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To cite this version:
Stephen J Stephen. THE DISTRIBUTION OF LARVAE OF THE GENUS OCTOPOTEUTHIS RUPPELL, 1844 (CEPHALOPODA, TEUTHOIDEA). Vie et Milieu / Life & Environment, 1985, pp.175-179. hal-03022091

HAL Id: hal-03022091
https://hal.sorbonne-universite.fr/hal-03022091
Submitted on 24 Nov 2020

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THE DISTRIBUTION OF LARVAE OF THE GENUS OCTOPOTEUTHIS RUPPELL, 1844 (CEPHALOPODA, TEUTHOIDEA)

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ABSTRACT. — While carrying out a systematic revision of the pelagic squid genus Octopoteuthis, the author examined 146 “larval” specimens of the genus from museum sources worldwide. Individuals could not be separated into species but morphometric and meristic characters were examined giving information on ontogenetic development. Specimens ranged in size from 1.3 to 27.0 mm dorsal mantle length (DML) and represented locations in the Atlantic, Pacific and Indian Oceans and also the Mediterranean Sea. Captures were made with a variety of trawls and plankton nets. The deepest record from a closing net was 1 200 m using a MOCNESS system. The largest group examined totalling 105 individuals was collected in the North Atlantic. In the Atlantic the highest larval occurrence was found to be in March, April, and June (which may reflect higher sampling pressure in those months) but specimens were obtained in all months except January and December. Low numbers in each of the other oceans prohibited an evaluation of yearly larval distribution.

INTRODUCTION

The circumglobal pelagic squid genus Octopoteuthis is represented by nine nominal species. The systematics of the genus is in considerable confusion because of species designations based on larval or early juvenile specimens, loss of type material, and the continued addition of new species without clarification of the status of earlier ones. The author has examined one hundred and forty-six Octopoteuthis larvae as part of an ongoing revision of the genus. Specimens of the genus Octopoteuthis, like other decapod squids, bear eight arms and two tentacles. The paired tentacles common to most squid are retained only during the larval period and
are autotomized at a dorsal mantle length (DML) of 25-30 mm, after which the stumps are gradually resorbed.

MATERIALS AND METHODS

The majority of specimens used in this study were borrowed from various institutions. Additional material was examined while on trip to the United States National Museum of Natural History (USNM), (Smithsonian Institution), Washington, D.C. Measurements and counts used are those recommended by Roper and Voss (1983). All measurements to the nearest 0.1 millimetre (mm) were taken by means of metric calipers. Hooks and suckers were counted under a dissecting microscope. Figures of larval distribution were constructed using collection data accompanying the specimens and supplemented, where possible, with published cruise data (Schmidt 1912, 1929; Gibbs et al., 1971). Because of the low number of specimens available data on additional larval specimens were extracted from the literature.

RESULTS

In all 146 larval specimens from the Atlantic, Indian, Pacific Oceans and the Mediterranean Sea were examined. The adult characters normally used to separate species (photophore numbers and patterns and the presence or absence of accessory cusps on arm hooks) do not develop early enough to be useful for specific identification of larvae. At present no other characters have been found that can be used for specific identification of larval Octopoteuthis. All specimens discussed in this paper will, therefore, be referred to as Octopoteuthis spp.

The larvae of Octopoteuthis go through a great change of body proportions especially between 1 and 15 mm DML. Figure 1 shows ontogenetic changes of larval Octopoteuthis from 5.0 to 10.9 mm DML. Initially the eyes appear stalked but by the time specimens reach a DML of 10-15 mm the eyes have become sessile. Most specimens lose their tentacular clubs at or about 12 mm DML but this loss may be premature due to damage during capture. Only fifteen larvae had at least one complete tentacle, one of which had a DML greater than 12 mm. The tentacular clubs in all specimens exami-
The largest number of specimens examined (105) came from the North Atlantic. A single specimen was from off the western coast of South Africa (Fig. 1B). Atlantic specimens were collected in all months except December and January with highest catches in March, April and June (Fig. 2A).

Only 40 other specimens were examined, 6 and 29 from the Pacific and Indian Oceans, respectively, and 5 from the Mediterranean Sea (Fig. 1B). Published literature sources were used to supplement these sparse data (Mediterranean: Degner, 1980).
1925, Issel 1925; Pacific: Okutani and McGowan 1969, Yamamoto and Okutani 1975; Atlantic: Cairns 1976, Massy 1909). Of the nearly 200 papers that mention the genus only a small number discuss specimens that could be identified as *Octopoteuthis* larvae and indicate collection data.

To aid in larval identification the author attempted to compare the monthly distributions with those of mature and near mature specimens (i.e. those having eggs or spermatophores) of various species. At least some mature members of each species could be found over the six to eight months represented in the collections examined thus making it impossible to determine when individual species might spawn and produce the larvae.

Specimens were captured using gear fished at depths ranging from 23-3 500 m (Fig. 2 B). For 13 specimens, gear depth information was missing (8 of these were from a single MOCNESS station). Gear types included the following open nets: Engle midwater trawl (EMT); Isaacs-Kidd midwater trawl (IKMT); rectangular midwater trawl (RMT); stramin 2 m net (S200); young fish trawl (Y330); and two closing net systems, a multiple opening-closing net environmental sensing system (MOCNESS) and a modified discrete-sampling Isaacs-Kidd 2 m midwater trawl (IKMT). Of the 133 specimens with depth data, 71 percent were collected in the first 500 m of water and 90 percent in the first 1 000 m (all gears combined).

Daytime depths of capture for larvae ranged from 55 to 1 200 m for closing nets (55-1 500 m for all gears). Half of the known daytime captures were from the first 500 metres (all gears). Night-time captures ranged from 50 to 1 000 m for closing nets (50-3 500 m for all gears). Fifty-four larvae were night-time captures with 40 of those collected in the top 500 m of water. The heaviest night-time concentration (31 individuals) was distributed between 100 and 400 m.

Size of individual animals (DML) did not seem to restrict vertical distribution. One daytime catch using a MOCNESS at 1 050 m yielded a pair of larvae with DMLs of 5.7 and 15.5, respectively. Two separate night-time trawls, one at 23 m and another at 50 m, yielded specimens of 1.9 and 16.8 mm DML.

**DISCUSSION**

Specific identification of *Octopoteuthis* larvae is at present unreliable; examination of a much larger number of specimens is needed to separate these morphologically similar larvae. Examination of specimens from areas in which only one species is known to occur (e.g. *Octopoteuthis deletron* Young, 1972 from off California) may be useful in solving this problem.

Some of the present observations agree with those of Roper and Young (1975). They reported day and night trawl catches of 60 and 81 percent, respectively, of larvae of *O. deletron* in the first 500 m of water. The remainder of their specimens were collected in the next 700 m. In comparison, 4 specimens out of 146 reported here came from gear fished to depths greater than 1 200 m, but these deeper records are probably the result of catches made while the nets were being set.

Roper and Young also found that night-time vertical distribution (near surface to 500 m) of *O. deletron* larvae encompassed and spread beyond their daytime distribution (200-400 m). Indeed *O. deletron* larvae were absent from the upper 200 m of water during the daylight hours. Unlike Roper and Young's observations, however, a substantial number of the larvae reported here (one third of all daytime catches) were found to inhabit the top 200 metres. There also did not appear to be any substantial difference between day and night-time ranges (55-1 200 and 50-1 000 m, respectively) when looking at the very limited data from closing gear presented here.

There may be several reasons why the present results differ from those of Roper and Young. First, the behaviour of individual species probably affects their distribution. Secondly, the larger sample number in the present study may have provided a more complete data picture. Third, the presence of more than one species may have confused the pattern. Fourth, latitudinal variability may have also have confused the picture. Finally, a combination of biological and physical parameters such as light, temperature and productivity may be regulating distribution. However, neither Roper and Young's nor the present study had enough information on these parameters to qualify their affect on distribution.

It should be stressed that the above results are based on a very limited number of museum specimens, which may not reflect the total distribution of *Octopoteuthis* larvae either temporally or spatially. The sparsity of *Octopoteuthis* in collections forces the use of available data. As stated earlier only a portion of the depth records are useful. Truly accurate depth distribution figures will have to await data from much larger numbers of larvae collected in discrete-sampling gear types.

**ACKNOWLEDGEMENTS.**—I would like to thank all the people who loaned specimens to me for this study including: P. Naggs, British Museum (Natural History), London; C. Lea, Texas A and M University, College Station, Texas; M. Roeleveld, South African Museum, Cape Town; J. Knudsen, Zoolo-
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gisk Museum, University of Copenhagen, Copenhagen; and E. Willassen, Zoologisk Museum, University of Bergen, Bergen. I am also grateful to CFE Roper and M.J. Sweeney of the USNM, Washington, D.C. who provided space and access to specimens while the author was on a short-term visitor’s appointment there in December of 1983. Finally I would like to thank my supervisor F.A. Aldrich, D. R. Idler and the staff of the Marine Sciences Research Laboratory, Memorial University of Newfoundland, St. John’s, Newfoundland.

LITERATURE CITED


Reçu le 23 août 1985; received August 23, 1985
Accepté le 18 octobre 1985; accepted October 18, 1985