Aspects of Barnacles ecology in Ligurian Sea

by

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Specimens and data of Cirripeds were collected from 1964 in Ligurian sea, particularly in harbours where asbestos panels were periodically immersed for studying general pattern of settlement, settlement periods, vertical distribution, survival, growth rate etc. in relation to the well known problems of fouling and material deterioration in sea water. Particular surveys were conducted between January 1966 and January 1967 in four main harbours : Genova, La Spezia, Savona and Imperia, where panels were immersed at — 80 cm throughout the year for periods of one, three, six and twelve months (when a panel was removed it was replaced by another which remained immersed for the same time). In Vado Ligure Bay, near Savona, observations were made throughout two years (November 1967 — Nov. 1969) at four station situated at — 4, — 7 and — 18 m depths. In Genoa harbour barnacles communities were studied in seven stations, different in pollution, between July 1969 and July 1970 and settlement under raft conditions at — 0,1, — 1, — 5, — 9, — 14 and — 16 m from August 1965 to December 1969. Also comparative observations between panels (asbestos 200 × 300 × 3 mm) settlement and natural barnacles communities were made, along the Ligurian coast, on piers, warves, piles, buoys etc.

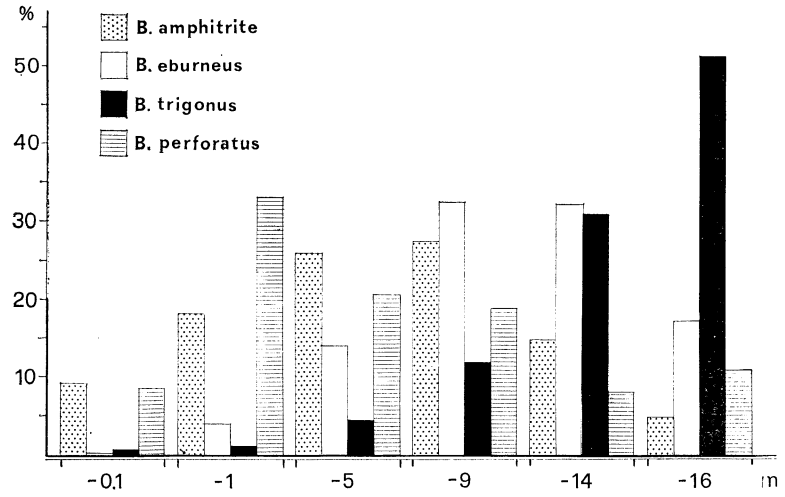

FIG. 1. — Vertical distribution in per cent of barnacles collected throughout four years on panels immersed at six depths during 1 and 3 months.

In Ligurian sea four species of barnacles (genus *Balanus*) are known : *Balanus amphitrite* Darw., *B.eburneus* Gould, *B. perforatus* Brug. and *B.trigonus* Darw. [RELINI, 1962, 1964 *a*, *b*], while in other parts of Italy probably occur : *B. (Megabalanus) tintinnabulum tintinnabulum* L., B. *(Megabalanus) tulipiformis* Darw., *B. spongicola* Brown, *B. improvisus* Darw., *B. calceolus* [RELINI, 1969].

Rapp. Comm. int. Mer Médit., **21**, 9, pp. 617-619, 2 fig. (1973).

Among Ligurian species *B. amphitrite* and *B.eburneus* are prevalently found in harbours; in more polluted areas *B. amphitrite* can be only species present. Along the rocky shore *B.perforatus* is the dominant barnacle in the low intertidal and in the upper part of infralitoral, while *B. trigonus* is more abundant in the lower infralitoral zone. These observations are confirmed by the comparison of vertical settlement of all species during two years on panels immersed in Vado Ligure bay (exposed to open sea) and on those of Genoa harbour [RELINI, 1968*b*]. On Vado Ligure panels dominant species are *B. perforatus* and *B.trigonus*, while in Genoa harbour *B.amphitrite* and *B.eburneus*.

In Ligurian sea the heaviest settlement of all barnacles occurs during summer months [RELINI, 1964*a*, *b*, 1968 *a*, *b*, RELINI & GIORDANO, 1969], but *B.perforatus cypris* can be found about all year long, this observation is in agreement with LE RESTE's data [1965]. *B. perforatus* seems to prefer for settlement panels exposed for several months i. e. panels covered by fouling. According to data collected in several years in Genoa harbour *B. amphitrite* settles from March to November with a maximum in June like *B. eburneus*, which settles between May and October. Shorter is the settlement period of *B. trigonus* : from June to October with a peak in the first month. The barnacles settlement on two faces of vertical panels is quite similar at the same exposure; only a heavy presence of Algae or colonial Ascidians can prevent barnacle attachment. The lower face of horizontal panels are always much more fouled by barnacles. By the comparison between settlement on panels exposed in Vado Bay and those of harbours it results that the " border effect " (heavier settlement along the corners) is stronger on vertical panels immersed in Vado Bay, particularly on the corners of upper part of panels. This behaviour during settlement, quite absent on the horizontal ones, may be in relation to the sea currents.

Four years observations were conducted in Genoa harbour on vertical distribution of barnacles and on the preferential depth for settlement on asbestos panels immersed for one and three months at six levels chosen from surface to — 16 m near the muddy bottom. *B. amphitrite* prefers 5-9 m depth panels, on which the 53 % of all *B. amphitrite* were collected. However the depth at which the highest settlement occurs seem to change in relation to the month : in May this depth is at — 14; than rises until August to — 1 m and goes down during September and October, reaching — 14 m in November. The reason of this variation is under investigation. *B. eburneus* prefers for settlement 9-14 m panels on which the 64% of specimens were found while the 81% of *B. trigonus* were recorded from 14-16m panels. The small number of *B.perforatus* founp on harbour panels did not allow to establish any preferential depth. In fig. 1 per cent vertical distribution is shown. For bibliography on this topic see HOUGHTON & STUBBINGS, 1963, RELINI & GIORDANO, 1969.

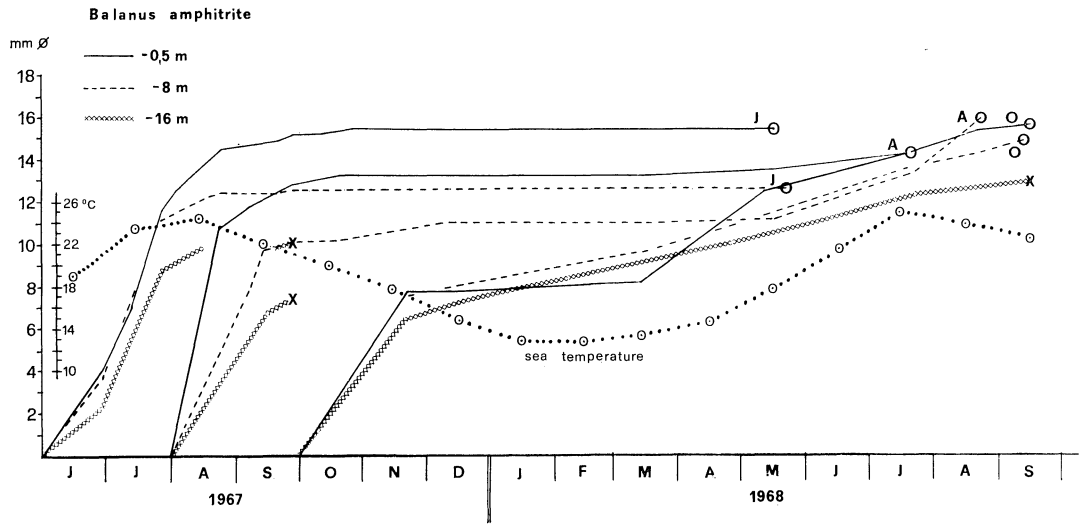

FIG. 2. — Growth rate curves (average values of basal rostro-carina diameter) of isolated *B. amphitrite* specimens settled at — 0,5, — 8 and — 16 m in June, August and October 1967. The signs Θ and × mean death of most part of barnacles and the stop of observations.
The sea temperature curve rapresents the monthly means at — 0,5 m.

The preferential depths for settlement are not always the best for a high growth rate. Investigations [RELINI & RELINI-ORSI, 1969] in this field were made on isolated barnacles settled on asbestos panels throughout two years at three main depths (— 0,5, — 8, — 16 m); three series of panels were considered. Experiments respectively started from June, August and October 1967 for collecting different generations, but only *B. amphitrite* was found in sufficient number in three series at three levels. Graphics of growth rate at nine different situations for *B. amphitrite* are drawn in fig. 2. The curves represent the mean values of basal rostro-carina diameter of several individuals (minimum 10). The size reached in winter depends strongly by period of settlement at superficial panels because the growth stops during winter : largest size is gained by barnacles settled in June but the highest monthly increase was in August, month in which the basal diameter overcomes 11 mm. In superficial waters only barnacles settled in October have a recommencement in growth during next summer.

Similar patterns are present in — 8 m depth barnacles but the size is lower and the October generation continues in growth also during winter like samples of same period settled at — 16 m. At this level high mortality was found in barnacles of June and August. Survival of *B. eburneus* which is present in good number only on — 8 and — 16 m panels is lower, but these barnacles settled in June show a mean basal diameter of 15,5 mm in September; the life period as for *B.amphitrite* generally does not exceed a year. The survival and size of *B.perforatus* and *B.trigonus* are higher and also the life period may last quite a few years; the former settled in June reached in September 16,5 mm and 27 in September of the second year (in superficial waters, the only level with sufficient samples); the latter reached with few specimens between June and October at — 8 m a diameter of 17,5 mm; the— 16 depth is better for settlement and survival but allows to gain the same size only in September of the second year.

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