

New records of the Pacific sleeper shark, *Somniosus pacificus* (Chondrichthyes: Squalidae), from the southwest Atlantic

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The genus *Somniosus* Lesueur, 1818, is represented worldwide by three species: the Greenland shark (*S. microcephalus* (Bloch and Schneider, 1801)), the Pacific sleeper shark (*S. pacificus* Bigelow and Schroeder, 1944) and the little sleeper shark (*S. rostratus* (Risso, 1826) (Compagno, 1984; Francis et al., 1988)).

There are few records of *Somniosus* from the South Atlantic. A female about 440 cm TL was caught in a depth of 677 m off Cape Columbine, South Africa (Bass et al., 1976), and Gushchin et al. (1986) reported a male 416 cm TL from 42° 24' S, 58° 19' W, off Patagonia, Argentina, at 800 m depth. These specimens, at first tentatively identified as *S. microcephalus*, were subsequently referred to *S. pacificus* by Francis et al. (1988). A brief reference without data (Soto et al., 1995) refers to *S. microcephalus* off Rio Grande do Sul, Brazil, and an identified *Somniosus* was sighted by Díaz de Astarloa (unpubl.) near the South Georgia Islands. The last-mentioned specimen was collected incidentally during a commercial catch of Patagonian toothfish (*Dissostichus eleginoides*) and returned immediately to the sea, before any detailed information could be obtained.

Recent exploratory cruises aboard the R/V *Azuchi Maru* to investigate potential fisheries resources off the South American continental shelf, such as the toothfish (*Dissostichus eleginoides*), facilitated the gathering of new information on the occurrence of sleeper sharks in the region.

The present paper reports new records of *Somniosus pacificus* from the southwest Atlantic.

Materials and Methods

Ten sleeper sharks were collected off the South American continental shelf within latitudes 34°–55° S. Catch data, coordinates, sex, total length and other data obtained are summarized in Table 1. Methods of counting and measuring followed Compagno (1984) and Ebert et al. (1987).

Specimen 1 was caught in a bottom trawl by the F/V *Mellino VI* while fishing for common hake (*Merluccius hubbsi*). The shark was gutted on board and the carcass frozen. Examination on board of stomach contents indicated that the shark had been preying heavily on hake. The frozen carcass was unloaded at Mar del Plata where it was photographed (Fig. 1). Specimen 2 was collected by the F/V *Arribazón Marplatense* and proportional measurements obtained from a sketch made to scale. Specimens 3 to 9, including that catalogued as INIDEP 578, were caught in bottom trawls by the R/V *Azuchi Maru* off the southernmost region of Argentina. Teeth of INIDEP 578 were photographed (Fig. 2) and a piece of skin with denticles cleared and stained with alizarin red, and then photographed (Fig. 3). The teeth and skin are held in the ichthyological collection of the Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP).

Results

Description. Snout short, broadly rounded. Body large, robust. Fins lobe-like, upper and lower caudal fin lobes broadly rounded, paddle-like. Dorsal fins low, equally-sized and lacking spines. First dorsal fin origin posterior to a vertical through pectoral fin base,

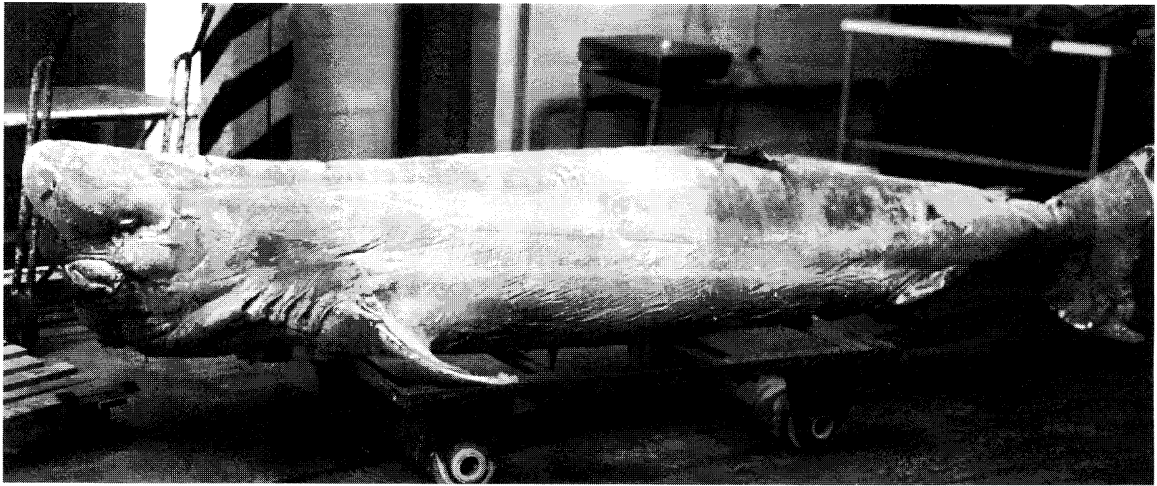


Fig. 1. *Somniosus pacificus* (410 cm TL, specimen no. 1) collected from off Uruguay.

insertion closer to pelvic fin base than pectoral fin base.

Proportional measurements for specimens 1, 2, 3 and 5 as follows (Table 2): pre-first dorsal fin length 44.3–50.0% TL; interdorsal distance 14.2–18.8% TL; prebranchial length 11.9–24.0% TL.

Distinctive keel on caudal peduncle only on specimens 3–9, and INIDEP 578 (Fig. 4A, B). Dermal denticles small, widely-spaced, arising obliquely from skin (*S. microcephalus*/*S. pacificus* type *vide* Francis et al., 1988) (Fig. 3).

Gape large, armed with sharp teeth. Upper jaw teeth dagger-like, separate (Fig. 2A, B); lower jaw teeth forming a single, sharp-edged overlapping band (Fig. 2C, D). INIDEP 578 with 64 teeth in upper jaw

outer series (3 functional, 4 replacement series); 59 teeth (left 30, right 29) in lower jaw (1 functional, 6 replacement series). Gape about 34 cm in this specimen.

Color when fresh. — Uniform dark brown when captured, due to a layer of mucus. Body color paler following removal of mucus. In all specimens examined, dark streak-like bands were apparent crossing the back and sides of the body (Fig. 4B).

Discussion

In his key to *Somniosus*, Compagno (1984) used tooth form and counts, lateral keels, and size, as diagnostic characteristics for separating *S. rostratus* from

Table 1. List of *Somniosus pacificus* collected from the southwest Atlantic

Specimen number	Date	Locality	Depth (m)	Sex	Total length (cm)	Data obtained
1	26 June, 1996	35°00' S, 51°00' W	300–400	male	410	Proportional measurements and weight
2	22 June, 1979	37°00' S, 54°00' W	501	–	407	Proportional measurements and skin
3	7 July, 1997	54°44' S, 62°48' W	725–831	female	463	Proportional measurements
4	17 May, 1997	54°44' S, 62°51' W	762	female	600	–
5	19 February, 1997	54°45' S, 62°48' W	913–1278	male	430	Proportional measurements
6	18 May, 1997	54°45' S, 62°49' W	849	female	500	–
7	25 April, 1997	54°46' S, 62°52' W	1048	female	447	–
8	13 February, 1997	54°46' S, 62°44' W	1180–1354	female	467	–
9	18 February, 1997	54°47' S, 62°54' W	1135–1442	female	444	–
INIDEP 578	19 February, 1997	54°45' S, 62°48' W	913–1278	male	385	Jaws and skin

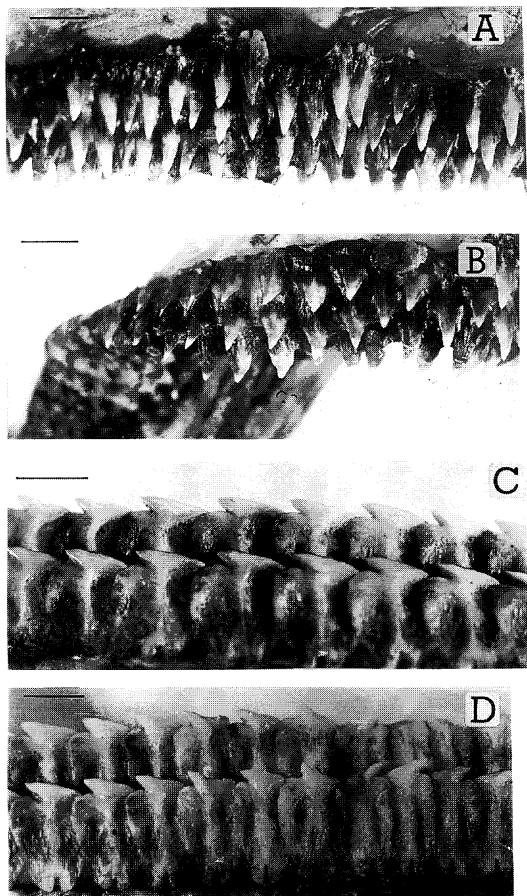


Fig. 2. Teeth of *Somniosus pacificus* (385 cm TL, INIDEP 578). A) Upper jaw, symphysis slightly to right; B) upper jaw, commisure right side; C) lower jaw, right, 6th to 13th teeth; D) lower jaw, symphysis slightly to right. Scales indicate 10 mm.

both *S. microcephalus* and *S. pacificus*. According to Compagno (1984), *S. microcephalus* and *S. pacificus* lacked lateral keels on the caudal fin base. However, Tanaka et al. (1982), Francis et al. (1988), Pequeño et al. (1991), and Stewart and Francis (1994) found lateral keels in *S. pacificus* taken off Suruga Bay (Japan), Australasia, Chile, and the Auckland Islands, respectively. Yano (1995) also reported lateral keels on 15 specimens of *S. microcephalus* recorded from around Greenland. Eight specimens from the southernmost western Atlantic examined in the present study (Nos. 3 to 9, and INIDEP 578) also had obvious lateral keels. Thus, the presence or absence of a lateral keel in the specimens of *S. pacificus* examined here was not a useful characteristic for species' determination, because specimens both with and without keels were found.

Compagno (1984) also used the distance between

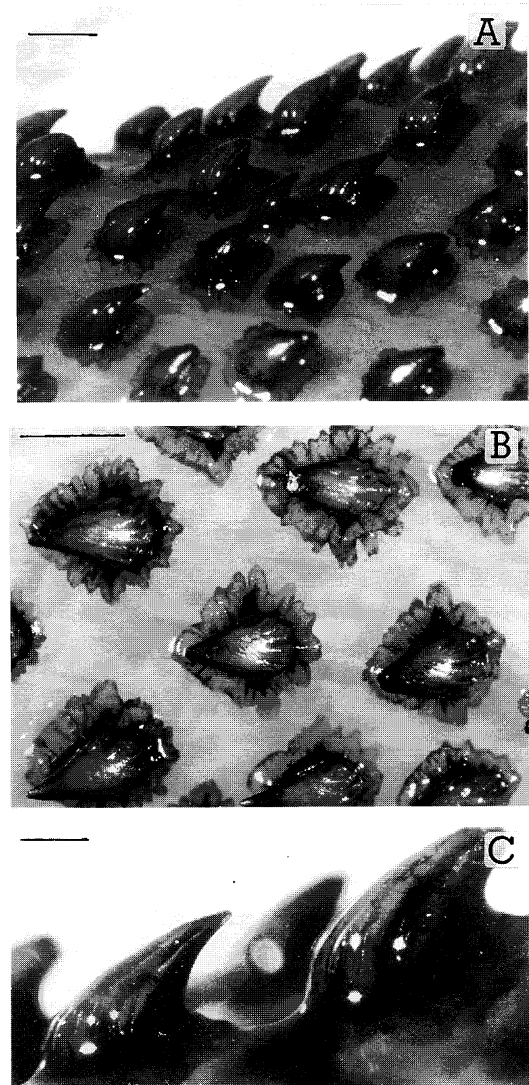


Fig. 3. Dermal denticles of trunk below first dorsal fin of *Somniosus pacificus*. INIDEP 578 (A, B); specimen 2 (C). A) Lateral view; B) dorsal view; C) lateral view. Scales of A) and B) indicate 1 mm; scale of C) indicates 0.5 mm.

the dorsal fins in relation to prebranchial length for distinguishing between *S. microcephalus* and *S. pacificus*, considering the interdorsal space to be at least as long as the prebranchial length in the former, about two-thirds this length in the latter. However, this character is also variable. For two of three specimens of *S. pacificus* from Australia and New Zealand, Francis et al. (1988) reported the interdorsal space as being somewhat smaller than the prebranchial length. The interdorsal space of the Uruguayan specimen (No. 1) was 1.5 times longer than the prebranchial length, and that in the specimen from Patagonia (Argentina) approximately 1.4 times longer than the prebranchial

length (Gushchin et al., 1986). In contrast, the sketch of specimen 2, indicated the interdorsal space as being almost as long as the prebranchial length, as was the case also in specimen 3. Specimen 5, by contrast, had an interdorsal space/prebranchial length ratio of 0.62. Clearly, the character was too variable for distinguishing between *S. microcephalus* and *S. pacificus*.

In a revised key to the genus *Somniosus*, Francis et

al. (1988) used both tooth formulae and snout to first dorsal fin origin distance for discriminating between *S. microcephalus* and *S. pacificus*. According to these authors, the tooth formula for *S. microcephalus* is 45–52/48–53, while that for *S. pacificus* is usually 22–48/53–60. The 385 cm TL male (INIDEP 578) had a tooth formula of 64/59. Although the tooth number in the lower jaw was within the range given by Francis et al. (1988) for *S. pacificus*, that in the

Table 2. Measurements and proportions of *Somniosus pacificus* from the southwest Atlantic

Specimen no.	1		2		3		5	
	cm	%	cm	%	cm	%	cm	%
Total length	410	100	407	100	463	100	430	100
Fork length	377	91.9	–	–	–	–	–	–
Precaudal length	353	86.1	–	–	–	–	–	–
Preorbital length	18	4.4	–	–	–	–	–	–
Prenarial length	6	1.5	–	–	–	–	–	–
Preoral length	15	3.7	–	–	–	–	–	–
Prebranchial length	49	11.9	60.2	14.8	91	19.6	105.5	24
Head length (Snout to 5 th branchial)	74	18.0	–	–	–	–	–	–
Prepectoral length	70	17.1	–	–	–	–	–	–
Preventral length	260	63.4	–	–	–	–	–	–
Prespiracle length	35	8.5	–	–	–	–	–	–
Head width length	68	16.6	–	–	–	–	–	–
Pre–first dorsal length	200	48.8	180.6	44.3	205.3	44.3	215	50
Interdorsal distance	77	18.8	57.7	14.2	87	18.8	66.4	15
Eye diameter	3	0.7	–	–	–	–	–	–
Interorbital width	43	10.5	–	–	–	–	–	–
Nostril width	8	1.9	–	–	–	–	–	–
Internarial width	26	6.3	–	–	–	–	–	–
Spiracle length	3	0.7	–	–	–	–	–	–
Eye–spiracle length	13.5	3.3	–	–	–	–	–	–
Mouth width	50	12.2	–	–	–	–	–	–
1st gill slit height	9	2.2	–	–	–	–	–	–
2nd gill slit height	10	2.4	–	–	–	–	–	–
3rd gill slit height	11	2.7	–	–	–	–	–	–
4th gill slit height	10.5	2.6	–	–	–	–	–	–
5th gill slit height	13	3.2	–	–	–	–	–	–
Caudal peduncle height	18	4.4	–	–	–	–	–	–
Pectoral: anterior margin	45	19.9	–	–	–	–	–	–
base	27	6.6	–	–	–	–	–	–
posterior margin	31	7.6	–	–	–	–	–	–
First dorsal: height	12	2.9	–	–	–	–	–	–
inner margin	17	4.1	–	–	–	–	–	–
2nd dorsal: anterior margin	34	8.3	–	–	–	–	–	–
base	22	5.4	–	–	–	–	–	–
2nd dorsal insertion to caudal origin	34	8.3	–	–	–	–	–	–
Body girth at pectoral origin	91	22.2	–	–	–	–	–	–
Upper caudal lobe	61	14.9	–	–	–	–	–	–
Interdorsal/prebranchial ratio	1.57		0.95		0.95		0.62	
Predorsal/total length ratio	0.48		0.44		0.44		0.50	

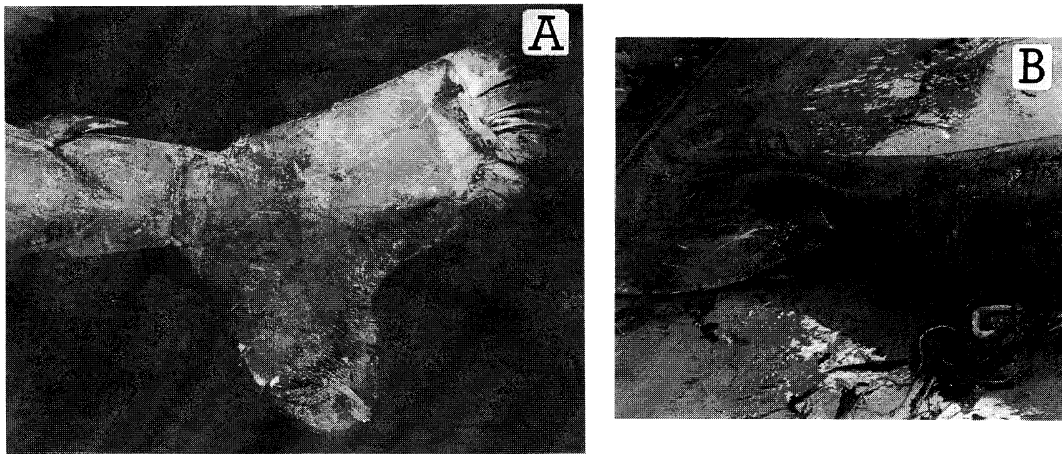


Fig. 4. Caudal region of specimens 1 (A) and 3 (B), showing the absence and presence of a lateral keel, respectively.

upper jaw was much higher, and even beyond within the range reported for *S. microcephalus*. Whereas, the specimen recorded from off Cape Columbine (southeastern Atlantic) by Bass et al. (1976) had a tooth formula of 48/53, that is, within the ranges for both *S. microcephalus* and *S. pacificus*, Gushchin et al.'s (1986) specimen captured off Patagonia had 56 teeth in the lower jaw, agreeing only with the formula for *S. pacificus*. (The upper jaw of the latter specimen was badly damaged, thus preventing an accurate tooth count). Considering the above evidence, it is clear that tooth number is not a reliable diagnostic characteristic.

With respect to the distance between the snout tip and the first dorsal fin origin, Francis et al. (1988) stated such to be $>43\%$ of the total length in *S. pacificus*, but under that figure in both *S. microcephalus* and *S. rostratus*. Four specimens examined here (Nos. 1, 2, 3 and 5) had the pre-first dorsal length/total length ratio $>43\%$ (Table 2). By plotting this measurement against total length for reported specimens of *Somniosus* (including accounts of Bass et al., 1976 and Gushchin et al., 1986), Francis et al. (1988) were able to separate *S. pacificus* from the other two species. The female specimen of *S. cf. pacificus* from off central Chile ($39^{\circ}45' S$) reported by Pequeño et al. (1991), had a pre-first dorsal length $>50\%$ of total length. Thus, all the characteristics previously used in keys to distinguish between *S. microcephalus* and *S. pacificus* (Bigelow and Schroeder, 1948; Compagno, 1984; Francis et al., 1988), the distance between the snout tip and first dorsal fin origin is the most useful for separating the species. All southern hemisphere examples of both *Somniosus microcephalus* and *S. pacificus* reported in the literature, as well as those

examined here, have the first dorsal fin situated more posteriorly than is the condition in *S. microcephalus*. This feature agrees with the original description of *S. pacificus* by Bigelow and Schroeder (1944), being also pointed out by Myagkov and Kondyurin (1995), and is the basis on which the present specimens were identified. Accordingly, all specimens reported thus far from the southwest Atlantic region are considered to have been examples of *S. pacificus*, rather than *S. microcephalus*.

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