

**Distribution of the species of *Dipturus* Rafinesque  
(Rajidae, Rajinae, Rajini) off Brazil and first record of  
the Caribbean skate *D. teevani* (Bigelow & Schroeder),  
in the Western South Atlantic**

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ABSTRACT. The Caribbean skate *Dipturus teevani* (Bigelow & Schroeder, 1951) is recorded for the first time from Brazilian waters. The specimen was collected in the continental slope off Bahia State. With this record, four species of *Dipturus* Rafinesque, 1810 are known from Brazil: *D. chilensis* (Guichenot, 1848), *D. leptocauda* (Kreft & Stehmann, 1975), *D. trachyderma* (Kreft & Stehmann, 1975) and *D. teevani* (Bigelow & Schroeder, 1951). They are typical inhabitants of deep waters between the outer shelf edge (195-200m) and the slope (more than 500m). Although morphologically conservative, the species of *Dipturus* can be distinguished from each other by the number of dorsal and nuchal thorns, the number of caudal thorns, dorsal and ventral spinulation and specific total length. An identification key for the species of *Dipturus* recorded from Brazil is presented.

KEY WORDS. Rajidae, *Dipturus*, distribution, Brazil

The genus *Dipturus* Rafinesque, 1810 consists of 29 species (MCEACHRAN & DUNN 1998). They have a worldwide distribution, except for the tropical eastern and North Pacific and are found from the continental shelf to archibenthal depths (STEHMANN 1970). The depth distribution of *Dipturus* species (MCEACHRAN & MIYAKE 1990), varies from 25 to almost 1150m; in tropical waters, they are found generally over the continental slope. According to these authors, the genus is most diverse in the western North Atlantic, the southern African region, and the eastern North Atlantic.

The species of *Dipturus* are offshore skates, characterized by its dorsal and ventral dark colour (from dark brown to black), a proportionally elongated stiff snout, and a smooth skin with few tubercles (COMPAGNO *et al.* 1989; CHEN & JOUNG 1989).

In Brazilian waters (western South Atlantic), *Dipturus* species are rare and poorly known. The thintail skate, *D. leptocauda* (Kreft & Stehmann, 1975), was described based on a juvenile specimen, captured in 1968 over the continental slope in 500m depth in southern Brazil.

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The yellownose skate, *D. chilensis* (Guichenot, 1848), (formerly known as *Raja flavirostris* Philippi, 1892) was first recorded from Brazilian waters by SADOWSKY (1973), in a list of cartilaginous fishes captured between Torres (Rio Grande do Sul, southern Brazil) and Maldonado (Uruguay).

VOOREN (1997), in a trawl survey of slope of Rio Grande do Sul (southwestern Atlantic), obtained two specimens, identified at the time as *D. leptocauda*. However Matthias Stehmann examined the specimens and identified them as the roughskin skate, *D. trachyderma* (Kreff & Stehmann, 1975) (Vooren, pers. comm.). This occurrence is the first record of the latter species in Brazil.

Recently, in July 1999, another *Dipturus* species was captured off Brazil, trawled over the continental slope by the French R.V. Thalassa. The specimen was identified as *Dipturus teevani* (Bigelow & Schroeder, 1951), and represents a new record of the caribbean skate for Brazilian waters.

A discussion on the distribution of the *Dipturus* species which occur in Brazil, and a key for their identification, are the main objectives of the present study.

## MATERIAL AND METHODS

The taxonomic classification follows MCEACHRAN & DUNN (1998); measurements of *D. teevani* are modified from MENNI (1973). The terminology of the spinulation of *Dipturus* species is based on STEHMANN & BÜRKELE (1984) and LEIBLE (1988) (Fig. 1). Specimens of the apparently rare *Dipturus leptocauda* were not examined (only the holotype is known). The species outlines are based on NORMAN (1937) for *D. chilensis*, KREFF & STEHMANN (1975) for both *D. leptocauda* and *D. trachyderma*, and BIGELOW & SCHROEDER (1953) for *D. teevani*. The specimens examined are deposited in the following institutions: Departamento de Biologia Animal e Vegetal, Universidade do Estado do Rio de Janeiro (AC.DBA-VUERJ [anatomical collection] and C.DBAVUERJ [ichthyological collection]); Museu Nacional do Rio de Janeiro (MNRJ); Museu de Zoologia da Universidade de São Paulo (MZUSP); Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (MCP); Fundação Universidade do Rio Grande, Rio Grande do Sul (FURG); and Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires (MACN).

### Material analysed

*Dipturus chilensis*. C.DBAV.UERJ 1734, male, 493mm TL, 580mm DW, Argentina; MCP 3760, female, 195mm TL, 144mm DW, northern Uruguay and Argentina; MCP 3761, male, 243mm TL, 185mm DW, northern Uruguay and Argentina; MCP 3757, female, 320mm TL, 235mm DW, northern Uruguay and Argentina; MCP 3756, female, 290mm TL, 237mm DW, northern Uruguay and Argentina; MCP 3759, male, 235mm TL, 182mm DW, northern Uruguay and Argentina; MCP 3751, female, 304mm TL, 235mm DW, northern Uruguay and Argentina; MCP 3753, female, 295mm TL, 232mm DW, northern Uruguay and Argentina; MCP 3758, male, 322mm TL, 245mm DW, northern Uruguay and Argentina; MCP 3752, female, 264mm TL, 201mm DW, northern Uruguay and Argentina; MACN 2885, male, 156mm TL, 117mm DW, 35°34'S, 52° 48'W;



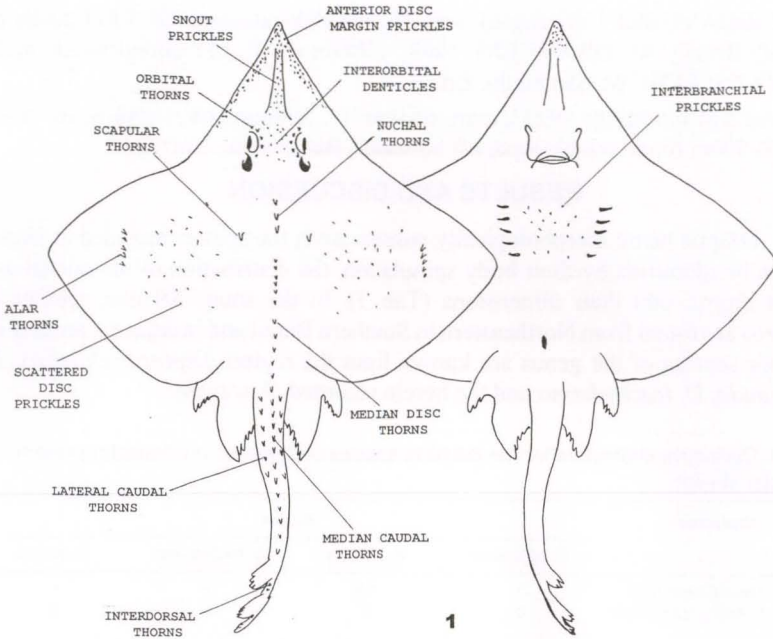


Fig. 1. Schematic diagram of the spinulation of Brazilian *Dipturus* species.

MACN 2600, female, 196mm TL, 147mm DW, 26°25'S, 55°54'W; MACN 2600, female, 182mm TL, 135mm DW, 26°25'S, 52°54'W; MACN 6035, female, 307mm TL, 233mm DW, Mar del Plata, Argentina; MACN 6035, male, 285mm TL, 221mm DW, Mar del Plata, Argentina; MACN 4365, female, 380mm TL, 296mm, 37°40' to 38°04'S, 54°48' to 55°15'W; MACN 4365, female, 370mm TL, 287mm DW, 37°40' to 38°04'S, 54°48' to 55°15'W; MACN 4365, female, 360mm TL, 275mm DW, 37°40' to 38°04'S, 54°48' to 55°15'W; MACN 4365, male, 347mm TL, 261mm DW 37°40' to 38°04'S, 54°48' to 55°15'W; MACN 569, female, 326mm TL, 250mm DW, Buenos Aires coast, Argentina; MACN 1334, male, 293mm TL, 225mm DW; 39°00S, 56°00'W; MACN 1500, male, 398mm TL, 316mm DW, Mar del Plata, Argentina; MACN 1500, male, 339mm TL, 325mm DW, Mar del Plata, Argentina; MACN 1500, male, 325mm TL, 254mm DW, Mar del Plata, Argentina; MACN 1500, male, 211mm TL, 155mm DW, Mar del Plata, Argentina; MACN 6162, female, 375mm TL, 287mm DW, 38°20'S, 56°25'W, Argentina.

*Dipturus trachyderma*. MZUSP 51600, male, 1510mm TL, 1000mm DW, 25°42'S, 45°08'W, Rio de Janeiro, Brazil, depth 477m; MCP 17429, male, 870mm TL, 642mm DW, Rio Grande do Sul, between Brazil and Uruguay coasts; FURG (18.IV.97), female, 1620mm TL, 1205mm DW, Rio Grande do Sul, Brazil; FURG EL 76, male, 971mm TL, 740mm DW, Rio Grande, Brazil; AC.DBA-VUERJ 1006 (head), sex, TL and DW unregistered, Rio Grande do Sul, Brazil;

AC.DBAVUERJ 1007 (head), sex, TL and DW unregistered, Rio Grande do Sul, Brazil; AC.DBAVUERJ 1008, 1504mm CT, LD unregistered, male, 23°17'S; 41°01'W, São Paulo, Brazil.

*Dipturus teevani*. MNRJ 19233, male, 671mm TL, 504mm DW, 13°40'S; 38°71'W, 450-500m (continental slope, off Salvador, Bahia State, Brazil).

## RESULTS AND DISCUSSION

Despite being morphologically conservative, the species included in *Dipturus* can be identified by their body spinulation, the distribution of the nuchal and caudal thorns, and their dimensions (Tab. I). In the south Atlantic, species of *Dipturus* are found from Northeastern to Southern Brazil and in adjacent areas (Fig. 2). Four species of the genus are known from the region: *Dipturus chilensis*, *D. leptocauda*, *D. trachyderma* and the herein recorded *D. teevani*.

Table I. Distinctive characters for the Brazilian species of *Dipturus*. (+) character present, (0) character absent

Characters	Species			
	<i>D. leptocauda</i>	<i>D. chilensis</i>	<i>D. trachyderma</i>	<i>D. teevani</i>
Number of caudal thorn rows	1	1-3	3	1
Number of median thorn rows of disc	0	0	1	0
Interdorsal space	+	+	+	0
Prickles along the snout	Only on snout apex	Only on snout apex	Along the snout	Only on snout apex
Space between 2 <sup>nd</sup> dorsal and caudal fin	+	0	+	0
Distance from anus to caudal apex, and to snout apex	Anus in midway between caudal apex and snout apex	Anus nearer caudal apex than snout apex	Anus nearer caudal apex than snout apex	Anus nearer caudal apex than snout apex
Dorsal surface of the disc	Smooth	Smooth	Rough	Smooth to touch (but with tiny prickles)
Ventral surface	Smooth	Smooth	Rough	Smooth
Interbranchial space with scattered tiny prickles	+	0	+	0
Preoral length in disc width	3 times	3,5 times	3,5 times	4,5 times
Preoral length in disc length	2,5 times	3 times	3 times	3,5 times
Mouth length in preoral length	3 times	2 times	2,5 times	2 times

### *Dipturus chilensis*

Figs 2, 3, 7

*Dipturus chilensis* has a wide geographical range, occurring from Chile in the Pacific, all the way around southern South America to southern Rio Grande do Sul, in the Atlantic (Fig. 2). The holotype was collected at Bahia de Quinteros, Chile (ESCHMEYER *et al.* 1998). According to LEIBLE (1987) and LEIBLE *et al.* (1990), *D. chilensis* is recorded in Chile from 31°50'S, 73°45'W near Los Vilos, to Isla Mocha (38°08'S, 73°45'W), in 60 to 1000m depth.

Studying the Patagonian fishes, NORMAN (1937) presented the distribution of this species as being: Chile, the Straits of Magellan, and from the Patagonian-Falklands/Malvinas to Argentina (i.e. between 44°14'S and 53°05'S). In their study

of the marine fishes of Patagonia, BELLISIO *et al.* (1979) affirm that *D. chilensis* is the most abundant skate captured in that region.

The Brazilian specimen was recorded from 33°47'S, 53°16'W (off Chuí, Rio Grande do Sul) (SADOWSKY 1973).

This species can be identified by a smooth dorsal surface with a single nuchal thorn, 1-3 caudal thorn rows (predominance of one row), a preoral length 3,5 times in disc width, and a mouth length two times in preoral length.

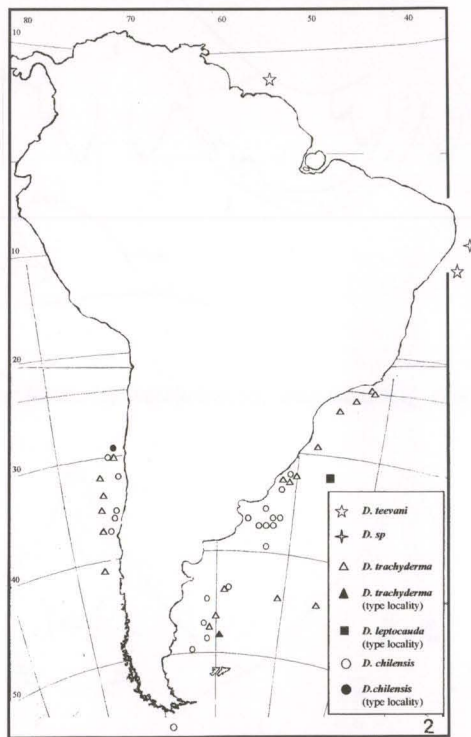


Fig. 2. Distribution of *Dipturus chilensis*, *D. leptocauda*, *D. trachyderma*, *D. teevani* and *Dipturus* sp. in Brazilian waters and adjacent areas.

### *Dipturus leptocauda*

Figs 2, 4

The type locality given by the authors reads “continental slope off Southern Brazil”, at 24°21'S, 43°54'W. Checking such co-ordinates, however it corresponds instead to the latitude of Rio de Janeiro, in southeastern Brazil (near Restinga de Marambaia), even though the research cruises of the FRV “Walther Herwig” to South America had its study area extending only from the south of Rio Grande do

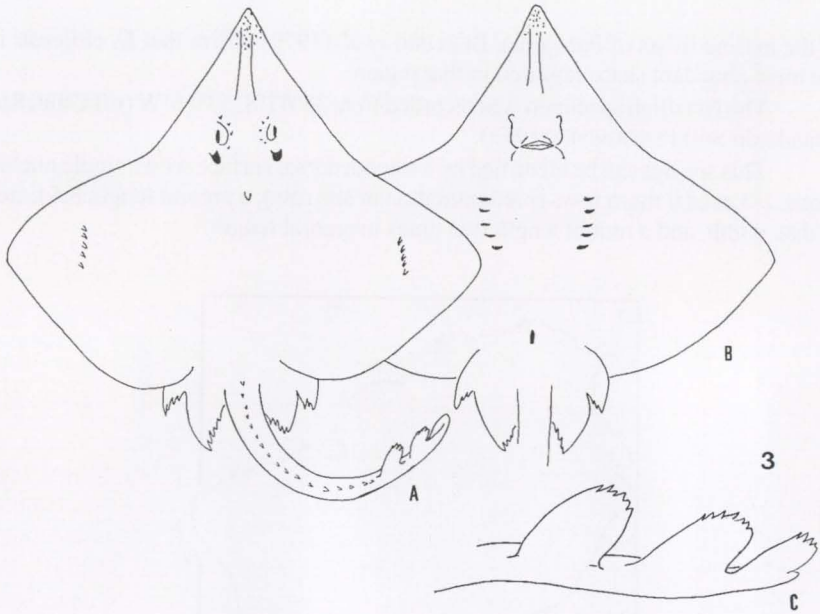


Fig. 3. *Dipturus chilensis*. (a) Dorsal view, (b) ventral view; (c) caudal region.

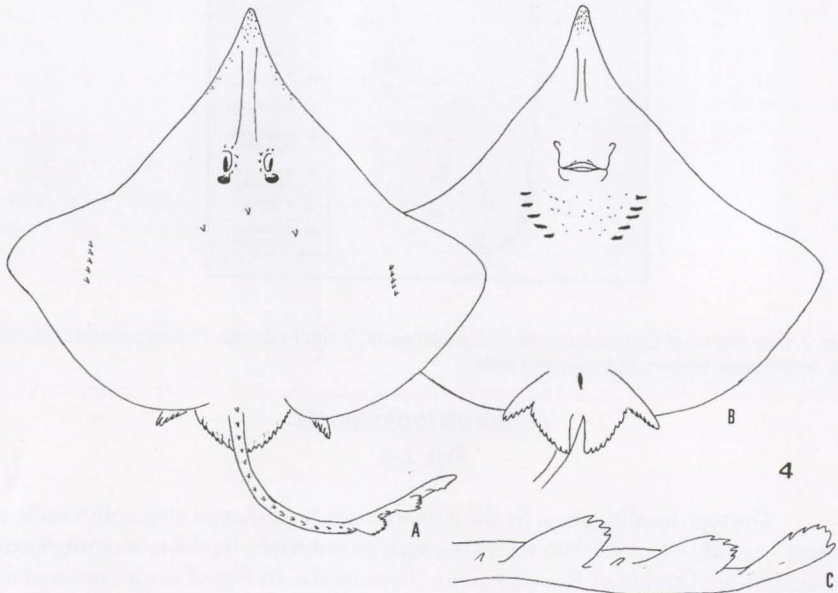


Fig. 4. *Dipturus leptocauda*. (a) Dorsal view, (b) ventral view; (c) caudal region.



Sul, Brazil, to southern Argentina (KREFFT 1968; KREFFT & STEHMANN 1975). It is supposed, therefore, that the co-ordinates given are in error, being thus the correct location of the type locality of *D. leptocauda*, 34°21'S, 43°54'W (i.e. off Rio Grande do Sul, Brazil).

Only a single specimen of *D. leptocauda*, the holotype, is known (Fig. 2). It is a young male of 479,5mm TL. According to KREFFT & STEHMANN (1975), this species can be identified by a single nuchal thorn, smooth dorsal surface of the disc, 16 predorsal thorns, one interdorsal thorn, and the anus in the midway between the apex of the caudal fin and the snout.

### *Dipturus trachyderma*

Figs 2, 5, 8, 9

As *D. chilensis*, this species is found in the southern Pacific (off Chile), the Chilean Patagonian waters (LEIBLE & STEHMANN 1987), and southern Argentina (the holotype, 49°S, 60°52'W) (KREFFT & STEHMANN 1987) (Fig. 2). Additional Argentine specimens were recorded by MENNI & GOSZTONYI (1977) in the following co-ordinates: 47°36'S, 60°45'W and 49°05.5'S, 61°12'W. Additional specimens collected in Argentina were taken in 45°30'S, 51°06'S, and 46°S to 45°40'S on the Patagonian shelf, to the North of the type locality (LEIBLE & STEHMANN 1987). Studying the fish associations in this region, MENNI & GOSZTONYI (1982) included *D. trachyderma* in what they called "ungrouped species", which were those characterized by being scarcely represented in the trawlings. In that region, *D. trachyderma* was captured along with the typical Magellanic species, such as the rajids *Bathyraja scaphiops* (Norman, 1937), *B. multispinis* (Norman, 1937) and *Amblyraja doellojuradoi* (Pozzi, 1935).

Studying the species composition of the demersal elasmobranchs in the southern Western Atlantic (Rio Grande do Sul), VOOREN (1997) recorded *Dipturus leptocauda*. This author (pers. comm.), in fact, was referring to *Dipturus trachyderma*. Other Brazilian records of *D. trachyderma* are from off southern São Paulo (25°42'S, 45°08'W), and Rio de Janeiro (23°17'S, 41°01'W, in 477m depth). Still other records (Acácio Tomás, pers. comm.) of this species are: 32°10'S, 50°06'W (Rio Grande do Sul: depth 400m); 29°10'S, 47°49'W (Rio Grande do Sul: depth between 400 and 513m); 23°43'S, 41°35'W (São Paulo: close to Rio de Janeiro; 259m deep, figure 2). This specimen is deposited at the Instituto de Pesca, Santos, São Paulo, but not seen. According to VOOREN (1997), the species composition of southern demersal elasmobranchs includes permanent residents, winter or summer migrants, and sporadically occurring species. *Dipturus trachyderma* fits in the last group. It occurs in depths of 100 to 500m.

This species can be easily identified by the rough dorsal and ventral surfaces of the disc, and by the presence of small scattered denticles, specially on the interorbital region (Fig. 9). It is the largest Brazilian *Dipturus*, reaching more than 2000mm of total length (LEIBLE & STEHMANN 1987).

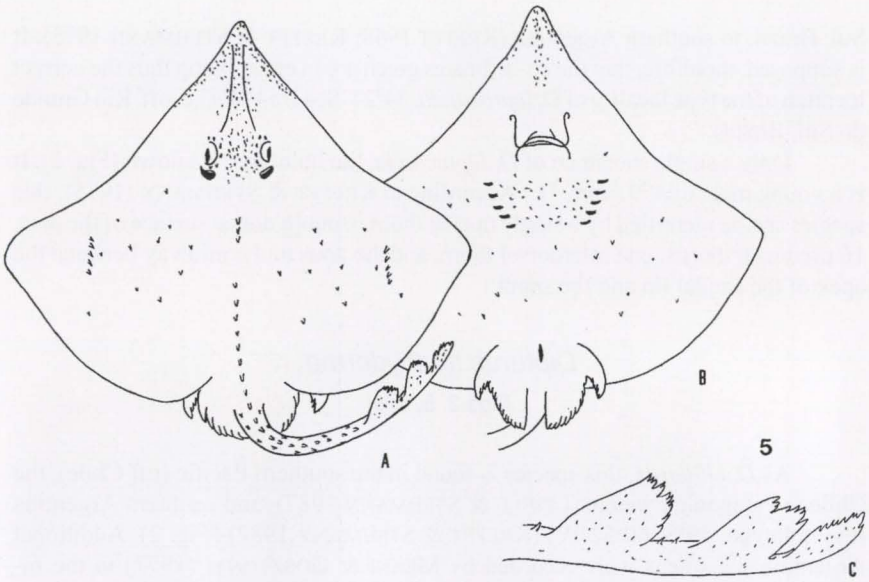


Fig. 5. *Dipturus trachyderma*. (a) Dorsal view, (b) ventral view, (c) caudal region.

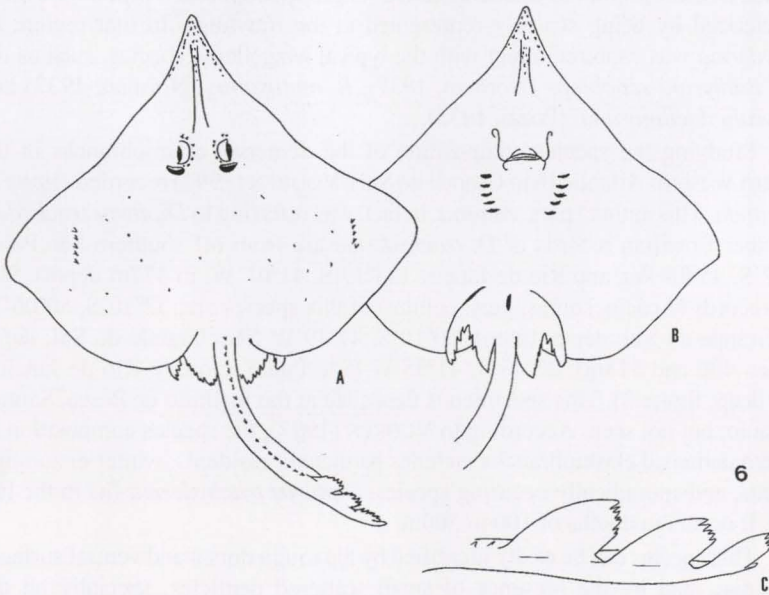


Fig. 6. *Dipturus teevani*. (a) Dorsal view, (b) ventral view, (c) caudal region.





Fig. 7. *Dipturus chilensis*, C.DBAVUERJ 1734, male, 493mm TL, 580mm DW, dorsal view.

### *Dipturus teevani*

Figs 2, 6, 10

The type specimen was caught off Pensacola, Florida, USA (29°11'N, 85°32'W), in 558m depth (BIGELOW & SCHROEDER 1951). The species was later found off the Great Bahama Bank and Santaren Channel at a depth of 549 to 622m, and off the coasts of Honduras and Nicaragua, between 16°43' and 12°25'N in 439-732m depth (BIGELOW & SCHROEDER 1965). UYENO & MIYAKE (1983) also recorded five specimens of *D. teevani* from off Suriname at depths between 525-940m.

The single known Brazilian specimen was collected on July 7, 1999, off Salvador, Bahia State (13°40'S; 38°71'W) at a depth between 450-500 m. The specimen represents the first record of *D. teevani* in Brazilian waters.

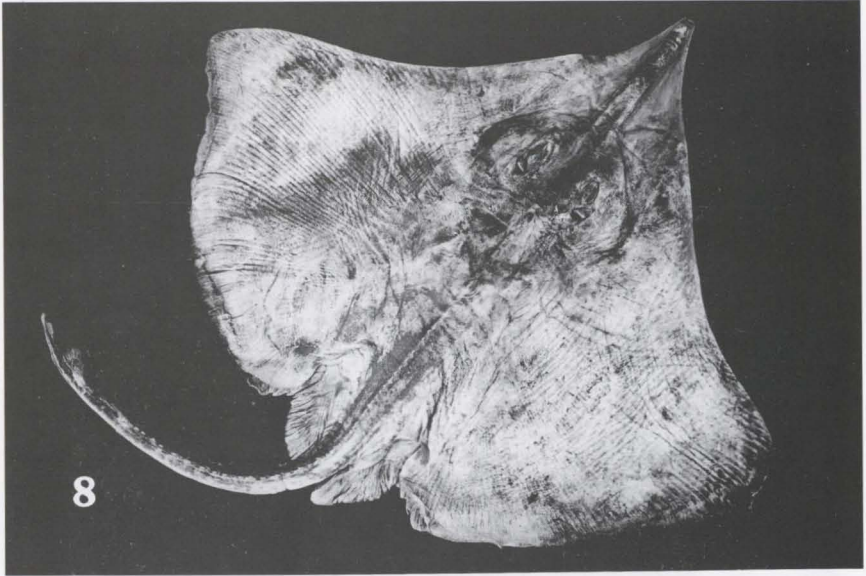


Fig. 8. *Dipturus trachyderma*, FURG EL 76, male, 971mm TL, 740mm DW, dorsal view.

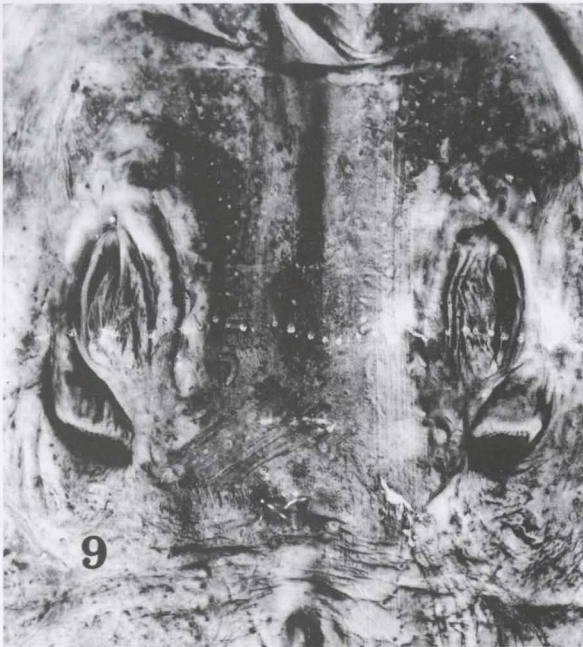


Fig. 9. *Dipturus trachyderma*, same specimen, detail of the interorbital space.

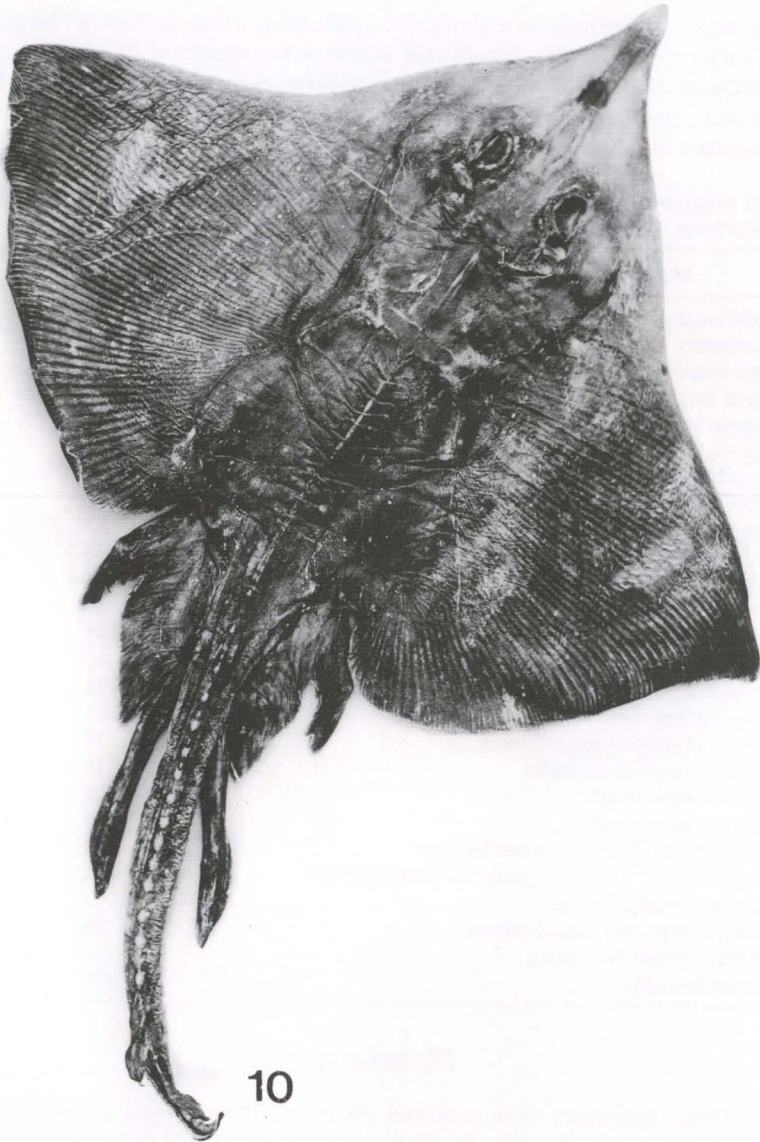


Fig. 10. *Dipturus teevani*, MNRJ 19233, male, 671mm TL, 504mm DW.

*Dipturus teevani* is identified by the following characters as shown in BIGELOW & SCHROEDER (1951, 1953, 1965) and UYENO & MIYAKE (1983): seven orbital thorns; no strong thorns anywhere on the dorsal surface (except on the tail region); minute prickles scattered over the entire disc; coarse prickles on snout and anterior margin of the disc; median row of the tail with 20 thorns; median caudal



thorns beginning posterior to axil of pelvic, and ending a little in front of first dorsal fin; no interspace between dorsals; tail widest at the middle of its length; caudal membrane ending below the middle of caudal fin; two rows of alar thorns; both dorsal and ventral surfaces dark brown; dental formula 27/26. Morphometric and meristic data of the specimen are given in table II.

Table II. Morphometric and meristic data conducted of *Dipturus teevani* (adult male) collected off Bahia State. Measurements are expressed in millimeters.

Morphometric/meristic characters	MNRJ 19233
Total length	671
Disc width	504
Disc length	385
Tip of snout to cloaca length	350
Caudal length	270
Horizontal eye diameter	22
Preorbital length	118
Cranium interorbital length	29
Internasal length	57
Prenasal length	104
Preoral length	119
Mouth width	57
Space between first gill slit	98
Space between fifth gill slit	60
Length of base of first dorsal fin	38
Height of first dorsal fin	23
Length of base of second dorsal fin	37
Height of second dorsal fin	18
Clasper outer length	102
Clasper inner length	140
Length from 1 <sup>st</sup> D origin to caudal apex	107
Length from 1 <sup>st</sup> D origin to posterior margin pelvic	119
Number of orbital thorns	7
Number of median caudal thorns	29
Number of alar thorn rows	2
Dental formula	27/26

### *Dipturus* sp.

Three specimens were collected off Recife, Pernambuco and Natal, Rio Grande do Norte (Northeastern Brazil figure 2) by researchers of the Universidade Federal Rural de Pernambuco and according to Rosângela Lessa it is a new species and it is being described.

### Key to the Brazilian species of *Dipturus*

1. A single nuchal thorn (Figs 3a, 4a) . . . . . 2
- . One row of nuchal thorns (Fig. 5a), or nuchal thorns entirely absent (Fig. 6a) . . . . . 3

2. Scapular thorns absent (Fig. 3a); interbranchial space smooth (Fig. 3b) without small scattered prickles; mouth width two times in preoral length; 1-3 rows of caudal thorns; anus closer to caudal apex than to snout apex . . . *chilensis*
- . One pair of scapular thorns (Fig. 4a); interbranchial space rough with small scattered prickles (Fig. 4b); mouth width three times in preoral length; median row of disc thorns absent; anus midway between caudal space and snout apex . . . . . *leptocauda*
3. One row of nuchal thorns (Fig. 5a); three rows of caudal thorns (Fig. 5a); One row of median disc thorns present (Fig. 5a); interdorsal space present (Fig. 5c); prickles along the whole snout (Fig. 5a); 2<sup>nd</sup> dorsal and caudal fin bases separated by a space (Fig. 5c); dorsal surface of disc rough; interbranchial space with small scattered spines (Fig. 5b); preoral length 3,5 in disc length; adults up to 2m in total length . . . . . *trachyderma*
- . Nuchal thorns absent (Fig. 6a); One row of caudal thorns (Fig. 6a); Median disc thorns absent (Fig. 6a); interdorsal space absent (Fig. 6c); prickles only on the snout apex (Fig. 6a); space between the 2<sup>nd</sup> dorsal and caudal fin base absent (Fig. 6c); dorsal surface of disc smooth to the touch (but with very small prickles); interbranchial space without small scattered prickles (Fig. 6b); preoral length 4,5 in the disc length; adults at the most 700mm in total length . . . . . *teevani*

## CONCLUSIONS

There are no apparent breaks in the distribution of *Dipturus* over the slopes. In South America, *Dipturus* species can be found from Northern to Southern Western Atlantic and Eastern Pacific, as seen in figure 2. *Dipturus chilensis*, *D. trachyderma* occur at least from Chile (Pacific Ocean) to Rio Grande do Sul (Atlantic Ocean). *Dipturus leptocauda* occurs in Rio Grande do Sul with *D. chilensis* and *D. trachyderma*. *Dipturus trachyderma* occurs as far as São Paulo, near Rio de Janeiro (Eastern Brazil). *Dipturus teevani* is the most northern species expanding the occurrence from Florida (USA) to Bahia (Northeastern Brazil).

*Dipturus trachyderma* is the most distinct species, showing rough dorsal and ventral surfaces, and the presence of prickles along the whole snout. It is also the species which reaches the largest adult body size, attaining more than two meters in total length.

The other three species have a quite smooth skin. *Dipturus chilensis* and *D. leptocauda* share the presence of a single nuchal thorn. The former has no scapular thorns and has a smooth interbranchial space, while a pair of scapular thorns can be found in *D. leptocauda* (as well as the presence of interbranchial prickles). *Dipturus teevani* is distinct from the other three by the absence of a space between the dorsal fins, and also between the second dorsal and caudal fin.

ACKNOWLEDGEMENT. The authors would like to thank Dr. Carolus Vooren (Fundação Universidade do Rio Grande); Drs. Zilda Lucena and Carlos Lucena (Museu de Ciências e

Tecnologia da PUC; Rio Grande do Sul); Dr. José Figueiredo (Museu de Zoologia da USP); Dr. Gustavo Nunan (Museu Nacional do Rio de Janeiro); and Gustavo Chiaramonte (Museo Argentino de Ciencias Naturales "Bernardino Rivadavia") for the loan of specimens or access to the fish collections under their care. Oceanographer Acácio Tomás (Instituto de Pesca de Santos) and Dr. Rosângela Lessa (Universidade Federal Rural de Pernambuco), for providing respectively information on two specimens of *D. trachyderma* and on the occurrence of *Dipturus* in Pernambuco. MSc Frieda Marti who translated papers from German articles. Dr. Paulo Brito, Biologist Hugo Santos (Universidade do Estado do Rio de Janeiro) and Dr. Gustavo Nunan, who kindly reviewed the manuscript and suggested pertinent improvements. Biologist Hugo Santos helped with the map on figure 2.

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Recebido em 02.III.2000; aceito em 05.IV.2001.