6. SUMMARY

An attempt was made in the present study to: 1) study numbers, species and succession of fungi in the formation of detritus of two marine macrophytes; 2) the biochemical changes brought about in the substrates and 3) the importance of various ages of detritus and of commonly isolated fungi in the feeding of some detritivores. Two most commonly occurring macrophytes along the coast of Goa, were used as substrates. The first was the brown alga *Sargassum cinereum* J. Ag and the second was the leaves of the mangrove *Rhizophora apiculata* BL.

Litterbags were used in all the experiments, except one that was carried out in 1000 l tanks using *S. cinereum* as substrate. Four field experiments with *S. cinereum* were carried out at Dona Paula bay at the mouth of the Zuari river. The duration of the experiments on an average was 28 d. Two field experiments using *R. apiculata* leaves as substrate were carried out at Chorao island, along the Mandovi river. The duration of these experiments was 60 d each.

Various isolation and enumeration techniques were carried out in order to isolate mycelial fungi and thraustochytrids which were subsequently identified. Surface sterilized and non-surface sterilized frond/leaf discs and stem bits were plated on nutrient media as whole discs/bits or a homogenous suspension. These were also used for the baiting technique for thraustochytrids using seawater and pine pollen. The numbers of fungi / g dry wt. detritus were determined using these cultural
techniques. Successional patterns were studied. Techniques for isolation and enumeration of fungi (including thraustochytrids) were evaluated.

In *S. cinereum* detritus, the biomass of thraustochytrids was estimated using the immunofluorescence technique. In case of *R. apiculata* leaf detritus, the biomass of fungi was estimated by direct observation after clearing and staining.

The most commonly isolated mycelial fungi from *S. cinereum* detritus included *Acremonium* sp., *Pythium* sp., *Phoma* sp., *Aspergillus* spp. and *Curvularia lunata* and the marine ascomycete *Lindra thalassiae*. On the whole, only a few mycelial fungi were isolated. The thraustochytrids isolated were *Labyrinthuloides minuta*, *Ulkenia visurgensis* and occasionally *Labyrinthula* sp. *Labyrinthuloides minuta* was isolated even from healthy algae. On the contrary, *U. visurgensis* was almost never isolated from 0 d old detritus. This was confirmed also by the immunofluorescence technique. The total numbers of mycelial fungi and thraustochytrids in detritus of *S. cinereum* generally reached a maximum at 14-21 d old detritus.

The biomass of the two thraustochytrids as determined by the immunofluorescence method varied with age. In terms of organic carbon, the two species together contributed 0.0031 % at 0 d and 0.065 % C at 21 d to the detritus. The number of cells obtained by this method were much higher than those obtained by cultural methods. The bacteria contributed a maximum of 0.09 % C to the detritus. Thus, thraustochytrids contributed nearly the
same amount of carbon to the biomass as that of the bacteria.

The *R. apiculata* leaf detritus was colonized by a variety of mycelial fungi and thraustochytrids. The phycomycete *Phytophthora vesicula* was isolated from 0 d onwards. Hyphomycetes like *Cirrenalia basiminuta* and Isolate No. 17 were isolated from 14 and 21 d onwards till the end of the experiment. *Amporphotheca resinae*, non-sporulating species and the thraustochytrids were isolated regularly throughout the course of the experiment, barring 0 d. The marine ascomycete *Lulworthia* sp. was isolated in moist chambers. Thus, a distinct succession was observed. The highest numbers of fungi were isolated from 56-60 d old detritus.

Compared to the *Sargassum* detritus, *R. apiculata* leaves showed a lower biomass of fungi, with a maximum of 0.0056 % dry wt. at 21 d and a minimum of 0.00064 % at 28 d. Bacterial biomass was also lower than that observed in *S. cinereum* detritus, the highest being 0.002 % at 35 d.

The biochemical constituents showed various trends. In detritus of *S. cinereum*, proteins, carbohydrates, reducing sugars, phenols, mannitol, alginates and carbon showed a decrease with age. In terms of ash free dry weight, proteins showed an increase in 28 d old detritus. Percentage nitrogen increased, thus decreasing C : N ratio. Ash content also increased.

Detritus of *R. apiculata* leaves also showed that proteins, carbohydrates, reducing sugars, phenols and carbon decreased with age. Percentage nitrogen did not show a marked change. C : N ratio increased initially and then dropped to its original
level. Cellulose and lignin content did not reveal appreciable changes. Percentage organic matter decreased with age.

Various ages of the detritus of both macrophytes were offered as feed for the prawn *Metapenaeus dobsoni* and that of *R. apiculata* to the crab *Sesarma quadrata*. Commonly isolated fungi from *R. apiculata* leaves namely *Amorphotheca resinae*, *Cirrenalia basimunta* and Isolate No. 17 were grown in labelled glucose. These were offered as feed to prawns. The assimilation efficiencies in all the experiments were calculated.

Feeding experiments showed that the prawns preferred the aged detritus especially 21 d in case of *S. cinereaum* and 35 d in case of *R. apiculata*. The crabs preferred 42 d old detritus. Leaching out of phenols and conditioning of the substrates by microorganisms could be two reasons to explain this preference.

The fungi fed to the prawns were all assimilated with efficiencies of above 45%. *Cirrenalia basimunta* was assimilated best with an efficiency of 50%.

Thus, in the present study, it was seen that thraustochytrids were nearly as important as bacteria in terms of biomass, in case of the algal detritus. However, only a few mycelial fungi were isolated. A successional pattern of mycelial fungi was noted in the mangrove detritus. The more aged detritus was preferred by the detritivores used in the study. The fungi were assimilated with an efficiency of upto 50%.