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Two Erroneous, Commonly Cited
Examples of “Swordfish”
Piercing Wooden Ships

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Swordfish (*Xiphias gladius*) have often been credited with driving their rostrum through the

planks and timbers of vessels, some to the depth of 30 inches (Gudger, 1940; Norman and Greenwood, 1975; Smith and Heemstra, 1986). Although many of these accounts may be correct, two commonly cited incidents are misidentifications and should be credited to members of the family Istiophoridae. The errors probably were caused when those who reported the "attacks" either misidentified the fish or used the term swordfish to include members of Istiophoridae as well as *X. gladius* (Xiphiidae). The latter confusion would not arise today because the name swordfish is restricted to *X. gladius* (American Fisheries Society, 1991; Nakamura, 1983).

Rostra in the two examples were compared with rostra from several istiophorids including 41 blue marlin (*Makaira nigricans*), 31 sailfish (*Istiophorus platypterus*), 14 white marlin (*Tetrapturus albidus*), 13 striped marlin (*T. audax*), eight black marlin (*M. indica*), three shortbill spearfish (*T. angustirostris*), and two longbill spearfish (*T. pfluegeri*). Methods for identifying rostra followed Fierstine and Voigt (1996). Two regions of the rostrum were important to this study: (1) half bill length (0.5L, or half the distance between the distal tip and the orbital margin of the prefrontal bone); and (2) one-fourth bill length (0.25L, or one-fourth the distance between the distal tip and the orbital margin of the prefrontal bone).

Incident 1.—Gudger (1940) described a piece of ship's timber (BMNH 1879.11.21.608) that is housed in the British Museum (Nat. Hist.) as containing three swords from a swordfish, the greatest number he found in any one ship. He made his interpretation from three items: a figure and description of the specimen given in the Guide to the Gallery of Fishes in the British Museum (Anon., Brit. Mus. Nat. Hist., 1908, unpubl.); a letter that accompanied the specimen when donated in 1832; and a photograph. Gudger realized that, unless the rostrum was identified as flat or round, he could not be sure whether the fish involved in the collision was a swordfish or spearfish (any member of Istiophoridae).

Our examination of the timber (two pieces of lumber separated by caulking) reveals only two rostra (Fig. 1), one of which apparently divided lengthwise along the groove for the left prenasal bone during impact to give the appearance of a third rostrum. The larger segment of the divided rostrum contains both right and left nutrient canals and groove for the right prenasal bone. The smaller segment lacks either a prenasal groove or a nutrient canal and is ro-

Fig. 1. Piece of ship's timber (BMNH 1879.11.21.608) containing two istiophorid rostra. The timber with caulking is held together by wires and fixed to a wooden base. Arrow indicates segment that apparently split from nearby rostrum upon impact. Dorso-ventral axis (D/V) is shown for each rostrum. Scale = 2.5 cm.

tated counterclockwise from the larger segment.

After reconstruction, the proximal end of the divided rostrum is 40.2 mm wide (W) and 28.3 mm deep (D). In cross-section, its nutrient ca-

Fig. 2. Large rostrum of incident 1 (Unk) compared to five istiophorid species measured in cross-section at one-half bill length (0.5L). (A) Ratio of height of nutrient canal (H) and depth of rostrum (D). (B) Ratio of distance of nutrient canal from dorsal surface of rostrum (DD) and depth of rostrum (D). Range of values and means are shown for *Makaira nigricans* (Mn), *M. indica* (Mi), *Istiophorus platypterus* (Ip), *Tetrapturus audax* (Tau), and *T. albidus* (Tal). Comparative data are from Fierstine and Voigt (1996).

Fig. 3. Small rostrum of incident 1 (Unk) compared to seven istiophorid species measured in cross-section at one-fourth bill length (0.25L). (A) Ratio of height of nutrient canal (H) and depth of rostrum (D). (B) Ratio of distance of nutrient canal from dorsal surface of rostrum (DD) and depth of rostrum (D). Range of values and means are shown for *Makaira nigricans* (Mn), *M. indica* (Mi), *Istiophorus platypterus* (Ip), *Tetrapturus audax* (Tau), *T. albidus* (Tal), *T. angustirostris* (Tan), and *T. pfluegeri* (Tp). Comparative data are from Fierstine and Voigt (1996).

nals are 2.5 mm high (H) and located 15.5 mm from the dorsal surface of the rostrum (DD). The prenasal bone is missing from its dorsal surface, but the depth of the right prenasal groove at the proximal end indicates the rostrum was broken approximately at 0.5L. The smaller rostrum is 27.5 mm wide (W) and 19.1 mm deep (D). In cross-section, its nutrient canals are 2.0 mm high (H) and located 10 mm from the dorsal surface of the rostrum (DD). No prenasal bone is visible, which indicates it was broken more distally than the divided (larger) rostrum, approximately at 0.25L. Because the oval cross-sections of both rostra have a D/W greater than 0.5, they are skeletal remains of an istiophorid, not a xiphiid (Fierstine and Voigt, 1996).

The relative size (H/D) and placement of the nutrient canals (DD/D) in the large specimen (Fig. 2) compares favorably with the range of values presented in Fierstine and Voigt (1996) for *M. nigricans*. There is a slight overlap with the ratios for *T. albidus*, but the rostrum of that species never obtains the depth (D) and width

(W) at 0.5L of the large specimen. Neither *T. angustirostris* nor *T. pfluegeri* was used for comparison because their rostra, unlike those of the other species and the unknown specimen, are not fused into a single structure at 0.5L. The smaller rostrum is more difficult to identify because its values for H/D and DD/D fall within the range of values presented in Fierstine and Voigt (1996) for *M. indica*, *M. nigricans*, *T. albidus*, *T. angustirostris*, *T. audax*, and *T. pfluegeri* but not for *I. platypterus* (Fig. 3). *Tetrapturus albidus*, *T. angustirostris*, and *T. pfluegeri* can be eliminated because their rostra never obtain the depth and width of the smaller specimen at 0.25L. We conclude that the larger rostrum is from *M. nigricans* and that the smaller rostrum is from *M. indica*, *M. nigricans*, or *T. audax*.

Incident 2.—Gudger (1940), quoting from the catalog of the Museum of the Royal College of Surgeons (now the Hunterian Museum), wrote "... the upper jaw of a Swordfish (*Histiophorus velifer*)—[sailfish?]... has penetrated the copper

sheathing, the felt, the deal, and the hard oak timbers to the depth of 14 inches. . . ." He also presented a photo of the specimen with an accompanying legend that read, "Sword of '*Histiophorus velifer*' (probably a *Makaira*). . . ." Gudger's use of three different fish names (swordfish, *Histiophorus velifer* = sailfish?, and *Makaira*) for this incident caused Tinsley (1964), after paraphrasing Gudger (1940), to think the sailfish (*I. platypterus*) was the species responsible. On the other hand, Norman and Greenwood (1975), who recognized the confusion with the names and believed all billfish to have similar habits, did not implicate any particular billfish (swordfish or spearfish) in the incident.

Unfortunately, we must rely on published accounts for information about this specimen because it was apparently destroyed when the Hunterian Museum was bombed in 1941 (letter dated March 1, 1994 from E. Allen, Hunterian Museum, Royal College of Surgeons, London, England). Gudger (1940) did not give dimensions of the rostrum, but Norman and Greenwood (1975) stated that it was a foot long and five inches in circumference. Figure 12 in Gudger (1940) reveals a rostral segment that is complete to its distal tip and that broke off in its solid region, probably near or distal to 0.5L. It appears oval (not flattened) in cross-section, and its nutrient canals are not visible. Dimensions of the rostrum at 0.5L compare most favorably with large specimens of *M. indica* and *M. nigricans*, but without more information, we can not choose one species over the other.

Several authors (Herald, 1961; Bond, 1979; Ayling and Cox, 1982) mention spearing behavior of nonfood items only when discussing *X. gladius*, ignoring the behavior in istiophorids. Numerous authors recognize the behavior in both families, some emphasizing the role in the swordfish (Goadby, 1975; Nakamura, 1983) and others emphasizing the role in istiophorids (Smith and Heemstra, 1986). In seven cases of marine turtles impaled by billfishes, four incidents were caused by istiophorids (Frazier et al., 1994), and it is likely that about half of the collisions between vessels and billfishes are caused by members of the Istiophoridae.

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