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A GIANT SQUID *ARCHITEUTHIS* SP. (MOLLUSCA, CEPHALOPODA) STRANDED ON THE PATAGONIAN SHORE OF ARGENTINA

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A female giant squid was stranded in Bustamante Bay, Argentina (45°08'S, 66°31'W), in May 1996; it was identified as *Architeuthis* sp. The main morphometric data are given and compared with South Atlantic Ocean records for this genus. Parasites found in the stomach, caecum and intestine are provisionally identified to genus.

Although numerous *Architeuthis* specimens have been found in nearly all the oceans (Aldrich 1991, Clarke 1986, Nesis 1987, Roeleveld and Lipiński 1991), very few records exist for the South-West Atlantic. Most records are from strandings and from stomach contents of sperm whales, and many are based on incomplete specimens or on parts only (Roeleveld and Lipiński 1991). For the South-West Atlantic, Clarke (1966, citing Korabelnikov 1959) lists records of *Architeuthis* fragments from the Antarctic (Elefante and Orcadas islands) in the general distribution of the genus. However, he omits them later when he refers to the broad distribution of the genus. *Architeuthis* sp. Steenstrup, 1857 was also documented by Castellanos and Menni (1969, citing Carcelles 1950) as being found at the Elefante and Orcadas del Sur islands. However, review of Carcelles' (1950) paper reveals no information about specimens coming from those localities.

The first record of a giant squid *Architeuthis* sp. in the South-West Atlantic was that of a female with a mantle length of 1 510 mm and a mass of 91 kg lacking tentacles (Arfelli *et al*. 1991). That specimen was found dying and drifting off Santa Catarina State, Brazil (27°24′S, 45°37′W) in September 1989. Later, a female *Architeuthis* sp. with a mantle length (*ML*) of 1 620 mm was caught alive by bottom trawl in San Jorge Gulf, off Caleta Olivia, (46°30′S, 66°W) in April 1995 (Brunetti *et al*. 1998). Another female, 1 300 mm *ML* and 86 kg mass without tentacles, was found on Bahia Bustamante beach (45°12′S, 66°30′W) in July 1995 and reported by Ruiz and Fondacaro (1996).

The current paper contains a description of a large female *Architeuthis* sp. stranded at Bustamante Bay, Argentina (45°08′S, 66°31.5′W). Its morphology is compared with that of the specimens for which data are currently available. Parasites of the digestive tract are also described.

MATERIAL AND METHODS

The source material for this paper is MCNOPM (Museum of Natural Sciences and Oceanography, Puerto Madryn, Argentina) Specimen 1139, *Archi-teuthis* sp., female, 45°08′S, 66°31.5′W, Bustamante Bay, Chubut Province, Argentina, stranded 24 May 1996.

The following measurements were taken before freezing: total length, dorsal mantle length, total mass, maximum mantle width, and lengths of right and left arms I, II, III and IV. Other general measurements were made in July 1996, after thawing the specimen for three days. Measurements and proportions of the body are given following Voss (1963) and Roeleveld and Lipiński (1991), those of the beak according to Wolff (1984) and Clarke (1986), those of the gladius according to Toll (1990, Fig. 1), and those of the statolith from Clarke (1978) and Roeleveld and Lipiński (1991). Cross-sectional features of beaks and gladius were not considered to avoid breaking them. The key proposed by Nesis (1987) was used to identify the specimen, although no information about tentacles was available. The maturity stages used were those proposed by Roeleveld and Lipiński (1991), namely Stage I immature, Stage II maturing, Stage III mature. The descriptions of Schmidt (1986) and Hochberg (1990) were used to identify the parasitic fauna.

The abbreviations used are listed below.

Body measurements and proportions — *ALI* I-IV = arm length index I-IV; *FLI* = fin length index; *FWI* = fin width index; *GFT* = number of gill filaments per outer demibranch: *HLI* = head length index; *HWI* = head width index; *ML* = mantle length; *VMLI* = ventral mantle length index; *MWI* = mantle width index; *NGLI* = nidamental gland length index; *SDI* I-IV = sucker diameter index I-IV; *TL* = total length; *TM* = total mass.

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Table I: Original data of a female *Architeuthis* sp. from Bustamante Bay, Argentina (stranded in May 1996), presented in the standard format proposed by Roeleveld and Lipiński (1991) for *Architeuthis* data collection. All linear measurements are in mm

Parameter	Value or information	
Date	24 May 1996	
Locality	Bustamante Bay, Argentina	
How collected	Stranded	
Repository	MCNOPM and CENPAT	
Catalogue number	1 139	
Sex	F	
Maturity	II	
Total length without tentacles	4 200	
Total mass (kg) without tentacles	180	
Dorsal mantle length	1 940	
Ventral mantle length	1 560	
Mantle width, maximum	730	
Mantle width at opening	690	
Head length	250	
Head width	560	
Fin length	610	
Fin width (after reconstruction)	440	
	Right	Left
Arm length I	1 650	1 530*
Arm length II	1 630	1 730
Arm length III	1 800	1 480*
Arm length IV	1 430*	1 340*
Sucker diameter (maximum), Arm I	21.5	19.1
Sucker diameter (maximum), Arm II	21.5	25.0
Sucker diameter (maximum), Arm III	19.4	21.0
Sucker diameter (maximum), Arm IV	16.0	14.5
Number of gill filaments per outer demibranch	59	64
Nidamental gland length	450	
Rostral length, lower beak	16.4	
Gladius length	1 663	
Gladius width	220	
Free rachis length	320	
Cone field length	462	
Cone field width	99	
Conus length	±20.0	

Arm/Club sucker rings collected
RtI # 7-16, 18, 20, 23-26, 28-49 (n = 38)
LtI # 1, 3, 6, 9-12, 15-20, 22-24, 26-31, 34, 36-42, 46-53, 55 (n = 39)
RtII # 2-4, 6-13, 18, 19, 22-29, 31-33, 35, 38-40, 43-45, 67 (n = 32)
LtII # 4-6, 8, 9, 11, 17, 19-27, 29, 30, 32, 35, 37, 38, 44-46, 48, 49, 54, 55, 58, 60, 61 (n = 32)
RtIII # 2, 3, 26, 30, 36, 38, 39, 41, 43 (n = 9)
LtIII # 8, 9, 12-14, 17, 20, 23, 25, 30 (n = 10)
RtIV # 1, 5, 7, 9-11, 13, 15, 20-22, 25, 27, 29, 31, 33, 35, 37, 44 (n = 19)
LtIV # 5-8, 11, 15, 21, 25, 35, 42, 45, 48, 49, 51, 57, 69 (n = 16)

Photographs: Whole view, lateral fin-like structures on ventral side of the head, fins, funnel, funnel-locking cartilage, connectives attached to Left Arm I base, beaks, radula, left statolith

Stomach content	Black liquid and pebbles
Observer	MER, PJB, JCB, AEG, LK, MAM
Photographer	MER, PJB, Franco Pertini

* Arms incomplete

Beak measurements and proportions — c = rostral tip to baseline, lower beak; *CL* (= f) = crest length, either beak; d = length of the baseline in profile, lower beak; e = distance the rostral tip lies behind the wing tip, lower beak; h = rostral base length, lower beak; *HdL* (= g) = hood length in the midline, either beak; *JW* (= j) = jaw angle width, either beak; *LRL* (= i) = rostral length, lower beak; *RC* = rostral tip to inner posterior corner of lateral wall, lower beak; *RL* (= a) = rostral length, upper beak; *RW* = rostral tip to

Table II: Morphometric data and indices of *Architeuthis* sp. found off Brazil (September 1989) and in Bustamante Bay (May 1996)

Parameter	Value or information		
Locality	Bustamante Bay		Off Santa Catarina
Latitude	45°08′S		27°24′S
Longitude	66°31.5′W		45°37′W
How collected	Stranded		Floating
Sex	F		F
Maturity	II		
ML (mm)	1 940		1 510
TL (mm)†	4 200		3 710
TM (kg)†	180		91
MLVI	80.4		
MWI	32.5		
HLI	12.9		
HWI	28.9		
FLI	30.4		36.4
FWI	23.0		21.6
	Right	Left	
ALI I	85.0	78.9*	
ALI II	84.0	89.2	
ALI III	92.8	76.3*	
ALI IV	73.7*	69.1*	121.9
SDI I	1.1	1.0	
SDI II	1.1	1.3	
SDI III	1.0	1.1	
SDI IV	0.8	0.8	
NGLI	23.20		
LRL (mm)	16.40		
GLI	85.70		
GWI	13.20		
CoLI	1.20		

* Arms incomplete
†Without tentacles

inner margin of wing, either beak; *WCL* = wing to crest length, upper beak; *WL* (= *b*) = wing length, lower beak; *WW* = wing width, upper beak.

Gladius measurements and proportions — *CFL* = cone field length; *CFW* = cone field width; *CoL* = conus length; *CoLI* = conus length index (*CoL*/*GL*); *FRL* = free rachis length; *GL* = gladius length; *GLI* = gladius length index (*GL*/*ML*); *GW* = gladius width; *GWI* = gladius width index (*GW*/*GL*).

Statolith measurements — *LDL* = lateral plus dorsal dome length; *LDW* max = greatest width of lateral dome; *RBW* = rostral base width; *RSL* = rostral length of statolith; *SADD* = length from spur to apex of dorsal dome; *STR* = length from spur to tip of rostrum; *TSL* = total statolith length; *WSL* = wing length.

RESULTS

The giant squid described was found stranded on the beach, in fairly good condition. The mantle was in one piece. Four arms were complete and four lacked their tips. Only the basal parts of the tentacular stalks were present. The fin was damaged in the middle part of both sides and the eyes were badly injured. The head, neck and arms had reddish-brown portions of skin remaining and the ventral side of the mantle was covered with a creamy white skin lining.

General morphology

The body measurements and proportions are listed in Tables I and II.

Mantle conical, broadest midway along its length (*MWI* 32.5), posteriorly acuminate and drawn out into a short tail (Fig. 1). Dorsal margin protruding in the midline, forming a slightly obtuse angle; ventral margin emarginate. Mantle wall muscular, 20 mm thick in the ventral midline.

Fin small (*FLI* 30.4), longer than wide (*FWI* 23.0 after reconstruction), laterodorsally attached and drawn out into a posterior point not reaching the end of the mantle. Small anterior lobe on both sides of the midline, torn from mantle (Fig. 1).

Head wider than long. Two lateral fin-like structures

Fig. 1: The specimen of *Architeuthis* sp. stranded at Bustamante Bay in May 1996

ventrally, with free sides united at right angle. Posterior free margin longer than anterior one (Fig. 2). Eyes prominent (distance between eye lenses 350 mm), large (estimated diameter 130 mm). Neck with folds. Nuchal cartilage teuthoid, broad anteriorly (width 115 mm), narrow posteriorly.

Funnel short (340 mm along midventral line), well developed and muscular, with large broadly U-shaped funnel valve (Fig. 2). Funnel-locking apparatus of mantle simple, well developed, elongate, with slightly curved ridge in mantle and groove in funnel. Funnel-locking cartilage narrower, bluntly pointed anteriorly, broadly rounded posteriorly (Fig. 2). No funnel organ found.

Arms well developed, rectangular to square in cross-section at their bases, except II left and IV right, which are oval, each with two rows of suckers, keels (swimming membranes) and protective membranes. Keels large in Arms IV (double in the left), and less developed in other arms (double in I left and I and II right). Trabeculae seen in nearly all arms (except in III left), arising proximal and distal to each sucker base, delimiting a more or less triangular area.

Arm suckers cup-shaped, pedunculate, with chitinous rings. First suckers smaller than second suckers (6% in Arms IV to 44% in Arms II). From a total of 183 sucker rings recovered undamaged from the arms, a size and shape pattern arises. In Arms I – III, sucker ring diameter, measured across the base of the toothed upper part of the ring, increasing from proximal suckers, reaching a maximum a short distance from mouth (5th and 6th pairs) and beyond these decreasing distally. Arms IV showing a decreasing pattern of sucker ring diameter from proximal to distal ends (Fig. 3a – d). Number of teeth on rings with similar tendency: maximum in 5th pair of sucker rings (52 on Arms I and II, 47 on Arm LIII) and minimum at most distal sucker rings recovered (8 and 9 teeth on 34th pair, Arms RII and LIV). Proximal pairs of sucker rings (Fig. 3e) cylindrical and low, their teeth subequal. Intermediate sucker rings (Fig. 3f) showing slightly elevated distal walls, their teeth gradually differentiating into four types: distal (triangular, high and sharp; approximately 4), sub-distal (with wide bases, robust and jaw shaped; approximately 3 on each side), lateral (pentagonal to triangular, medium sized), proximal and sub-proximal (small, triangular to acuminated). Distal sucker rings (Fig. 3g) with very high distal wall, large distal teeth curved to oral side and their lateral, sub-proximal and proximal teeth fused forming a lamina.

Only basal part of tentacles remaining (right 250 mm, left 170 mm), both flattened in section.

Buccal membrane well developed, with connectives attached to dorsal borders of Arms I, II and IV and to ventral borders of III (DDVD). Left Arm I with three connectives attached to medial part and dorsal and ventral borders (Fig. 4).

Location of first sucker relative to attachment of buccal connectives variable. I and II right arms and both III arms, suckers on opposite sides; in I and II left arms and both IV arms, on same side.

Internal organs

Mantle cavity not reaching tip of mantle. Internal organs covered by very dark reddish-brown membrane.

Gills well developed, creamy white, length 450 mm (right) and 490 mm (left), width 135 mm (both), with 59 and 64 lamellae per outer demibranch respectively. No branchial heart detected at bases of gills.

Reproductive system with large ovary (mass 14 027 g) occupying $\frac{2}{3}$ of mantle cavity. Oocytes oval, small

Fig. 2: Dissection of the *Architeuthis* sp. stranded at Bustamante Bay in May 1996 – (a) lateral fin-like structures on the ventral side of the head, (b) the funnel and (c) the funnel-locking cartilage

(major axis length 0.65-2.52 mm; mean 1.65 mm). Nidamental glands creamy white, large (length 450 mm, mass 3 002 g), paired, anteriorly free from each other, posteriorly fused in a single body. Oviducts paired, elongated, 200 mm (right) and 210 mm (left) long, weighing 327 and 298 g respectively. Both 80 mm wide, creamy white, covered by mantle cavity lining, opening into oviducal gland and with no oocytes inside. Oviducal glands paired, creamy white, kidney-shaped, facing sides concave; right 305 mm long, 215 mm wide, 3 721 g; left 360 mm long, 215 mm wide, 3 900 g.

Systemic heart mid-ventral, light brown to grey.

Digestive system with long œsophagus (approximately 750 mm long). Stomach creamy white, divided into two parts: anterior part globe-shaped (150 mm length) and muscular, posterior part tubular (510 mm). Muscular portion in lateral right margin showing dilation with thinner wall, similar to second part of stomach. First tubular part extended to posterior end of mantle cavity, then turning to left in approximate right angle. Stomach with chitinous, folded, partly reddish inner lining. Black liquid and pebbles inside. Caecum creamy white, rounded (90 × 90 mm), coiled, connected with anterior left margin of muscular stomach. Rectum creamy white, long (560 mm), ending in two well developed anal papillae (45 mm long), with apical and lateral appendages. Intestine full of black liquid and pebbles. Anus opening into funnel. Pancreas grey, long and slender, extending forward to relatively small and oval brownish digestive gland (590 mm long, 250 mm wide, 3 150 g). Ink sac small (80 mm), ending in white structure (ink gland?), and with long duct.

Beaks

The upper and the lower beaks are shown in Figure 5 and the measurements and ratios are given in Tables III and IV.

Upper beak (rostral length 16.8 mm) with darkened wings having chitin dark brown at anterior border (shoulder), light brown to yellow toward posterior border. Rostrum pointed, curved downwards at tip, and broad (*a*/*j*: 1.244), with inner surface slightly concave. Hood lying high above crest (*f*/*g*: 1.523). Rostrum-hood curvature strong. Crest slightly curved to straight. Each lateral wall with ridge on surface. Jaw angle

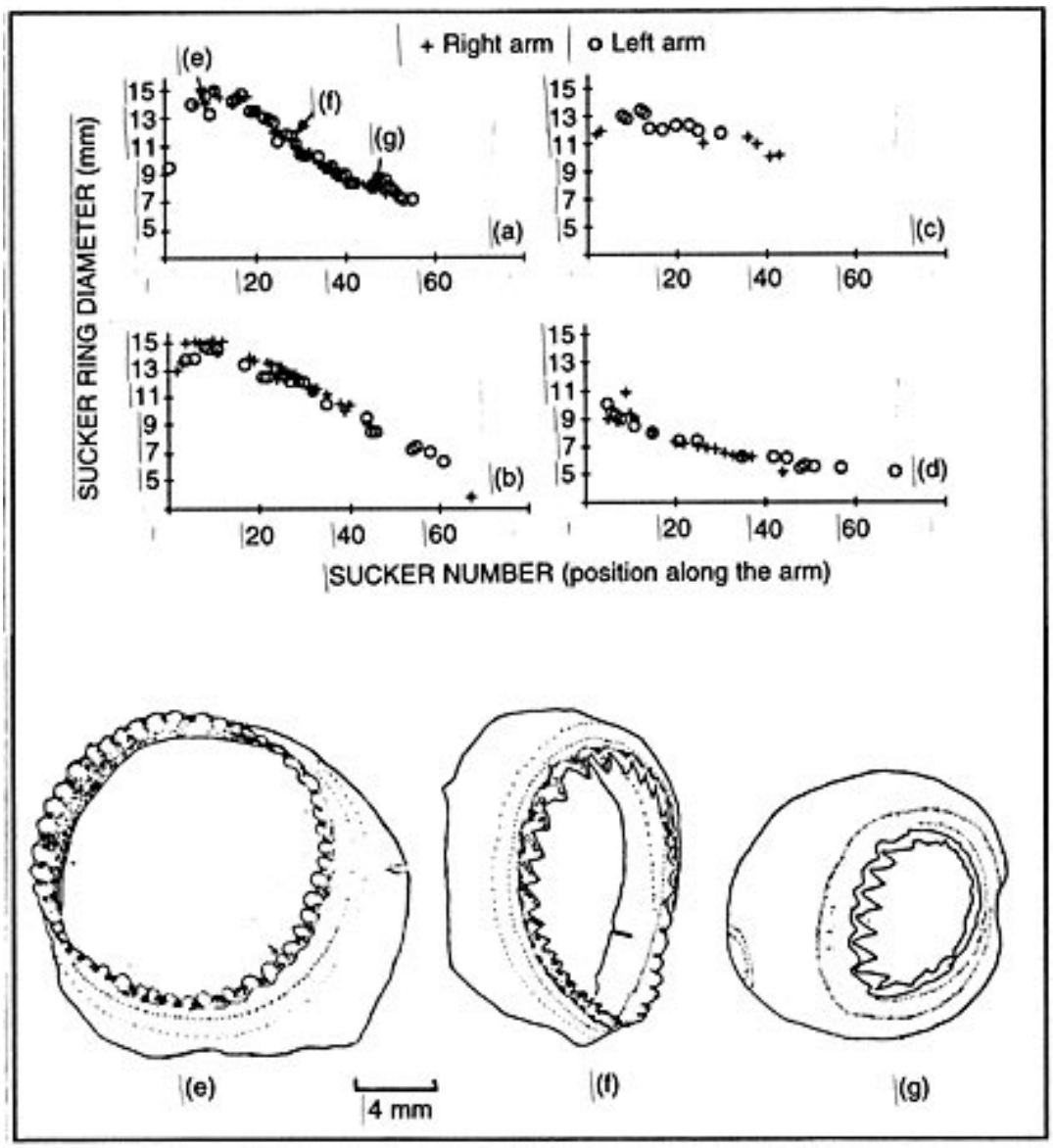

Fig. 3: Relationship between the sucker ring diameter and the sucker position along the arm for (a) Arms I, (b) Arms II, (c) Arms III, (d) Arms IV, and aspects of (e) proximal, (f) medial and (g) distal sucker rings

slightly recessed and acute, with fold running from jaw angle to hood-wing inner curvature, which is strong. Wing base insertion just above base.

Lower beak (rostral length 16.4 mm) with darkened wing having chitin light brown to yellow and extending almost to border. With slight tendency to be squat (*c*/*d*: 0.901), somewhat "square" (*d*/*f*: 1.330) and protruding forwards (*d*/*e*: 3.936). Jaw edge short relative to wing length (*b*/*i*: 3.079); wing angle obtuse. Rostrum distinctly longer than deep (*g*/*i*: 1.579) and broad (*i*/*j*: 1.205). Rostral edge straight, with some small notches (Fig. 5c) and small hook at rostral tip. Seen in profile,

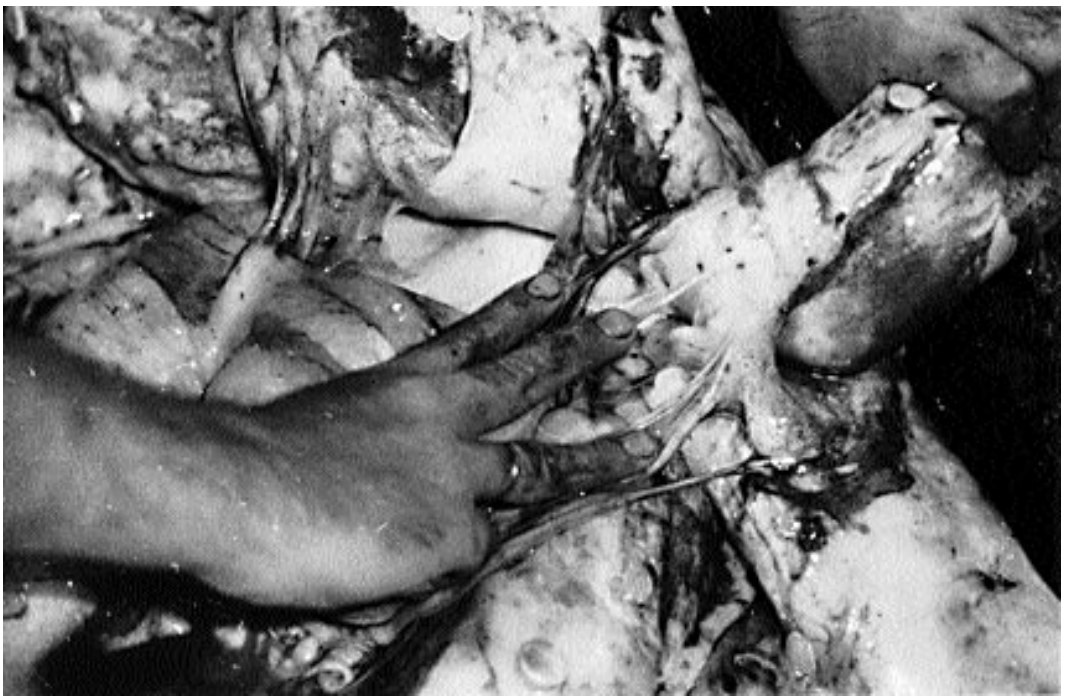

Fig. 4: Base of Left Arm I of the *Architeuthis* sp. stranded in May 1996 in Bustamante Bay with three connectives respectively attached to the medial part, dorsal and ventral borders

midline of hood slightly curved, its surface with step running across it from rostral tip on each side. Posterior edge of hood with broad deep notch in the midline.

Table III: Upper and lower beak dimensions of the *Architeuthis* specimen stranded in Bustamante Bay in May 1996. Abbreviations after Wolff (1984, upper case) and Clarke (1986, lower case)

Parameter		Dimensions (mm)	
		Lower beak	Upper beak
RL	*a*		16.8
LRL	*i*	16.4	
RC		73.4	
RW		61.0	34.7
WL	*b*	50.5	
JW	*j*	13.6	13.5
HdL	*g*	25.9	67.6
WCL			83.6
CL	*f*	50.9	103.0
WW			22.2
	c	61.0	
	d	67.7	
	e	17.2	
	h	23.4	

Hood lying high above crest (*f*/*g*: 1.965). Crest moderately curved particularly near posterior end. Lateral wall slightly dish-shaped inwards, with no ridges or folds on surface, and free corners slightly separated. Hood wing structure broad, without wing fold, shoulder forming distinct and irregular tooth with thin and long cartilage below. Jaw angle recessed behind tooth, with strip of chitin below jaw angle, in inner face of wing, and no angle point remaining.

Both beaks with small comma-like formations (Fig. 5d), rough to touch, more pigmented than rest of surrounding areas, on anterior part of walls and hood (upper beak) and both wings and hood (lower beak).

Radula

Radula with tricuspid rachidian, bicuspid first lateral and unicuspid second lateral and marginal teeth. Marginal plates square, about half size of base of remaining teeth, with big knob occupying nearly whole plate, slightly bent towards posterior part of plate, and small half moon-shaped concavity in posterior part of knob (Fig. 6).

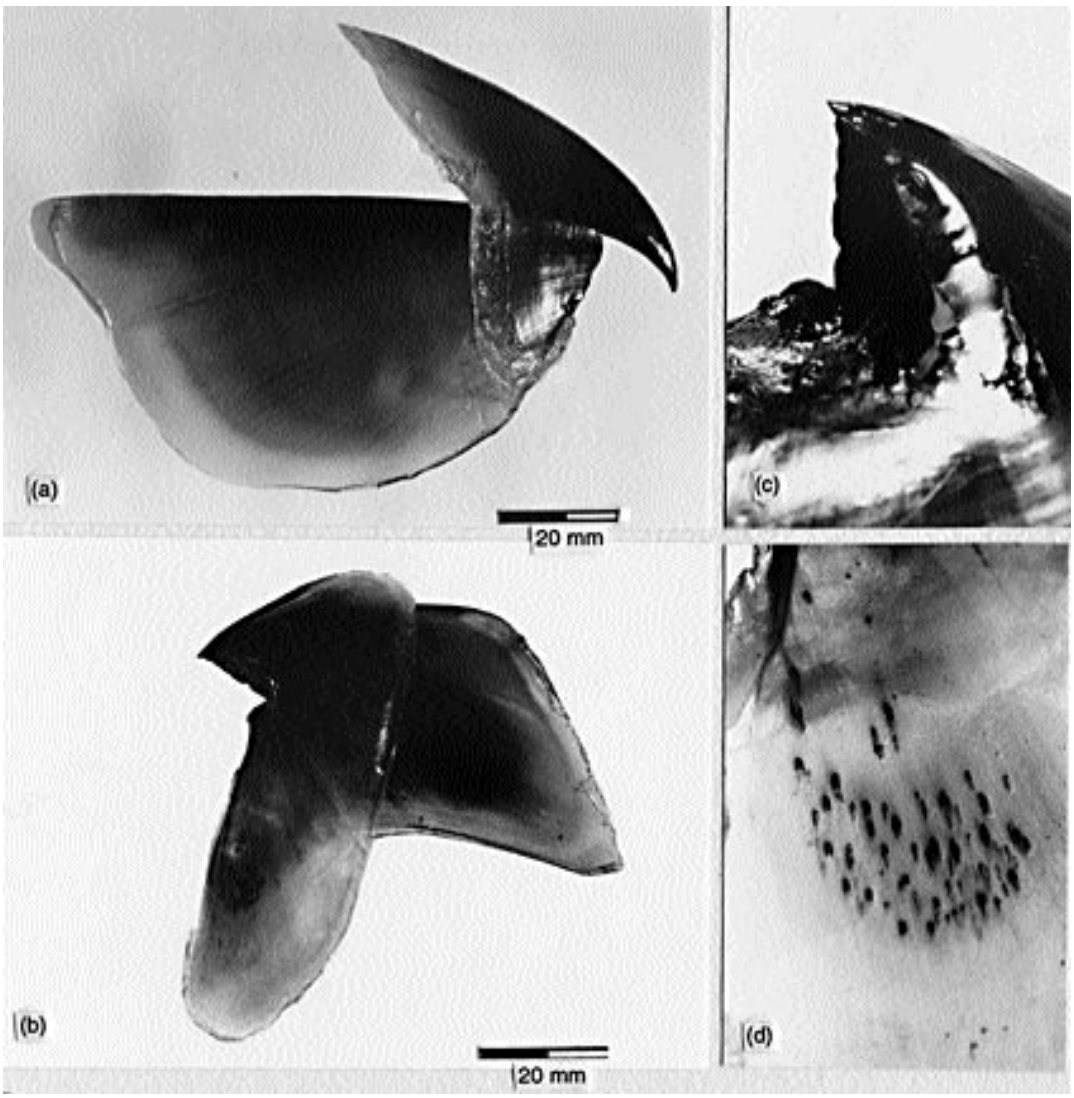

Fig. 5: (a) Upper beak, (b) lower beak, (c) rostral edge of lower beak, and (d) "comma-like" formations of lower beak of the *Architeuthis* sp. stranded in May 1996 in Bustamante Bay

Gladius

Gladius not reaching posterior end of mantle, long and lanceolate (*GLI* 85.7), thin, broad (*GWI* 13.2), bluntly pointed anteriorly, sharper posteriorly, broadest at about $\frac{1}{3}$ from anterior tip (Fig. 7). Vanes gently widening posteriorly from free rachis, then gently curved to form slightly convex lateral margins. Opaque area $\frac{1}{3}$ from anterior tip, parallel to margins, thicker anteriorly and thinner at widest part of gladius. Free rachis short (19.2% of *GL*), broad (7.5% of *GL*), terminating anteriorly in acute point at tip of gladius. Lateral ridges (ribs) indistinct at anterior $\frac{1}{3}$, distinctly thickened thereafter, rod-like, fused at posterior tip. From a point 46.2 cm from posterior tip, thin plates appearing along outer edge of lateral rods, broadened posteriorly, fused ventrally at posterior tip to form shallow and hollow cone *(CoLI* 1.20),

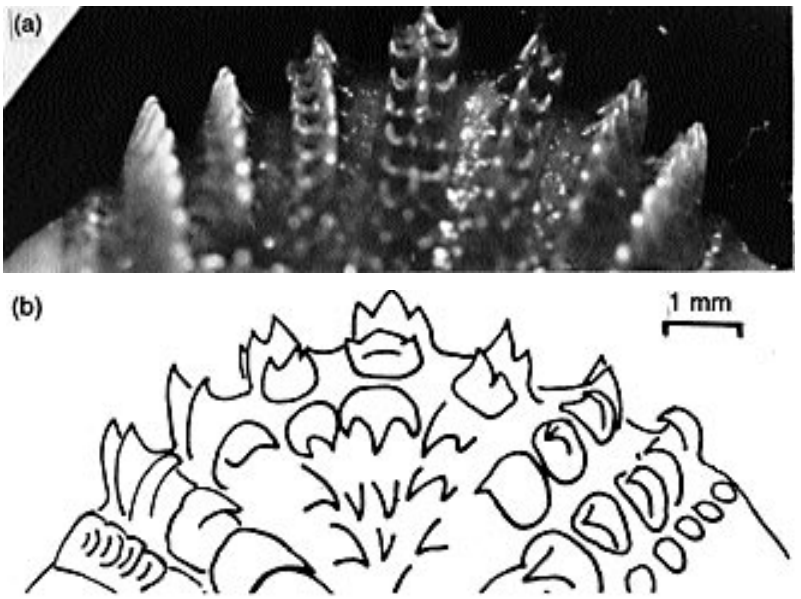

Fig. 6: Radula from the May 1996 Bustamante Bay *Architeuthis* – (a) anterior view (light microscopy), (b) posterior view (scheme)

and having four ribs on each, diverging from posterior tip.

Statoliths

The main statolith dimensions are listed in Table V.

Statolith white, opaque, its anterior surface slightly concave, its posterior surface slightly convex (Fig. 8). Anterior surface with two dorsal domes, one large and slightly flexed posteriorly, the other only slightly noticeable. In right statolith both domes conspicuous and approximately same size. Lateral dome large, with three lobes, inferior one bearing conspicuous knob. Dorsal spur prominent, rounded; medial fissure deep; ventral spur rounded; rostrum prominent, narrow at base, ventral end rounded; ventral fissure deep (only seen when statolith is soaked in water), covered with

Table IV: Lower beak ratios of three *Architeuthis* specimens, from Bustamante Bay (Argentina, May 1996), Green Point and Orange River (South Africa), the last two after Roeleveld and Lipiński (1991)

Parameter	Ratio		
	Bustamante Bay (*LRL* 16.400 mm)	Green Point (*LRL* 16.660 mm)	Orange River (*LRL* 17.350 mm)
RC/RW	1.20	±1.16	1.20
RC/RL	4.48	4.28	4.35
RC/WL	1.45	1.47	1.46
RC/JW	5.40	±5.40	5.42
RW/RL	3.72	±3.70	3.63
RW/WL	1.21	±1.27	1.22
RW/JW	4.49	±4.67	4.53
RL/WL	0.32	0.34	0.34
RL/JW	1.21	±1.26	1.25
WL/JW	3.71	±3.67	3.71
WL/RL	3.08	2.91	2.97

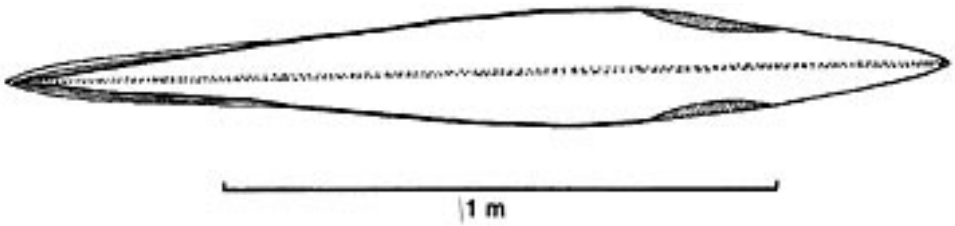

Fig. 7: Diagrammatic ventral view of the gladius of the *Architeuthis* from Bustamante Bay stranded in May 1996 (anterior part to the right)

thin calcareous layer; wing long and wide (left 0.21 mm, right 0.27 mm); rostral angle obtuse.

Parasites

A high level of parasitism was found in the stomach, the caecum and the intestine of the current specimen. All parasites were identified as plerocercoids of the Tetraphyllidea (Cestoda), with a characteristic scolex bearing four large leaf-like flaps or bothridia.

The plerocercoids observed were representatives of two families, the Oncobothriidae Braum, 1900 and the Phyllobothriidae Braum, 1900. Precise identification to genus within the Oncobothriidae is only possible from the adult stage. Notwithstanding, the plerocercoids present in large numbers in this *Architeuthis* specimen were identified as probably belonging to the genus *Oncobothrium* Blainville, 1828.

Only three specimens of the Phyllobothriidae were found in the sample examined. All of them were found with an invaginated scolex, making their identification difficult. They are probably members of the genus *Phyllobothrium* (Fig. 9).

DISCUSSION

General morphology

If the general morphology of the *Architeuthis* specimen stranded in May 1996 in Bustamante Bay is compared with information documented for other *Architeuthis* specimens, some points become clear. The presence of anterior fin lobes in *Architeuthis* sp. was discussed by Roeleveld and Lipiński (1991), who noted that most observations in the literature specifically noted no such fin lobes. In contrast, the Argentine specimen clearly has anterior fin lobes torn from the mantle. The fin-like structures found on the ventral side of the head of the Argentine specimen have also not been reported before, according to the literature available.

Internal organs

Roeleveld and Lipiński (1991) gave an account of the few descriptions of the particular *Architeuthis*

Table V: Comparison of statolith dimensions of *Architeuthis* specimens from Bustamante Bay (May 1996) and southern Africa's Orange River (Roeleveld and Lipiński (1991)

Parameter	Bustamante Bay (*ML* 1 940 mm)				Orange River (*ML* 1 680 mm)	
	Dimension (mm)		*% TSL*		Dimension	*% TSL*
	Left	Right	Left	Right	Left	Left
TSL	2.13	2.05			2.70	
RSL	0.70	0.67	32.9	32.7	0.80	29.6
LDL	1.42	1.44	66.7	70.2	1.90	70.4
SADD	1.07	0.86	50.2	41.9	1.21	44.8
STR	1.65	1.86	77.5	90.7	1.95	72.2
LDW max	1.19	1.15	55.9	56.1	1.47	54.4
RBW	0.31	0.37	14.5	18.0	0.62	23.0
WSL	1.34	1.61	62.9	78.5	1.07	39.6

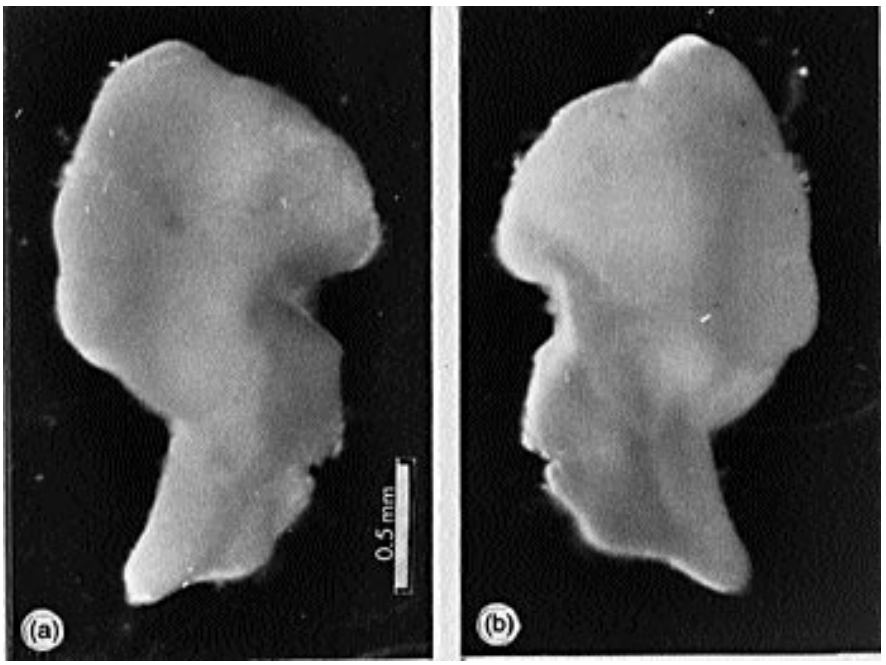

Fig. 8: Left statolith of the *Architeuthis* stranded in Bustamante Bay in May 1996 – (a) anterior surface, (b) posterior surface

internal organs reported by them. They described the digestive tract, gills, systemic heart, ink sac, female reproductive system and the eggs of some *Architeuthis* specimens from South Africa. The internal organs of the May 1996 specimen from Bustamante Bay closely resemble those of South African specimens. The major differences noticed were the shape of the oocytes (oval in the specimen described here, rounded in the South African specimens) and the differentiation of the stomach into two different parts in the Argentine *Architeuthis*. The first part is strongly muscular and the rest has very thin walls and turns to the left of the mantle cavity in an approximate right angle.

Beaks and radula

The upper and lower beaks and the lower beak ratios of the May 1996 Bustamante Bay and Green Point and Orange River (Roeleveld and Lipiński 1991) specimens (Table IV) are similar, according to Plate XIV of Roeleveld and Lipiński (1991). However, the beak of the Argentine specimen is rather small (*LRL* 16.4 mm, in *ML* 1.94 m) compared to the South African specimens (*LRL* 16.66 and 17.35 mm, in *ML* 1.70 and 1.68 m respectively).

The features of the lower beak of the Bustamante Bay specimen agree with those given by Clarke (1986) for the genus, except for the angle point reported by that author. No angle point was observed in the two South African specimens either (Roeleveld and Lipiński 1991). In shape, the lower beak of the *Architeuthis* from Brazil is similar to that of the Bustamante Bay specimen (Arfelli *et al.* 1991), although the last authors gave no morphological or morphometric details.

Clarke (1986) calculated regression equations for lower rostral length against total mass (in g) for all *Architeuthis*, and *LRL* against *ML* (in mm) for North Atlantic and South African *Architeuthis* separately. Applying these equations to data from the Bustamante Bay specimen, the values obtained are 60.5 kg (*TM*), 1 613 mm (*ML*) and 917 mm (*ML*), underestimates of both *TM* (180 kg without tentacles) and *ML* (1 940 mm). Roeleveld and Lipiński (1991) also found that these equations used in back-calculations resulted in serious underestimation. The latest Busta-

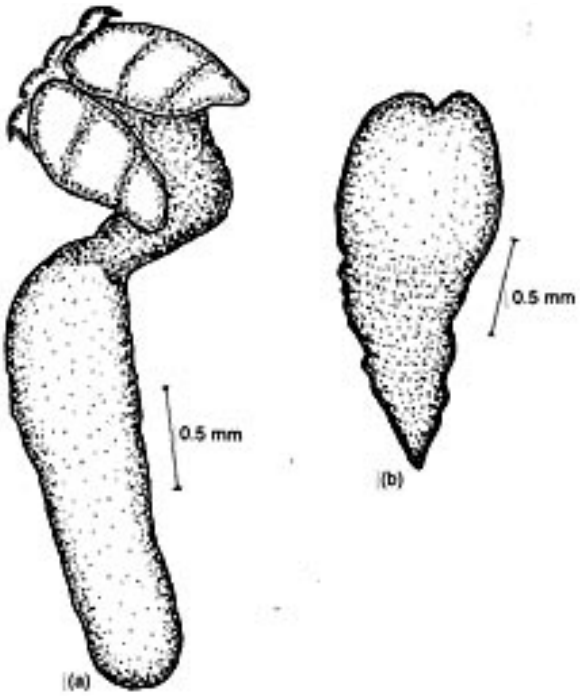

Fig. 9: Parasites found in the *Architeuthis* stranded in Bustamante Bay in May 1996 – (a) *Oncobothrium* sp. (b) *Phyllobothrium* sp.

mante Bay specimen was weighed and measured shortly after it stranded, and its beak was in excellent condition. Therefore, the data given here may prove useful in revising such regression equations in future.

The radula of the Argentine specimen closely resembles that of the South African Orange River specimen (Roeleveld and Lipiński 1991), but no details are given on lateral plates of the latter to allow comparison.

Gladius

The morphology of the gladius given here agrees with Pfeffer's (1912) general description for the family Architeuthidae. However, there are some differences from the descriptions of gladii given by Roper and Young (1972) for a juvenile *Architeuthis* specimen and by Toll and Hess (1981) for a mature male of the same genus. Compared to the gladius of the juvenile, the gladius of the Bustamante Bay specimen has a less rounded anterior, and the anterior part of the rachis is narrower relative to the vane width. The latest specimen also has a distinctive conus at the posterior end. The specimen described by Toll and Hess (1981) had more marked anterior shoulders, the vanes were wider in a more posterior position (according to the authors' drawing), and they had wider expansions of the lateral cone field. The gladius of the Bustamante Bay specimen is also similar in shape to the Sandy Cove, Newfoundland, *Architeuthis dux* specimen (1 690 mm *ML*) illustrated by Aldrich (1991, Fig. 10).

Statoliths

The first description of an *Architeuthis* statolith is that by Roeleveld and Lipiński (1991) for a South African specimen from the Orange River. That statolith's proportions compared with the *Architeuthis* specimen from Bustamante Bay differ mainly in the total length and in the rostral base width, which are respectively smaller and narrower in the Argentine specimen, and in the wing length (Table V). The wing of the Bustamante Bay specimen statolith is long and wide, more similar to that of *Architeuthis kirki* from New Zealand (Gauldi *et al*. 1994).

Parasites

Plerocercoids of the genus *Phyllobothrium* occur free or attached in the stomach, caecum and rectum of host cephalopods. *P. loliginis* is the most common species encountered in the cephalopods *Loligo*, *Illex* and *Todarodes* from the Pacific, Atlantic (including the Caribbean Sea) and Indian oceans (Hochberg 1990). Off Argentina, *Phyllobothrium* sp. is a common parasite of *Illex argentinus* (Nigmatullin and Shukgálter 1990, Sardella *et al*. 1990).

Adults of the two orders of cestodes commonly represented in cephalopods, the Tetraphyllidea and the Trypanorhyncha, are parasites of the digestive tracts of sharks, skates and rays.

At present, the only records of parasites found in *Architeuthis* are those documented by Pippy and Aldrich (1969), who reported the presence of *Hepatoxylon trichiuri* (Trypanorhyncha) from *A. dux* off Newfoundland, and those of Pérez-Gándaras and Guerra (1978), who reported the presence of unidentified Trypanorhyncha larvae (= tetrarhynchid) in *Architeuthis* sp. from the eastern South Atlantic (South Africa). In the Argentine specimen examined here, there was no parasite other than larval stages of the Tetraphyllidea. The difference can be attributed to different trophic spectra between the geographic areas.

Clarke (1986) refers to the wide distribution of the

genus *Architeuthis*, from 80°N in the eastern North Atlantic to the subtropical convergence at about 40°S, in the Atlantic, Indian and Pacific oceans. According to Clarke, present knowledge suggests that the genus occurs in neither the Antarctic nor, probably, south of the subtropical convergence. The present record expands the southern distribution up to 45°08′S and is the fourth for the South-West Atlantic. It is remarkable that three of the four specimens involved have been found in two successive years (1995 and 1996) in San Jorge Gulf, between 45°08′ and 46°30′S, and two of them in the same bay, only 4 km apart. As Bustamante Bay is a small, rather open bight, with a 13 km wide, north-east to south-west orientated mouth, up to 11 m deep, with many islands spread within, specific factors may occur to promote the *Architeuthis* strandings.

No specific identification of the *Architeuthis* specimen from the May 1996 Bustamante Bay specimen was attempted. Its fin has the same anterior lobes as the Durban and Green Point specimens described by Roeleveld and Lipiński (1991). Suckers and the arrangement of the sucker rings coincides also with that of the South African specimens (Roeleveld and Lipiński 1991). Beaks and radula are similar to those of the Orange River specimen described by Roeleveld and Lipiński (1991). The gladius shape strongly resembles that of *Architeuthis dux* from Newfoundland (Aldrich 1991). Statoliths are more similar to *Architeuthis kirki* from New Zealand (Gauldie *et al.* 1994) than to that of the Orange River *Architeuthis* (Roeleveld and Lipiński 1991). Undoubtedly, more information is needed to clarify its specific status.

The May 1996 Bustamante Bay specimen is now preserved in neutral formaldehyde at the Museum of Natural Science and Oceanography in Puerto Madryn, Argentina. Beaks, radula, gladius, sucker rings, statoliths and internal organs are deposited at the Centro Nacional Patagónico (Consejo Nacional de Investigaciones Científicas y Técnicas), Puerto Madryn, for further study. Results dealing with biochemical composition will be presented later.

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