



# Biodiversity and biology of ornamental wrasses (Family: Labridae) of Gulf of Mannar, southeast coast of India

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Received: 08 May 2016, Accepted: 10 Jan 2017, Published: 20 Jan 2017

Original Article

## Abstract

The global marine ornamental fish trade is a multibillion dollar industry. About 90% of the marine ornamental fish species are collected from the wild, mainly from coral reefs and adjacent habitats. Keeping this in view, a survey was undertaken to study the biodiversity of marine ornamental fish species with special reference to labrids (wrasses) in Gulf of Mannar. Of the 113 ornamental fish species recorded, 16 species belong to the family Labridae showing a rich biodiversity. Seasonal occurrence of labrids was investigated in five fish landing centres viz., Thoothukudi, Vallinokkam, Mandapam, Vembar and Chinna Erwadi and six reef islands namely Kuswari, Villangu Shuli, Kariya Shuli, Nallathanni, Musal and Krusadai along the Gulf of Mannar coast. The study revealed that 11 species are distributed along Thoothukudi coast, followed by Vallinokkam coast (7 species), Mandapam coast (4 species) and Vembar (2 species). No labrid was recorded from Chinna Erwadi during the study period. Of the 16 species, *Xyrichtys pavo*, *Cheilinus chlorurus* and *Thalassoma hardiwicki* were recorded from all the 6 islands, whereas *Cheilinus undulatus* was from 5 islands except Musal island. However, the remaining 11 species were observed only from 1 to 3 islands. From the study on food and feeding habits of labrids of Gulf of Mannar, it was learnt that they are carnivorous and feeding mainly on coral polyps, molluscs, crustaceans, fishes, polychaetes, seaurchin etc., showing their dependency over the coral reefs. Among the 11 species, *X. pavo* was found to occur in large numbers, constituting a minor

fishery mainly along Thoothukudi coast. Asymptotic length ( $L_{\infty}$ ) and Growth Co-efficient (K) of *X. pavo* were estimated to be 42.53 cm and 0.27 respectively. Age and growth of *X. pavo* was also studied. Spawning and recruitment of *X. pavo* were found to occur throughout the year with a peak in April and August in the Gulf of Mannar.

**Keywords:** Wrasse, Labridae, ornamental fish, Gulf of Mannar.

## Introduction

The Gulf of Mannar is one of the world's richest regions from a marine biodiversity perspective. It has unique ecological systems mainly contributed by coral reefs, sea grass beds and mangroves for several finfish and shellfish species. There are 21 islands extending from Pamban to Thoothukudi. The Gulf of Mannar with its islands provides a very interesting heterogeneous group of fauna and flora with about 3,600 species (Ramadhas *et al.*, 1999). In addition to being a source of several edible resources, Gulf of Mannar offers tremendous scope for ornamental fishery resources also.

The global ornamental fish trade which was US\$ 176 million in 2000 increased to US\$ 342 million in 2010 at an annual compounded growth rate of 6.2% (Tissera, 2012). The overall ornamental fish trade was about 1.06 million US\$ during 2009 (Rani *et al.*, 2014). In the ornamental fish trade, the marine ornamental fish species constitute only about 10 - 15% of the market. About 95% of marine fish are collected from the wild, while 5% are bred fish (Kurup *et al.*, 2006). Nevertheless, research undertaken on biodiversity, stock assessment, breeding, transportation and management of marine aquarium fishes led to fast growth of this trade scientifically (Jayasankar, 1998). The ecology and biology of an ornamental fish, *Abudefduf glaucus* from Minicoy Atoll, Lakshadweep was studied by Pillai and Mohan (1990). Murty (2002) reported a total of 600 species of marine fishes from the Lakshadweep group of islands. Among them, about 300 species belonging to about 35 families are known for their attractive colours and shapes. Of these different families, Labridae (wrasses) was found to be the most dominant one which was followed by the families, Scaridae (parrotfishes) and Pomacentridae (Damsels, Clownfish) (Murty, 2002). Venkataramani and Jayakumar (2006) studied the biodiversity and biology of parrotfishes of Gulf of Mannar. Among the various marine ornamentals, fishes such as pomacentrids, pomacanthids, chaetodontids, balistids, labrids and acanthurids are found to dominate in the marine ornamental fish trade. Among these fishes, the members of the family Labridae, popularly called as wrasses, hogfishes, razorfishes and cories find prominent place in the marine ornamental fish trade. They are distributed in Atlantic, Pacific and Indian Oceans. The shape of the body varies irrespective of species. Even within the same species, body shape changes during growth. The members of this family changes colour during growth and also the colour pattern varies with sex.

The study conducted by Venkataramani *et al.* (2004) revealed that of the 25 families, the family, Labridae (16 species) ranked second next to the family Chaetodontidae (18 species) in the number of species. Though several studies on various aspects of resources of Gulf of Mannar have been made, no attempt has been hitherto under taken on the biodiversity and biology of labrids in Gulf of Mannar. Hence the present investigation was undertaken with the objectives of studying the seasonal occurrence of labrid species, of knowing their food and feeding habits, growth, and reproductive potential through growth parameters and age at first maturity.

## Material and methods

The study was undertaken during the year 2003-2004 at five fish landing centres *viz.*, Mandapam, Valinokkam, Chinna Erwadi, Vembar and Thoothukudi and six reef islands *viz.*, Kaswari, Villangu Shulli, Kariya Shulli, Nallathanni, Musal Thivu and Krusadai. Survey on the occurrence of these labrids in the above-mentioned reef islands of Gulf of Mannar was conducted by SCUBA diving throughout the year except the rainy season (Oct - Dec). Sampling was done once in a week (*i.e.*, 4 times in a month) throughout the year in the catches in specialized bamboo traps operated exclusively for ornamental fishes at a depth of 20 m in Chinna Erwadi, whereas in Thoothukudi, Mandapam and Valinokkam sampling from landing centres was done from the catches of trawl net and gill net. Seasonal occurrence and species richness of labrid species were recorded at different landing centres. Food and feeding habits of these species were studied by using the method of the index of preponderance (Natarajan and Jhingran, 1961). Out of the 16 species studied, as *Xyrichtys pavo* was found to occur in large numbers and constituting a minor fishery mainly along Thoothukudi coasts, its population parameters were analysed in detail. Growth parameters like asymptotic length, growth co-efficient, age and growth, spawning and recruitment were calculated by using FISAT computer programme developed by Gayanilo *et al.* (1994).

## Results and discussion

From the 113 species recorded from Gulf of Mannar, 16 species were found to belong to the family Labridae, showing richer biodiversity than any other families of ornamental fishes except Chaetodontidae (18 species). Month-wise seasonal occurrence of labrids of Gulf of Mannar is given in Table 2. The study revealed that 11 species are distributed along Thoothukudi coast, followed by Vallinokkam coast (7 species), Mandapam coast (4 species) and Vembar (2 species). No labrid was recorded from Chinna Erwadi during the study period. Of the 16 species, *X. pavo*, *Cheilinus chlorurus* and *Thalassoma hardwicke* were recorded from all the 6 islands, whereas *C. undulatus* was from 5 islands except Musal island. However, the remaining 11 species were observed only from 1 to 3 islands. From the study on food and feeding habits of labrids of Gulf of Mannar, it was learnt that they are carnivorous, feeding mainly on coral polyps, molluscs, crustaceans, fishes, polychaetes, seaurchin etc., showing their dependency over the coral reef. Various biological features of the labrid species recorded are given below. Asymptotic length

Table 1. Age and growth of *X. pavo*

Year	1	2	3	4	5	6	7	8	9	10	11	12
Length (cm)	10.83	19.16	25.83	30.83	34.99	37.49	39.99	41.66	43.33	44.16	44.99	45.10

Table 2. Month-wise Seasonal Occurrence of Labrids in Different Landing Centres of Thoothukudi

Species	Sep 2003	Oct 2003	Nov 2003	Dec 2003	Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Jun 2004	Jul 2004	Aug 2004
<i>Bodianus speciosus</i>	—	—	—	—	+	—	—	—	—	—	—	—
<i>Cheilinus chlorurus</i>	—	—	—	+	+	—	—	+	—	—	—	—
<i>Cheilinus oxycephalus</i>	—	—	—	—	—	—	—	+	—	—	—	—
<i>Cheilinus undulatus</i>	+	—	—	+	+	—	—	—	+	—	—	—
<i>Coris formosa</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Gomphosus coeruleus</i>	+	+	—	—	—	—	—	+	—	—	—	—
<i>Halichoeres zeylonicus</i>	—	—	—	+	+	—	+	+	—	—	+	—
<i>Hemigymnus fasciatus</i>	—	—	—	—	—	—	—	+	—	—	—	—
<i>Thalassoma lunare</i>	—	—	—	—	—	—	—	+	+	—	—	—
<i>Thalassoma purpureum</i>	—	—	—	—	—	—	—	—	+	—	—	—
<i>Xyrichtys pavo</i>	+	+	+	+	+	+	+	+	+	+	+	+
<b>Vallinokkam</b>												
Species	Sep 2003	Oct 2003	Nov 2003	Dec 2003	Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Jun 2004	Jul 2004	Aug 2004
<i>Anampses lineatus</i>	—	—	—	—	—	—	—	+	—	—	—	—
<i>Choerodon robustus</i>	—	—	—	—	—	+	+	+	—	—	—	—
<i>Helichoeres centriquadrus</i>	—	—	—	—	—	—	—	+	—	—	—	—
<i>Helichoeres zeylonicus</i>	—	—	—	—	—	—	—	—	+	—	—	—
<i>Hemigymnus fasciatus</i>	—	—	—	—	—	—	—	+	+	—	—	—
<i>Thalassoma hardwicki</i>	—	—	—	—	—	—	—	—	+	+	—	—
<i>Thalassoma lunare</i>	+	—	—	—	—	—	—	+	+	—	+	—
<b>Mandapam</b>												
Species	Sep 2003	Oct 2003	Nov 2003	Dec 2003	Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Jun 2004	Jul 2004	Aug 2004
<i>Halichoeres centriquadrus</i>	—	—	—	—	—	—	—	+	+	—	—	—
<i>Hemigymnus fasciatus</i>	—	—	—	—	—	—	—	+	+	—	—	—
<i>Thalassoma lunare</i>	—	+	+	+	+	+	+	+	+	+	+	—
<i>Labroides dimidiatus</i>	—	—	—	—	—	—	—	+	+	—	—	—
<b>Vembar</b>												
Species	Sep 2003	Oct 2003	Nov 2003	Dec 2003	Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Jun 2004	Jul 2004	Aug 2004
<i>Coris formosa</i>	—	—	—	—	+	—	—	+	—	—	—	—
<i>Xyrichtys pavo</i>	—	—	—	—	+	—	—	+	—	—	—	—

( $L_{\infty}$ ) and Growth Co-efficient (K) of *X. pavo* were estimated to be 42.53 cm and 0.27 respectively. Age and growth of *X. pavo* were also studied (Table 1). Spawning and recruitment of *X. pavo* were found to occur throughout the year with a peak in April and August in Gulf of Mannar.

#### ***Anampses lineatus* Randall, 1972 (Lined wrasse):**

This species was recorded from Nallathanni and Musal islands of Gulf of Mannar at a depth of 5-20 m. Only two specimens were collected and they measured 8 and 10 cm. They were found to feed on crustaceans and sea urchins. The collected specimens were matured males measuring 10 cm with prominent ribbon shaped pinkish white testis. This species

is collected in traps along with chaetodonts and are sent to Kolkata for export at a price of Rs. 100 per fish. It is reported to be a rare species in Gulf of Mannar.

#### ***Bodianus speciosus* (Bowdich, 1825) (Black bar hogfish):**

This species was recorded for the first time from the Gulf of Mannar. Two specimens of this species were collected from the Nallathanni and Krusadai islands of Gulf of Mannar at a depth of 15-20 m. The collected specimens were male, measuring 27 and 29 cm. This species was found to feed on polyps, medusae and bivalves. It is known to be a protogynous hermaphrodite (Gomon and Forsyth, 1990). It is a rare species in Gulf of Mannar.

***Cheilinus chlorurus* (Bloch, 1791) - (Floral wrasse):**

This species was recorded from all the six reef islands of Gulf of Mannar at a depth of 2-20 m. In this region, the maximum length recorded is known to be 19 cm. Gut content analysis of this species showed the presence of crustaceans such as copepods, crab larvae and mysids, molluscs, starfishes and seaurchins. This species fetches a price of Rs. 250 per individual along Mandapam coast of Gulf of Mannar due to attractive body colouration. It is also a rare species in Gulf of Mannar.

***Cheilinus oxycephalus* Bleeker, 1853 - (Snotty wrasse):**

This species was collected from the Musal and Krusadai islands of Gulf of Mannar at a depth of 3-20 m and also from the seaweed beds along the Mandapam coast of Gulf of Mannar. The maximum length recorded is 15 cm along this coast. Studies on the food habits showed that this species is a primary carnivore, feeding on crustaceans, molluscs and fishes. Unidentified polychaete worms were also recorded in the gut contents. Two female specimens, measuring 12 and 14 cm in total length, were collected from Krusadai Island at a depth of about 20 m and were found to have matured ovary. Juveniles of this species (less than 10 cm) have a good aquarium value, sold at a rate of Rs. 175 per individual fish along Mandapam coast of Gulf of Mannar. It is also a rare species in Gulf of Mannar.

***Cheilinus undulatus* Ruppell, 1835 - (Humphead wrasse):**

This species was recorded from all the six islands, Kuswari, Villangu Shuli, Kariya Shuli, Nallathanni and Krusadai islands of Gulf of Mannar at a depth of 3-20 m. Specimens having 20 cm length were found to be caught in gill nets and trawl nets at a depth of 35 m. The maximum size recorded for this species is 22 cm. This species was observed to move in groups around *Acropora* and *Montipora* corals. Gut content analysis showed that this species is a carnivore, feeding on molluscs, shrimps, amphipods, polychaetes and fishes. It was learnt that it fetches a price of Rs. 125/- per individual fish along Tuticorin coast of Gulf of Mannar. This species was recorded in less numbers in Gulf of Mannar during the study.

***Choerodon robustus* (Gunther, 1862) - (Robust tuskfish):**

This species was collected from Nallathanni, Musal and Krusadai islands of Gulf of Mannar at a depth of 3-20 m. The maximum length collected is 27.8 cm. Gut content analysis was studied and this species found to feed on bivalves, shrimps, seaurchins, polychaetes and coral polyps. It is known to be a popular aquarium fish and fetch a price of Rs. 220 per fish along the Mandapam coast of Gulf of Mannar. It is also a rare species in Gulf of Mannar.

***Coris formosa* (Bennett, 1830) - (Queen coris):** This species was collected from Kuswari, Nallathanni and Musal

islands of Gulf of Mannar at a depth of 5-20 m. The specimens of 20 cm and above were also caught by trawl nets, gill nets and hooks and lines at depth of 30-40 m. The maximum length recorded is 35 cm in Gulf of Mannar. In the reef islands of Gulf of Mannar, specimens of *C. formosa* with three different colour patterns were collected during the survey. Similar colour variation was observed in *Coris juiils* by Fruciano *et al.* (2012) who conducted a study on the body shape variation and colour change during growth in this protogynous fish. They hypothesized that the deeper body and steeper head profile accompany the striking secondary colour pattern, enhancing it (the vivid colours are probably more visible in a bigger and deeper body) for social display purposes (for instance in mate choice or in agonistic relationships between secondary males). This species was observed to feed on crustaceans, (shrimps, crabs and amphipods), echinoderms and small molluscs. Fish scales were also recorded in the gut contents. Maximum length reported for this species is 42.5 cm. Matured males and females were collected from the Nallathanni, musal islands of Gulf of Mannar at a depth of 20 m. The number of matured ova was estimated to range from 52,170 - 65,250 in specimens of 25-28 cm. This species was collected in less numbers in the reef islands of Gulf of Mannar.

***Halichoeres centriquadrus* (Lacepede, 1801) - (Checkerboard wrasse):**

It was recorded from Nallathanni and Krusadai islands of Gulf of Mannar at a depth of 3-20 m. The maximum length recorded for this species at Gulf of Mannar is 22 cm. Gut content analysis showed that this species feeds on molluscs, crustaceans such as crabs and shrimps, seaurchins and starfishes. Matured checkerboard wrasses were recorded from Nallathanni island of Gulf of Mannar at a depth of 20 m. The length at minimum maturity was estimated to be 14 cm which could be attained at an age of 2 years. This species, particularly the adult fetches a very good price of Rs. 300 per fish along Mandapam coast of Gulf of Mannar and are sent to Kolkata for export. It was recorded in less numbers in Gulf of Mannar.

***Halichoeres zeylonicus* (Bennett, 1833) - (Goldstripe wrasse):**

Two specimens of this species were recorded from Kuswari, Musal and Krusadai islands of Gulf of Mannar at a depth of 2-20 m. The maximum length collected was reported to be 20 cm. It is also a rare species in Gulf of Mannar.

***Hemigymnus fasciatus* (Bloch, 1792) - (Barred thicklip):**

This species was recorded from Nallathanni and Krusadai islands of Gulf of Mannar at a depth of 2-20 m. Food habits of this species revealed the presence of crustaceans such as crabs, *Acetes* and amphipods, molluscs and seaurchins. Juveniles and maturing fishes of this species (15-28 cm) were recorded from the reef islands and the maximum length recorded in Gulf of Mannar is 28 cm. Juveniles have better ornamental

value than the adults and fetch a price of Rs. 220 per fish along Vallinokkam and Mandapam coasts of Gulf of Mannar. It is also a rare species in Gulf of Mannar.

***Thalassoma lunare* (Linnaeus, 1758) - (Moon wrasse):** This species was recorded from Kuswari, Villangu Shuli and Nallathanni islands of Gulf of Mannar at a depth of 3-20 m and also from the seaweed beds along Mandapam coast at a depth of 2-15 m. Young ones of this species (10-15 cm) were found to swim around the coral reefs of *Acropora*, *Pocillopora* and *Montipora*. The maximum length recorded for this species is 20 cm. Studies on the food habits of this species revealed the presence of shrimps, molluscs and searhins in the gut contents. Juveniles measuring less than 10 cm, fetch a price of Rs. 150 per fish in domestic markets and are also sent to Kolkata for export. These fishes are caught in less numbers in the reef islands of Gulf of Mannar.

***Thalassoma purpurum* Forsskal, 1775 - (Surge wrasse):** Two specimens measuring 12 and 15 cm were collected from the Krusadai islands of Gulf of Mannar at a depth of 10-20 m. The maximum length recorded for this species in Gulf of Mannar is 15 cm. This species was found to feed on crustaceans, polychaete worms and molluscs. It is also a rare species in Gulf of Mannar.

***Xyrichtys pavo* (Valenciennes, 1839) - (Peacock wrasse):** This species was collected in large numbers in all the six reef islands of Gulf of Mannar at a depth of 7 - 20 m. This species was also collected in good numbers by gill nets and hooks and lines at a depth of 30 - 50 m. Maximum length recorded is 34.5 cm in Gulf of Mannar. The asymptotic length ( $L_{\infty}$ ) was estimated to be 42.53 cm and Growth Co-efficient (K) was calculated to be 0.27. The study on age and growth of this species revealed that it could attain a size of 41.11 cm at an age of 12 years.

Life span was estimated to be 12 years. Recruitment was found to take place round the year with a peak in April in August. Gut content analysis revealed the presence of fishes, molluscan

shells, crustacean remains, sea urchins and polychaete worms, revealing that this species is a carnivore. The specimens of 25 cm and above were found to be with matured gonads. The length at minimum maturity is 25 cm. The number of matured ova ranged from 48,250-1,21,000 in specimens of 25-28 cm in total length.

## Acknowledgements

The authors wish to thank the Registrar, Tamil Nadu Veterinary and Animal Sciences University, Chennai and the Dean, Fisheries College and Research Institute, Thoothukudi for the facilities provided.

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