AN ATTEMPT TO ASSIGN BERTALLANFY GROWTH PARAMETERS TO ARISTEUS ANTENNATUS RISSO 1816 (CRUSTACEA DECAPODA) OF THE LIGURIAN SEA.

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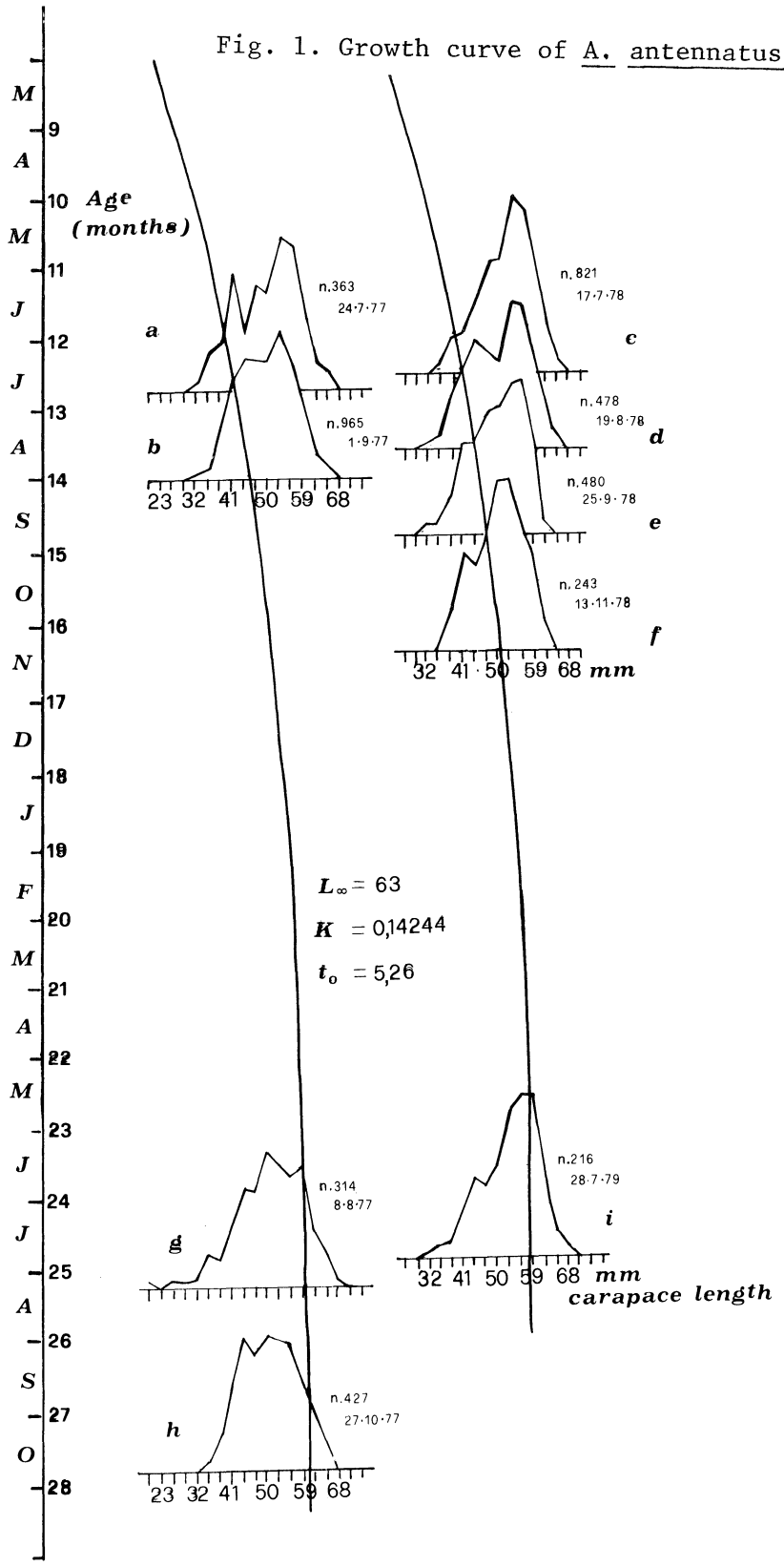
Résumé - On a derivé une function de croissance pour la crevette rouge Aristeus antennatus de la Mer Ligure en se basant sur précédentes observations sur la reproduction et sur nombreuses séries de mesures longueur de carapace/frequence, collectionées mensuellement dans le Golfe de Gênes.

Summary - On the basis of previous work on the reproduction of Aristeus antennatus, and a series of carapace length/frequency distributions collected at monthly intervals in the Gulf of Genoa, a Von Bertallanfy growth curve was derived for the ligurian population.

Populations dynamics are becoming increasingly required in the mathematical modelling of the exploitation of marine resources: in particular growth parameters of Mediterranean stocks are continually being collected and brought up to date by the GFCM (FAO). Nevertheless, data concerning the growth of bathyal shrimps are generally lacking in these reports. During four years, in the research programme (1977-1980) of the Italian CNR "Progetto finalizzato Oceanografia e Fondi Marini subprogetto Risorse biologiche", red shrimps of the species Aristeus antennatus were sampled at monthly intervals on two kinds of bathyal bottom in the Ligurian Sea, and carapace length-frequency distributions derived. The latter are now used, according to Pauly (1980), to derive a growth function, after having overcome some difficulties due to the discontinuous processes of growth. As every interpretation of size frequency distributions is at least in part subjective, we tried to substantiate some assumptions on the basis of our previous work on reproduction (Relini Orsi e Relini, 1979). The growth curve was obtained on the basis of the following observations and/or suppositions.

1) Ligurian stocks of A. antennatus are composed of 90% females (from a sample of 10.000 sexed shrimps): growth studies were only possible with these. The smallest size of mature females (i.e. bearing large violet ova) was 32 mm c.l.
2) In these populations spawning occurs for six months (summer and autumn) and is almost totally lacking during the remainder of the year: this could al-

Fig. 1. Growth curve of A. antennatus.



low a separation between successive cohorts in the short life span that shrimps generally have. Each cohort is clearly composed of several micro-cohorts.

3) Carapace length (c.l.) (from the eye socket to the median posterior edge), was measured to the next lowest millimeter; subsequently data, mainly for adult and large sized specimens, were grouped in three millimeters size classes. During the spawning season the size frequency distributions can often be divided into two parts at about 50 mm c.l. (fig. 1b, d, f, h): these two groups were assumed to be cohorts, i.e. shrimps 1 and 2 years old. In the latter a main modal length at 53-56 mm is followed on the rigth by a smaller group (fig. 1a): these were considered to represent the last two instars of the population. In the first group, lesser modes appear (fig. 1a, d, g) that can sometimes be followed until they fuse with the second group. The existence of instars of 35, 41 and 47 mm c.l. was predicted and their modal group separated as suggested by Garcia and Le Reste (1981), on the basis of their distributions being symmetrical. These shrimps, derived from the long spawning period (from July to December) of the previous year, should, in July, be a minimum of six and a maximum of 12 months old. At the end of the spawning season the largest shrimps appear reduced in numbers.
4) From a total of 3,500 adult females, collected from June to November, the newly moulted specimens (exoskeketons like thin tissue-paper) were sought and their stage of ovarian maturity recorded. They consisted of only about 2% of the total population, 82% of which had spent ovaries and 15% were in a state of advance maturity: the moult rate, therefore, seems to be associated with the spawning rate, the intermoult period generally being as long as that of the ovarian maturation.
5) On the basis of observations concerning the micro anatomy of the ovarian tissue and the reproductive structure of the population (fig. 2) the time necessary for the ovarian maturation was found to be about two months. Younger adult female shrimps (32-47 mm c.l.) were thought to ovulate and moult up to a maximum of 3 times in their reproductive season; the older ones (about two years old) moulted only once or twice. From the deplacements of modes toward the right, in intervals of time consistent with these reproductive assessments, some segments of a growth curve were lerived; the parameters of a function of von Bertallanfy were then calculated (fig. 1) in c.l., having assumed that the birthday was on 1 July· this is:

$$lt = 63\left[1-e^{-0,004748\ (t-160)}\right]$$

while the monthly growth is:

$$lt = 63\left[1-e^{-0,14244\ (t-5,26)}\right]$$

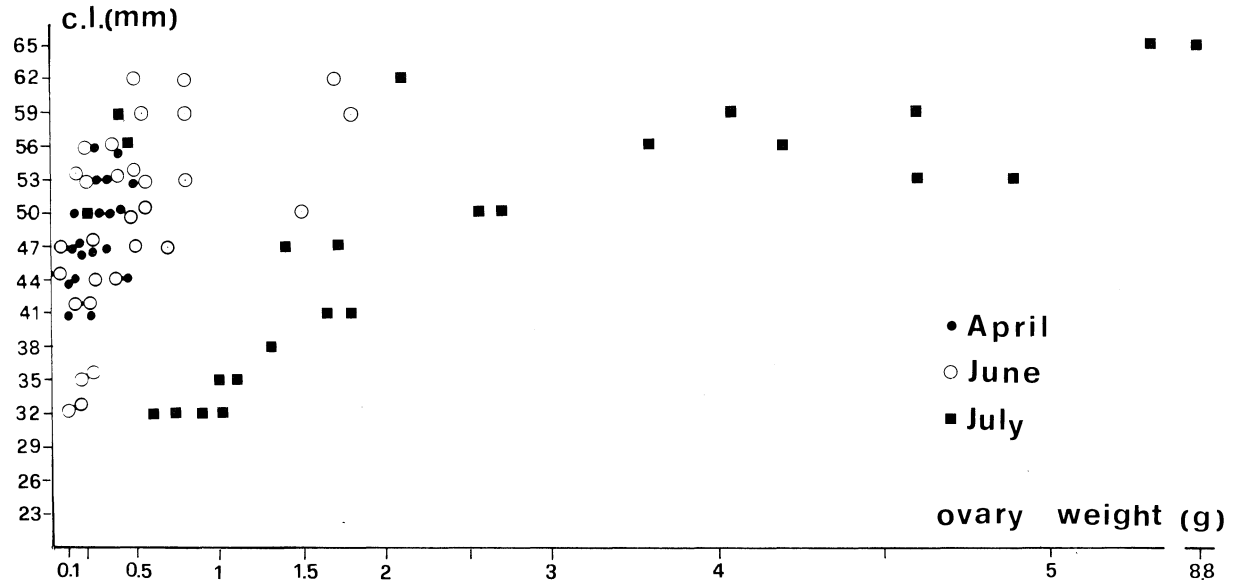


Fig. 2. Ovarian weights recorded in April, at the beginning of June and in July when the first instances of violet ova were evident. The figure shows that the ovary starts to mature in June and after two months reaches the spawning condition.

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