Zootaxa 3340: 29–43 (2012)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Comparative morphology of rostral cartilages in extant mackerel sharks (Chondrichthyes, Lamniformes, Lamnidae) using CT scanning

FREDERIK H. MOLLEN[1], SABINE P. WINTNER[2,3], SAMUEL P. IGLÉSIAS[4],
SEAN R. VAN SOMMERAN[5] & JOHN W. M. JAGT[6]

[1] *Elasmobranch Research, Meistraat 16, B-2590 Berlaar, Belgium. E-mail: frederik.mollen@telenet.be*
[2] *KwaZulu-Natal Sharks Board, Private Bag 2, 4320 Umhlanga Rocks, South Africa. E-mail: wintner@shark.co.za*
[3] *Biomedical Resource Unit, University of KwaZulu-Natal, P.O. Box X54001, Durban 4000, South Africa.*
[4] *Muséum national d'Histoire naturelle, Département Milieux et Peuplements Aquatiques, USM 0405, Station de Biologie Marine de Concarneau and UMR 7208 CNRS/MNHN/IRD/UPMC, Biologie des Organismes et Ecosystèmes Aquatiques, BP 225, F-29182 Concarneau cedex, France. E-mail: iglesias@mnhn.fr*
[5] *Pelagic Shark Research Foundation, 750 Bay Avenue Unit 216, Capitola, California 95010, USA. E-mail: psrf@pelagic.org*
[6] *Natuurhistorisch Museum Maastricht, de Bosquetplein 6-7, NL-6211 KJ Maastricht, the Netherlands. E-mail: john.jagt@maastricht.nl*

Abstract

A comparative study of rostral morphology of extant mackerel sharks (Lamniformes, Lamnidae) is presented. Based on computed tomography (CT) scans of fresh specimens, 3D reconstructions, dried museum chondrocrania and the available literature, detailed morphological descriptions of the rostral cartilages are provided for the type species of all three extant lamnid genera, namely *Carcharodon carcharias* (Linnaeus, 1758), *Isurus oxyrinchus* Rafinesque, 1810 and *Lamna nasus* (Bonnaterre, 1788), and compared with those of *I. paucus* Guitart Manday, 1966 and *L. ditropis* Hubbs & Follett, 1947. Despite intraspecific variation, the rostral cartilages of all extant lamnids present significant differences that allow genus- and species-level identification, which is especially of use to identify fossil rostral nodes of these particular taxa. The main differences were found to be in overall calcification of the rostrum (*Lamna* > *Isurus* > *Carcharodon*), general configuration of the rostral open space, position of the base of the lateral rostral cartilages, (non-)abutting lateral cartilages, (absent) rostral keels and shape of the rostral node. In cross section, the base of the rostral node is rounded in *Lamna*, Y-shaped in *Isurus* and uncalcified in juvenile and subadult *Carcharodon* (tesserae absent).

Key words: *Carcharodon*, *Isurus*, *Lamna*, taxonomy, rostrum, computed tomography.

Introduction

Rostral morphology is an important character in cladistic analyses of elasmobranchs (see *e.g.*, Regan 1906; White 1936, 1937; Carvalho 1996; Shirai 1996). Moreover, the rostra of all extant lamnoids are diagnostic, permitting species identification (see Compagno 1990; Mollen 2010), with the possible exception of *Odontaspis noronhai* (Maul, 1955) for which no data are available. Based on dental records, many of these extant lamnoids are also known from Miocene and Pliocene deposits worldwide (see, *e.g.*, Cappetta 1987, 2006; Purdy *et al.* 2001). Their rostra can thus be determined also, even when found unassociated with other skeletal remains such as teeth, and can therefore be used in compiling extinct faunal lists (see Purdy *et al*. 2001; Mollen 2010; Mollen & Jagt 2012).

Although chondrichthyan fish fossilise well only in exceptional conditions, making skeletal material rare (see Zangerl 1981; Cappetta 1987), Purdy *et al*. (2001) recorded more than a hundred shark rostral nodes of different types, all from the Yorktown Formation, of Pliocene (Zanclean, 5.33–3.60 Ma) age, in North Carolina (USA). However, those authors were able to assign them only to the orders Lamniformes and Carcharhiniformes, with the exception of the genus *Lamna*. Their attempt to assign the material to lower-ranking taxa was hampered by the fact that data on rostral morphology are very limited, even for lamnids (see Compagno 1990; Mollen 2010); all original species description, as well as many subsequent papers on their comparative morphology (*e.g.* Garrick 1967; Moreno & Morón 1992; Nakaya 1971), lack detailed skeletal information.

Accepted by M. R. de Carvalho: 30 Apr. 2012; published: 8 Jun. 2012