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SECOND OCCURRENCE OF *Odontaspis noronhai* (Maul, 1955) *

(Segunda ocorrência de *Odontaspis noronhai* (Maul, 1955)

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RESUMO

Foram capturados nove exemplares de *Odontaspis noronhai* (Maul, 1955) através de espinhel de atum, no sudeste do Brasil (24° S - 44° W), em outubro de 1981. O material utilizado para identificação foi um macho adulto com 342 cm, e a cabeça de outro exemplar, com comprimento calculado em 360 cm. A identificação foi efetuada com base no número, forma e disposição dos dentes, e em dados morfométricos. Este é o primeiro registro de ocorrência da espécie, após sua descrição, com base em um único exemplar, capturado em 1941, na Ilha da Madeira.

ABSTRACT

Nene specimens of *Odontaspis noronhai* (Maul, 1955) taken by longlins off the Southeast coast of Brazil (24° S - 44° W) in October 1981, are recorded. Specimens used for indentification were an adult male, 342 cm total length, and the head of another specimen calculated to be 360 cm long. The idenfification was based on the number, pattern, and arrangement of the teeth, and morphometrics. This is the first reported occurrence of the species since a single specimen caught in 1941, off Madeira was described.

1. INTRODUCTION

This paper records the presence of *Odontaspis noronhai* in Brazilian waters.

The main characteristics of the genus *Odontaspis* (Agassiz, 1838) are: five gill openings in front of the pectorals an anal fin, two dorsal fins about the same size, the first dorsal base terminating over or anterior to the origin of the pelvis fins, no fin spines, and no nictitating membrane or fold (BIGELOW & SCHROEDER, 1948. and GARRICK, 1974). This genus includes about eight living species of sharks (GARRICK, 1974). One of them, *O taurus* (Rafinesque, 1810) is commonly found in the Southeast of Brazil, but despite its similarity to *O. noronhai* (mainly in the teeth pattern) the first inhabits shallow waters and is usually less than 300 cm long.

Odontaspis ferox (Risso, 1810), *O. herbsti* (Whitley, 1950), and *O. noronhai* (Maul, 1955) are deep-sea demersal sharks of large size, up to 360 cm in total length, and dark in color as typical of many deep-water fishes.

Records of these species are relatively scarce. However *O. ferox* is widely reported from the Mediterranean Sea, Atlantic, Pacific and Indian Oceans. The relationship between *O. ferox* from the Mediterranean and *O. ferox* from other oceans has still to be clarified, some non-Mediterranean records being referred to *O. herbsti,* which is very similar, and likewise presents a wide distribution (MAUL, 1955; GARRICK, 1974 and BASS; D'AUBREY; KISTNASAMY, 1975).

The last species of this group, *Odon-*

(*) A 367 cm (total length) male of *O. noronhai,* caught by the longliner Tooshinamaru 101, in September 1984 (24° S - 43° W), is preserve in formalina. A summary of this paper was published by "Sociedade Brasileira para o Progresso da Ciência" during its 35th Annual Meeting in 1982.

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taspis noronhai, was described from a single specimen from Madeira, without any further record, until the present report of nine specimens in Brasilian waters.

The region of the catch is close to the continental shelf, which is 90 nautical miles wide. In this area the water masses are affected by upwelling and by geostrophic adjustment of the Brazil current flowing by the edge of the continental shelf. Undeneath the surface layer the water mass on the shelf slope between Cabo Frio and São Sebastião Island may be classified as South Atlantic Central Water, and may reach a depth of about 500 m. The interval of temperature and salinity variation of this water mass was 6.0°C ⟨ T ⟨ 20.0°C and 34.5% ⟨ S ⟨ 36.4% respectively *.

The paucity of occurrences of odontaspidid sharks is surprising considering their large size and wide geographic distribuition. It has been suggested that they normally inhabit depths not accessible to fishermen, and that those specimens captured on the shelf are strays (GARRICK, 1974). The lack of interest in unusual sharks by a great number of fishermen (who cut off the head and fins of the shark after the catch, preventing recognition) and the reduced number of experts experienced in shark identification, are other reasons for the scarcity of records.

2. MATERIAL AND METHODS

The specimens were captured by longline from the boat "Itaipu I" belonging to "Irmãos Ono" Company, of the Brasilian Tuna fleet, based in Santos - São Paulo State. The fishing gear was baited with squid, and operated in depths ranging from 60 to 120 m.

The first catch was in early October 1981, off São Sebastião Island-SP, 24° 30' S – 44° 10' W (depths over 600 m), when eight specimens (males and females) were caught. According to the captain, Akira Nakamura, they were caught from the same section of the longline, on two consecutive days. Three specimens were released, and five were brought in and commercialized, with the following dressed weights: 100, 102, 105, 117 and 127 kg. The head of the largest specimen was offered to the authors for identification. The total length of this specimen was estimated to be 360 cm, and on the basis of a similar species, *Odontaspis taurus* (SADOWSKY, 1971) 200 kg in weight. A complete specimen for study was requested by the authors, and on the following trip, in late October, it was caught by the same boat at 24° 40' S - 44° 16' W (over a depth of 600 to 700 m). This specimen (FIGURE 1), an adult male of 342 cm total length, is now on display, stuffed, at the "Museu de Pesca" of the "Instituto de Pesca" (Santos-São Paulo-Brazil, catalogue number 547).

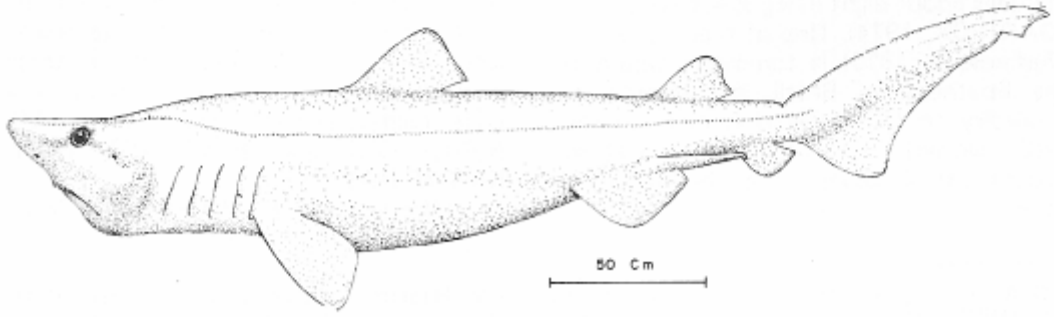

FIGURE 1 – *Odontaspis noronhai*, male, 342 cm total length, from Brzil.

(*) Data obtained from Dr. Luiz Miranda, in 1982 ("Instituto Oceanográfico - Universidade de São Paulo - Brasil").

The morphometrics was based on BASS (1973) and BASS; D'AUBREY; KISTNASAMY (1975), using a compass and a tape measure. The total length is the distance from the tip of the snout to the upper caudal origin adding the caudal length (SADOWSKY, 1968). The dressed weight is the fish weight without the gill, gut, head and fins.

The morphometric data are expressed in percentages of the total length. The measurements of the holotype marked with an "x" were obtained from published drawings by MAUL (1955).

The height of the teeth was measured at the middle of each tooth from the inferior side of the base to the tip of the cusp, and the dental formula was established on the basis of the tooth terminolgy by APPLEGATE (1965).

The scientific names presented in this paper are used according to the Official List of Generic Names in Zoology of the INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLAUTRE (1965)

3. RESULTS AND DISCUSSION

The catch of nine specimens of *Odontaspis noronhai* off the Brazilian coast, is the first record of this species, after the description of Maul, on the basis of a single specimen. The holotype is an immature female measuring 171 cm total length, taken off Madeira (at a depth ranging from 800 to 1,000 m) in April 1941. It is preserved in the collection of the Museum at Funchal, Madeira (catalogue nº 2691).

This present record was possible mainly by the study of the head (the part of the fish with no commercial value). Without the contact with the fishermen this occurrence of *O. noronhai* would not have been noticed, because the caught specimens were commercialized under the name of other more common species in the region.

The rare or unknown species register is almost always a consequence of the fisherman's interest and his courtesy in furnishing material for study. It usually results in important communications, e. g., WHITLEY (1950), DAUGHERTY (1964), ABE et alii (1968), GARRICK (1974) and others.

Lack or delays in the scientific communications, concerning events already known by fishermen may also make the zoogeographic shark survey difficult. An example of this happened in Japan, where the species *O. ferox* (classified by Risso in 1810) was recorded only in 1968, although already known by the fishermen with a common name, and having even quotation in the market of Tokyo (ABE et alii, 1968).

TABLE 1 gives the proportional dimensions of one specimen and the head of another caught in Brazilian waters, as well as the holotype of *O. noronhai*, and of the largest specimen of *O. ferox* *.

These data show many discrepancies between the holotype and our specimen: the distances from the tip of the snout to the parts of the head are relatively larger in the holotype, and the length from the tip of the snout to the origin of the fins is larger in our specimen (for example: the distance from the tip of the snout to the origin of the caudal fin represented 73.3% of the total length in our specimen, and 68.3% in the holotype); the height of the first dorsal fin is similar to the height of the ventral fin in the Brazilian specimen, but is larger in the holtype; and the eye shape (in its fresh state) is round in the holotype, but ovoid in the Brazilian specimen (the diameter with angulation of 135º), resulting in the diminution of the inter-orbital space. Besides the mentioned divergences, there are others with less taxonomic importance. The discrepancies could be interpred as a product of several natural and well-known factors, already studied (BASS, 1973), such as growth

(*) Data obtained from Dr. Leonard Compagno, in 1982.

change in proportional dimension, sexual dimorphism, and the individual variation. In this way it should be considered that the specimen is twice the holotype in length, differente sex and gonadal stadium, and possibly belongs to different populations (Southwest and Northeast of Atlantic Ocean). These facts show the disadvantage in the use of morphometrics as taxonomic characters (STEFFENS & D'AUBREY, 1967). Besides the natural factors, the discrepancies in the morphometric characters can be originated from different technics of measurement and possible imperfections in the drawing.

TABLE 1

Proportional dimentisons percentages of total length in specimens of odontaspidid sharks (x = measurements taken from figure).

	Odontaspis noronhai			*O. ferox*
	specimen from Brazil	head from Brazil	holtype	specimen *
Total length	342 cm	360 cm	171 cm	277 cm
Sex	M	–	F	M
Tip of snout to:				
inner nostrils	3.9	3.9	x 4.5	5.3
mouth	4.4	4.7	5.0	5.7
eye	5.7	5.9	x 6.4	7.0
espiracle	9.8	10.9	12.6	13.1
1st gill-slit	16.0	–	19.0	20.3
5th gill-slit	23.5	–	24.0	26.5
pectoral fin origin	22.8	–	24.0	26.6
1st dorsal fin origin	31.3	–	30.4	34.8
Ventral fin origin	52.6	–	51.2	57.8
2nd dorsal fin origin	59.6	–	55.0	65.0
Anal fin origin	68.1	–	62.0	73.3
upper caudal fin origin	73.7	–	68.3	76.0
1st dorsal fin:				
height	6.0	–	x 6.4	7.0
anterior margin	10.5	–	x 12.7	12.8
base	9.6	–	x 10.9	12.1
lobe	2.3	–	x 1.8	3.1
2nd dorsal fin:				
height	4.3	–	x 4.1	5.3
anterior margin	7.2	–	x 8.2	8.7
base	6.4	–	x 7.0	7.2
lobe	2.1	–	x 1.6	2.7

(*) Data obtained from Dr. L. Campagno, in 1982.

	Odontaspis noronhai			*O. ferox*
	specimen from Brazil	head from Brasil	holotype	specimen
Pectoral fin:				
inner margin	4.2	–	x 6.4	–
anterior margin	11.6	–	x 10.6	13.3
base	4.6	–	x 3.6	6.2
Ventral fin:				
height	5.6	–	x 4.5	–
anterior margin	7.5	–	x 10.0	–
base	7.9	–	x 9.1	–
origin to tip of lobe	11.4	–	x 14.1	12.4
Clasper-outer margin	8.9	–	–	6.5
Anal fin:				
height	3.1	–	x 2.5	5.0
anterior margin	4.2	–	x 5.2	7.0
base	3.5	–	x 4.5	5.1
lobe	2.0	–	x 1.8	2.0
Caudal fin:				
upper margin	26.3	–	x 31.8	24.0
lower lobe	8.5	–	x 9.5	10.9
base of notch to tip	5.5	–	–	4.8
Nostrils length	0.9	1.0	–	–
Internasal distance	3.7	4.1	–	4.0
Mouth width	6.3	7.5	–	5.6
Mouth length	3.7	5.3	–	–
Eye diameter horizontal	1.8	1.7	2.1	1.6
Eye diameter vertical (ca 135°)	1.9	1.8	–	–
Interorbital distance	4.5	4.7	5.0	–
Eye to spiracle	3.4	3.1	x 2.5	3.9
1st gill-slit length	5.1	–	x 5.4	6.2
5th gill-slit length	4.8	–	x 4.5	5.8
Upper furrow length	–	0.7	–	0.7
Lower furrow length	–	0.9	–	1.6
Spiracle length	0.3	0.3	–	0.3
Trunk height:				
at pectoral fin origin	13.5	–	x 12.7	
at 1st dorsal fin origin	15.2	–	x 13.6	

TABLE 2 contains: measurement of the teeth, number of symphysial teeth, and dental formula of our specimen and of the head. The interspecific differences are more apparent in the teeth (STEFFENS & D'AUBREY, 1967).

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TABLE 2

Measurement (mm), number of symphysial teeth, and dental formula of our specimen (342 cm) and of the head (360 cm).

Row nº	Height of the Teeth in the Outer Row			
	Upper jaw		Lower jaw	
	Specimen	Head	Specimen	Head
1	14.0	17.0	17.5	21.5
2	16.0	19.5	19.5	24.5
3	10.5	12.0	16.0	19.0
4	12.0	16.5	14.0	17.0
5	12.0	16.5	12.0	16.5
10	8.0	11.0	8.0	11.0

Row nº	Number of Symphysial Teeth in the Lower Jaw	
	Specimen	Head
1	7	5
2	5	4
3	3	4

Dental Formula on the Basis of the terminology by Applegate:
S = Symphysial, A =Anterior, I = Intermediate, L = Lateral and, P = Posterior.

Specien	38	= P–3	L–13	I–1	A–2				A–2	I–1	L–13	P–3
	42	= P–3	L–13		A–2	S–3		S – 3	A–2		L–13	P–3
Head	40	= P–4	L–13	I–1	A–2				A–2	I–1	L–13	P–4
	43	= P–4	L–13		A–2	S–3		S–3	A–2		L–13	P–3

Comparing our specimen (FIGURE 2) and the head (FIGURE 3) a great similarity with *O. noronhai* was observed concerning the number, shape and arrangement of the teeth, taxonomic characters which are necessary for the species indentification. The shape of the teeth consisting of an awlshaped central cusp and one small denticle on each side near the broad base, is similar to hat of *Odontaspis tauros*, which is only relatively smaller and with denticles relatively larger, also on the posterior teeth.

The shape and arrangement of the teeth in the studied material and in the holtype were similar, except for the presence of two minute symphysial teeth in the upper jaw of the holotype. The studied material presented three symphysial dental rows on each side in the lower jaw, while the holotype had only one row on each side. This supposed difference was eiminated with a new examination and rectification of a description made later by Maul *. According to Maul, these minute symphysial teeth are very small in the holotype, and as two rows wers located behind the beginning of the other rows, they were not noticed in the first description.

The jaw of one odontaspidid shark of 240 cm (FIGURE 4), belongging to the David Ward Collection (Kent-England) and proceeding from the Indian Ocean or South China Sea **, was very similar to the holotype, but without the minute symphysial teeth in the upper jaw and with three symphysial dental rows on just one side of the lower jaw. The absence of these rows on the other side is probably due to their destruction during the preparation of the jaw for commercialization ***.

(*) Personal communication from Dr. G. E. Maul, in 1982.

(**) Personal communication from Mr. David Ward, in 1982.

(***) Personal communication from Dr. Leonard Compagno, in 1982.

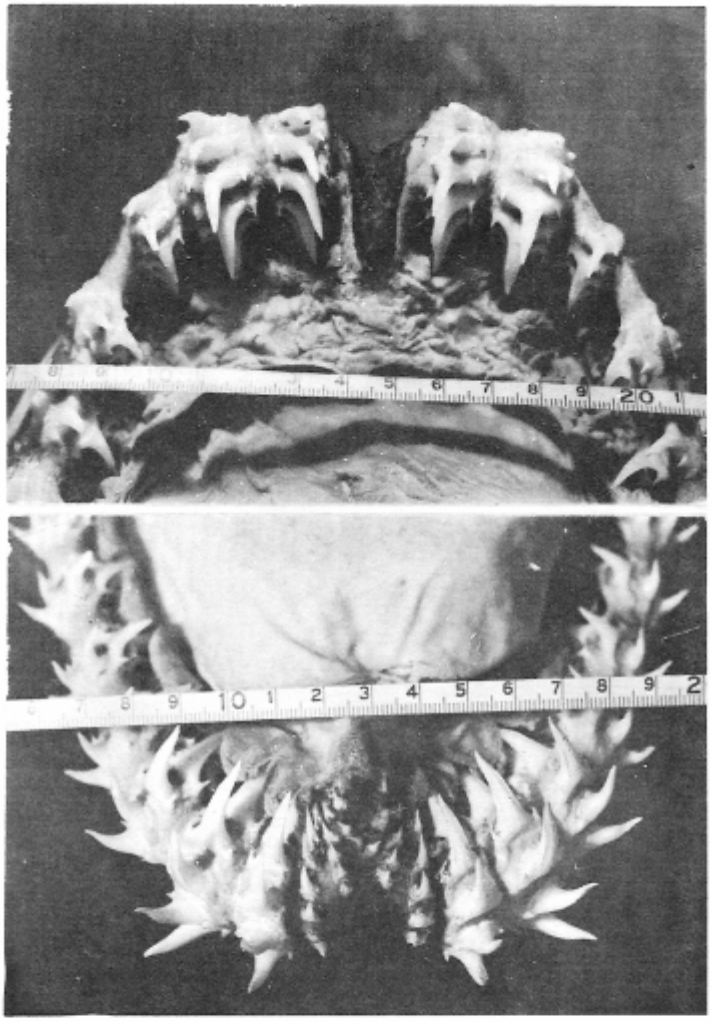

FIGURE 2 – Jaws of *Odontaspis noronhai*, male, 342 cm total length, from Brazil. The picture shows in the upper jaw (above) the lack of the symphysials teeth, and in the lower jaw the presence of tree rows of symphysials teeth on boarder of shagreen.

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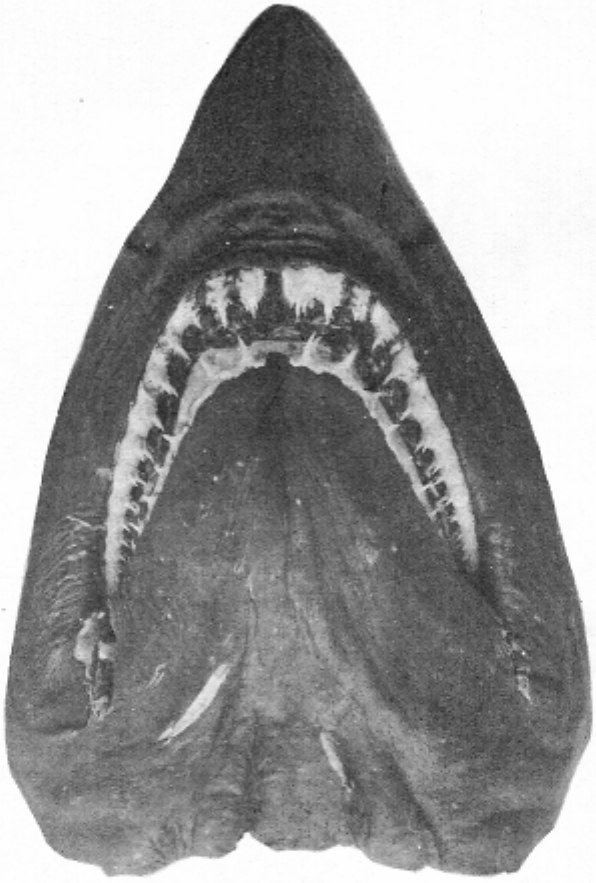

FIGURE 3 – Head of *Odontaspis noronhai* from Brazil, showing the arrangement and shape of the teeth.

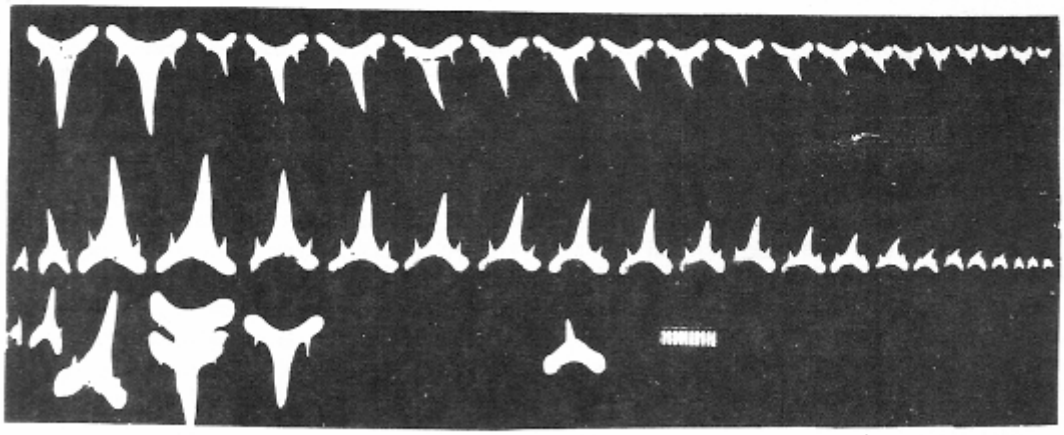

FIGURE 4 – Teeth of an odontaspidid shark of 240 cm from the Indian Ocean or South China Sea.

Little is known about the distribution of the odontaspidid deep sea sharks. The best known distribution is that of *O. ferox*, which according to SPRINGER (1973) is possibly cosmopolitan in warm and temperate seas. The only information about *O. noronhai* are that it was caught off Madeira (33º N — 19ºW) and on the Southeast coast of Brazil (24º S — 44º W), and somewherein the Indian Ocean or even in the South China Sea (on the basis of one jaw presumably of *O. noronhai*' belonging to David Ward's Collection). Besides thess records there is the possibility that the studied species occurs also in the Pacific Ocean, based on reserches of BELYAEV & GLIKMAN (1970). They have studied deposits of shark teeth on the Pacific bottom, finding among several teeth also those identified as belonging to *Odontaspis aff. ferox*. The number of occurrences of this kind of teeth is considered usual. The picture of these teeth (table 2 number 26 in the mentioned publication), does note permit an accurate identification. But, considering that this sample was collected in the central part of the Pacific (20º N — 130º W at depth of 4,370 m), it is possible that they belong to a deep-sea odontaspidid shark, possibly also *O. noronhai.*

The nine adult specimens found off Brazil were caught in October, when probably they were outside their usual habitat during migrational movement. Similarly in New Zealand (GARRICK, 1974) five specimens of *O. herbsti* were registered as the first catch of the species in October. In both cases the catches occurred during spring, suggesting a probable migration for reproduction.

The color of the whole specimen and the head was dark reddish brown, similar to the holotype, but one hump at the upper caudal origin of our specimen was not mentioned in Maul's description.

The specimens from Brazil were called "Mangona-de-fundo" by the authors, due to the similarity with the well-know "Mangona", *O. taurus.*

According to FAO (1981) it is possible that *Odontaspis noronhai* is a morphological extreme of *O. ferox* and not a valid species, in view of considerable variation occurring in *Eugomphodus taurus* * in the characters separting *O. noronhai* and *O. ferox*. Nervetheless, the catch of these specimens on the Southeast coast of Brazil conrirms the existence of the species *O. noronhai.*

4. IDENTIFICATION

The species *Odontaspis noronhai* (MAUL, 1955) canbe easily separated from similar species of odontaspidid deep-sea sharks by differences of pattern and arrangement of their teeth. The existence of one denticle on each side of the base of the teeth; the presence of only two rows of large anterior teeth on each side of the symphysis and the lack of a gap behind the row of smaller intermediate teeth in the upper jaw; and three rows of small symphysial teeth on each border of the shagreen entering the mouth at the symphysis in the lower jaw, represent safe characters for distinguishing *O. noronhai*, over 171 cm, compared with the other related species (the holotype, of 171 cm, presented one minute symphysial tooth on each side of the symphysis in the upper jaw).

5. ADDENDUM

One more specimen was caught when this paper had been concluded. This specimen, an adult male, 353 cm total length, was caught by the "Itaberaba" lon-

(*) *E. taurus* is a synonym of *Odontaspis taurus.*

gliner. According to the captain, Shozo Nakamura, it happened in November 13, 1982, at 24º 30' S – 44º 03' W. This exemplar is now stuffed in the "Museu do Mar" (Santos-SP), catalogue number 250.

This specimen is very similar to those captured the year before, except for the symphysial teeth number. It presented only two rows on each side in the lower jaw, while the previosly caught *O. noronhai* had three rows; and presented one row on the left side in the upper jaw, not found in our specimen nor in the head from Brazil, but seen in the holotype. These facts show that the number of rows of symphysial teeth is not a stable character of this species.

The dental formula of this last specimen was:

$$\frac{43}{40} = \frac{P{-}4\ L{-}13\ I{-}1\ A{-}2\ S{-}1}{P{-}4\ L{-}12\ A{-}2\ S{-}2} \mid \frac{A{-}2\ I{-}1\ L{-}13\ P{-}6}{S{-}2\ A{-}2\ L{-}12\ P{-}4}$$

The hypothesis of migration for reproduction was reinforced since this last specimen was also caught during the spring, in the same area and was as large as the others from Brazil, and mainly by the presence of considerable quantity of sperm in its sexual organ.

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