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AN EOCENE LEATHERBACK TURTLE (CRYPTODIRA: DERMOCHELYIDAE) FROM SEYMOUR ISLAND, ANTARCTICA.

MARCELO S. DE LA FUENTE (*)

SERGIO N. SANTILLANA (**)

SERGIO A. MARENSSI (**)

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(*): Facultad de Ciencias Naturales y Museo de La Plata. Paseo del Bosque S/N. (1900) La Plata. Argentina. CONICET.

(**): Instituto Antártico Argentino. Cerrito 1248. (1010) Buenos Aires. Argentina.

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RESUMEN: Se describen los primeros restos fosiles de tortugas **Dermochelyidae** en la Península Antártica. Los mismos proceden de afloramientos de la Formación La Meseta (Eoceno) en tres localidades de la Isla Marambio (Seymour). Los materiales fósiles consisten en placas aisladas y un pequeño fragmento de la coraza, de naturaleza epitecal, correspondientes a diversos especímenes. Esta armadura epitecal es sólo conocida entre los miembros de la familia **Dermochelyidae** registrados desde el Eoceno medio hasta la Actualidad. Los especímenes antárticos son tentativamente referidos al género *Psephophorus*, taxón cuyas especies se registran desde el Eoceno medio - superior hasta el Plioceno en Europa, Nueva Zelanda y América del Norte.

ABSTRACT: The outcrops of La Meseta Formation from Seymour Island yielded the first Antarctic fossil remains of Dermochelyid. It consist of isolated platelets and a small portion of the shell of epithecal nature. This epithecal armor is only known in Middle-Upper Eocene to Recent members of the family Dermochelyidae among the turtles. The Antarctic specimens are tentatively referred to Psephophorus, a genus whose species are recorded from Middle - Upper Eocene to Pliocene of Europe, New Zealand and North America.

INTRODUCTION

During the last six summer Antarctic Expeditions of the Instituto Antártico Argentino, field work was carried out by geologists of this Institution (IAA) and paleontologists of the Departmento Científico Paleontología Vertebrados, in five land mammal-bearing localities with outcrops of La Meseta Formation (Eocene), Seymour Island, Antarctic Peninsula (Fig.1). Several vertebrate remains as Chondrichthyes, Osteichthyes, Aves, Marsupials and placental mammals were found in those localities (see MARENSSI *et al.*, 1994, and references therein).

Although the probable record of pleurodiran turtles in Antarctic Peninsula has been previously cited (WOOD *in* PRITCHARD, 1974; FUENTE *in* MARENSSI *et al.*, 1994) its presence has never been proved. In this article, the first record of cryptodiran turtles of Antarctica is documented. Remains of these turtles were collected in three mammal-bearing localities (DPV 6/84 = RV-8200, DPV 2/84 and IAA 1/90)(Fig.2) and are referred to Family **Dermochelyidae**. This family of leatherback turtles is represented by the living species *Dermochelys coriacea* (Linnaeous, 1766) and by several Eocene to Pliocene taxa.

The material used in this study is housed in the Departamento de Paleontología Vertebrados of the Museo de La Plata (MLP), La Plata, Argentina.

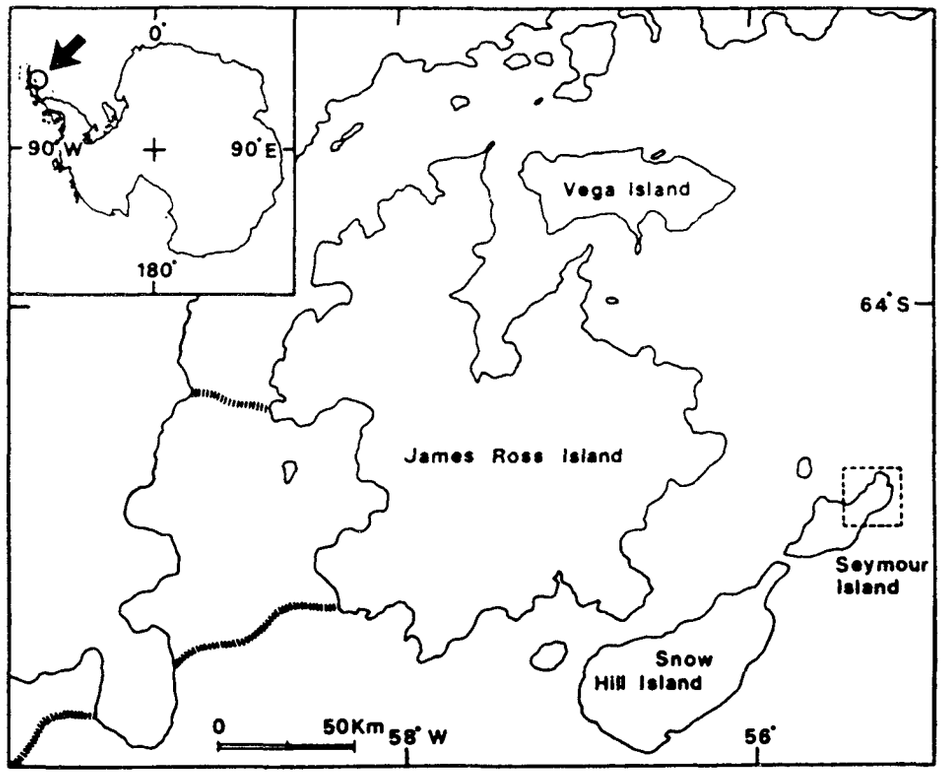

Figure 1. Sketch maps showing the location of Seymour Island, northern Antarctic Peninsula.

GEOLOGICAL SETTING

The Eocene La Meseta Formation consists of approximately 720 m of poorly consolidated shallow marine, estuarine and deltaic sedimentites (MARENSSI, unpublished data). This unit rests unconformably on rocks of the Maastrichtian-Paleocene Marambio Group (RINALDI et al, 1978) and also upon the the Upper Paleocene Cross Valley Formation (ELLIOT & TRAUTMAN, 1982). The Eocene sediments fill a broad channel or canyon- like trough cut subareously but filled after a marine transgresion (MARENSSI & SANTILLANA, 1994).

ELLIOT & TRAUTMAN (1982) divided the La Meseta Formation into three informal members designated I to III from base to top. Lately, SADLER (1988) subdivided this unit into seven major lithofacies (TELM 1 to 7) with seven minor subunits. Finally, MARENSSI & SANTILLANA (1994) indicated that La Meseta Formation is a depositional sequence and can be divided into six unconformity-bounded units or informal Allomembers.

Localities DPV 6/84 (RV-8200 or The Mammal Site, WOODBURNE & ZINSMEISTER, 1984), DPV 2/84 and IAA 1/90 (The Ungulate Site, MARENSSI et al, 1994) are situated in the middle part of the formation into Member II of ELLIOT & TRAUTMAN (1982), TELM 4-5 of SADLER (1988) or Allomember *Cucullaea* I of MARENSSI & SANTILLANA (1994) (Fig. 3). This section consists of thick shelly conglomerates, well sorted fine sands and interlaminated sand-mud channel fills.

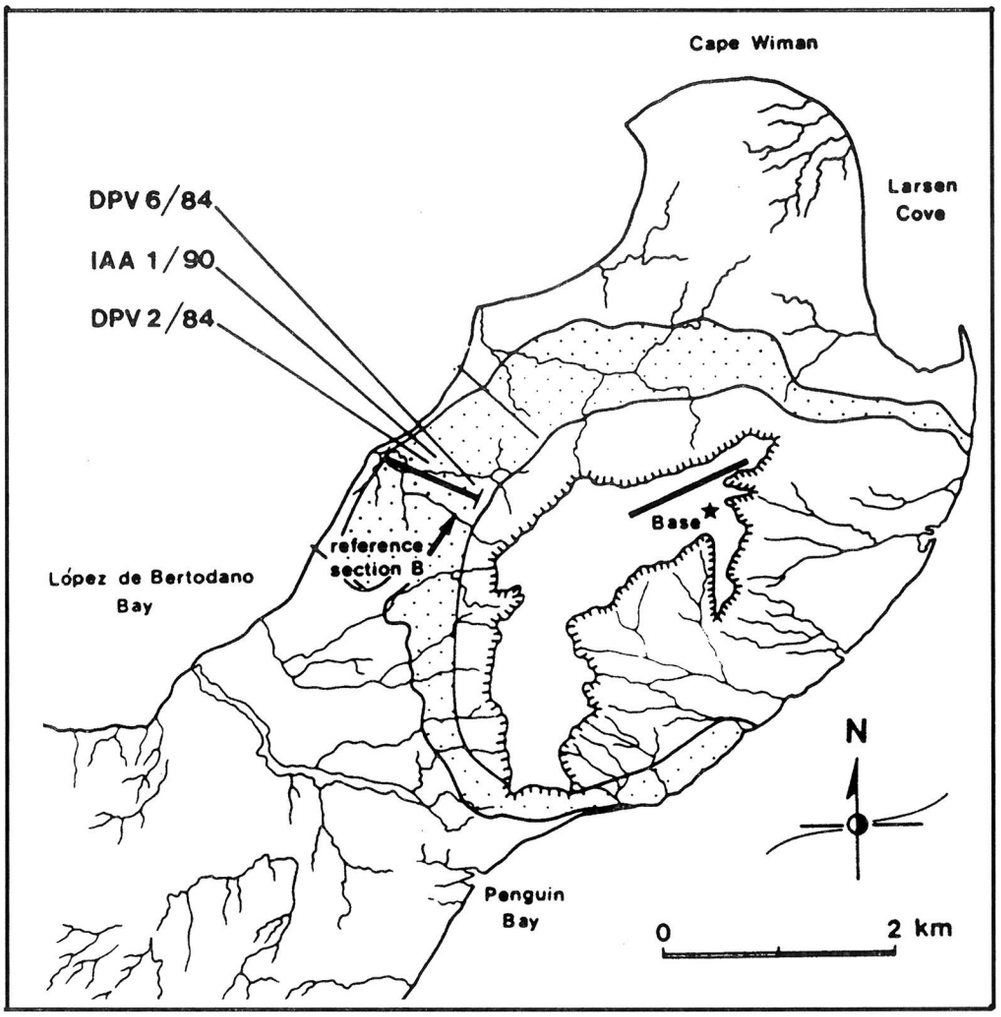

Figure 2. Sketch map showing the northern tip of Seymour Island, the outcrop of TELM 4/5 units of the La Meseta Formation and the location of the collecting localities.

The coquina marking the base of this unconformity-bounded unit where locality DPV 2/84 is located, is TELM 4 of SADLER (1988). It has an erosive base, a maximun thickness of 4 m and can be traced laterally for several kilometers. The macrofauna is dominated by the robust pelecypod *Cuccullaea raea* but marine and terrestrial remains also occur. Locality IAA 1/90 occurs in a thin shelly conglomerate within the sand/mud lithofacies in the middle part of the allomember. The macrofauna is dominated by naticid gastropods, but remains of land and marine vertebrates are also present. Finally, locality DPV 6/84 is situated near the top of this unconformity-bounded unit immediately bellow a hummocky bedded thick sand. MARENSSI *et al.,* (1994) and MARENSSI (unpublished data) indicate that this part of the formation represent a tide-dominated and wave-influenced estuary. Terrestrial and marine organisms have been concentrated in this transitional environment by sedimentological and sometimes biological processes and hence they reflect communities that lived in different habitats and perhaps differents times.

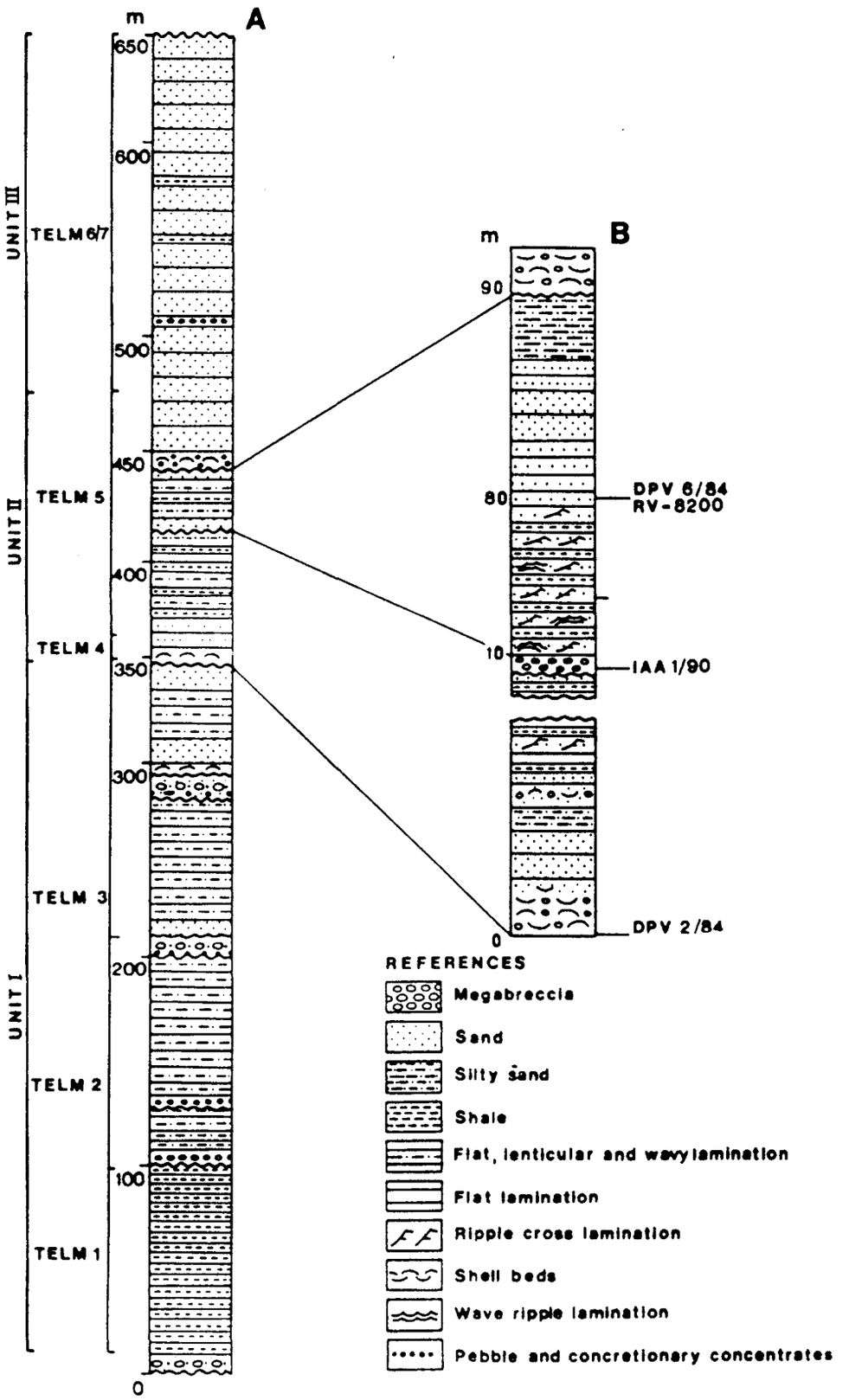

Figure 3. a. Stratigraphic section of the La Meseta Formation, Seymour Island, Antarctic Peninsula. b. Stratigraphic section of the TELM 4/5 units showing the distribution of fossil turtles localities within them.

SYSTEMATIC PALEONTOLOGY

Order **Chelonii** Brongniart, 1800

Infraorder **Cryptodira** Cope, 1868

Duperfamily **Chelonioidea** Baur, 1893

Family **Dermochelyidae** Gray, 1825

cf. *Psephophorus* H. v. Meyer, 1847

Material: MLP 88-I-1-354 (RV-8200, TELM 5), an isolated epithecal plate; MLP 90-I-20-270/273, two isolated plates (IAA 1/90, TELM 5); MLP 92-II-2-113, a fragment of an epithecal plate (DPV 2/84, TELM 4), MLP 94-III-15-28 a fragment of epithecal corace with four plates [Coquine of Miles (DPV 2/84), TELM 3/4]; MLP 95-I-10-11/12/13, fragments of epithecal plates (IAA 1/90, TELM 5).

Localities: Fossil turtles have been collected in three localities: DPV 6/84 (= RV-8200), DPV 2/84 and IAA 1/90. These localities have been described by MARENSSI *et al.* (1994: pag. 5-6) (Fig. 2). Abbreviations: DPV 2/84, 6/84 = fossil vertebrate and flora localities of the Departamento Científico de Paleontología Vertebrados , Museo de La Plata; IAA 1/90 = fossil mammal localities of the Instituto Antártico Argentino (Dirección Nacional del Antártico); RV-8200 = fossil vertebrate and flora localities of the Department of Earth Sciences, University of California at Riverside.

Horizons: TELM [= Tertiary Eocene La Meseta stratigraphical units, see SADLER (1988)] 3/4/5

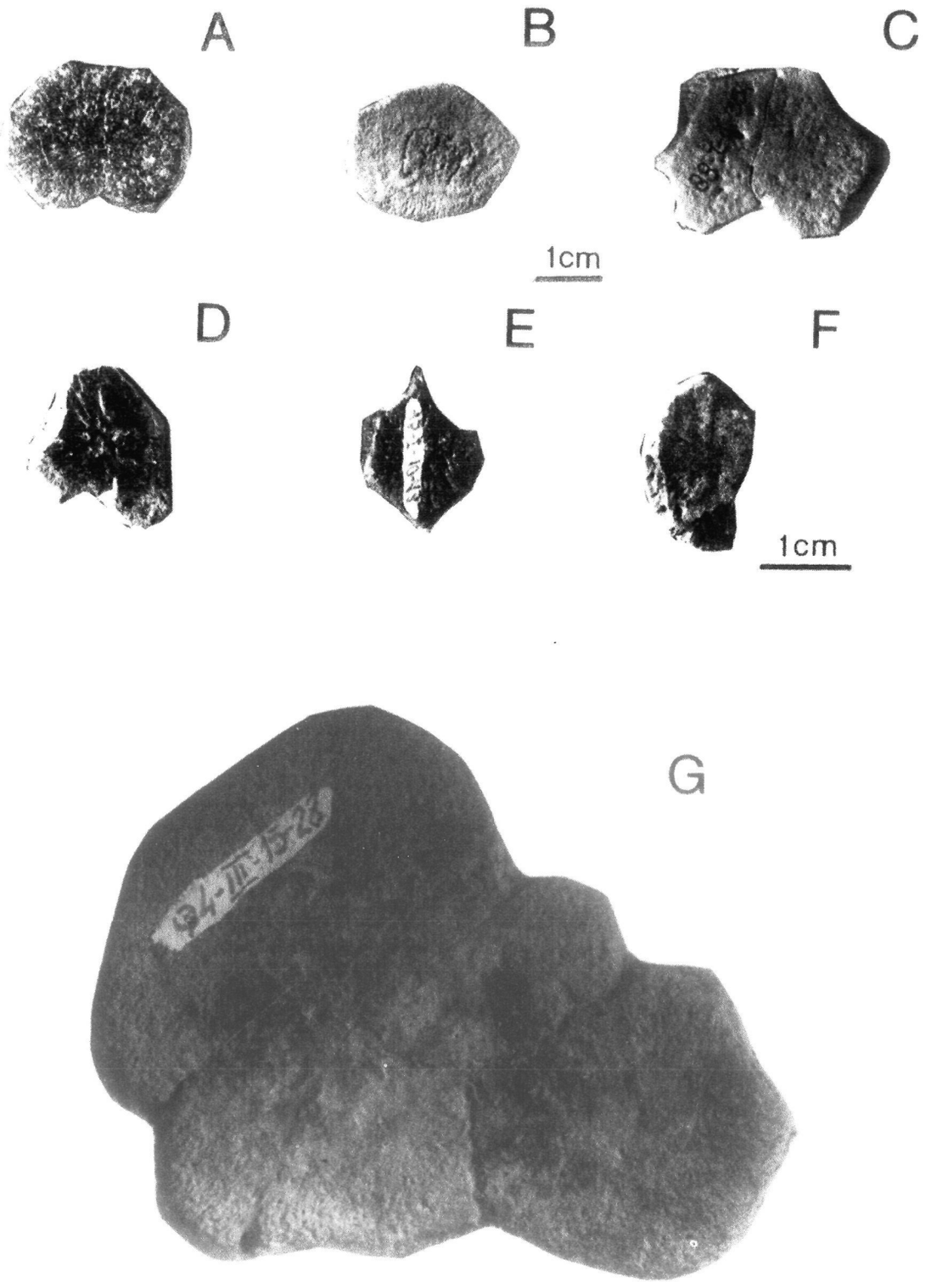

Figure 4. Isolated platelet from the epithecal shell of Seymour Island specimens: A (MLP 90- I- 20- 270), B (MLP 90- I- 20- 273), C (MLP 88- I- 1- 354), D (MLP 95- I- 10- 12), E (MLP 95- I- 10- 13), F (MLP 92- II- 2- 113), G fragment of 4 platelets (MLP 94- III- 15- 28).

DESCRIPTION AND MEASUREMENTS

The material consists of several platelets belonging to different specimens. These platelets fill the interval between consecutives ridges, forming a characteristic mosaic of smaller plates without keeled platelets.

Specimen MLP 88-I-1-354 (Fig. 4, C) is a poligonal irregular plate delimited by 9 sides. The maximun plate length is 31 mm, and 18 mm thick. The dorsal surface is smooth and in ventral view it has small capilar holes.

Specimen MLP 90-I-20-270 (Fig. 4, A) is an octogonal plate (26 mm length x 11 mm thick) and MLP 90-I-20-273 (Fig. 4, B) is pentagonal (24 mm length x 12 mm thick). Both bones are characterized by a smooth dorsal surface.

Specimen MLP 92-II-2-113 (Fig. 4, F) is a small fragment of an isolated platelet (19 mm length x 8 mm thick) with a smooth outer surface.

Specimen MLP 94-III-15-28 (Fig. 4, G) is a small fragment of epithecal armor-plating (64 mm in length) with four irregular plates of different sizes. Plates are closely fitting and upon outer surfaces the sutures are sinuous.The thickness of the ephitecal bones is 14 mm.

Specimen 95-I-10-12/13 (Fig, 4, D-E) are two isolated irregular platelets that show on their dorsal surface a slightly radial decoration comparable with that present in several plates of *Psephophorus polygonus* figured by SEELEY (1880: plate XV, 1). This platelets are smaller (22 mm) and less thick (6 mm) than the other Antarctic platelets described above.

REMARKS

The situation of the isolated plates within the shell can not be determined. Unlike *Dermochelys coriacea*, in other fossil taxa such as *Psephophorus* (see SEELEY, 1880; DOLLO, 1888; PALMER, 1909) the epithecal plates cover all the plastron. Differences in size and thickness among the plates in Seymour material could be showing different positions on the armor. After WEEMS (1974) and BROIN & PIRONON (1980) in *Psephophorus calvertensis* Palmer, 1909, the plastral platelets are thicker than the dorsal ones, while in *P.rupeliensis* (Van Beneden, 1883) the plastral plates are thinner (see DOLLO, 1888). WEEMS (1974) also pointed out that in *P.calvertensis* the platelets of the outer and posterior edges are much smaller and thinner than the other ones.

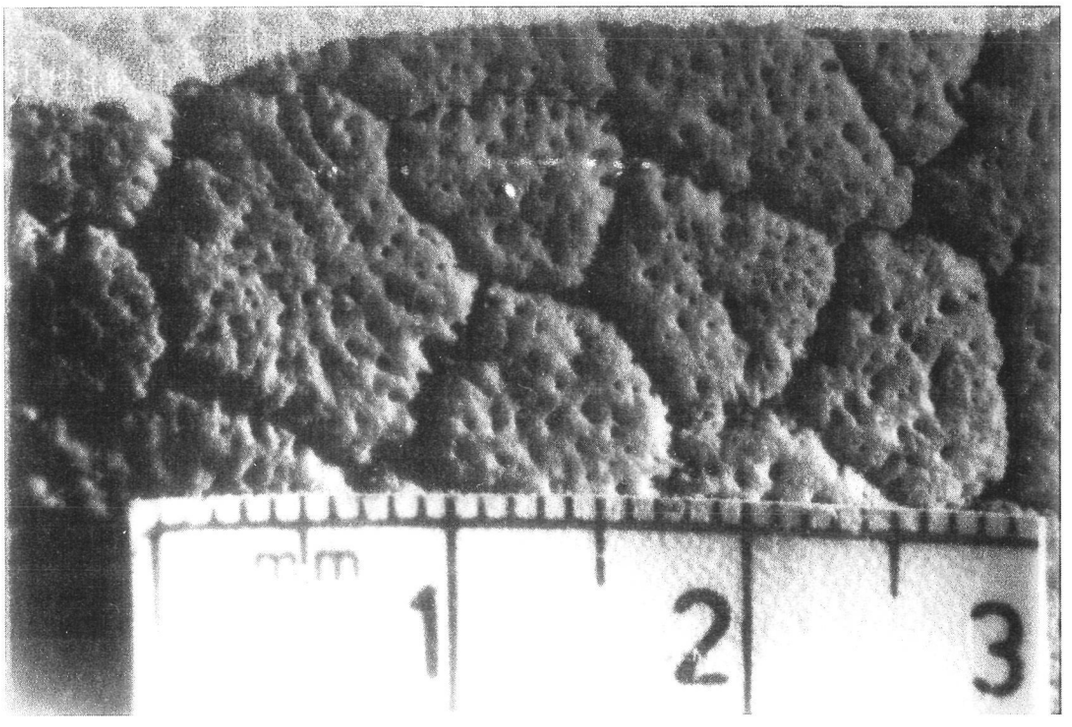

Figure 5. Detail of the epithecal carapace of living Dermochelys coriacea showing the irregular mosaic of dermal platelets.

DISCUSSION

The assignment of the isolated plates and the small armor-plating of Antarctica to the family **Dermochelyidae** is made by comparison with a portion of the carapace of the living leatherback turtle *Dermochelys coriacea* (Fig. 5). This species is the largest living sea turtle of the world and shows the main characters of the family **Dermochelyidae**. These features are: great size, absence of cornified integumentary structures, extreme reduction of the thecal bones of the carapace and plastron, strong longitudinal ridges on both carapace and plastron, development of an epithecal shell layer consisting of a mosaic of thousands of small poligonal plates. The great thecal bone reduction is unique among living chelonians. Neural and peripheral plates are lacking. The thecal bones are restrained to the nuchal bone and a slightly lateral expansion of the ribs widely separated from each other. The plastral plates are all present except the odd entoplastron. However, they are reduced to splint-like structures, forming a marginal ring of bones surrounding a large central fontanelle. Likewise, the body is protected by an armor of leathery consistence covering the epithecal carapace.

Other unique internal characteristics of *Dermochelys coriacea* pointed out by PRITCHARD & TREBBAU (1984) are: presence of a looped esophagus up to 2 m in

length, degree of endothermy, and vascularization of the cartilage (see RHODIN *et al.*, 1981). Those peculiar morphological and phisiological characteristics could be in relation with the invasion of a specific ecological niche. PRITCHARD & TREBBAU (*op.cit.*) consider that other sea turtles, though able to make oceanic crossing migrations, are essentialy costal forms depending for food on continental organisms, while the dermochelyids are truly pelagic. The success of the leatherbacks as true pelagic turtles is a result of the high specialization in the consumption of scyphomedusans. According to PRITCHARD & TREBBAU (1984) such diet is more easily obtenible in the necessary volume in the more productive cooler waters outside the tropics, where an advantage in a degree of endothermy would enable a reptile to inhabit the low temperatures of high latitudes. Although the nesting areas of *Dermochelys coriacea* is almost restricted to the tropics, the large latitudinal range of the living leatherback turtle (northernmost record 71° N and southernmost 47° S) support this statement.

Five genera have been included in the family **Dermochelyidae**: *Cosmochelys* Andrews, 1919 from the Eocene of Nigeria; *Dermochelys* Blainville, 1816, Recent worldwide oceanic distribution; *Eosphargis* Lydekker, 1889, from the Early Eocene of England, Belgium and Denmark; *Psephophorus* von Meyer, 1847, from the Eocene-Pliocene of Europe (England, Belgium, Czechoslovakia, Italy, France and Germany), New Zealand, North Africa and North America; *Pseudosphargis* Koenen, 1891, from the Late Oligocene of Germany.

Although the Antarctic material is clearly a dermochelyid, its taxonomic position within the family is obscure due to its fragmentary nature. However, the Seymour Island platelets were compared with the armor of living and fossil taxa. The genus *Cosmochelys* is represented by only one species: *Cosmochelys dolloi* Andrews, 1919. On comparing the Seymour Island platelets with the shell of the holotype of *Cosmochelys dolloi* ANDREWS (1919: plate II) the differences in the decoration of the plates are remarkable. Unlike our specimens, the Nigerian species shows the outer surface sculptured with a series of irregular tuberosities in the middle surrounded by radial ridges. Other characteristics of the Nigerian species, such as the slender ridges of the rows of longitudinally keeled plates and the mosaic of smaller plates placed between the ridges are only two rows of platelets, are not comparable with our material.

The differences in size, dimentions, thickness and decoration between the Seymour Island platelets and the individual plates of *Dermochelys coriacea* prevent the inclusion of the Antarctic specimens in the same genus and species than the living leatherback turtle.

Eosphargis is represented by two species, one of them named *E.gigas* (Lydekker, 1889) from the London Clay Formation (Lower Eocene), Sheppey Island, England (LYDEKKER,1889) and from the Lower Eocene of Belgium (DOLLO, 1909); and another one, *E.breineri* Nielsen, 1959 from the Early Eocene of

Denmark (NIELSEN, 1959,). The English material of *E.gigas* includes two specimens with skull and postcraneal bones, while the Belgian one is an almost complete specimen shortly portrayed by DOLLO (1909). *E.breineri* is known by craneal and postcraneal bones described by NIELSEN (1959, 1963). Both species of *Eosphargis* share a primitive trait such as the absence of epithecal shell, a character that makes a strong difference between *Eosphargis* and the more apomorphic taxa of dermochelyids (Seymour specimens included).

The genus *Psephophorus* H. von Meyer, 1847 includes several named species [*P.polygonus* H. von Meyer, 1847; *P.calvertensis* Palmer, 1909; *P.pseudostracion* (Gervais, 1849), *P.rupeliensis* (Van Beneden, 1883); *P.eocaenus* Andrews, 1901; *P.scaldii* (Van Beneden, 1871)] (see MLYNARSKI, 1976; BROIN & PIRONON, 1980). *P.eocaenus* from the Middle or Upper Eocene of Qsar El Sagha, Fayum, Egypt (ANDREWS, 1906) and *P.scaldii* from the Miocene of Anvers, Belgium (VAN BENEDEN, 1871) are not comparable with the Antarctic specimens, because they are known by an humerus and other remains of the appendicular skeleton. *P.calvertensis* Palmer, 1909, from the Middle Miocene of Maryland, consists of several epithecal shell fragments. According to PALMER (1909: pl 31) the main remain is a portion of the medium ridge shell, the other shell fragments are a dorso-lateral ridge sector and a plastral piece. The plastral plates of the *P.calvertensis* are mostly large, thick and smooth on the dorsal surface like the largest platelets of Seymour Island specimens. The holotype of *Psephophorus polygonus* H. von Meyer, 1847, from the Miocene of Czechoslovakia, figured by SEELEY (1880: pl. 15), consists of a median part of the epithecal shell that includes a longitudinal medial keel made of rows of large thickened plates between a mosaic of smaller circular to poligonal platelets irregulary arranged. The smaller platelets from Seymour Island could be comparable with the polygonal plates without ridges of *P.polygonus*. *P.pseudostracion* (Gervais, 1849) from the Pliocene of Vandargues (France) figured by GERVAIS (1872, pl 9, fig 4) according to BROIN & PIRONON (1980) consists of a longitudinal row of large plates and small plates at both sides. Although *P.rupeliensis* (Van Beneden, 1883), from the Oligocene of Belgium, is known by remains of the skull, post-craneal skeleton and carapace of several specimens, only a few elements have been figured by VAN BENEDEN (1883) (isolated polygonal platelets, vertebrae and ilium) first, and then by DOLLO (1888) (three fragments of humerus), and other specimens have never been described. According to BROIN & PIRONON (1980) one specimen housed in the exposition of the Royal Institut of Natural Sciences of Belgium is characterized by the large polygonal platelets.

In spite of the fragmentary nature of the Seymour Island specimens, some platelets could be comparable with the epithecal armor remains of these species. However, nothing is known about the morphology of the epithecal carapace, the arrange of the ridges and the mosaic of small platelets to make an accurate determination.

Several fragmentary materials (isolated platelets, shell fragments and appendicular skeleton) have also been referred to the genus *Psephophorus* from the

Miocene of Italy (BROIN & PIRONON, 1980) and Germany (DAMES, 1894), the Middle Eocene of England (LYDEKKER, 1889) and the Eocene of New Zealand (KOHLER, 1994); and there are two species that have a close relation with *Psephophorus* (see BROIN & PIRONON, 1980). One of them is *?Psephophorus oregonensis* PACKARD, 1940, from the Eocene of Oregon, named upon the fragments of the carapace and skeleton. The other is *Pseudosphargis ingens* (Koenen, 1891) from of the Upper Oligocene of Westphalia (Germany), which was described by DAMES (1894) upon a skull fragment. According to (NIELSEN, 1959), these two last species could be probably assigned to the genus *Psephophorus* but this statement has not been certified.

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BIBLIOGRAPHY

ANDREWS, C.W. (1906). *A descriptive catalogue of the Tertiary Vertebrata of the Fayum Egypt.* Trust Brit. Mus. (Nat.Hist.): 1-324. London.

ANDREWS, C.W. (1919). A description of a new species of Zeuglodont and a Leathery turtle from the Eocene of Southern Nigeria. *Proc. Zool. Soc. London*, **1 (18)**: 309-318. London.

BROIN, F. DE & PIRONON, B. (1980). Découverte d'une tortue dermochélyidée dans le Miocène d'Italie Centro-Méridionale (Matese oriental), province de Benevento. *Riv. Ital. Paleont.*, **86 (3)**: 589-604. Milano.

DAMES, W. (1894). Die Chelonier der norddeutschen Tertiarformation. *Pal. Abh. N. F.*, **2 (4)**: 197-220. Jena. [Non Vide]

DOLLO, L. (1888). Première note sur les Chéloniens oligocènes et néogènes de la Belgique. *Bull. Mus. Roy. Hist. Nat. Belgique*, **5**: 59-96. Bruxelles.

DOLLO, L. (1909). The fossil Vertebrates of Belgium. *An. New York Acad. Sci.*, **19 (4)**: 99-119. New York.

ELLIOT, D.H. & TRAUTMAN, T.A. (1982). Lower Tertiary on Seymour Island, Antarctic Peninsula. *In* CRADDOCK, C. (ed.): *Antarctic Geoscience.* Madison University of Wisconsin. Press, 287-298.

GERVAIS, P. (1872): Ostéologie de *Sphargis* luth. *Nouv.Arch.Mus.Nat.Paris*, **8 (2)**: 199-228.

KÖHLER, R. (1994). An Eocene turtle humerus (**Dermochelidae**, *Psephophorus*) from New Zealand. *Studia Geol. Salmanticensia*, **30**: 101-106. Salamanca.

LYDEKKER, R. (1889). Chelonia *In: Catalogue of the Fossil Reptilia and Amphibia in the British Museum (Natural History)*. Trust Brit. Mus. (Nat. Hist.), **3**: 1-239. London.

MARENSSI, S.A. & SANTILLANA, S.N. (1994). Unconformity bounded units within the La Meseta, Seymour Island, Antarctica: a preliminar approach. *XXI Polar Symposium*, Warzawa, Poland, September 1994. Abstract: 33-37.

MARENSSI, S.A., REGUERO, M.A., SANTILLANA, S.A. & VIZCAINO, S.F. (1994). Eocene land-mammals from Seymour Island, Antarctic palaeobiogeographical implications. *Antarctic Science*, **6**: 3-15. London.

MEYER H. v. (1847). Mittheilungen an Prof. Bronn. *Neues Jahrbuch Min.*: 572-580. Stuttgart. [*Non Vide*]

MLYNARSKI, M. (1976). Testudines. *In*: *Encyclopedia of Paleoherpetology*. Part. **7**: 130 pp. Stuttgart-New York.

NIELSEN, E. (1959). Eocene turtles from Denmark. *Medd. fra. Dansk. Geol. F.*, **14 (2)**: 96-114. Kobenhavn.

NIELSEN, E. (1963). On the post-cranial skeleton od *Eosphargis breineri*. *Medd. fra. Dansk. Geol F.*, **15 (3)**: 281-313.Kobenhavn.

PACKARD, E.L. (1940). A new turtle from the marine Eocene of Oregon. *Oregon State Coll., Stud. Geol.*, **2**: 3 pp. [*Non Vide*]

PALMER, W. (1909). Description of a new species of leatherback turtle from the Miocene of Maryland. *Proc. U.S. Nat.Mus.*, **36** : 369-373. Washington.

PRITCHARD, P. (1984). Evolution and Zoogeography of South American Turtles. *Studia Geol, Salmanticensia. vol. esp. I. Studia Palaeocheloniologica I*: 225-233. Salamanca.

PRITCHARD, P. & TREBBAU, P. (1984). *The turtles of Venezuela*. Contr. Herpet., **2**: 1-403. Soc. Stud. Amphibians & Reptiles ed. Oxford, Ohio.

RHODIN, A.G.J.; OGDEN, J.A. & CONLOGUE, G.J. (1981). Chondro-osseous morphology of *Dermochelys coriacea*. *Nature*, **290**: 244-246. London.

RINALDI, C.A.; MASSABIE, A.; MORELLI, J.; ROSEMMAN, L.H. & DEL VALLE, R.A. (1978). Geología de la Isla Vicecomodoro Marambio, Antártida. *Contrib. Inst. Antártico Argentino*, **217**: 1-37. Buenos Aires.

SADLER, P.M. (1988). Geometry and stratification of uppermost Cretaceous and Paleogene units on Seymour Island, Northern Antarctic Peninsula. *In:* FELDMAN R.M. & M.O.WOODBURNE (Eds.). *Geol. Soc. Amer. Mem.*, **169**: 303-320.

SEELEY, H.G. (1880). Notes on *Psephophorus* v. Meyer, a new type of chelonian reptile allied to the leathery turtle. *Quart. Journ. Geol. Soc.*, **36**: 406-413. London.

VAN BENEDEN, P.J. (1871). Les reptiles fossiles en Belgique. *Bull. Acad. Roy. Belgique*, s. **2, 31**: 9-16. Bruxelles.

VAN BENEDEN, P.J. (1883). Notes sur les ossements de *Sphargis* trouvés dans la terre à brique du Pays Waas. *Bull. Acad. Roy. Belgique*, s.**3, 12**: 665-684. Bruxelles.

WEEMS, R.E. (1974). Middle Miocene sea turtles (*Syllomus*, *Procolpochelys*, *Psephophorus*). *J. Paleont.* **48 (2)**: 278-302. Lawrence.

WOODBURNE, M.O. & ZINMEISTER, W.J. (1984). The first land mammal from Antarctica and its biogeographic implications. *J. Paleont.*, **58**: 913-948.
