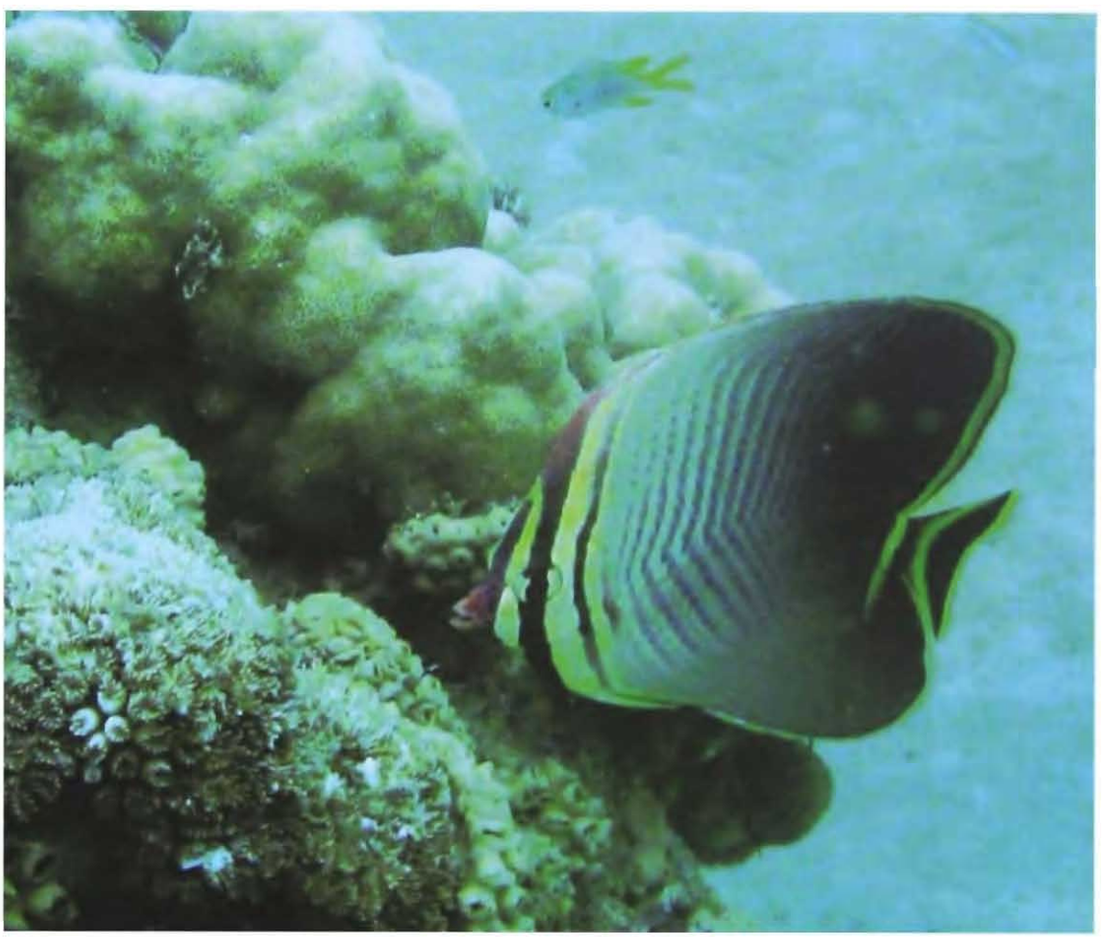
21. *Chaetodon triangulum* Cuvier, 1831

Common name Triangle butterflyfish

1831. Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.* v., **7** : 44 (Type locality : Batavia).

Description Medium size butterflyfish, attains 15 cm. Dorsal fin XI-XII spines, 24-27 rays; Anal fin III spines, 20-22 rays; P 13-14; V 1, 5. Deep-bodied, typical grey colour, three dark bars on head; edge of soft dorsal black; ventral fins light yellow; black triangle in caudal fin. Inhabit lagoon and seaward reefs. Closely associated with *Acropora* corals, particularly the staghorn variety. Territorial and in pairs. Feed mainly on coral polyps, it is an obligate coral feeder. Depth range 4-25 m. Very similar to *Chaetodon baronesa* of the Pacific Ocean, distinguished only by the tail (black with two yellow lines in *C. triangulum).*

Distribution Indian Ocean : Madagascar to the Andaman Sea and western sector of the Indonesian Archipelago and India (Andaman and Nicobar Islands).



Triangle butterflyfish ***Chaetodon triangulum***

22. *Chaetodon trifascialis* Quoy and Gaimard, 1825

Common name Chevroned butterflyfish

1825. Quoy, J.R.C. and Gaimard, J.P. *Voyage Uranie, Zool.*, : 379 (Type locality : Gaum).

Description Medium size butterfly fish, attains 18 cm. Dorsal fin XIII spines, 14-16 rays; Anal fin III–V spines; 13-15 rays. Body elongate; Colour is generally white with narrow chevron markings. A black bar through eye to nape; caudal fin blackish with yellow margin. Territorial species which occur in shallow lagoon and semi-protected seaward reefs. Closely associated with tabular and staghorn *Acropora* corals upon which they feed on their polyps and mucus. Solitary or in pairs. Depth range 2-30 m. Easy to identify for the elongated shape and triangular fins.

Distribution Indo-Pacific Red Sea and East Africa to the Hawaiian, Society islands and India (Andaman and Nicobar islands).

Chevroned butterfly fish *Chaetodon trifascialis* Photo : Sreeraj

23. *Chaetodon trifasciatus* Mungo Park, 1797

Common name Redfin butterflyfish

1797. Park, M. *Trans. Linn. Soc.* London., **3** : 34 (Type locality : Sumatra).

Description Medium size butterflyfish, attains 15 cm. Dorsal fin XIII–XIV spines, 20-22 rays; Anal fin III spines, 18-21 rays; Pectoral fin 14-15 rays; Ventral fin I spine, 5 rays. Body oval in shape, faded horizontal lines, anal fin ending in a flashy orange band. A broad yellow edged black bar through eye. Distinguished by the orange caudal peduncle, yellow edged black bar across middle of caudal fin. Tip of caudal fin is transparent. Occur in coral-rich lagoons and semi-protected seaward reefs. Swim in pairs. Feed exclusively on coral polyps, particularly of the *Pocillopora* type. It is an obligate corallivore. Depth range 2-20 m.

Distribution Indo-Pacific from South Africa to Hawaii and India (Andaman and Nicobar Islands).

Redfin butterflyfish *Chaetodon trifasciatus*

24. *Chaetodon unimaculatus* Bloch, 1787

Common name Teardrop butterflyfish

Bloch, M.E. 1787. *Nat. Ausl. Fische.*, **3** : 75 (Type locality : East Indies).

Description Medium size butterfly fish, attains 20 cm. Dorsal fin XII–XIII spines, 19-23 rays; Anal fin III spines, 18-20 rays; Pectoral fin 14-15 rays; Ventral fin I spine, 5 rays. Easily identified by the color pattern of yellow, white and black. Caudal fin is transparent. Tear on side is a good diagnostic. Common in back reef, reef front, along the external reef in pair or small shoals. Feeding primarily on hard and soft corals, but also on other benthic invertebrates and algae. More common in areas with a dense cover of leather corals (*Sarcophyton* and *Sinularia*). Depth range 4-40 m.

Distribution Indo-Pacific East Africa to the Hawaiian, Marquesan, and Ducie islands, north to southern Japan, south to the Lord Howe and Rapa islands; throughout Micronesia and India (Andaman and Nicobar islands).

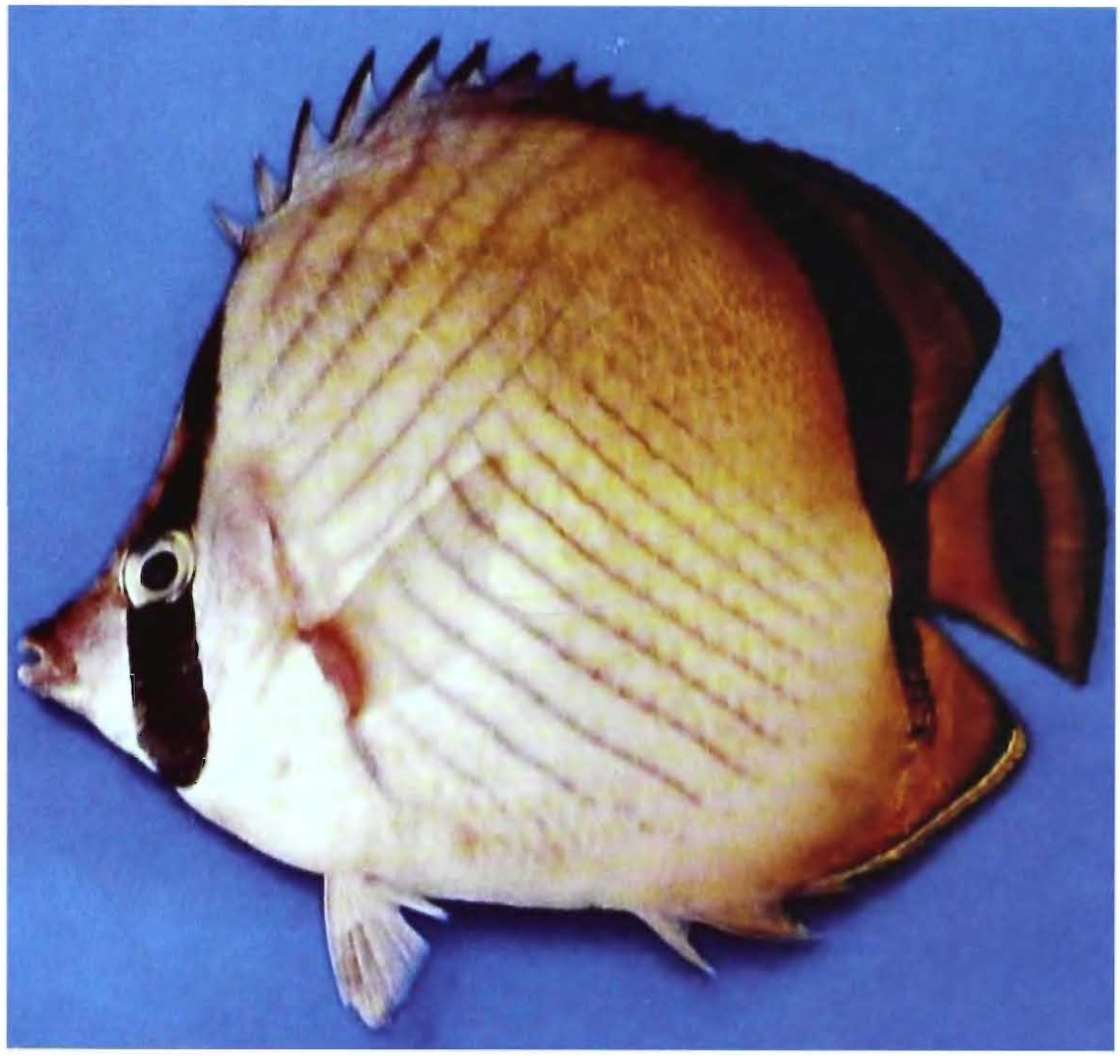
Teardrop butterfly fish *Chaetodon unimaculatus*

25. *Chaetodon vagabundus* Linnaeus, 1758

Common name Vagabond butterflyfish

1758. Linnaeus, C. *Systema Naturae*, Ed. **10** : 276 (Type locality : "Indiis).

Description Average sized butterflyfish, attains 20 cm. Dorsal fin XIII spines, 22-25 rays; Anal fin III spines, 19-22 rays; Pectoral fin 15-16 rays; Ventral fin I spine, 5 rays. Body white with diagonal black lines, superimposing with a distinctive pattern. Vertical black band covering the eye and on the back. Dorsal, anal and caudal fins yellow, the dorsal with a thin blue border. Black bands over head and tail. Found in reef flats, lagoon and seaward reefs and sometimes in turbid waters. Swim in pairs. Omnivorous, feed on algae, coral polyps, crustaceans, anemones, polychaetes and worms. Resembling all the white and black butterflyfishes with yellow fins, the colour patterns more strictly resembles *Chaetodon auriga*, but *C. vagabundus* lacks the dorsal filament.



Vagabond butterfly fish *Chaetodon vagabundus*

Vagabond butterfly fish *Chaetodon vagabundus*

Very similar species is *Chaetodon decussatus* of Indian Ocean, with black fins.

Distribution Indo-Pacific Red Sea and East Africa to the Line and Tuamoto islands, north to southern Japan, south to the Lord Howe, Austral islands and India (Andaman and Nicobar islands).

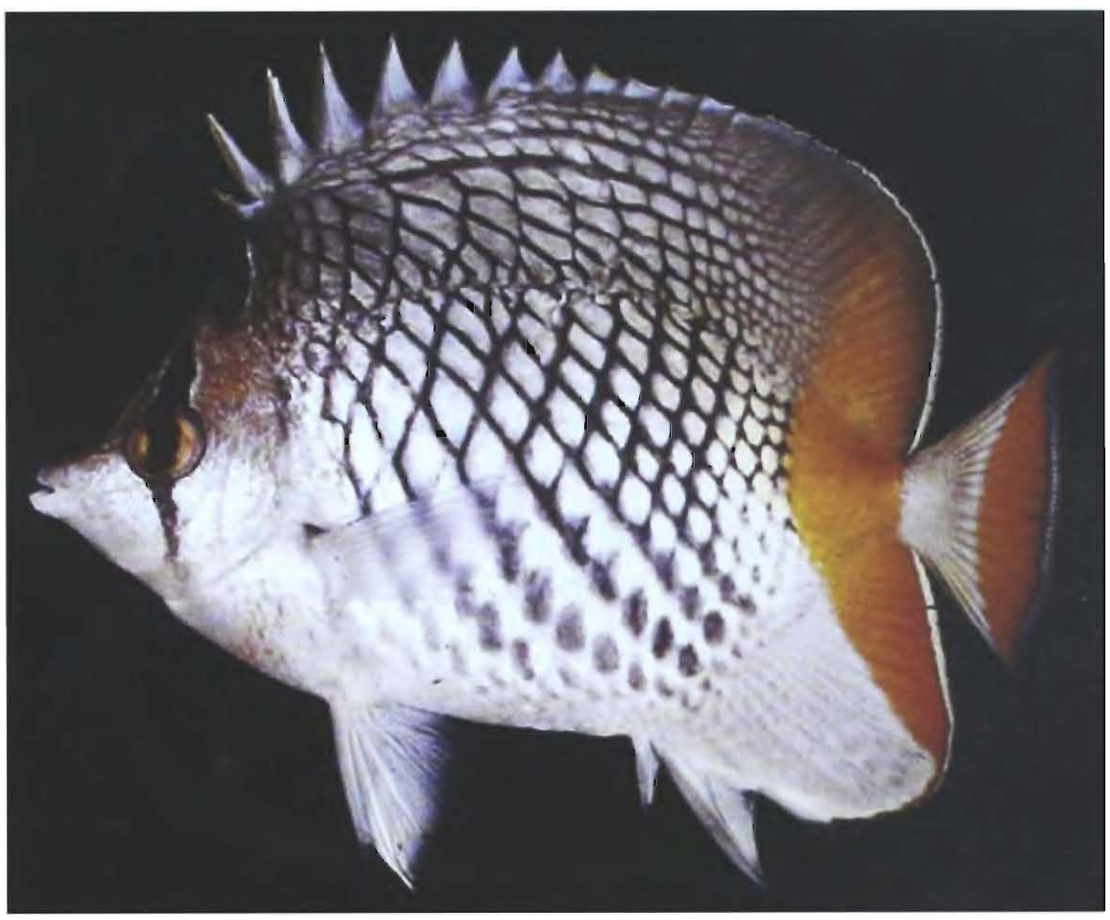
26. *Chaetodon xanthurus* Bleeker, 1857

Common name Pearlscale butterflyfish

1858. Bleeker. *Proc. Zool. Soc. London*, : 53 (Type locality : Ambonia).

Description Medium butterflyfish, attains 12 cm. Dorsal fin XII–XIV spines, 20-23 rays; Anal fin III spines, 16-17 rays; Pectoral fin 14 rays; Ventral fin I spine, 5 rays. Body oval and disc-like; snout pointed; caudal fin emarginated. Body white; a horse shoe shaped black mark on nape; posterior part of body brick red; caudal fin with brick red sub-marginal band; sides of body with cheveron markings. Usually found around rich coral areas. Depth range 1-30 m. Territorial and omnivorous.

Distribution Indian Ocean East Africa to Sri Lanka, Maldives and India (Andaman and Nicobar islands).



Pearlscale butterflyfish *Chaetodon xanthurus* - Photo : John E. Randall

27 *Chaetodon xanthocephalus* Bennett, 1833

Common name Yellowhead butterflyfish

1833. *Chaetodon xanthocephalus* Bennett, *Proc. Zool. Soc.* p. 182 (Type locality : Ceylon).

Description A large size butterflyfish; attains 20 cm; Dorsal fin XIII–XIV spines, 21-26 rays; Anal fin III spines, 21-23 rays; Pectoral rays 15. Body moderately large, laterally compressed; snout elongated and pointed. Body yellowish white with bluish tinge, 5-6 narrow dark subvertical streaks on sides, a dark band across eye disappearing with age and an indistinct dark area in front of eye. Dorsal and anal fins dark violet, more so posteriorly; bases yellowish, edges white. Caudal light bluish, blackish longitudinal streaks between median rays, upper and lower border yellowish, posterior margin white. Pectoral and ventral yellowish white. Usually found around rich coral areas. Depth range 5-40 m. Territorial and omnivorous.

Distribution Widespread in the Indian Ocean from Maldive Islands to the east coast of Africa and the Andaman and Nicobar Islands.

Yellowhead butterflyfish *Chaetodon xanthocephalus* - Photo : Sreeraj

28. *Chelmon rostratus* Linnaeus, 1758

Common name Beaked butterflyfish

1758. Linnaeus, C. *Systema Naturae*, ed., **10** : 273 (Type locality : Habitat in Indiis).

Description Large butterflyfish, attains 20 cm. Dorsal fin IX spines, 28-30 rays; Anal fin III spines, 19-21 rays; Pectoral fin 14-15 rays; Ventral fin I spine, 5 rays. Body deep with a typical elongate snout. Three vertical orange stripes on body; a narrow black edged orange bar through eye; a black eyespot on the dorsal fin. A common species found singly and in pairs along in rocky shores and coral reefs; territorial species; feeds on invertebrates; depth range 1-25 m.

Distribution Indo-West Pacific, India (Andaman and Nicobar islands).

Beaked butterflyfish *Chelmon rostratus* - Photo John E. Randall

29. *Coradion altivelis* McCulloch, 1916

Common name High-finned butterflyfish

1916. McCulloch, *Biol. Res.*, **4** (Part-4) : 191. (Type locality : Wide bay, Queensland, Australia).

Description Body rounded and deep; attains 15 cm; dorsal fin continuous with VIII spines and 31-33 rays; Anal fin III spines, 20-22 rays; Pectoral rays 14; Snout somewhat pointed Dorsal and anal fin gradually increasing in length posteriorly, resulting soft dorsal and anal fin very elevated; body overall whitish with two close-set dark brown bars at level of pelvic fins; a third broader dark brown bar posteriorly on juveniles which becomes orange yellow in adults; a dark brown bar through eye and another across base of caudal fin; pelvic fins dark brown to black.

Inhabits outer reef slopes and drop-offs at depths of 3 to 15 m. Omnivorous; usually in pairs.

Distribution Widespread in the Indo-West Pacific from Andaman Sea and Sumatra, Indonesia to Papua New Guinea, north to southern Japan, south to northwest Australia and the Great Barrier Reef.

High-finned butterflyfish ***Coradion altivelis*** - Photo Titus

30. *Forcipiger flavissimus* Jordan and McGregor, 1898

Common name Long nose butterflyfish

1898. Jordan, D.S. and McGregor., In : Jordan and Evermann, *Bull.U. S. Nat. Mus.*, **47** : 1671.

Description Medium size butterfly fish, attains 22 cm, snout included. Dorsal fin XII–XIII spines; 19-25 rays; Anal fin III spines; 17-19 rays; Pectoral fin 15; Ventral fin I spine, 5 rays. Body bright yellow, head black above, white ventrally; spot on anal fin. *F. flavissimus* has relatively shorter snout with a larger mouth, higher dorsal spine count, and absence of dark-centered scales on the thorax than *F. longirostris*. Common in exposed seaward reefs but also found in lagoon reefs; solitary or in small groups; feed on a wide variety of animal prey including hydroids, fish eggs, small crustaceans but prefers tube feet of echinoderms, and polychaete tentacles.

Distribution Indo-Pacific Red Sea and East Africa to the Hawaiian and Easter islands, north to southern Japan, south to Lord Howe Island; throughout Micronesia. Eastern Pacific: southern Baja California, Mexico and from the Revillagigedo, Galapagos Islands and India (Andaman and Nicobar Islands).

Long nose butterfly fish ***Forcipiger flavissimus***

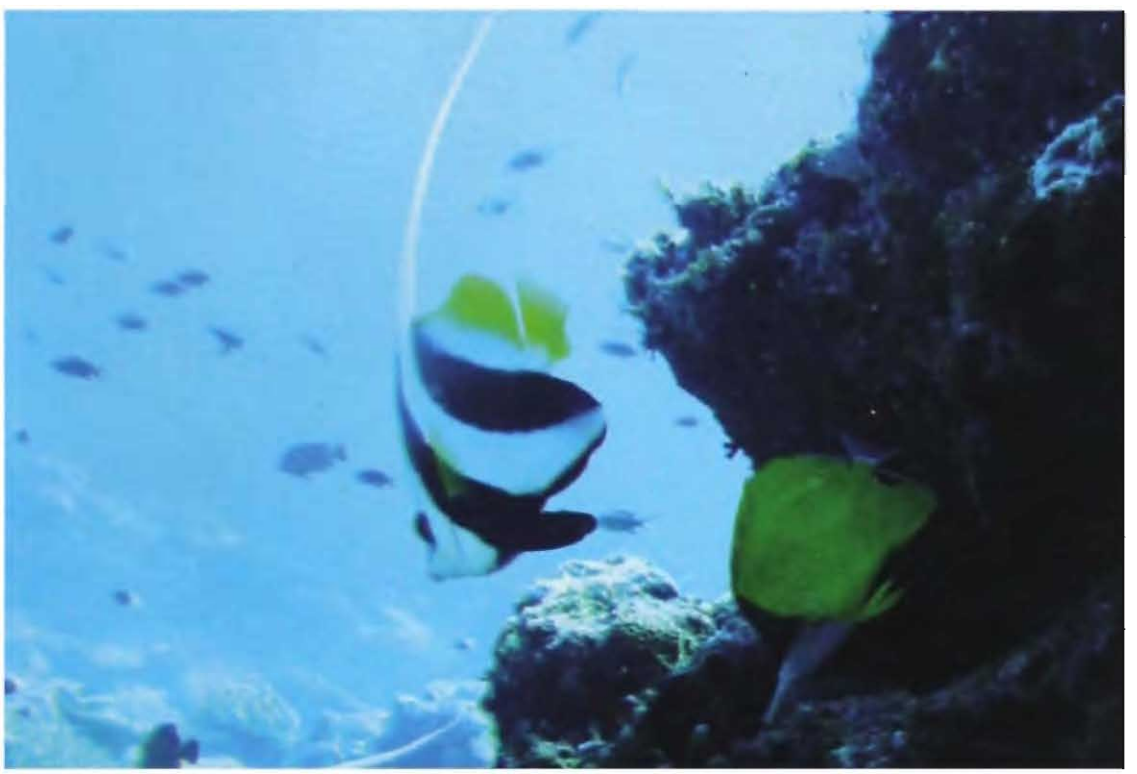
31. *Forcipiger longirostris* Broussonet, 1782

Common name Big long-nose butterfly fish

1782. Broussonet, P.M.A. *Ichth. Decas,* I : 6 (Type locality : Hawaiian Islands).

Description Medium size butterfly fish, attains 22 cm snout included. Dorsal fin X–XI spines, 24-28 rays; Anal fin III spines, 17-20 rays; Pectoral fin 14-15; Ventral fin I spine, 5 rays. Body yellow colour, with extremely long snout. Head black above, white ventrally, black spot on anal fin. A generally uncommon species that inhabits seaward reefs to depths greater than 60 m. Feeds mainly on whole organisms such as small crustaceans. Solitary or in small shoals. *Forcipiger flavissimus* is very similar. The two species are nearly undistinguishable when observed in the environment. Main differences are snout is longer in *F. longirostris*, mouth gape is larger in *F. flavissimus, F. longirostris* has grey spot in the white area under the mouth slightly more pronounced.

Distribution Indo-Pacific: East Africa to the Hawaiian, Marquesan, and Pitcairn islands, north to the Ogasawara Islands, south to New Caledonia and the Austral Islands; throughout Micronesia and India (Andaman and Nicobar Islands).



Big long-nose butterfly fish *Forcipiger longirostris*

32. *Hemitaurichthys zoster* Bennett, 1831

Common name Black pyramid butterflyfish

1831. Bennett, E.T. *Proc. Zool. Soc.*, : 61 (Type locality : Mauritius).

Description Medium sized butterflyfish, attains 16 cm. Dorsal fin XII spines, 24-26 rays; Anal fin III spines, 20-21 rays; Pectoral fin 17-19 rays; Vetral fin I spine, 5 rays. Readily identified by the black body with a broad white band and white tail; dorsal spines over white area are yellow. Inhabit open water off the reef edge, to depths greater than 35 m. Form large schools. Feed on zooplankton and algae.

Distribution Indian Ocean: East Africa to Guam, south to Mauritius, north to India (Andaman and Nicobar Islands).

Black pyramid butterflyfish ***Hemitaurichthys zoster*** - Photo : Titus

33. *Heniochus acuminatus* (Linnaeus, 1758)

Common name Long fin bannerfish

1758. Linnaeus, C. *Syst. Nat.*, ed., **10** : 272 (Type locality : Indiis).

Description : Large butterflyfish, attains 25 cm. Dorsal fin XI spines, 22-27 rays; Anal fin III spines, 17-19 rays; Pectoral fin 17-18 rays; Ventral fin I spine, 5 rays. Body compressed, 4th dorsal spine and its filament greatly prolonged. Two black bands, the second starts behind the dorsal filament; yellow pectoral, dorsal and caudal fins. Inhabit deep, protected lagoons and channels, and the deeper parts of outer reef slopes in pairs or solitary, seldom in groups, depth range 2-75 m. A planktivorous species. Distinguished from the very similar *H. diphreutes* by the longer snout, rounder shape and longer and more angular anal fin.

Distribution Indo-Pacific East Africa and Persian Gulf to the Society Islands, north to southern Japan, south to Lord Howe Island, throughout Micronesia and India (Andaman and Nicobar Islands).

Long fin banner fish *Heniochus acuminatus*

Long fin banner fish *Heniochus acuminatus*

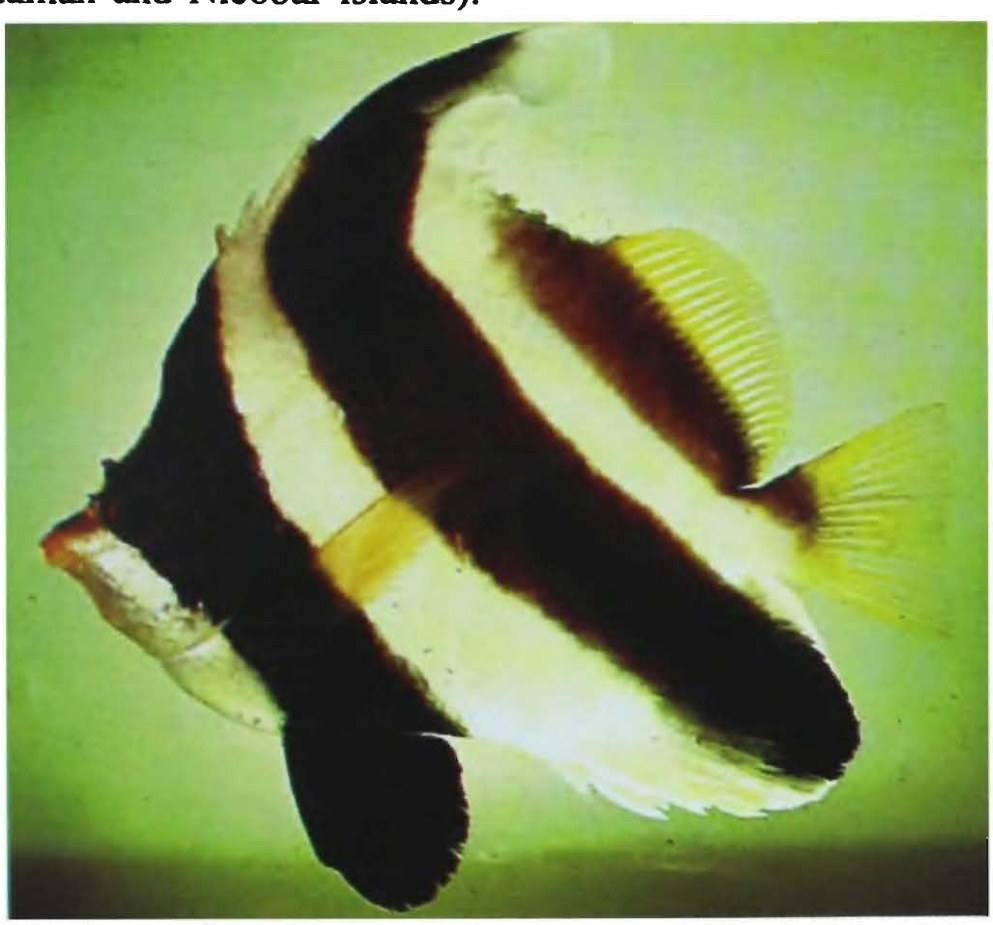
34. *Heniochus chrysostomus* Cuvier, 1831

Common name Pennant bannerfish

1831. Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.*, **7** : 99 (Type locality : Tahiti).

Description Medium size butterflyfish, attains 18 cm. Dorsal fin XI–XII spines, 21-22 rays; Anal fin III spines, 17-18 rays; Pectoral fin 16 rays; Ventral fin I spine, 5 rays Body color is white, with three oblique broad dark brown bands, the first running from the top of the head through the eye to the abdomen, the second from the fourth dorsal spine to the posterior of the anal fin, and the third on the back and the adjacent dorsal fin; elongate, yellow snout, long and pennant first rays of dorsal fin, Common in coral-rich areas of subtidal reef flats and lagoon and seaward reefs. Adults usually in pairs. Feed mainly on coral polyps. Identifiable from other *Heniochus* for the yellow snout and the pennant dorsal fin.

Distribution Indo-Pacific Western India to Pitcairn Islands, north to southern Japan, south to Rowley Shoals, southern Queensland, and New Caledonia; throughout Micronesia and India (Andaman and Nicobar islands).



Pennant banner fish *Heniochus chrysostomus* - Photo : John E. Randall

35. *Heniochus diphreutes* Jordan, 1903

Common name Schooling bannerfish

1903. Jordan, D.S. *Proc. U. S. Nat. Mus.*, **26** : 694.

Description Medium size butterflyfish, attains 18 cm. Dorsal fin XII–XIII spines, 23-25 rays; Anal fin III spines, 17-19 rays; Pectoral fin 16-18 rays; Ventral fin I spine, 5 rays. Front of dorsal fin extended as a long, pinnate like filament. Body is white with two broad oblique dark-brown bands running across the body from the dorsal fin to the abdomen and anal fin. A short brown band runs from the top of the head to the eye. The soft portion of the dorsal fin and the caudal fin are yellow. Occur primarily along outer reef slopes, in current channels, depth range above 5-35 m. adults in large schools well above the bottom; Feed on plankton. Compared with *H. acuminatus, H. diphreutes* is smaller, with shorter snout, snout and nape spots lighter.

Distribution Indo-Pacific: Red Sea and South Africa to warm-temperate Australia, Hawaiian Islands and India (Andaman and Nicobar islands).

Schooling banner fish ***Heniochus diphreutes*** - Photo Sreeraj

36. *Heniochus monoceros* Cuvier, 1831

Common name Masked bannerfish

1831. Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.*, **7** : 100 (Type locality : Mauritius).

Description Large butterflyfish, attains 23 cm. Dorsal fin XII spines, 24-27 rays; Anal fin III spines, 17-19 rays; Pectoral fin 16-17 rays; Ventral fin I spine, 5 rays. Body white with 3 black bands, the first cover the head, the second starts behind the dorsal filament and continuous with pelvic fins and the oblique third from middle of the back to rear anal fin; yellow dorsal and caudal fins. A pair of brown bony knobs is on the forehead. Occur in lagoon and seaward reefs with rich coral growth, depth range 2 – 30 m. Adults are often paired and occasionally found hovering side by side under tabular corals. Feed on bottom living animals e.g. invertebrates associated with algal zones. Identified from other *Heniochus* spp. for the acute but short dorsal filament. Compared with the more similar *Heniochus singularis*, this has yellowish posterior sides, brown knob and the central band behind the dorsal filament.

Distribution Indo-Pacific East Africa to the Tuamoto Islands, north to southern Japan, south to New South Wales, Tonga and India (Andaman and Nicobar islands).

Masked banner fish *Heniochus monoceros* - Photo John E. Randall

37 *Heniochus pleurotaenia* Ahl, 1923

Common name Phantom bannerfish

1923. Ahl, E. *Archiv für Naturgeschichte,* **5** : 24 (Type locality : padang).

Description Medium size butterflyfish, attains 19 cm. Dorsal fin X spines, 23-25 rays; Anal fin III spines, 17-18 rays; Pectoral fin 16-17 rays; Ventral fin I spine, 5 rays. Raised dorsal fin; sides with an incomplete white band between ventral and anal fins. Adults with horns above the eyes and a striking forehead knob. Found in pairs or aggregations at various depths, often on shallow reef crest with some surge. Usually in mixed algae and coral habitats to about 1-25 m depth, but may go offshore, in lagoon and along the reef front and external reef, in areas rich in coral, its main food. It feeds also on other benthic invertebrates. Easily distinguished from other *Heniochus*, and in particular from *Heniochus varius* in the white band between ventral and anal fins.

Distribution Indian Ocean Maldives and Sri Lanka to Java, north to the Andaman Sea and India (Andaman and Nicobar islands).

Phantom bannerfish *Heniochus pleurotaenia*

38. *Heniochus singularis* Smith and Radcliffe, 1911

Common name Singular bannerfish

1911. Smith, H. M. and Radcliffe, L. *Proc. U. S. Nat. Mus.*, **40** : 321 (Type locality : Philippines).

Description : Large butterflyfish, attains 25 cm. Dorsal fin XI–XII spines, 25-27 rays; Anal fin III spines, 17-18 rays; Pectoral fin 16-17 rays; Ventral fin I spine, 5 rays. Fourth dorsal spine prolonged as a tapering white filament; body white with 3 black bands. The first cover the head, the second starts before the dorsal filament. The space between the second and third bands has a reticulated pattern more or less dark; yellow dorsal and caudal fins; black knob on forehead. An uncommon species that inhabits deep lagoon and seaward reefs. Adults solitary or in small groups and prefer areas with rich coral growth, in lagoon and bay and along the external reef, usually in pairs. Largest of the bannerfishes. Feed on coral polyps. Identified from other *Heniochus* spp. for the acute but short dorsal filament. Compared with the more similar *Heniochus monoceros*, this has reticulated darker sides, black knob and the central band before the dorsal filament.

Distribution Eastern Indian Ocean to Samoa, north to southern Japan, south to Rowley Shoals, New Caledonia and India (Andaman and Nicobar Islands).

Singular banner fish *Heniochus singularis* - Photo : Sreeraj

BUTTERFLYFISHES AS INDICATOR IN CORAL REEF HABITAT

The Andaman and Nicobar Islands falls within what is the Indo-Pacific realm – the world's richest region of marine biodiversity perspective having unique ecological systems mainly contributed by coral reefs (as spawning and feeding grounds), sea grass beds (as nursery grounds) and mangroves (as shelter and feeding grounds) for many species of commercially important finfish and shellfish.

A pair of *Chaetodon trifasciatus* feeding on polyp of boulder coral *Porites lutea*, North Bay South Andaman.

The butterflyfishes under the family Chaetodontidae are one of the most conspicuous elements of the coral reef community. The butterflyfishes are very closely related to angelfishes in their colour pattern. The butterflyfishes gets its name because of its comb shaped teeth. They are brightly coloured. Burgess (1978) estimated 114 species in 10 genera with *Chaetodon* (90 species), Kuiter (2002) updated to 125 species distributed worldwide in tropical and temperate coral reef habitats.

A pair of *Chaetodon trifasciatus* on the reef of Smith Island, North Andaman

The recorded species have exclusive ornamental value and are not considered as food fishes. Coastal waters are highly structured, covering a large variety of different bottom types that are inhabited by a diverse assemblage of organisms. Many of these habitats are still insufficiently known and require continued effort to sample, describe and register all species. However, due to increasing signs of human induced local and global impacts (e.g. Cohen *et al.*, 1997; Gommes *et al.*, 1998; Phillippart, 2007), there is also a pressing need to study further coastal organisms to understand their ecological role and function and to evaluate their potential use as indicators and/or key species for coastal ecosystem monitoring and management. Indicators are here

defined as a subset of organisms that strongly and transparently respond to distinct natural or human-induced factors or changes. 'Strongly and transparently' shall signify that observed responses should be directly related to distinct factors, relatively easy to measure and, hence, cost- and time-effective. The measuring of such responses can be based on occurrence and distribution patterns, local abundance, weight, size, behaviour or physiology (Nicholls 2002). Indicators should be relatively abundant and widespread, easy to sample and tolerant to a wide variety of environmental conditions. Key species interact tightly with an entire assemblage and are able to modify it directly or indirectly. Some key species act as 'ecosystem engineers', as they physically change the environment, either by themselves or by manipulating distinct habitat features. Due to their interactive role, key species provide important information on ecosystem processes and,

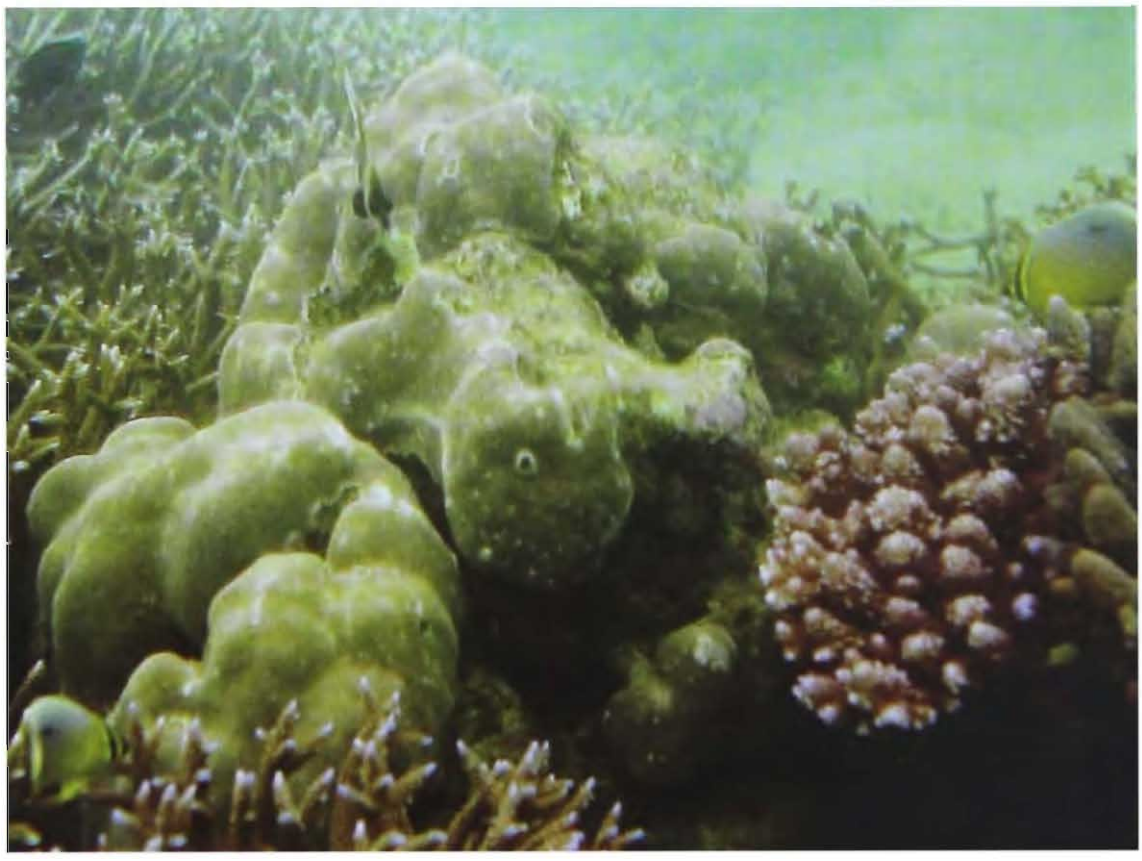
Chaetodon trifasciatus on the Healthy Reef of Grub Island, MGMNP, Wandoor, South Andaman. Dominating by *Acropora* sp.

hence, can also be used as indicators of ecosystem integrity and state. Most parsimonious, time- and cost-effective ecosystem monitoring and management may be achieved by using groups of easily accessible and widely distributed species that to some extent combine the features of indicator and key species (Nicholls 2002). Because these species will allow essential information to be obtained about distinct habitat features as well as about an overall assemblage within a certain area, they would be 'ecosystem indicators' in a very integrative way. This study highlights the butterflyfish, family Chaetodontidae, as a group of mainly coral reef organisms that have a high value for ecosystem monitoring and management, but also require intensified systematic and ecological research. Butterflyfish are relatively common and of high economic importance in many coastal areas as ornamental fish. This study investigates if butterflyfishes qualify as coastal habitat indicators and if they may also play a role as key species in coastal assemblages. Gaps in the knowledge in butterflyfish

Chaetodon trifasciatus on the reef of North Reef Island, Middle Andaman. One of the best reef of Andaman and Nicobar Islands.

ecology and basic systematics are pointed out to stimulate further research. Butterflyfishes as habitat indicators in the last few years, considerable research on coral reef fishes has been carried out to examine the effects of both naturally varying factors and human induced modifications on habitat utilization at different scales. Today several species of butterflyfishes are used by conservation Zoologists as indicator species to identify habitat that are critical and need to be protected. Butterflyfishes are also monitored to indicate climate change and environmental degradation. Thus, like other animals and birds, butterflyfishes are now studied as living ecological mechanism.

Almost all the research involves direct observation of butterflyfishes on the coral reefs of Andaman and Nicobar Islands. The underwater survey was made using SCUBA, at the depth between 4-20 m. Fortunately, butterflyfishes are diurnal so all work is done during daylight hours at different places of Andaman and Nicobar Islands. Since reef fishes are disturbed under conditions of high turbulence and surge and poor visibility, most work is done under favourable weather conditions. At study site four 100 m transects are placed in a parallel pattern. To minimize



Chaetodon trifasciatus on the reef of Jolly Buoy Island South Andaman.

diver's impact each fish census commenced 10 minute after the tape had been laid out. Since we are interested in living corals and coral feeding butterflyfishes, the transects are established in areas of high coral cover. The next step is to count the numbers of each species of butterflyfishes within 10m of either side of the transect lines (English *et al.* 1997). Abundance, distribution and diversity of fishes are calculated. Observation also focused on fish species and the species on which coral fed upon. The species identification and data are recorded on plastic sheet with a pencil in *in situ* condition and the underwater features of each species were noted to confirm their identification.

Coral reefs are being highly degraded by many types of disturbances such as cyclones, earthquake, tsunami, outbreaks of crown- of-thorns starfish that can vary in their effect at small scales and further increase spatial variability in benthic habitats (Brown 1997). The increasing prevalence of disturbances on coral reefs, such as coral bleaching (Hoegh-Guldberg 1999), is leading to worldwide degradation of habitats for reef organisms. This degradation, when combined with naturally occurring habitat variation at small scales (Done 1982), is likely to affect fishes with close links to their habitat, especially fishes with obligate coral feeding requirements, such as butterflyfishes (Hourigan *et al.* 1988). The distribution patterns of butterflyfishes are often closely related to the distribution of their particular prey resources, (Birkeland and Neudecker 1981; Carpenter *et al.* 1981). For coral-feeding fishes, the composition and quantity of prey resources varies greatly across a range of different spatial and temporal scales. It has been well documented that butterflyfish abundances often vary in accordance with coral cover and often decline following extensive coral depletion, giving the notion that this family may be useful as an indicator of environmental quality on coral reefs (Crosby & Reese 1996). Degradation of coral resources may also lead to sublethal stresses in butterflyfishes (Pratchett *et al.*, 2004). Butterflyfish occur mainly in coral reef habitats, mostly close to or near the bottom of the littoral zone and are most frequently found on coral reefs. They are territorial with daily short-distance movements within and among foraging and resting sites in the reef areas. Butterflyfish species are relevant to fisheries in many areas worldwide and several species have high

economic importance for aquarium trade. There is least fishing pressure in Andaman and Nicobar Islands and as regards to exploitation of butterflyfish, only small collections are made by Department of Fisheries and Navy for their aquarium use. Human-made constructions, such as artificial reefs, may lead to increased visits by butterflyfishes of the respective area and enhance abundance in the immediate surroundings. (Golani and Diamant 1999). This change in distribution and abundance has happened during a phase with temperature increase due to global climate change and habitat degradation due to earthquake- tsunami of December 2004, mainly observed in some of the islands of Nicobar group of Islands. The immigration of butterflyfishes into nearby healthy reef areas was observed in Nancowry group of Islands. Butterflyfishes have very active foraging behaviour. These and additional characteristics of their resource use may render butterflyfishes essential components of food webs in coral reef ecosystems. Currently, 35 species of butterflyfishes are reported, the most diverse being *Chaetodon*, which consists of 25 species. Some species have a rather restricted occurrence, such as *Chaetodon plebeius and C. triangulam*, which are restricted to Eastern Indian Ocean. With future revisions, more detailed systematic information can be obtained and with further exploration of remote islands, new discoveries of butterflyfish species can be expected. All descriptions of butterfly fish species so far have been based exclusively on morphological data. Even among populations from neighbouring or close-by habitats considerable morphological variation exists. Butterflyfishes may be more speciose in the Indo-West Pacific because they have suffered fewer exitinctions there, due to greater area effect with increased habitat diversity and opportunity for speciation or because the diversity and density of resources available to them is greater. The reefs of the North Reef Island, where the effects of siltation are minimal, corals are healthy, similarly the butterflyfishes is well represented with 27 species and the obligate coral feeder *C. trifasciatus* is abundant. In Andaman and Nicobar former species is the most abundant shallow water chaetodontid, occurring at all reefs of Andaman and Nicobar islands in good numbers. They are usually observed in pairs picking at scleractinians. Each pair appears to forage with in a limited area. The areas of the fringing

reefs in North Reef, Rani Jhansi Marine National Park, Mahatma Ghandhi Marine National Park, Great Nicobar in Andaman and Nicobar Islands seemed to be the richest in terms of suitable habitat for butterflyfishes. There the amount of healthy, living sceractinian coral and other reef invertebrates was high and other habitats and sources of food were readily available. At Nancowry Island, the calm sheltered bays, rich in soft corals, harboured only 19 species of butterflyfish, *C. ornatissimus* and *C. unimaculatus* were seen only on the outer reef. At some of the islands in Nancowry group namely Camorta, Terrasa, Chowra, due to submergence of coastal areas after the earthquake and Tsunami silt was filling up the holes and crevices of the reef which under normal conditions provide shelter for benthic invertebrates. A large number species that occurred at most islands sampled, are *C. auriga, C. falcula, C. lunula, C. meyeri, C. plebeius, C.*

Succession in Coral Reef : Soft Corals growing over hard corals, after Earthquake and Tsunami (December, 2004) in Camorta Islands, Nancowry (Nicobar).

vagabundus, F. flavissimus, and H. acuminatus and were most common in sheltered sites with fair amounts of soft coral and *C. trifasciatus* was most common where hard corals were best developed.

Many knowledge gaps still exist in butterflyfishe ecology and systematics. However, the currently available data suggest that butterflyfishes may indeed be suitable habitat indicators and may also qualify as key species in coral reef ecosystems. Because of considerable inter- and intraspecific variations in habitat preferences, food selection, behaviour, and body structure, special attention should be paid to treat species, populations, and size classes separately from each other. Because not all butterfly fish species are equally well known and even some new ones may be encountered, exploration, monitoring, and management focusing on this group should be co-ordinated worldwide, thus enhancing information exchange and initiating joint research efforts in butterflyfish ecology and systematics. At the same time, this study may also serve as a model for screening other organism groups for their potential as ecosystem indicators. Obligate corallivorous butterflyfishes (Chaetodontidae) have been suggested as indicators of the health of coral reefs. There has been a call to relate specific changes in butterflyfish ecology and behaviour to identified stressors. For the first time it is reported here that there is a breakdown of the normal rigid territorial butterflyfish behaviour at the onset of an intense, large-scale coral degradation event in the Andaman and Nicobar Islands due to climate change also by earthquake and tsunami of December, 2004. The three main species, *Chaetodon trifascialis, C. triangulam* and *C. trifasciatus*, fed almost exclusively on *Acropora* spp. These species of coral are among the first to die during stress, due to climate change. It is speculated that this early behavioural response by these butterflyfishes is because their prime food resource being coral is the first to perish. It is recommended that baseline data be gathered on corallivorous butterflyfish territory size and rate of excursion on healthy, unstressed reefs. Deviation from these baseline results, along with early bleaching corals such as *Montipora* spp. and branching *Acropora* spp., is highly likely to indicate the coming of a bleaching event. *Chaetodon trifasciatus* as an indicator species identified from Andaman and Nicobar

Islands. The monitoring programme is inexpensive and easily learned by non-specialists. Thus it is useful in our area where funds for conservation and management are scarce.

Coral degradation in land fall Island, North Andaman due to earthquake and tsunami of December, 2004. (Photo: Ponnuswamy)

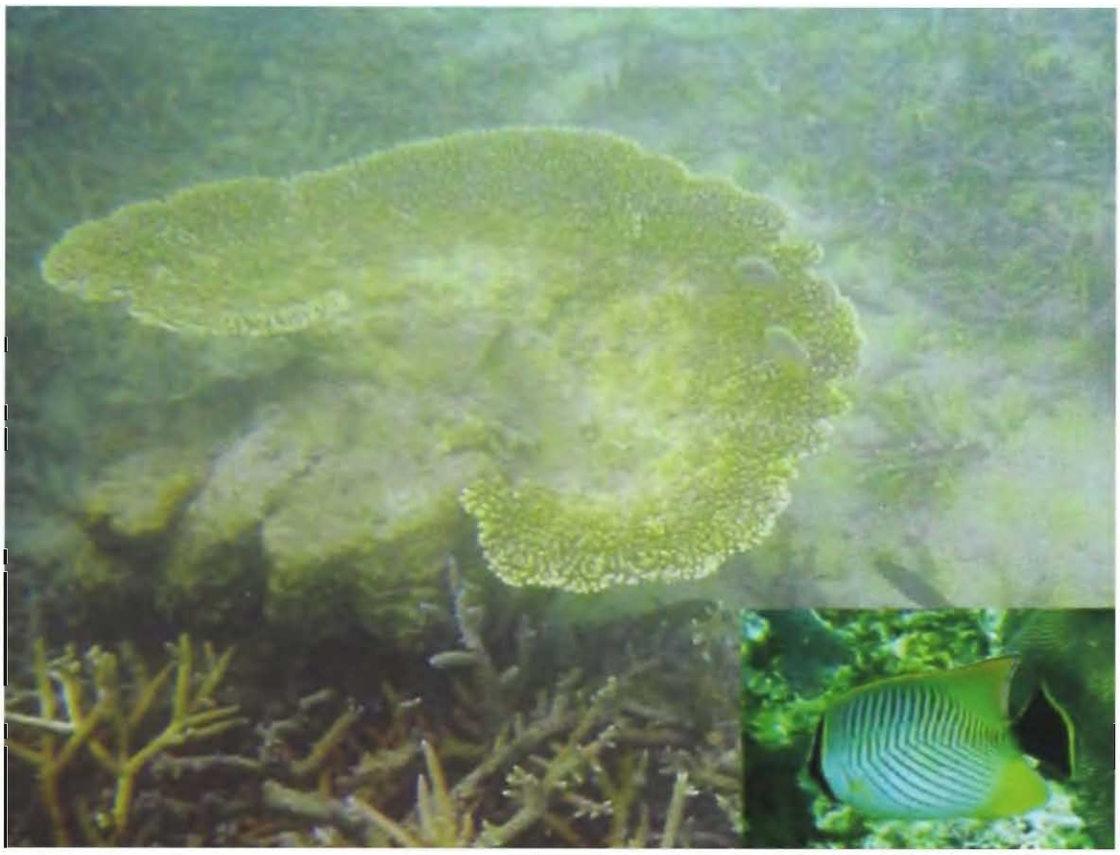


Plate Coral, *Acropra hyacinthus* under stress due to Climate Change, Grub Island, Andaman Island - *Chaetodon trifascialis* feeds exclusively on *Acropora*.

Family SCARIDAE
Parrotfishes

These fishes belong to the "Order Perciformes" and "Suborder Labroidei" as members of the "Family Scaridae" (Parrotfishes) with 2 Subfamilies, 9 genera, and 96 species. They are wrasse-shaped, yet more heavy-bodied. The main difference is the structure of their mouth. Wrasses have individual teeth, but parrotfish teeth are actually fused together, forming a beak. So much the better to feed upon the reef structure itself. They are rather homogenous in general morphology; all have an unnotched dorsal fin of IX, 10 rays and an anal fin of III, 9 rays; the scales are cycloid and relatively large, 22-24 in longitudinal series. In fact, they can be given much credit for producing the sand that settles in lagoons and along beaches. When they bite-off pieces of reef rock, it is ground-up by a set of plate-like teeth in the back of their throat. Any coral polyps and algae on these rock pieces serve

Green humphead parrotfish in groups ram its head against corals to facilitate feeding. Photo : Sreeraj (Havelock Island, Andaman)

as the main course, with the calcium carbonate rock being returned as sand. Some species of parrotfishes form a mucous cocoon to sleep in at night while tucked-away in some crevice. It is thought these cocoons are a form of protection against nocturnal predators. They are also wide-ranging individuals and don't adapt well to confinement. Since they are herbivores, small plaster of Paris stones that contain seaweed and algae are useful in maintaining them in closed systems.

The name 'parrotfish' refers to the teeth, which are fused into a parrot-like beak. The teeth of parrotfishes are constantly replaced. Those on the biting edges are relatively small and as they wear, are replaced by new teeth that are developing within the 'beak' Most of the visible 'beak' is cement on the outside of the jaw. The erupted teeth are only on the cutting edge. Depending upon the type of parrotfish, the teeth appear to develop in vertical rows (scraping *Scarus* species) or oblique rows (excavating species such as *Chlorurus).* Parrotfishes are nearly all herbivores that occur on coral reefs. They feed by grazing algae off coral. They are not selective, but graze turf and calcareous

Scarus quoyi in courtship Males swim rapidly with the caudal fin elevated, North Bay Reef, South Andaman.

algae, along with the calcareous coral upon which it grows. In addition to jaw teeth, parrotfishes have specialised pharyngeal teeth in the "throat" which grind food. This results in the algal cell walls being broken, releasing the contents for digestion. It also reduces the coral to a paste. Parrotfish feeding is responsible for the removal of significant amounts of coral. Thus, these parrotfishes ingest large amount of calcareous materials along with live coral polyps and this is ground into a fine powder with the help of powerful pharyngeal teeth and passed out as faeces. Thus, parrotfishes contribute substantially to the formation of bottom sediments.

Parrotfish's characteristic "chisel" marks are seen on boulder coral.

DISTRIBUTION

Parrotfishes are distributed in tropical and subtropical seas. They occur mainly in reefs and algal beds. In Indian Ocean, about 50 species are reported to occur. The occurrence and diversity are high in Andaman and Nicobar Islands and Lakshadweep Islands. By an intensive study made along the entire stretch of Andaman and Nicobar Islands on the biodiversity of scarid fishes, 22 species of parrotfishes were recorded in the family Scaridae by SCUBA diving and using underwater still camera, (Nikonas V).

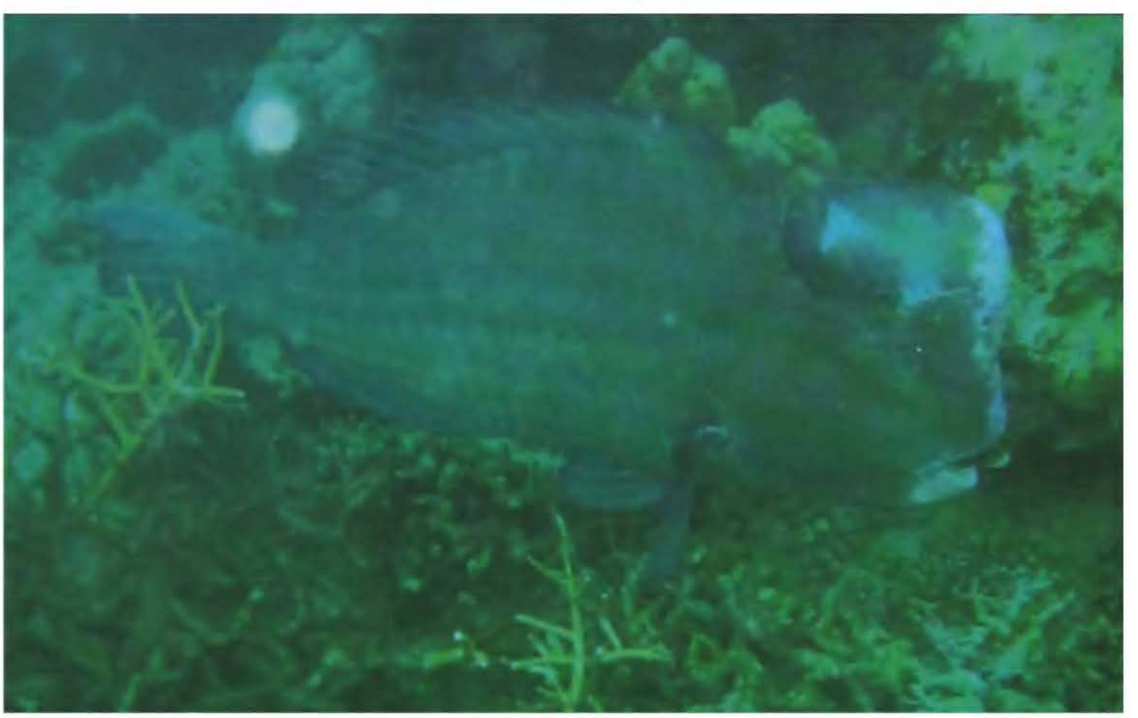
1. *Bolbometopon muricatum* (Valenciennes, 1840)

Common name Green humphead parrotfish

1840. *Bolbometopon muricatum* Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.*, **14** : 208.

Description Dorsal fin IX spines; 10 rays; Anal fin III spines; 9 rays; Pectoral rays usually 16; Median predorsal scales 2 to 5. Sometimes confused with the humphead wrasse or other 'humphead' parrotfishes. Unlike the wrasse, it has a vertical head profile, and unlike other parrotfishes, it is uniformly covered except for the leading edge of the head which is often light green to pink, and has a nodular outer surface to its beak. The primary phase is a dull gray with scattered white spots, gradually becoming uniformly dark green. Juveniles are found in lagoons; adults in clear outer lagoon and seaward reefs up to a depths of at least 30 m. Usually in small groups. Feeds on benthic algae, live corals and shellfishes. May ram its head against corals to facilitate feeding. Sleeps in caves. The largest of the parrotfishes, reaches 120 cm.

Distribution Indo-Pacific Red Sea and East Africa to Samoa and the Line Islands, north to the Yaeyama and Wake islands, south to the Great Barrier Reef and New Caledonia and India (Andaman and Nicobar Islands).



***Bolbometopon muricatum* Green humphead parrotfish** Photo : Sreeraj

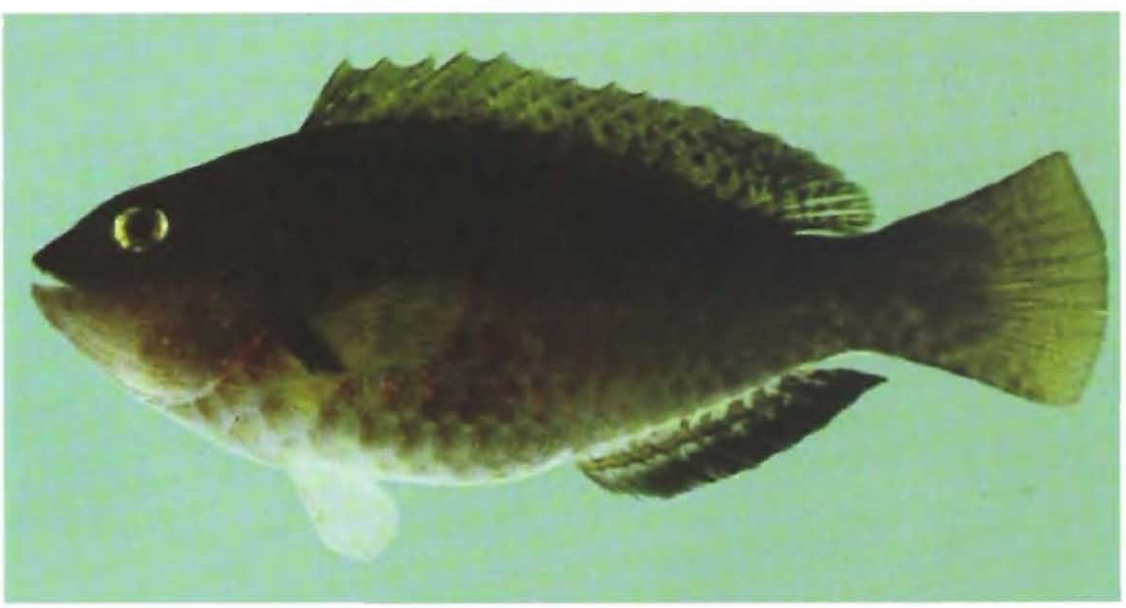
2. *Calotomus spinidens* (Quoy & Gaimard 1824)

Common name Spinytooth parrotfish

1824. *Calotomus spinidens* Quoy, J.R.C. and Gaimard, J.P. *Voy. Uranie. Zoology.*

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays , Pectoral rays 13; Ventral fin I spine, 5 rays; median predorsal scales 4; a single row of 4-5 scales on cheek below eye; dorsal spines flexible; caudal fin rounded; General body color when fresh is greenish brown with scales finely flecked with pale; shade of white ventrally. Across the chin, 2 irregular dull reddish bars interspaced by white or yellow; upper opercular margin with a diffused dark spot. Hyaline pectorals with a yellowish flush; pelvic fins hyaline except for numerous small white spots and some reddish blotches. Lateral line interrupted (scales usually 19 + 7). Found in coastal bays in sea grass beds or substrata with heavy algal growth; a small species, depth range 5-10 m, the largest 19 cm.

Distribution Indo-Pacific, Marshall Islands and Tonga to East Africa and India (Andaman and Nicobar Islands).



***Calotomus spinidens* Spinytooth parrotfish** - Photo : John E. Randall

3. *Calotomus viridescens* (Ruppell, 1835)

Common name Viridescent parrotfish

1835. *Calotomus viridescens* Ruppell, W.P.E.S. *Fische des Rothen Meeres.*, 1-148, Pls. 1-33.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines; 9 rays; Ventral fin I spine, 5 rays. Head and body gray-brown with darker scale edges, paler ventrally. Numerous dark spots on scales on operculum and region circumscribed by pectoral fin. Flexible dorsal spines; caudal fin rounded in juveniles, double emarginate in adults; pectoral fin base yellowish, the rest unpigmented; pale pelvic fins with 2 reddish bars, at the center and near the base. Skin dark, almost black around anus. Orangish iris. Inhabits coral and rocky reefs and grass bed areas to depths of about 30 m. Occurs singly or in small groups. Feeds mainly on marine angiosperms and epiphytic algae.

Distribution Western Indian Ocean and India (Andaman and Nicobar Islands).

***Calotomus viridescens* Viridescent parrotfish** Photo : John E. Randall

4. *Cetoscarus bicolor* (Ruppell, 1829)

Common name Bicolour parrotfish

1828. *Cetoscarus bicolor* Rüppell, W.P.E.S. *Fische des Rothen Meeres* : 1-141 + 3 pp., col. Pls. 1-35.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral rays 14-15 , Ventral fin I spine, 5 rays; median predorsal scales 5-7; three rows of scales on cheek; no canine teeth on dental plates; caudal fin emarginate; initial phase reddish brown, yellow on back, the scales on side rimmed and spotted with black; terminal phase green, the edges of scales pink. Occurs in clear lagoon and seaward reefs. Depth range 1 – 30 m. Small juveniles usually in dense coral and algal habitats. Benthic grazer of algae. Attains 80 cm.

Distribution Indo-Pacific: Red Sea to the Tuamoto Islands, north to the Izu Island, south to the southern Great Barrier Reef and India (Andaman and Nicobar Islands).

***Cetoscarus bicolor* Bicolour parrotfish** Photo : John E. Randall

5. *Chlorurus bleekeri* (de Beaufort, 1940)

Common name Bleeker's parrotfish

1940. *Chlorurus bleekeri* Weber, M. and Beaufort de L.F. The Fishes of the Indo-Australian Archipelago v., **8** : i-xv + 1-508.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral rays 15; Ventral fin I spine, 5 rays; Scales large, 4 medial predorsal scales; 2 scale rows on cheek. Caudal fin truncate in both phases. Lips do not cover dental plates. Adults with 1-2 canines posteriorly on side of upper dental plate. The initial phase is reddish-brown with a diffuse yellowish patch in the center of the caudal peduncle and markings on the lips similar to those of the terminal male. Males identified by white patch on cheek and females strongly barred. Found in clear coastal and inner reefs, in lagoons and channel reefs. Feed mainly on algae. Reaches about 30 cm.

Distribution Western Central Pacific: Moluccas north to the Marshall Islands, south to Rowley Shoals, the Great Barrier Reef, Vanuatu and India (Andaman and Nicobar islands).

Chlorurus bleekeri **Bleeker's parrotfish**
Terminal phase Photo John E. Randall

6. *Chlorurus enneacanthus* (Lacepede, 1802)

Common name Captain parrotfish

Chlorurus enneacanthus Lacepède, B.G.E. 1802. *Hist. Nat. Poiss.*, **4** : 6.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral fin 14-15 rays; Ventral fin I spine, 5 rays. Caudal fin truncate to emarginated. Head and body green, rear part of the body scales narrowly pinkish; dental plates greenish; caudal fin violet with blue upper and lower margins. Attains 40 cm. Found on shallow fringing reefs, usually in areas with dead coral and rubble. Feeds on benthic algae.

Distribution Western Indian Ocean Mozambique, Mauritius, Chagos Archipelago, Maldives and India (Andaman and Nicobar Islands).

Chlorurus enneacanthus **Captain parrotfish** Photo : John E. Randall

7 *Chlorurus japanensis* Bloch,1789

Common name Palecheek parrotfish

1789. *Chlorurus japanensis* Bloch, M.E. *Ausland. Fische.*, v., **4** : 242-248, Pls. 1-3.

Description Pectoral rays 15; median predorsal scales 4; two rows of scales on cheek; no canines on lower dental plate; lips only slightly covering dental plates; front of head strongly rounded. Female is dark-brown but the tail is dark red. Male has yellow cheek and yellow area on sides near tail that are bright underwater. Inhabits seaward coral and rocky reefs, inner reefs with rich coral habitat. Feeds on benthic algae; depth range 2-20 m. Reaches 30 cm.

Distribution Indo-Pacific: Ryukyu Islands to Australia and India (Andaman and Nicobar Islands).

***Chlorurus japanensis* Palecheek parrotfish** Photo : John E. Randall

8. *Chlorurus sordidus* (Forsskal, 1775)

Common name Daisy parrotfish

1775. *Chlorurus sordidus* Forsskal, P. *Descript. Animal.*, : 1-20 + i-xxxiv + 1-164.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; pectoral fin 14-15 rays; median predorsal scales 4; two rows of scales on cheek; lips covering less than half of the dental plates; front of head strongly rounded. Initial phase very variable in coloration. Small individuals may be uniformly dark brown to light gray with or without the dark-centered light area on the caudal peduncle; large individuals may have a series of irregular rows of small light spots posteriorly or have the dark-centered light area on the caudal peduncle. The terminal phase is also variable with or without a large tan area on the side or on the caudal peduncle. Rounded snout. Depth range 3-50 m. Inhabit both coral rich and open pavement areas of shallow reef flats and lagoon and seaward reefs. Feed on benthic algae. Reaches 40 cm.

Distribution Indo-Pacific: Red Sea south to Natal, South Africa and east to the Hawaiian, Line, and Ducie islands, north to the Ryukyu Islands, south to Perth, New South Wales, Lord Howe Island, Rapa Island and India (Andaman and Nicobar Islands).

Chlorurus sordidus **Daisy parrotfish** - Photo : John E. Randall

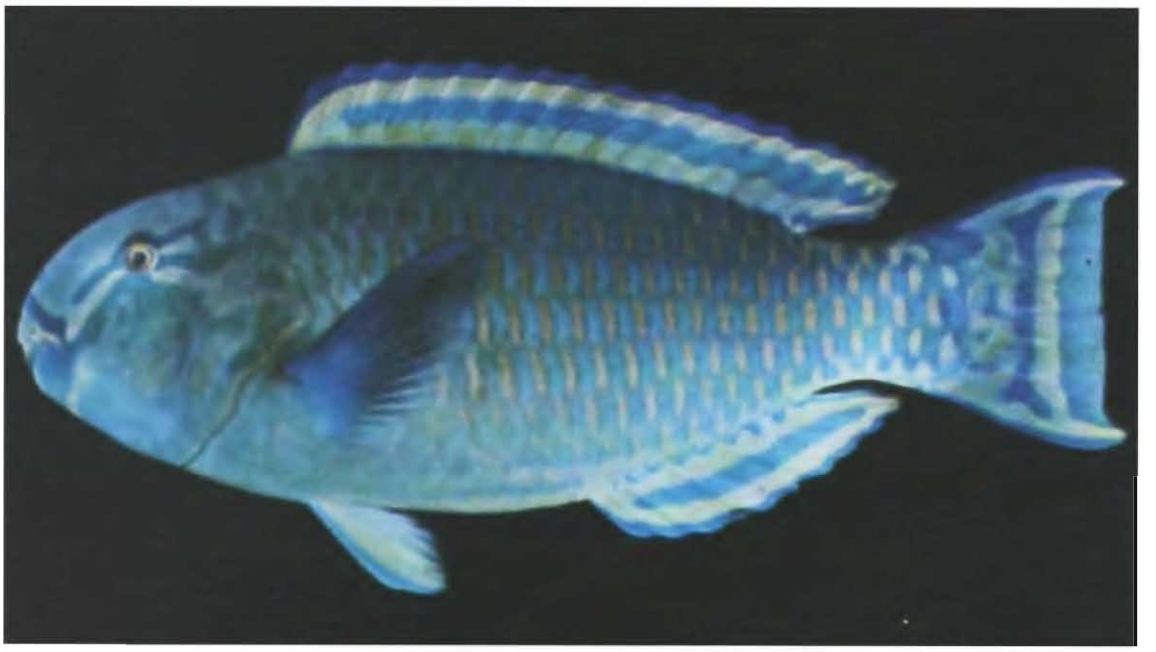
9. *Chlorurus strongylocephalus* (Bleeker 1854)

Common name : Indian Ocean steephead parrotfish

1854. *Chlorurus strongylocephalus* Bleeker, P. *Nat. Tijd. Ned. Indië.*, v., **7** : 415-448.

Description : Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; pectoral fin 15-17 rays; median pre dorsal scales 4; three rows of scales on cheek; caudal fin truncate with slightly prolonged lobes. Body green colour with salmon pink bar on each scale; dental plates blue- green; Juveniles usually solitary; adults may form schools. Feeds on algae, and inhabits reef edge. Reaches 70 cm. depth range 2-35 m. The species complex comprises of *Chlorurus gibbus*, *Chlorurus strongylocephalus* in the Indian Ocean and *Chlorurus microrhinos* in the west-central Pacific. Inhabits lagoon and seaward reefs.

Distribution : Indian Ocean : East Africa to southwest Indonesia, and India (Andaman and Nicobar Islands).



***Chlorurus strongylocephalus* Indian Ocean steephead parrotfish**

Photo : John E. Randall

10. *Leptoscarus vaigiensis* (Quoy & Gaimard, 1824)

Common name Marbled parrotfish

1824. *Leptoscarus vaigiensis* Quoy, J.R.C. and Gaimard, J.P. *Voyage Uranie, Zool.*, : 192-401.

Description Body elongate; Dorsal fin IX spines, 10 rays; Anal fin III spine, 9 rays; Pectoral 13 rays; Ventral fin I spine, 5 rays; median predorsal scales 4; a single row of scales on cheek below eye;. Color when fresh is greenish with pale and dark brown on scales, the latter almost covering entire scales. Head with irregular bands and spots, most distinct band on the chin. Somewhat fleshy lips, covering teeth in both jaws. Fleshy rim of anterior nostril expands dorsoposteriorly to a flap extending to or beyond posterior nostril. Yellow-orange iris with outer green ring. Flexible dorsal spines; deeply incised inter spinous membrane of dorsal fin. Found in sheltered bays, lagoons and inhabits seagrass areas or areas with hard substrates heavy with algal cover. Usually occur in small groups. Feeds on seagrasses and algae. Attains 35 cm.

Leptoscarus vaigiensis **Marbled parrotfish** - Photo : John E. Randall

Distribution Indo-Pacific: northern Red Sea and South Africa to Easter Island, north to southern Japan, south to Poor Knight's Island in New Zealand and Rottnest Island in Australia. Southeast Atlantic: False Bay, South Africa and India (Andaman and Nicobar Islands).

11 *Scarus dimidiatus* Bleeker, 1859

Common name Yellow Barred Parrotfish

1840: *Scarus dimidiatus* Cuvier, G. and Valenciennes A. *Hist. Nat. Poiss.* v., **14** : i-xxii + 2 pp. + 1-464 + 4 pp., Pls. 389-420.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral fin 14; Ventral fin I spine, 5 rays; 3 rows of scales on cheek. Caudal fin slightly rounded to truncate; initial phase light greyish yellow with four alternating slightly diagonal bars of dark grey and yellow on back; caudal fin yellow; terminal male with a dark grey stripe extending back from eye; rest of the body green, the scale rimmed with salmon pink. Closely resembles *S. oviceps* differs in that its initial phase has fewer, less vertical diagonal black bars on the back and the terminal phase lacks the light-centered bar between the eye and the pectoral fin base, is darker and less brilliant blue on the upper head and back and is usually larger. Inhabits lagoon and seaward reefs to at least 1-15 m. Occurs singly. Attains 30.0 cm.

Distribution Indo-Pacific Mauritius to the Line and Tuamoto islands, north to the Ryukyu Islands, south to Shark Bay, Great Barrier Reef and India (Andaman and Nicobar Islands).

Scarus dimidiatus **Yellow Barred Parrotfish** Photo John E. Randall

12. *Scarus festivus* Valenciennes, 1840

Common name Festive parrotfish

1840. *Scarus festivus* Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.*, **14** : 282

Description Dorsal fin IX spine, 10 rays; Anal fin III spine, 9 rays. Adults identified by lines radiating from eyes, two of which over the top of the head. Coloration changes slowly with growth. Males develop a distinctive lump on the forehead. Found in clear lagoon and seaward reefs. Feeds on benthic algae.

Distribution Indo-Pacific East Africa to the Tua moto Islands, north to the Ryukyu Islands, south to Lord Howe Island and India (Andaman and Nicobar Islands).

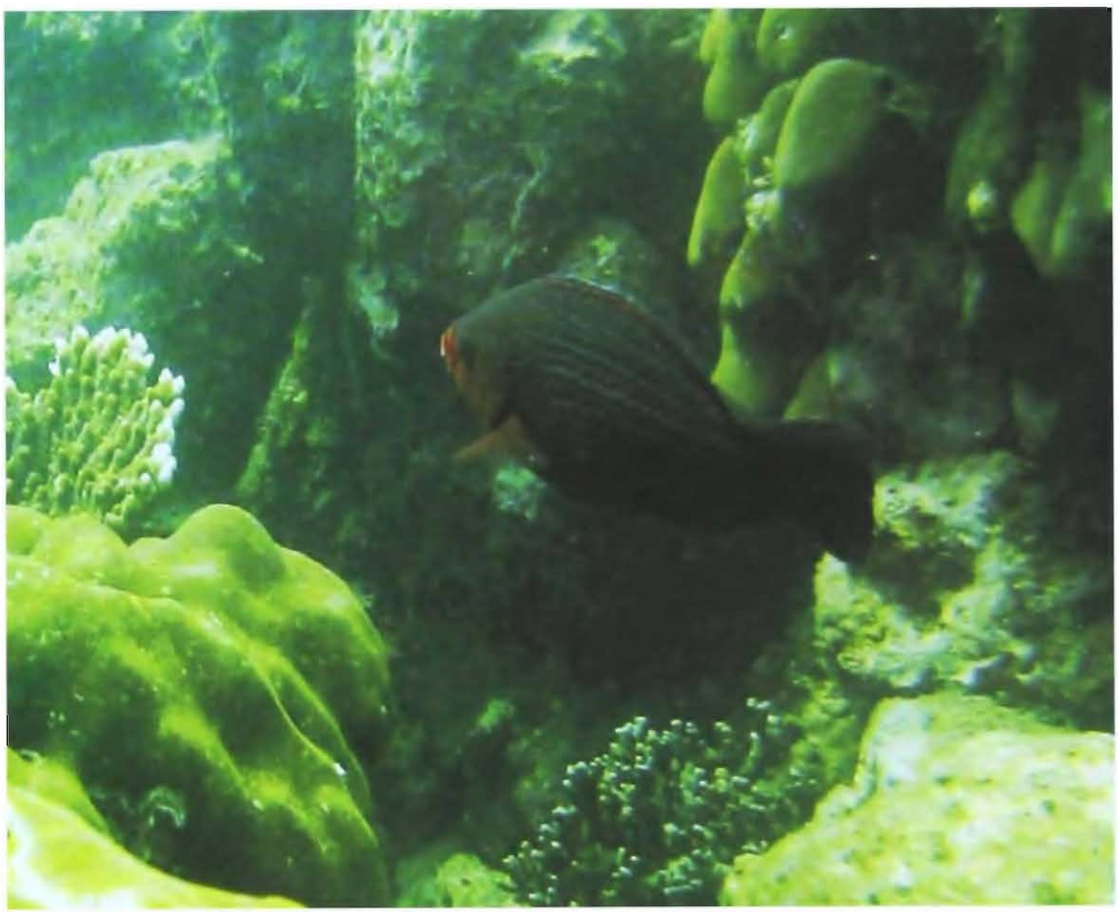
Scarus festivus **Festive parrotfish** Photo John E Randall

13. *Scarus frenatus* Lacepede, 1802

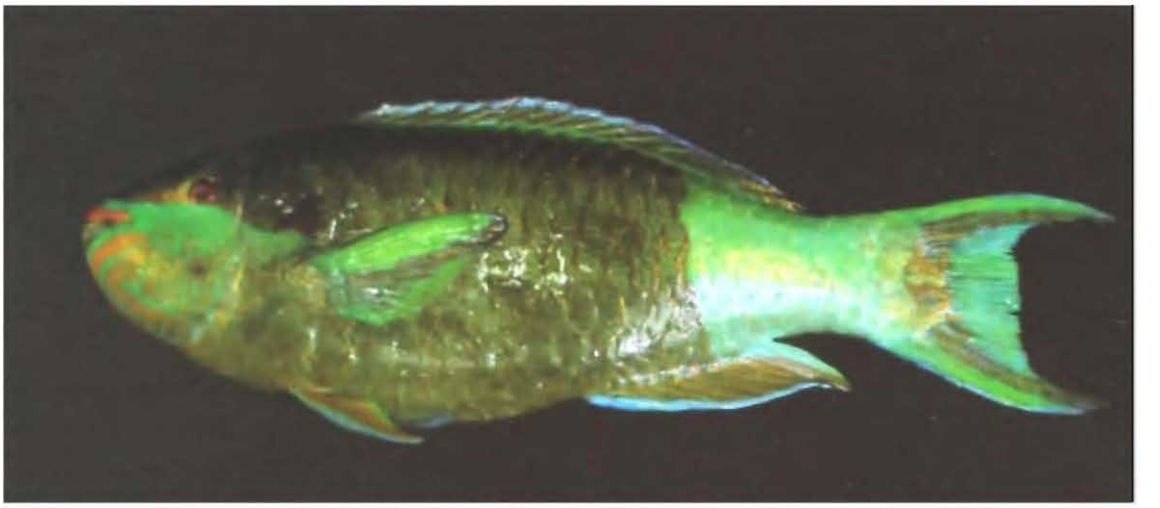
Common name Bridled parrotfish

1802. *Scarus frenatus* Lacepède, B.G.E. *Hist. Nat. Poiss.*, **4** : 13.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines; 9 rays; Pectoral 14-15 rays; median predorsal scales 6-7; lips covering most of the dental plates, the mouth slightly inferior. Initial phase brownish yellow to reddish brown, paler on caudal peduncle, with six dark brown stripes on side of body; fins red. Terminal phase green. Usually found on exposed outer reefs, sometimes in very shallow water, grazes on benthic algae. Generally solitary. Often in schools of mixed species when feeding. Attains 47 cm.



***Scarus frenatus* Bridled parrotfish** : Initial phase - Photo : Sreeraj



Scarus frenatus **Bridled parrotfish**

Distribution Indo-Pacific Red Sea to the Line and Ducie islands, north to southern Japan, south to Shark Bay, Western Australia and Lord Howe, Rapa islands and India (Andaman and Nicobar Islands).

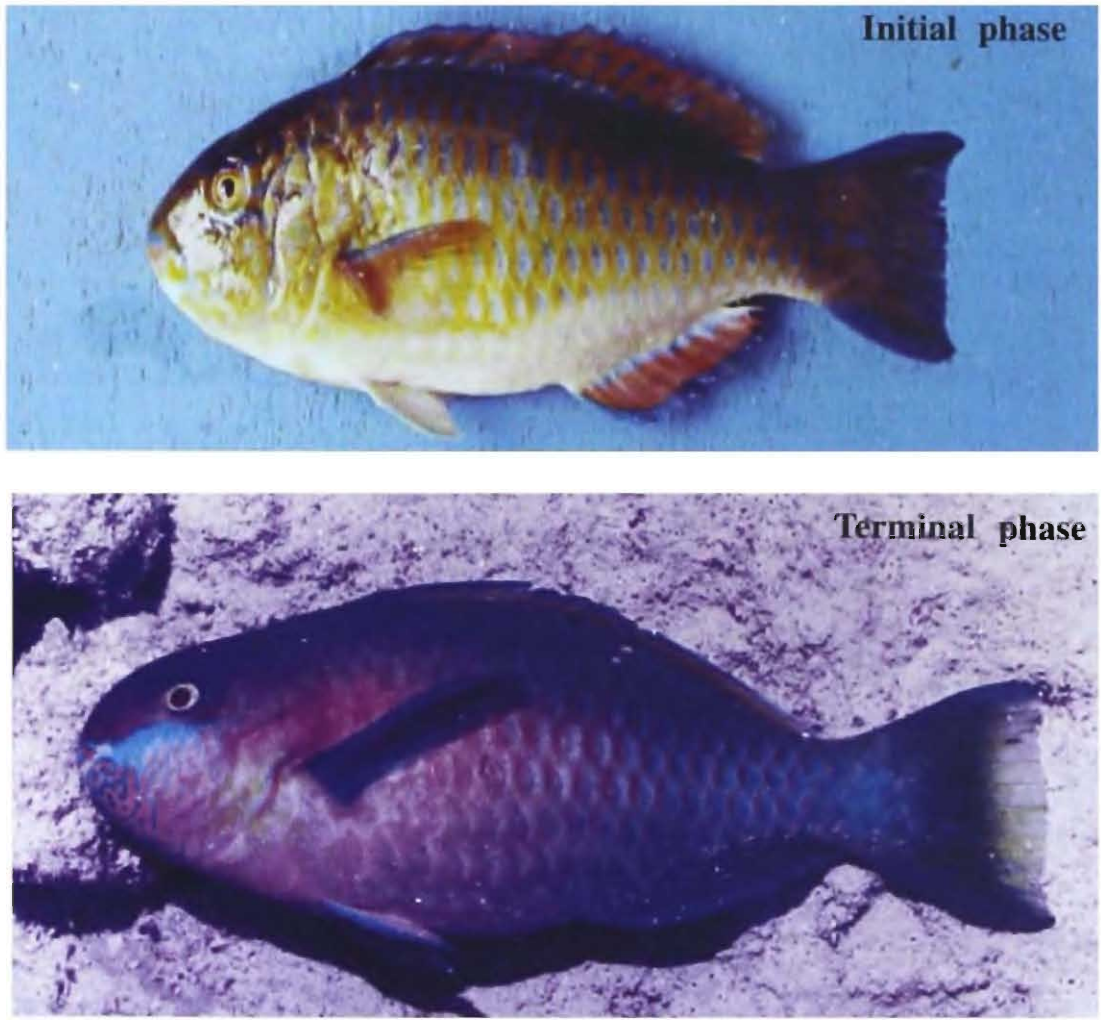
14. *Scarus ghobban* Forsskal, 1775

Common name Blue-barred parrotfish

1775. *Scarus ghobban* Forsskal, P. *Descript. Animal.*, : 28.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines; 9 rays; Pectoral 15-16 rays; Ventral fin I spine, 5 rays; median predorsal scales usually 6; three rows of scales on cheek; lips covering more than half of the dental plates. Distinctive yellow and blue-barred primary phase; terminal phase green dorsally, shading to pale salmon pink on cheek and chin, with two transverse blue bands on chin and three narrow irregular green bands extending posteriorly from eye. Adults inhabit lagoon and seaward reefs, in slopes and drop-offs, often solitary but may sometimes occur in small groups. Feed by scraping algae from rocks and corals. Depth range 3-36 m. Reaches 75 cm.

Distribution Indo-Pacific: Red Sea and Algoa Bay, South Africa to Rapa and Ducie islands, north to southern Japan, south to Perth, New South Wales, and India (Andaman and Nicobar Islands).



Scarus ghobban **Blue-barred parrotfish**

15. *Scarus globiceps* Valenciennes,1840

Common name Globehead parrotfish

Scarus globiceps Cuvier, G. and Valenciennes, A. 1840. *Hist. Nat. Poiss.*, **14** : 242.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral rays 14; median predorsal scales 5-7; three rows of scales on cheek; lips nearly covering dental plates. Initial phase grayish brown with three whitish stripes on abdomen; terminal phase green, the edges of the scales salmon pink. More common in outer reef habitats than in protected waters. Depth range 3-12 m. Reaches 27 cm.

Distribution Indo-Pacific: East Africa to the Line and Society islands, north to the Ryukyu Islands, south to Shark Bay, southern Great Barrier Reef of Australia, Rapa in the Austral Island and India (Andaman and Nicobar Islands).

Scarus globiceps **Globehead parrotfish**

16. *Scarus niger* Forsskal, 1775

Common name Dusky parrotfish

1775. *Scarus niger* Forsskal, P. *Descript. Animal*, p. 28

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral fin 13-15 rays; Ventral fin I spine, 5 rays; median predorsal scales 6-8; three rows of scales on cheek; dental plates largely covered by lips; Adult population has a distinctive reddish brown colouration; a small black-edged yellow green spot at upper end of gill opening; Juveniles recognized by the twin black spots on the tail. Inhabits coral-rich areas of clear lagoons, channels, and outer reef slopes. Feeds on benthic algae. Depth range 2-15 m. Attains 40.0 cm.

Distribution Indo-Pacific: Red Sea south to Sodwana Bay, South Africa and east to the Society Islands, north to the Ryukyu Islands, south to Shark Bay, Western Australia, southern Great Barrier Reef and India (Andaman and Nicobar Islands).

***Scarus niger* Dusky parrotfish** - Photo : Sreeraj

17 *Scarus prasiognathos* Valenciennes, 1840

Common name Greencheek parrotfish

1840. *Scarus prasiognathos* Cuvier, G. and Valenciennes A. *Hist. Nat. Poiss.* v., **14** : i-xxii + 2 pp. + 1-464 + 4 pp., Pls. 389-420.

Description Dorsal fin IX spines, 9-10 rays; Anal fin III spines, 9 rays; Pectoral fin 15 rays; Ventral fin I spine, 5 rays. Scales large. Median predorsal scales 6; 3 scale rows on cheek, with 1-3 scales in ventral row. Caudal fins emarginate in initial phase to deeply concave in large terminal phase. Lips nearly covering dental plates; Initial phase dark reddish brown, scale centers with small white spots on anterior part of body. Terminal males with 0-2 canines posteriorly on side of upper plate, none on lower. The terminal phase has the distinctive brilliant green throat and lacks the filamentous middle dorsal spine. Usually associated with outer reefs but will enter shallow water in protected areas. Often in large schools. Grazes on benthic algae. Depth range 1-15 m. Attains 70.0 cm.

Distribution Indo-West Pacific: Maldives to New Ireland in Papua New Guinea, including Cocos-Keeling Islands, north to Ryukyu Islands, south to the Philippines, includes Palau and India (Andaman and Nicobar Islands).

***Scarus prasiognathos* Greencheek parrotfish** Photo : John E. Randall

18. *Scarus psittacus* Forsskal, 1775

Common name Common parrotfish

1775. *Scarus psittacus* Forsskal, P. *Descript. Animal*, p. 29.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral fin 13-15 rays; Ventral fin I spine, 5 rays; median pre-dorsal scales 4. Caudal fin emarginated. Dental plates white. Initial phase reddish brown to grey; snout paler than rest of head; a diffuse dark spot at base of first membrane of dorsal fin and a small black spot at upper base of pectoral fins; scales of the body of terminal male about half green and salmon pink. The initial phase closely resembles that of *S. globiceps* and *S. rivulatus*. Inhabit reef flats and lagoon and seaward reefs to at least 25 m depth. Graze on benthic algae. Secrete a mucus cocoon. Attains 30.0 cm.

Distribution Indo-Pacific: Red Sea south to Sodwana Bay, South Africa to the Hawaiian, Marquesan, and Tuamoto islands, north to southern Japan, south to Shark Bay, Western Australia, Lord Howe Island and India (Andaman and Nicobar Islands).

***Scarus psittacus* Common parrotfish** Photo John E. Randall

19. *Scarus quoyi* Valenciennes 1840

Common name Quoy's parrotfish

1840. *Scarus quoyi* Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.* v., **14** : i-xxii + 2 pp. + 1-464 + 4 pp., Pls. 389-420.

Description Body fairly compressed. Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays. Colour: Teeth yellowish white. Body green with red edges of scales above and brownish-red to pink below. Caudal peduncle greenish. Head reddish-brown above, snout and behind mouth green, lower parts orange with wavy blue or green lines behind eye. Dorsal fin orange with blue border. Anal fin reddish-brown with blue border. Caudal fin yellow-green, basally blue and with upper and lower borders blue. Pectoral fin with broad red band below upper ray. Inhabits coral-rich areas of outer channels and seaward reefs. Occurs singly or in small groups, over intertidal flats to graze on algae during high water mark. Depth range 2-18 m. Attains 40.0 cm.

Distribution Indo-West Pacific India to Vanuatu, north to the Ryukyu Islands, south to New Caledonia; Palau in Micronesia and India (Andaman and Nicobar Islands).

Scarus quoyi Quoy's parrotfish

20. *Scarus rivulatus* Valenciennes, 1840

Common name Rivulated parrotfish

1840. *Scarus rivulatus* Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.* v., **14** : i-xxii + 2 pp. + 1-464 + 4 pp., Pls. 389-420.

Description Dorsal fin IX spines, 10 rays; Anal fin III spines, 9 rays; Pectoral fin 13-15 rays; Ventral fin I spine, 5 rays; median pre dorsal scales 5-7; caudal fin slightly rounded to truncate in initial phase, the lobes slightly prolonged in terminal phase; Males easily recognized by the yellow pectoral fins and orange cheeks.Female is plain grey with pale lines along abdominal area. The initial phase closely resembles that of *S. globiceps* and *S. psittacus*. Inhabits rocky and coral reefs from tidal pools to at least 10 m deep. Form schools and grazes on benthic algae and corals. 40.0 cm.

Distribution Indo-West Pacific: Thailand to NewCaledonia, north to the Ryukyu Islands, south to Perth and New South Wales in Australia and India (Andaman and Nicobar Islands).

Scarus rivulatus **Rivulated parrotfish** - Photo : John E. Randall

21 *Scarus rubroviolaceous* Bleeker, 1847

Common name Ember parrotfish

1847. *Scarus rubroviolaceous* Bleeker, P. *Nat. Gen. Arch. Ned. Ind.*, **4**(2) : 162.

Description Dorsal fin IX spines; X rays; Anal fin III spines, 9 rays; Pectoral fin 14-16 rays; Ventral fin I spine, 5 rays; median predorsal scales 6; three rows of scales on cheek. Body moderately elongate; dorsal profile of head rising steeply from mouth to level of eye; caudal fin of adults in initial phase slightly emarginated, of terminal males lunate; initial phase reddish brown to grey, with small black spots and lines on scales of the body; fins red; terminal males green, the edges of the scales salmon pink; cheek yellowish; dental plates blue-green. Males develop a gibbus forehead. Occurs in seaward reefs. Usually over rocky or coral substrates, at boulder-strewn slopes at the base of high-island cliffs where it may occur in large schools. Feeds on benthic algae. An uncommon species. Depth range 1 – 36 m. Attains70.0 cm.

Distribution Indo-Pacific East Africa south to Durban, South Africa and east to the Tuamoto Islands, north to the Ryukyu and Hawaiian islands, south to Shark Bay, Western Australia and the southern Great Barrier Reef. Eastern Pacific Gulf of California to the Galapagos Islands and India (Andaman and Nicobar Islands).

Scarus rubroviolaceous **Ember parrotfish** Photo : John E. Randall

22. *Scarus scaber* Valenciennes, 1840

Common name Fivesaddle parrotfish

1840. *Scarus scaber* Cuvier, G. and Valenciennes, A. *Hist. Nat. Poiss.*, **14** : 239.

Description : Dorsal fin IX spines, X rays; Anal fin III spines, 9 rays; Pectoral fin 12-13 rays; Ventral fin I spine, 5 rays; predorsal scales 6-7. Caudal fin truncate, lobes slightly extended. Body yellowish on upper part with four blotches, the antero-dorsal blotch on head is larger and darker. Inhabits shallow lagoon reefs, in areas with dense coral cover. Feeds on algae by incessant grazing in coral reefs. Depth range 1-20 m. Attains 37.0 cm.

Distribution Western Indian Ocean: East Africa south to Natal, South Africa; also around islands of the western Indian Ocean.

***Scarus scaber* Fivesaddle parrotfish** - Photo : Sreeraj

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