

# Males are different: Sexual dimorphism of Upper Teeth in two Species of Lantern Sharks (Etmopteridae)

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## Biological Aspects:

- Etmopteridae, or Lantern Sharks, are the most diverse family among the Squaliformes (42 species in 5 genera)
- Etmopteridae are cosmopolitically distributed in deeper waters from 100 to more than 2000 m at continental shelves, insular slopes and seamounts
- ovoviparous females give birth from 6 to 16 puppies per litter
- common bycatch in deep sea fisheries
- generally, the dentition of *Etmopterus* is dognathic heterodont
- upper jaws display 2 to 3 functional rows of multicusp teeth (Fig. 1 & 4)
- lower jaw teeth are single-cusped, arranged staggered with cusps bent towards the rears (Fig. 4)
- specimens presented here were caught in Suruga Bay off Japan in depths of 400 m



2 cm *Etmopterus brachyurus*



2 cm *Etmopterus molleri*

## Analyses and Results:

- jaws of *E. brachyurus* and *E. molleri* were analyzed focussing on the number of cusplets of upper jaw teeth
- the cusplet numbers of teeth in the 2nd and 3rd functional tooth series as well as the 3rd replacement tooth series were counted (N = 563)
- the teeth were analysed with regards to species, and sexual dimorphism as well as inner jaw variation
- additionally, preserved adult female specimens housed in the MNHN, and DMB (Tokai University) were inspected as closely as possible with special regards to subadult individuals
- adult males show significantly more lateral cusplets than adult females do; only adult males show in certain jaw areas a first pair of cusplets which is smaller than the following ones (Fig. 1)
- male and female specimens cluster together, not species, if analysed with regards to cusplet numbers (Fig. 2)
- within jaws of male specimens, upper teeth can be grouped by number and structure of lateral cusplets (Fig. 3)

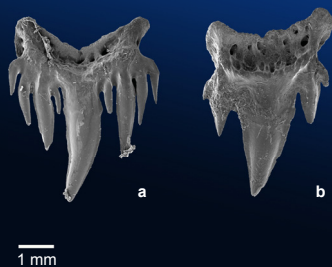


Fig. 1: SEM images of upper teeth of *E. brachyurus* (a = male; b = female); the same sexual dimorphic characters appear in upper teeth of *E. molleri*.

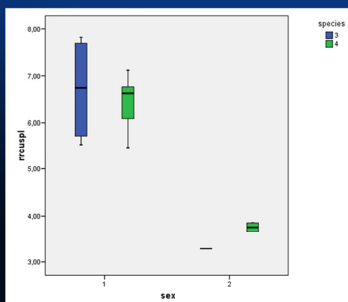


Fig. 2: Boxplot showing separation of male and female specimens of *E. brachyurus* (3) and *E. molleri* (4) by cusplet numbers. Species are not separable by upper tooth structure.

## Conclusions:

- results indicate that the often used character "number of cusplets of upper teeth" of *Etmopterus* is not supportive for species identification, but bares information about sex
- additionally to the number of lateral cusplets, adult male specimens of *E. molleri* and *E. brachyurus* show a first pair of lateral cusplets which is smaller than the following pair of cusplets
- as to cusplet numbers of upper teeth, the situation is similar in *E. pusillus*, *E. bigelowi* (Tachikawa et al. 1999), and *E. baxteri* (Straube et al. 2007)
- subadult specimens of the mentioned species of *Etmopterus* display upper tooth structures, which are similar to adult female upper teeth
- probably several species of *Etmopterus* show sexual dimorphism in upper tooth morphologies
- as to the fossil record, consisting almost solely of single teeth, upper teeth of fossil taxa of *Etmopterus* may give information to genus level, sex and in part to its former position in jaws
- generally, more data are desirable to verify results presented here
- one can only speculate about the reason for increasing cusplet numbers in males when reaching sexual maturity: is it a consequence of a shift in the diet, as seen in *Etmopterus spinax* (Coelho et al. 2006), or should the phenomenon be placed in the context of (seasonal?) courtship behaviour?

## References:

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- Shirai S, Tachikawa H (1993) Taxonomic resolution of the *Etmopterus pusillus* species group (Elasmobranchii, Etmopteridae) with description of *E. bigelowi*, n. sp. Copeia, 2, 483-495.



Fig. 3: Analysed groupings of upper teeth within jaws of adult male specimens of *E. brachyurus*. Anterior teeth (positions S to 05) show a gradual decrease of cusplet size; lateral teeth (positions S to 13) show a first pair of cusplets, which is smaller than the following pairs of cusplets; posterior teeth (positions 9 to 18) show again gradual decrease of cusplet size. S = symphysis, numbers 01 to 18 refer to position of tooth in jaw counting from the symphysis to the rears.

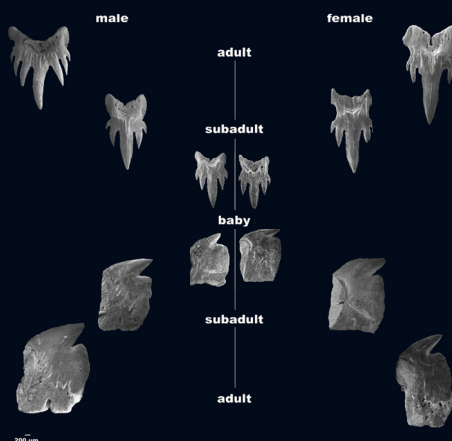


Fig. 4: Dentition development in *E. baxteri*. Note the morphological changes of upper tooth shape with growth: number of lateral cusplets in males increases with reaching sexual maturity. Males of *E. baxteri* do not show a first pair of cusplets, which is smaller than the following ones. Generally, lower teeth increase in size, but do not show such significant sexual dimorphism as upper teeth do.

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