SHELL VARIABILITY IN THE STEM TURTLES *PROTEROCHERSIS* SPP.

SUPPLEMENTARY INFORMATION:

MATERIAL,

EXTENDED METHODS,

SUPPLEMENTARY TABLES,

SUPPLEMENTARY FIGURES,

AND

SUPPLEMENTARY REFERENCES

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MATERIAL

It should be noted that some of the specimens described here (SMNS 17755, SMNS 17756, SMNS 18440, SMNS 50917, SMNS 56606, SMNS 81917, ZPAL V.39/164, ZPAL V.39/197, ZPAL V.39/277, ZPAL V.39/378, ZPAL V.39/381, ZPAL V.39/383, and ZPAL V.39/384), including the ontogenetically youngest individuals, lack any diagnostic characters that would unambiguously support their identification as *Proterochersis robusta* or *P. porebensis*. They all come, however, from Poręba and Murrhardt – the localities which thus far yielded numerous diagnostic specimens referable only to *P. porebensis* and *P. robusta*, respectively. Following Szczygielski and Sulej (in press), we therefore refer them to these taxa. This identification is tentative, but in the light of current knowledge seems to be probable.

PROTEROCHERSIS ROBUSTA

The specimens informative for this study are:

CSMM uncat. The holotype of "*Murrhardtia staeschei*" Karl & Tichy, 2000. Found in Mettelberg Quarry, near Murrhardt, Germany. A mostly complete shell (Figs 2A–B, 3A, 9A, S5A, S7A), missing the marginal sections of the carapace (including the cranial edge of the cervical region, but not the last two right marginal scute areas), parts of the first three and of the fifth vertebral scute, pleurals, inframarginals, right bridge and right part of the cranial lobe of the plastron. Figured by Wild (Wild 1987), described and figured by Karl and Tichy (Karl & Tichy 2000) and Szczygielski and Sulej (2016). Carapace approximately 36.5 cm long.

SMNS 11396. The holotype of "*Proterochersis intermedia*" Fraas, 1913. Found in Stuttgart-Rohracker, Germany. A fragment of the right side of the plastron (Fig. 3B), with partial areas of the first and second abdominal and femoral, and sutures visible, a natural mold of the visceral surface of the same fragment, a partial natural internal mold of the carapace with impressions of the fourth to 10th dorsal rib, with corresponding rib heads and vertebrae embedded in matrix, and fragments of carapace. The carapace shows no discernible external characters and thus is not informative for this study. Described and figured by Fraas (1913) and Szczygielski and Sulej (2016, in press).

SMNS 12777. The holotype of *Proterochersis robusta*. Found in Rudersberg, Germany. A natural mold of the shell, with small fragment of the ninth marginal scute area, complete right side of the pelvis and caudal right side of the plastron preserved (areas of the second abdominal, femoral, anal, intercaudal, base of the caudal, damaged third and fourth inframarginal, fragments of the left anal and caudal scute), and some sutures visible as impressions (Figs 3C, 9B). Figured by Stromer (Stromer 1912) and (in part) by Młynarski (Młynarski 1976). Figured and described in detail by Fraas (1913) and Szczygielski and Sulej (2016, in press).

SMNS 16442. Found in Murrhardt, Germany. A damaged cranial part of the carapace (apparently corresponds to the area of the first, and cranial and medial parts of the second vertebral scute, Fig. 2C), an cranial lobe of the plastron (humeral scute area and entoplastron, bearing the medial parts of gular scutes, with epiplastra missing, Fig. 3D), a rock impression of the latter, a caudal lobe of the plastron (area of femorals and anals with a base of the right caudal process, Fig. 3D), a damaged part of the carapace margin with a fragment of the cranial part of the bridge, and some difficult to interpret fragments and impressions in plaster (one of them probably of a marginal sulci), some of these elements with traceable sutures. Due to extensive damage, the fragments of the carapace show little surficial characters. The plastron is better preserved. Described and figured by de Broin (1984) and Szczygielski and Sulej (2016, in press). Histological sections from that specimen were examined by Scheyer and Sander (2007).

SMNS 16603. Found in the vicinity of Lorch, Germany. An internal mold of a shell of a young specimen, with a caudal right part of the carapace (Fig. 2D–E), a pelvis, a part of the right axillary buttress and an cranial fragment of the plastron (consisting of the area of the right extragular and gular, a part of the left extragular, and medial parts of humeral scutes, Figs 3E, S7B) preserved. Described and figured by de Broin (1984) and Szczygielski and Sulej (2016, in press).

SMNS 17561. Found in Murrhardt, Germany. A virtually complete shell (2F–G, 3F, 9C, S5B, S7C–D, S8A–C), but with substantial parts restored or filled with plaster and paint. The areas of the left extragular, the last pair of inframarginals, right parts of the third and fourth vertebral, caudal part of the second right pleural, right third and fourth pleural, parts of the right supramarginals, right second to fifth and possibly ninth to 12th marginal, left third marginal, and caudal part of the right bridge seem to be at least partially restored. Based on our observations, however, these repairs seem to even out some minor surficial damage suffered by this specimen rather than to fill for any large missing areas of the shell, but their extent is difficult to evaluate. In any case, the morphology is consistent with other specimens of *Proterochersis robusta* and *P. porebensis*, so no major errors were made during that treatment. Carapace approximately 35 cm long. This specimen was described and figured by Gaffney (1986),

Karl and Tichy (Karl & Tichy 2000), and Szczygielski and Sulej (2016). The line drawing of the shell of *Proterochersis robusta* that was first presented in Gaffney (1990), and has frequently been used since, is based mainly on that specimen.

SMNS 17755. Found in Murrhardt, Germany. A left bridge and most of the left half of the plastron, consisting of the areas of the sixth to ninth (and part of the 10th) marginal, second third, and part of the first supramarginal, second and third inframarginal, fragment of the humeral scute, most of the pectoral, both abdominals, femoral and fragment of anal scute, with visible sutures (Fig. 3G). Large part of this specimen is relatively well-preserved, although the lateral surface is heavily damaged and significant area, especially in cranial section, is restored with plaster. This specimen was described and figured by Szczygielski and Sulej (2016, in press).

SMNS 17755a. Found in Murrhardt, Germany. A fragment of carapace, consisting of the areas of the last vertebral scute, a broken off and dislocated fragment of the fourth vertebral scute area, a part of the third and complete fourth left pleural, a fragment of the 10th, most of the 11th, full 12th, and most of the 13th left marginal, with sacrum and dorsal parts of both ilia preserved inside and with visible sutures (Figs 2H, S5C). This specimen was described and figured by Szczygielski and Sulej (in press).

SMNS 17930. Found in Oberbrüden, Germany. An internal mold of the carapace with embedded right part of the pelvis and small parts of the right bridge, and a large part of the carapace (Figs 2I–J, 6, S8D), including the areas of the cervical scute, complete first vertebral and increasingly more fragmentary second, third, fourth, and small fragment of the fifth vertebral scute, complete first pair of pleurals, fragmentary second, third, and fourth right pleural, damaged right supramarginals, and marginal scutes: the first and the second, a fragment of the third, complete fourth, fragmentary fifth and 10th, complete 11th, and a fragment of the 12th. Part of the mid-section and fragments near the right cranial and caudal margin are restored with plaster. Carapace approximately 36 cm long.

SMNS 18440. Found in Murrhardt, Germany. A left bridge fragment, comprising the area of small caudal fragments of the pectoral scute, nearly complete first and complete second abdominal scute, most of the femoral scute, a part of the first and complete second, third, and (poorly preserved) fourth inframarginal, a fragment of the fifth and 10th marginal scute, and complete sixth, seventh, eighth, and ninth marginals, complete three supramarginals, and fragments of the second and third pleural scute, with sutures visible (Figs 2K, 3H). Apart from several breaks, it is well-preserved. This specimen was described and figured by Szczygielski and Sulej (in press).

SMNS 50917. Found in Murrhardt, Germany. A fragmentary plastron consisting of an area of complete left femoral scute and fragments of the left pectoral, the first and the second left abdominal, the right femoral and right and left anal scutes (Fig. 3I). Viscerally, a base of the pelvis and the epipubic process are preserved. Associated is an unspecified, poorly-preserved shell fragment, possibly from the bridge area.

SMNS 56606. Found in Murrhardt, Germany. A mostly complete pelvis of a young individual with attached badly damaged caudal part of the carapace (natural surface preserved only in the partial area of the last and the second-to-last left marginal scute and in some places along the rim of the caudal notch), at least one sacral vertebra and rib pair, caudal segment of the dorsal vertebral column (approximately two complete and caudal half of the third centrum with associated rib heads), and poorly preserved caudal part of the plastron, consisting of the areas of mostly intact intercaudal scute and damaged caudal sections of the anal scutes, with caudal processes broken off (Fig. 3J).

SMNS 81917. Found in Murrhardt, Germany. A partially preserved plastral bone (hypoplastron or hypoplastron) of a juvenile exposed in visceral view (Fig. S6A).

PROTEROCHERSIS POREBENSIS

All of the existing specimens (ZPAL V.39/1–28, ZPAL V.39/34, ZPAL V.39/48–72, ZPAL V.39/155–300, ZPAL V.39/331–366, ZPAL V.39/370, ZPAL V.39/373–404, ZPAL V.39/416–420, and uncatalogued) were studied. The specimens informative for this study are:

ZPAL V.39/1. A fragment of a middle right section of a carapace consisting of partial areas of the first and the second vertebral scute, including proximal parts of three ribs (Fig. S4G–H).

ZPAL V.39/2. A fragment of a middle left section of a carapace, consisting of partial areas of the second and the third vertebral scute, including proximal parts of five ribs (Fig. S4A–B).

ZPAL V.39/3. A large part of an isolated costal with sutural edges. This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/4. An isolated neural bone with transverse, ω-shaped sulcus. This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/6. Caudal right section of a carapace, including partial area of the fifth vertebral scute, two last marginal scute areas, and partial area of the third-to-last marginal scute, with part of the caudal process of ilium (Figs S5D, S8E–F).

ZPAL V.39/8. A fragment of a left bridge region, consisting of the areas of complete first and cranial part of the second supramarginal scute, a part of the fifth, complete sixth, and part of the seventh marginal scute, a fragment of the first pleural scute, and minute fragments of the axillary and the first two inframarginal scutes. This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/18. Caudal right part of the carapace, consisting of the last marginal scute area, partial area of the second-to-last and third-to-last marginal scute, partial fourth and fifth vertebral scute areas, and partial area of the fourth right pleural, with part of the caudal process of ilium (Fig. S5E).

ZPAL V.39/22. A fragment of the cranial left nuchal part of the carapace, including left half of the cervical scute, part of the first vertebral scute, and parts of the cranial two marginals (Fig. S3A). This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/23. A fragment of the caudal left carapacial rim, consisting of the area of the last marginal, a caudal part of the preceding marginal, and a small fragment of the last vertebral scute, with sutural edge (Fig. S5F). This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/34. A nearly complete shell of a juvenile (Figs 4A–B, 5A, 9K, S4C, S5G, S7E–G). Carapace approximately 28 cm long. This specimen was described and figured by Sulej et al. (2012) and Szczygielski and Sulej (2016).

ZPAL V.39/48. The holotype of *Proterochersis porebensis*. A nearly complete shell (Figs 4C–D, 5B, 9G, S2A–B, S5H, S7H–J), pelvis, left scapulocoracoid, and right femur. Carapace approximately 42.5 cm long. This specimen was described and figured by Szczygielski and Sulej (2016) and Szczygielski (2017).

ZPAL V.39/49. A mostly complete shell (Figs 4E–F, 5C, 9D, S2C–F, S5I, S7K–M) and pelvis. Carapace approximately 49 cm long. This specimen was described and figured by Szczygielski and Sulej (2016) and Szczygielski (2017).

ZPAL V.39/56. Left caudal process of plastron (Fig. 9L–N).

ZPAL V.39/57. Cranial left part of the carapace, consisting of partial areas of the cervical scute, first vertebral, first left pleural, and marginal scute areas: complete first, fragmentary second, complete third and fourth, and partial fifth (Figs S1N, S3B).

ZPAL V.39/59. Caudal left part of the carapace, consisting of two last marginal scute areas and partial last vertebral scute area, with part of the caudal process of ilium (Fig. S5J). This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/60. A fragment of a carapace, consisting of a complete ninth scute area and fragmentary areas of the third supramarginal scute and the third pleural scute (Fig. S1O–P).

ZPAL V.39/63. Caudal right part of the carapace, consisting of partial areas of the fourth and fifth vertebral scutes, and a posterodorsal part of the fourth pleural scute area, with attached dorsal section of the right ilium (Fig. S1A–B).

ZPAL V.39/66. Caudal plastral lobe consisting of the area of the caudal part of the anal scutes, nearly complete intercaudal scute, proximal part of the right and complete left caudal scute, with the basal part of the ischia attached to the visceral surface (Fig. 9J).

ZPAL V.39/68. Caudal plastral lobe consisting of the area of the caudal part of the anal scutes, the complete intercaudal scute, and proximal parts of caudal scutes, with the basal part of the ischia attached to the visceral surface (Fig. 9H). Although the caudal scutes are broken at the base, it is clear that they were elongated and aligned caudally. This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/69. Caudal plastral lobe consisting of the area of the anal, intercaudal, and caudal scutes, with bases of the lateral pubic processes and basal part of the ischia and pubis attached to the visceral surface (Fig. 9F). This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/70. Caudal plastral lobe consisting of the area of the caudal part of the anal scutes, nearly complete intercaudal scute, proximal part of the left and complete right caudal scute, with the basal part of the ischia attached to the visceral surface (Fig. 9I).

ZPAL V.39/71. Caudal plastral lobe consisting of the area of the caudal part of the anal scutes, nearly complete intercaudal scute, proximal part of the left and complete right caudal scute, with the basal part of the ischia attached to the visceral surface (Fig. 9E).

ZPAL V.39/72. A mostly complete carapace, missing only parts of the areas of the third, fourth, and fifth vertebral scute, fragments of the second left and third and fourth right pleural scute, part of the second and most of the third right supramarginal scute, as well as the eighth and cranial part of the ninth right marginal scute (Figs 4G–H, S4D, S5K). Associated with a proximal caudal vertebra. Carapace approximately 44.5 cm long. This specimen was described and figured in Szczygielski and Sulej (2016) and Szczygielski (2017).

ZPAL V.39/157. A fragmentary plastron, consisting of partial sections of the right femoral and right anal scute areas with attached right lateral pubic process.

ZPAL V.39/165. A partially preserved plastral bone (likely right hyoplastron) of a juvenile.

ZPAL V.39/169. A fragment of the dorsal vertebral column consisting of one complete and small fragments of two surrounding vertebrae and an attached part of a carapace with intervertebral sulcus (Figs S2G, S4E–F).

ZPAL V.39/176. A fragment of a costal with sutural edges (Fig. S1E).

ZPAL V.39/186. Left gular tubercle of a large specimen (Fig. S7N–Q). This specimen was described and figured by Szczygielski and Sulej (in press).

ZPAL V.39/187. A fragment of the cranial plastral lobe consisting of the area of the right gular and extragular (Fig. S7R–T).

ZPAL V.39/189. A fragment of the cranial plastral lobe consisting of the area of the right gular and medial part of the right extragular (Fig. S7U–X).

ZPAL V.39/197. A partially preserved plastral bone (likely right hyoplastron) of a juvenile (Fig. S6C).

ZPAL V.39/199. Left caudal process of plastron (Fig. 9O–Q).

ZPAL V.39/200. (?)Left caudal process of plastron (Fig. 9R–T).

ZPAL V.39/213. A fragment of the caudal left carapacial rim, consisting of the area of the last marginal, a caudal edge of the preceding marginal, and a small fragment of the last vertebral scute, with suture running at the base of the peripheral (Fig. S5L).

ZPAL V.39/277. A partially preserved plastral bone of a juvenile (Fig. S6B).

ZPAL V.39/333. A fragment of the right part of the cranial plastral lobe, consisting of the complete right gular, extragular, and an cranial part of the right humeral scute area, and small fragment of the left humeral scute area (Fig. S7Y–A').

ZPAL V.39/377. An unankylosed fragment of the dorsal vertebral column of a young specimen, consisting of one complete vertebra and an cranial half of a succeeding vertebra (Figs S1H–K, S2I).

ZPAL V.39/378. An ankylosed fragment of the dorsal vertebral column, consisting of one complete vertebra and fragments of a preceding and succeeding vertebra with associated rib heads (Figs S1F–G, S2J).

ZPAL V.39/379. A fragment of the right part of the cranial plastral lobe, consisting of the complete right gular, extragular, and an cranial part of the right humeral scute area (Fig. S7B'–D').

ZPAL V.39/380. Caudal right part of the carapace, consisting of two last marginal scute areas and partial last vertebral scute area, with part of the caudal process of ilium (Fig. S5M).

ZPAL V.39/381. A fragmentary costal of a hatchling (Fig. S1C–D).

ZPAL V.39/382. A fragment of a large costal.

ZPAL V.39/383. A partially preserved plastral bone of a juvenile.

ZPAL V.39/384. A partially preserved plastral bone of a juvenile (Fig. S6D).

ZPAL V.39/385. A nearly complete cranial plastral lobe with bases of the dorsal processes of the epiplastra and complete caudal process of the entoplastron preserved on the visceral side, and areas of both gular, both extragular, two supernumerary, right humeral and right pectoral scutes, as well as partially preserved left humeral and pectoral, and the first pair of abdominals (Figs 7, S7E'–G').

ZPAL V.39/386. Caudal left part of the carapace, consisting of partial area of the last and third-to-last marginal scute, complete area of the second to last marginal scute, and partial fourth and fifth vertebral scute areas, with part of the caudal process of ilium (Fig. S5N).

ZPAL V.39/387. A fragment of the cranial plastral lobe consisting of the area of the left gular and extragular, and an cranial part of the left humeral scute area (Fig. S7H'–J').

ZPAL V.39/388. A fragment of the cranial plastral lobe consisting of the area of the right gular and extragular (Fig. S7K'–M').

ZPAL V.39/390. Cranial left part of carapace consisting of partial areas of the cervical scute, the first vertebral scute, and damaged two cranialmost left marginal scutes (Fig. S1L–M).

ZPAL V.39/402. Caudal part of the carapace consisting of the middle area of the fifth vertebral with coosified last dorsal vertebra and both sacral vertebrae (Fig. S2K–L).

ZPAL V.39/420. A fragment of the cranial plastral lobe consisting of the area of the left gular and extragular (Fig. S7N'–P')

TABLES

Table S1. *Proterochersis robusta*, carapace scutes. **+** – preserved whole or nearly whole; **P** – partially preserved; ***** – preserved only as an impression or damaged bone but providing at least partial data about the outline; **-** – not preserved or insignificant part preserved. X indicates lack of the fifteenth marginal. **R** means right, **L** means left side of the body. Note that the numbering of caudalmost marginals is uncertain if the twelfth one is not preserved at least in most part. SMNS 17561 has most of its scutes restored – these restorations seem to be mostly superficial and close to the original shape of the elements, but their extent is difficult to evaluate.

Specimen	Side	Cervical	Vertebral					Pleural				Supramarginal			Marginal													
			1	2	3	4	5	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CSMM	R	P	P	P	P	+	+	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	P	+	P	P	+	P	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	?P	?+	?+	?X
SMNS 11396	R	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
SMNS 16442	R	-	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
SMNS 16603	R	-	-	-	-	P	P	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
SMNS 17561	R	+	+	+	+	+	+	+	+	+	+	+	+	+	P	+	P	+	+	+	+	+	+	+	+	P	P	+	X
	L	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	P	P	+	+	+	P	P	+	P	P	P	X
SMNS 17755	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	P	P	P	-	-	-	-	*	P	P	P	P	P	-	-	-	-	?
SMNS 17755a	R	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	P	+	-	-	-	-	-	-	-	-	-	-	-	-	P	P	+	+	-	?
SMNS 17930	R	+	P	P	P	P	P	P	+	P	P	P	P	P	+	+	P	+	P	-	-	-	-	P	+	P	-	-	?
	L	P	+	P	P	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	?
SMNS 18440	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	P	P	-	P	+	P	-	-	-	-	P	+	+	+	P	P	-	-	-	-	?
SMNS 56606	R	-	-	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?

Table S2. *Proterochersis robusta*, plastron scutes. **+** – preserved whole or nearly whole; **P** – partially preserved; ***** – preserved only as an impression or damaged bone but providing at least partial data about the outline; **-** – not preserved or insignificant part preserved. **R** means right, **L** means left side of the body. SMNS 17561 has most of its scutes restored – these restorations seem to be mostly superficial and close to the original shape of the elements, but their extent is difficult to evaluate.

Specimen	Side	Extragular	Gular	Humeral	Pectoral	Abdominal		Femoral	Anal	Caudal	Intercaudal	Axillary	Inframarginal			
						1	2						1	2	3	4
CSMM	R	-	P	P	P	P	P	+	+	+	+	-	-	-	-	-
	L	P	+	+	+	+	+	+	+	+		+	-	P	-	-
SMNS 11396	R	-	-	-	-	P	P	P	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
SMNS 12777	R	-	-	-	-	-	+	+	+	P	+	-	-	-	-	*
	L	-	-	-	-	-	-	-	*	*		-	-	-	-	-
SMNS 16442	R	-	P	P*	*	-	-	P	+	-	-	-	-	-	-	-
	L	-	P	P*	*	-	-	P	+	P		-	-	-	-	-
SMNS 16603	R	+	P	P	-	-	-	-	-	-	-	P	-	-	-	-
	L	-	-	P	-	-	-	-	-	-		-	-	-	-	-
SMNS 17561	R	P	+	+	+	+	P	+	+	+	+	+	+	+	+	*
	L	+	+	+	+	+	+	+	+	+		+	+	+	+	*
SMNS 17755	R	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	L	-	-	P	P	P	+	+	P	-		-	-	-	-	-
SMNS 18440	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	P	+	P	-	-		-	P	+	+	+
SMNS 50917	R	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-
	L	-	-	-	-	P	P	+	P	-		-	-	-	-	-
SMNS 56606	R	-	-	-	-	-	-	-	P	-	+	-	-	-	-	-
	L	-	-	-	-	-	-	-	P	P		-	-	-	-	-

Table S3. *Proterochersis porebensis*, carapace scutes. **+** – preserved whole or nearly whole; **P** – partially preserved; ***** – preserved only as an impression or damaged bone but providing at least partial data about the outline; **-** – not preserved or insignificant part preserved. X indicates lack of the fifteenth marginal. **R** means right, **L** means left side of the body. Note that the numbering of caudalmost marginals is uncertain if the twelfth one is not preserved at least in most part. See text for discussion on ZPAL V.39/34 marginal scutes.

Specimen	Side	Cervical	Vertebral					Pleural				Supramarginal			Marginal													
			1	2	3	4	5	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ZPAL V.39/1	R	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/2	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/5	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	+	P	-	-	-	-	-	?
ZPAL V.39/6	R	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?P	?+	?+	?X
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/8	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	+	P	-	-	-	-	-	P	+	P	-	-	-	-	-	-	-	?
ZPAL V.39/18	R	-	-	-	-	P	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	+	X
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/21	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/22	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	+	P	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/23	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?P	?+	?X
ZPAL V.39/34	R	+	+	P	P	P	P	P	P	P	P	*	P	+	?	+	P	P	P	P	+	+	+	+	+	P	+	P	X
	L	+	+	P	P	P	P	P	P	P	+	*	+	+	?	+	P	P	P	P	P	P	+	P	+	P	+	+	X
ZPAL V.39/48	R	+	+	P	+	+	+	+	+	+	+	+	+	+	P	P	P	P	P	P	+	+	+	+	P	P	P	+	+
	L	+	+	+	+	+	+	+	+	+	+	P	+	+	P	+	P	P	P	+	+	+	+	P	P	P	P	+	+
ZPAL V.39/49	R	+	+	+	+	P	P	+	+	+	P	+	+	+	+	+	P	+	P	P	+	+	+	+	P	P	P	P	X
	L	+	+	P	P	P	P	+	P	P	P	+	+	P	P	+	P	P	+	+	P	P	+	+	+	P	+	+	X
ZPAL V.39/54	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?+	?X

Specimen	Side	Cervical	Vertebral					Pleural				Supramarginal			Marginal												
			1	2	3	4	5	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ZPAL V.39/57	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	P	P	-	-	-	-	P	-	-	-	-	-	-	+	P	+	+	P	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/59	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?P	?+	?X
ZPAL V.39/60	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-	-	-	-	-	-	-	+	-	-	-	-	-	?
ZPAL V.39/63	R	-	-	-	-	P	P	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/67	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	P	-	-	-	P	-	-	-	-	-	-	-	-	+	-	-	-	-	-	?
ZPAL V.39/72	R	P	+	+	P	P	P	+	+	P	P	+	+	P	+	+	+	+	+	P	P	-	P	P	P	P	+	+	X
	L	P	+	+	P	P	P	+	P	+	+	+	P	+	P	P	+	P	P	P	+	P	+	+	P	P	+	+	X
ZPAL V.39/158	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-	P	+	P	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/160	R	-	-	-	-	-	-	-	P	-	-	P	+	P	-	-	-	-	-	P	+	P	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/161	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	+	P	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/167	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	?
ZPAL V.39/168	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-	?
ZPAL V.39/173	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	?
ZPAL V.39/213	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?+	?X
ZPAL V.39/370	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/380	R	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?+	?+	?X
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/386	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	+	P	X

Specimen	Side	Cervical	Vertebral					Pleural				Supramarginal			Marginal													
			1	2	3	4	5	1	2	3	4	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ZPAL V.39/390	R	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	+	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/394	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-	P	+	P	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/395	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	P	-	-	-	-	P	-	-	-	-	-	-	-	-	P	+	P	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/396	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	P	P	P	-	-	+	P	-	-	P	-	-	-	P	+	+	P	P	-	-	-	-	-	-	-	-	?
ZPAL V.39/397	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	?
ZPAL V.39/399	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?+	?X
	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
ZPAL V.39/400	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	P	-	-	-	-	-	?
ZPAL V.39/402	R	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?
	L	-	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?

Table S4. *Proterochersis porebensis*, plastron scutes. **+** – preserved whole or nearly whole; **P** – partially preserved; **-** – not preserved or insignificant part preserved. **R** means right, **L** means left side of the body.

Specimen	Side	Extragular	Gular	Humeral	Pectoral	Abdominal		Femoral	Anal	Caudal	Intercaudal	Axillary	Inframarginal			
						1	2						1	2	3	4
ZPAL V.39/8	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	P	P	P	-
ZPAL V.39/13	R	-	-	-	-	-	-	P	P	-	P	-	-	-	-	-
	L	-	-	-	-	-		P	P	-		-	-	-	-	-
ZPAL V.39/21	R	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/34	R	-	-	P	P	P	P	P	P	+	+	P	P	P	P	P
	L	+	P	P	P	P	P	P	+	P		P	+	+	+	P
ZPAL V.39/48	R	P	P	P	+	+	+	+	+	P	+	+	+	+	+	+
	L	+	+	P	+	+	+	+	+	+		P	+	+	P	+
ZPAL V.39/49	R	+	+	+	+	P	P	+	+	P	+	P	+	+	+	+
	L	P	+	+	+	+	+	+	+	+		+	P	+	+	P
ZPAL V.39/56	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	+		-	-	-	-	-
ZPAL V.39/62	R	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	P	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/64	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	P	P	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/66	R	-	-	-	-	-	-	-	P	P	P	-	-	-	-	-
	L	-	-	-	-	-	-	-	P	+		-	-	-	-	-
ZPAL V.39/68	R	-	-	-	-	-	-	-	P	P	+	-	-	-	-	-
	L	-	-	-	-	-	-	-	P	P		-	-	-	-	-
ZPAL V.39/69	R	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-
	L	-	-	-	-	-	-	-	+	+		-	-	-	-	-
ZPAL V.39/70	R	-	-	-	-	-	-	-	P	+	+	-	-	-	-	-
	L	-	-	-	-	-	-	-	P	P		-	-	-	-	-
ZPAL V.39/71	R	-	-	-	-	-	-	-	P	+	+	-	-	-	-	-
	L	-	-	-	-	-	-	-	P	P		-	-	-	-	-
ZPAL V.39/157	R	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/159	R	-	-	-	P	P	P	P	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/160	R	-	-	-	-	-	-	-	-	-	-	-	-	P	P	P
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/170	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	P	P	-		-	-	-	-	-
ZPAL V.39/172	R	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	P	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/185	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	P	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/186	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	P	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/187	R	+	P	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-

Specimen	Side	Extragular	Gular	Humeral	Pectoral	Abdominal		Femoral	Anal	Caudal	Intercaudal	Axillary	Inframarginal			
						1	2						1	2	3	4
ZPAL V.39/189	R	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/194	R	-	-	P	P	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/199	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	+		-	-	-	-	-
ZPAL V.39/200	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	?+		-	-	-	-	-
ZPAL V.39/333	R	+	P	P	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	P	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/343	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	P	P	P	-	-	-		-	-	-	-	-
ZPAL V.39/379	R	+	+	P	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/385	R	P	+	P	P	P	-	-	-	-	-	-	-	-	-	-
	L	+	+	P	P	P	-	-	-	-		-	-	-	-	-
ZPAL V.39/387	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	+	+	P	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/388	R	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/389	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	+		-	-	-	-	-
ZPAL V.39/400	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	P	-
ZPAL V.39/404	R	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	-	-	-	-	-	-	-	-	-		-	-	-	-	-
ZPAL V.39/420	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	L	+	+	P	-	-	-	-	-	-		-	-	-	-	-

Table S5. Measurements of *Proterochersis* spp. given in the text.

#		Neural canal				Carapace								Plastron					Ilium
		Dorsal		Sacral		Complete length	Cervical scute	Supramarginal scute		Ninth marginal	Caudalmost marginal scute			Gular	Extragular	Intercaudal scute		Femoral scute area	Width
		Height	Width	Height	Width		Length	Height	Length	Length	Width	Length	Max size	Width	Width	Length	Width	Thickness	
ZPAL	V.39/8							5.5	8.0										
	V.39/18										2.1	2.0	2.4						
	V.39/22						1.5												
	V.39/23										1.6	1.4	1.9						
	V.39/34					~28.0	0.8		~4.2	3.5	2.1	1.0						1.8	~2.0
	V.39/48	~0.6	~0.7			~42.5	1.5	4.2	6.6	5.2				2.6	3.2			2.1	3.5
	V.39/49	~0.8	~0.7			~49.0	2.2	5.0	7.7	6.5				2.7/2.4				2.5	4.0
	V.39/57						2.4												
	V.39/59										3.2	3.9	5.1						
	V.39/60									7.8									
	V.39/63																		6.3
	V.39/68															2.2	1.2		
	V.39/69															2.3	2.2		
	V.39/72					~44.5	1.9	4.2	6.7	6.0									3.7
	V.39/157																	2.7	
	V.39/169	~0.4	~0.5																
	V.39/370			0.8	0.7														
	V.39/377	0.8	~0.3																
	V.39/378	~0.4	~0.5																
	V.39/385													1.9	3.9				
	V.39/390						1.0												
	V.39/402	~0.8	~1.0	1.0	0.9														
SMNS	17561					~35.0													
	17930					~36.0													
CSMM	uncat.					36.5													

Table S6. MANOVA of size variation in the anal plastral region.

Effect	SS	MS	df	F	p-value
Species (centroid size)	275.08	275.08	1	2.8	> 0.3
Species (shape)	0.01	0.002	30	0.32	1
Sex (centroid size)	284.67	284.67	1	3.21	> 0.3
Sex (shape)	0.04	0.001	30	2.48	< 0.01

Table S7. Examples of sexual dimorphism in extant and fossil turtles.

Body section		Feature	References
Limbs		Feet wideness	Keswick & Hofmeyr 2015
		Rugose surfaces on male hindlimbs	Berry & Shine 1980
		Size and shape of claws on forelimbs	Wibbels *et al.* 1991; Wyneken 2001
Pelvis		Size of pelvic aperture	Cordero 2018
Shell	**Whole shell**	Kinesis	Pritchard 2008; Keswick & Hofmeyr 2015
		Presence or absence of particular shell scutes	Lichtig & Lucas 2017
		Relative shape and size of particular shell scutes or bones	Brophy 2006; Leuteritz & Gantz 2013; Lichtig & Lucas 2017
		Shape and size of caudal aperture of the shell	Pritchard 2008; Leuteritz & Gantz 2013; Keswick & Hofmeyr 2015
		Shell height	Brophy 2006; Pritchard 2008; Keswick & Hofmeyr 2015
		Shell length	Chiari & Claude 2011
		Shell width	Brophy 2006; Chiari & Claude 2011; Keswick & Hofmeyr 2015
		Time of fontanelle retention	Pritchard 2008
	Carapace	Allometric growth dynamic	Chiari & Claude 2011; Keswick & Hofmeyr 2015
		Degree of saddling	Pritchard 2008
		Shape of the caudal part	Wibbels *et al.* 1991; Pritchard 2008
		Plastron length	Brophy 2006
	Plastron	Seasonal plastron de-ossification and scute softening in males	Wibbels *et al.* 1991; Wyneken 2001; Pritchard 2008
		Shape and size of anal notch	Brophy 2006; Pritchard 2008; Cadena *et al.* 2013; Leuteritz & Gantz 2013; Sullivan & Joyce 2017
		Shape and size of gular processes	Pritchard 2008
		Ventral concavity	Wyneken 2001; Pritchard 2008; Cadena *et al.* 2013; Leuteritz & Gantz 2013
Tail		Cloacal position	White & Murphy 1973; Wyneken 2001
		Tail length	Berry & Shine 1980; Wibbels *et al.* 1991; Wyneken 2001; Sullivan & Joyce 2017
Whole body		Body size	Berry & Shine 1980; Brophy 2006; Pritchard 2008; Leuteritz & Gantz 2013; Ceballos & Iverson 2014; Keswick & Hofmeyr 2015; Lichtig & Lucas 2017; Cordero 2018

PRINCIPAL COMPONENT ANALYSIS

PRINCIPAL COMPONENT COEFFICIENTS FOR GULARS AND EXTRAGULARS IN VENTRAL VIEW

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
x1	0,088652	-0,232026	-0,000252	0,070683	-0,009663	0,309625	-0,368513	0,095648	-0,073229	0,355246
y1	0,526482	0,291836	0,109098	-0,403410	-0,094228	-0,133440	0,113118	-0,383049	-0,103834	0,021558
x2	-0,407408	-0,108021	0,476158	-0,565403	0,173562	0,086573	-0,260376	-0,094146	-0,193022	-0,183285
y2	0,193091	0,161074	-0,182779	-0,270955	-0,319280	0,498776	-0,007306	0,372947	-0,149040	-0,130456
x3	0,164788	0,169812	0,399969	0,399016	-0,194046	0,090516	-0,049367	0,071571	-0,208998	-0,241876
y3	-0,065301	0,382683	0,037788	0,051472	0,139891	0,002903	0,015141	-0,036708	0,050137	0,090778
x4	0,212117	0,107146	0,178894	0,128081	0,011423	0,127594	-0,166298	-0,189403	0,035066	-0,028307
y4	-0,002224	0,287338	0,013334	0,022336	0,126198	-0,053230	-0,034848	0,001677	0,092070	-0,010319
x5	0,199756	0,009757	-0,111636	-0,099171	0,141994	0,098174	-0,246033	-0,161771	0,237931	0,284321
y5	0,059485	0,149784	-0,099097	-0,039773	0,127787	-0,059255	-0,132162	0,075852	0,184739	-0,007018
x6	0,125275	-0,111971	-0,189464	-0,167777	0,216657	-0,042881	0,083680	0,216889	-0,173045	0,092700
y6	0,076106	-0,049135	-0,163081	-0,107771	0,172912	-0,142463	0,063994	0,354939	-0,178633	-0,096555
x7	0,045370	-0,124813	-0,141129	-0,129049	0,062868	-0,112283	0,130274	0,068325	-0,073588	-0,081593
y7	0,026773	-0,220678	-0,057543	-0,039290	-0,099572	-0,335497	0,004971	-0,072574	-0,035726	-0,302317
x8	-0,014543	-0,054915	-0,112996	-0,107937	0,033948	-0,062654	0,145989	0,067787	-0,029008	0,012802
y8	0,009132	-0,284785	0,080092	-0,006906	-0,331489	-0,232842	0,038619	-0,074130	0,180521	0,053521
x9	-0,073234	0,025245	-0,095842	-0,084649	0,036437	-0,043623	0,158444	0,007494	0,078930	-0,032515
y9	-0,010290	-0,265237	0,133975	-0,031920	-0,292313	-0,034595	0,094678	-0,013125	-0,062192	0,429401
x10	-0,127384	0,084728	-0,061865	-0,062693	0,029616	-0,018424	0,139605	0,019388	0,166387	0,029940
y10	-0,042742	-0,173606	0,086308	0,000081	-0,193245	0,104120	0,216000	-0,134971	-0,174810	0,138532
x11	-0,177274	0,136425	-0,022345	-0,054519	-0,052394	0,031003	0,148821	-0,015158	0,215720	0,063791

y11	-0,098610	-0,069154	0,040821	0,069246	0,030120	0,163371	0,222184	-0,137254	-0,116342	0,139279
x12	-0,238601	0,202936	0,019605	-0,053355	-0,161443	0,029534	0,202701	0,004126	0,224311	0,099598
y12	-0,126783	-0,015576	-0,010659	0,107174	0,324507	0,234917	0,260407	-0,188978	0,002340	0,105546
x13	-0,188436	0,174166	-0,030639	0,081465	-0,215392	-0,001357	0,143313	0,070196	-0,046986	-0,004940
y13	-0,151196	-0,014219	-0,146242	0,184023	0,145591	0,231830	0,106389	-0,158528	-0,204659	-0,112006
x14	-0,125966	0,135489	-0,083096	0,075270	-0,200941	-0,133232	-0,053249	0,012502	-0,197652	-0,008164
y14	-0,139794	-0,028551	-0,277381	0,133419	0,019474	0,072092	-0,179122	-0,226456	-0,270503	-0,173035
x15	-0,066966	0,100332	-0,059189	0,061068	-0,146606	-0,135229	-0,098403	0,046012	-0,042050	-0,021187
y15	-0,117663	-0,048044	-0,287110	-0,014418	-0,064964	0,005281	-0,311132	-0,229172	0,145738	-0,038685
x16	-0,026336	0,062688	-0,064262	0,068261	-0,056993	-0,166158	-0,054208	-0,037018	-0,119460	0,007428
y16	-0,074953	-0,074855	-0,071675	-0,000523	-0,146443	0,079553	-0,238234	0,060671	0,353100	-0,212687
x17	0,012973	0,029305	-0,103948	0,083696	-0,014737	-0,167933	-0,111423	-0,050608	-0,066841	0,115972
y17	-0,046999	-0,070520	0,103441	0,010563	-0,051228	0,071971	-0,055222	0,118373	0,188665	-0,202149
x18	0,062588	-0,043990	-0,090583	0,086413	0,016006	-0,094946	-0,084216	0,040053	-0,077431	0,076613
y18	-0,027713	-0,025099	0,164498	0,039638	0,029208	-0,010659	0,009798	0,084869	0,170696	-0,059257
x19	0,118360	-0,122058	-0,045243	0,090122	0,064916	-0,012749	-0,013532	-0,088345	0,006972	-0,115515
y19	-0,012367	0,007647	0,191335	0,068998	0,095921	-0,086806	0,011775	0,203998	0,084651	0,102706
x20	0,169532	-0,193386	0,027983	0,099881	0,125477	0,054274	0,131577	-0,181474	0,082487	-0,223731
y20	0,015001	0,031104	0,181445	0,091189	0,148609	-0,131421	-0,083652	0,300145	0,002034	0,176959
x21	0,246737	-0,246849	0,109878	0,080598	0,139310	0,164175	0,221214	0,097932	0,253508	-0,197299
y21	0,010565	0,027993	0,153430	0,136826	0,232544	-0,244608	-0,115396	0,081473	-0,158949	0,086201

PRINCIPAL COMPONENT COEFFICIENTS FOR SECTIONED GULARS

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
x1	0,249798	-0,259061	0,153091	-0,467814	0,055956	0,272172	0,029684	-0,157621	0,154001
y1	-0,175060	-0,314140	-0,065367	-0,288720	-0,061554	0,312190	-0,142677	0,189876	0,221518
x2	0,179387	-0,275286	0,315104	0,076572	0,259868	-0,107752	0,213988	0,048680	-0,372785
y2	-0,187546	-0,277455	0,063426	0,163951	0,144338	-0,076013	0,086587	0,303936	-0,080143
x3	0,041577	-0,174545	0,319421	0,229572	0,057046	-0,202093	-0,033695	-0,233790	0,140636
y3	-0,245260	-0,124884	0,062990	0,238973	-0,011293	-0,098310	0,072000	0,022999	0,158799
x4	-0,126645	0,008961	0,249078	0,154860	-0,240526	-0,009970	-0,313383	0,148576	0,342905
y4	-0,317561	0,037876	0,028003	0,165920	-0,114249	0,040339	-0,169594	-0,241112	-0,110521
x5	-0,231825	0,197545	0,105751	-0,010321	0,013165	0,268691	0,166287	0,347084	-0,077176
y5	-0,343368	0,189343	-0,043327	0,096082	0,059270	0,139037	0,063662	-0,277270	-0,220795
x6	-0,174480	0,186909	-0,008890	-0,134190	0,194361	0,082448	-0,057016	0,047427	0,106756
y6	-0,143134	0,213362	-0,239421	-0,457194	0,148389	-0,207837	0,254351	-0,111475	0,086368
x7	-0,163665	0,092875	-0,045247	0,049410	-0,003834	0,109757	0,046826	-0,192328	0,245706
y7	0,189729	-0,015302	-0,210865	-0,120624	-0,077541	-0,462366	-0,435544	0,165590	-0,078919
x8	-0,208554	-0,052903	-0,100819	-0,150991	0,130665	-0,141248	-0,160874	0,276102	-0,376598
y8	0,264903	0,026468	-0,144641	0,167055	-0,294826	0,003110	0,221259	0,019636	0,122755
x9	-0,154291	-0,148789	-0,092985	-0,111654	-0,140047	-0,323397	-0,094160	-0,214265	-0,033689
y9	0,206376	0,017974	-0,122851	0,123074	-0,126113	0,113049	0,113280	0,133807	0,064796
x10	-0,055219	-0,239557	-0,223263	0,040573	-0,332683	-0,094670	0,400760	-0,089784	-0,063957
y10	0,169517	-0,013990	-0,057552	0,065740	-0,078856	0,175467	0,064654	0,264714	-0,119678
x11	0,049358	-0,152508	-0,234610	0,012516	-0,167382	-0,032062	0,146706	-0,031562	0,042920
y11	0,146969	-0,055624	-0,037402	0,058398	0,027188	0,159450	-0,144880	-0,073102	-0,102578

x12	0,134120	-0,034908	-0,190347	-0,034974	0,041526	0,175999	-0,191735	-0,132714	-0,177708
y12	0,147703	-0,067740	-0,000307	0,037145	0,130575	0,142605	-0,229762	-0,344544	-0,094254
x13	0,144524	0,141328	-0,166672	0,174833	0,176762	0,099822	-0,185988	0,203974	0,140689
y13	0,121748	0,011767	0,044579	0,115062	0,318750	0,093951	-0,004598	-0,144683	0,049267
x14	0,151631	0,297459	-0,109926	0,103324	0,165888	-0,206545	0,010839	0,035696	0,255414
y14	0,098094	0,131808	0,163149	-0,051668	0,321613	-0,227939	0,267906	0,056046	0,181288
x15	0,164283	0,412481	0,030314	0,068284	-0,210768	0,108846	0,021760	-0,055477	-0,327115
y15	0,066889	0,240537	0,559589	-0,313195	-0,385689	-0,106734	-0,016643	0,035581	-0,077904

PRINCIPAL COMPONENT COEFFICIENTS FOR CAUDAL PROCESSES

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
x1	-0,207782	0,029857	-0,301730	-0,307655	0,157363	-0,395922	0,072367	-0,011466	0,320984
y1	0,029789	0,359727	-0,499377	0,092208	-0,067751	-0,217315	-0,283477	-0,194601	-0,228382
x2	-0,032834	-0,097825	-0,154618	0,283460	-0,621150	0,086964	0,466157	0,139665	-0,076186
y2	0,243620	-0,009999	0,006578	0,247318	-0,110652	0,022416	-0,309677	0,378158	0,536441
x3	-0,048253	-0,271796	-0,342903	-0,089378	0,227227	0,586215	-0,280985	-0,041611	0,138337
y3	0,050755	0,210506	-0,038782	-0,191148	0,408175	0,323608	0,512919	0,293728	-0,112104
x4	0,036343	-0,186036	0,224554	-0,014185	-0,037690	0,012032	-0,212749	0,154020	-0,073443
y4	0,287944	-0,163553	0,024638	-0,002427	0,317649	-0,306591	0,211895	-0,101112	-0,041099
x5	-0,008120	-0,164547	0,209540	0,032387	0,079531	-0,159213	-0,131625	0,010078	-0,134472
y5	0,182413	-0,171842	-0,004430	-0,080125	-0,022777	0,128883	0,052402	-0,122152	0,155065
x6	-0,047714	-0,113773	0,200771	0,093054	0,118659	-0,180322	-0,058923	0,051573	-0,087532
y6	0,071417	-0,220109	-0,029735	-0,154160	-0,149886	0,188582	0,003773	-0,347205	-0,054637
x7	-0,090798	-0,048256	0,183757	0,122171	0,127668	-0,054305	-0,010572	0,000975	-0,049269

y7	-0,045880	-0,306138	-0,073875	-0,237172	-0,202147	-0,004879	-0,016931	-0,255550	-0,146631
x8	-0,140882	-0,000522	0,132728	0,122452	0,098064	0,005670	-0,043047	-0,201670	0,068633
y8	-0,143278	-0,339197	-0,058433	-0,240785	-0,157937	-0,183273	0,070474	0,214901	-0,014782
x9	-0,197209	-0,004120	0,083227	0,115181	0,073861	0,013628	0,011859	-0,223877	-0,035019
y9	-0,233891	-0,221903	-0,109142	-0,044119	0,080167	-0,167246	-0,081764	0,420620	-0,151396
x10	-0,240640	0,043488	0,021680	0,125692	0,035022	0,092445	0,112701	0,043834	-0,034437
y10	-0,312570	0,083774	-0,125447	0,273968	0,050331	0,013546	-0,035090	0,014363	-0,133104
x11	-0,161813	0,160927	0,130070	-0,101837	0,000242	0,148690	0,015853	-0,063527	0,013119
y11	-0,208316	0,124329	-0,024636	0,184283	0,029700	0,079774	-0,042868	-0,076927	-0,027803
x12	-0,040710	0,220483	0,054514	-0,279792	-0,207219	-0,004411	0,054834	0,037610	0,273518
y12	-0,119499	0,105978	0,016467	0,155713	0,019129	-0,008055	0,041639	-0,036849	0,136046
x13	0,057329	0,237797	0,012071	-0,281496	-0,123493	-0,067324	0,033404	-0,077334	0,191615
y13	-0,053129	0,082200	0,053068	0,151656	0,021959	0,015330	0,022663	0,004787	0,109352
x14	0,154782	0,190436	-0,071007	-0,181523	-0,060707	-0,037194	-0,078422	0,098368	-0,185343
y14	-0,000475	0,076904	0,111247	0,103619	0,006829	0,025287	0,023845	-0,046715	0,147405
x15	0,237261	0,125051	-0,126472	-0,016025	-0,012375	0,057709	-0,146645	0,169538	-0,267092
y15	0,050435	0,073306	0,188216	0,009604	-0,032753	-0,028460	0,078809	-0,133639	0,155252
x16	0,324696	-0,001033	-0,135142	0,109516	0,029032	-0,004783	0,002544	0,112301	-0,093703
y16	0,082577	0,133905	0,262269	-0,072925	-0,050109	0,007099	-0,068100	-0,125711	-0,043809
x17	0,406343	-0,120131	-0,121039	0,267979	0,115966	-0,099877	0,193250	-0,198477	0,030289
y17	0,118088	0,182112	0,301373	-0,195509	-0,139928	0,111294	-0,180513	0,113901	-0,285815

RESULTS OF REGRESSION ANALYSIS FOR GULARS AND EXTRAGULARS IN VENTRAL VIEW

Total sample size: 11

Regression Coefficients

ProcCoord1	0,05820842	ProcCoord15	0,01295491	ProcCoord29	-0,01839421
ProcCoord2	0,02293745	ProcCoord16	0,02734338	ProcCoord30	0,03176098
ProcCoord3	-0,04760614	ProcCoord17	-0,00700109	ProcCoord31	-0,00970878
ProcCoord4	0,03843660	ProcCoord18	0,02056299	ProcCoord32	0,01704538
ProcCoord5	-0,04867311	ProcCoord19	-0,02484100	ProcCoord33	0,00397286
ProcCoord6	-0,06686331	ProcCoord20	0,00919663	ProcCoord34	-0,00322649
ProcCoord7	-0,00008640	ProcCoord21	-0,04041714	ProcCoord35	0,01884070
ProcCoord8	-0,04304497	ProcCoord22	-0,00971369	ProcCoord36	-0,01836300
ProcCoord9	0,04567955	ProcCoord23	-0,06239325	ProcCoord37	0,03315441
ProcCoord10	-0,00239963	ProcCoord24	-0,01733141	ProcCoord38	-0,02817712
ProcCoord11	0,04700084	ProcCoord25	-0,05038202	ProcCoord39	0,03988737
ProcCoord12	0,02545187	ProcCoord26	-0,00386046	ProcCoord40	-0,02725621
ProcCoord13	0,03251643	ProcCoord27	-0,02882654	ProcCoord41	0,04611421
ProcCoord14	0,03348881	ProcCoord28	0,01966098	ProcCoord42	-0,02564876

Sums of squares (the sums of squares below are within-group SSs)

Total SS: 0,09200218

Predicted SS: 0,01593230

Residual SS: 0,07606988

% predicted: 17,3173%

Permutation test against the null hypothesis of independence

Number of randomization rounds: 10000

P-value: 0,1207

RESULTS OF REGRESSION ANALYSIS FOR CROSS-SECTIONED GULARS

Total sample size: 10

Regression Coefficients

ProcCoord1	0,00127316	ProcCoord7	0,00552270	ProcCoord13	0,00335539
ProcCoord2	-0,03187105	ProcCoord8	-0,01065635	ProcCoord14	-0,00751846
ProcCoord3	-0,02036913	ProcCoord9	0,01679392	ProcCoord15	-0,02737244
ProcCoord4	-0,04474181	ProcCoord10	0,00114301	ProcCoord16	0,01771224
ProcCoord5	-0,01465551	ProcCoord11	0,01009951	ProcCoord17	-0,03473907
ProcCoord6	-0,02947083	ProcCoord12	-0,00084811	ProcCoord18	0,01548106

ProcCoord19	-0,03511381	ProcCoord23	0,00512285	ProcCoord27	0,02892643
ProcCoord20	0,01255907	ProcCoord24	0,00561976	ProcCoord28	0,01109528
ProcCoord21	-0,01853612	ProcCoord25	0,02072573	ProcCoord29	0,05896640
ProcCoord22	0,00701938	ProcCoord26	0,00817399	ProcCoord30	0,04630283

Sums of squares

Total SS: 0,15826903

Predicted SS: 0,00725683

Residual SS: 0,15101220

% predicted: 4,5851%

Permutation test against the null hypothesis of independence

Number of randomization rounds: 10000

P-value: 0,7252

RESULTS OF REGRESSION ANALYSIS FOR CAUDAL PROCESSES IN VENTRAL VIEW

Total sample size: 10

Regression Coefficients

x1	-0,09933161	y5	0,07373439	x10	-0,10977007	y14	0,00362126
y1	0,05764042	x6	-0,03838539	y10	-0,13473069	x15	0,12672128
x2	-0,00880860	y6	0,02141083	x11	-0,06761618	y15	0,02421887
y2	0,11728950	x7	-0,05202531	y11	-0,08519389	x16	0,15812565
x3	-0,03135756	y7	-0,04169073	x12	-0,00634434	y16	0,04295406
y3	0,03322206	x8	-0,06920797	y12	-0,04789647	x17	0,18719745
x4	-0,00181375	y8	-0,09591393	x13	0,04164696	y17	0,06346018
y4	0,11558508	x9	-0,09432280	y13	-0,01909351		
x5	-0,02307839	y9	-0,12861742	x14	0,08837061		

Sums of squares (the sums of squares below are within-group SSs)

Total SS: 0,23992373

Predicted SS: 0,13673385

Residual SS: 0,10318988

% predicted: 56,9905%

Permutation test against the null hypothesis of independence

Number of randomization rounds: 10000

P-value: 0,0002

FIGURES

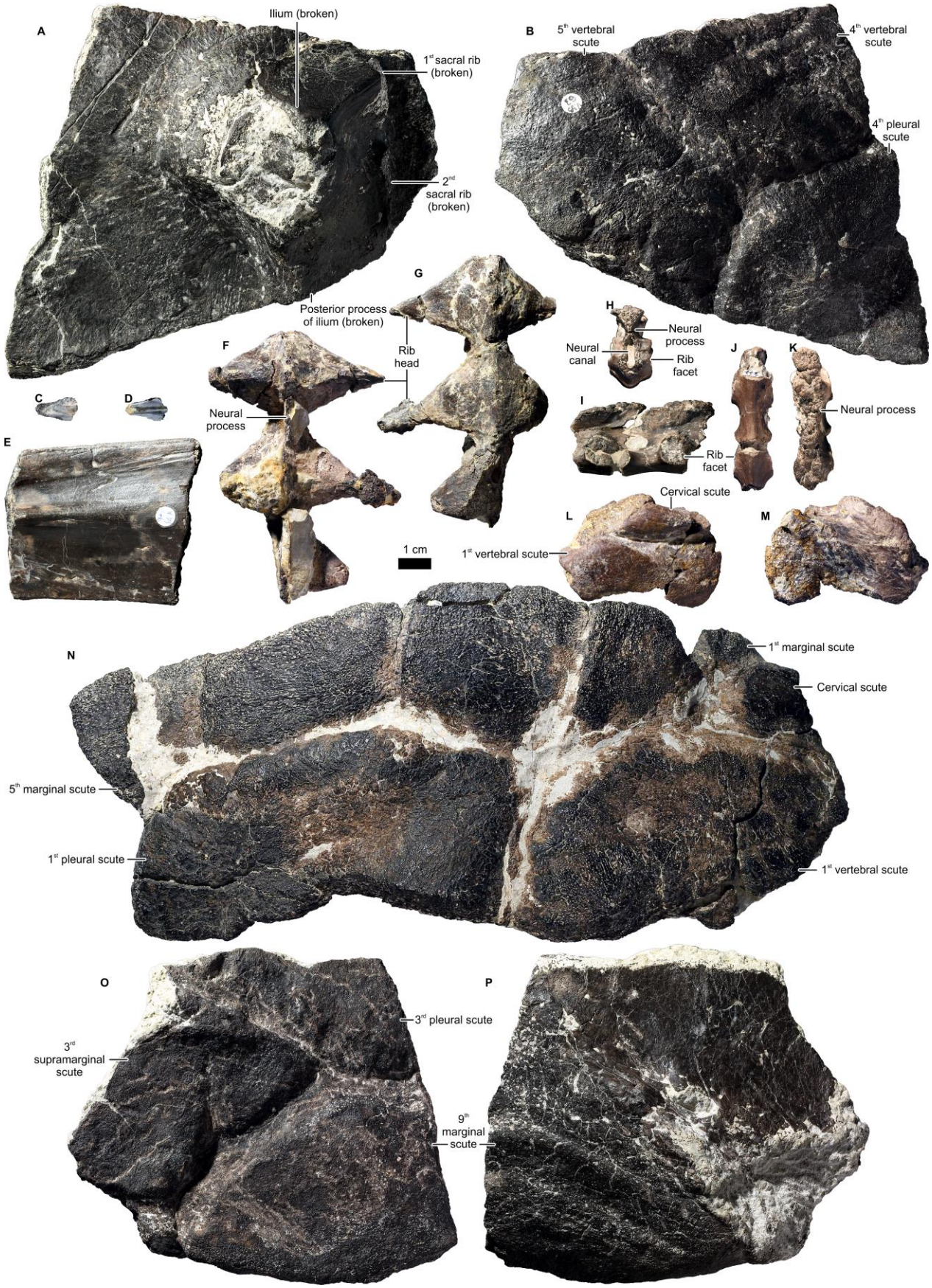

Fig. S1. Carapace variability of *Proterochersis porebensis*.

A–B: ZPAL V.39/63, carapace fragment of a large specimen with attached ilium in (**A**) visceral and (**B**) external view.

C–D: ZPAL V.39/381, fragmentary costal of a (?)hatchling in (**C**) external and (**D**) visceral view.

E: ZPAL V.39/176, costal fragment of a large specimen in visceral view.

F–G: ZPAL V.39/378, fragmentary dorsal vertebral column in (**F**) dorsal and (**G**) ventral view.

H–K: ZPAL V.39/377, fragmentary dorsal vertebral column of a juvenile in (**H**) cross-section (caudal view at a broken vertebra), (**I**) lateral right, (**J**) ventral, and (**K**) dorsal view.
L–M: ZPAL V.39/390, cranial part of a carapace in (**L**) external and (**M**) visceral view.
N: ZPAL V.39/57, cranial part of a carapace in external view.
O–P: ZPAL V.39/60, carapace fragment in (**O**) external and (**P**) visceral view.

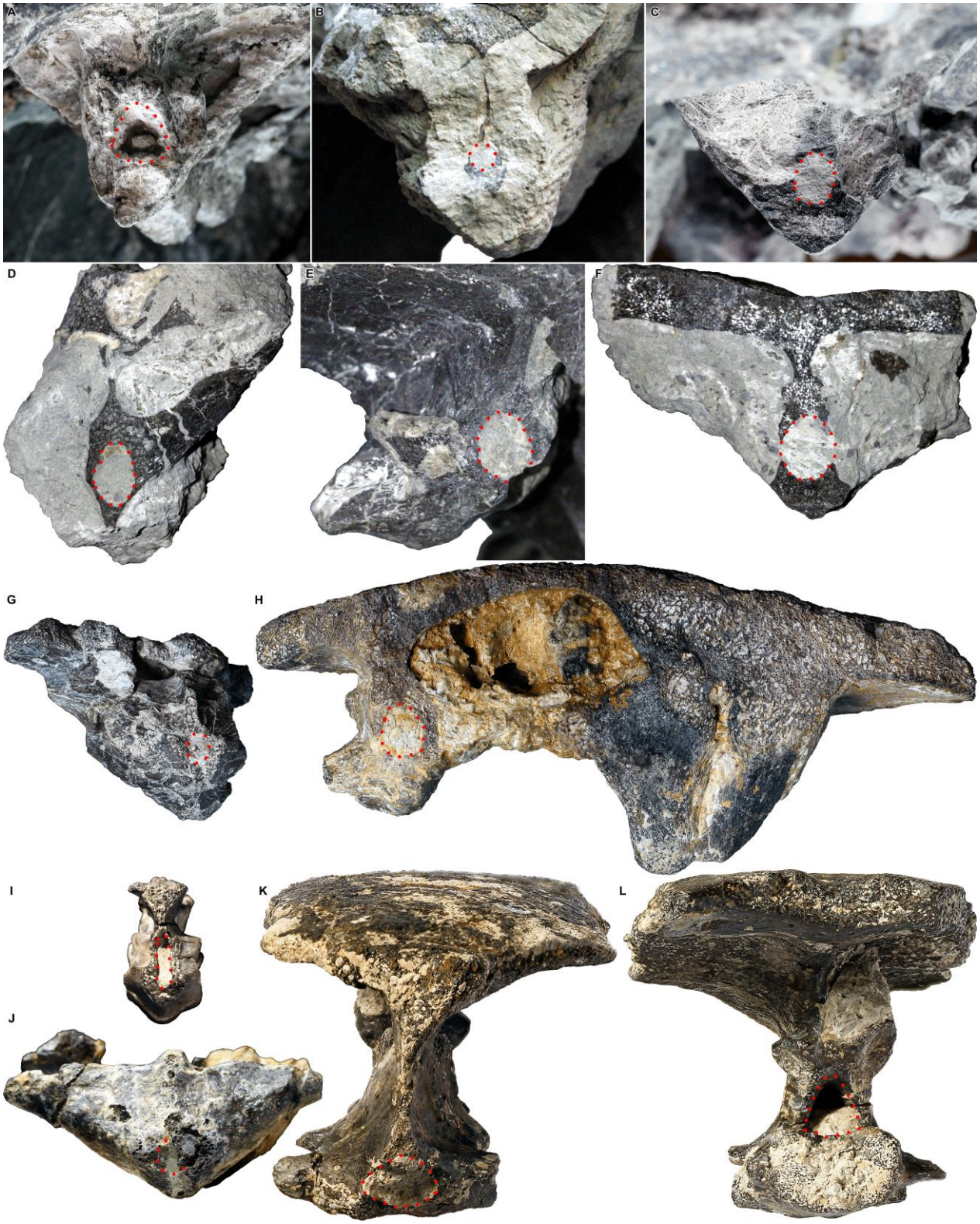

Fig. S2. Shape of the neural canal in *Proterochersis porebensis*.

A–B: ZPAL V.39/48, (**A**) cranial opening of the dorsal neural canal and (**B**) cross-section through the mid-dorsal vertebral column.

C–F: ZPAL V.39/49, cross-sections through the vertebral column in (**C**) cranial part of the trunk, (**D**) mid-section of the trunk, (**E**) cranial part of the sacrum, and (**F**) mid-section of the sacrum.

G: ZPAL V.39/169, fragmentary dorsal vertebral column in caudal view.

H: ZPAL V.39/370, cross-section through the first sacral vertebra in cranial view.

I: ZPAL V.39/377, of cross-section a dorsal vertebra in caudal view.

J: ZPAL V.39/378, fragmentary dorsal vertebral column in (?)cranial view.

K–L: ZPAL V.39/402, (**K**) damaged last dorsal vertebra in cranial view and (**P**) second sacral vertebra in caudal view.

Specimens not to scale. Outlines of the neural canals indicated by red dotted lines.

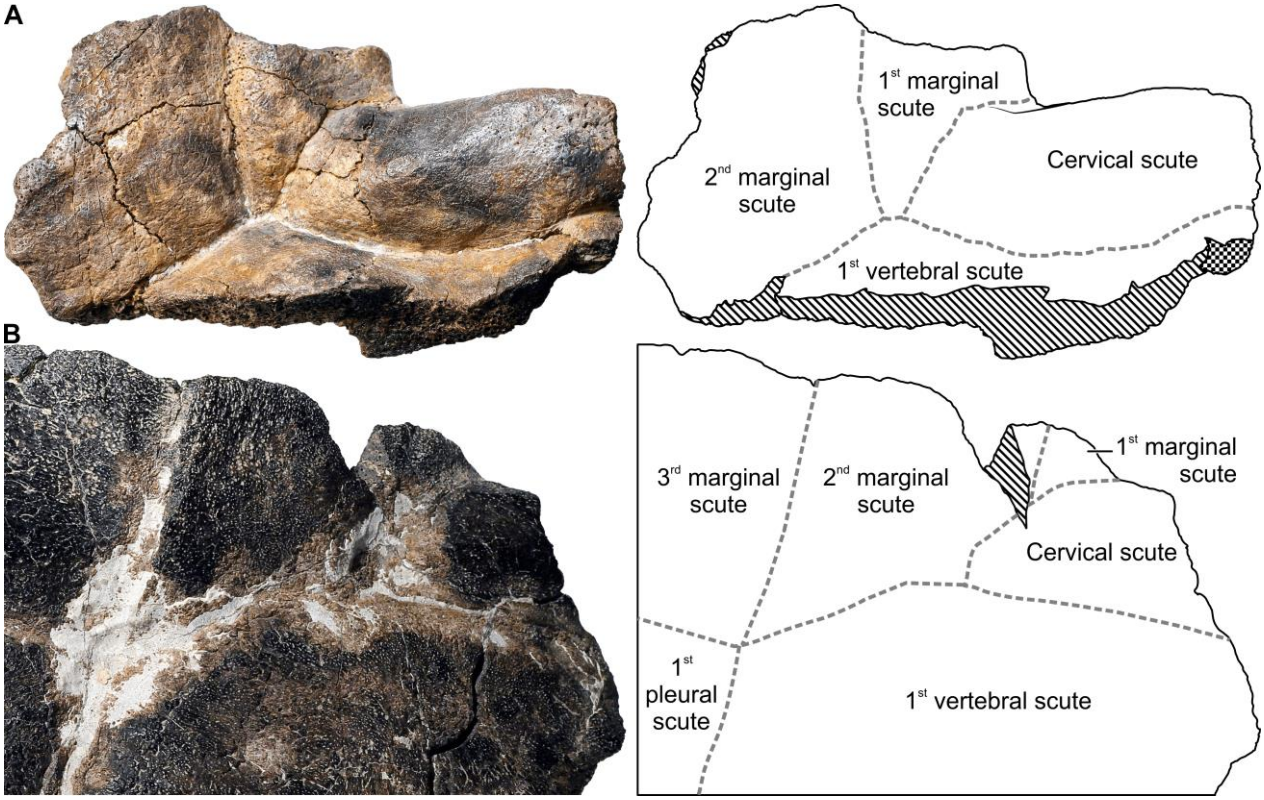

Fig. S3. Layout of cranial carapacial scutes in *Proterochersis porebensis*.

A: ZPAL V.39/22.

B: ZPAL V.39/57.

Specimens not to scale.

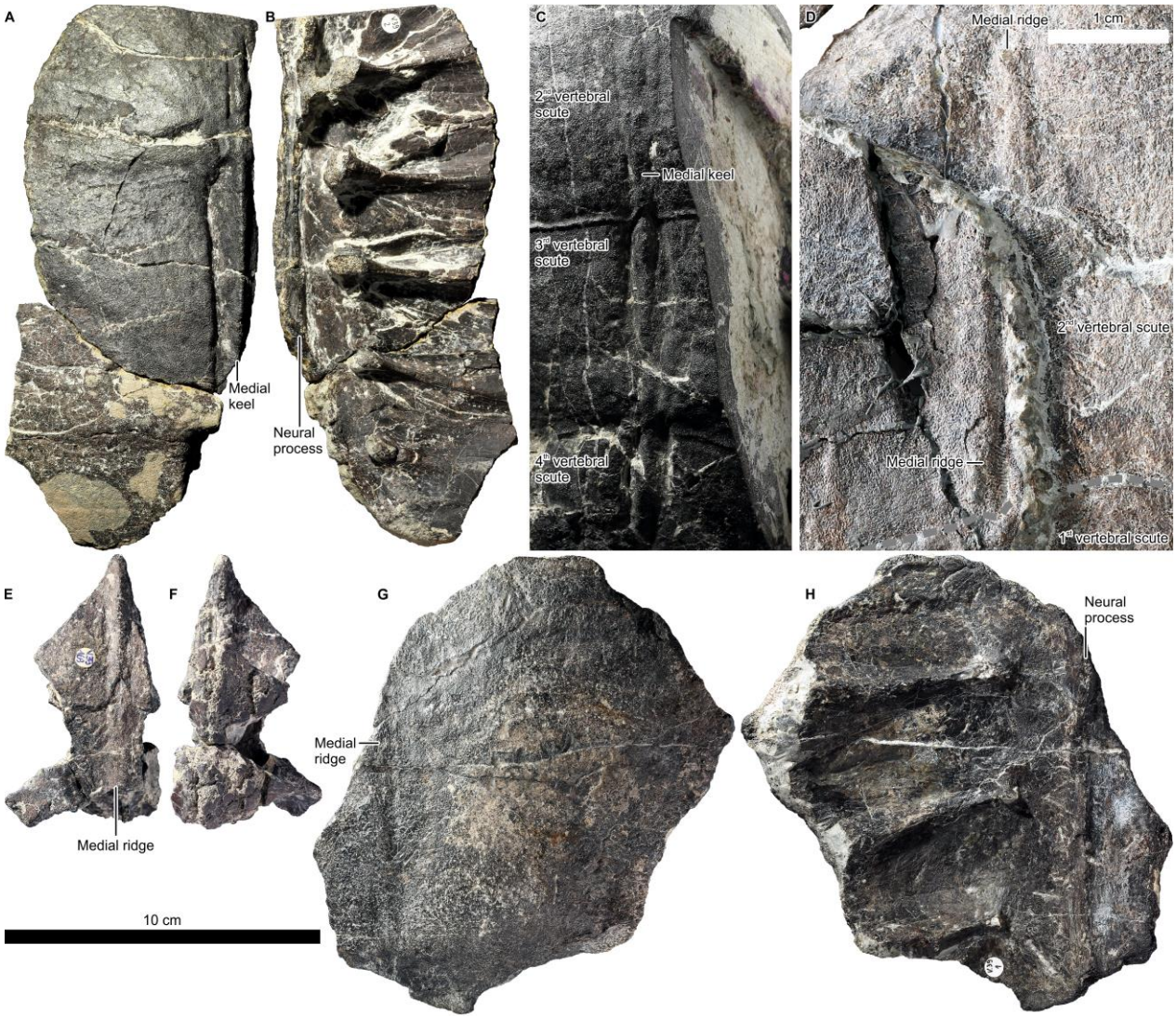

Fig. S4. Middorsal structures of *Proterochersis porebensis*.

A–B: ZPAL V.39/2, carapace fragment in (**A**) external and (**B**) visceral view.

C: ZPAL V.39/34, close-up on middorsal carapacial keel in dorsal view.

D: ZPAL V.39/72, close-up on middorsal carapacial ridge in anterodorsal view.

E–F: ZPAL V.39/169, carapace fragment with part of dorsal vertebral column in (**E**) dorsal and (**F**) ventral view.

G–H: ZPAL V.39/1, carapace fragment in (**G**) external and (**H**) visceral view.

A–B and **E–H** in the same scale.

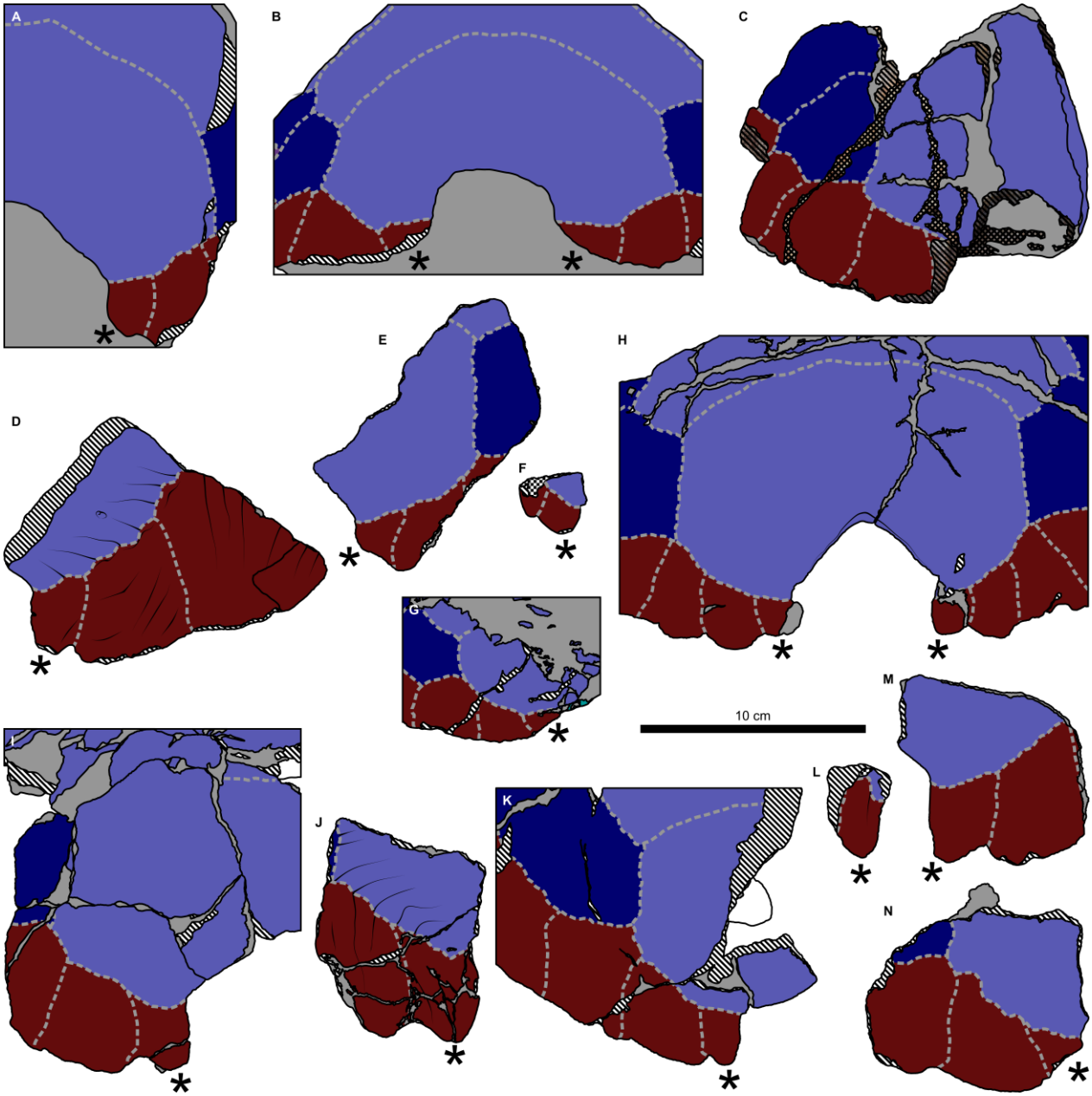

Fig. S5. Caudal regions of carapace of (**A–B**) *Proterochersis robusta* and (**C–N**) *P. porebensis* in external view.

A: CSMM uncat.
B: SMNS 17561.
C: SMNS 17755a.
D: ZPAL V.39/6.
E: ZPAL V.39/18.
F: ZPAL V.39/23.
G: ZPAL V.39/34.
H: ZPAL V.39/48.
I: ZPAL V.39/49.
J: ZPAL V.39/59.
K: ZPAL V.39/72.
L: ZPAL V.39/213.
M: ZPAL V.39/380.
N: ZPAL V.39/386.

Last marginals indicated by **asterisk**.

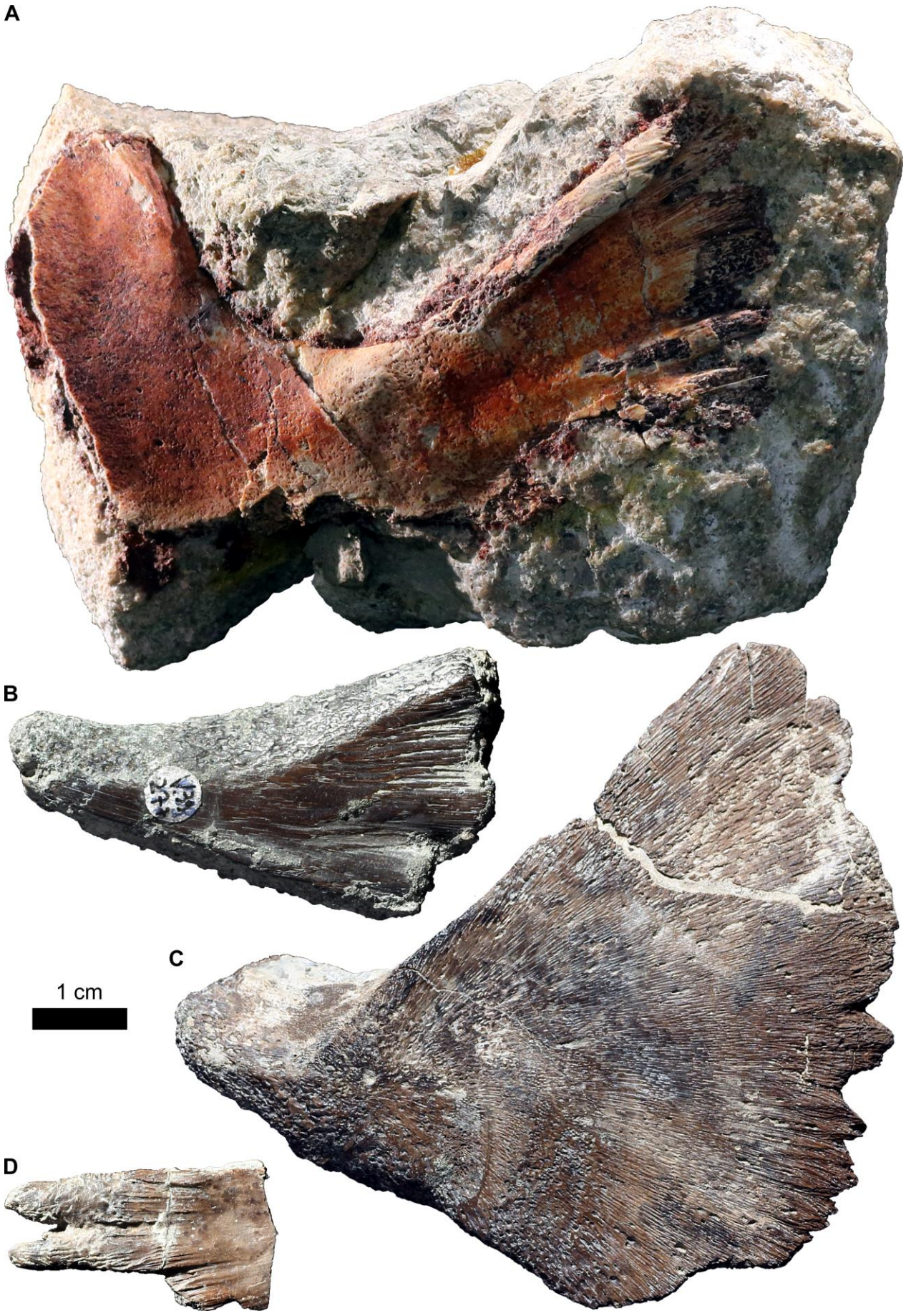

Fig. S6. Plastral bones of young individuals of (**A**) *Proterochersis robusta* and (**B–D**) *P. porebensis*.
A: SMNS 81917, hyoplastron or hypoplastron.
B: ZPAL V.39/277, xiphiplastron or mesoplastron.
C: ZPAL V.39/197, hyoplastron in external view.
D: ZPAL V.39/384.

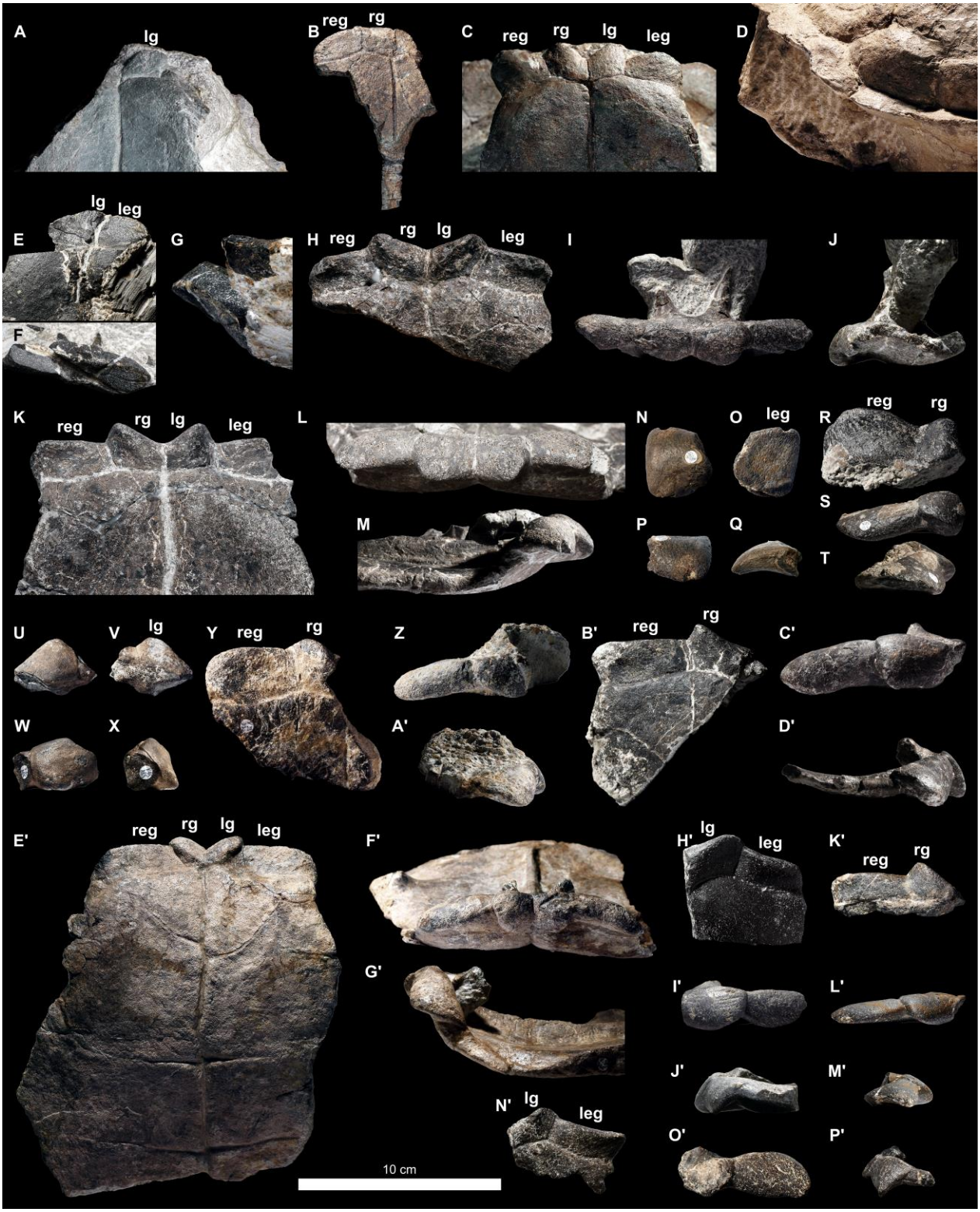

Fig. S7. Gular plastral regions of (**A–D**) *Proterochersis robusta* and (**E–M'**) *P. porebensis*.

A: CSMM uncat. in ventral view.

B: SMNS 16603, plastron in ventral view.

C–D: SMNS 17561 in (**C**) ventral and (**D**) lateral left view.

E–G: ZPAL V.39/34 in (**E**) ventral, (**F**) cranial, and (**G**) lateral left view.

H–J: ZPAL V.39/48 in (**H**) ventral, (**I**) cranial, and (**J**) lateral left view.

K–M: ZPAL V.39/49 in (**K**) ventral, (**L**) cranial, and (**M**) lateral right view.

N–Q: ZPAL V.39/186, extragular tubercle in (**N**) dorsal, (**O**) ventral, (**P**) cranial, and (**Q**) lateral left view.

R–T: ZPAL V.39/187 in (**R**) ventral, (**S**) cranial, and (**T**) lateral right view.

U–X: ZPAL V.39/189, gular tubercle in (**U**) dorsal, (**V**) ventral, (**W**) cranial, and (**X**) lateral right view.

Y–A': ZPAL V.39/333 in (**Y**) ventral, (**Z**) cranial, and (**A'**) lateral right view.

B'–D': ZPAL V.39/379 in (**B'**) ventral, (**C'**) cranial, and (**D'**) lateral right view.

E'–G': ZPAL V.39/385 in (**E'**) ventral, (**F'**) cranial, and (**G'**) lateral left view.

H′–J′: ZPAL V.39/387 in (**H′**) ventral, (**I′**) cranial, and (**J′**) lateral left view.
K′–M′: ZPAL V.39/388 in (**K′**) ventral, (**L′**) cranial, and (**M′**) lateral right view.
N′–P′: ZPAL V.39/420 in (**N′**) ventral, (**O′**) cranial, and (**P′**) lateral right view.

Abbreviations:

leg – left extragular scute.
lg – left gular scute.
reg – right extragular scute.
rg – right gular scute.

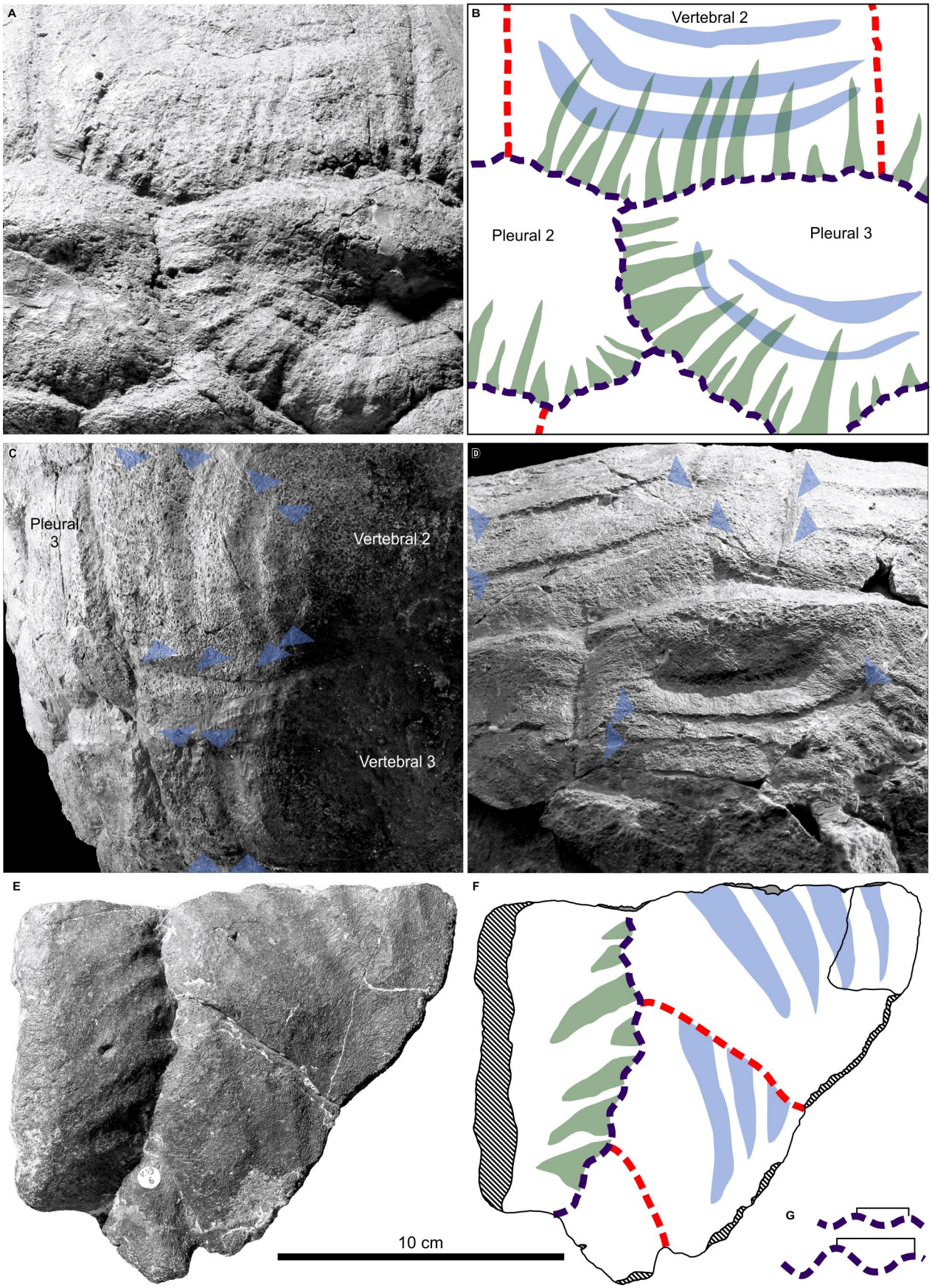

Fig. S8. Superficial scute features in the carapace of (**A–D**) *Proterochersis robusta* and (**E–F**) *P. porebensis*.
A–C: SMNS 17561 in (**A–B**) lateral left and (**C**) dorsal view.
D: SMNS 17930 in lateral right view.
E–F: ZPAL V.39/6 in external view.
G: Schematic representation of an undulating (sinuous) sulcus in smaller (supposedly younger, top) and larger (supposedly older specimens, bottom) individual. The frequency decreases and the amplitude of the undulations increases with the size of the specimen.

Photographs black and white for better contrast. Straight (non-undulating) sulci indicated by **red** dashed lines, undulating (sinuous) sulci indicated by **purple** dashed lines, growth marks indicated in **blue**, radial striation indicated in **green**. Note that the edges of growth marks and striations are usually ill-defined, so the layout presented here is approximate.

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