

THE EXPOSURE OF THE HOST SHIPWORM TO EXTERNAL FACTORS AND ITS EFFECTS ON THE ASSOCIATED ORGANISMS

V. SANTHAKUMARI

National Institute of Oceanography, Cochin-682 018, India

ABSTRACT

The reaction of the commensalic ciliates when their host shipworm was exposed to air in the laboratory and to direct sunlight was studied and the results indicated that a reduction in number of the commensalic ciliates increased with increase in time of exposure. This showed that any stress on the host would affect the associates as well.

INTRODUCTION

THE SEASONAL infestation study of the commensalic ciliates in shipworms (Santhakumari and Nair, 1973) showed that cent per cent of the hosts were infected with the ciliates. The present study attempts to find out the reaction of these ciliates when their host shipworm was exposed to air inside the laboratory and to direct sunlight. The information would be useful in the eradication of timber boring organisms. The ciliate species involved in the test are *Nucleocorbula adherens*, *Boveria teredinidi*, *Trichodina balakrishnia*, *Thigmozoan fencheli* and *Nyetotherus marina*, the taxonomy of which was described by Santhakumari and Nair (1970, 1973).

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 the encouragement received throughout the work. Funds were provided by the Council of Scientific and Industrial Research for the execution of the 'Scheme on the biological aspects of marine borer problem in India'.

MATERIAL AND METHODS

Test panels infected with shipworms were removed from the water and their surface was cleaned of foulers without damaging the pallets of shipworms as far as possible. They were then exposed to air in the laboratory conditions and to direct rays of sun. During the course of the experiments, the panels were also exposed to rain for a period of nearly 4 hours. At definite intervals of time, a few host animals were removed from their burrows and random samples of ciliates were taken with the aid of a graduated pipette, from different regions of the mantle cavity. At least four samples were taken from different sites in the mantle cavity from each shipworm. The number of dead animals in each case was noted and recorded as percentage. The condition and length of the hosts were also noticed.

RESULTS

Table 1 provides the results of observations from test panels exposed to air in the shaded conditions of the laboratory. The host specimens were apparently healthy despite complete removal from water for as long a period as about 48 hours. Thereafter, they showed signs of stress to exposure. Such animals looked unhealthy and exhausted, with flabby bodies. Their heart beat was slow and very feeble at widely spaced intervals. In certain cases heart-beat was not at all discernible after 48 hours. Nevertheless, the ctenidia showed evidence of ciliary activity when removed to normal sea water. One noteworthy feature regarding the association of the ciliates with the host during the course of these tests was the significant reduction in the number of the ciliates in the mantle cavity. The reduction in the number was not progressive and proportional to the time of exposure and curiously, in a few instances, the number showed an increase as the exposure time was increased (Table 1). However, a noticeable reduction in number was evident after 24 hours of exposure in the case of *Nucleocorbula adherens*, *Boveria teredinidi*, and *Nyctotherus marina*. The reduction in number was noticed even earlier (after 6 hours) in the case of *Thigmozoon fencheli* and *Trichodina balakrishnia*. An accurate assessment of the rate of mortality was considerably hampered as a result of this reduction in their numbers in the hosts body when the period of exposure was prolonged.

The second test was carried out with the object of noting the nature of stress on the ciliates present in the shipworm exposed to direct sunlight, a situation which is comparatively more severe than that of exposure to the shaded conditions within the laboratory. In this case the process of desiccation is naturally much more rapid.

The results of this test are presented in Table 2. The shipworms were apparently healthy until 48 hours as in the previous case and thereafter they showed signs of weakness and indications of slight putrefaction were evident, with a foul smell emanating from the burrows probably owing to bacterial decay. A noticeable reduction in the number was discernible even after two hours of exposure in the case of *N. adherens*, *B. teredinidi* and *T. balakrishnia*. In the case of *T. fencheli* and *Nyctotherus* this was evident only after about 6 hours and after 24 hours none was alive in the mantle cavity of any specimen. None of the shipworms examined after about 54 hours contained any ciliates alive or dead and those examined at 50 hours contained only *B. teredinidi*, while those examined at 48 hours contained 13 specimens of *N. adherens*, 163 specimens of *B. teredinidi* and just 3 of *T. balakrishnia*. It would be seen that in this test also an accurate assessment of the ratio of mortality of ciliates was not possible as a result of their apparent disappearance from the hosts body.

DISCUSSION

The reduction in numbers of the ciliates was noticed when their hosts were exposed to air. Similarly observations on mussels were noticed by Kidder (1933), Beers (1959) and Lane *et al.* (1955). The reduction may be due to the death or accidental ingestion by the host and expulsion in the excurrent water as a result of the movements of the foot, mantle or valves.

TABLE 1. Condition of the ciliates when their host *Nausitora hedlevi* was exposed to air (Laboratory conditions)

			Total number, number and percentage of dead ciliates from <i>N. hedlevi</i>									
Condition and length (cm) of the host		Time of exposure of the host in hours	<i>Nucleocorbula adherens</i>		<i>Boveria teredinidi</i>		<i>Trichodina balakrishnia</i>		<i>Thigmozoön fencheli</i>		<i>Nyctotherus marina</i>	
			Total No. of ciliates	No. & % of dead ciliates	Total No. of ciliates	No. & % of dead ciliates	Total No. of ciliates	No. & % of dead ciliates	Total No. of ciliates	No. & % of dead ciliates	Total No. of ciliates	No. & % of dead ciliates
Healthy	3.6	1	31	0	148	0	50	0	10	0	2	0
Healthy	6.0	2	48	0	326	0	188	0	13	0	1	0
Healthy	2.9	3	35	1 (2.9)	129	0	86	0	18	0	1	0
Healthy	3.7	6	20	1 (5)	192	2 (1.0)	39	0	12	0	2	0
Healthy	5.8	24	27	1 (3.7)	288	3 (1.6)	5	2 (40)	0	0	4	0
Healthy	4.5	48	5	0	176	4 (2.3)	8	0	0	0	0	0
Unhealthy	6.0	50	3	0	96	2 (2.1)	3	0	0	0	0	0
Unhealthy	6.5	54	2	1 (50)	29	3 (10.3)	2	0	1	0	1	0

An interesting observation made during this study was regarding the nature of the relationship between the host and its associates. It was clear that these associates apparently need a healthy host for their normal existence and activities and any stress on the host seems to be a stress on the associates as well. This was evident from the fact that shipworms subjected to the physical stress of exposure to the air and thus prevented from normal shiphoning were found on subsequent examination to be comparatively free from the associates. These associates obviously have deserted their host most probably on account of adverse conditions in their habitat. These conclusions are significant and show that most of these associates are apparently harmless commensalic forms living within the mantle cavity which affords considerable protection for these organisms.

REFERENCES

- BEERS, C. D. 1959. Some observations on the autecology of the ciliate *Conchophthirus mytili*. *J. Elisha Mitchell Sci. Soc.*, 75 : 3-10.
- KIDDER, G. W. 1933. Studies on *Conchophthirus mytili* De Morgan I. Morphology and division. *Arch. Protistenk.*, 79 : 1-24.
- LANE, C. E., R. W. SIMS AND E. J. CLANCEY 1955. Anaerobiosis in *Teredo*. *Am. J. Physiol.*, 183 : 3.
- SANTHAKUMARI, V. AND N. BALAKRISHNAN NAIR 1970. *Nucleocorbula adherens* gen. and sp. nov. (Ciliate, Thigmotrichida) from shipworms. *Ophelia*, 7 : 139-144.
- AND ——— 1973. Ciliates from marine wood boring molluscs. *Treubia*, 28 : 41-58.
- AND ——— 1973. Seasonal infestation of the commensalic ciliates of the shipworm *Naustora hedleyi* and *Teredo furcifera*. *J. mar. biol. Ass. India*, 15 : 566-570.