

Short communication

Size at maturity of the smallnose fanskate *Sympterygia bonapartii* (Müller & Henle, 1841) (Pisces, Elasmobranchii, Rajidae) in the SW Atlantic

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The smallnose fanskate *Sympterygia bonapartii* is found in coastal and shelf waters between southern Brazil and southern Argentina. Since 1994 it has become an alternative and commercially important target of demersal fisheries. In Uruguayan waters, the onset of sexual maturity in the species is at 65.5 cm for females and at 50–57 cm for males.

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Introduction

The smallnose fanskate *Sympterygia bonapartii* (Müller & Henle) is found from Rio Grande do Sul in southern Brazil to southern Argentina (Figueiredo, 1977). It is considered a coastal and intermediate shelf species (Cousseau and Perrotta, 2000), occurring down to 150 m (Paesch *et al.*, 1995). Along with other skates and demersal sharks, it is a common by-catch in the coastal and continental shelf bottom-trawl fisheries of the Argentine–Uruguayan Common Fishing Zone, ZCPAU (34° 30′–39° 30′ S; Figure 1; Ehrhardt *et al.*, 1977; Paesch and Meneses, 1999). Since 1994, it has been fished extensively by bottom trawl and bottom longline (Meneses and Paesch, 1999).

Material and methods

Data for the analyses were obtained during seven cruises carried out between spring 1994 and autumn 1998 on board

the RV “Aldebarán” (operated by DINARA, Uruguay), designed to help assess demersal fishery resources in the ZCPAU. In all, 436 female and 123 male *Sympterygia bonapartii* were analysed. Total length, sex, clasper length (males), and the presence or absence of yellow ovarian follicles and egg capsules in uteri (females) were recorded. Clasper length was measured *sensu* Compagno (1984), from the point of insertion to the distal end. Females were considered mature when yellow ovarian follicles and/or egg capsules were present. Total length at first maturity (M_L) of females was estimated using cumulative frequencies. A logistic model was fitted to the binomial maturity data (immature = 0, mature = 1):

$$M_L = \beta(1 + e^{(\alpha_1 - \alpha_2 L)}) \quad (1)$$

where M_L is the fraction of mature females per size class (%m = M_L), L the total length, and β , α_1 , and α_2 are

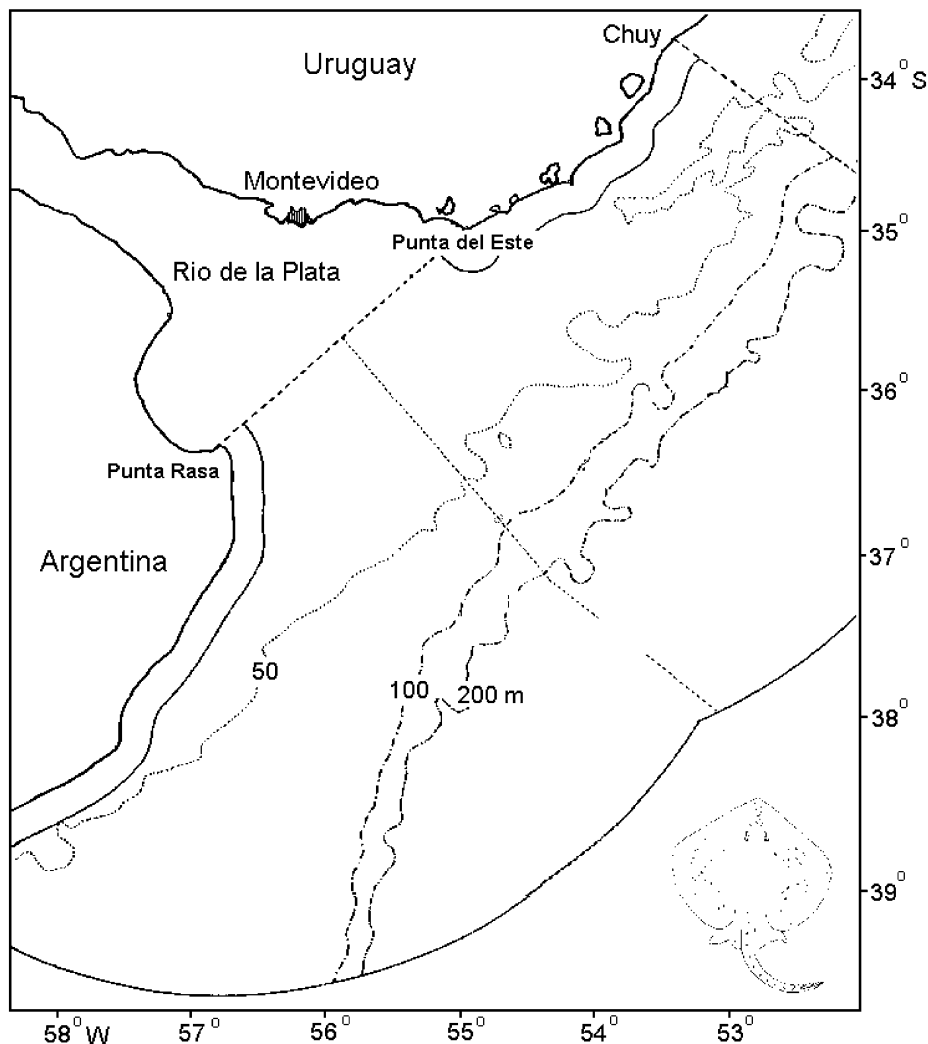


Figure 1. The Argentine-Uruguayan Common Fishing Zone (ZCPAU), with the bathymetry indicated.

parameters (Restrepo and Watson, 1991). The average size at M_L was obtained from the relationship

$$50\%(m) = -\alpha_2/\alpha_1 \quad (2)$$

The size at first maturity for males was inferred by investigating the clasper length/total length relationship, as described by Capapé (1974), Capapé and Quignard (1974), and Templeman (1987).

Results and discussion

Females ranged in size from 30 to 79 cm total length (TL). The smallest mature female was 43 cm TL and the largest immature female was 73 cm TL. The onset of sexual maturity was calculated to lie at a TL of 65.5 cm ($r = 0.99$;

Figure 2). De Queiroz (1986) estimated the value to be 70 cm for female smallnose fanskate off southern Brazil, and Mabrugaña *et al.* (2002) reported it as 64 cm for Argentine waters.

The size range of males examined ranged from 41 to 78 cm. There is a three-phased sigmoid relationship between clasper length and TL in skates (Capapé, 1974; Capapé and Quignard, 1974; Templeman, 1987), the middle phase of the sigmoid representing maturing fish. According to the data plotted in Figure 3, this phase for smallnose fanskate is at a TL of 52–57 cm; most males >57 cm had well-developed claspers. De Queiroz (1986) reported that males first matured at 52 cm, but Mabrugaña *et al.* (2002) estimated the same value to be 65 cm. However, the latter calculation may well have been in error because female skates generally mature at a larger size than males (e.g. Jardas, 1973; Nottage and Perkins, 1983;

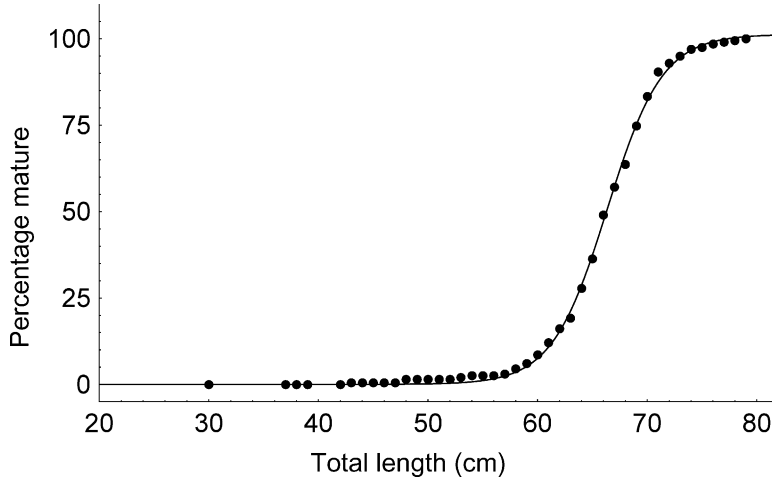


Figure 2. Logistic model (line) fitted for the relationship between total length and percentage of mature females for *Sympterygia bonapartii* (actual measurements in closed circles).

Fuentealba and Leible, 1990; Walker, 1999; Walmsley-Hart *et al.*, 1999; Oddone 2003). Although there may well be natural variations among populations, estimation of size at maturity can be affected by the use of different methodologies to measure claspers. *Mabragaña et al.* (2002), unlike *De Queiroz* (1986), measured the claspers from the tip of the pelvic fin to the tip of the clasper. This would mean that, in fish with claspers shorter than the pelvic fin, clasper length would be negative. That method differs from the method used for this analysis and recommended by *Compagno* (1984), so it may well be

the cause of the different sizes at maturity in the literature for the species. Clearly, therefore, comparisons between a species' size at maturity documented by different authors have to be viewed with caution unless the same methodology was applied.

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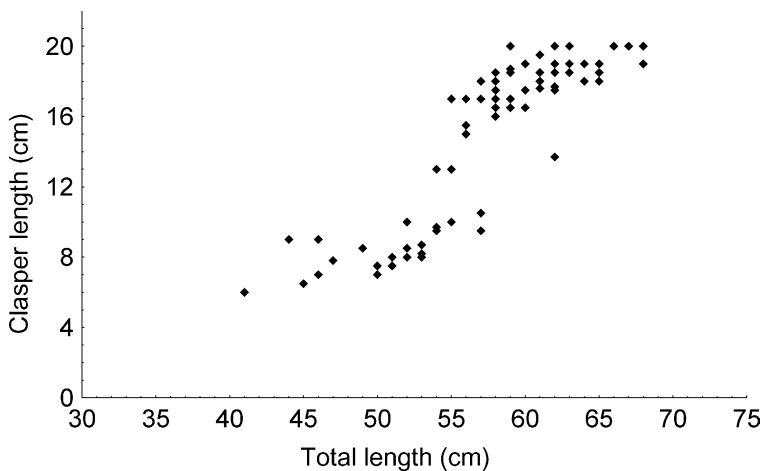


Figure 3. Relationship between clasper length and total length for *Sympterygia bonapartii*.

References

- Capapé, C. 1974. Contribution à la biologie des Rajidae des côtes tunisiennes. 2. *Raja radula*, Delaroche, 1809: répartition géographique et bathymétrique, sexualité, reproduction, fécondité. Archives de l'Institut Pasteur Tunis, 51: 211–228.
- Capapé, C., and Quignard, J. P. 1974. Contribution à la biologie des Rajidae des côtes tunisiennes. 1. *Raja miraletus*, Linné, 1758: répartition géographique et bathymétrique, sexualité, reproduction, fécondité. Archives de l'Institut Pasteur Tunis, 51: 39–60.
- Compagno, L. J. V. 1984. FAO species catalogue. Sharks of the world: an annotated and illustrated catalogue of sharks species known to date. Part 2, Carcharhiniformes. FAO Fisheries Synopsis, 125(4): 251–655.
- Cousseau, M. B., and Perrotta, R. G. 2000. Peces Marinos de Argentina: biología, distribución, pesca. INIDEP, Mar del Plata. 167 pp.
- De Queiroz, E. 1986. Estudo comparativo da alimentação de *Sympterygia acuta* Garman, 1887 e *S. bonapartei* Müller & Henle, 1841 (Pisces: Rajiformes) com relação a distribuição, abundância, morfologia e reprodução, nas águas litorâneas do Rio Grande do Sul – Brasil. MSc thesis, Fundação Universidade Federal do Rio Grande. 118 pp.
- Ehrhardt, N. M., Arena, G. J., Abella, A. J., Rios, C. A., Moratorio, N. B., and Rey, M. A. 1977. Evaluación preliminar de los recursos demersales en el área común de pesca argentino-uruguay. Informe Técnico INAPE, 13. 186 pp.
- Figueiredo, J. L. 1977. Manual de peixes marinhos do sudeste do Brasil. 1. Introdução. Caços, raias e quimeras. Museu de Zoologia, Universidade de São Paulo. 104 pp.
- Fuentealba, M., and Leible, D. 1990. Perspectivas de la pesquería de raya volántin *Raja (Dipturus) flavirostris*: estudio de edad, crecimiento y algunos aspectos reproductivos. In Perspectivas de la Actividad Pesquera en Chile, pp. 227–236. Ed. by M. A. Barbieri. Escuela de Ciencias del Mar, UCV, Chile.
- Jardas, I. 1973. A contribution to our knowledge of the biology and ecology of thornback ray (*Raja clavata* L.) and brown ray (*Raja miraletus* L.) in the Adriatic. Acta Adriatica, 15(3): 1–42.
- Mabragaña, E., Lucifora, L. O., and Massa, A. M. 2002. The reproductive biology and abundance of *Sympterygia bonapartii* endemic to the south-west Atlantic. Journal of Fish Biology, 60: 951–967.
- Meneses, P., and Paesch, L. 1999. Características de las especies obtenidas como captura incidental en las campañas de evaluación dirigidas a merluza, corvina y pescadilla. In Estudios realizados sobre los Elasmobranchios Dentro del Río de la Plata y la Zona Común de Pesca Argentino-Uruguay en el Marco del “Plan de Investigación Pesquera”, pp. 4–12. Ed. by G. Arena and M. Rey. INAPE–PNUD, URU/92/003.
- Nottage, A. S., and Perkins, E. J. 1983. Growth and maturation of roker, *Raja clavata* L. in the Solway Firth. Journal of Fish Biology, 23: 43–48.
- Oddone, M. C. 2003. Biología reproductiva de *Atlantoraja cyclophora* (Regan, 1903) no Sul do Brasil. Rio Grande. MSc thesis, Fundação Universidade Federal do Rio Grande. 99 pp.
- Paesch, L., Bazzino, G., Salazar, M., and Meneses, P. 1995. Análisis de los cambios espacio-temporales en la estructura poblacional de los rajiformes en la Zona Común de Pesca Argentino-Uruguay. VI Congreso Latino americano de Ciencias del Mar (COLACMAR), Universidad Nacional de Mar del Plata (Resumen 554, p. 149).
- Paesch, L., and Meneses, P. 1999. La pesquería de elasmobranchios en la Zona Común de Pesca Argentino-Uruguay. In Estudios realizados sobre los Elasmobranchios Dentro del Río de la Plata y la Zona Común de Pesca Argentino-Uruguay en el Marco del “Plan de Investigación Pesquera”, pp. 1–3. Ed. by G. Arena and M. Rey. INAPE–PNUD, URU/92/003.
- Restrepo, V. R., and Watson, R. A. 1991. An approach to modelling crustacean egg-bearing fractions as function of size and season. Canadian Journal of Fisheries and Aquatic Sciences, 48: 1431–1436.
- Templeman, W. 1987. Differences in sexual maturity and related characteristics between populations of thorny skate (*Raja radiata*) from the northwest Atlantic. Journal of Northwest Atlantic Fisheries Science, 7: 155–167.
- Walker, P. A. 1999. Fleeting images. Accumulated papers. PhD thesis, Universiteit van Amsterdam (NIOZ Publication, 3299).
- Walmsley-Hart, S. A., Sauer, W. H. H., and Buxton, C. D. 1999. The biology of the skates *Raja wallacei* and *R. pullopunctata* (Batoidea; Rajidae) on the Agulhas Bank, South Africa. South African Journal of Marine Science, 21: 165–179.