AN *ARARIPEMYS*-LIKE DECORATED PLEURODIRE TURTLE IN THE PALEOCENE OF NORTHWESTERN ARGENTINE

Marcelo de la FUENTE & France de LAPPARENT de BROIN

FUENTE de la M. & LAPPARENT de BROIN F. de 1997. An *Araripemys*-like decorated pleurodire turtle in the Paleocene of northwestern Argentine. [Une tortue pleurodire à décoration d'*Araripemys* dans le Paléocène du Nord-Ouest argentin]. GEOBIOS, **30, 2**: 235-242. Villeurbanne, le 17.05.1997.

Manuscrit déposé le 11.09.1995; accepté définitivement le 04.01.1996.

ABSTRACT - An *Araripemys*-like decorated pleurodire turtle from an outcrop of Maíz Gordo Formation (Late Paleocene) in the vicinities of Mina Aguilar (Jujuy province, Argentina) is described. It appears to be a new taxon which remains undefined. The evolution of the nuchal bone is considered. A list of African and South American pit-decorated pleurodiran turtles is given.

KEYWORDS: CHELONII, PELOMEDUSOIDES, PALEOCENE, JUJUY, ARGENTINE.

RÉSUMÉ - Sont décrits les fragments d'une tortue pleurodire à décoration de type *Araripemys,* récoltés dans un gisement de la formation Maíz Gordo (Paléocène supérieur) près de Mina Aguilar (province de Jujuy, Argentine). Ils appartiennent à un nouveau taxon qui ne pourra être défini qu'avec du matériel complémentaire. L'évolution de la plaque nucale est évoquée. Une liste des tortues pleurodires d'Afrique et d'Amérique du Sud à décoration composée de cupules séparées par des crêtes assez aiguës est présentée.

MOTS-CLÉS: CHELONII, PELOMEDUSOIDES, PALÉOCÈNE, JUJUY, ARGENTINE.

RESUMEN - Se describen los restos de una tortuga pleurodira, con una ornamentación del tipo presente en *Araripemys,* procedente de afloramientos de la Formación Maíz Gordo (Paleoceno superior) expuestos en las proximidades de Mina Aguilar (provincia de Jujuy, Argentina). Aunque sea un nuevo taxón, queda indeterminado hasta el hallazgo de nuevo material. La evolución de la placa nucal es examinada. Se da la lista de las tortugas pleurodiras decoradas con cúpulas y crestas marcadas de Africa y América del Sur.

PALABRAS CLAVE: CHELONII, PELOMEDUSOIDES, PALEOCENO, JUJUY, ARGENTINA.

INTRODUCTION

During 1972-1973, field work was carried out by researchers of the Aguilar Mining Company and the Vertebrate Paleontology Department of La Plata Museum in the area located between Aguilar and Mal Paso Mountains, belonging to the Humahuaca Department, Jujuy province, Argentine. The main stratigraphic task was developed by Jorge Fernández through two profiles in Quebrada Azul and Quebrada del Puesto. At Quebrada del Puesto, the Santa Barbara Subgroup outcrops with its three components: Mealla, Maíz Gordo and Lumbrera Formations. Remains of a pit-decorated plates of one turtle and algal material were found in sediments of Maíz Gordo Formation (see Figs. 1, 2).

The three mentioned formations of Santa Barbara Subgroup (see Moreno 1970) from northwestern Argentine yielded several remains of chelonians (see Broin & Fuente 1992, 1993a,b), particulary Pleurodires Podocnemididae from Maíz Gordo Formation (Upper Paleocene-Early Eocene, after Pascual et al. 1981) in several localities of the Tres Cruces sub-basin (see Pascual et al. 1991). The first reference concerning the discovery of a turtle from "las margas verdes multicolores" (= Maíz Gordo Fm.) was made by Cattoi & Freiberg (1958) who named and described *Podocnemis argentinensis*. This species is a Podocnemididae known from Quebrada de Humahuaca, Jujuy province. As argued by Broin & de la Fuente (1993b: 197) the genus is new and will be defined; it is only provisionally related to "*Podocnemis*".

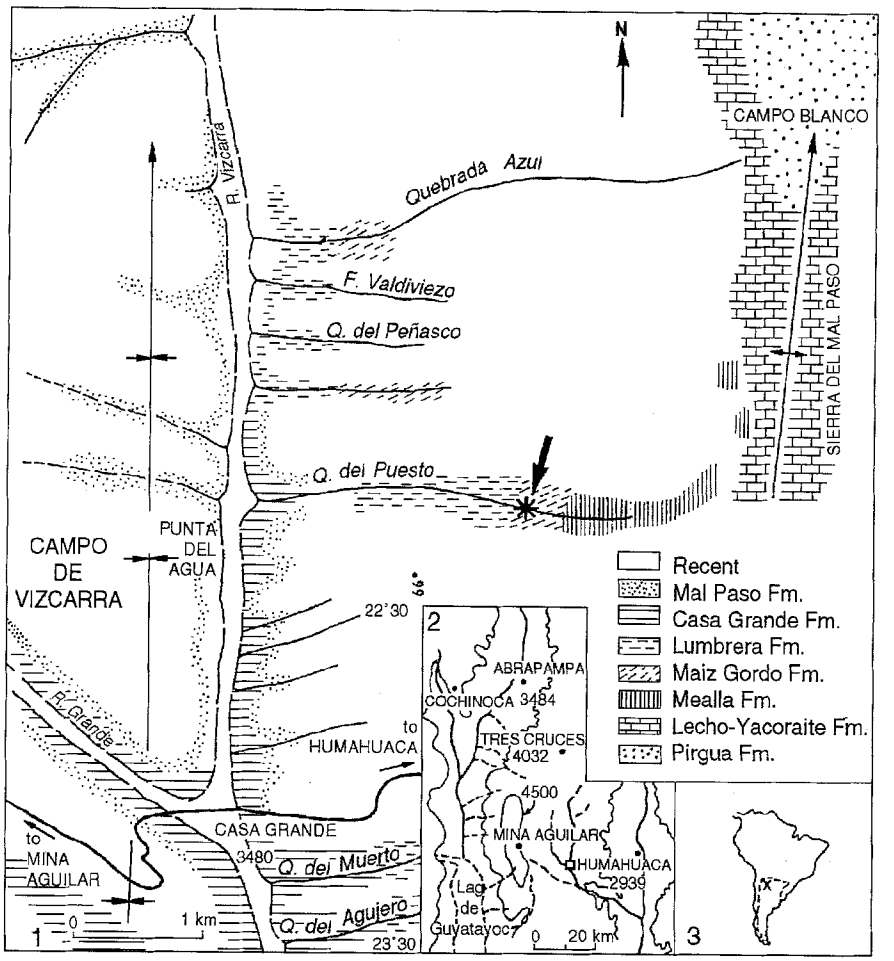

FIGURE 1 - Geological sketch map from western flank of Mal Paso Mountain to Vizcarra River. Redrawn from Fernández et al. 1973. **1.** Discovery area (arrow) of the fossil turtle near Mina Aguilar. **2.** Localization of Mina Aguilar area. Square: area represented in 1. **3,** localization in Argentine. *Carte géologique schématique du flanc ouest du Mont Mal Paso vers la rivière Vizcarra. Repris de Fernández et al. 1973. **1.** Secteur du lieu de découverte (flèche) de la tortue fossile près de Mina Aguilar. **2.** Secteur géographique de Mina Aguilar. Carré: partie représentée en 1. **3,** localisation en Argentine.*

In a first approach, we suggested for the new taxon of Pelomedusoides portrayed in this paper, a possible affinity with *Araripemys* (Ararimydidae? in Broin & de la Fuente 1993a: 78; 1993b: 30), because it has an anterior notch and is characterized by a special carapace decoration of pits. In fact, after examination, it cannot nowadays be placed in any known family. The study of this Argentine material provides us the opportunity to consider briefly the evolution of the nuchal plate and to make a list of pit-decorated pleurodire turtles worldwide.

Abbreviations. MLP, Museo de La Plata, La Plata, Argentine. MNHN, Muséum national d'Histoire naturelle, Paléontologie, Paris, France. This work is a contribution to IGCP Project 301 (Paleogene of South America).

SYSTEMATICS

CHELONII Brongniart, 1800
PLEURODIRA Cope, 1864
PELOMEDUSOIDES Cope, 1864

Incertae familiae

Nov. gen., nov. sp. indet.

Locality - The specimen was discovered at Quebrada del Puesto next to Mina Aguilar, Humahuaca Department, Jujuy province, Argentine. Fig. 1 see Broin & de la Fuente 1993b, Fig.1, spot 65, Fig. 2, spot Pa.

Horizon - A bluish calcareous limestone level with grayish tonalities belonging to Maíz Gordo Formation. Horizon 5 from Fernández et al. (1973) profile. This stratigraphic horizon was referred to Upper Paleocene-Lower Eocene by Pascual et al. 1981 and to Upper Paleocene by Gayet et al. 1991. Figs 1,2.

Material - MLP-73-VII-4-1. Anterior margin of the carapace formed by the first, second and third pair of peripheral bones, a fragment of the fourth right peripheral bone, the nearly complete nuchal bone, the medial part of the first pleural and a posterior fragment of the right border belonging to peripherals 7,8,9. Figs 3,4. (see Broin & de la Fuente 1993b: 198).

Measurements (mm) of the specimen MLP 73-VIII-4-1.

Estimated length of the carapace	500
Width of the carapace at the level of the third peripherals (3)	333
Length x maximum width of the nuchal	69 x 88
Anterior width of the nuchal	29
Length x maximum width of the first left peripheral (1)	176 x 61

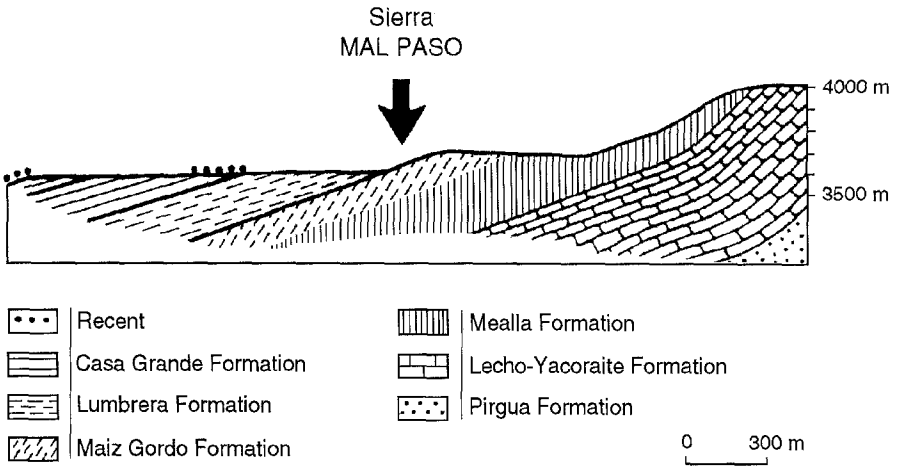

FIGURE 2 - Schematic cross section between western flank of Mal Paso Mountain and Vizcarra River. Redrawn from Fernández et al. 1973. *Schéma de la coupe du flanc ouest du Mont Mal Paso et de la Rivière Vizcarra. Repris de Fernández et al. 1973.*

Length x maximum width of the second left peripheral (2)	76 x 67
Length x maximum width of the third left peripheral (3)	68 x 58
Length x maximum (estimated) width of the first pleural (1)	80 x 150
Length x width of the first left marginal (1)	
/anterior border	23 x 31
/posterior border	23 x 39
Length x width of the second left marginal (2)	
/anterior border	51 x 71
/posterior border	51 x 48
Length x maximum width of the third left marginal (3)	53 x 63
Depth x width of the nuchal notch	32 x 115
Length x maximum width of the first vertebral scute (1)	95 x 118

Description - The carapace is only known by the three first pairs of peripheral bones of the anterior margin, the nuchal bone, the first right pleural and a posterior fragment of the right border, belonging probably to a specimen of 500 mm of linear carapace length (Figs. 3,4). The width of the anterior margin at the lateral sutures of the third peripheral bones is 333 mm (it reached 335 mm in the whole specimen). In spite of its fragmentary nature, it is possible to determine that the carapace of the MLP specimen was low-arched in the normal condition of aquatic turtles.

The decoration is characterized by small polygonal pits, most of them with 5 sides, which are 6 x 5 or 6 x 4 mm in length and width. These pits show an irregular pattern, roughly arranged so that their length is perpendicular to the anterior border.

The carapace scutes ought to have been very thin, upon such a decorated bone surface. The scute sulci are well defined on the dorsal surface, sunk in the bone and slightly sinuous. The anterior margin is built by a lengthening of the peripherals 1 and 2 on each side of the nuchal and displays a deep medial notch. This notch is delimited by the curved anteromedial border of the peripherals 1 and the recessed nuchal bone but the anterior border of the nuchal is transversal, not notched (Figs. 3,4.1,2). The anterior edge of the nuchal embayment is thicker than the remaining anterior border of the carapace margin.

The nuchal bone is slightly wider than long, with a moderately narrow anterior border. The width of the anterior nuchal border is 33% of the posterior one, the two lateral borders converging forward in a straight line. The dorsal surface of the plate is slightly vaulted, nearly flat. The ventral surface is slightly concave in front and caudal to a transverse thickening at the anterior third of the plate and this thickening is mainly developed laterally. There is no cervical scute. The marginal scutes 1 are small, relative to the following marginals and are twice as wide as long, displaying a subrectangular outline, somewhat oval in shape. The anterior border of the marginals 1 is narrowed while the anterior border of marginals 2 are extended towards the middle plane. Marginals 2 and 3 are larger than the first and rectangular in outline. The vertebral scute 1 is anteriorly much wider than the second vertebral scute. The direction of the preserved anterior part of the lateral border of the vertebral 2 shows that this scute was narrower than the first vertebral. The former one extends nearly up to the middle of the posterior sulci of the marginal scutes 2 (Figs. 3,4.1).

On the visceral surface, the impression of the marginal scutes sulci are long and progressively reduced from the third peripheral to the nuchal bone (Figs. 3, 4.2). Particularly, on the ventral surface of the nuchal plate, the skin of the body wall could be attached along the bone margin. In postero-visceral view of the third right peripheral, only the anterior border of the depression upon which the axillar buttress of the hyoplastron articulates, is preserved. This axillar depression is well developed and could be extended below a narrow part of the latero-visceral surface of the pleural 1, lateral to the axillar buttress. The latter extends from the

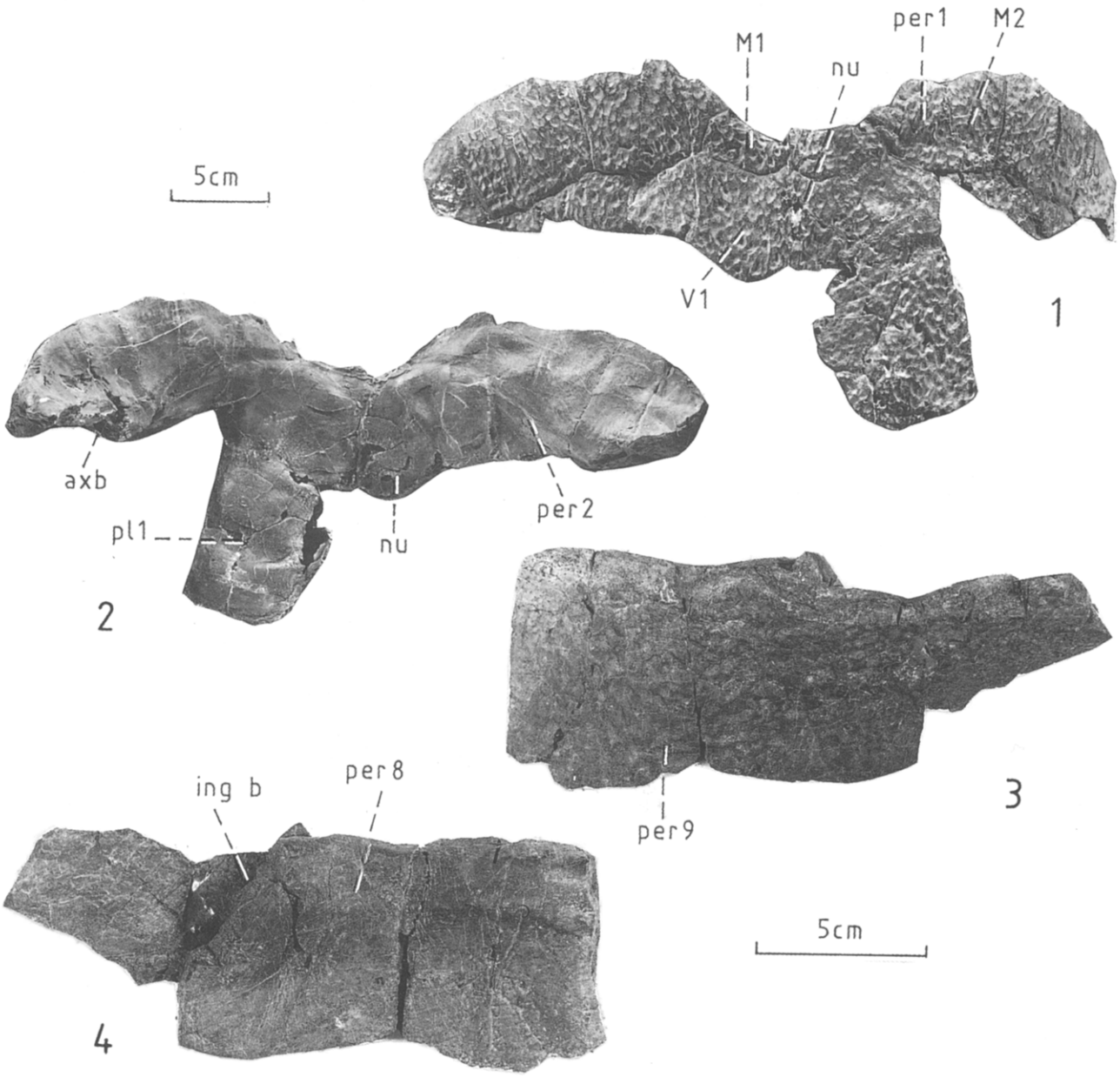

FIGURE 3 - *Araripemys*-like turtle from Maíz Gordo Formation (Late Paleocene), Jujuy province, Argentine (MLP 73-IV-4-1). **1,2.** Anterior border of the carapace, dorsal and visceral views. **3,4.** Right bridge-area peripherals, dorsal and visceral views. **ax b, ing b,** axillar and inguinal buttresses; **nu,** nuchal bone; **M,** marginal scutes; per 1, 2, 7, 8, 9, peripheral bones 1,2,7,8,9; **pl. 1,** pleural bone; **r1-2,** ribs one and two; **V,** vertebral scutes. *Tortue de type*Araripemys, *Formation Maiz Gordo, Paléocène supérieur, province de Jujuy, Argentine, MLP 73-IV-4-1.* ***1,2.*** *Bord antérieur de la carapace, vues dorsale et ventrale.* ***3,4.*** *Fragment de la bordure droite dans la région du pont, vues dorsale et ventrale.* ***ax b, ing b****, contreforts axillaire et inguinal;* ***M,*** *écaille marginale,* ***nu,*** *plaque nucale;* ***per*** *1, 2, 7, 8, 9, périphériques 1, 2, 7, 8, 9;* ***pl. 1,*** *pleurale 1;* ***r1-2,*** *côtes 1-2;* ***V,*** *écaille vertébrale.*

middle of the posterior border of the peripheral 3 and probably not much under the pleural 1 (see in Fig. 3, the flat surface of the preserved medial part of the ventral pleural 1 is noticeable) probably as in Recent *Peltocephalus dumerilianus.*

The first pleural is relatively long (8 mm/15 estimated mm = 53 %) and the first rib is much reduced as in all Recent pleurodires.

A fragment of the postero-lateral right border of the carapace is also preserved. It consists of the

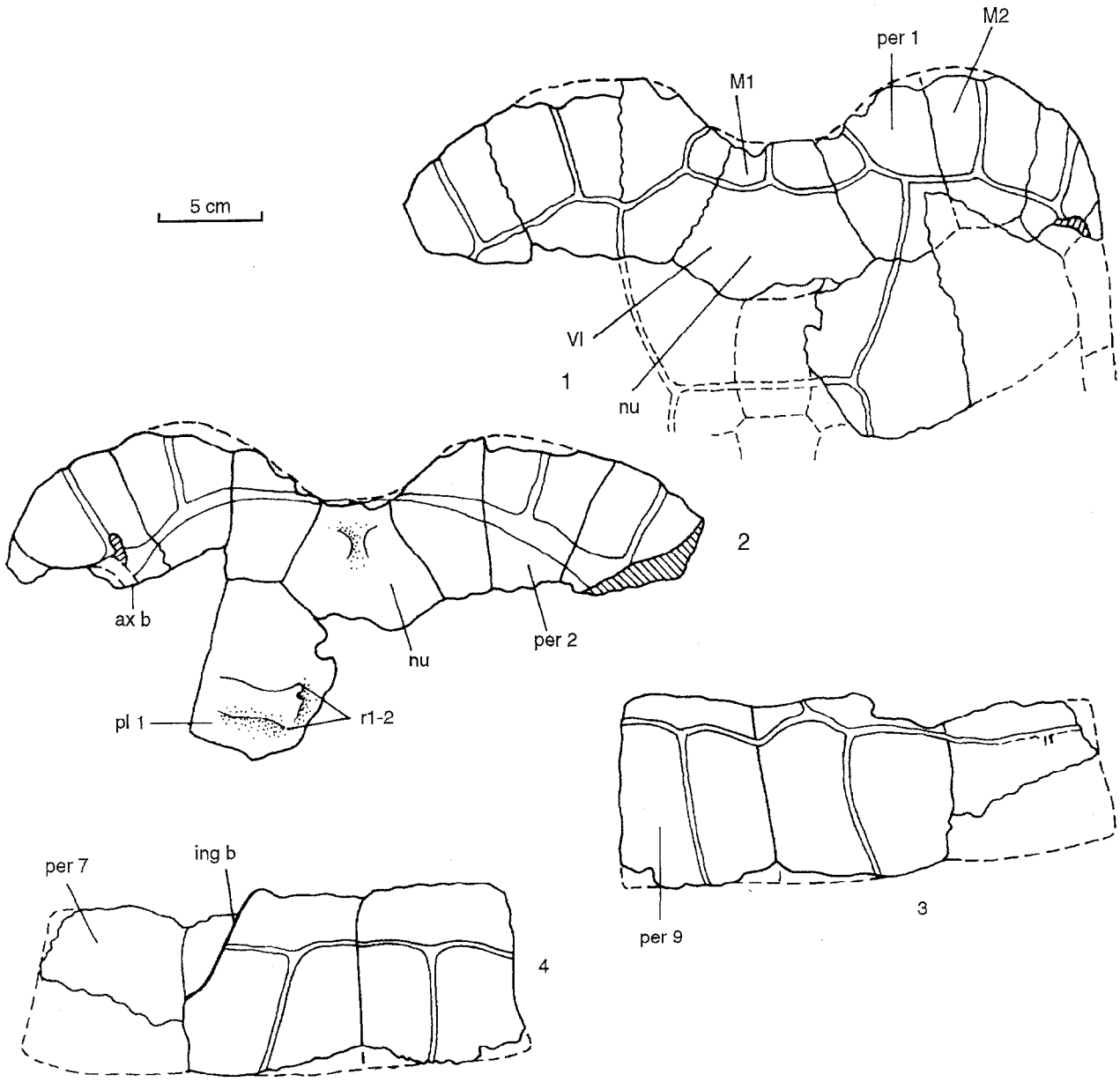

FIGURE 4 - Sketch of *Araripemys*-like turtle from Maiz Gordo Formation, Late Paleocene, Jujuy province, Argentine (MLP 73-IV-4-1). Abbreviations as in Fig. 3. *Schéma de la tortue de type*Araripemys, *Formation Maiz Gordo, Paléocène supérieur, province de Jujuy, Argentine, MLP 73-IV-4-1. Abréviations comme Fig. 3.*

two last bridge peripherals (7 and 8) and the peripheral 9, which is the first posterior to the bridge. The dorsal view is characterized, as the above portrayed remains, by a pit-decorated surface (Figs. 3,4.3). On the antero-visceral surface of the peripheral 8, the suture of the posterior margin of the inguinal buttress is well delimited (Figs. 3, 4.4). This structure should have extended, more or less, onto the visceral surface of pleural 5.

COMPARISON

The shape of the nuchal bone, as described above, and its proportions - much wider posteriorly, narrowed anteriorly, not much lengthened, with a short ventral border and a moderately long dorsal border of the first marginal scutes - together with the absence of a cervical scute, is inconsistent with Cryptodira and, within the Pleurodira, is consistent with the Pelomedusoides, particularly with Podocnemidoidea; but the kind of notched

anterior border of the carapace appears to be autapomorphic inside the Pelomedusoides.

We consider that in turtles the primitive shape of the nuchal bone is very wide, anteriorly and posteriorly, and very short, with adjacent short pleurals 1 retaining a strong rib 1. The nuchal is slightly notched and the anterior peripherals prominent, so that all the anterior border is notched, with indented marginals in *Proganochelys* (see Gaffney 1990) and without marginal indentations in the primitive Cryptodira, such as *Kayentachelys* GAFFNEY et al. 1987 and many other Mesozoic cryptodire forms (Lapparent de Broin & Murelaga-Bereikua in prep. and see below). The nuchal is then narrowed (as the whole carapace and particularly the vertebral scutes) and lengthened in a parallel way in different cryptodire groups. Within the Cryptodira, the Chelydridae and the Chelonioidea remain near the original form in Recent ones and the Trionychidae develop the nuchal in width. In the primitive Pleurodira, the situation is identical but the anterior border of the nuchal is transverse, not notched, and the peripherals 1 and 2 are not truely prominent, while the nuchal is still wide anteriorly and posteriorly, and short: *Platychelys* WAGNER, 1853 and see Bräm, 1965, *Notoemys* CATTOI & FREIBERG, 1961 and see de la Fuente & Fernández 1989-1992, Fernández & de la Fuente 1994. The same in *Palaeochersis* ROUGIER et al. 1995 which can or cannot be considered as a proto-Pleurodire. Then, in Chelidae as well as in Pelomedusoides (and similarly in several Cryptodira groups), together with the general narrowing of the shell, the nuchal bone is narrowed posteriorly and anteriorly. In Chelidae, like in the present form, it is anteriorly narrowed in Recent forms, and the most extreme is in *Hydromedusa* in the *Hydromedusa-Chelodina* group and in *Platemys* in the *Phrynops* group (respectively, anterior/posterior border: 20-27% and 37%). It is also lengthened in a Mesozoic chelid of the Area Loma de la Lata (Broin & de la Fuente 1993b, 15) (around 30%, with the anterior border lacking). The nuchal bone is as much lengthened as the peripherals 1 and 2 in the Recent Chelidae, without notched border. Here, the peripherals 1 and 2 are much more lengthened, relatively more than in the Mesozoic chelid and more than the nuchal.

The absence of cervical and the relatively short dorsal marginals border fit only with the Pelomedusoides: some Recent Australian Chelidae of the *Emydura* group lack the cervical but the marginals are longer on the nuchal, like in all the Chelidae. Within the Pelomedusoides, the state of the nuchal of the present form which is not as much lengthened as the peripherals, excludes the Recent Pelomedusidae and the Bothremydidae of the *Taphrosphys* group (see Broin in Antunes & Broin 1988). As well as the stronger lengthening of the anterior peripherals, the unnotched nuchal also excludes the Bothremydidae of the *Bothremys* group, which has a slightly notched nuchal (Broin in Antunes & Broin 1988). The proportions of the nuchal are here consistent with Podocnemididae, not very different from those of *Peltocephalus* (a little narrower: anterior border/posterior one: 24,5%, but the character of the narrowing is variable in the groups) but the lengthened peripherals 1 and 2 exclude the known forms.

The Argentine form has been first compared with Araripemydidae (Broin & de la Fuente 1993b) because of the united anterior notch and pitted decoration in a pleurodire turtle. The primitive Pelomedusoides *Araripemys,* with its decoration similar to that of the present form, appears to be special. It has a very developed notch: the anterior border is so much notched and the anterior part of the nuchal bone is so much reduced that the first pleurals (which are moderately lengthened) are part of the anterior border of the shell. The marginals 1 are also reduced but they are laterally disposed as if they were lateral to a wide primitive nuchal; but the nuchal is lengthened between the pleurals 1, as if it was a prenuchal bone in Trionychidae. *Araripemys* is very derived by some characters such as its strong flatness; it appears very primitive by some characters and neotenic by some others such as pleuro-peripheral fontanelles and the absence of buttresses under the pleurals 1 and 5 (see Broin 1994; Meylan & Gaffney 1990) but it has already narrowed vertebrals, reduced first ribs to their medial part (eventually still laterally long forward of the rib 2), evolved pleurodire ilion suture (wide and short, roughly triangular, posteriorly restricted to a very short part of the pygal bone). The very marked anterior notch may have occurred from a primitive wide and short nuchal bone, like in the Pelomedusoides "*Platycheloides*" cf. *nyasae* (a new genus in prep.) from Aptian of Gadoufaoua figured in Broin 1980. The posterior lengthening of the narrowed nuchal bone between the pleurals 1, in front of the neural 1 reduced in length (still primitively short sided behind) is also derived and autapomorphic. In the Argentine form, the anterior notch is secondary in another way, the shell (not flat and without fontanelles) being also already reduced in width, with vertebrals and nuchal reduced in width; but furthermore it has a complete nuchal, cranially lengthened, more lengthened pleurals 1, completely reduced first rib, buttresses developed under the pleural 1 and probably under pleural 5; the strong lengthening of the peripherals 1, 2 and 3 is autapomorphic. The decoration of the present form is similar to that of *Araripemys*; the pits are larger than in *Araripemys, which is consistent* with the difference in size between both taxa; but it has

sharper crests than in *Araripemys*. Decoration and notched anterior border may seem to be an expression of a common trend between *Araripemys* and this turtle, but they appear as a parallel development.

Some cryptodire turtles also have a pitted decoration, and still have scutes, like the Cretaceous Trionychoid (see Meylan & Gaffney 1989), Nanhsiungchelyidae *Basilemys, Zangerlia, "Basilemys" orientalis* and *Nanhsiungchelys* (see Hay 1908; Mlynarski 1972; Sukhanov & Narmandakh 1975, 1977; Yeh 1966). Furthermore they also have a notched anterior border of the carapace. But they have the primitive anterior border shape of the Cryptodira, evoked above, with the wide and short notched nuchal and still a cervical scute. The pits are relatively smaller and the crests between them are wider. It is a very interesting exemple of parallelism with the Argentine form.

The primitive decoration of the turtles, which we found modified and more or less accentuated in Pleurodira, is granulous, crested, and it develops in Pleurodira salient polygons and not pitted ones, except *Araripemys* and the present Argentine turtle. If it is a Podocnemidoid and near the Podocnemidids, according to the shape of the preserved plates, its decoration appeared independently of *Araripemys*.

In the present state of knowledge we can assert that: the northwestern part of Argentine was part of the Andin basin with a northern Gondwanan fauna of Pelomedusoides at the Late Paleocene, with this new Pelomedusoides in association with *"Podocnemis" argentinensis* in Maíz Gordo Formation (see the study of the evolution of the turtle fauna in South America *in* Broin 1991; Broin & de la Fuente 1993a,b); no other continental turtle is known in northern Argentine before the arrival of testudinines and chelids in Miocene time (age not yet precise, see the localities 58-60, Paraje Molle Grande, Andalhualá, Tiopunco and Angostaco, Broin & de la Fuente 1993a,b).

ARARIPEMYDID, PIT-DECORATED PLEURODIRE TURTLES LIST

They are all known in Early Cretaceous, Afro-South-American Northern Gondwana (sensu Broin 1988a). Some of them are attributed to *Araripemys* without contest. In Africa, they consist of isolated plates, peripheral, pleural, plastral bones. Some of them have been first attributed to undefined Trionychoidea (Broin 1977), which has been already rectified (Broin 1980).

South America: *Araripemys barretoi* PRICE, 1973. Chapada do Araripe, Ceará state, Brazil, Albian, probably Early.
Africa (MNHN coll.): *Araripemys* sp. (smaller than *barretoi*). Gadoufaoua, Niger, Broin 1980, pl. 3, 1; Broin 1988a, map 3. Timimoun, Algeria. Aoulef, Algeria. Aptian.
Araripemys sp. (larger than *barretoi*). Gara Samani, Algeria; Broin 1977, pl. 7, 9-11. In Abangarit, Niger. Gara Tabroumit, Kem Kem Plateau, Morocco, Broin 1988, map 3; Gmira, 1994, pl. 17. Albian, probably Late.
?*Araripemys* sp., larger forms than *barretoi*, Timimoun, Algeria, Aptian or Albian? Broin 1977, pl. 7, 7-8; In Abangarit, Niger, Garet Touidjine, near Oued Boudjihane, Algeria, Albian, probably Late .

In another work, one of us attributed to Araripemydidae a small decorated form of primitive Pelomedusoides with lateral mesoplastra, *Taquetochelys* BROIN, 1980, in fact poorly known. Instead of pits, it has tubercles and rounded or rugose crests separated by thin sulci. This attribution was made by parallelism with Trionychidae which include altogether pitted forms (e.g. most parts of dorsal shell of *Trionyx*) and tuberculous forms (e.g. *Lissemys*). This parallel is rather poor to define a family. But we can remind that, if *Taquetochelys* has still lateral mesoplastra unlike *Araripemys* which lost them, no reduced anterior border and already reduced last neurals, the two have a flat shell with loose pleuro-peripheral contact and reduced buttresses which can unite them. As *Araripemys* and the Argentine form are considered, the important point is that we have here pleurodire turtles with a pitted decoration and still with scutes (scutes sulci visible on the plates), like Nanhsiungchelyidae but unlike Trionychidae.

Acknowledgments - We would like to thank Lic. Cecilia Deschamps (Museo de La Plata) and Anwar Janoo for the English review, D. Serrette for the photograph fig. 3 (1 and 2) and F. Pilard for the drawings.

REFERENCES

BROIN F. de 1977 - Contribution à l'étude des Chéloniens. Chéloniens continentaux du Crétacé et du Tertiaire de France. *Mémoires du Muséum national d'Histoire naturelle*, C, 38: I-IX, 1-366.

BROIN F. de 1980 - Les Tortues de Gadoufaoua (Aptien du Niger): aperçu sur la paléogéographie des Pelomedusidae (Pleurodira). *Mémoires de la Société géologique de France*, n. sér., 139: 39-46.

BROIN F. de 1988a - Les Tortues et le Gondwana. Examen des rapports entre le fractionnement du Gondwana et la dispersion géographique des tortues pleurodires à partir du Crétacé. *Studia Geologica Salmanticensia, Studia Palaeocheloniologica*, 2 (5): 103-142.

BROIN F. de 1988b - Etude complémentaire de *Rosasia soutoi* Chelonii, Bothremydidae): 162-188. *In* ANTUNES M.T. & F. DE BROIN 1988, *Le Crétacé terminal de Beira Litoral, Portugal: remarques stratigraphiques et écologiques; étude complémentaire de Rosasia soutoi (Chelonii, Bothremydidae). Ciências Terra* (UNL), 9: 153-200.

BROIN F. de 1991 - Fossil Turtles from Bolivia. *In* SUAREZ-SORUCO R. (ed), *Fósiles y Facies de Bolivia, vol.1, Vertebrados. Revista Técnica de Yacimientos Petrolíferos Fiscales Bolivianos*, 12 (3-4): 509-527.

BROIN F. DE & FUENTE M.S. de la 1993a - Les tortues fossiles d'Argentine: première synthèse. Actes de la Table Ronde Européenne, Paléontologie et Stratigraphie d'Amérique latine, Lyon 1992. *Documents des Laboratoires de Géologie de Lyon*, 125: 73-84.

BROIN F. DE & FUENTE M.S. de la 1993b - Les tortues fossiles d'Argentine. *Annales de Paléontologie,* 79 (3): 169-231.

CATTOI N. & FREIBERG M. 1958 - Una nueva especie de "*Podocnemis*" del Cretácico argentino. *Physis,* 21 (60): 58-67.

CATTOI & FREIBERG 1961 - Nuevo hallazgo de Chelonia extinguidos en la República Argentina. *Physis,* 22 (63): 202.

FERNÁNDEZ J., BONDESIO P & PASCUAL R. 1973 - Restos de *Lepidosiren paradoxa* (Osteichtyes, Dipnoi) de la Formación Lumbrera (Eogeno, Eoceno?) de Jujuy. Consideraciones estratigráficas, paleoecológicas y paleozoogeográficas. *Ameghiniana,* 10 (2): 152-172.

FERNÁNDEZ M.S. & FUENTE M.S. de la 1994 - Redescription and phylogenetic position of *Notoemys*: The oldest Gondwanian pleurodiran turtle. *Neues Jahrbuch für Geologische und Paläontologische Abhandlungen,* 193(1): 81-105.

FUENTE M.S. de la & FERNÁNDEZ M.S. 1989-1992 - *Notoemys laticentralis* CATTOI & FREIBERG, 1961 from the Upper Jurassic of Argentina: a member of the infraorder Pleurodira (Cope 1868). *Studia Geologica Salmanticensia: Studia Palaeocheloniologica.* 3 (2): 25-32.

GMIRA S. 1994 - Etude des Chéloniens fossiles du Maroc. Anatomie. Systématique. Phylogénie. *Cahiers de Paléontologie,* CNRS (éd.), Paris, 140 p.

GAFFNEY E. 1990 - The comparative osteology of the Triassic turtle *Proganochelys. Bulletin of the American Museum of Natural History,* 194, 263 p.

GAFFNEY E.S., HUTCHINSON J.H., JENKINS F.A. & MEEKER L.J. 1987 - Modern turtles origins: the oldest known cryptodire. *Science,* 237: 289-291.

GAYET M., MARSHALL L.G. & SEMPERE T. 1991 - The Mesozoic and Paleocene Vertebrates of Bolivia and their Stratigraphic Context: a Review. *In* SUAREZ-SORUCO R. (ed.), *Fósiles y Facies de Bolivia. Vol. 1, Vertebrados. Revista Técnica de Yacimientos Petrolíferos Fiscales Bolivianos,* 12 (3-4): 393-433.

HAY O.P. 1908 - The Fossil Turtles of North America. *Publications of the Carnegie Institution*, 75, 568 p.

LAPPARENT DE BROIN F. de 1994 - Turtles from the Chapada do Araripe, Early Cretaceous, Ceará State, Brasil. *Boletim do 3 Simpósio sobre o Cretáceo do Brasil* (1994), UNESP-Campus de Rio Claro/SP: 137-138.

MEYLAN P. & GAFFNEY E.S. 1989 - The Skeletal Morphology of the Cretaceous Cryptodiran Turtle, *Adocus,* and the Relationships of the Trionychoidea. *American Museum Novitates*, 2941, 60 p.

MEYLAN P. & GAFFNEY E.S. 1991 - *Araripemys* PRICE, 1973: 326-334. *In* J.G. MAISEY (ed.), *Santana Fossils. An illustrated Atlas*, 459 p. T.F.H. Publications, Inc., Neptune City, New Jersey.

MLYNARSKI M. 1972 - *Zangerlia testudinimorpha* nov. gen., nov. sp. a primitive land tortoise from the Upper Cretaceous of Mongolia. Results of the Polish-Mongolian expeditions. Part 4. *Palaeontologia Polonica*, 27: 85-92.

MORENO J. 1970 - Estratigrafía y paleogeografía del Cretácico Superior en la Cuenca del Noroeste argentino, con especial mención de los subgrupos Balbuena y Santa Barbara. *Revista de la Asociación Geológica Argentina*, 25 (1): 5-44.

PASCUAL R., BOND M. & VUCETICH M. 1981 - *El subgrupo Santa Barbara (Grupo Salta) y sus vertebrados, cronología, paleoambientes y paleobiogeografía.* Actas 8 Congreso Geológico Argentino, San Luis, 1981, 3: 743-758.

ROUGIER G.W., DE LA FUENTE M.S. & ARCUCCI A.B. 1995 - Late Triassic Turtles from South America. *Science, Reports*, 268 (5212): 855-858.

SUKHANOV V.B. & NARMANDAKH P. 1975 - New turtles of the group of *Basilemys* (Chelonia, Dermatemydidae) in Asia: 94-101. *In Fossil Fauna and Flora of Mongolia*, Nauka (ed.), Moscou [in russian].

SUKHANOV V.B. & NARMANDAKH P. 1977 - The shell and limbs of *Basilemys orientalis* (Chelonia, Dermatemydidae). *In Fossil Fauna and Flora of Mongolia.* The joint Soviet-Mongolian Paleontological Expedition. Transaction 4: 57-80 [in russian].

YEH H.K'. 1966 - A new Cretaceous turtle of Nanhsiung, Northern Kuangtung. *Vertebrata Palasiatica*, 10 (2): 191-200.

M. de la FUENTE
Facultad de Ciencias Naturales y Museo de La Plata
Paseo del Bosque S/N
1900 La Plata, Argentine

F. de LAPPARENT de BROIN
Laboratoire de Paléontologie, URA 12 du CNRS
Muséum national d'Histoire naturelle
8 rue Buffon
F-75005, Paris