Abundance distribution and faunal composition of Pteropodal Shells from the recent sediments of the Cilician Basin : N.E. Mediterranean Sea

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ABSTRACT
Mapping of the combined abundance of the shells of thecosomata pteropods and heteropods evaluated in the coarser than 250 micron fractions of 95 surface sediment samples evenly covering the shelf and bathyal parts of the Cilician Basin between Cyprus and Turkey (Shaw and Bush, 1978, fig.2), showed that down to a depth of about 100m shelf sediments are generally poor in shells (Alavi, 1980). Their abundance is particularly low over those parts of the shelf under the direct influence of discharge from Rivers Seyhan, Tarsus, and Göksu. However, along the southern Anatolian margin to the west of River Göksu, where the shelf is narrow and no major river flows into the sea, most of the shelf sediments are richer in shells presumably due the greater influence of open-sea conditions on the neritic waters.

Slope (200-800m) sediments to the west of the Göksu delta are generally richer in shells except for areas of obvious sediment redeposition. At such localities finer sand fractions can still be rich in shell fragments. No evidence of significant shell dissolution could be found in the majority of the samples from the bathyal zone, and shell abundance continuously increases with depth reaching to as much as about 6000 shells per gram of the coarse fraction of sand at a depth of 2000 m.
The most common pteropod species is Limacina inflata (d'Orbigny), representing between 35 to 45% of the pteropodal shell assemblages from the bathyal zone. Other common species are L. trochiformis (d'Orbigny), Styliola subula (Quoy and Gaimard), and subspecific forma of Creseis virgula (Rang). Each of these species can account for 15 to 30% of the bathyal pteropodal assemblages. Less frequent but widely occuring forms are Creseis acicula (Rang), Clio pyramidata Linnaeus, and Hyalocyclis striata (Rang). Meso- and bathyplagic forms such as Diacria trispinosa (de Blainville), Clio cuspidata (Bosc) and C. polita (Pelseneer) occur rarely in some deep-water (1000m) samples. The last species is only known from the Recent sediments in the Levantine Sea (Almogi-Labin and Reiss, 1977 and Herman, 1981).

There are no detailed published data on the composition of the living pteropods from this region. L. inflata is recorded to be the most common pteropod species occuring in plankton tows from the offshore waters of the northeastern Levantine Sea. This form and L. trochiformis together can account for up to 40% of the total plankton catch in this region (Kimor and Berdugo, 1967, Kimor and Wood, 1975, and Pasteur et al., 1976). The composition of the fauna is also found comparable with those reported from other parts of the Levantine Sea (Rampal, 1968 and Almogi-Labin and Reiss, 1977), and generally similar to that of the tropical-subtropical, oligotrophic and saline gyre-centre water-masses in the open ocean (Be' and Gilmer, 1977).
The shells of various species of the heteropod genus Atlanta constitute between 10-15% of the total planktonic molluscan shells in the coarse sand fractions of the bathyal sediments. A. inflata Souleyet, reported oh be the most common species of the group in offshore surface waters from this part of the Levantine Sea (Kimor and Berdugo, 1967 and Kimor and Wood, 1975), represents the most widely occuring and abundant species in the basin. It has also been recorded in deep-sea surface sediments from the Ionian Sea (Geronimo, 1970) and known to be common in the Gulf of Naples (Richter, 1968).

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The growth equation of Temora stylifera Dana

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The von Bertalanffy growth model has been introduced to describe the growth of cephalothorax of the copepod Temora stylifera DANA. Measurements have been carried out on adults only and the calculated parameters, for the male individuals, are: L_∞= 1.28 mm, k=0.38 and t_0=-0.67; the growth equation may be written as follows:

$$l_t = 1.28 (1-e^{-0.38 (t+0.67)})$$

Taking into consideration the existing evidence, from the current bibliography, that the approximate generations interval, for Temora stylifera, is three to four weeks, the total time needed, for males to reach their maximum length, has been roughly estimated to five to six months.

This study has been based on zooplankton samples, collected with a WP-2 nylon net, mesh size 0.24 mm, from a station grid of 14 localities, during a two and a half year period, from a certain area of the Aegean Sea, North Evoikos Gulf, on the course of 14 campaigns. The sampled vicinity can be considered as an enclosed one, almost isolated, and is characterized by the well mixed water masses, in the whole column, max depth up to 80 m., due to the strong tidal currents.
The attempt to determine the growth equation parameters has been based on the adult male cephalothorax measurements only in order to avoid the possible size diversion due to the different growth rates between males and females, plus the fact that males were more abundant during most of the sampling periods and the interference of the abdomen length variations. Preliminary calculations demonstrated a well known phenomenon, that, in both sexes, the total length of the copepod versus cephalothorax presents a better correlation than the total length versus abdomen.
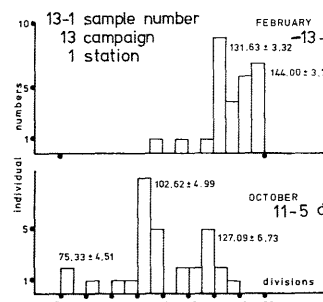
Measurements have been performed on specimens obtained from one sample only for each sampling period, where an abundance of adult individuals had been noticed. Various methods, for the proper estimation of the cephalothorax length, have been applied but competent results were revealed by the use of a projecting device only, under a total magnification of 127 times. Less accurate approaches did not provide adequate length estimations in order to choose the suitable class range at the size-frequency histograms.
The forementioned methodology, exposed a repeatable size - frequency distribution, from all samples analysed. For each sample three cohorts were usually observed. An example of the revealed groups of sizes, based on the selected class intervals, is given in the histogram. It should be noted that 1 mm equals to 127 divisions and the measurements' accuracy is 1.0 division. It is believed that these
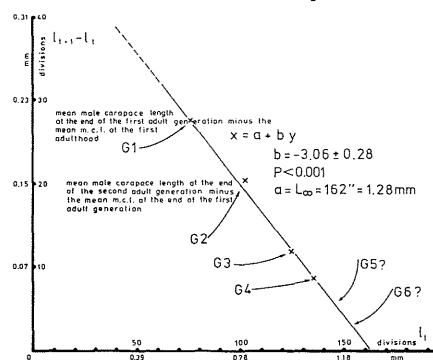
size-frequency distributions are reflecting a sequence of generations because:
1) Specimens from one sample only, of such a peculiar area, must belong to the same patch. Each cohort includes individuals with corresponding growth rates, so, the different groups of sizes can be attributed to successive spawning periods. This implies also a regular and simultaneous spawning activity of all females.
2) The difference between the means of two successive cohorts of older generations, e.g. fifth and forth adult generations, is smaller but of the same, more or less, magnitude, for all sampling periods, than that from the younger ones, e.g. third and second. Consequently, the variations of the mean values can not be attributed to temperature influence only, since, during these periods, temperature presented increased or declined alterations.
A combination of the different data, provided the $Y = l_{t+1}-l_t$ versus $X = l_t$, plot, where l is the cephalothorax length and t the corresponding time.
The maximum adult male cephalothorax measured 1.22 mm and the minimum 0.50 mm, with corresponding total lengths of 1.61 mm and 0.89 mm. No adult specimens with smaller cephalothorax size has been noticed in our samples, therefore it is considered that around this min value, the integration of the adulthood occurs. From the figure, the approximate number of generations needed for the individuals to reach their max length can be estimated, from five to six or possibly seven.
The growth coefficient, k = 0.38, attains rather high values, probably due to the eutrophic character of the ecosystem studied.
The t_0 growth parameter, calculated for the different generations, gives similar values, meaning that, in all cases, it has been almost equally underestimated a little more than half of a generation period.