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Effect of Pollution on the Abundance of Marine Fouling Organisms

By

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Abstract

The effects of domestic pollutants on the abundance, and breeding seasons of the mollusc Bankia gouldi and the crustacean Limnoria tripunctata were studied. The breeding period was not found to be greatly affected, although L. tripunctata was found to peak mainly in September at the testing sites of this study; however, an earlier study twenty kilometers north of this site had L. tripunctata peaking in June and September.

The number of impacted larvae of both species was found to be inversely affected by the increase of domestic pollutants levels that were analyzed. However; the mechanism that caused this effect has not been determined yet, and further studies should be conducted to elucidate the factors involved.

Introduction

Of the marine fouling organisms found on the Syrian coastal areas, wood-boring organisms inflict the major damage to the local merchant, recreational and fishing wooden boats. However; the degree of infestation was found to vary from one location to another.

The object of this research was to determine the effect of domestic pollutants, namely; ammonia, nitrites and phosphates, on the abundance and therefore, the breeding seasons of the two-boring organisms that were identified in an earlier study (Habal, 1980) to be Bankia gouldi which is a mollusc, and Limnoria tripunctata, a crustacean.

Materials and Methods

Wood panels made from the local timber, Pinus brutia, were used in two small testing stations that allowed submersion of the panels at two meters depth. The panels used were 30X15X1.5 cm in dimensions and the method of Turner (1959) was adopted whereby monthly duplicate panels were used replaced by new sets each month.

The number of B. gouldi attacks was determined by counting the number of points of entry of these organisms with their characteristic two calcareous tubes in each hole, whereas the number of L. tripunctata was determined by counting the number of surface tunnels, if formed, with their slanted points of entry and the several small pores interconnecting the tunnels with the sea. When tunnels were not complete, the slanted points of entry sufficed.

One of the two testing stations was moored at a location about one kilometer from the points of domestic sewage discharge, and the second was moored about 1.5 km from the discharge points. Water temparature was taken daily and averaged for each month, and monthly samples were taken and chemically analyzed from each of the testing locations.

Results

1 - The Chemical Analysis of Marine Water Samples

The results of the chemical analysis of the marine water samples collected from the two mooring sites are summarized in Tables 1, 2 and are represented in Figures 1-4.

2 - Determination of the Abundance and Breeding Seasons

The number of molluscan and crustacean attacks were counted monthly. Table (3) shows the number of B. gouldi and L. tripunctata attacks before the domestic sewage discharge points, while Table (4) shows the number of attacks of both species after the discharge points. These results are represented in Figures 5-7.

Table (1) : The concentration of pollutants at the first testing site before sewage discharge points

Month	Ammonia mg/1	Nitrite mg/1	Phosphate mg/1
January	0.105	0.001	0.010
February	0.110	–	0.015
March	0.102	–	0.005
April	0.121	0.001	0.008
May	0.125	0.002	0.012
June	0.130	0.002	0.18
July	0.132	0.005	0.020
August	0.135	0.003	0.017
September	0.124	0.005	0.020
October	0.115	0.002	0.015
November	0.103	0.002	0.010
December	0.105	0.001	0.011

The surface temperature was taken five centimeters below the surface and averaged for each month, these results are summarized in Table (5) and represented in Figure (8).

Table (2) : The concentration of pollutants at the second testing site after sewage discharge points

Month	Ammonia mg/1	Nitrite mg/1	Phosphate mg/1
January	0.305	0.0025	0.025
February	0.201	0.0010	0.011
March	0.228	0.0015	0.015
April	0.209	0.0010	0.013
May	0.453	0.0030	0.032
June	0.862	0.0085	0.083
July	4.573	0.0355	0.024
August	3.205	0.0130	0.021
September	1.905	0.0024	0.018
October	0.490	0.0032	0.023
November	0.282	0.0018	0.013
December	0.298	0.0024	0.012

Table (3) : The number of wood-borers attacks before sewage discharge points.

Month	B. gouldi	L. tripuntata
January	4	0
February	2	0
March	12	7
April	68	16
May	31	84
June	18	283
July	12	498
August	15	381
September	55	1401
October	115	258
November	129	32
December	2	14

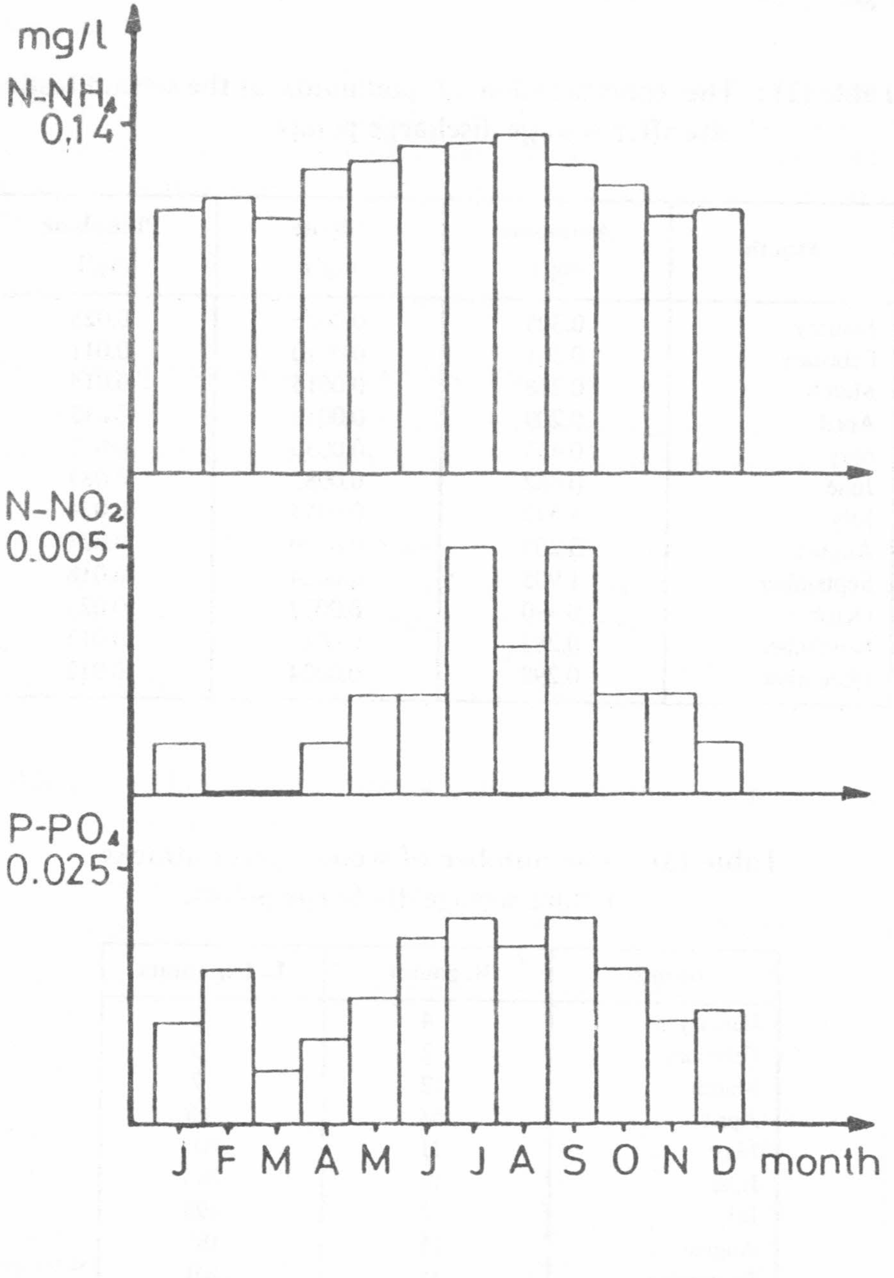

Figure (1)

The concentration of pollutants before the domestic discharge points at Lattakia.

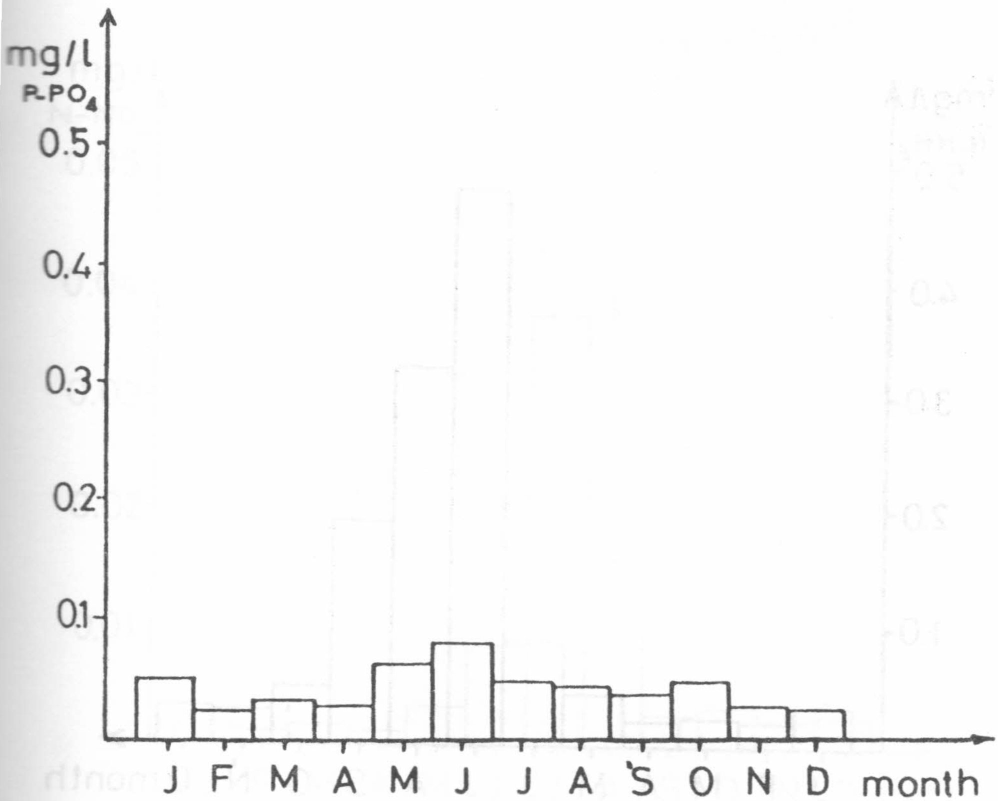

Figure (2)

The concentration of ammonia after the domestic sewage discharge points at Lattakia.

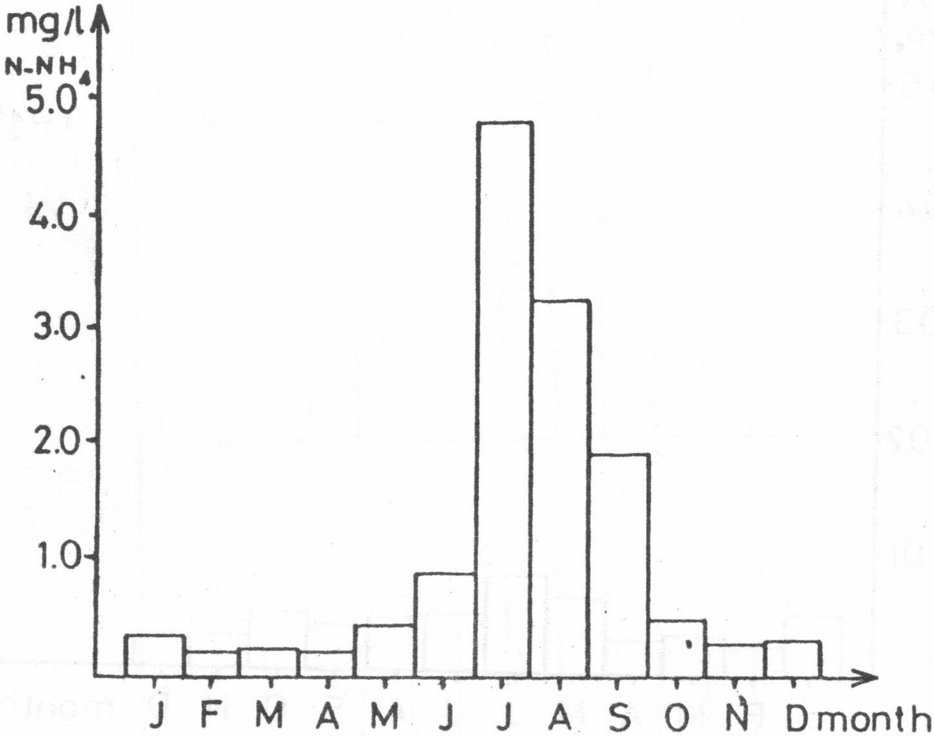

Figure (3)

The concentration of nitrites after the domestic sewage discharge points at Lattakia.

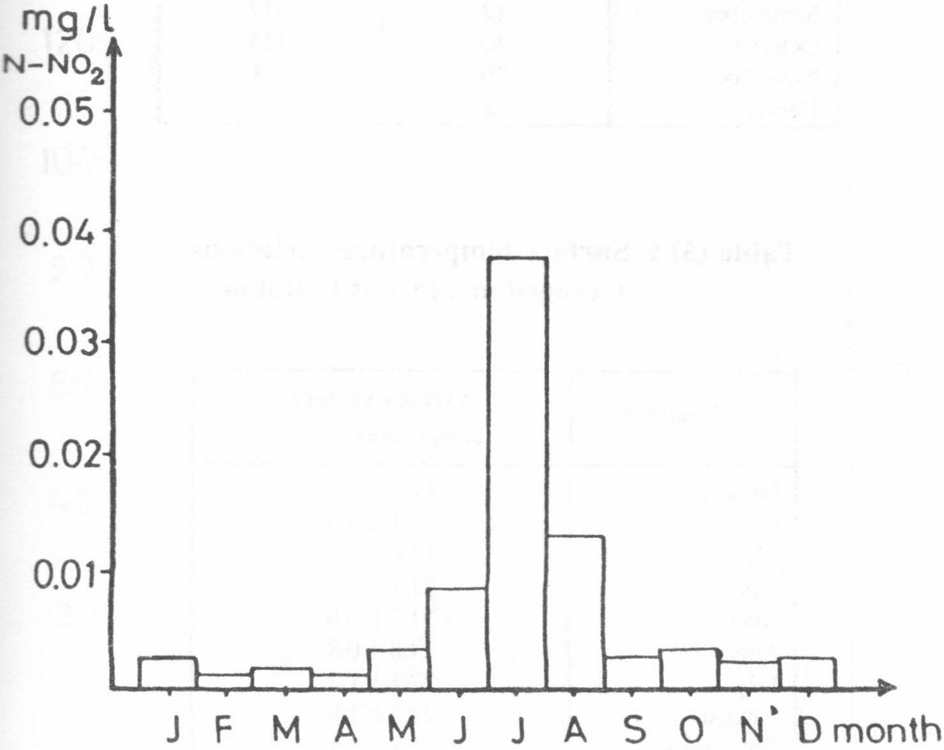

Figure (4)

The concentration of phosphates after the domestic sewage discharge points.

Table (4) : The number of wood-borer attacks after sewage discharge points.

Month	B. gouldi	L. tripuntata
January	0	0
February	0	0
March	2	5
April	16	3
May	4	10
June	1	14
July	2	12
August	4	38
September	12	412
October	46	135
November	20	13
December	2	6

Table (5) : Surface temperature variations averaged monthly at Lattakia.

Month	Average surface temperature (°C)
January	17.0 ± 0.4
February	17.3 ± 0.6
March	18.0 ± 0.3
April	21.1 ± 0.9
May	21.7 ± 0.6
June	24.8 ± 0.8
July	27.1 ± 1.2
August	27.6 ± 1.8
September	27.3 ± 1.3
October	25.1 ± 0.9
November	20.9 ± 1.1
December	19.6 ± 0.7

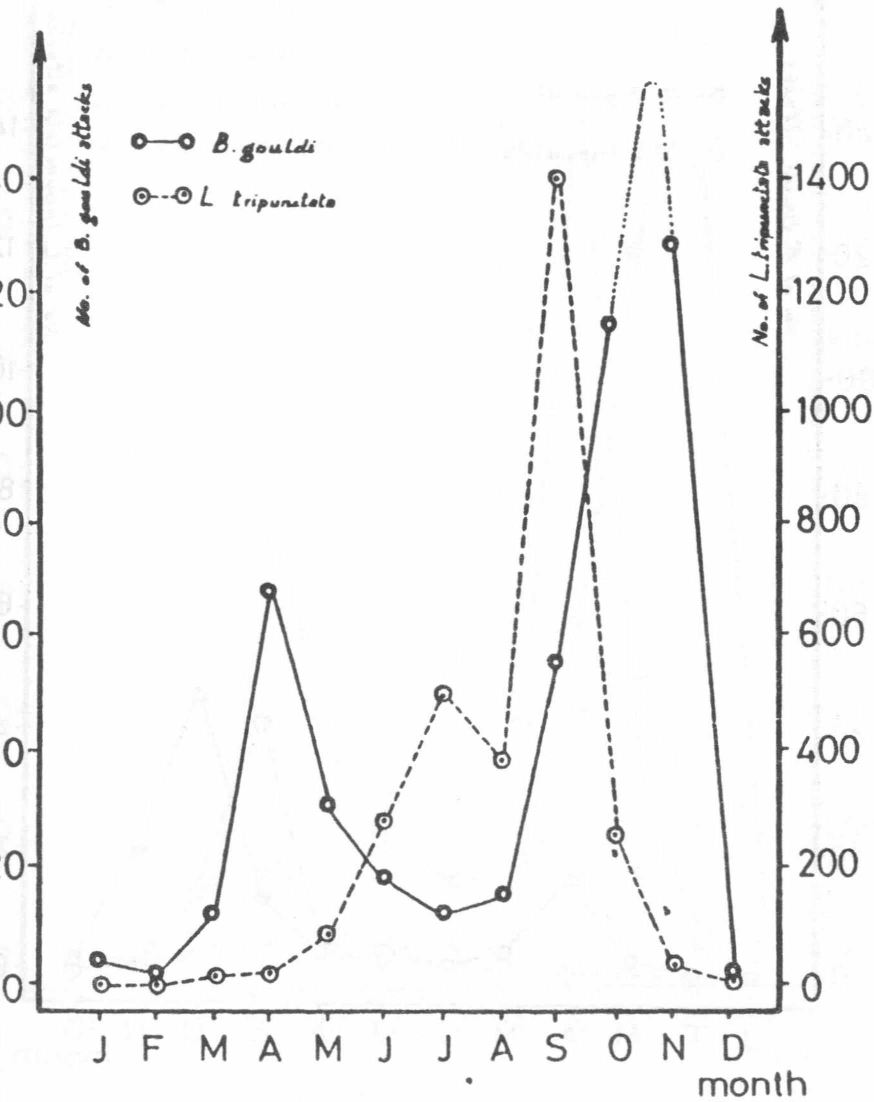

Figure (5)

The breeding seasons of B. gouldi and L. tripunctat before domestic sewage discharge points at Lattakia.

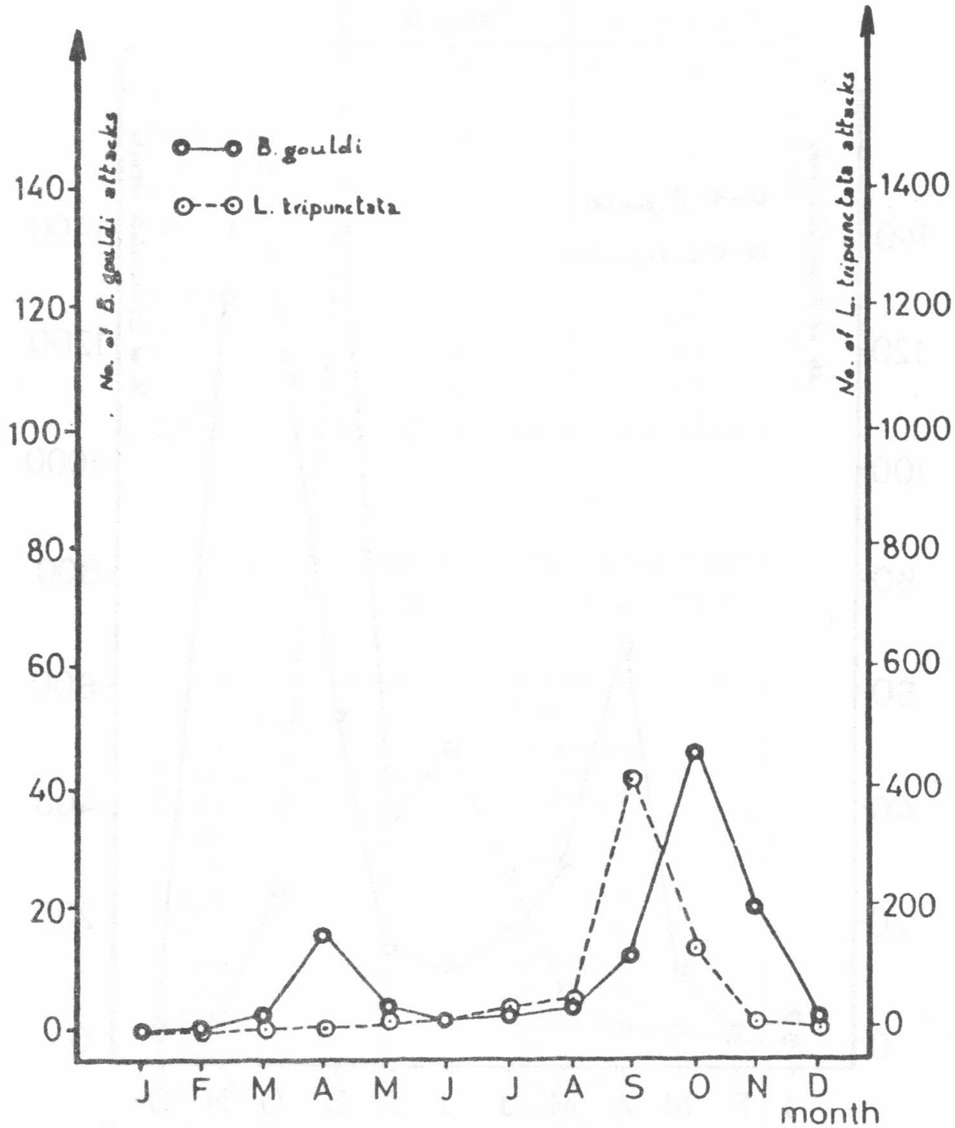

Figure (6)

The breeding seasons of B. gouldi and L. tripunctat after points of domestic sewage discharge at Lattakia.

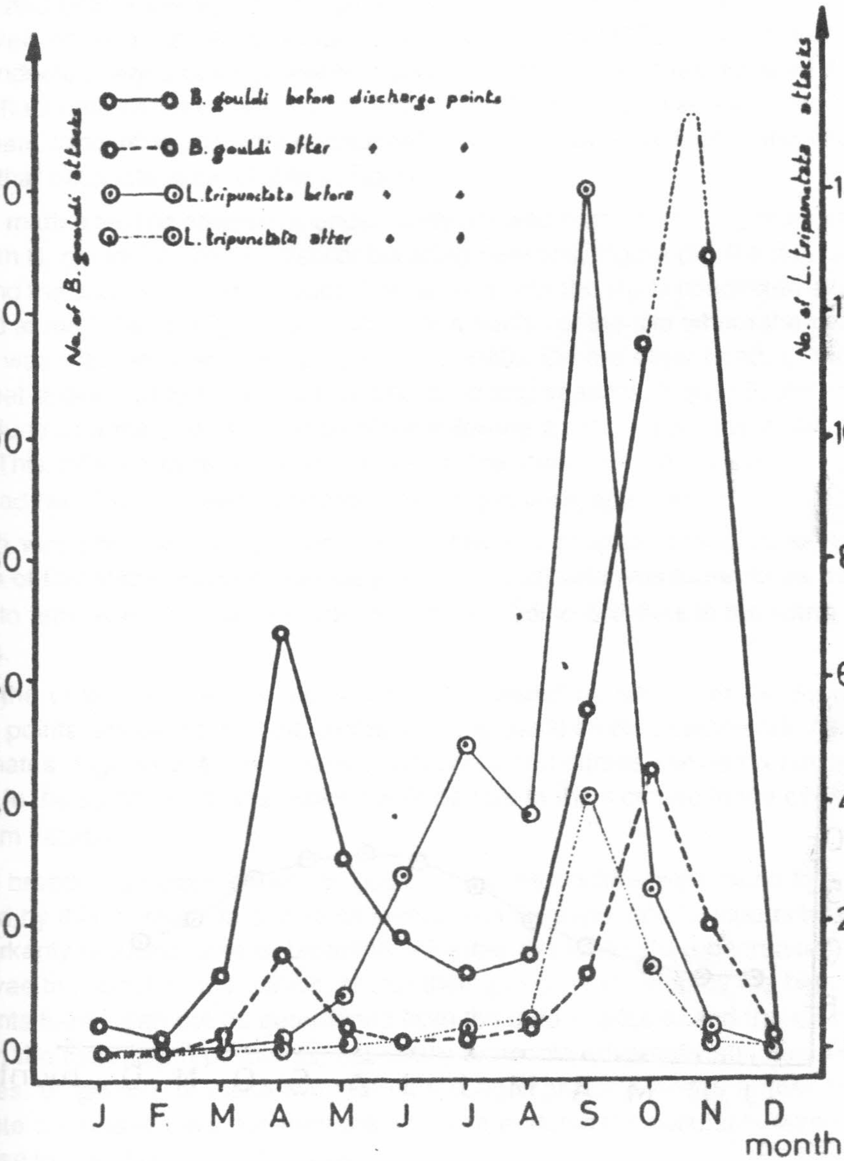

Figure (7)

The breeding seasons of B. gouldi and L. tripunctat before and after domestic discharge points at Lattakia.

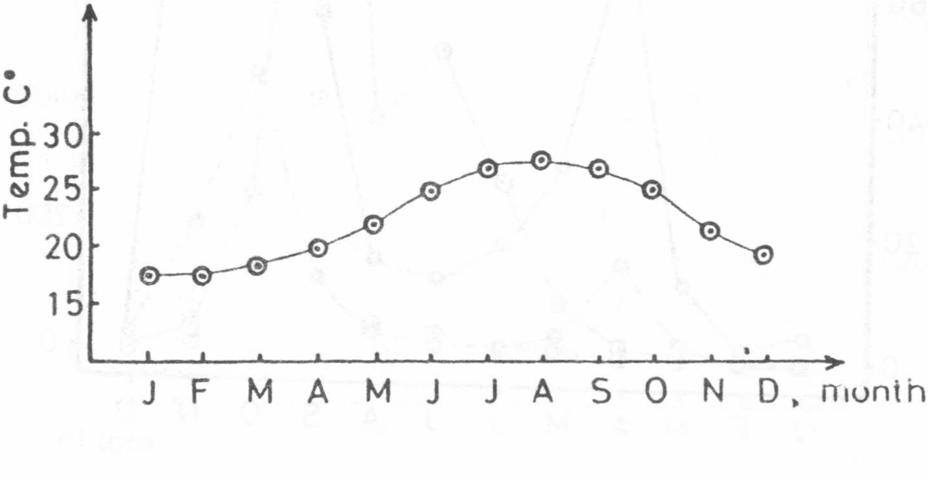

Figure (8)

The surface temperature at Lattakia port taken five centimeters below the surface.

Discussion

Although ammonia levels were found to be relatively constant at the first sampling site located before sewage discharge areas, the nitrite levels fluctuated within acceptable levels when compared to aquatic systems, Thurston (1979), since ammonia analysis conducted over a comparativelly large area of the Syrian coast showed these levels to fluctuate between 0.09-0.15 mg/1. Therfore, these values along with the phosphate concentrations were considered as the normal basal load of the marine waters at that particular area, (Table 1, Figure 1).

The marine fouling organisms under study showed normal rate of growth at the first site, with B. gouldi having two distinct breeding seasons, Figure (5), the first peaked in April and the second in mid-October. This agrees with the study conducted at a station moored at the White Harbor twenty kilometers north of the site where the first testing station was moored at for this study (Habal, 1980). On the other hand, L. tripunctata had what appreared to be two non-distinct breeding seasons, Figure-5, the first peaking in June and the second in September following a small decrease in the breeding rates. This differed from the earlier study at the White Harbor in that L. tripunctata there had two distinct breeding seasons peaking in June and August.

Both wood-boring species under study showed minimal boring activities in the months of December through February, and L. tripunctata was found to be more sensistive to temperature variations with maximal breeding activities in the warm summer months.

On the otherland, the second mooring and sampling site, after the sewage discharge points, showed a marked increase in the basal levels of ammonia, nitrites and phosphates, Figures 2-4. The levels of ammonia and nitrites showed a noticeable increase in the summer months, which could be due to the increase in the city's population from vacationers.

The breeding seasons of both B. gouldi and L. tripunctata were found to be greatly affected by this increase in pollutants levels, with B. gouldi and L. tripumctata exhibiting markedly reduced rates of breeding. Whether this is due to a decreased ability of the larvae to impact on the panels, or that their growth is stunned by the high levels of pollutants found, can not be determined from the data available, and the mechanisms by wich the increase in pollutants, especially ammonia adversally affected the breeding rates, or growth, of these two marine fouling organisms needs further studies to elucidate the relationship between the increase in domestic pollutants levels and the decrease in breeding rates observed.

References

Habal, a. (1980) "The Identification of Some Marine Fouling Organisms and their breeding Seasons at Lattakia Port" 5th. Internation Congress on Marine Fouling and Corrosion, Barcelona, Spain. 1980.

Turner, R.D. (1959) "Marine Boring and Fouling Organisms" D.L. Rey editor, University of Washington Press.

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