

determine species of *Eucinostomus*, indicate the inadequate knowledge of taxonomy of these fishes and the necessity of future studies.

The size of our specimens does not reflect the true population structure because we used only individuals larger than 77.1 mm SL. Our results may not apply to fishes smaller than this because of allometry.

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OCCURRENCE OF *CENTROSCYLLIUM FABRICII* (REINHARDT, 1825) (ELASMOBRANCHII, SQUALIDAE) IN THE BEAGLE CHANNEL, SOUTHERN SOUTH AMERICA

Roberto C. Menni, George H. Burgess and Mirta L. Garcia

The squalid shark genus *Centroscyllium* comprises a small group of seven or eight poorly known species with rather restricted distributions (Bigelow and Schroeder, 1948, 1954, 1957; Compagno, 1984; Melendez C. and Meneses R., 1986; Melendez, 1988; Shirai and Nakaya, 1990). The genus is being revised by Shigeru Shirai and George Burgess. Currently recognized species include the re-

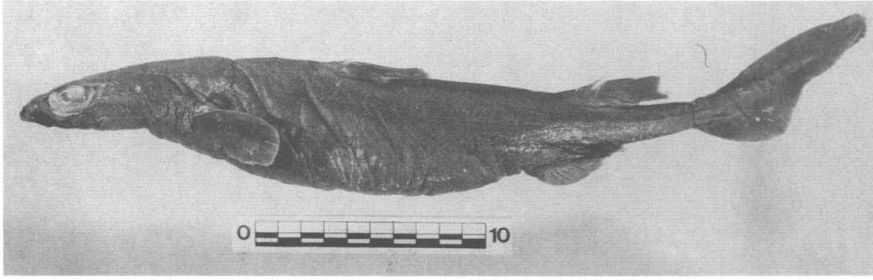


Figure 1. *Centroscyllium fabricii* (MLP 9-VIII-90-1), 378 mm female, captured off Ushuaia, Beagle Channel, Argentina.

cently described *excelsum* Shirai and Nakaya, 1990; *fabricii* (Reinhardt, 1825); *granulatum* Gunther, 1887; *kamoharai* Abe, 1966; *nigrum* (Garman, 1899); *ornatum* (Alcock, 1889); and *ritteri* Jordan and Fowler, 1903. The status of *C. ruscosum* Gilbert, 1905, often relegated to synonymy of *C. nigrum*, is questionable.

Until recently, the sole species from the western South Atlantic represented in collections was *C. granulatum*, originally described from the holotype captured in the Malvinas Islands off southern Argentina, and reported by Melendez C. and Meneses R. (1986) and Melendez (1988) from the Chilean slope in the eastern Pacific between Arica (18°25'S) and Isla Mocha (38°15'S). Fowler (1945) and Mann F. (1954) reported *C. fabricii* from Chile, but these reports probably refer to *C. granulatum* since we have examined numerous specimens of this species from the west coast of South America, but none of the former. More recently, Bahamonde and Pequeño (1975) do not include *C. fabricii* in their list of Chilean fishes.

An early listing of *C. fabricii* from the Malvinas by Lahille (1921) probably refers to *C. granulatum*. Bigelow and Schroeder (1948) erred in referring Lahille's listing to "*C. granulatum* Günther, 1880," actually *Spinax granulatus* (= *Etmopterus granulatus*), another squalid with the identical specific epithet described by Günther (1880) from off Chile prior to his equally brief description of *C. granulatum* in 1887 (Burgess and Springer, MS¹; Krefft, 1968). Similarly, Pozzi and Bordale (1935) and Lopez (1963) are thought to have included *C. fabricii* on the basis of *C. granulatum*, while Menni et al. (1984) and Menni (1986) recorded the species correctly as *C. granulatum*. Lopez et al. (1989) reported, under the name *C. granulatum*, the material studied herein.

Three specimens of a *Centroscyllium* species (Fig. 1) were collected in the Argentine (northern) portion of the Beagle Channel by members of the Bioecología de los Recursos Icticos del Canal Beagle research project, and were forwarded to the Laboratory of Ichthyology, Museo de La Plata, for further study. Initial use of the keys and descriptions of Bigelow and Schroeder (1948, 1957) and Compagno (1984), and later comparisons with *Centroscyllium* spp. material housed at the Florida Museum of Natural History revealed that these are referable to *C. fabricii*, a predominantly northern species heretofore known only from as far south as the offing of Chesapeake Bay, U.S.A., in the western Atlantic. In the eastern Atlantic *C. fabricii* has been recorded southward to Liberia and then, disjunctly, from off Namibia to Cape Agulhas (Burgess, unpubl.; Compagno et al., 1989).

Measurements were made following criteria used by Springer (1979), Springer and Burgess (1985), Burgess and Springer (1986), and Yamakawa et al. (1986).

¹ Burgess, G. H. and S. Springer. A new species of the lantern shark genus *Etmopterus* (Elasmobranchii, Squalidae) from the eastern Pacific off Central America. Manuscript.

Table 1. Morphometric measurements of Argentinean *Centroscyllium fabricii* compared to specimens from throughout its range in the Atlantic Ocean. The relative changes in many proportions, expressed as percentages of total length (in parentheses), are functions of ontogenetic growth.

	UF 3974 U.S.A.		UF 44543 Iceland		Argentina		Argentina		UF 3974 U.S.A.		Argentina		UF 44758 Namibia	
	Sex	320 F	342 F	349 F	358 F	362 M	372 F	378 F	349 F	358 F	362 M	372 F	378 F	378 F
Total length (mm)		7 (2)	5.5 (2)	—	5 (1)	7 (2)	5 (1)	6 (2)	—	12 (3)	13 (4)	13.5 (4)	15 (4)	15 (4)
Sex		14 (4)	16 (5)	—	12 (3)	13 (4)	13.5 (4)	15 (4)	—	27.9 (8)	29 (8)	29.4 (8)	29 (8)	29 (8)
Tip of snout to:		31 (10)	29 (9)	—	27.9 (8)	29 (8)	29.4 (8)	29 (8)	—	20 (6)	23 (6)	20.5 (6)	18 (5)	18 (5)
Anterior nasal aperture		20 (6)	20 (6)	18 (5)	20 (6)	23 (6)	20.5 (6)	18 (5)	—	47 (13)	47 (13)	39 (11)	41 (11)	41 (11)
Posterior nasal aperture		47 (15)	44 (13)	35.5 (10)	34.5 (10)	47 (13)	39 (11)	41 (11)	—	64 (18)	64 (18)	63 (17)	56 (15)	56 (15)
Front of mouth		70 (22)	63 (18)	59.5 (17)	58.2 (16)	64 (18)	63 (17)	56 (15)	—	76 (21)	76 (21)	76 (20)	74 (20)	74 (20)
Eye		83 (26)	79 (23)	71 (20)	73.8 (21)	76 (21)	76 (20)	74 (20)	—	75 (21)	75 (21)	75 (20)	75 (20)	75 (20)
Spiracle		83 (26)	80 (23)	70.5 (20)	74.5 (21)	76 (21)	75 (20)	75 (20)	—	119 (33)	119 (33)	123.5 (33)	111 (29)	111 (29)
First gill opening		100 (31)	115 (34)	118 (34)	121 (34)	119 (33)	123.5 (33)	111 (29)	—	190 (52)	190 (52)	215 (58)	210 (56)	210 (56)
Fifth gill opening		175 (55)	185 (54)	192 (55)	203 (57)	205 (57)	215 (58)	210 (56)	—	205 (57)	205 (57)	226.5 (61)	224 (59)	224 (59)
Pectoral fin origin		180 (56)	204 (60)	202 (58)	219.1 (61)	205 (57)	226.5 (61)	224 (59)	—	265 (73)	265 (73)	294.5 (79)	285 (75)	285 (75)
Pelvic fin origin		235 (74)	256 (75)	271.5 (78)	280 (78)	265 (73)	294.5 (79)	285 (75)	—	204 (56)	204 (56)	236.0 (63)	222 (59)	222 (59)
Second dorsal fin origin		170 (53)	198 (58)	209 (60)	220.5 (62)	204 (56)	236.0 (63)	222 (59)	—	66 (18)	66 (18)	70.5 (19)	77 (20)	77 (20)
Origin upper caudal lobe		51 (16)	69 (20)	60 (17)	70 (20)	66 (18)	70.5 (19)	77 (20)	—	23 (6)	23 (6)	34.5 (9)	30 (8)	30 (8)
Anus		21 (7)	30 (9)	32 (9)	36.5 (10)	23 (6)	34.5 (9)	30 (8)	—	97 (27)	97 (27)	127 (34)	110 (29)	110 (29)
Distance between fin bases:		86 (27)	93 (27)	102 (29)	113 (32)	97 (27)	127 (34)	110 (29)	—	43 (12)	43 (12)	43.5 (12)	48 (13)	48 (13)
First-second dorsals		36 (11)	41 (12)	46.5 (13)	43.5 (12)	43 (12)	43.5 (12)	48 (13)	—	15 (4)	15 (4)	18.1 (5)	20 (5)	20 (5)
Second dorsal-caudal		10 (3)	14 (4)	14 (4)	19.1 (5)	15 (4)	18.1 (5)	20 (5)	—	29 (8)	29 (8)	24.2 (7)	34 (9)	34 (9)
Pectoral-pelvic		14 (4)	26 (8)	27 (8)	28 (8)	29 (8)	24.2 (7)	34 (9)	—	21 (6)	21 (6)	15 (4)	15 (4)	15 (4)
Pelvic-caudal		15 (5)	19 (6)	—	15.2 (4)	21 (6)	15 (4)	15 (4)	—	21 (6)	21 (6)	20.5 (6)	26 (7)	26 (7)
Length from caudal origin to:		20 (6)	20 (6)	18 (5)	20 (6)	21 (6)	20.5 (6)	26 (7)	—	9 (3)	9 (3)	11.5 (3)	10 (3)	10 (3)
Tip 2nd dorsal free margin		9 (3)	11 (3)	11.2 (3)	12.8 (4)	9 (3)	11.5 (3)	10 (3)	—	6 (2)	6 (2)	7.5 (2)	11 (3)	11 (3)
Tip pelvic fin		8 (3)	6 (2)	6.1 (2)	—	6 (2)	7.5 (2)	11 (3)	—	4 (1)	4 (1)	7.0 (2)	6 (2)	6 (2)
Intermarial distance		6 (2)	5 (2)	5.1 (2)	—	4 (1)	7.0 (2)	6 (2)	—	33 (9)	33 (9)	35.5 (10)	36 (10)	36 (10)
Orbit length		32 (10)	33 (10)	35 (10)	37.5 (11)	33 (9)	35.5 (10)	36 (10)	—	9 (3)	9 (3)	9 (3)	10.2 (3)	10.2 (3)
Orbit height		11 (3)	10 (3)	8.5 (2)	8 (2)	9 (3)	9 (3)	10.2 (3)	—	8 (2)	8 (2)	9 (2)	9 (2)	9 (2)
Upper labial furrow length		6 (2)	5 (2)	5.1 (2)	—	4 (1)	7.0 (2)	6 (2)	—	15 (4)	15 (4)	15 (4)	15 (4)	15 (4)
Lower labial furrow length		32 (10)	33 (10)	35 (10)	37.5 (11)	33 (9)	35.5 (10)	36 (10)	—	20 (6)	20 (6)	20.5 (6)	26 (7)	26 (7)
Mouth width		11 (3)	10 (3)	8.5 (2)	8 (2)	9 (3)	9 (3)	10.2 (3)	—	9 (3)	9 (3)	11.5 (3)	10 (3)	10 (3)
Mouth length		8 (2)	8 (2)	8.5 (2)	8 (2)	9 (3)	9 (3)	10.2 (3)	—	6 (2)	6 (2)	7.0 (2)	6 (2)	6 (2)

Table 1. Continued.

	UF 3974 U.S.A.	UF 44543 Iceland	Argentina	Argentina	UF 3974 U.S.A.	Argentina	UF 44758 Namibia
Spiracle greatest diameter	5 (2)	3 (1)	6.5 (2)	5.5 (2)	5 (1)	6.0 (2)	5 (1)
Eye to spiracle length	7 (2)	8 (2)	6 (2)	7 (2)	7 (2)	8.5 (2)	8 (2)
Gill opening 1 height	10 (3)	11 (3)	8 (2)	10 (3)	10 (3)	6 (2)	9 (2)
Gill opening 3 height	8 (3)	11 (3)	10 (4)	9.5 (3)	8 (2)	9 (2)	9 (2)
Gill opening 5 height	10 (3)	10 (3)	10 (4)	9.5 (3)	10 (3)	9.5 (3)	12 (3)
Interocular distance	29 (9)	35 (10)	30 (9)	34.1 (10)	32 (9)	34 (9)	29 (8)
First dorsal fin:							
Base	31 (10)	21 (6)	32.5 (9)	27.5 (8)	33 (9)	33.5 (9)	32 (9)
Inner margin	20 (6)	19 (6)	18.2 (5)	21 (6)	20 (6)	19 (5)	22 (6)
Height	16 (5)	13 (4)	damaged	12 (3)	16 (4)	15 (4)	15 (4)
Anterior margin	33 (10)	25 (7)	damaged	40 (11)	32 (9)	37 (10)	36 (10)
Spine	13 (4)	12 (4)	damaged	14.5 (4)	10 (3)	11 (3)	10 (3)
Exposed spine	10 (3)	11 (3)	damaged	10 (3)	10 (3)	11 (3)	10 (3)
Second dorsal fin:							
Base	30 (9)	31 (9)	36 (10)	31.5 (9)	32 (9)	35 (9)	36 (10)
Inner margin	18 (6)	16 (5)	19 (5)	18 (5)	20 (6)	18 (5)	19 (5)
Height	18 (6)	20 (6)	19 (5)	20 (6)	23 (6)	20 (5)	22 (6)
Anterior margin	43 (14)	37 (11)	37.5 (11)	41 (11)	42 (12)	44.5 (12)	42 (11)
Spine	29 (9)	23 (7)	28 (8)	24.5 (7)	21 (6)	26 (7)	24 (6)
Exposed spine	18 (6)	18 (5)	22.5 (6)	18.5 (5)	20 (6)	19.5 (5)	20 (5)
Pectoral fin:							
Base width	15 (5)	17 (5)	17 (5)	18 (5)	17 (5)	23 (6)	15 (4)
Anterior margin	27 (9)	29 (9)	30 (9)	31 (9)	25 (7)	37 (10)	36 (10)
Greatest width	27 (9)	24 (7)	26 (7)	28 (8)	27 (8)	27 (7)	28 (7)
Maximum length	34 (11)	34 (10)	35 (10)	35.5 (10)	36 (10)	38 (10)	42 (11)
Pelvic fin:							
Overall length	42 (13)	42 (12)	44 (13)	45 (13)	43 (12)	45.5 (12)	43 (11)
Anterior margin	15 (5)	21 (6)	23 (7)	21 (6)	18 (5)	24.5 (7)	25 (7)
Distal margin	26 (8)	23 (7)	29 (8)	29.8 (8)	26 (7)	29 (8)	29 (8)

Table 1. Continued.

	UF 3974 U.S.A.	UF 44543 Iceland	Argentina	Argentina	UF 3974 U.S.A.	Argentina	Argentina	UF 44758 Namibia
Caudal fin:								
Upper lobe, outer margin	84 (26)	90 (26)	76 (22)	68.5 (19)	94 (26)	75 (20)	84 (22)	
Lower lobe, outer margin	34 (11)	43 (13)	37.5 (11)	39.5 (11)	43 (12)	42 (11)	41 (11)	
Upper lobe, tip to notch	20 (6)	20 (6)	18 (5)	14.5 (4)	22 (6)	18 (5)	25 (7)	
Trunk width at:								
Pectoral fin origin	—	38 (11)	47 (14)	52 (15)	—	48 (13)	42 (11)	
Pelvic fin origin	17 (5)	20 (6)	—	—	16 (4)	30 (8)	23 (6)	
Caudal fin origin	5 (2)	6 (2)	7 (2)	7 (2)	6 (2)	7.5 (2)	6 (2)	
Trunk height at:								
Pectoral fin origin	—	37 (11)	40 (12)	33.5 (9)	—	36 (10)	36 (10)	
Pelvic fin origin	21 (7)	29 (9)	—	—	22 (6)	28.2 (8)	23 (6)	
Caudal fin origin	9 (3)	10 (3)	10 (3)	10.2 (3)	9 (3)	10 (3)	11 (3)	

Study Material.—*Centroscyllium fabricii*: MLP 9-VIII-90-1, three females, 349, 358 and 372 mm total length (TL), off Ushuaia, Beagle Channel, Argentina, 54°50'S, 68°20'W, 1987; UF 3974, 320 mm TL female and 362 mm TL male, off Delaware, U.S.A., 1,152–1,234 m, 30 June 1953; UF 44543, 342 mm TL female, off Iceland, 1,505–1,510 m, 9 March 1986; UF 44758, 378 mm female, off Namibia, 652 m, 9 September 1984.

Specimens of *C. granulatum* (*), *C. kamoharai*, *C. nigrum* (*), *C. ritteri* (*), and *C. ruscosum* (*) deposited at the Florida Museum of Natural History and other institutions, including types (indicated by *), were available for comparison.

Description.—Proportional measurements of Argentinean specimens expressed as percentages of total length:

Trunk at origin of pectoral: width 13–15, height 9–12; snout length in front of: outer nostrils 1, mouth 8; horizontal diameter eye 5–6; mouth: width 10–11, length 2; labial furrow length: upper 2, lower 2; gill opening height: 1st 2–3, 3rd 2–4, 5th 3–4; first dorsal fin: height 3–4, base 8–9; second dorsal fin: height 5–6, base 9–10; caudal fin: upper outer margin 19–22, lower outer margin 11; pectoral fin: maximum length 10, maximum width 7–8; distance from tip of snout to origin of: first dorsal 33–34, second dorsal 58–61, upper caudal 78–79, pectoral 20–21, pelvic 55–58; interspace between fin bases: first dorsal-second dorsal 17–20, second dorsal-upper caudal 9–10, pectoral-pelvic 29–34, pelvic-lower caudal 12–13.

Height of trunk at level of first dorsal fin 12–14 of precaudal length (PCL); head 26 of PCL. Preoral length (POL) 38–39 of head length; preanarial length 17–18 of POL; internarial 51–55 of POL; horizontal diameter of eye (HDE) 70–72 of POL.

Origin of first dorsal fin (D1) clearly posterior to adpressed pectoral fin tips (by about $\frac{2}{3}$ HDE); inner margin D1 56–76 of its base; D1 spine located approximately $\frac{1}{3}$ way between pectoral insertion and pelvic origin; exposed portion D1 spine 50–54 of HDE.

Second dorsal fin (D2) base 105–115 of D1 base; D2 inner margin 51–57 of its base; D2 spine located over posterior $\frac{1}{3}$ of pelvis; interspace between D2 and caudal 89–116 D2 base; origin of pelvis clearly anterior to D2 origin. Anterior margin pectoral fin 42–44 of head length.

Complete morphometric measurements of Argentinean specimens are included in Table 1.

At first sight the preserved specimens appear black but they are uniformly dark brown dorsally, darker ventrally; no other marking apparent. Teeth tricuspidate, in three functional rows. Dermal denticles are thorn-like spines erupting out of stellate bases.

DISCUSSION

Comparisons of proportional measurements of the Beagle Channel material with those provided by Bigelow and Schroeder (1948) and specimens of a graded size series of *C. fabricii* from throughout its range show good agreement (Table 1). Dermal denticles of *C. fabricii* are described by Bigelow and Schroeder (1948, 1957) as “in the form of spines or thorns on stellate bases” and are illustrated in the 1948 work. Our SEM photographs of denticles from the head (Fig. 2) and trunk (Fig. 3) are consistent with these illustrations and descriptions, including the mid-spine curvature. Slight differences are observed between head and trunk denticles, a trend common in squaloid sharks. The distribution of scales on the body surface is rather regular.

The 358 mm/151 g (eviscerated weight) specimen was dissected for biological data. Stomach contents included digested fishes and crustaceans (probably the crab *Lithodes antarcticus*). The two ovaries contained a total of eight ova weighing 56.18 g and measuring from 19.7–25.5 mm (\bar{x} = 22.7, N = 5), and the liver

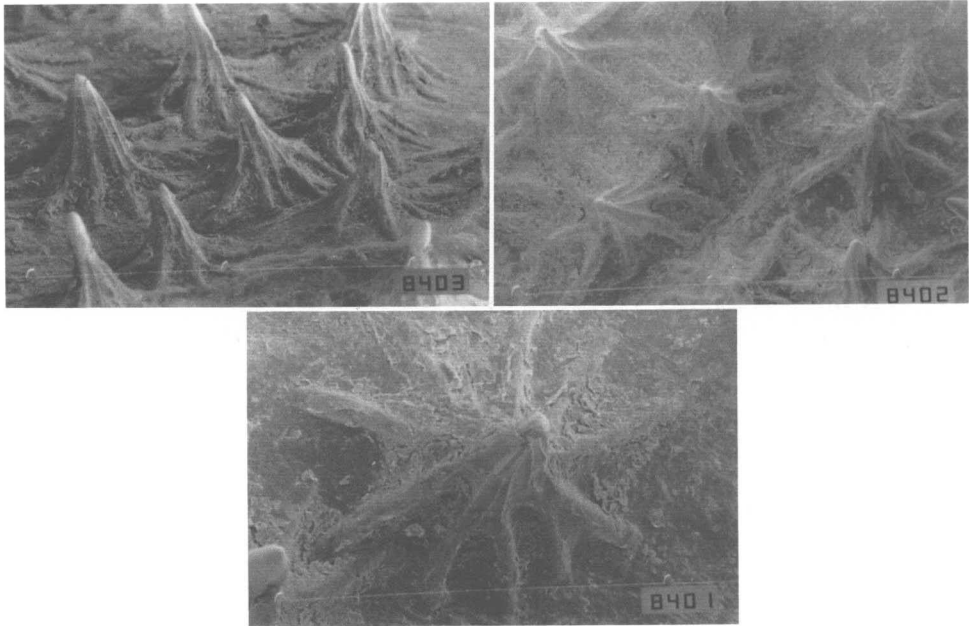


Figure 2. Dermal denticles of *Centroscyllium fabricii* (MLP 9-VII-90-1): head denticles. A left) Oblique lateral view (50×); B right) Top view (50×); C bottom) Top view, single denticle (100×).

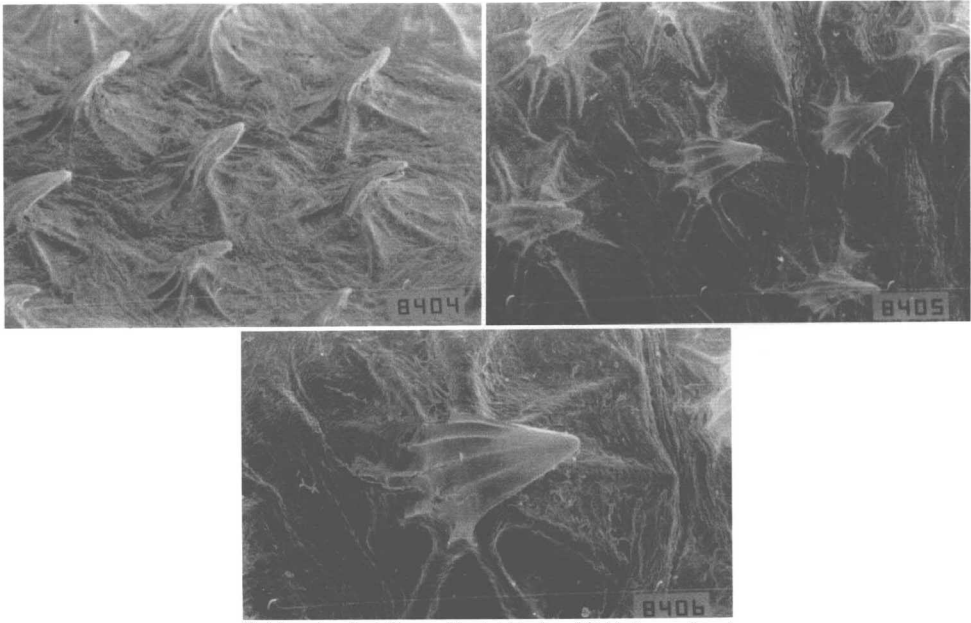


Figure 3. Dermal denticles of *Centroscyllium fabricii* (MLP 9-VII-90-1): trunk denticles at level of first dorsal fin. A left) Oblique lateral view (50×); B right) Oblique top view (50×); C bottom) Top view, single denticle (100×).

weighed 47.64 g. The liver from the 349 mm /134 g (eviscerated weight) specimen weighed 32.48 g. The 372 mm specimen had a total weight of 295 g.

Beagle Channel specimens of *C. fabricii* were collected in shallow waters of less than 130 m depth. *C. fabricii* is considered a deepwater species that is largely confined to the deepest continental shelf and upper slope waters (Burgess, unpubl. data; Compagno, 1984). In the northern portion of its range "it may move to near the surface, especially during the winter and when darkest" (Compagno, 1984) and in the western North Atlantic it is found in shallower waters in the northern part of its range than in the south (Burgess, unpubl. data). Presumably the shallow depths of capture of the Beagle Channel material is similarly related to water temperature. Water temperature from the coast line to 20 m depth in the capture area (February 1987 to November 1989 data) range from 3.2–11.7°C at the surface and from 4.8–11.7°C at the bottom.

The distributions of squaloid sharks is both interesting and perplexing. The geographic ranges of many squalid species are poorly known because of inadequate and/or inappropriate sampling. The development of larger and more efficient bottom and midwater trawls, increases in deepwater longline fishing effort, and accelerated worldwide exploratory fishing activities have demonstrated that many species thought to be rare are in fact much more numerous and far more widespread. Although Argentinean waters have been well sampled in German and Japanese fisheries investigations, the few specimens collected make it difficult to determine if the Beagle Channel *C. fabricii* represent an established population or simply transient waifs. Based on zoogeographical considerations and our knowledge of squaloids, however, it seems quite reasonable to assume that this species is a resident of the region. Similar antitropical patterns of distribution are also evident in the squalid genera *Etmopterus* and *Squalus* (Burgess and Springer, MS).¹ The scarcity of *C. fabricii* in the southwest Atlantic is puzzling, however, since this species is abundant throughout its range in the North Atlantic.

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1987 CORAL REEF BLEACHING AT CABO PULMO REEF, GULF OF CALIFORNIA, MEXICO

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The bleaching of stony corals has been cause of concern the last few years, mainly for its widespread geographical occurrence and the mortality of affected coral colonies. Two important papers have reviewed the available information (Brown, 1987; Williams and Williams, 1990). Both mention that bleachings can be caused by many different circumstances, but it is recognized that the global events of the last decade may have high temperature of the ocean water as its most possible origin.

During 1983, the eastern Pacific region suffered massive coral mortalities caused by "El Niño" Southern Oscillation (80% of the living coral cover in some areas)