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Unique hooks in the male scaled squid *Lepidoteuthis grimaldi*

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The male scaled squid *Lepidoteuthis grimaldii* hereby reported for the first time, is equipped with a pair of grossly enlarged sabre-like hooks. These unique hooks, found only on males, are without parallel amongst cephalopods. As a sexually dimorphic character, they are more likely to be involved in reproduction than predation.

Although the giant squid *Architeuthis dux* is debatably the largest of squids, other species—some unknown, some very poorly known, and a number giant-sized—are being trawled as deepwater fisheries expand in many regions of the world, particularly off southern Australia and New Zealand. In these waters, unusual insights into deep-sea cephalopod life histories are consequently becoming apparent (Jackson & Mladenov, 1994; Norman & Lu, 1997).

Recently one such squid, a large male attributed to *Lepidoteuthis grimaldii* (*sensu* Clarke, 1960), 422 mm in mantle length (ML), was caught between 950 and 1100 m depth by a commercial trawler on the Cascade Rise (150°26′E 43°99′S) south of Tasmania, Australia. Upon examination of archived material in New Zealand, two additional specimens caught in New Zealand waters were found (an immature male 270 mm ML and a large damaged female > 500 mm ML). To the best of our knowledge, all known adult specimens have been caught in bottom trawls, suggesting that *Lepidoteuthis* is a demersal species, found in similar habitats to *Moroteuthis ingens* (e.g. Jackson & Mladenov, 1994).

Until now, the most remarkable feature of this genus had been the presence of large overlapping roof-tile-like dermal cushions covering the mantle (Roper & Lu, 1990); to this we add abrupt enlargement of the 8th sucker and sucker ring on each dorso-lateral arm (arm II) of the male, with the sucker ring pronounced into a spectacular hook that stands both erect from and in marked contrast to all other suckers (which typically possess 7–9 fang-like teeth) (Figure 1). The presence of hooks within the genus *Lepidoteuthis* is hitherto unreported and will shed light on the taxonomic position of this unusual genus.

All previous descriptions of *Lepidoteuthis* are based on young, damaged, or female individuals (Joubin, 1900; Clarke, 1960, 1964; Clarke & Maul, 1962; Zeidler, 1988; Nesis & Nikitina, 1990). To our knowledge, the male and his associated reproductive structures have not been described.

Although hooks occur in many families of squid, their abrupt enlargement (the hook-bearing suckers being five times the diameter of any other sucker on the animal), the elongation of the hook into a sabre-like structure, and their restriction solely to the dorso-lateral arms of males are characters/states unique to *Lepidoteuthis*. The increase in hook size as a function of maturity, and presence in males only, suggests that their principal role is reproductive rather than predatory.

The relatively long terminal organ (penis) of a mature male is half the length of the mantle, from which it projects freely for a considerable portion of the organ's length. Species with such long organs presumably use them directly to implant spermatophores hydraulically into the female, and as a rule lack modification of either ventral arm (hectocotylus) for spermatophore transfer (e.g. Murata et al., 1982; Jackson & Mladenov, 1994; Norman & Lu, 1997). It had been proposed that *Lepidoteuthis* possessed a hectocotylus, given recurring ventral arm dissimilarity amongst disarticulated heads recovered from sperm whales (Clarke & Maul, 1962), but the comparable arm on our mature male specimen is intact and lacks any such modification. We can confirm that *Lepidoteuthis* lacks a hectocotylus, and support the alternative contention (Clarke & Maul, 1962) that earlier disarticulated heads belong to females with regenerating ventral arm tips.

Lepidoteuthis grimaldii is sexually dimorphic, in that mature females attain twice the size of mature males, and in that the male possesses a single enormous sabre-like hook on each dorso-lateral arm. Such unique hooks may function as raptorial devices to aid male purchase of the larger female; the hooks probably embed directly into her flesh, or lock into her scales. We cannot discount the additional possible role of hooks in male–male agonistic behaviour. Both the hooks and the associated reproductive strategy are without parallel in cephalopods.

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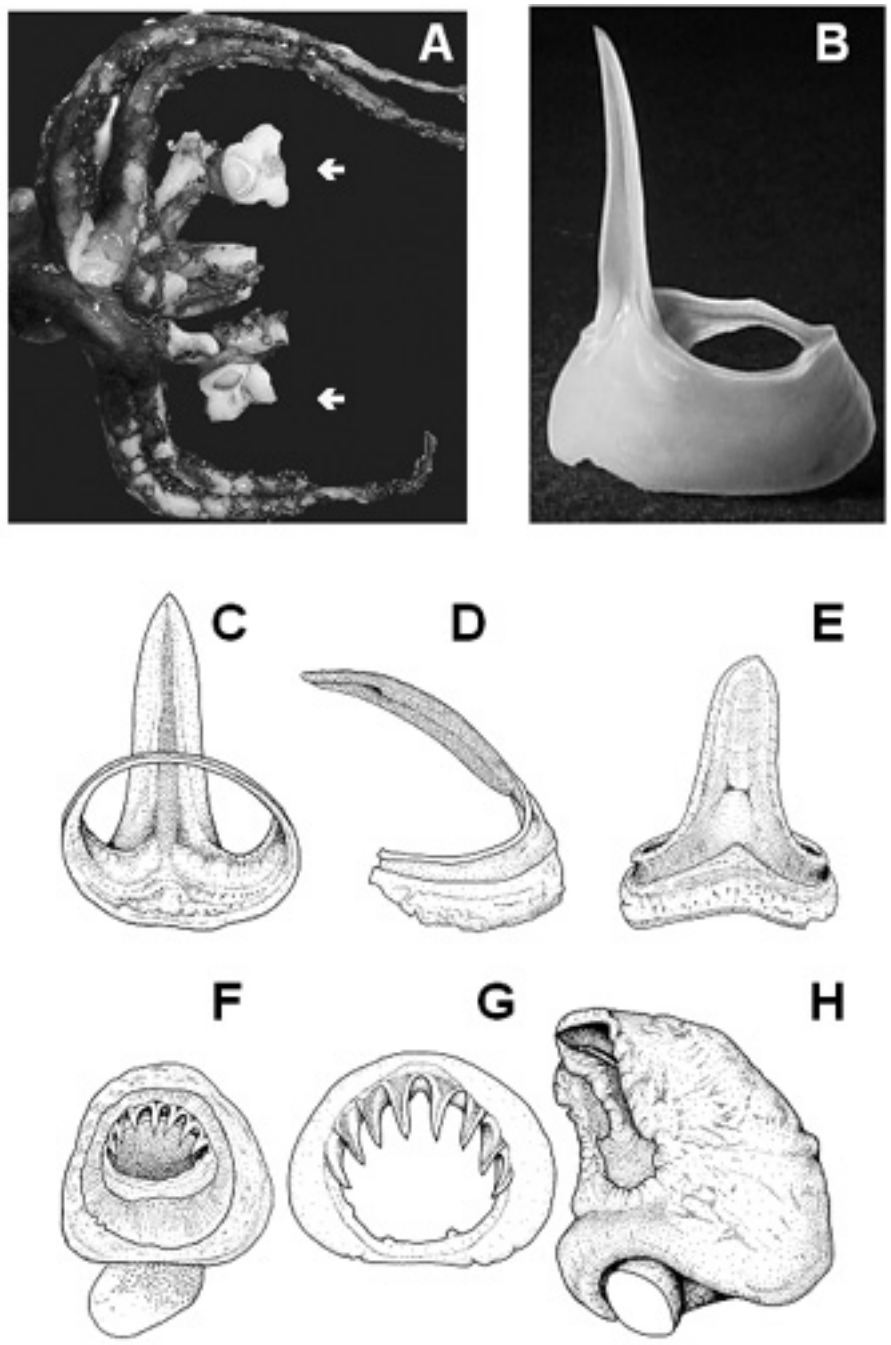

Figure 1. Suckers and sabre-like hooks of *Lepidoteuthis grimaldii*. (A) Head and arms (some damaged), mature Tasmanian male (UTAS-LAP01: 422 mm ML)—arrows indicate grossly enlarged suckers and hooks; (B) extracted hook (33.8 mm height) from same; (C–E) three perspectives of hook from an immature New Zealand male (14.0 mm height, NMNZ M.110530 ~270 mm ML); (F) typical sucker with sucker ring *in situ*; (G) additional extracted sucker ring from the dorsal arm of a large damaged female (NMNZ M.118364: >500 mm ML); (H) hook from an immature New Zealand male (same as C–E) *in situ*—note extensive enveloping sheath. NMNZ, Museum of New Zealand; UTAS, University of Tasmania.

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