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SABELLARIIDS AS ASSOCIATES OF OTHER INVERTEBRATES AND THEIR ROLE IN THE FORMATION OF *BENTHIC ANIMAL COMMUNITIES**

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Abstract

Observations on the habits of *Hyatella cribriformis* (Hyatt)—*Sabellaria floridensis* Hartman, *Callyspongia diffusa* (Ridley)—*S. pectinata* Fauvel and *Montipora informis* Bernard—*S. pectinata* Fauvel, as associates, and on the growth pattern of *Porites solida* (Forskål) in response to external stimuli in the aquarium conditions suggest that the viability of habits of the component species of an animal community has an important role in the formation of *benthic animal communities* in the marine environment.

Introduction

Animal communities exist in all the benthic divisions of the marine environments, from the intertidal to the abyssal benthic zones and additional informations on the behaviour of the individuals in a community may be helpful, for understanding further their role in 'Ecosystem'. Studies on the biology and systematics of Polychaetes were initiated under the suggestions and guidance of Dr. S. Jones, Director, CMFR Institute and during these studies the habits of certain benthic animals have proved helpful in interpreting the processes of species interaction of animals in a marine environment, when such a study is tackled from the basic units of the two groups of organisms, for the purpose of discussions on the *community* concepts.

The sabellariid polychaetes are having colonial tube building habits and the term 'associates' is used in a broader sense to denote the individual component of a *biotic community* rather than that of the individual association of two members of the different taxonomic category. A *biotic community* is an 'assemblage with unity of taxonomic composition and relatively uniform appearance . . . and with a definite trophic organization and metabolic pattern.' (Odum, 1959, p. 246) The contributing factors for the assemblage of the different animals in the community can be biologically determined or environmentally determined or a combination of both and the interactions of these factors in the marine environment would usually be so great that it will be difficult to assign the precise reasons for the stability or the parallelism in the community. Perhaps the biological viability of the individual species play an important role and it decides the limitations that a species can afford, in accordance with the faunal ('*biocoenotic*') or the environmental ('biotopic') structure. The term 'biocoenose', coined by Mobius in 1877 to indicate localised assemblage of animals has got wider implications than the word community (Hedgpeth,

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1957) and N.S. Jones (1950), Thorson (1957), Hedgpeth (1957), Odum (1959), Knox (1961), Zenkevitch (1963), Longhurst (1964), Mills (1969) and G. F. Jones (1969) have elaborately discussed the different views, put forward by various investigators in connection with the community concepts.

The following observations on the synchronised habits of a few sabellariids with the habits of other invertebrates from the Indian region indicate the scope of the interactions of the species components in a benthic animal community. The study reveals that the level of tolerance between the individuals forms one of the crucial factors and their interdependence has a major role in the formation of the community structure.

a. *Hyatella cribriformis* and *Sabellaria floridensis* as associates :—

Samples of these sponges and the Sabellariids in encrusted growth forms were collected from the Gulf of Mannar in 12 fathoms in fine mud and silty sand. The skeletal structures of sponge were observed, growing over the tubes made by the Sabellariids (Fig. 1A) and the balanced growth of the organisms make a solid substratum in the muddy bottom for other animals to colonise. Hermit crabs, Sertularians, Telesto and actinians were the dominant animals found settled on this substratum. Young specimens of *Pherusa* sp., a sedentary polychaete which are found only in calcareous substratum, especially boring on corals and molluscan shells, are found along with these animals and it is definite that the larvae of *Pherusa* are secondarily settled since the calcareous fragments concentrated by the sabellariids to form their tube, might have given the preferential habitat for them.

b. *Callyspongia diffusa* and *Sabellaria pectinata* as associates :—

Sabellaria settled on *Callyspongia diffusa* were collected from the intertidal region of Mandapam. The sponge is found to grow along with the tubes of Sabellariids (Fig. 1B) and this gives a secondary covering over the tubes. Because of the harmonious growth of the two organisms, the sponge acts as a substratum for the polychate.

c. *Montipora informis* and *Sabellaria pectinata* as associates :—

Cylindrical growth forms of these corals were collected from the vicinity of Mandapam, Gulf of Mannar. These corals are massive types and there is clear evidence that the change in the pattern of growth is due to the association of sabellariid. The tube of the polychaete forms a cylindrical substratum on which the polyps grow. The larvae of the polychaetes settle on the dead surface of the corals, formed by the sedimentation or other factors and in course of time the live colony of corals adjacent to the tubes of polychaetes grow over their tubes. A synchronised growth of the two organisms results in the formation of colonies as shown in figure 1.c. Similar growth patterns are observed in *Montipora spumosa* (Lamarck), *M. monasteriata* (Forskål), *M. divaricata* Brugman and *Favites abdiata* (Ellis and Solander) in these localities. The viable growth pattern of the coral due to secondary stimuli is substantiated by the growth form observed on the glass bottle (fig. 1D) in the aquarium tank and is presented elsewhere in this account.

Similar changes in the pattern of growth of corals due to the association of certain crustaceans are known. The gall-forming habits of *Haplocarcinus marsupialis* Stimpson on branching corals *Pocillopora caespitosa* and *Seriatopora hystrix* are well illustrated by Potts (1915) from Murray Island, Great Barrier reef. The earlier workers believe that the galls are due to the pathogenic activity of *Haplocarcinus* but Potts thinks there is no justification for 'calling the crab a parasite, since it does not live up on the tissue of the coral'. The crabs once settle at the tip of a branch (Potts, fig. 1C) stimulates the growth of the branch around the cavity in such a way to form a chamber which later becomes the gall that protects the crab during its further life. *P. caespitosa* produce long and slender branches in undisturbed waters and short and thick branches in places of strong wave action, and this viable habits of this species, together with the presence of the crab creates the variation in form, the former having the primary importance in the formation of the gall.

During the investigations a colony of the massive coral, *Porites solida*, kept in a glass bottle and reared in the aquarium tank to study the boring effect of *Polydora* on the coral, has given a side result which substantiates the view, mentioned above, as regards the growth pattern of the coral in harmony with the external stimuli. After a few days it was found that the polychaetes were not thriving in the bottle and the polyps of the coral which were in contact with the rim of the bottle started growing over the bottle. The specimen was kept undisturbed and the pattern of growth of the coral polyps observed. The colony was found spreading over the outer surface of the bottle and a flat colony of 179 polyps developed (fig. 1D) within a period of eleven months. The rate of growth of the coral will naturally be faster in the sea than in the aquarium conditions.

Discussion

The examples of the associates *Hyattella cribriformis S.—floridensis, Callyspongia diffusa—S. pectinata* and *Montipora informis—S. pectinata* are presented to show the synchronised growth of different sedentary invertebrates in particular environments. The coral that grows on the flat surface of a bottle in the aquarium will naturally grow on similar surfaces elsewhere and with a surface which grows along with the coral, like the tubes constructed by sedentary animals, it is possible that the tube will form a core for the corals to grow upon. The synchronised growth of the coral and the tubicolous animals, results in the formation of different growth forms, contrary to the conventional habits and if there is a chance of an assemblage of a number of species having similar biological activities ; in course of time can lead to the formation of a biotope and a small community in the strict sense as has been statistically designated qualitatively as well as quantitatively for interpretations.

If such harmonious growth can happen in the complex physical conditions of the marine environment, especially for organisms like corals, it would be easier for the animals having convergent habits to concentrate on a particular habitat of uniform conditions resulting in the formation of '*parallel communities*' to the level of ecological units or '*biocoenosis*'. In this context it is worthwhile to comment that the component species in a community are always on different levels of organisation since they are always active and the community will be in a dynamic equilibrium rather than in a stable equilibrium and the statistical designation of a community at the time of observation which can change in course of time either under changed circumstances or by the prolonged activity of the component species themselves.

The more the number of species constituting the community, the more the complexity of the community and the physico-chemical environments further add

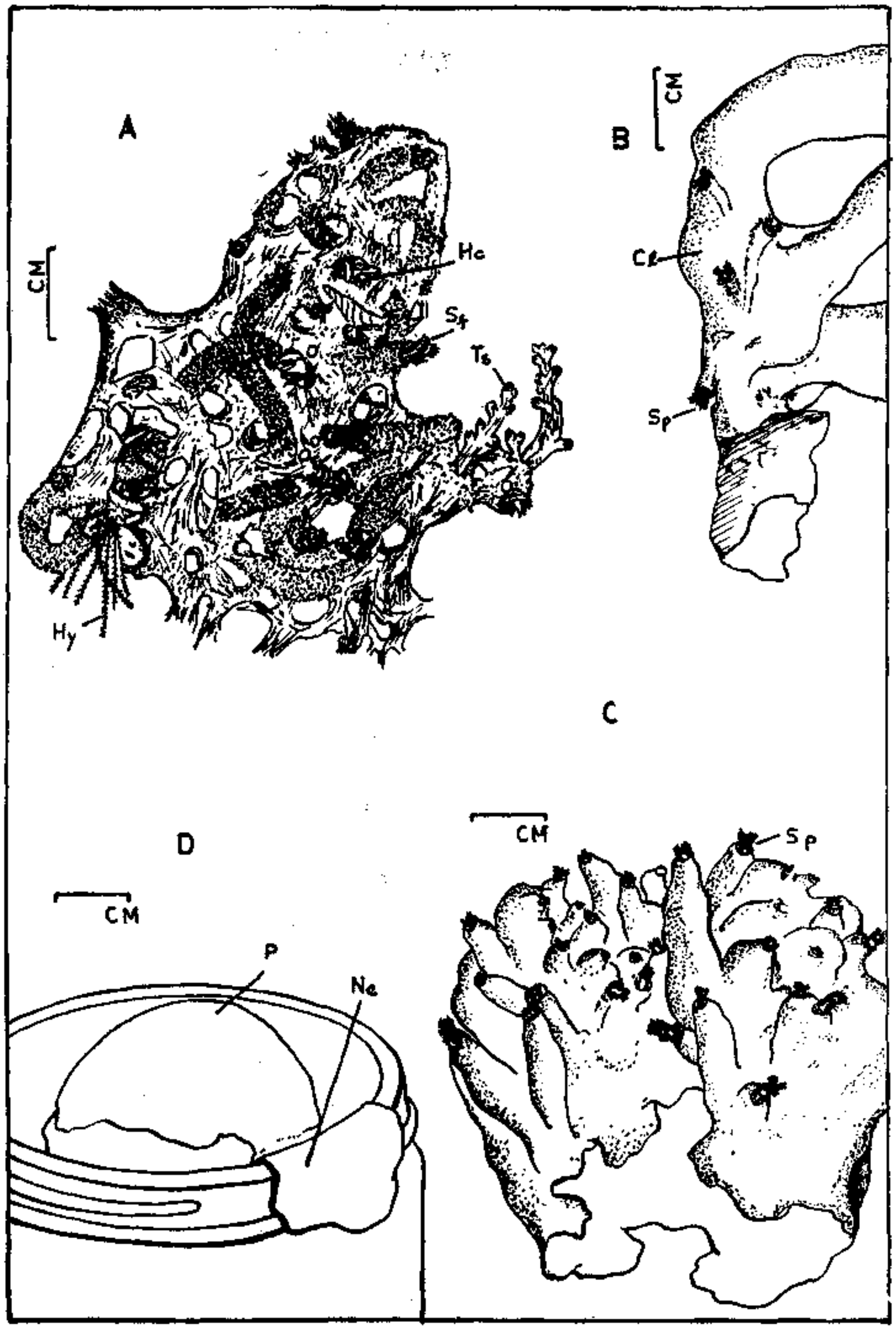

FIG. 1. A. *Hyatella cribriformis* (Hyatt)—*Sabellaria floridensis* Hartman. B. *Callyspongia diffusa* (Ridley)—*S. pectinata* Fauvel. C. *Montipora informis* Bernard—*S. pectinata*. D. Growth pattern of *Porites solida* (Forskål) on glass bottle.

Cl. *Callyspongia diffusa* ; Hc. Hermit crabs ; Ht. *H. cribriformis* ; Hy. Hydroids ; Nc. New colony ; P. *P. solida* ; Sf. *S. floridensis* ; Sp. *S. pectinata* ; Ts. Telesto.

to the contributing factors for the community structure. The above examples show only the condition before the formation of the community in the true sense. It also indicates that the presence of certain animals like the Sabellariids can produce hard substratum in a region of sand with high percentage of mud and silt and influence other animals which require a hard substratum to settle and thus change the faunal pattern. There is strict parallelism observed in the *Sabellaria cementarium—Modiolus metcalfei—Diopatra neopolitana* community in the Cochin backwaters and in the Netravathy estuary at a distance of about 250 miles and the details will be discussed elsewhere.

SUMMARY

The examples of the associates, *Hyatella cribriformis* (Hyatt)—*Sabellaria floridensis* Hartman, *Callyspongia diffusa* (Ridley)—*S. pectinata* Fauvel and *Montipora informis* Bernard—*S. pectinata* are presented to show the synchronised growth of different sedentary invertebrates in particular environment.

Observations on growth pattern of *Porites solida* (Forskål) on a glass vessel in the aquarium conditions and the different growth forms of *Montipora informis* due to the presence of the sabellariids explain the process of species interaction due to physical stimuli.

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