

# A New Sea Turtle (Testudines, Cheloniidae) from the Middle Eocene of Uzbekistan

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**Abstract**—A new sea turtle, *Puppigerus nessovi* sp. nov., from the Middle Eocene (Lutetian–Bartonian) of the Dzheroi 2 locality in Uzbekistan is described based on cranial and dentary fragments, isolated limb bones, and shell plates. The new species differs from the only known species *P. camperi* (Gray, 1831) from the Eocene of Great Britain and Belgium in its longer mandibular symphysis which closely approaches the foramen dentofaciale majus, in the retention of the costoperipheral fontanelles in adults, and in the normal pholidosis of the posterior part of the carapace.

**Key words:** Sea turtle, new taxa, Middle Eocene, Uzbekistan.

## INTRODUCTION

An interesting fauna composed mostly of Paleogene marine vertebrates was discovered by L.A. Nessov and A.O. Averianov in 1987 in the Dzheroi 2 locality near the village of Muruntau in the central Kyzylkum Desert, Uzbekistan. Fossil vertebrates occur in gray and yellow quartz sand with granular phosphorites. Based on the chondrichthian fauna, the locality is dated Middle Eocene, namely, the Lutetian–Bartonian boundary (Case *et al.*, 1996). The vertebrate assemblage includes various cartilaginous and bony fishes, the sea turtle *Puppigerus nessovi* sp. nov. (Cheloniidae), unidentifiable land tortoises, the sea snakes *Palaeophis tamdy* (Averianov, 1997) and *Pterosphenus muruntau* Averianov, 1997 (Palaeopneustidae), two crocodile taxa, and the birds Charadriiformes indet., Rallidae indet. (two taxa), *Odontopteryx* sp. (Pelagornithidae), *Zheroia kurochikini* Nessov, 1988 (Laornithidae), *Murunkus subitus* Pantelev et Nessov, 1993 (Diomedidae) (Nessov, 1988, 1992a, 1992b; Averianov *et al.*, 1991; Pantelev

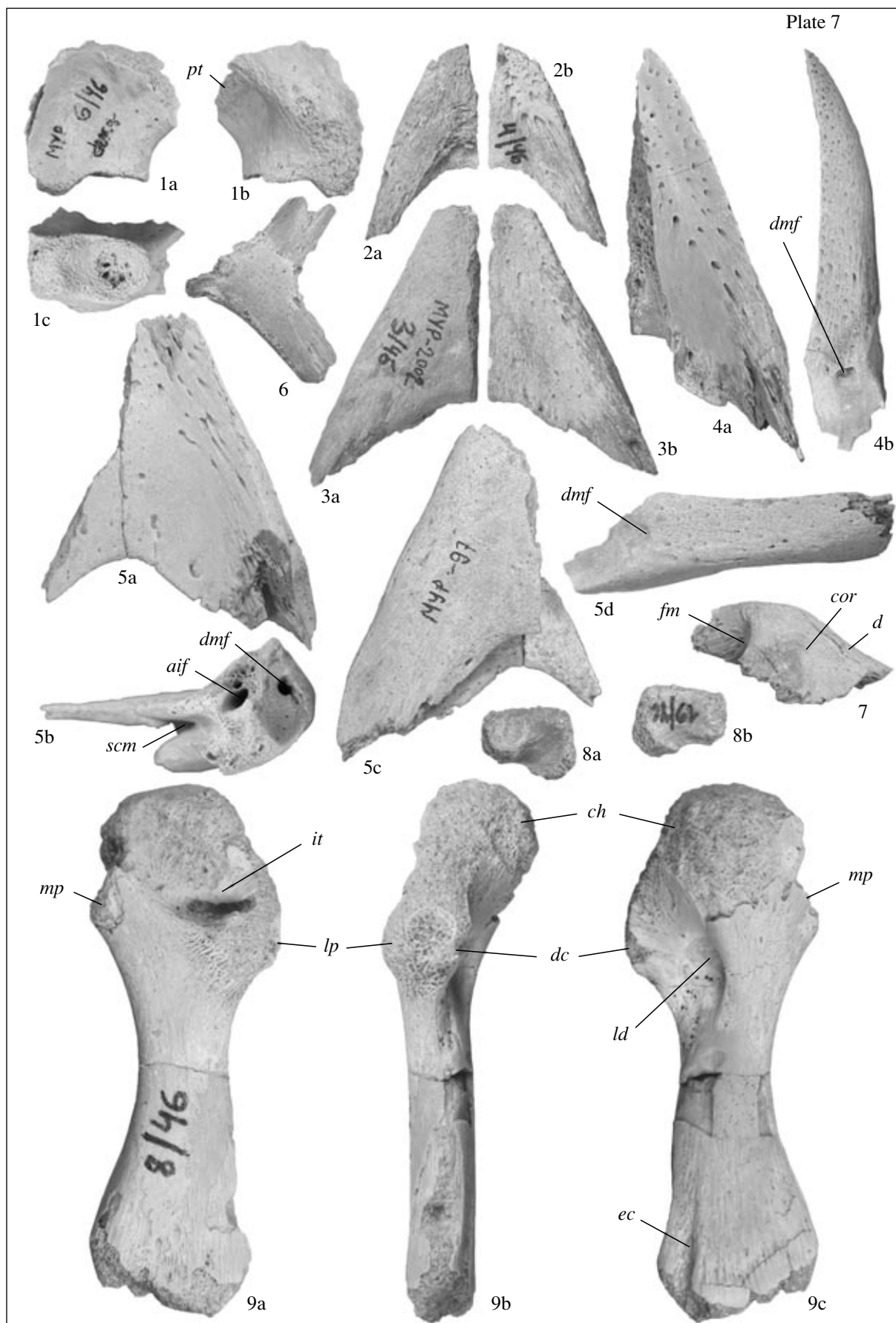
and Nessov, 1993; Nessov and Averianov, 1996; Case *et al.*, 1996; Averianov, 1997, 2002).

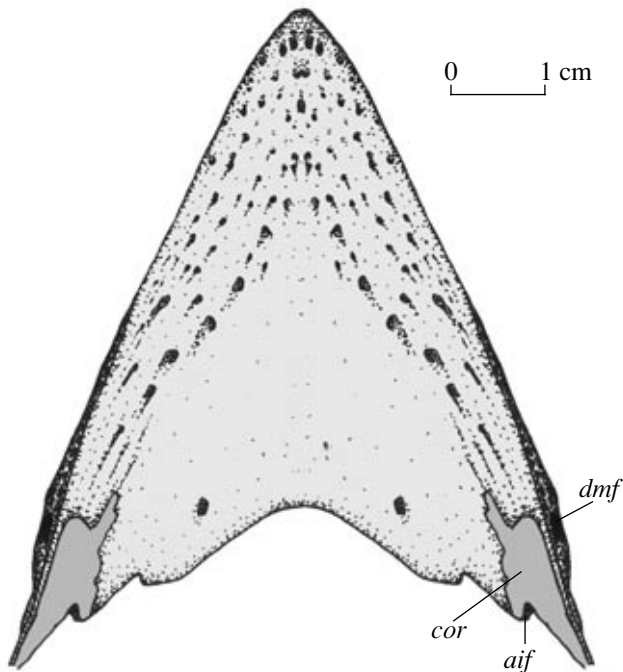
Most of the vertebrates was collected by Nessov and Averianov in 1987 and Averianov and A.V. Pantelev in 1989. Some specimens from Dzheroi 2 were passed to the author by D. Ward, C. King, and T.P. Malyskina in 1997, 2002, and 2003. Turtles from Dzheroi 2 were previously identified as “sea turtles belonging to archaic Eochelyinae (1.5 times larger than the Paleocene *Tasbacka aldabergeni* Nessov) and cf. Syllomiinae” (Nessov, 1988, p. 122); “one genus from the Eochelyinae and another, probably, from other group” (Pantelev and Nessov, 1993, p. 96); “eochelyine and syllomiine(?) sea turtles” (Nessov, 1992b, p. 474); or “turtles (sea turtles belonging to two genera and, probably, big-headed or pond turtles)” (Nessov, 1992a, p. 35). The specimens identified as Syllomiinae were determined based on fragments of sculptured shell plates, which are probably of limited reliability. Land tortoises are represented by fragments too incomplete to identify with certainty.

## Explanation of Plate 7

All specimens come from the Dzheroi 2 locality, central Kyzylkum Desert, Uzbekistan; Lutetian–Bartonian, Middle Eocene.

**Figs. 1–9.** *Puppigerus nessovi* sp. nov., cranial and postcranial bones: (1) specimen ZIN PH, no. 6/46, articular process of the right quadrate,  $\times 1.1$ : (1a) anterior, (1b) posterior, and (1c) ventral views; (2) ZIN PH, no. 4/46, left dentary of a young individual,  $\times 1.1$ : (2a) ventral and (2b) dorsal views; (3) ZIN PH, no. 3/46, left dentary of a young individual,  $\times 1.1$ : (3a) ventral and (3b) dorsal views; (4) ZIN PH, no. 2/46, fragmentary left dentary,  $\times 1.1$ : (4a) dorsal and (4b) lateral views; (5) holotype ZIN PH, no. 1/46, fragmentary dentaries,  $\times 1.1$ : (5a) dorsal, (5b) posterior, (5c) ventral, and (5d) lateral views; (6) ZIN PH, no. 18/46, left scapula of a young individual, posterior view,  $\times 1.1$ ; (7) ZIN PH, no. 7/46, fragment of the left coronoid and dentaries, medial view,  $\times 1.1$ ; (8) ZIN PH, no. 19/46, metatarsal V,  $\times 1.1$ : (8a) posterior and (8b) anterior views; and (9) ZIN PH, no. 8/46, left humerus of a young individual,  $\times 2.2$ : (9a) ventral, (9b) anterior, and (9c) dorsal views. Designations: (*aif*) foramen alveolare inferius, (*ch*) caput humeri, (*cor*) coronoid, (*d*) dentary, (*dc*) deltopectoral crest, (*dmf*) foramen dentofaciale majus, (*ec*) ectepicondylar notch, (*fm*) fossa meckelii, (*it*) fossa intertubercularis, (*ld*) fossa for joint tendon of the latissimus dorsi and teres major muscles, (*lp*) lateral process, (*mp*) medial process, (*pt*) suture for the pterygoid, and (*scm*) sulcus cartilaginis meckelii.





**Fig. 1.** Reconstruction of the dentary of *Puppigerus nessovi* sp. nov., dorsal view (based on specimens ZIN PH, nos. 1/46 and 2/46). Designations: (*aif*) foramen alveolare inferius, (*cor*) facet for the coronoid, and (*dmf*) foramen dentofaciale majus.

This paper describes a sea turtle from the Dzheroi 2 locality that is assigned to a new species of the genus *Puppigerus*.

The material examined is stored in the paleoherpetological collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZIN PH).

#### SYSTEMATIC PALEONTOLOGY

Order Testudines Linnaeus, 1758

Suborder Cryptodira Cope, 1868

Family Cheloniidae Gray, 1825

Genus *Puppigerus* Cope, 1871

*Puppigerus nessovi* Averianov, sp. nov.

Plate 7, figs. 1–9; Plate 8, figs. 1–8

**Etymology.** The species is named in honor of the Russian paleontologist L.A. Nessov.

**Holotype.** ZIN PH, no. 1/46, dentary fragment; Uzbekistan, Navoi Viloyat, central Kyzylkum Desert, ca. 20 km north of the village of Muruntau, Dzheroi 2 locality; Middle Eocene, Lutetian–Bartonian.

**Description** (Fig. 1). The quadrate (Pl. 7, fig. 1) is represented by the articular process with an incom-

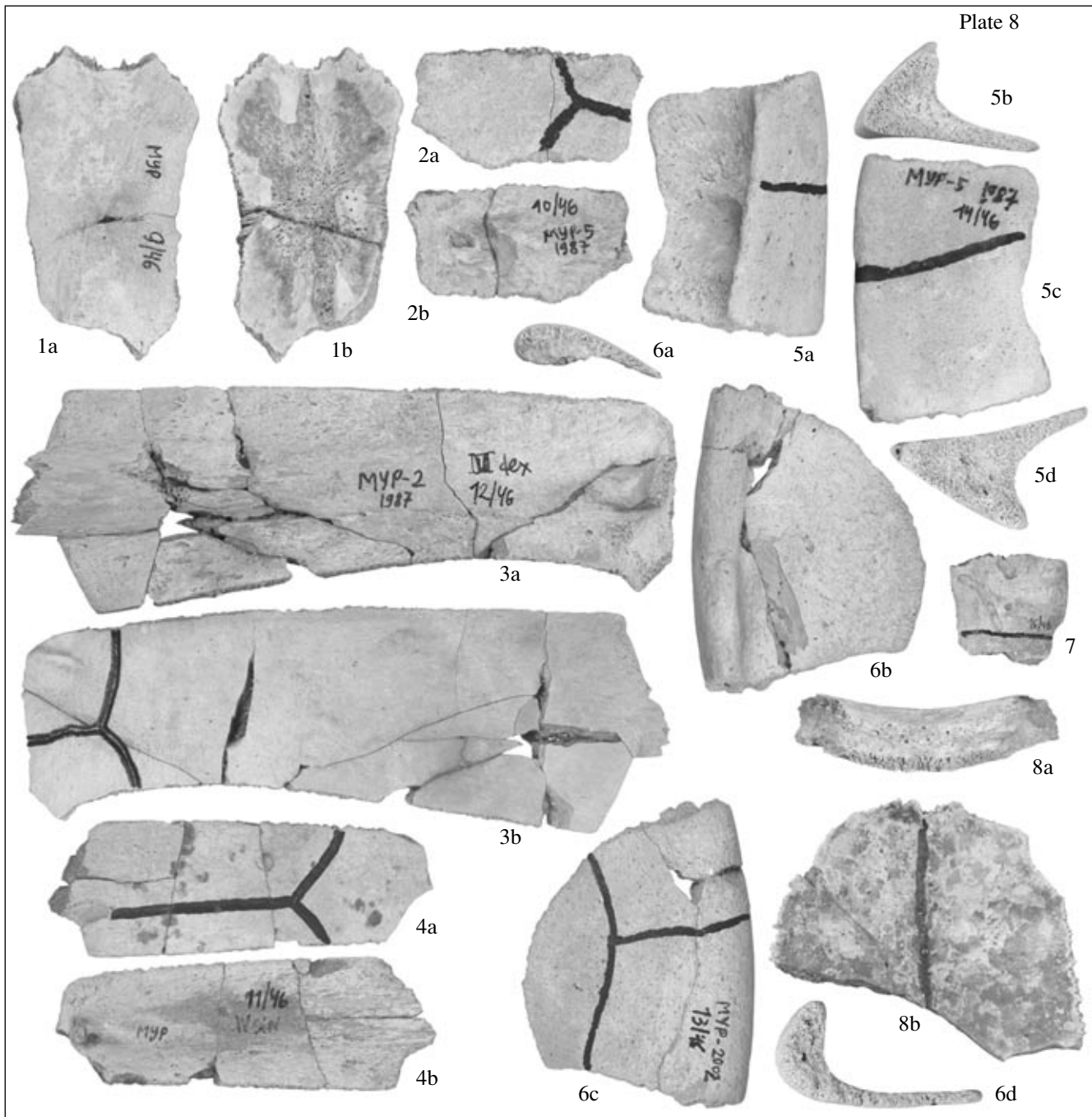
pletely preserved mandibular condyle. The condyle is formed of two approximately equal facets positioned at an angle of ca.  $\sim 125^\circ$  to each other. A high crest extends along the anterolateral margin and separates a concave anterior surface forming the posterior wall of the lower temporal fenestra from a flattened lateral surface of the cavum tympanicum. The anteromedial margin of the processus articularis is a high crest forming the base of the processus epipterygoideus. Lateral to this crest, the posterior surface of the bone has a fragment of a suture for the pterygoid.

The dentary (Pl. 7, figs. 2–5; Fig. 1) is triangular in dorsal view, with a pointed anterior end. The bone is almost uniform in height, except for the anterior margin. The mandibular symphysis is very long, closely approaches the level of the foramen dentofaciale majus. The dentary has a very low, flat eminence along the symphysis. On each side from this eminence, the dorsal surface of the bone is concave. The lateral margins of the dentary are relatively high, almost straight, and very sharp. The anterior and lateral surfaces of the dorsal side of the bone and almost the whole of its ventral side are pierced by large nutrient foramina. The sulcus cartilaginis meckelii is large and deep. Above and lateral to this sulcus, there is the canalis alveolaris inferior, which terminates posteriorly in a relatively large foramen alveolare inferius. The posterior part of the lateral surface of the bone has a large foramen dentofaciale majus, which opens a relatively short canal extending anteromedially. The posterodorsal margin of the mandibular symphysis overhangs the ventral margin and extends posteriorly far beyond the latter. The anterior end of the coronoid reached the level of the posterior edge of the mandibular symphysis.

The coronoid (Pl. 7, fig. 7) is almost completely preserved in contact with the posterior part of the dentary. Its posterior margin has a deep notch, the anterior border of the fossa meckelii.

The scapula (Pl. 7, fig. 6) belongs to a young individual. The spine of the scapula is positioned at an angle of  $100^\circ$  to the acromion.

The humerus (Pl. 7, fig. 9) has nonossified epiphyses (preserved fragment is 43 mm long) and a widely open ectepicondylar notch; it belongs to a young animal (see Zug *et al.*, 1986, fig. 2). The bone is advanced in structure, displaying a chelonioid level of organization, or a “thalassian” type (Zangerl, 1953; Hirayama, 1992), with the angle  $\alpha = 160^\circ$  (it is impossible to measure the angle  $\beta$  because of incomplete ossification of the proximal epiphysis; however, it was probably more than  $60^\circ$ ). The lateral process is located just distal to the head of the humerus. The epiphyses of the lateral process and deltopectoral crest are separated by a small circular fossa. On a level with the lateral process, the dorsal side of the bone has a large, deep oval fossa for the attachment of the combined tendon of the musculus latissimus dorsi



#### Explanation of Plate 8

All specimens come from the Dzheroi 2 locality, central Kyzylkum Desert, Uzbekistan; Middle Eocene, Lutetian–Bartonian.

**Figs. 1–8.** *Puppigerus nessovi* sp. nov., plates of the carapace: (1) specimen ZIN PH, no. 9/46, even (second or fourth) vertebral plate,  $\times 0.9$ : (1a) dorsal and (1b) ventral views; (2) ZIN PH, no. 10/46, third or fifth costal plate of a young individual,  $\times 0.9$ : (2a) dorsal and (2b) ventral views; (3) ZIN PH, no. 12/46, odd costal (third or fifth) plate,  $\times 0.9$ : (3a) ventral and (3b) dorsal views; (4) ZIN PH, no. 11/46, even costal (second, fourth, or sixth) plate of a young individual,  $\times 0.9$ : (4a) dorsal and (4b) ventral views; (5) ZIN PH, no. 14/46, left bridge peripheral plate,  $\times 0.9$ : (5a) ventral view, (5b) anterior articular surface, (5c) dorsal view, and (5d) posterior articular surface; (6) ZIN PH, no. 13/46, right third peripheral plate,  $\times 0.9$ : (6a) anterior articular surface, (6b) ventral view, (6c) dorsal view, and (6d) posterior articular surface; (7) ZIN PH, no. 15/46, fragment posterior peripheral plate, ventral view,  $\times 0.45$ ; and (8) ZIN PH, no. 17/46, fragment of a pygal plate,  $\times 0.9$ : (8a) frontal and (8b) dorsal views.

and musculus teres major. The ventral side has a large fossa intertubercularis, with a very deep, narrow depression along the base of the lateral process.

Metatarsal V (Pl. 7, fig. 8; greatest width is 13.5 mm) is almost rectangular, with a large, rounded medial facet for tarsal IV. The lateral region of the bone is flat-

tened, with a relatively small distal facet for the proximal phalanx of digit V.

An even neural plate (second or fourth; Pl. 8, fig. 1) is relatively long (greatest length  $\times$  width, 56.5  $\times$  33.5 mm) and flat, heptagonal (the posterior margin is asymmetrical), with a weak ornamentation composed of long longitudinal ridges.

In the costal plates (Pl. 8, figs. 2–4), the relative width of the vertebral scute decreased with age. Adults, with a 38–40-cm-long shell (Pl. 8, fig. 3), retain well-developed costoperipheral fontanelles.

The third peripheral plate (Pl. 8, fig. 6; 55.5 mm long along the external edge, the greatest width on the dorsal side is 42 mm) is triangular, with a relatively large costal scute.

The bridge peripheral plate (Pl. 8, fig. 5; 48 mm long at the external edge and 31 and 33 mm wide on the dorsal side at the anterior and posterior edges, respectively) has an intermarginal sulcus located close to the anterior edge and a fossa for a rib positioned close to the posterior edge. The costomarginal sulcus is inconspicuous. The medial margin of the dorsal side is concave.

The pygal plate (Pl. 8, fig. 8) has a relatively short anterior margin adjoining along its entire extent the second suprapygal plate and the longitudinal horn sulcus.

**Comparison.** The new species is distinguished from the type (and the only known) species of the genus *Puppigerus*, *P. camperi* (Gray, 1831), from the Eocene of Great Britain and Belgium by the longer mandibular symphysis located close to the level of the foramen dentofaciale majus, the preservation of the costoperipheral fontanelles in adults, and by the presence of a longitudinal horn sulcus on the pygal plate.

**Remarks.** To date, four genera of Paleogene sea turtles with a long hard palate and a long mandibular symphysis have been described: *Euclastes* Cope, 1867 [cranial material of this taxon was previously referred to the genus *Osteopygis* Cope, 1868, which was described based on postcranial bones of a macrobaenid (see Parham, 2003)]; *Erquelinnesia* Dollo, 1887; *Puppigerus* Cope, 1871; and *Tasbacka* Nessov, 1987 (Zangerl, 1971; Moody, 1974; Foster, 1980; Fastovsky, 1985; Nessov, 1987; Tong and Hirayama, 2002; Hirayama and Tong, 2003). The turtle from Dzheroi 2 differs from the osteopygines *Euclastes* and *Erquelinnesia* in the narrow and pointed (rather than wide and blunt) anterior end of its skull; it differs from *Puppigerus camperi* and *Tasbacka* in the longer mandibular symphysis which closely approaches the level of the foramen dentofaciale majus. It is similar to *Puppigerus camperi* and differs from *Tasbacka* in the substantially longer dorsal side of the mandibular symphysis compared to the ventral side, the more advanced structure of the humerus of the thalassian type, and in the presence of a large, well-pronounced fossa for the combined tendon of the latissimus dorsi and teres major muscles on the humerus. Taking into account the above set of char-

acters, it is expedient to assign the turtle from Dzheroi 2 to the genus *Puppigerus*.

The surface of almost all shell plates of *P. nessovi* sp. nov. displays traces of life activity of certain organisms, or pathological changes of bone tissue, in the form of shallow grooves and pits (see, for example, Pl. 8, fig. 7), similar to those of turtles from the Lower Cretaceous of Kyrgyzstan and described as *Sulculites bellus* Vialov et Nessov, 1974 (Vyalov and Nessov, 1974).

**Material.** In addition to the holotype, the collection of ZIN PH contains fragments of the quadrate (ZIN PH, no. 6/46), dentaries (nos. 2–5/46), dentary and coronoid (no. 7/46), scapula (no. 18/46), humerus (no. 8/46), metatarsal V (no. 19/46), and carapace plates: vertebral (no. 9/46), costal (nos. 10–12, 16/46), third peripheral (no. 13/46), bridge peripheral (no. 14/46), posterior peripheral (no. 15/46), pygal (no. 17/46) plates, and many small, poorly preserved fragments of skull, postcranial skeleton, and shell from the type locality.

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