A BRIEF REVIEW OF THE BIOLOGY OF THE OCEANIC SQUID, SYMPLECTOTEUTHIS OUALANIENSIS (LESSON)

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Abstract—1. Our current knowledge of the squid, SympLECTOteuthis oualaniensis, one of the organisms utilized to a large extent during the Alpha Helix Kona Expedition, is briefly reviewed.

Symplectoteuthis oualaniensis (Lesson, 1830) is a member of the order Teuthoidea, the suborder Oegopsida and the family Ommastrephidae. Squids belonging to this family are among the largest and most numerous of the fast-swimming oceanic species. For example, Dosidicus gigas, the largest member of the family, reaches a total length (tip of tentacles to tip of tail) of about 4 m (Duncan, 1941) and has been observed to leap some distance out of the water (Roper & Young, 1974); Todarodes pacificus has been captured in quantities of over 600,000 tons per year in Japan (Clarke, 1966).

The systematic position and, indeed, the identity of S. oualaniensis are in doubt. Wormuth (pers. comm.), relying on morphometrics, found that S. oualaniensis is more similar to Ommastrephes bartramii than to its supposed congener, S. luminosa. The feature that unites species of SympLECTOteuthis is the fusion of the funnel and mantle locking cartilages. That is, these animals have the funnel permanently joined to the ventral wall of the mantle. On the other hand, in addition to morphometric similarities, both O. bartramii and S. oualaniensis share an apparently unique feature: some of the tentacular suckers bear small finger-like projections which, presumably, are sensory organs (pers. obs.). The systematics of this family is being investigated by a number of workers (C. C. Lu, C. F. E. Roper, M. R. Clarke, J. H. Wormuth), and ultimately some generic rearrangement will probably be proposed (Wormuth, pers. comm.).

Clarke (1965) noted that two species of squids occur in the Pacific Ocean that can be identified as S. oualaniensis, and that these species have overlapping distributions. The larger species which attains a mantle length (ML) of 305 mm (females) can easily be distinguished from a slightly smaller species that grows to 250 mm ML (females) by the presence of spherical photophores forming an oval patch in the anterodorsal mantle musculature (Clarke, 1966); the smaller species lacks this patch. Only the large species with the dorsal patch occurs off Hawaii. Unfortunately the type specimen of S. oualaniensis, comprised 54% of the diet by weight of the Sooty Tern and 38% of the diet of the Brown Noddy both of which feed primarily during the day.

S. oualaniensis, therefore, probably occupies near-surface water both day and night; however, it is not necessarily restricted to these depths. Its close relatives in the genus Ommastrephes, while also common in near-surface water, have been photographed as deep as 1200 m, and the tentacle of one specimen
was caught in a reversing water bottle at nearly 1500 m (Clarke, 1966). Off Hawaii the related Hyaleuthis pelagicus which occurs in the upper 100 m at night and is occasionally found in bird stomachs, has been taken in an opening-closing net in excess of 1800 m during the day (Young, 1975). Roper & Young (1974) concluded that some members of the Ommastrephidae, while primarily surface living species, are capable of roaming through great depths of the ocean. The same behaviour may well occur in S. oualaniensis. Indeed, the peculiar extraocular photoreceptors in this squid led Young (1975) to suggest that one organ functions in near-surface waters while another functions at greater depths.

S. oualaniensis is a quick and powerful swimmer. This ability is apparent not only from its thick, muscular mantle but also by its near absence in trawls. Although common around Hawaii, this species, for the most part, easily avoids standard midwater trawls. Except for the anomalous capture of one large specimen that may have become entangled in the mesh of the net, the largest specimen taken during an intensive trawling program around Hawaii over the last 4 years was only 34 mm in mantle length. This specimen was taken in a 15 ft. (width of the net mouth) Isaacs-Kidd midwater trawl towed at 4 knots.

These powerful swimmers can readily propel themselves out of the water. Indeed, one young specimen was taken from the deck of our research ship; it probably flew aboard during the night. Ommastrephes bartramii, the close relative of S. oualaniensis, is commonly known as the flying squid, and it has been observed gliding above the surface of the ocean during the day (Arata, 1954; cf. Lane, 1957; Clark, 1966). On October 1, 1970, J. Andrews (pers. comm.) observed a school of flying squid from the R/V Mahi at about 01°N and 180°W. Although none of the squid were captured, the locality and the description of the animals strongly suggest that he observed one of the species of Symplectoteuthis. He was standing on the ship's bridge, about 15 ft. above sea level, when he saw about 20-24 squid 5-7 inches long leave the water under the bridge wing. The squid flew in a path parallel to the ship about 3 ft. above the calm sea, and they reentered the water just beyond the ship's bow. The speed of the ship was 10 kts., and the distance the squid traveled was estimated to be 150-200 ft. A jet of water trailing from the funnel could be seen during the first part of the flight. In spite of the small size of the spread fins, the animals seemed to glide for about half of the flight. There was no variation in their course during the flight, which lasted about 5 sec.

Squid apparently dart from the water when being pursued by a large predator (Clarke, 1966; Ashmole & Ashmole, 1967). This behaviour must be common, for both the sooty tern and the brown noddy which feed heavily on squid around Hawaii do not enter the water to catch prey (Brown, 1973).

Information on predators of S. oualaniensis is meager. In addition to the birds mentioned above a number of fish are known to feed extensively on squid, but the identification and the size categories of the squid consumed are unknown. Off Hawaii the skipjack tuna (Katsuwonus pelamis), and the yellowfin tuna (Thunnus albacares) and the wahoo (Acanthocybium solandri) feed heavily on squid (Welsh, 1950) as probably does the bigeye tuna (Thunnus obesus) (cf. King & Ikehara, 1956). Beaks of young squid, apparently S. oualaniensis, have been found in the stomachs of blue marlin (Makaira nigricans), and T. Clarke (1971) found a variety of squid beaks in the stomach of the scalloped hammerhead shark (Sphyra lewini) off Hawaii. On the other hand, the mahimahi ( Coryphaena hippurus) and the bonito (Euthynnus yaito) in Hawaiian water are only occasional predators on squid (Welsh, 1950). Although the night-feeding porpoises Stenella longirostris hawaiensis and Stenella attenuata feed heavily on squid, they do not eat S. oualaniensis (Shomura & Hida, 1965; Norris & Dohl, in preparation).

Around the night light S. oualaniensis can be seen to attack and frequently capture lanternfish (Myctophidae) which have migrated to the surface from deep water. Stomachs of 10 S. oualaniensis were examined: 9 were captured around the night light and one came from a midwater trawl. All specimens were between 130 and 185 mm ML. Stomach contents included amphipods, crab megalopa, small shrimps, stomatopod larvae, crab zoea, large copepods, euphausiids, and enoploteuthid squids, but primarily fishes. One stomach contained the remains of 14 fish. Most of the small crustaceans probably came from the stomachs of devoured fish. In one squid stomach a crab megalopa, a euphausioid and a small shrimp were neatly encased in a membrane which must have been the remnant of a fish stomach. The enoploteuthid squid, however, were too large to have come from the fish. This small and biased sample suggests that S. oualaniensis in this size range feeds primarily on small fish and occasionally eats other squids.

S. oualaniensis is abundant over vast areas of the Pacific and Indian Oceans. While this species is fished commercially off Okinawa (Sasaki, 1929; Clarke, 1966), Clarke (1966) has indicated that it remains a largely untapped resource of the open ocean. Its palatability can be vouched for. However, in spite of its abundance and its commercial potential, little is known of its biology. As with the other chief experimental organism of the Kona Expedition of the R/V Alpha Helix, we are at an unusual stage where we know more about the biochemistry of the animal than we do about the organism as a whole. Clearly, much more work remains before we have a complete picture of the ecology of this fascinating animal.

REFERENCES


NORRIS K. & DOHL T. (Monograph on porpoises). (In preparation.)


