Gayana Zool. 54(3-4): 67-77, 1990 ISSN 0016-531X

STUDIES ON ARGENTINE PLEURONECTIFORMES V: MORPHOMETRICS AND OTHER BIOLOGICAL ASPECTS OF *XYSTREURYS RASILE* (BOTHIDAE, PARALICHTHYINAE)

ESTUDIOS SOBRE PLEURONECTIFORMES DE LA ARGENTINA V: MORFOMETRIA Y OTROS ASPECTOS BIOLOGICOS DE XYSTREURYS RASILE *(BOTHIDAE, PARALICHTHYINAE)*

Mirta L. García and Roberto C. Menni*

ABSTRACT

Xystreurys rasile (Jordan, 1890) is the most common flounder in the Mar del Plata area in Argentina (38°S, 57°30'W). A detailed description based on 39 specimens is provided, together with full references. Total length of 641 specimens landed at Mar del Plata harbour ranges from 234 to 402 mm. Larger fish were observed in winter and at the end of the summer. Equations of the length-weight relationship were $9.33.\ 10^{-8}.\ L^{3.783048}$ (males, r = .85) and $5.32.\ 10^{-7}.\ L^{3.086809}$ (females, r = .90). The sexual cycle was analyzed on 80 males and 366 females. At the studied area *X. rasile* is in a post spawning or gonadal recrudescense stage during the southern hemisphere autumn and winter. First evidences of maturity appear in both sexes at the beginning of spring, with full maturity ocurring during late spring. Available information indicates that the species lives in depths between 26 to 135 m with temperatures from 7.3 to 20.1 °C mainly in low salinities. The largest abundances were observed at about 40-50 m depth.

KEYWORDS: *Xystreurys rasile,* Bothidae, Morphometrics, Sexual cycle, Argentine fish fauna.

RESUMEN

Xystreurys rasile (Jordan, 1890) es el lenguado más común en el área de Mar del Plata, en Argentina (38°S, 57°30'W). Se provee una descripción detallada, basada en 39 ejemplares, junto con referencias completas. El rango de longitud de 641 ejemplares desembarcados en el puerto de Mar del Plata fue de 234 a 402 mm. Los peces de mayor tamaño fueron observados en invierno y al fin del verano. Las ecuaciones para la relación longitud-peso fueron $9.33.\ 10^{-8}.L^{3.783048}$ (machos, r = .85) y $5.32.\ 10^{-7}.\ L^{3.086809}$ (hembras, r = .90). El ciclo sexual fue analizado sobre 80 machos y 366 hembras. En el área estudiada *X. rasile* está en post-desove o reversión gonadal durante el otoño y el invierno del hemisferio sur. Las primeras evidencias de madurez aparecen en ambos sexos al comienzo de la primavera, y de madurez completa al final de la primavera. La información disponible indica que la especie vive entre 26 y 135 m de profundidad, con temperaturas de 7.3 a 20.1 °C, mayormente en bajas salinidades. Las mayores abundancias se han observado hacia los 40-50 m.

PALABRAS CLAVES: *Xystreurys rasile,* Bothidae, Morfometría, Ciclo sexual, Ictiofauna argentina.

*CONICET. Museo de La Plata, Paseo del Bosque s/n 1900 La Plata, Argentina.

INTRODUCTION

In spite of their considerable economic importance, flatfishes are among the last fish groups to attract a biological study in the Southwestern Altantic. This is largely due to some morphological homogeneity which results in taxonomic difficulties.

During the first half of the century, Lahille (1939) and Norman (1934, 1937) published classical papers on Argentine pleuronectiforms including many taxonomic information. Later Menni *et al.* considered the Bothinae (1984) and *Thysanopsetta naresi* (1985).

Xystreurys rasile is the most common flounder in the Mar del Plata area (38°S, 57°30'W) (See also Bellisio *et al.*, 1979 and García, 1987a). It is currently used for human food and also in the fish meal industry.

As far as it is known, the species ranges from 23°06'S to 47°S at 26-135 m depth, with bottom temperatures from 7.3 to 18.8 °C (Norman, 1937; Lema, 1963; Carvalho *et al.*, 1968; Roux, 1973; Bellisio *et al.*, 1979; Gosztonyi, 1981; Menni *et al.* , 1981). Nakamura (1986) indicates a wider distribution.

From an ecological point of view, Menni and López (1984) consider *X. rasile* as a member of the "Inner shelf mixed fauna". In a similar context, Angelescu and Prenski (1987) and Prenski and Sanchez (1988) show its general distribution, fishery group and bathymetry. Fabre (1988) studied the otoliths morphology and Fabre and Cousseau (1988) provide observations on the age and growth. García (1987a) treated with detail its feeding habits, which are mainly based upon crustacea reptantia —the fish being a primary carnivore— and proposed a putative trophic net.

The aim of this paper is to provide complete references for *X. rasile*, a description based on numerous specimens, the length of fishes commercially captured, the length-weight relationship and a sexual cycle analysis. Temperature, salinity and depth range of the area in which the species occurs are also considered.

MATERIAL AND METHODS

Fish studied for this paper come from commercial samples landed at the Mar del Plata harbour between May 1981 and March 1982, and from fishing cruises performed by the Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP) ships which also provided oceanographical data. Description follows criteria from Norman (1934, 1937), Ginsburg (1952) and Menni *et al.* (1984, 1985). It is based on 39 specimens whose origin, total length (mm) and number at the Laboratorio de Ictiología (Museo de La Plata) files (in parenthesis) follows:

R/V Capitán Canepa, trip 03/81.

Haul 42, 6-4-81: 277 (19); 258.5 (20); 270 (21); 270 (22); 267 (23).

Haul 43, 6-4-81: 277.5 (30); 284 (31); 264 (32); 295 (33); 246.5 (34); 261 (35); 263 (36); 280 (37); 266.5 (38); 287 (39); 266 (40); 294 (41); 280 (42); 268.5 (43); 242.5 (52); 236 (53).

Haul 48, 7-4-81: 282 (142); 280 (144); 290 (145); 282.5 (146).

Haul 57, 10-4-81: 240 (47); 255 (48); 241 (49); 226 (50); 239 (51).

Haul 58, 10-4-81: 251 (57); 319 (58); 280 (59).

No data, 4-81: 280 (148); 211 (149).

Coastal fishing, 8-81: 223 (67); 251 (68); 250 (69); 238.5 (70).

For biological studies 641 specimens from commercial captures were examined and used to show length distribution. Subsamples were taken for other analysis. It must be noted that small specimens were discarded aboard because of market preferences. Data from 86 males (234 to 340 mm TL and 80 to 337 g W) and 394 females (243 to 402 mm TL and 100 to 580 g W) were used in the calculation of the length-weight relationship according to Moroney (1968) and Ricker (1975). The maturity scale of seven stages developed for *Merluccius hubbsi* by Christiansen and Cousseau (1971) was adopted for the analysis of the sexual cycle in 79 males and 365 females. The gonosomatic index was calculated as GI = gonad weight. 100/ total weight of fish. Specimens were weighted to the nearest gram and gonads to 0.01 g. During fishing trips, staff

from the INIDEP checked over 2,700 individuals on which distributional information is mainly based.

TAXONOMIC ASPECTS

The genus *Xystreurys* Jordan and Gilbert, 1881 includes only two species: *X. liolepsis* Jordan and Gilbert, 1881 from Southern California and the Southwestern Atlantic *X. rasile*. This last species was formerly described in the genus *Verecundum* Jordan, 1890. Hubbs and Marini (1939) gave special weight to the validity of this genus, which Norman do not recognize neither in his 1934 monograph or his synopsis (1966). Considering of the differential characteristics proposed by Hubbs and Marini (1939) two exceptions are found: there exist dextral individuals, and the caudal length may be lesser than the head length. Gill rakers characteristics are, as far as the experience with *Paralichthys* species suggest, only of specific value, as also is with fin rays lengths and branching. Lastly, the morphology of the olfatory laminae is used at supraspecific level (Norman, 1934). Then we maintain in this paper the use of *Xystreurys* as in Norman (1934, 1937, 1966).

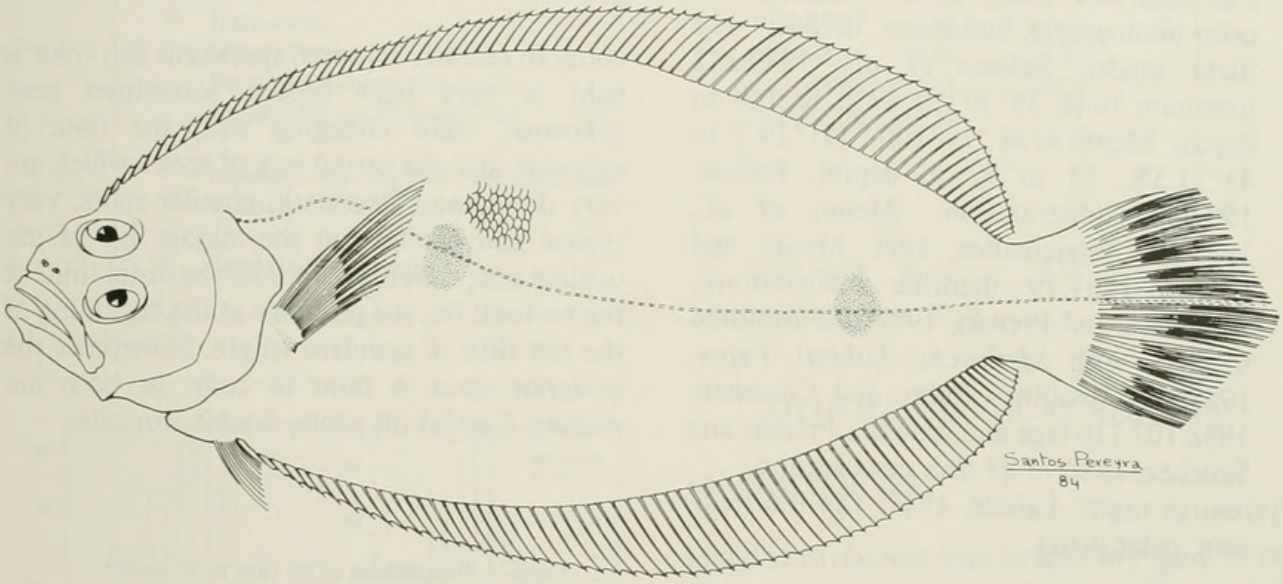

FIG. 1. *X. rasile*, a female 300 mm TL, Mar del Plata.

Xystreurys rasile (Jordan, 1890) Norman, 1934 (Fig. 1)

Verecundum rasile Jordan, 1890:330 (original description, Bahía, Brazil). Hubbs and Marini. 1939:159-166 (revision, Argentina). De Buen, 1950:96 (reference). Ringuelet and Aramburu, 1960:90-91 (nominal, key). Barcellos, 1962b:12 (Rio Grande do Sul, Brazil). Nani, 1964:17 (Mar del Plata, February to April). Olivier *et al.*, 1968:32, 34, 36, 46, 69 and 82 (benthic associations in Mar del Plata). Menezes, 1971:60 (Rio Grande do Sul, Brazil). Benvegnú, 1973:499 (Rio Grande do Sul, Brazil and Maldonado, Uruguay). Lema *et al.*, 1980:33 (reference, Brazil). Gosztonyi, 1981:265 (36°59' to 46°59'S down to 135 m). Nakamura, 1986: 302-303 (description, distribution in Argentina, color photograph).

Hippoglosina notata Berg, 1895:75 (description, Mar del Plata).

Xystreurys brasiliensis Regan, 1914a:17 (description, Brazil). Regan, 1914b:23 (description, Brazil).

Xystreurys notatus: Miranda Ribeiro, 1915:11 (Brazil, Uruguay and Argentina).

Xystreurys rasile: Norman, 1934:121 (revision, new combination). Mac Donagh, 1936:425 (sinonimization of *H. notata).* Norman, 1937:135-136 (description, North of Patagonia). Chiesa, 1945:98 (Argentina from 35° to 44°S). Angelescu *et al.*, 1958:136 (captured with *Merluccius hubbsi).* Barcellos, 1962a:10 (Rio Grande do Sul, Brazil). Lema, 1963:36 (Southern Brazil and Uruguay). Nani and González Alberdi, 1966:7, tables I and II (seasonal variation, Mar del Plata). Carvalho *et al.*, 1968:7 (Bahia, Brazil, to Argentina). Iwai *et al.*, 1972:31 (reference). Roux, 1973:167 (description, 23°06' to 38°25'S, 37 to 63 m depth). Cotrina *et al.*, 1976:40 (Argentina). Far Seas Res. Lab., 1976:76 (description, color photograph). Stehmann, 1978:111-113 (field guide). Bellisio *et al.*, 1979:242 (common from 39°30' to 47°S to 100 m depth). Menni *et al.*, 1981:271 (41°29.1' to 43°31.5'S, 52 to 92 m depth). Bellisio, 1982:435 (distribution). Menni *et al.*, 1984:200 (systematics, key). Menni and López, 1984:79 (benthic associations). Angelescu and Prenski, 1987:140 (captured together with *Merluccius hubbsi).* Fabre, 1988:7-14 (otoliths). Fabre and Cousseau, 1988:107-116 (age and growth). Prenski and Sanchez, 1988:75-87 (fish associations).

Xystreurys rasilis: Lahille, 1939: 184-186 (revision, color plate).

COMMON NAMES: Lenguado, lenguado chico, lenguado amarillo (Arg.). Rapurata-montsukihirame (Jap.).

DESCRIPTION

Body compressed, elongated, sinistral (ocassionally dextral). Scales cicloids in both sides. Head scaled, including preopercle and opercle, but neither snout nor interorbital crest. Lateral line on both sides straight through nearly all its length, smoothly curved over the pectoral fin (always less than in *Paralichthys* species). Vertical rows of scales 74 to 107 (N = 14) (78 to 86, *auctorem*) (Curiously Lahille mentioned 121 to 140). Gill rakers elongated, without lateral comb, 3 to 7 in the upper part of the first arch (1 to 7, *auctorem*), 8 to 12 in the lower (N = 30) (10 to 11, *auctorem*). With pseudobranch. Origin of dorsal fin generally over the first half of the eye. Dorsal rays 74 to 87 (N = 34) (78 to 89, *auctorem*); anal rays 60 to 69 (N = 34) (63 to 73, *auctorem*). Pectoral fin of the eyed side 10 to 12 (N = 12) (9 to 10, *auctorem*). Pectoral of the blind side 9 to 11 (N = 6). Ventral rays of the eyed side 6 (N = 5), of the blind side 6 (N = 6). Ventral fins do not differ much in length, but that of the ocular side is consistently larger and is inserted nearest the middventral line. They reach to the first or third anal ray (Table 1). Maxillary reaches the level of the middle of the eye, measuring from 8.84 to 11.08% of the standard length. Interorbital very narrow, crestlike. Other measurements and proportions in Table 2.

COLOR: In recently captured specimens fish color is light or very light brown, sometimes near yellowish, color changing with the time of exposure and the partial lack of scales which are very deciduous. Two dark, circular spots, very typical and obvious on the middle line of the oculate side; the anterior under the distal third of the pectoral fin, the posterior at the beginning of the last fifth of standard length. Sometimes the posterior spots is faint in color or both are missing. Caudal fin acute, double truncate.

TABLE 1. Frequencies of fin rays in *X. rasile.*

Dorsal-fin rays

75	76	77	78	79	80	81	82	83	84	85	86	87
2	3	3	5	4	3	3	5	2	1	1	1	1

Anal-fin rays

60	61	62	63	64	65	66	67	68	69
1		7	1	6	9	4	3	1	2

Pectoral-fin rays of the eyed side

10	11	12
7	4	1

Pectoral-fin rays of the blind side

9	10	11
2	2	2

TABLE 2. Measurements and proportions of *X. rasile*.

	Range	$\bar{X}$	SD
Measurements expressed as percentages o standard length			
Head length	21.74-26.95	24.32	0.92
Body depth	39.02-46.72	43.89	1.58
Maxillary length	8.84-11.08	10.00	0.41
Eye diameter	4.93-6.68	5.62	0.40
Interorbital	0.65-1.79	1.28	0.27
Caudal-peduncle length	3.30-7.27	4.88	0.62
Measurements expressed as percentages of head length			
Eye diameter	20.06-27.59	23.15	1.66
Snout length	14.77-23.52	19.81	2.13
Interorbital	2.61-7.47	5.26	1.09
Maxillary length	28.51-45.15	40.94	2.52
Pectoral-fin length (eyed side)	43.78-86.52	75.75	8.29
Pectoral-fin length (blind side)	28.67-55.70	47.37	5.71
Measurements expressed as percentages of caudal-peduncle depth			
Caudal-peduncle length	27.82-54.14	46.31	5.98

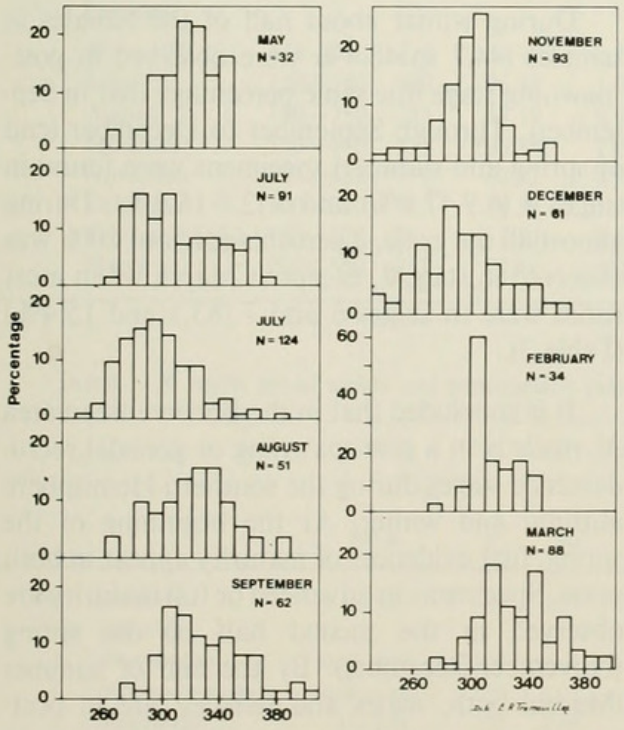

FIG. 2. Length frequency distribution of sampled. *X. rasile* at Mar del Plata.

OTHER BIOLOGICAL RESULTS

LENGTH SAMPLES

Length distribution may be seen in Figure 2. The observed range was from 234 to 402 mm, with modes near 300 mm (larger frequency in February), except in December when small lengths were present. Larger fish seems to occur in winter and at the end of summer.

LENGTH-WEIGHT RELATIONSHIP

The obtained equations are:

Males: $W = 9.33 \cdot 10^{-8} \cdot L^{3.783048}$ being $r = 0.88$.

Females: $W = 5.32 \cdot 10^{-7} \cdot L^{3.086809}$ being $r = 0.90$.

Regression lines corresponding to the equations are displayed together with observed values in Figures 3 and 4.

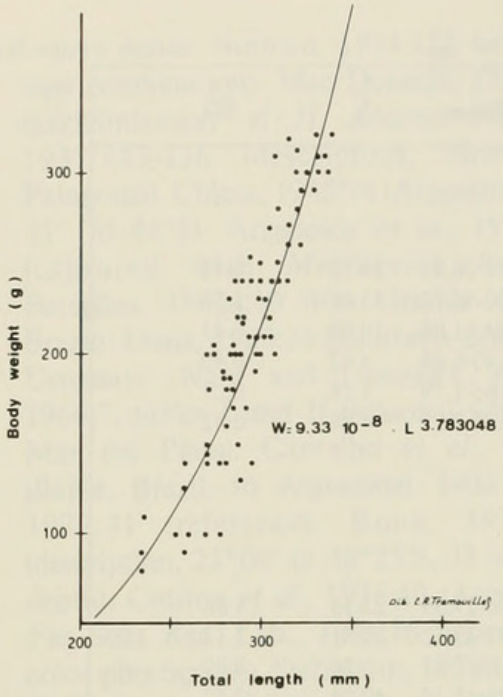

FIG. 3. *X. rasile*, length-weight relationship in males.

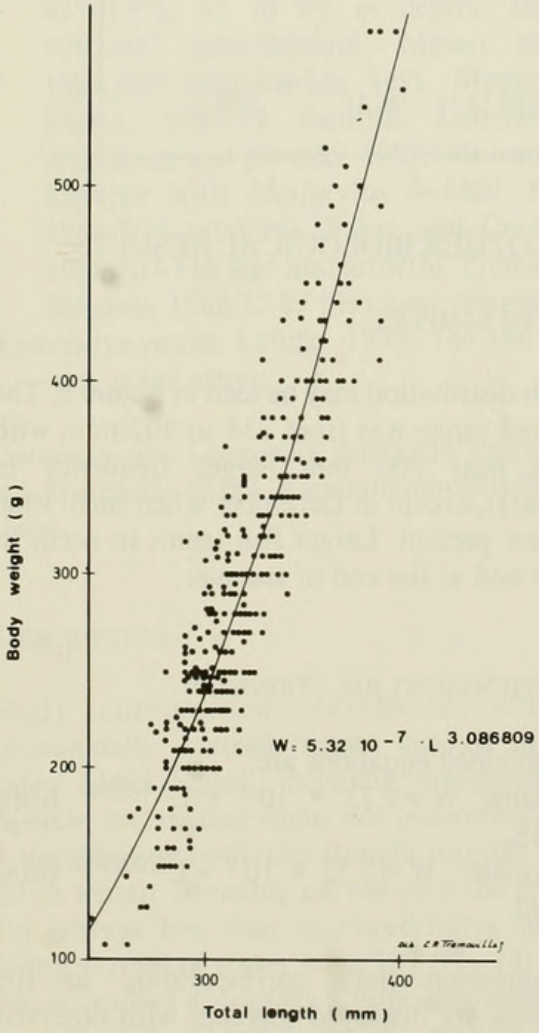

FIG. 4. *X. rasile*, length-weight relationship in females.

SEXUAL CYCLE

Basic data for the sexual cycle analysis are given in Tables 3, 4 and 5. As mentioned in the pertinent section, maturity stages were macroscopically determined following Christiansen and Cousseau (1971). Cyclical changes in gonad weight and the gonosomatic index have been assessed in relation to that stages. Table 3 shows the percentage of individuals in each stage by month. Table 4 includes the number of specimens and the monthly variation of the total weight, gonad weight and gonosomatic index for both sexes. Table 5 show minimum and maximum weight of the gonads and the values of the gonosomatic index related to maturity stages in both sexes. These data suggest that most males and females are in gonadal recrudescence during the autumn (seasons of the Southern Hemisphere). In winter, most males are in virginal prematurity (70.6-90%). Lesser percentages are found in stage 3 (first maturity, 10-17.6%) increasing to 50% during September. During December, specimens were in advanced maturity (stage 4, 50%) and full maturity (stage 5, 10%). During March and May higher percentages (83.3-100%) of testicular recrudescence were observed (Table 3).

During winter about half of the females in samples (44.7 to 48.4% were observed in post-spawning stage (the same percentage that in September). Through September to December (end of spring and summer) specimens were found in stages 4 (6.9-47.9%) and 5 (2.6-16.9%). During almost all the cycle, a percentage about 20% was observed in stage 2, except in March when most fishes were in stages 6 and 7 (83.1 and 15.4%) (Table 3).

It is concluded that in the Bonaerensean area *X. rasile* is in a post-spawning or gonadal recrudescence stages during the southern Hemisphere autumn and winter. At the beginning of the spring, first evidences of maturity appear in both sexes. Specimens in advanced or full maturity are observed in the second half of the spring (November-December). By the end of summer (March) both, males and females, are in post-spawning or recrudescence stages, a situation in which they spent also autumn and winter.

TABLE 3. Percentage of individuals in each maturity stage through the year.

Stages	1 & 2		3		4		5		6		7	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
May, 1981	—	19.2	—	—	—	—	—	—	—	80.8	100.0	—
July	70.6	29.7	17.6	7.8	—	—	—	—	—	48.4	11.8	14.0
August	90.0	28.9	10.0	26.3	—	—	—	—	—	44.7	—	—
September	50.0	17.2	50.0	10.3	—	6.9	—	—	—	44.8	—	20.7
November	75.0	25.4	18.8	8.4	6.2	47.9	—	16.9	—	1.4	—	—
December	5.0	7.7	35.0	41.0	50.0	35.9	10.0	2.6	12.8	—	—	—
February, 1982	—	13.3	100.0	16.7	—	—	—	—	—	60.0	—	10.0
March	—	1.5	—	—	—	—	—	—	16.7	83.1	83.3	15.4

TABLE 4. *X. rasile*, monthly range of total weight, gonad weight and gonosomatic index.

	Total weight (g)			Gonad weight (g)			GI	N spec.
Males	Range	$\bar{X}$	SD	Range	$\bar{X}$	SD		
May, 1981	220—320	266	49.80	0.20—0.55	0.34	0.34	0.09—0.14	5
July	150—300	211	43.14	0.11—1.31	0.51	0.28	0.04—0.44	17
August	180—310	264	43.33	0.72—3.35	1.63	0.81	0.25—1.08	4
September	190—290	245	47.96	0.60—2.93	1.66	0.97	0.27—1.05	9
November	127—319	227	58.48	0.40—6.00	2.23	1.42	0.31—1.94	15
December	80—240	137	48.11	0.30—3.23	1.10	0.56	0.33—1.76	20
February, 1982	210—300	242	42.72	0.35—0.80	0.55	0.22	0.14—0.38	4
March	180—300	236	47.75	0.07—0.53	0.33	0.18	0.04—0.20	5
Females								
May, 1981	145—360	274	54.97	0.79— 3.99	2.22	0.82	0.41— 1.22	26
July	150—540	300	96.32	1.08—10.64	3.16	1.65	0.56— 4.25	64
August	180—350	283	62.19	0.63— 6.32	3.28	1.34	0.35— 1.86	23
September	150—640	335	100.84	1.07—24.53	5.87	5.01	0.49— 8.76	58
November	124—432	279	60.37	0.90—47.70	14.16	9.66	0.44—11.34	64
December	100—390	221	71.59	1.13—25.63	9.22	7.40	0.86—10.68	38
February, 1982	190—370	286	51.50	1.33— 4.73	2.93	0.97	0.58— 2.88	30
March	200—580	337	79.41	1.06— 6.47	2.90	1.23	0.27— 1.60	62

TABLE 5. *X. rasile*, gonad weight and gonosomatic index related to sexual stages.

		MALES					FEMALES				
		Gonad weight (g)			GI	N spec.	Gonad weight (g)			GI	N spec.
		Range	$\bar{X}$	SD			Range	$\bar{X}$	SD		
1&2	Virginal Pre-maturity	0.11—3.35	1.16	0.77	0.04—1.22	35	0.63—5.07	1.99	0.78	0.35—1.85	66
3	First maturity	0.30—6.00	1.33	1.42	0.14—1.94	19	1.13—23.15	5.61	4.24	0.86— 6.61	45
4	Advanced maturity	0.66—4.50	2.20	1.05	0.29—1.76	11	5.83—25.63	16.58	4.05	2.91—11.34	52
5	Full maturity	1.45—2.59	2.02	0.80	1.45—1.73	2	21.00—47.70	27.93	7.71	6.34—11.09	11
6	Post-spawning	0.20—0.55	0.36	0.13	0.09—0.17	6	0.83— 8.42	3.28	1.39	0.36— 2.88	157
7	Reversion	0.07—1.31	0.54	0.44	0.04—0.44	6	1.12— 8.05	3.73	1.69	0.27— 1.56	34

ENVIRONMENTAL DATA AND CAPTURE

During the 1978 autumn, Gosztonyi (1981) found *X. rasile* from 26 to 135 m depth with bottom temperatures from 7.8 to 18.8 °C in the area between 36°50' and 46°59'S (15 stations). Our own data (Menni *et al.*, 1981) show the species from 52 to 92 m with bottom temperatures from 7.3 to 10.5°C from 41°29.1' to 43°31.5'S (4 stations).

Other data were obtained from seven trips performed by the INIDEP within areas and dates given in Table 6. This information indicates the presence of *X. rasile* in low salinity coastal waters with relatively high temperatures.

Cruises C 03/81 and C 14/81 provide a consi-

TABLE 6. Oceanographical data of considered cruises.

Cruises	Date	Latitudinal range	N°	Depth	Temperature °C	Salinity‰
C 03/81	22/3-25/4	34°34'-40°48'S	38	10-48	12.9-19.39	32.027-33.841
H 05/81	18/7-25/7	42°21'-45°54'S	7	80-104	13.80-14.50	33.180-33.790
C 14/81	08/10- 1/11	35°53'-40°49'S	36	10-46	11.39-15.37	32.805-33.787
C 04/82	04/11-11/11	36°38'-37°57'S	6	13-23	13.20-14.50	33.680-33.800
C 05/82	19/12/82	43°45' S	1	54	11.37	33.343
C 02/83	16/4-24/4	34°39'-36°22'S	3	18-34	18.09-20.11	30.550-32.100
H 01/84	12/5-17/5	45°15'-46°52'S	4	68-89	10.60	33.410-33.470

TABLE 7. *X. rasile.* Capture weight and number of specimens related to depth. C 03/81.

Depth (m)	N° Sts.	Capture (kg)	$\bar{X}$ Capture (kg)	N° Spec.	$\bar{X}$ N° Spec.
10	1	0.9	0.9	6	6
11	1	0.2	0.2	1	1
15	1	1.3	1.3	6	6
17	1	3.8	3.8	20	20
18	2	2.4	1.2	10	5
20	2	4.6	2.3	27	13.5
22	1	0.2	0.2	1	1
24	1	5.2	5.2	23	23
25	2	6.8	3.4	33	16.5
27	1	4.0	4.0	11	11
28	2	2.7	1.35	21	10.5
30	3	28.6	9.53	189	63
31	1	5.5	5.5	—	—
32	2	48.0	24.0	—	—
33	1	0.6	0.6	3	3
35	2	13.0	6.5	118	59
36	1	13.0	13.00	—	—
38	1	22.0	22.0	168	168
39	2	19.5	9.75	65	
40	4	91.0	22.75	492	123
41	1	1.2	1.2	7	7
44	1	20.5	20.5	—	—
46	2	15.1	7.55	71	35.5
48	1	7.8	7.8	31	31

TABLE 8. *X. rasile*. Capture weight and number of specimens related to depth. C 14/81.

Depth (m)	N° Sts.	Capture (kg)	$\bar{X}$ Capture (kg)	N° Spec.	$\bar{X}$ N° Spec.
10	1	4.0	4.0	21	21
11	1	1.2	1.2	5	5
12	1	2.2	2.2	7	7
15	1	0.3	0.3	2	2
17	2	8.7	4.35	30	15
18	1	13.4	13.4	56	56
19	2	8.0	4.0	21	10.5
21	2	6.5	3.25	40	20
22	6	5.7 (5 sts)	1.14	38	6.33
23	2	13.8	6.9	95	47.5
24	4	39.6	9.9	217 (3 sts)	72.33
26	2	24.9	12.45	126	63
30	3	29.2	9.73	123	41
37	1	2.2	2.2	7	7
38	1	4.3	4.3	25	25
40	2	44.6	22.3	193	96.5
42	2	17.5	8.75	119	59.5
44	1	36.2	36.2	158	158
46	1	6.0	6.0	37	37

derable number of specimens (1.303 and 1.320 respectively). Quantity of specimens and weight of capture referred to depth are given in Tables 7 and 8. Note that captures in both trips are larger at about 40 m depth. This data are confirmed by results of other cruises, suggesting that the species occurs from the coast beyond the 100 m isobath, with a larger abundance about 40-50 m.

DISCUSSION

Based on available and new information, the genus *Xystreurys* instead of *Verecundum* is maintained for *X. rasile*. A detailed description with morphometric and meristic data of numerous specimens is provided, showing, as expected, some variation on values given by previous research. The complete references, provided as a synopsis of the historical and bibliographical development of the knowledge of the species, show that *X. rasile* is probably the easily recognizable species among the about fifteen pleuronectiforms occurring in the area. Data on distribution are more common than biological ones. Very recently Fabre (1988) studied the otolith morphology. Fabre and Cousseau (1988) show that the growth is fast, the species reaching commercial sizes when 3 years old. Lengths between 234 to 402 mm were observed in commercial samples, with modal values around 300 mm. Length distribution and length-weight relationship show that females are larger and heavier than males. Minimum length and weight for a mature female were 294 mm and 100 g, for a mature male 288 mm and 150 g. First evidence of maturity appears at the beginning of spring. Specimens in advanced or full maturity occur in the second half of the spring. By the end of summer both, males and females, are in post-spawning or recrudescence stage, in which they spent also autumn and winter. Preliminary data by Fabre and Cousseau (1988) support this timmings. *X. rasile* matures before *Paralichthys isosceles*, which is an other abundant species of flounder here, but the autumn-winter resting period is a common feature. These species are largely sympatric, but they widely differ in trophic preferences (García, 1987 a,b). Bannister (1977) says that "The small dabs and flounders tend to form endemic populations in shallow waters..." in several ares of the world. This seems to be the case with *X. rasile*. From this ecological point of view, Menni and López (1984) consider the species as a member of the "Inner shelf mixed fauna" association. The authors comment that this fauna is clearly recog-

nizable in any faunistic report, and that it includes several species with a large biomass with its consequent commercial importance. Olivier *et al.* (1968) found *X. rasile* over sand-mudy and rocky bottoms considering it a species with not well defined social fidelity. Other community relationships of the species can be seen in Angelescu and Prenski (1987) and Prenski and Sánchez (1988). Data from the present paper show that *X. rasile* occurs in coastal waters with low salinities and high temperatures, with some indications of a larger abundance about 40-50 m depth.

ACKNOWLEDGMENTS

We thank Prof. M.B. Cousseau for her advise on sexual stages and help during the sampling; and to Dr. A.E. Gosztonyi and two anonymous revisers for critical comments.

REFERENCES

ANGELESCU, V., F.S. GNERI and A. NANI. 1958. La merluza del mar argentino (Biologia y Taxonomia). Serv. Hidrogr. Naval, H. 1004: 1-224.

ANGELESCU, V. and L.B. PRENSKI. 1987. Ecología trófica de la merluza común del mar argentino. (Merlucciidae, *Merluccius hubssi*). Parte 2. Dinámica de la alimentación analizada sobre la base de las condiciones ambientales, la estructura y las evaluaciones de los efectivos en su área de distribución. Contr. INIDEP 561: 1-205.

BANNISTER, R.C.A. 1977. North Sea plaice. *In:* Gulland, J.A. (ed.) Fish population dynamics. Wiley-Interscience Publ., Londres, 243-282 pp.

BARCELLOS, B.N. 1962 a. Classificação econômica dos peixes do Rio Grande do Sul. Bol. Inst. cienc. nat. Porto Alegre, 14:5-16.

BARCELLOS, B.N. 1962 b. Nomes comuns dos peixes da costa do Rio Grande do Sul e seus correspondentes em sistematica. Bol. Inst. cienc. nat. Porto Alegre, 15:7-20.

BELLISIO, N.B. 1982. Historia maritima argentina. I. Flora y fauna marítima, Buenos Aires, 295-473 pp.

BELLISIO, N.B., R.B. LÓPEZ and A. TORNO. 1979. Peces marinos patagónicos. Subsecretaría de Pesca, Buenos Aires, 1-279 pp.

BENVEGNU, G. de Q. 1973. Relacao dos peixes teleósteos. Publ. Esp. Inst. oceanogr. Sao Paulo, 3 (1):489-500.

BERG, C. 1895. Enumeración sistemática y sinonímica de los peces de las costas argentina y uruguaya. Anal. Mus. nac. B. Aires, Ser. II, 4, (1):1-120.

CARVALHO, J.P., L.R. TOMASSI and M.D. NOVELLI. 1968. Lista dos linguados do Brasil. Contr. Inst. oceanogr. Sao Paulo, Ser. oceanogr. biol., 14:1-26.

CHIESA, J.A.L. 1945. Peces. Ferrari & Saccone, Buenos Aires, 308 pp.

CHRISTIANSEN, H.E. and M.B. COUSSEAU. 1971. La reproducción de la merluza en el mar argentino (Merlucciidae, *Merluccius merluccius hubbsi*) 2. La reproducción de la merluza y su relación con otros aspectos biológicos de la especie. Bol. Inst. Biol. Mar., 20:44-74.

COTRINA, C., H. OTERO and M.B. COUSSEAU. 1976. Informe sobre la pesca exploratoria del B/I "Prof. Siedlecki" (Noviembre de 1973-Enero de 1974). Contr. Inst. Biol. Mar., 331:1-59.

DE BUEN, F. 1950. El Mar de Solís y su fauna de peces (2da. parte). Publ. cient. Serv. oceanogr. y pesca del Uruguay, 2:46-144.

FABRE, N.N. 1988. Estudio morfológico y morfométrico de los otolitos de dos especies de lenguados, *Xystreuris rasile* y *Paralichthys isosceles* (Pisces, Bothidae). Physis, A, 46 (110):7-14

FABRE, N.N. and M.B. COUSSEAU. 1988. Primeras observaciones sobre edad y crecimiento en el lenguado *(Xystreuris rasile)*. Publ. Com. Téc. Mix. Fr. Mar., 4: 107-116.

FAR SEAS RESEARCH LABORATORY (ed.). 1976. Colored illustrations of bottom fishes collected by japanese trawlers. Vol. II, i-iv, 1-188 pp. (Several authors). Japan Deep Sea Trawlers Ass., Tokyo, Japan.

GARCÍA, M.L. 1987a. Régimen alimentario de *Xystreuris rasile* (Jordan, 1890) (Teleostei, Bothidae). Inv. Pesq., 51 (2):155-166.

GARCÍA, M.L. 1987b. Pleuronectiformes de la Argentina III. Alimentación de *Paralichthys isosceles* (Bothidae, Paralichthyinae). Notas Mus. La Plata, 21, Zool. (207):111-125.

GINSBURG, I. 1952. Flounders of the genus *Paralichthys* and related genera in american waters. Fish Bull., 71:261-351.

GOSZTONYI, A.E. 1981. Resultados de las investigaciones ictiológicas de la campaña I del B/I "Shinkai Maru" en el mar argentino (10.04-09.05. 1978). Contr. Inst nac. Inv. Des. Pesq., 283:267-280.

HUBBS, C.L. and T.L. MARINI. 1939. The status and synonymy of *Verecundum rasile*, a flounder of Brazil and Argentina. Papers Michigan Acad. Sc., Arts and Letters, 24 (2):159-166.

IWAI, T., I. NAKAMURA, T. INADA, K. NAKAYA, I. IKEDA, T. SATO and H. HATANAKA. 1972. Systematics results of fishery research in patogonian waters of the Argentine Republic. Publ. Bureau of fischeries, Japan 40 pp. (In japanese).

JORDAN, D.S. 1890. List of fishes obtained in the Harbor of Bahia, Brazil, and in adjacent waters. Proc. U.S. natn. Mus., 13:313-336.

LAHILLE, F. 1939. Los peces argentinos de cara torcida. Physis 16:179-205.

LEMA, T. de 1963. Resultados ictiológicos da primeira campanha oceanografica do Museo Rio-Grandense de Ciencias Naturais. Iheringia, Ser. Zool., Porto Alegre, 30:1-56.

LEMA, T. de, M.F. OLIVEIRA and C.A. LUCENA. 1980. Levantamento preliminar dos Pleuronectiformes do extremo sul do Brasil ao Rio de La Plata (Actinopterygii:Teleos-

tei). Iheringia, Ser. Zool., Porto Alegre, 56:25-52.

MAC DONAGH, E.J. 1936. Sobre algunos peces marinos. Notas Mus. La Plata, I, Zool., 4:423-429.

MENEZES, N.A. 1971. Relação dos peixes osseos coletados durante os cruzeiros do navio oceanografico "Prof. W. Besnard" as costas do Rio Grande do Sul. Contr. avulsas Inst. oceanogr. Univ. Sao Paulo, Ser. oceanogr. biol., 25:44-61.

MENNI, R.C., M.L. GARCÍA and M.B. COUSSEAU 1984. Pleuronectiformes de la Argentina, I. Especies de los géneros *Mancopsetta* y *Achiropsetta* (Bothidae, Bothinae). Rev. Mus. Arg. C. Nat. "B. Rivadavia", Zool., 13(8):95-105.

MENNI, R.C., M.L. GARCIA and M.B. COUSSEAU. 1985. Pleuronectiformes de la Argentina, II. *Thysanopsetta naresi* (Bothidae, Paralichthyinae). Hist. Nat., 4 (2):13-17.

MENNI, R.C. and M.L. LÓPEZ. 1984. Distributional patterns of Argentine marine fishes. Physis A, 42 (103):71-85.

MENNI, R.C., H.L. LÓPEZ and M.L. GARCÍA. 1981. Lista comentada de las especies de peces colectadas durante la campaña V del B/I "Shinkai Maru" en el mar argentino (25/8-15/9/78). Contr. Inst. nac Inv. Des. Pesq. 383:267-280.

MENNI, R.C., R.A. RINGUELET and R.H. ARAMBURU. 1984. Peces marinos de la Argentina y Uruguay. Ed. Hemisferio Sur, B. Aires, 359 pp.

MIRANDA RIBEIRO, A. de 1915. Fauna brasiliense. Peixes V (Eleutherobranquios Aspirophoros). Physoclisti. Arch. Mus. nac. Rio de Janeiro, 17:1-34.

MORONEY, M.J. 1968. Hechos y estadisticas. Eudeba. B. Aires, ix-xv, 441 pp.

NAKAMURA, I. (ed.). 1986. Important fishes trawled off Patagonia. Japan Mar. Fish. Resource Res. Center, 369 pp.

NANI, A. 1964. Variaciones estacionales de la fauna íctica del área de pesca de Mar del Plata. CARPAS/2/D. Téc., 20:1-21.

NANI, A. and P. GONZÁLEZ ALBERDI. 1966. Informe preliminar sobre el muestreo de la pesca de arrastre de la Región de Mar del Plata, destinado a la industria de reducción. CARPAS/3/D. Téc. 7:1-7.

NORMAN, J.R. 1934. A systematic monograph of the flatfishes (Heterosomata) I. Psettodidae, Bothidae, Pleuronectidae. The Trustees of the British Museum, i-viii, 459 pp.

NORMAN, J.R. 1937. Coast fishes. Part II. The Patagonian region. "Discovery" Rept., 16:1-150.

NORMAN, J.R. 1966. A draft synopsis of the orders, families and genera of recent fishes and fish-like vertebrates. British Mus. (Nat. Hist.), Londres, 649 pp.

OLIVIER, S.R., R. BASTIDA and M.R. TORTI. 1968. Resultados de las campañas oceanográficas Mar del Plata I-V. Contribución al trazado de una carta bionómica del área de Mar del Plata. Las asociaciones del sistema litoral entre 12 y 70 m de profundidad. Bol. Inst. Biol. Mar., 16:1-85.

PRENSKI, B. and F. SÁNCHEZ. 1988. Estudio preliminar sobre asociaciones ícticas en la zona común de pesca argentino-uruguaya. Publ. Com. Téc. Mix. Fr. Mar., 4:75-87.

REGAN, C.T. 1914 a. Diagnoses of new marine fishes collected by the British Antarctic ("Terra Nova") expedition. Ann. Mag. Nat. Hist., (8),13:11-17.

REGAN, C.T. 1914 b. British Antarctic ("Terra Nova") expedition 1910. Nat. Hist. Rept. Fishes. Zool. 1 (1):1-54.

RICKER, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Bd. Canada, 191:1-382.

RINGUELET, R.A. and R.H. ARAMBURU. 1960. Peces marinos de la República Argentina. Agro II (5):1-141.

ROUX, C. 1973. Poissons téléostéens du plateau continental brésilien. Ann. Inst. oceanogr. Monaco, N.S. 49 (Fasc. supl.):23-207.

STEHMANN, M. 1978. Illustrated field guide to abundant marine fish species in Argentine waters. Mitt. Inst. seefisch. Hamburg, 23:1-114 (mimeographed).

Manuscrito aceptado en mayo de 1990