

CHAPTER 8

8. FOOD AND FEEDING ECOLOGY

8.1 INTRODUCTION

Many fish of the marine shallow waters invade the mangrove shore at high tide to consume resident invertebrates (Sasekumar *et al.*, 1984). These invertebrates are in/or closely associated with the substratum and include both the meiofauna and the macrofauna (Wootton, 1992). Primary production by photosynthesizing green plants is the initial source of virtually all the macronutrients and organic micronutrients eventually eaten by fishes (Wootton, 1992). Most of the primary production within the aquatic environment is generated by single-celled algae. Typically, fishes exploit these algae indirectly by feeding carnivorously on herbivorous invertebrates or on other invertebrate and vertebrate carnivores.

Some fishes can feed on decaying matter and organic detritus, while most fishes feed either directly or indirectly on detritivorous invertebrates. The importance of mangrove-derived plant detritus as a source of energy input of coastal food webs has been emphasized (Odum and Heald, 1975). The decaying leaves, stems and roots are the source of detritus but the leaves from fringing trees are the source of nutrients and energy, as are many terrestrial

arthropods or other animals that fall into the water (Wootton, 1992).

Fish can be classified broadly on the basis of their feeding habits as detritivores, herbivores, carnivores and omnivores. The aim of this study is to investigate the food and feeding habits of three common species of fish that occurred in the mangrove creeks, *Ambassis gymnocephalus*, *Stolephorus tri* and *Liza melinoptera*.

8.2 Results And Discussion

8.2.1 Food Classification

The stomachs of most specimens contained at least some materials that formed an amorphous mass. The food were usually mastigated and partially digested. In some cases, such materials could be partially identified, e.g. fragments of decomposing vegetation, but more often they were difficult to identify due to their minute size or poor physical state.

Organic detritus probably forms a major portion of the amorphous mass, which is also made up of partially broken-up and semi-digested food. For convenience, this amorphous mass of materials is referred to as 'unidentified debris' (Chong and Sasekumar, 1981).

The term 'plant macrophytes' refers to freshly (green) ingested plant materials. Inorganic particles like sand and silt particles were classed as 'grit' (Chong and Sasekumar, 1981). The miscellaneous matter refers to the food items which did not occur commonly. Fish scales and bones and unidentified algal or fungal spores or unidentified eggs were classified in this category.

8.2.2 Analysis Of Stomach Fullness

This analysis is to observe the condition of feeding. Stomach fullness ranged from empty to gorged. Fishes with gorged stomach, full and half full were taken to have fed actively, while the rank from empty to the other ranks of fullness were considered as poorly fed.

The percentage of occurrence and volume of stomachs of *Ambassis gymnocephalus*, *Stolephorus tri* and *Liza melinoptera* in various degrees of fullness are shown in Table 7.0. The stomach condition of 55.0% of *Ambassis gymnocephalus* specimens examined were in the actively fed condition. While the percentage of poorly fed was 43.1%.

Most specimens of *Stolephorus tri* were in poorly fed condition than in actively fed condition. However, for *Liza melinoptera* the feeding condition of poorly and actively

Table 7.0 : Percentage occurrence of stomachs of *Ambassis gymnocephalus*, *Stolephorus tri* and *Liza melinoptera* in various degrees of fullness.

Species	Stomach fullness						Total number of specimens examined
	0	1	2	3	4	5	
<i>Ambassis gymnocephalus</i>	21.1	21.1	0.9	25.7	16.5	12.8	109
<i>Stolephorus tri</i>	33.3	20.8	0.0	12.5	2.1	31.3	48
<i>Liza melinoptera</i>	23.4	15.6	10.9	10.9	3.1	35.9	64

fed were almost in the same percentage.

8.2.3 Analysis Of Stomach Contents

The stomach contents of *Ambassis gymnocephalus*, *Stolephorus tri* and *Liza melinoptera* are shown in Table 7.1. The majority of the stomachs contained more than one food item in varying degrees of abundance. Each species had their own preference of a particular food item. Both animal and plant matter were noticed in the stomach. Some of the stomachs were partially full of plant matter, some with animal remains and some with the mixture of plant and animal remains. The food items identified are described as follows:

Unidentified debris : In almost all the species examined, a considerable portion of the stomach contents consisted of unidentifiable finely ground up matter. All the 'debris' has been ingested and ground up in the stomach. The unidentifiable debris assumed to be detritus may be a consequence of actual detritus consumption. Presence of animal residuals were assumed as part of the total ingestion of the organism or as residuals picked up from the substratum. Probably, the majority of the unidentified debris in the stomachs comprised of such materials and detritus.

Table 7.1 : Stomach contents of *Ambassis gymnocephalus*, *Stolephorus tri* and *Liza melin* during 1992 and 1993, expressed as percentage volume of food (V) and percent of occurrence (O).

Food Item	<i>Ambassis gymnocephalus</i>		<i>Stolephorus tri</i>		<i>Liza melinoptera</i>	
	V	O	V	O	V	O
Unidentified debris	10.1	73.4	11.3	50.0	15.3	76.6
Organic detritus	-	-	10.0	50.0	-	-
Crustacea						
Acetes	-	-	35.5	43.8	-	-
Amphipoda	6.0	32.1	-	-	-	-
Cladocerans	5.7	33.9	-	-	-	-
Copepoda	8.1	55.1	-	-	-	-
Mysidacea	17.0	77.1	-	-	-	-
Mollusca						
Gastropoda	10.1	41.3	-	-	-	-
Thaliacians	-	-	-	-	1.0	35.9
Plant macrophytes	3.8	77.1	2.7	62.5	5.6	76.6
Algae & Diatoms						
<i>Amphora</i>	-	-	-	-	1.0	73.4
<i>Asterionella</i>	0.6	41.3	-	-	1.3	62.5
<i>Coscinodiscus</i>	2.1	74.3	-	-	1.7	76.6
<i>Cyclotella</i>	-	-	-	-	0.6	46.9
<i>Navicula</i>	-	-	-	-	1.5	75.0
<i>Nitzschia</i>	-	-	-	-	1.5	75.0
<i>Pleurosigma</i>	0.9	50.5	-	-	0.4	42.2
<i>Rhizosolenia</i>	-	-	-	-	0.2	32.8
<i>Surirella</i>	-	-	-	-	0.4	67.2
<i>Triceratium</i>	-	-	-	-	0.2	32.8
Grit	27.0	44.0	40.5	39.6	69.0	76.6
Miscellaneous	8.8	3.7	-	-	0.3	62.5
No. of stomachs examined	109		48		64	

The digested portion of the food when mixed with the mucus of the stomach was included with the debris. The volumetric and occurrence importance of the unidentified debris as one of the food items is also shown in Table 7.1. All the species had volumetric percentage of more than 10% whereas in the stomach of *Liza melinoptera* it constituted more than 15%. Analysis for percentage occurrence of unidentified debris for *Ambassis gymnocephalus*, *Stolephorus tri* and *Liza melinoptera* indicated that each species had 73.4%, 50.0% and 76.6% respectively.

Crustaceans : Generally, the crustaceans included portions of cladoceran, copepods, amphipods, mysids and fully and portions of *Acetes* sp. The intact body of *Acetes* sp. was always observed in the stomach of *Stolephorus tri*, with percentage of volume and occurrence at 45.5% and 43.8% respectively. It seems to have been swallowed whole. This food item did not occur in the stomach of *Liza melinoptera*. Appendages, stalked eyes and carapace were seen in a partially digested form in the stomach of *Ambassis gymnocephalus*. Among them, mysids appendages were most numerous. Mysids constituted 17.0% of the volume and 77.1% of the occurrence. Copepods and amphipods were found regularly in small quantities compared to mysids. Cladoceran was only found in the stomach of *Ambassis gymnocephalus*. It constituted only 5.7% in volume but occurred in 33.9% of the stomachs examined.

Molluscs : Fragments of small gastropods probably (veliger larvae) with crushed shells were observed. Such gastropods were found only in the stomach of *Ambassis gymnocephalus* constituting 10.1% of the volume and occurred in 41.3% of the stomachs examined.

Thaliacians : This species of tunicates had barrel-shaped body with complete and independent muscle-bands around the body. It had a transparent body and was small in size (not more than 1mm). This food item was found only in the stomach of *Liza melinoptera*. It occurred in 35.9% of the stomachs examined and constituted 1.0% of the volume.

Plant macrophytes : Plant macrophytes occurred in all the three species. Eventhough this food item was present in small volume but it occurred in more than 50.0% of the stomachs examined in all the three species examined.

Diatoms : This food item was present in the stomach of *Ambassis gymnocephalus* and *Liza melinoptera*. The percentage occurrence of diatoms were high eventhough their volumetric percentage was generally insignificant when compared with the other abundant food items. The species present in the stomach of *Ambassis gymnocephalus* were *Asterionella* sp., *Coscinodiscus* sp. and *Pleurosigma* sp. Species of diatoms that occurred in the stomach of *Liza melinoptera* were *Amphora* sp., *Asterionella* sp., *Coscinodiscus* sp.,

Cyclotella sp., *Navicula* sp., *Nitzschia* sp., *Pleurosigma* sp., *Rhizosolenia* sp., *Surirella* sp., and *Triceratium* sp. The diatoms were not fragmented.

Grit : Particles of very fine sand were recognized. This item which is probably consumed accidentally by the three species during the feeding on the bottom.

Miscellaneous matter : This constituted an insignificant portion of the diet, namely the spores of algae and fungi and occasionally the fragments of fungal mycelia. All these miscellaneous matter were found in the stomach of *Liza melinoptera*. The miscellaneous matter in the stomach of *Ambassis gymnocephalus* constituted fish scales and small fragments of fish bones. No miscellaneous matter were found in the diet of *Stolephorus tri.*