Composition of the marine fouling in the Bay of Jururu, Holguin Province. I. Preliminary quantitative study

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The communities of marine fouling began to receive special attention from the second half of the XVIII century with the works of Sellier (Juarrero, 1985). Since this date and in a noticeable way in the present century, the study of this not well so-called "plagues" was intensified due to the considerable damages that cause in different economic interests, mainly in the hulls of the ships, in the piles of the docks and in all the building (thermoelectric, electronuclears) that use the sea water in their cooling systems (Arango, 1964) .

In Cuba, for not holding large sources of fresh-water, it is used the sea water like resource obligatorily to be utilized in the systems of caloric interchange of our industries, therefore, it is of essential importance a previous study of the marine fouling in the areas where is the economic objective (Gómez, 1967).

All intent of control on these communities should keep in mind, in the first place, a study of the composition and dynamics of the same ones, with a goal to proposing more and more effective methods that avoid the fixation and growth of these organisms (Galant, 1976).

In the present work, communities of different marine fouling in the Bay of Jururú, Holguín Province are quantitatively examined; the abundance in different materials are analyzed also, as well as the season of the year in that the most intense attacks take place.

MATERIALS AND METHODS

This work was carried out between November of 1983 and January of 1985 in The Bay of Jururú. The same one is located in the North-East region of the country, between the 21º 5´ of North latitude and the 76º 2´de West latitude, limited by Cape Leeward and Cape Windward. It presents a muddy bottom, covered great part for *Thalassia*, and the depth oscillates between two and eight meters. The values of salinity and temperature are observed in the figure 1.

In order to make a quantitative analysis of the different fouling populations and to compare diverse kinds of materials according to vulnerability to allow the aggression of these organisms, it was settled for disposed a panel near the mouth of the bay, to a meter deep, with 36 concrete plates, steel and copper-nickel. The used plates had an area of 225 cm2.

To quantify the organisms that settled monthly they retired three plates of different material every month and they were substituted by other new ones; in the same way, a series of plates was placed in the month of November and they went retiring one to one in the successive months of the year, corresponding to periods of growing time (accumulative). Once retired the plates inside a bag, they preserved the organisms with formalin to 5%. The count and identification of the organisms on the plates were carried out using the grid method, marking three areas of 25 cm2 each one aleatorily (Juarrero, 1985).

RESULTS AND DISCUSSION

The analysis was realized as much for the exhibition phases (monthly and accumulative) like for the different types of materials it pointed out that the community of marine fouling is constituted by a large diversity of organisms (Table 1), being the most abundant the polychaetes of the Serpulidae family, the species of Barnacles *Balanus eburneus and Balanus amphitrite niveus*, representatives of Ascidians and the bivalves *Crassostrea virginica*, *Anomia simplex* and *Pinctada imbricata.*

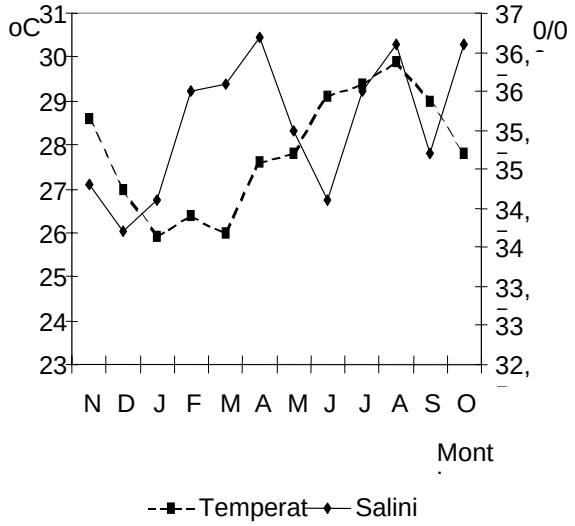

Fig. 1. Temperature and salinity average on the bay (1-meter depth).

These results correspond with those obtained by Alcolado (unpublished) in researches carried out in the thermoelectric of the Mariel and for Kucherova (1967) who summarized that the fundamental characteristic of the biocenosis of the growths of undesirable is the abundance of tubular worms, barnacles and tunicates. Gómez (unpublished) reported as fouling species more abundant in the Cienfuegos Bay to the barnacle *B. eburneus*, also consigned by Gallant (1976) as main fouling in the Lagoon of the Restinga, Venezuela.

Among the fauna associated to the fouling marine appeared vast number of Brachyurans of the family Majidae, Caridean shrimps (Juarrero and Gómez, 1989) and specimens of amphipods, copepods, isopods, cumaceans and tanaidaceans. According to Gallant (1976) these groups of associate organisms find protection in the masses fouling and they are part of the diet of higher trophics levels.

In the monthly phase, the serpulids constituted the dominant group in both materials, with high values of density in the

month from April to May, reaching the maximum value in the steel plates. In the concrete plates they also appear two picks of maximum density in the months from June to July and August to September (Fig. 2). These months of notable's attacks they coincide with the higher values obtained of salinity for the bottom and surface of the bay.

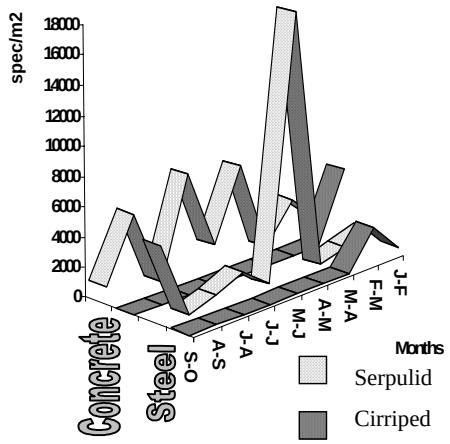

Fig. 2. Monthly phase. Density of serpulids worms and barnacles in both materials.

The species *Balanus eburneus* appears only the first month (January to February) and then in the month of April to May, in the concrete plates, with very low values.

In the accumulative phase, at the same as in the previous one, there is a serpulids dominance, appearing to the two months high picks of density as much for serpulids as for cirripedis and to the five months of exhibition the highest values for both groups (Figure 3). Both materials have similar response, because the establishments after the months are no longer over the material, but on the own organisms that had seated (Juarrero, 1985).

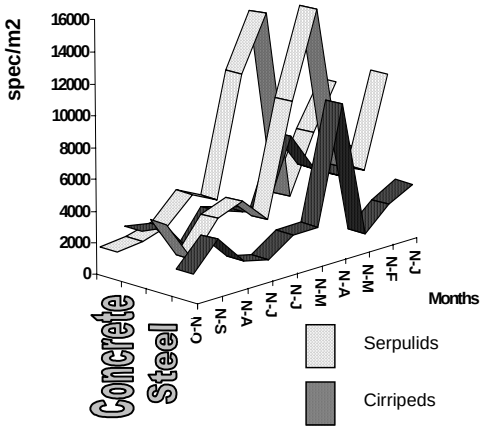

Fig. 3. Accumulative phase. Density of serpulids and barnacles in both materials.

CONCLUSIONS

1. The polychaets of the Serpulidae family, the Barnacles *Balanus eburneus* and the tunicates, were the dominant fouling organisms.
2. The serpulids worms reached in the different materials and exhibition phases the highest values of density.
3. - In the month of April, to the five months of exhibition, appear the maximum values of density for serpulids and barnacles.
4. The proliferation of the organisms is presented independent to the material type.
5. Apparently, the establishments of the organisms decrease in the accumulative phase and in other less dominant groups it ends up disappearing.

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Table 1. Composition and abundance of marine fouling and associated organisms in Jururu Bay (1:uncommon, 2: Abundant, 3: very abundant).

Organisms	Fouling	Associated	Concrete	Steel	Abundance
Coelenterata					
Hydrozoa	X		X	X	1
Annelida					
Serpulidae	X		X	X	3
Nereidae		X	X	X	2
Sabellidae	X		X	X	1
Mollusca					
Bivalvia					
Anomia simplex	X		X	X	2
Pinctada imbricata	X		X	X	1
Crassotrea virginica	X		X	X	2
Hormomya exustus	X		X		1
Spondylus americanus	X		X	X	1
Chama sp.	X		X		1
Crustacea					
Copepoda		X	X	X	1
Amphipoda		X	X	X	3
Cumacea		X	X	X	1
Tanaidacea		X	X	X	1
Isopoda					
Paracerceis caudata		X	X		1
Cirripedia					
Balanus eburneus	X		X	X	3
B. amphitrite niveus	X		X	X	2
Caridea					
Trachycharis restrictus		X	X		1
Periclimenes americanus		X		X	1
Alpheus sp.		X	X		1
Brachyura					
Pilumnus sayi		X	X		1
P. dasypodus		X	X		1
P. caribaeus		X		X	1
Pilumnoplax sp.		X		X	1
Mithrax sculptus		X	X	X	1
M. spinosissimus		X	X		1
Micropanope sp.		X	X	X	1
Microphrys bicornutus		X	X	X	3
Macrura					
Panulirus argus		X		X	1
Bryozoa					
Bugula sp	X		X	X	2
Chordata					
Ascidiacea	X		X	X	3
Osteichthyes		X	X		1
Labrisomus sp.		X	X		1