J. mar. biol. Ass. India, 1976, **18** (1): 91-98

SEASONAL INCIDENCE AND RELATIVE ABUNDANCE OF ASSOCIATED ORGANISMS OF THE WOOD BORING ISOPODS *SPHAEROMA TEREBRANS* AND *S. ANNANDALEI*

V. SANTHAKUMARI

National Institute of Oceanography, Cochin, India

ABSTRACT

This study was based on the monthly collections of the wood boring isopod, *Sphaeroma terebrans* from Ayiramthengu, Karunagapally and Neendakara and *S. annandalei* from Aroor taken during the period 1965-66. Five species of ciliates namely *Lagenophrys cochinensis, Folliculin* sp., *Zoothamnium rigidum, Cothurnia gammari, Vorticella companula*; the ostracod *Microsyssitria indica* and the isopod *Iais singaporensis* were found to be associated with these wood boring isopods. The seasonal incidence and relative abundance of the associated organisms of these isopods in relation to hydrographical conditions were studied. Among these associated organisms, *L. cochinensis* was the most abundant of all the species. The data were statistically analysed and it was found that their occurrence is significantly different during different months of the year. In general, the number of organisms and the species were found to be associated more with *S. terebrans* than with *S. annandalei*.

INTRODUCTION

THE population cycles of the associated organisms occurring on the wood boring isopods, *Sphaeroma terebrans* Bate and *S. annandalei* Stebbing were studied with a view to finding out the nature of incidence and related aspects of their occurrence during the seasonal cycles. The associated organisms discussed here are *Lagenophrys cochinensis, Folliculina* sp., *Zoothamnium regidum, Cothurnia gammari, Vorticella companula, Microsyssitria indica* and *Iais singaporensis*. The hydrography and the detailed description of the Kayamkulam and the Ashtamudi area have been given earlier (Santhakumari and Nair, 1975). The environment and hydrography of the Aroor station have also been described (Santhakumari and Vannucci, 1971).

Sphaeromids are reported from different areas of the backwaters of Kerala (Pillai, 1961). In the present study the relative abundance and seasonal incidence of the associated organisms of these isopods have been examined during different months of the year. The data are statistically analysed.

The author wishes to express her deep sense of gratitude to Dr. N. Balakrishnan Nair, Professor of Aquatic Biology and Fisheries, University of Kerala for guidance and encouragement received throughout the work. Funds were provided by the Council of Scientific and Industrial Research for the execution of the Scheme 'Studies on the biological aspects of marine borer problem in India'. Thanks are due to Shri H. Krishna Iyer, Scientist, National Institute of Oceanography, Cochin, for statistical interpretation of the data.

HABITAT

The Cochin Backwater is an open estuary and Aroor station is situated within the estuary. Ayiramthengu station is at the Kayamkulam Lake about 0.8 km away from the barmouth. This estuary remains closed for a period of 4 months from February to May due to the appearance of the sand bar in this area. The site of the Karunagappally station is at the southern region of Kayamkulam Lake. Neendakara station is situated 0.3 km away from the barmouth and the influence of the sea at this station is much greater than the other stations.

The hydrographical conditions of the stations are presented in Figs. 1a, b, c & d.

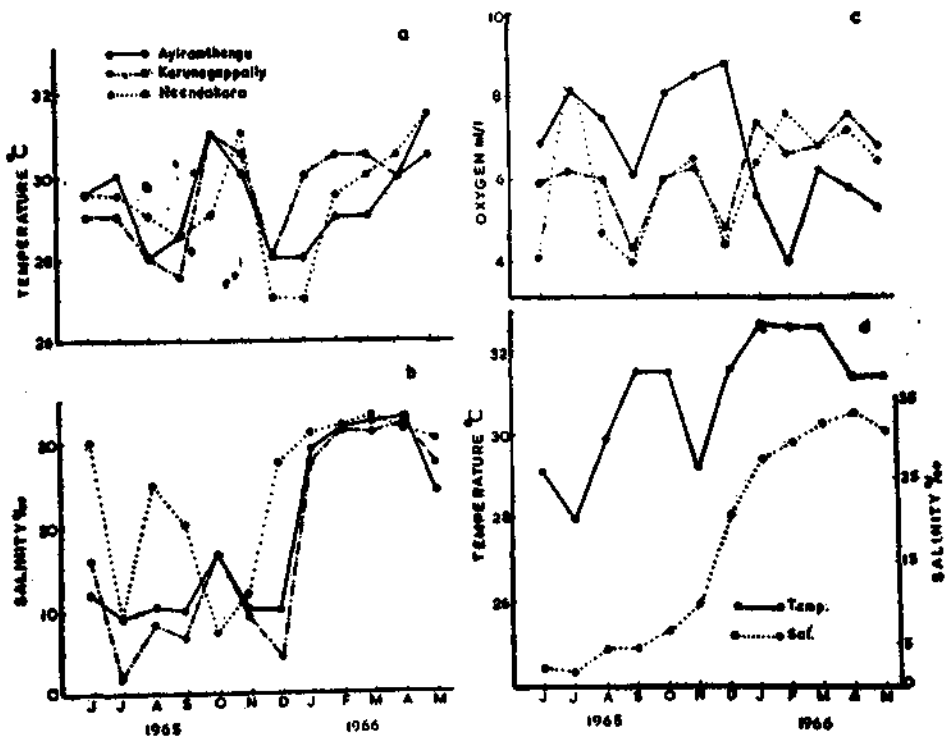

Fig. 1a. Temperature (°C) at stations, Ayiramthengu, Karunagappally and Neendakara (signs common for Figs. 1a to 1c); b. Salinity (‰); c. Oxygen (ml/l); and d. Shows temperature (°C) and salinity (‰) at Aroor.

MATERIAL AND METHODS

S. terebrans were more at stations Ayiramthengu, Karunagappally and Neendakara, while *S. annandalei* were more at Aroor. Hence *A. annandalei* from Aroor and *S. terebrans* from other three stations were chosen for this study. Monthly samples were collected from the infested timber structures during the period 1965-1966. In order to assess the number of associates, the hosts' body surface was

scraped out with a scalpel and the scrapings were placed on a cell counter and the organisms were counted. Ten specimens were examined each month and the average of these have been given in Figs. 2a-g.

RESULTS

A. *S. terebrans*

Lagenophrys cochinensis (Fig. 2a)

This species was found in abundance at stations Ayiramthengu, Karunagappally and Neendakara. This could be collected throughout the year from Ayiramthengu in fairly large numbers. At this station there is significant difference in the average number of ciliates present on the specimen during different months (calculated X^2_{11} =20542.3, which is significant at 0.1% level). A peak was observed during July when the salinity was minimum with high oxygen value. Thereafter a fall in number was discernible to reach the minimum during October when the salinity and oxygen values were 16.87‰ and 8.1 ml/l respectively. The temperature variation was not wide. At Karunagappally this species was present during the months of August, November, December, February, March and April. The occurrence of these ciliates during these months are significantly different (calculated X^2_5 = 8971.56, significant at 0.1% level). Maximum number of specimens were found in November and minimum in March when the salinity was 9.11‰ and 31.04‰ respectively. During that time there was no much difference in the case of temperature and oxygen. At Neendakara station, the average number of ciliates present on the specimen vary significantly during the different months of the year (calculated X^2_{11} = 8348.9, significant at 0.1% level). During September and May they were totally absent. Maximum number of specimens were observed during January and April when the salinity was noticed to be high.

This ciliate was noticed all over the hosts' body especially on the pleopods. It was, however, absent from the mandibles, the labium, the labrum and the maxillule.

Folliculina sp. (Fig. 2b)

This was another major ciliate commensal which occurred in abundance over *S. terebrans*. The occurrence of this form at Ayiramthengu varies significantly during the year (calculated X^2_{11} = 1974.75, significant at 0.1% level). A peak was observed during August and it declined to minimum in February when the salinity value was 10.42‰ and 32.24‰ respectively. This species was noticed from Karunagappally during August, November, December, February, March and April. The number of ciliates varies significantly during these months (calculated X^2_5 = 19.05, which is significant at 1% level). The maximum occurrence was noticed during the month of March when the salinity was found to be 31.04‰. The maximum number of this species at Neendakara was observed during April. There is significant variation in the average number of ciliates during different months of the year (calculated X^5_{11} =748.84, significant at 0.1% level).

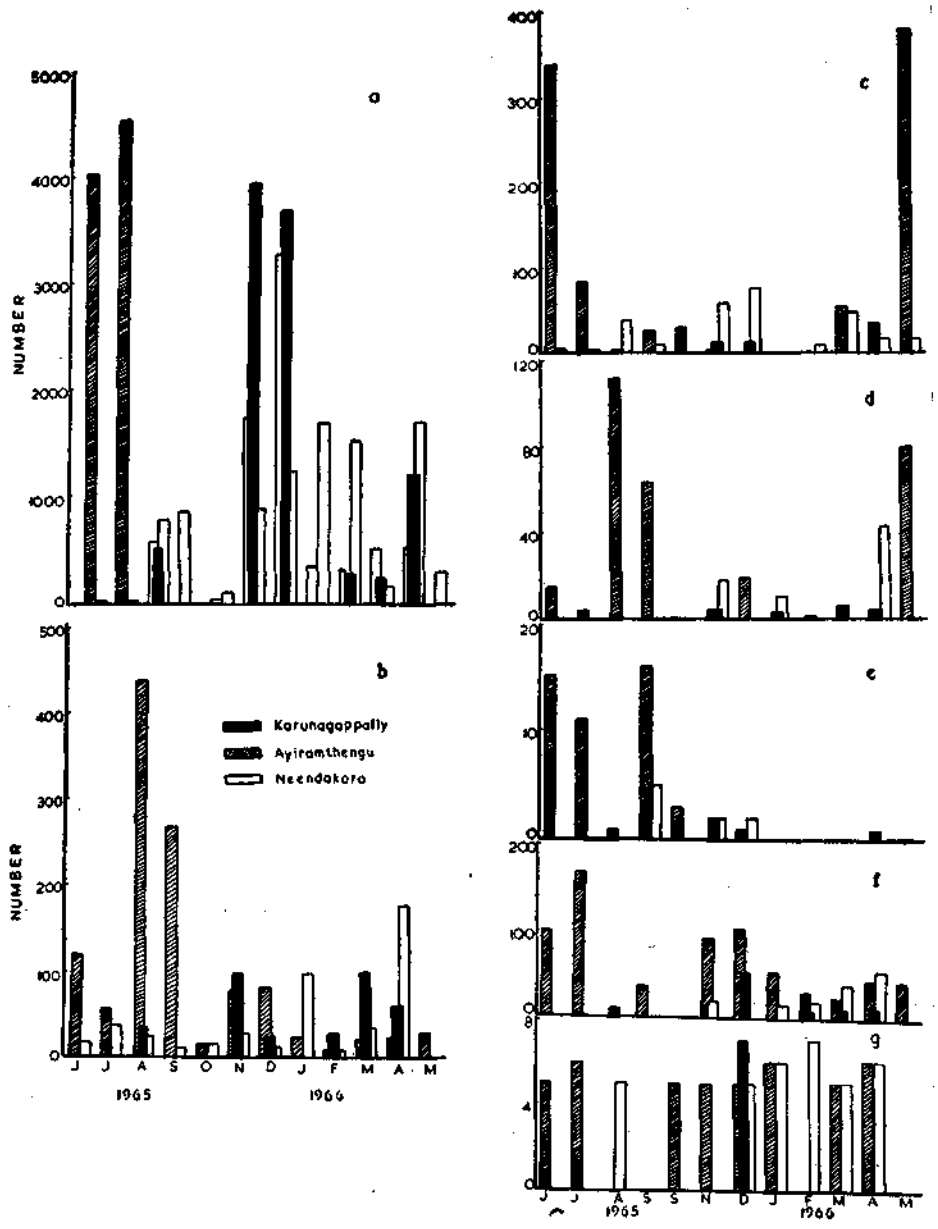

Fig. 2a. *Lagenophrys cochinensis* seasonal infestation of associates on *Spheroma terebrans* from Ayiramthengu, Karunagappally and Neendakara ; b. *Folliculina* sp. ; c. *Zoothamnium rigidum* ; d. *Cothurnia gammari* ; e. *Vorticella companula* ; f. *Microsyssitria indica* ; and g. *Iais singaporensis*.

The maximum number of this species was noticed on the posteriodorsal surface of the host even though it appeared on the mid and anterio-dorsal region of the body, the pleopods and the uropods.

Zoothamnium rigidum (Fig. 2c)

The seasonal variation in the number of this species at all stations showed a marked difference. At Ayiramthengu the number of ciliates was totally absent during December, January and February, while in other months the average number of ciliates is varying significantly (calculated $X^2_8 = 1717.72$ which is significant at 0.1% level). The maximum if found during the month of May, then the salinity was 23.78‰. Ciliates were observed during the months of August, November and December at Karunagappally. During these months, the average number of ciliates did not show any significant variation (calculated $X^2_2 = 5.44$, which is significant at 5% level). But at Neendakara there is significant variation in the average number of ciliates during the different months of the year (calculated $X^2_{10} = 320.70$ which is significant at 0.1% level).

The major site of attachment of this species on the hosts' body was over pleopods, dorsal side of the head region, the antennae and the antennule.

Cothurnia gammari (Fig. 2d)

This species was represented only in small numbers. A scrutiny of the seasonal occurrence of this species revealed that it appeared in greater numbers during the month of August, the salinity being 10.42‰ at Ayiramthengu. The average number of ciliates varies significantly during the different months (calculated $X^2_{11} = 705.87$, which is significant at 0.1% level). The occurrence of this species was particularly nil during October. At Karunagappally this species was found only in November then the salinity was 9.11‰ and at Neendakara during the month of November, January and April.

It appeared on the host as single individuals as well as in colonies. The chief site of attachment of this species was on the pleopods of the host.

Vorticella companula (Fig. 2e)

Among the ciliates observed on *S. terebrans*, *V. companula* was the only species which was found in very small numbers. Number of ciliates at Ayiramthengu was found only in the months of June to October and December when the salinity fluctuated between 9 and 12‰. During these months of occurrence, there is significant variation in the number of ciliates (calculated $X^2_5 = 31.38$, which is significant at 0.1% level). But at Karunagappally this species occurred during November when the salinity value was 9.11‰ and April (Sal. 31.3‰), while at Neendakara they were present only in September, November and December and April when the salinity varied from 11.7‰ to 31.3‰.

It occurred on the antennules, antennae and pleopods.

Microsyssitria indica (Fig. 2f)

This ostracod constituted another important member of the commensalic fauna and could be collected throughout the year except for August and October from Ayiramthengu. The average number varies significantly over the different months of the season (calculated $X^2_{10} = 383.42$). A peak was noticed in July when the salinity was low (8.91‰). At Karunagappally this species was present during the months of August, November, December, February, March and April (calculated $X^2_5 = 83.24$, which is significant at 0.1% level). This was observed from January to April, during the high saline period, from Neendakara station. Here also significant variation in the number of ostracods is noticed during these months (calculated $X^2_3 = 33.26$, which is significant at 0.1% level).

This species was found attached to the setae of hosts' mouth parts, pereopods, pleopods, uropods and occassionally over the main body also.

Iais singaporensis (Fig. 2g)

This was found from the body of the host as well as from the burrow of the host. Its association with the host is not so intimate as that of other organisms. It was found during June, July, October to January, March and April from Ayiramthengu and the maximum observed in July when salinity was 8.91‰. At Karunagappally this species was present only in December but at Neendakara this was found during August, December, January, February, March and April.

From the data obtained during the present study it is clear that the occurrence as well as the peak period of the associated organisms of *S. terebrans* is different in different localities and hence generalization of the occurrence and relative abundance of these associates are difficult.

The present study reveals the presence of a rich commensalic fauna on the wood boring isopod, *S. terebrans* occurring along the Kerala Coast.

B. *S. annandalei*

The results presented in Fig. 3 represent a study of the seasonal variations and relative abundance of the different groups of ecto-commensalic organisms on *S. annandalei*, at Aroor. The hydrographical conditions are presented in Fig. 1 d.

Lagenophrys cochinensis rank first in abundance at this station also. It could be collected from July to April and the peak was in March when the salinity was 29.6‰. As in the case of *S. terebrans*, this species appeared all over the body of *S. annandalei*, with the maximum number on the pleopods. A peak occurrence was noticed in March and they were conspicuous by their absence during May and June.

Cothurnia gammari occupied the second place in numerical abundance. Maximum number was observed during August when the salinity was 2.0‰ and it was totally absent from April to June.

Folliculina sp. was another ciliate occurring in large numbers. The maximum number noticed during December, then the salinity was 10.1‰. No infestation had been noticed during September, October, January, May and June.

Zoothamnium rigidum was present only in July, August, November, January and March with a peak in August, then the salinity was 2.0‰. The incidence of this species was a erratic over the host. The average number recorded on each specimen was also small. For nearly seven months the host was free from infestation of this species.

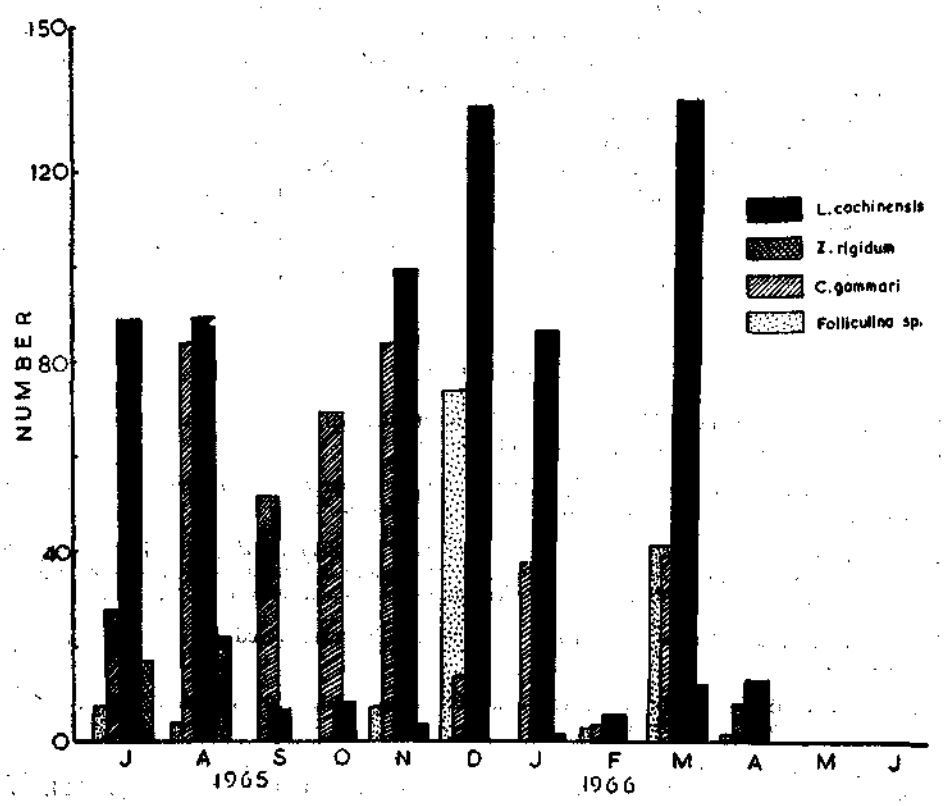

Fig. 3. Seasonal infestation of associates on *S. annandalei* from Aroor.

The average number of *L. cochinensis*, *C. gammari*, *Folliculina* sp. *Z. rigidum* were significantly different over the months of the season. The calculated X^2 values for these 4 species were respectively 597.70 with 10 degrees of freedom, 416.29 with 10 degrees of freedom, 511.66 with 7 degrees of freedom and 42.92 with 5 degrees of freedom. All the calculated chisquares are significant at 0.1% level.

Discussion

It will be seen from the result that the maximum number of *L. cochinensis* (4555) was found on *S. terebrans* collected in July from Ayiramthengu. A comparison of associates with the host organisms, *S. terebrans* and *S. annandalei* showed that

S. terebrans harboured a large number of associates than *S. annandalei*. For instance the case of *L. cochinensis*, *S. terebrans* harboured 33 times the number of organisms present on *S. annandalei*. Similarly *Folliculina* sp., *Z. rigidum* and *C. gammari* were also found in greater number on *S. terebrans* than on *S. annandalei*. But in the case of *C. gammari* there was not so much difference in number in the two different hosts.

In general, brackish water populations of wood borers were found to harbour a greater number of ciliate species than that of marine populations (Fenchel, 1965). The maintenance of a population of ecto-commensals, in any locality depends on whether these associates can maintain a sufficient number of individuals to infest new hosts. Hence gregarious animals tend to have a higher number of commensals and parasites than those which live in isolation (Mohr, 1959). More over, the male and female are closely associated for a long period before mating which place when the female moults (Kinne, 1953) and as the animals may moult several times this habit must facilitate the spreading of the commensals to new hosts even more. Besides these factors, Nair (1965) has reported a migratory habit for *Sphaeroma* as in the case of the related isopod *Limnoria lignorum* (Kramp, 1927 ; Johnson, 1937 ; Somme, 1940 ; Menzies, 1957 ; Nair, 1962). This tendency of migration is of particular significance in the spread of ecto-commensals in these localities.

References

Fenchel, T. 1965. On the ciliate fauna associated with the marine species of the amphipod genus *Gammarus* I.G. Fabricius. *Ophelia*, **2**(2) : 281-303.

Johnson, M. W. 1935. Seasonal migrations of the wood borer *Limnoria lignorum* (Rathke) at Friday Harbor, Washington. *Biol. Bull.*, **69**(3) : 427-438.

Kinne, O. 1953. Zur Biologie und Physiologie von *Gammarus duebeni* Lilli. II uberidie Hautungsfrequents, ihre Abhangigkeit on temperature and Salzgehalt Sowie uber ihr Verhalten bie isoliert gehaltenen und amputierter Versuchstieren. *Zool. Jb* (Physiol)., **64** : 183-206.

Kramp, P. L. 1927. Undersog leserover paekwormog Paelekrebs ved Hirtshals. *Ingenioran.*, **27** : 329.

Menzies, R. J. 1957. The marine borer family Linoridae (Crustacea, Isopoda). *Bull. Mar. Sci. Gulf Caribbean*, **7** (2) : 101-200.

Mohr, J. L. 1959. On the protozoan associates of *Limnoria*. Friday Harbor Symposium on boring and fouling organisms. University of Washington Press, Seattle. pp. 84-91.

Nair, N. B. 1962. Ecology of marine fouling and wood boring organisms of Western Norway. *Sarsia*, **8** : 1-65.

——— 1965. Seasonal settlement of marine wood boring animals at Cochin Harbour, South West coast of India. *Int. Revueges Hydrobiol.*, **50**(3) : 411-_0.

Pillai, N. K., 1961. Monograph, wood boring Crustacea of India, Press, Simla, pp. 1-61.

Santhakumari, V. and M. Vannucci 1971. Monsoonal fluctuations in the distribution of hydromedusae in the Cochin Backwater, 1968-1969. *J. mar. biol. Ass. India*, **13**(2) : 211-219.

——— and N. B. Nair 1975. Ecology of marine wood boring and fouling organisms from estuarine regions of Kerala. *Bull. Dept. Mar. Sci., Univ. Cochin*, **7** (4) : 827-844.