

# ON THE LIFE HISTORY OF *PHILYRA GLOBOSA* (FABRICIUS), (DECAPODA : BRACHYURA)

By B. F. CHHAPGAR, M.Sc., Taraporevala Marine Biological Research Station, Bombay

A serious lacuna in our knowledge of the Brachyuran fauna is the almost total lack of information about the life history of our crabs. Owing to the difficulty in rearing brachyuran eggs through successive larval stages up to the adult, under laboratory conditions, hardly any studies on this aspect of the problem have been made in India, except for a few notes by McCann<sup>1</sup>, and Chacko and Thyagarajan<sup>2</sup> on fresh water crabs, and Menon<sup>3</sup>, Naidu<sup>4</sup>, and Prasad and Tampi<sup>5</sup> on marine Brachyura.

It is not difficult to secure the first zoeae by hatching the eggs from a berried crab in the laboratory. The exigencies, however, of maintaining the zoeae at proper conditions of temperature and aeration—and most difficult of all, the proper food—have precluded the success of most attempts to rear the zoeae to the megalopa stage. An alternative method is to grow freshly collected larvae at least upto one moulting in a laboratory, and to connect such stages by further collection and nurture in the laboratory upto one stage each time. This method, though not most accurate, can be accepted as workable when the successive stages, both laboratory born and collected from the sea, are carefully examined and compared. This method has, therefore, been used in the present study.

Berried crabs were secured and their eggs hatched out in the laboratory to obtain the first zoeal stages. At the same time, zoeae were collected in plankton by the use of townets. A circular plankton net with a ring diameter of 20 inches, and made of fine Swiss organdy cloth was used, a large bottle being tied at the tip of the net. Towsings were made just below the surface and varied from 8 to 15 minutes. Runs were made, weather and tide permitting, from opposite the Taraporevala Aquarium west to Malabar Hill and beyond. A smaller plankton net with a ring diameter of 10 inches and made of bolting silk was also used for making collections along the shore at Marine Drive. The contents of the bottles were immediately transferred to a large shallow jar, and the samples were examined alive in the laboratory and sorted out. They were then kept in aerated dishes or finger-bowls, and fed with diatoms

---

<sup>1</sup> McCann, C., *J. Bombay nat. Hist. Soc.* XXXIX, pp. 531-542, pls. i, ii (1937).

<sup>2</sup> Chacko, P. I., and Thyagarajan, S., *J. Bombay nat. Hist. Soc.* (1) LI, pp. 289-291, figs. 1-4 (1952).

<sup>3</sup> Menon, M. K., *Bull. Madras Govt. Mus., Nat. Hist.* (ns. (3) III, pp. 1-45, pls. i-x (1933); (5), pp. 11-56, pls. i-ix (1937).

<sup>4</sup> Naidu, K. G. Raja Bai, *Proc. Ind. Acad. Sci.* XXXIII, pp. 32-40, pls. i-iii, fig. 1-13 (1951).

<sup>5</sup> Prasad, R. R., and Tampi, P.R.S., *J. Bombay nat. Hist. Soc.* (3) 61, pp. 674-686, pl. i, figs. 1-58 (1953).

and mollusc larvae. The zoeae were examined with the aid of a binocular microscope, in watch glasses and cavity slides. Appendages were cut off with a pair of entomological needles No. 20 mounted on holders. This was necessary in examining the details and making counts of the setae on the various appendages. Drawings were made with the aid of a camera lucida.

#### EGGS AND EARLY DEVELOPMENT

Starting with the observation of eggs from berried crabs, the different zoeal stages obtained in plankton were identified and connected with the following stages by the number and size of the spines on the carapace and maxillipeds and the shape of the telson.

The characteristics that distinguish the zoeae of *Philyra globosa* (Fabricius), are the presence of fairly long dorsal and rostral spines, and extremely short lateral spines, together with a flat, triangular, plate-like telson.

Unlike many other crabs, there proved to be three zoeal stages in this crab. This is rather remarkable, considering that all other crabs have either two, four, or five stages. Another peculiarity, common to some species of *Ebalia* also, is the presence of six setae on the maxillipeds of the third zoeal stage, most crabs having eight. All the stages are active, in which the individuals swim about by means of the maxillipeds and on occasion propel themselves backward by jerking motions of the abdomen. The first zoeal stages swim at the surface and towards light. The second and third zoeal stages also swim towards light but usually remain at the bottom. The megalopa stage avoids light, creeping underneath the aerating stones kept in the bowls. They also remain at the bottom.

Berried crabs were obtained from the beginning of December up to the first week of March and the first larval stages appeared in plankton in the last week of December.

The body lengths were taken from the base of the dorsal spine to the extreme tip of the telson, using specimens which were as nearly straight as it was possible to find. All dimensions are in millimetres.

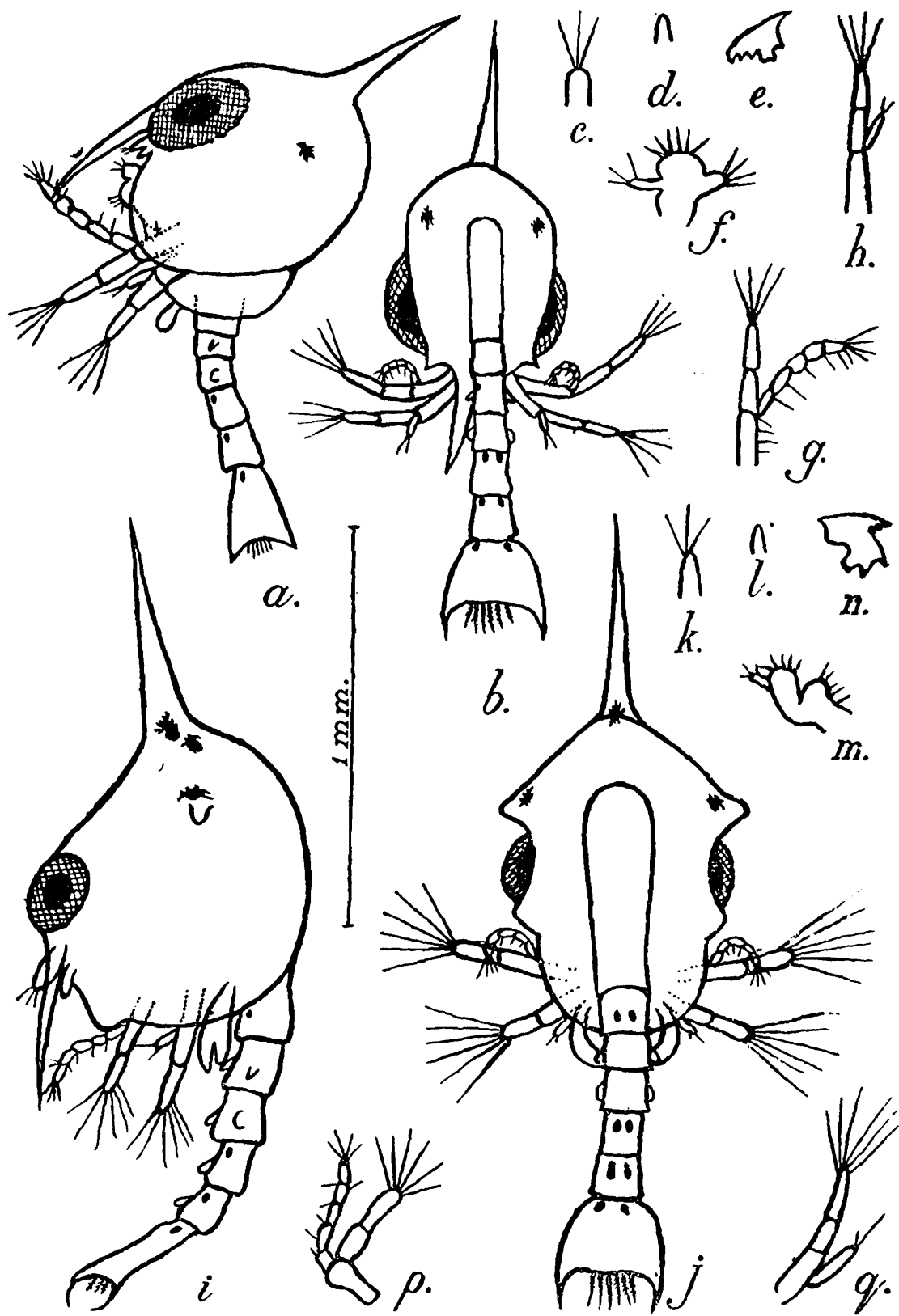
*Eggs.*—The berried female has its abdomen completely flexed as normally, the number of eggs being small and hidden from view. The eggs are circular, golden yellow or orange in colour, and measure 0.233 mm. Later they turn black due to the absorption of yolk and the pigmentation of the larvae inside the eggs. The later eggs are very slightly larger than the earlier ones.

*First zoea* (text-fig. 1, *a* to *h*).—Measurements: Body length 1.26; eye width 0.5; body width 0.4; dorsal spine 0.33; rostral spine 0.26.

The carapace is rounded. The dorsal spine is slightly longer than the rostrum and is straight. There is no trace of the lateral spines. There is a long and narrow slit at the back where the abdomen comes out.

The antennule is an unjointed process with three aesthetes. The antenna is a rudimentary stump without any aesthetes. The mandible is heavy and bilobed. The maxillae are drawn closely up against the

body. The first maxilla consists of a short, narrow, one-jointed exopodite bearing two setae distally and one in the middle; and two large, broad endites bearing six and four setae.



TEXT-FIG. 1.—*Philyra globosa* (Fabricius).  
a. to h. 1st zoea, and i. to q. 2nd zoea.

a. Side view; b. Dorsal view; c. Antennule; d. Antenna; e. Mandible; f. 1st maxilla; g. 1st maxilliped; h. 2nd maxilliped; i. Side view; j. Dorsal view; k. Antennule; l. Antenna; m. 1st maxilla; n. Mandible; p. 1st maxilliped; q. 2nd maxilliped.

The first maxilliped consists of a short base with an exopodite of two segments bearing four long non-plumose setae, and an endopodite of five segments with four short hairs at the tip and several others along it.

The four hairs at the tip of the exopodite are constant and indicative of the first zoea. The second maxilliped is similar to the first except that the endopodite has only one segment with two short hairs at the tip.

Rudiments of the chelipeds have appeared as buds.

The abdomen consists of five segments and a telson. It bears a pair of hook-like lateral knobs on the second segment, and a pair of rounded knobs on the third segment. There are also a pair of irregularly oval pigmented spots on the fourth and fifth segments, on the base of the telson, and one below and behind the dorsal spine. These are the only colours in this zoea, the rest of the body being colourless; the interior of the body is seen through the transparent colourless cuticle as a greenish or sometimes orange tinge.

The telson is in the form of a flat triangular plate, with six setae in the centre, and a lateral spine on each side. The setae are plumose in their basal half and naked distally. The fifth abdominal segment is slightly constricted where it joins the telson.

*Second zoea* (text-fig. 1, *i* to *q*).—Measurements: Body length 1.53; eye width 0.56; body width 0.60; dorsal spine 0.46; rostral spine 0.43.

In general there is no great change in shape or appearance from the first zoea except the increase in size and the fact that the lateral spines have appeared as rounded prominences. A branched chromatophore has appeared at the base of the dorsal spine. Both the maxillipeds are similar to those of the first zoea, except that there are six hairs on the exopodites.

There is an additional pair of pigmented spots on the first abdominal segment, and the chelipeds have appeared. Buds of the pleopods can also be seen.

*Third zoea* (text-fig. 2).—Measurements: Body length 2.0; dorsal spine 0.7; rostral spine 0.53.

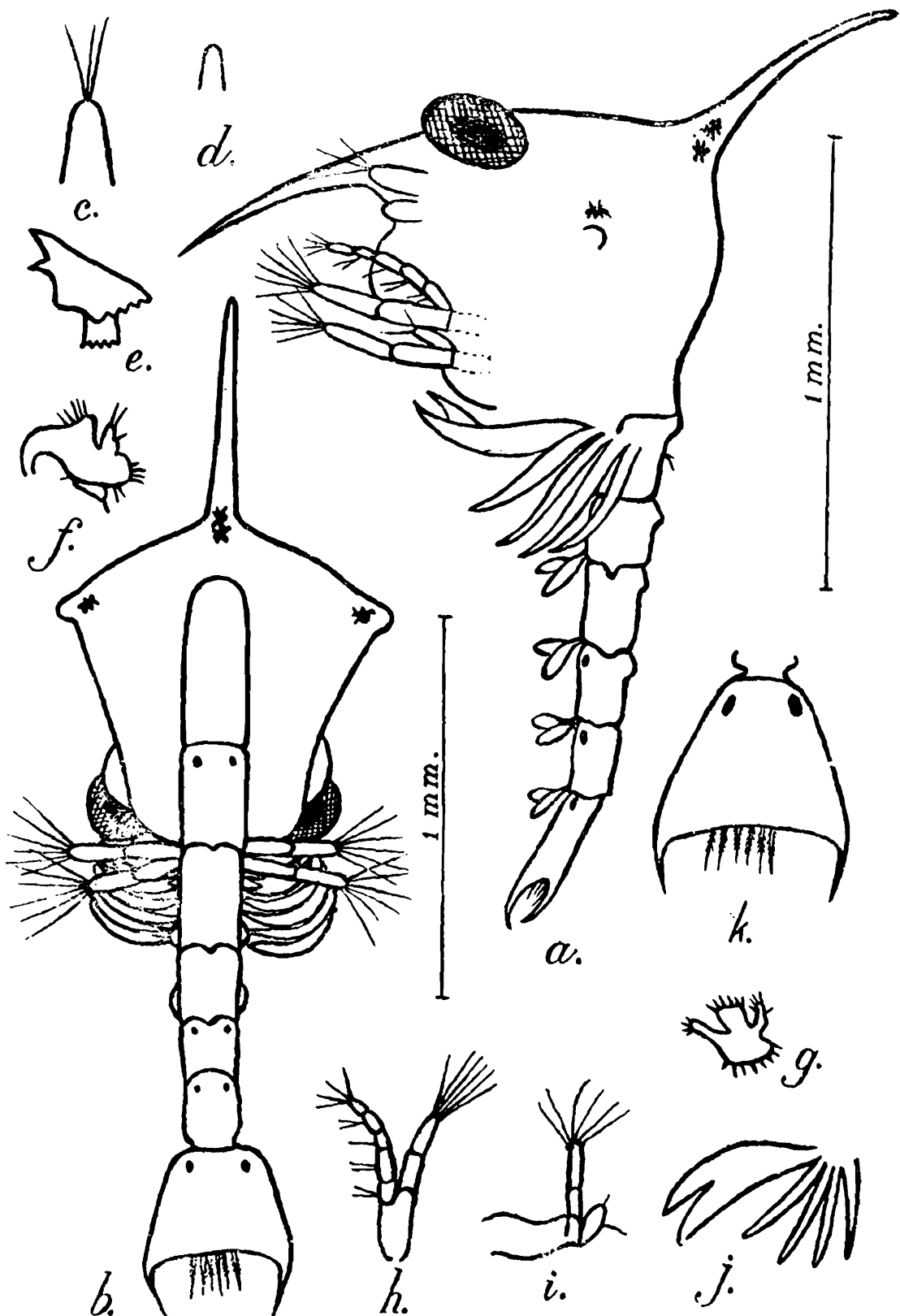
The general shape is the same as in the preceding stages. The eyes have begun to be stalked. The walking legs appear as long but still unjointed buds. The distal sides of the first, second and third abdominal segments are prolonged in the middle. The pleopods have lengthened, but still have no definite character. The maxillae remain the same except for an increase in number of setae. The exopodites of the maxillipeds have six hairs only. A pair of hairs have appeared on the first abdominal segment.

*Megalopa* (text-fig. 3).—Measurements: Body length from tip of rostrum to the termination of the telson 1.73; eye width 0.83; carapace width 1.16; carapace length from end of rostrum 1.16; length of dorsal spine 0.4.

The megalopa in this crab differs from those of others in having extremely well-developed spines. Thus there is a huge median dorsal spine; in front of this are two shorter spines, and at the same level, two lateral spinules which are sometimes very long. In front of these are two minute lateral spinules.

The rostrum consists of three short and blunt processes.

The chelipeds and four pairs of pereopods are well developed. The tips of the last pairs of pereopods do not bear any curled setae. The ventral cornua are extremely long.



TEXT-FIG. 2.—*Philyra globosa* (Fabricius) 3rd zoea.

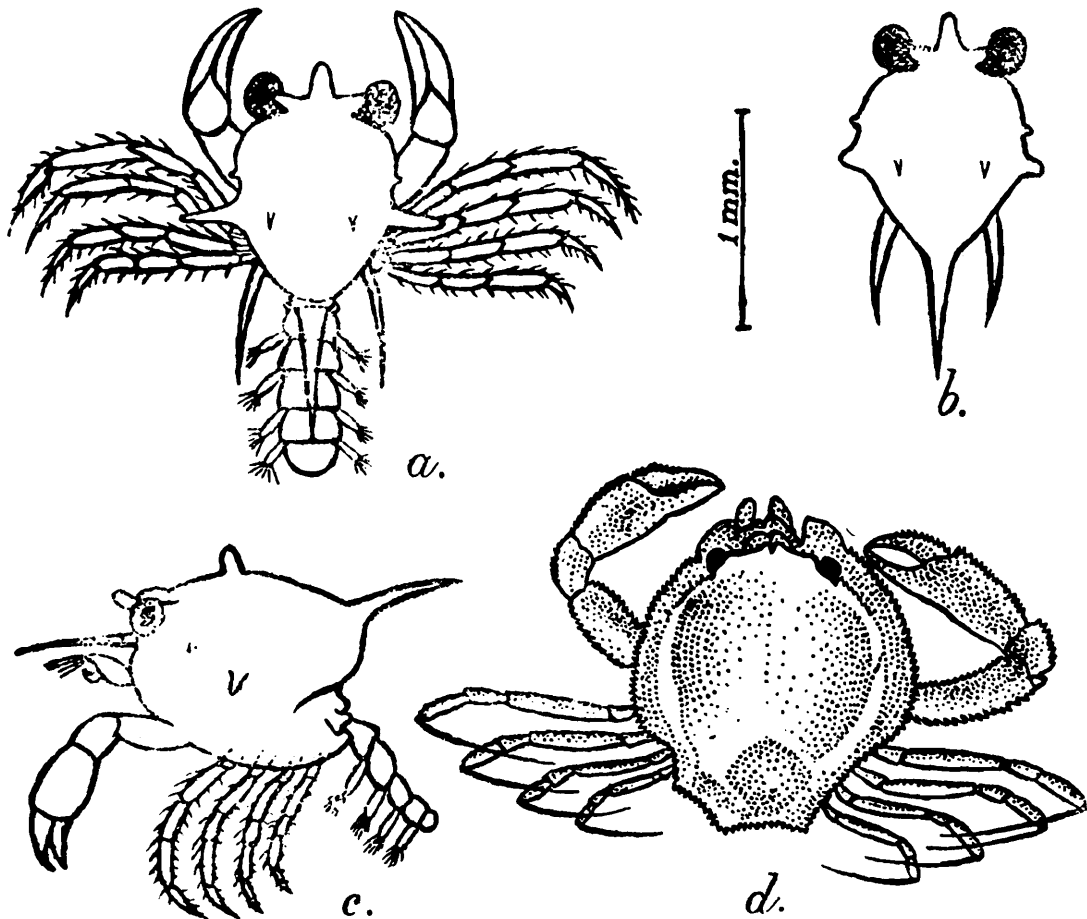
a. Side view; b. Dorsal view; c. Antennule; d. Antenna; e. Mandible; f. 1st maxilla; g. 2nd maxilla; h. 1st maxilliped; i. 2nd maxilliped; j. Cheliped and legs; k. Telson.

The abdomen consists of five segments and the telson. The second, third, fourth and fifth segments bear pleopods with six setae each. The telson is a rounded plate without any setae. The megalopa uses its

pleopods for swimming, the abdomen being held out horizontally, although it can now be curled under the body.

*First instar* (text-fig. 3d).—Measurements: Carapace length 1.66; carapace breadth 1.5.

The carapace is subcircular, with the epistome projecting beyond the broad front. The lateral and posterior margins are serrulate. The merus of the external maxillipeds is narrow and acutely triangular.



TEXT FIG. 3.—*Philyra globosa* (Fabricius) Megalopa.

a. Dorsal view; b. Dorsal view of variant with stunted spines; c. Side view; 1st instar.

The chelipeds are massive, with both borders of the arm, outer border of the wrist, outer border of the hand, and basal half of the hand spinulate. The legs diminish in length from the anterior to the posterior.

#### ACKNOWLEDGMENTS

The author takes this opportunity to express his grateful thanks to Dr. C. V. Kulkarni, Director of Fisheries, Bombay, for his constant guidance and encouragement throughout the course of his studies.