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Late Cretaceous Decapoda from the Izumi Group of Japan, with descriptions of two new genera and one new species of Axiidea and one new family of Brachyura

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Abstract

Seven species of decapods are described from the Izumi Group (Upper Cretaceous: Campanian–Maastrichtian) of Hyogo and Osaka Prefectures, central Japan. Archaeopidae, a new family of Retroplumoidea embraces the monotypic Late Cretaceous genus *Archaeopus*. *Hinecaris simplex*, a new genus and species is the first record for the axiidean family Axiidae from the Cretaceous rocks of Japan. "*Callianassa*" (s.l.) *masanorii* Karasawa, 1998, is re-described and is moved from Callianassidae to Gourretiidae. A re-description is given for *Linuparus japonicus* Nagao, 1931, and *Archaeopus ezoensis* (Nagao, 1941). The lectotype for *Linuparus japonicus* Nagao, 1931, is herein designated.

Key words: Decapoda, Achelata, Axiidea, Brachyura, Izumi Group, Cretaceous, Japan

Introduction

Decapods have been recorded from the Upper Cretaceous (Campanian–Maastrichtian) Izumi Group of central Honshu, Japan. Collins, Kanie, and Karasawa (1993) reported a brachyuran, *Archaeopus ezoensis* (Nagao, 1941). Karasawa (1998) described two new species, *Hoploparia miyamotoi* Karasawa, 1998 (Nephropidae) and "*Callianassa*" (s.l.) *masanorii* Karasawa, 1998 (Callianassidae). Kishimoto (2002) discussed the morphology of a palinurid, *Linuparus japonicus* Nagao, 1931, from the Izumi Group. Kishimoto (2012) summarized occurrences of decapods from the group and figured representatives of these taxa. Examination of newly and previously known specimens reveals several new taxa and systematic problems that remain to be addressed. Thus, the purpose of this paper is to describe the previously unrecorded species, to re-describe the hitherto known species, and to update the taxonomic status of two taxa.

Institutional abbreviations

D: Museum of Nature and Human Activities, Hyogo (01-), 6 Yayoigaoka, Sanda, Hyogo 669-1546, Japan

WMNH-Ge: Wakayama Prefectural Museum of Natural History, Funo, Kainan, Wakayama 642-0001, Japan

MFM: Mizunami Fossil Museum, Yamanouchi, Akeyo, Mizunami, Gifu 509-6132, Japan

Systematics

Infraorder Achelata Scholtz and Richter, 1995
Superfamily Palinuroidea Latreille, 1802
Family Palinuridae Latreille, 1802

Genus *Astacodes* Bell, 1863

Type species: *Astacodes falcifer* Bell, 1863, by monotypy.

Species included: see Schweitzer *et al*. (2010, p. 45).

Remarks: Although Frantescu (2013) synonymized *Astacodes* with *Palinurus* Weber, 1795, we treat *Astacodes* as a valid genus, followed Karasawa *et al*. (2013) and Schweitzer *et al*. (2015).

Astacodes sp.

(Pl. 2, figs. 2a, b)

Description: Carapace poorly preserved and deformed, its posterior half not preserved. Surface of carapace

densely ornamented with anteriorly directed, pointed tubercles which varying in size. Frontal margin gently concave, rimmed. Supraorbital horns triangular, directed anterolaterally. Orbital margin broken. Gastric region with weak subdorsal carinae. Cervical groove well marked, V-shaped. Postcervical carinae absent. Antennal carina weakly developed. Left pereiopod 1 poorly preserved, the detailed characters unknown.

Discussion: The carapace of the present specimen resembles that of *Astacodes falcifer* Bell, 1863, from the Early Cretaceous of eastern United Kingdom and Argentina (Aguirre-Urreta, 2012), but differs in having a V-shaped cervical groove of the carapace. However, we cannot make sufficient comparison because the specimen is represented by a single incomplete carapace.

The hitherto known species of *Astacodes* has been known from the Early Jurassic of Czech Republic, the Early Cretaceous of Switzerland, United Kingdom, Questionably Australia, and Argentina, and the Late Cretaceous of Czech Republic and U.S.A (Aguirre-Urreta *et al*., 2012; Schweitzer *et al*., 2015). The occurrence of *Astacodes* sp. from the lower Maastrichtian Izumi Group represents the youngest record for the genus.

Material examined: WMNH-Ge-1141220001 from Nadayamamoto (=Loc. Aw16 of Morozumi, 1985), Minamiawaji City, Hyogo Prefecture; nodule of the Shimonada Formation of the Izumi Group (early Maastrichtian; *Pachydiscus* sp. aff. *P. subcompressus* Zone of Morozumi, 1985).

Genus *Linuparus* White, 1847

Type species: *Palinurus trigonus* von Siebold, 1824, by monotypy.

Species included: see Kornecki *et al*. (2017, p. 284).

***Linuparus japonicus* Nagao, 1931**

(Pl. 1; Pl. 2, figs. 1a–1c; Pl. 3–Pl. 6; Pl. 7, fig. 1)

Linuparus japonicus Nagao, 1931, p. 212, pl. XIV, figs. 1–3.

Linuparus japonicus Nagao; Imaizumi, 1978, p. 21, pl. 3, figs. 1–3; Kishimoto, 2002, p. 45, figs. 1–25 (non fig. 24); Kishimoto, 2012, p. 32, with unnumbered 7 figs.

Types: Nagao (1931), who described his new species, *Linuparus japonicus*, based upon four specimens, did not indicate a holotype so that all these specimens are syntypes. Among these, two specimens (Pl. XIV, Figs. 1, 1a, and Pl. XIV, Figs. 2, 2a) occurred from "*Scaphites* Bed of the Upper Ammonites Beds (Senonian) exposed along the Pombets, a tributary of the Ikushumbets, Province of Ishikari, Hokkaidô" (=Upper Yezo Group (Turonian–Maastrichtian, Late Cretaceous) of Ikushunbetsu, Mikasa City, Hokkaido, by Karasawa and Kato, 2001) and two specimens (Pl. XIV, Fig. 3 and one unfigured specimen) were collected from "Kunitan Beds (Senonian) of the Kuji Cretaceous developed along the railway cutting at Kunitan near Kuji, Province of Rikuchû" (=Kunitan Formation (Santonian–Campanian, Late Cretaceous) of the Kuji Group of a railway cutting at Kunitan near Kuji, Kuji City, Iwate Prefecture, by Karasawa and Kato, 2001). His illustrated specimen (Pl. XIV, Figs. 1, 1a) consisting of the carapace, pleon, thoracic sternum, and pereiopods is designated here as the lectotype of *Linuparus japonicus* Nagao, 1931, and the other specimens thus becomes paralectotypes. The four specimens described by Nagao (1931) are now deposited in the Hokkaido University Museum collection (UHR). Y. Kobayashi (Research Division of the Hokkaido University Museum) kindly sent one of the authors (HK) photographs of each specimen attached with the original label. Examination of these photographs and original description and figures of Nagao (1931) show that UHR 3188 is the lectotype (Nagao, 1931, Pl. XIV, Figs. 1, 1a) and UHR3185 is the paralectotype (=Nagao, 1931, Pl. XIV, Fig. 3). Additionally, UHR 4510 was the latex cast of the paralectotype (Nagao, 1931, Pl. XIV, Figs. 2, 2a) and UHR 3187 is the paralectotype of an unfigured specimen by Nagao (1931, p. 213).

Type locality and stratigraphic horizon: *Scaphites* Bed of the Upper Ammonites Beds (Senonian) exposed along the Pombets, a tributary of the Ikushumbets, Province of Ishikari, Hokkaidô (Nagao, 1931, p. 214) (=Upper Yezo Group (Turonian–Maastrichtian, Late Cretaceous) of Ikushunbetsu, Mikasa City, Hokkaido, by Karasawa and Kato, 2001) by the lectotype herein designated.

Diagnosis: Moderate to large-sized *Linuparus*. Carapace subrectangular, about 0.45 times as wide as long. Rostrum narrow, rimmed, flattened dorsally, concave medially, consists of two triangular, supraorbital horns directed anteriorly. Upper orbital margin concave, rimmed, with triangular outer orbital spine directed anteriorly. Cephalic region sparsely granular; lateral margins moderately convex, weakly dentate; dorsolateral margins keeled, convex outward, granular, with four short forward-directed spines; longitudinal postorbital carinae low, finely granular, extending from pointed, forwardly directed postorbital spines posterior to supraorbital horns, to level of low, granular, medial node directed anteriorly; gastric region weakly concave axially, much narrower than long, defined by granular, convex ridge arising anteriorly as a pair of low, granular nodes. Cervical groove broad, deep, smooth,

forming concave-forward arc; medial element straight or weakly convex, situated at posterior half of carapace. Postcervical groove shallow, nearly parallel to cervical groove on branchial regions; dorsal areas defined by cervical and postcervical grooves weakly convex. Thoracic region sparsely granular; cardiac region raised longitudinally, defined laterally by sinuous depressions, with well inflated anterior margin; medial keel well-marked, granulated; lateral margins keeled, finely granular, nearly straight; lateral regions with stridulatory apparatus, situated just posterior to cervical groove; posterior margin gently concave with broad, deep marginal groove and prominent ridge. Pleon elongate, punctate; tergite and pleuron of each somite bounded by shallow, oblique groove; pleuron of somites 2–5 subtriangular, directed posteriorly, with pointed tip and two spines on posterior margin. Antennules long, slender. Antennae very long; peduncles robust, composed of three segments; basal segments stout, bearing longitudinal ridge on dorsal surface, with anteromesial and laterodistal spines; intermediate and distal segments with two longitudinal ridges dorsally; flagellum rigid, dorso-ventrally compressed, extremely long, multiarticulate, grooved dorsally and ventrally. Pereiopods 5 apparently shorter and slender than other pereiopods. Epistome longitudinally inflated with median suture; anterior margin with median projection directed anteroventrally.

Description: Moderate to large-sized *Linuparus*. Carapace subrectangular, about 0.45 times as wide as long, dorso-ventrally compressed. Rostrum about 30% carapace width, flattened dorsally, rimmed, concave medially, composed of two triangular, supraorbital horns directed anteriorly. Upper orbital margin concave, rimmed, with triangular outer orbital spine directed anteriorly. Cephalic region sparsely granular; lateral margins moderately convex, weakly dentate; dorsolateral margins keeled, convex outward, granular, with four short spines directed forward; longitudinal postorbital keels low, finely granular, extending from pointed, forwardly directed postorbital spines posterior to supraorbital horns, to level of low, granular, medial node directed anteriorly; gastric region weakly concave axially, much narrower than long, defined by irregularly dentate, convex ridge arising anteriorly as a pair of low, granular nodes. Cervical groove broad, deep, forming concave-forward arc; medial element straight or weakly convex, situated at posterior half of carapace; lateral elements steeply inclined anteroventrally across dorsolateral margins. Postcervical groove shallow, nearly parallel to cervical groove on branchial regions; dorsal areas defined by cervical and postcervical grooves weakly convex. Thoracic region sparsely granular; cardiac region raised longitudinally, defined laterally by sinuous depressions, with well inflated anterior margin; medial keel well-developed, granulated; lateral margins keeled, finely granular, nearly straight; lateral regions with stridulatory apparatus, situated just posterior to cervical groove; posterior margin gently concave with broad, deep marginal groove and prominent ridge.

Pleon elongate with punctate surface; tergite and pleuron of each somite bounded by shallow, oblique groove. Somites 1–5 much narrower than wide, subrectangular in outline. Somites 1–4 medially keeled; each tergite bearing articulated ring posteriorly; Somite 1 with reduced pleuron; somite 2 widest of all somites; somite 3 about as long as somite 2, slightly narrower than somite 2; somite 4 about as long as somite 3, slightly narrower than somite 3; somite 5 slightly longer than somite 4, narrower than somite 4; somite 6 trapezoidal, longest of all somites, narrower than somite 5, with reduced pleura. Pleuron of somites 2–5 subtriangular, directed posteriorly, with pointed tip and two spines on posterior margin. Telson subrectangular, much longer than wide, converged distally; calcified anterior part on anterior one-third of telson bearing shallow median groove with forwardly concave distal margin; flexible posterior area striate with gently convex distal margin. Flexible posterior area of uropods striate; endopod and exopod with gently arched lateral margin and slightly convex distal margin.

Thoracic sternum triangular, longer than wide, widest at sternite 7, smooth, concave axially. All sternites fused. Sternites 1–3 completely fused, small, triangular, separated laterally from sternite 4 by shallow insertion. Sternite 4 diverged posteriorly; lateral margins concave; lateral elements raised, separated from those of sternite 5 by deep insertion, with narrow, posterolaterally directed episternal projections. Sternite 5 diverged posteriorly, wider than sternite 4; lateral margins concave; lateral elements raised, separated from those of sternite 4 by deep insertion, with posterolaterally directed episternal projections. Sternite 6 diverged posteriorly, wider than sternite 5, with median sulcus; lateral margins concave; lateral elements raised, separated from those of sternite 5 by deep insertion, with posterolaterally directed episternal projections. Sternite 7 diverged posteriorly, wider than sternite 6; lateral margins concave; lateral elements raised, separated from those of sternite 6 by deep insertion, with posterolaterally directed episternal projections. Sternite 8 narrower than sternite 7; lateral margins slightly concave; axial element separated from that of sternite 7 by shallow, concave groove; lateral

elements raised, separated from those of sternite 7 by deep insertion, with posteriorly directed episternal projections. Gonopore of male not preserved, but that of female located on coxa of pereiopods 3.

Antennules long, slender. Antennular peduncles composed of three segments; basal segments shorter than intermediate one, much longer than wide, distal segment about as long as intermediate one.

Antennae very long. Antennal peduncles robust, composed of three segments; basal segments stout, bearing longitudinal ridge on dorsal surface, with anteromesial and laterodistal spines; intermediate segment narrower than basal segment, bearing two longitudinal ridges on dorsal surface, with unarmed lateral and mesial margins; distal segment narrower than intermediate segment, bearing two longitudinal ridges on dorsal surface, with unarmed lateral and mesial margins. Antennal flagellum rigid, dorsoventrally compressed, extremely long, multiarticulate, grooved dorsally and ventrally.

Maxillipeds 3 elongate, extending beyond epistome. Basis short. Ischium much longer than wide, dentate on mesial margin. Merus longer than ischium, much longer than wide, dentate on mesial margin. Carpus, propodus, and dactylus shorter than merus; margins unarmed; dactylus subcylindrical with pointed tip. Maxillipeds 2 flattened dorsoventrally; meus elongate.

Pereiopods 1–5 flattened laterally, ovate in cross section, without chelae, but detailed characters indistinct by preservation. Propodi, carpi, and meri of pereiopods 1–4 punctuated, tuberculated. Pereiopods 5 apparently shorter and slender than other pereiopods.

Epistome longitudinally inflated with median suture; anterior margin with median projection directed anteroventrally.

Remarks: The above diagnosis and description are given examination of the type specimens described by Nagao (1931) and the present specimens. *Linuparus japonicus* has been recorded from the Upper Yezo Group (Turonian-Maastrichtian, Late Cretaceous) of Hokkaido (Nagao, 1931), the Kunitan Formation (Santonian–Campanian, Late Cretaceous) of Iwate Prefecture (Nagao, 1931), the Izumi Group (Campanian–Maastrichtian, Late Cretaceous) of Osaka and Hyogo Prefectures (Imaizumi, 1978; Kishimoto, 2002; Kishimoto, 2012; present work), and the Furushiroyama Formation (Coniacian, Late Cretaceous) of Ehime Prefecture (Mizuno, 1974).

Material examined: D1048485, D1048486, D1048491, and D1048497 from Yura (=Loc. Aw16 of Morozumi, 1985), , Sumoto City, Hyogo Prefecture, mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985). D1048487 and MFM247119 from Nadachino (=Loc. IZM-1 of Collins *et al*., 1993), Minamiawaji City, Hyogo Prefecture; mudstone of the Shimonada Formation of the Izumi Group (early Maastrichtian; *Pachydiscus* sp. aff. *P. subcompressus* Zone of Morozumi, 1985). D10848487–D1048489 and D1048492–D1048495, from Nadanigoro (=southwest Loc. IZM-1 of Collins *et al*., 1993), Minamiawaji City, Hyogo Prefecture; mudstone of the Shimonada Formation of the Izumi Group (early Maastrichtian; *Pachydiscus* sp. aff. *P. subcompressus* Zone of Morozumi, 1985). D1048491 from Hirota (=Loc. Aw7 of Morozumi, 1985), Minamiawaji City, Hyogo Prefecture; sandy siltstone of the Seidan Formation of the Izumi Group (late Campanian; *Pachydiscus awajiense* Zone of Morozumi, 1985).

Infraorder Astacidea Latreille, 1802
Section Homarida Scholtz and Richter, 1995
Superfamily Nephropoidea Dana, 1852
Family Nephropidae Dana, 1852

Genus *Hoploparia* McCoy, 1849

Type species: *Astacus longimanus* Sowerby, 1826, by subsequent designation of Rathbun (1926).

Species included: see Kornecki *et al*. (2017, p. 277–278).

***Hoploparia miyamotoi* Karasawa, 1998**

(Pl. 7, figs. 2a–Pl. 8)

Hoploparia miyamotoi Karasawa, 1998, p. 217, figs. 1.1–1.4, 2.1–2.4.

Hoploparia miyamotoi Karasawa; Kishimoto, 2012, p. 33, with two unnumbed figures.

Diagnosis: Rostrum with small dorsolateral spines on distal half; one supraorbital, one metaorbital and one postantennal spine present, all small; pleonal somites with well-developed lateral carina, somites 3–5 bearing two marginal spines on pleura (slightly modified from Karasawa, 1998, p. 217).

Remarks: Karasawa (1998) erected this species based upon four type specimens. The specimens figured herein are more well preserved. Within the original description he did not refer characters to the pereiopod 1; however, among newly obtained specimens, chelae of the pereiopod 1 are poorly preserved. A short palm is slightly longer than high and is finely punctuated laterally, and unarmed dorsal and ventral margins are gently diverged distally.

We have to notice that two paratypes, MFM247004 and MFM247006, have been lost and not deposited in the Mizunami Fossil Museum.

Material examined: D1048498–D1048500 from Yura (=Loc. Aw16 of Morozumi, 1985), Sumoto City, Hyogo Prefecture; mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985).

Infraorder Axiidea de Saint Laurent, 1979

Families included: Anacalliacidae Manning and Felder, 1991; Axiidae Huxley, 1879; Bathycalliacidae Sakai and Türkay, 1999; Callianassidae Dana, 1852; Callianideidae Kossmann, 1880; Callianopsidae Manning and Felder, 1991; Coralaxiidae Sakai and de Saint Laurent, 1989; Ctenochelidae Manning and Felder, 1991; Eucalliacidae Manning and Felder, 1991; Gourretiidae Sakai, 1999; Lipkecallianassidae Sakai, 2005; Micheleidae Sakai, 1992; Paracalliacidae Sakai, 2005; Strahlaxiidae Poore, 1994.

Remarks: In his major revision of Axioidea and Callianassoidea, Sakai (2011) classified nine families under Axioidea and 11 families under Callianassoidea. However, the recent molecular phylogenetic analyses (Bracken *et al*., 2009; Robles *et al*., 2009) showed that both superfamilies are polyphyletic. Therefore, the superfamilial classification for Axiidea has not been used (*i.e*., Dworschak *et al*., 2012; Poore *et al*., 2014). We concur. After Sakai (2011)'s work, Poore (2015a) synonymised Thomassiniidae de Saint Laurent, 1979, with Callianideidae Kossmann, 1880, Ctenocheloidae Sakai, 2011, was synonymous with Ctenochelidae Manning and Felder, 1991 (Poore, 2015b), and Poore and Collins (2015) showed that Meticonaxiidae Sakai, 1992, was the junior synonym of Micheleidae Sakai, 1992. Sakai (2016) added a new family, Tosacallianassidae Sakai, 2016, to axiidean families; however, Poore and Dworschak (2017) synonymised Tosacallianassidae with Ctenochelidae Manning and Felder, 1991. Sakai (2017a) erected the new monotypic family Neoaxiidae Sakai, 2017a, but the family was the junior synonym of Axiidae (Dworschak and Poore, 2018). Poore (2017) added three families, Calocarididae Ortmann, 1891, Eiconaxiidae Sakai and Ohta, 2005, and Eiconaxiopsididae Sakai, 2011, to the junior synonym of Axiidae. Additionally, Dworschak and Poore (2018) synonymised Pseudogourretiidae Sakai, 2011, with Gourretiidae and gave Paracalliacinae a full family status. Thus, Axiidea consists of 14 families.

Family Axiidae Huxley, 1879

Genus *Hinecaris*, new genus

Type species: *Hinecaris simplex*, new genus and species, by monotypy; feminine gender.

Etymology: A combination derived from Hine, name of country in modern history age, and *karis* (Greek), a shrimp.

Discussion: *Hinecaris* is similar to the Cretaceous forms of *Axiopsis* Borradaile, 1903, described by Frațescu (2014), but differs in that a weakly rugose carapace lacks the median gastric and submedian gastric carinae. Besides *Axiopsis*, *Acanthaxius* Sakai and de Saint Laurent, 1989, *Axius* Leach, 1816, *Cretaxiopsis* Charbonnier, Audo, Garassino, and Hyžný, 2017, *Huxleycaris* Bravi and Garassino, 1998, *Libanoaxius* Charbonnier, Audo, Garassino, and Hyžný, 2017, *Paraxiopsis* de Man, 1905, *Protaxius* Beurlen, 1930, and *Schlueteria* Fritsch and Kafka, 1887, have been known from the Cretaceous deposits. The new genus is clearly distinguished from *Acanthaxius*, *Axius*, *Huxleycaris*, *Paraxiopsis*, and *Schlueteria*, by presence of weakly developed gastric carinae and absence of a median postcervical carina. *Hinecaris* differs from *Cretaxiopsis*, *Libanoaxius*, and *Protaxius* by having rounded ventral margins of the pleon.

The axiids from Japan have been sparsely recorded as fossils. The previously known records were *Axius* (s.l.) sp. from the Oligocene Kishima Group (Karasawa and Fudouji, 2000) and *Protaxius* sp. from the Late Jurassic Somanakamuma Group (Kato *et al*., 2010). Therefore, the present new genus and species represents the third fossil record for the family from Japan.

***Hinecaris simplex*, new species**

(Pl. 9, figs. 1a–3c)

Etymology: The trivial name is derived from a simple carapace.

Diagnosis: Moderate-sized axiid. Carapace very weakly rugose. Rostrum acutely triangular, about longer than wide at base, continuous with supraorbital carinae; lateral margins unarmed; dorsal surface with narrow median sulcus extending at about anterior one-third of gastric region. Outerorbital spine short, directed anterolaterally. Gastric region gently convex; median and submedian carinae absent; supraorbital carinae weak with small tubercles; outerorbital carinae nearly straight, finely tuberculate. Antennal region with finely tuberculate, oblique antennal carina. Cervical groove deep, well defined. Postcervical median carina absent. Pleon elongate, finely punctate. Somite 1 much wider than long, trapezoidal in dorsal view, divergent posteriorly, bearing transverse, dorsal groove at anterior fifth, with narrow anterolateral lobes. Somite 2 much longer than somite 1; tergite bearing narrow articulate ring along posterior margin, divided from pleuron by shallow notch and groove. Somites 3–5, slightly shorter than somite 2; each

tergite bearing narrow articulate ring along posterior margin, divided from pleuron by shallow notch and rather deep groove; ventral margin strongly convex. Somite 6 slightly longer than somite 5; pleuron reduced, ventral margin sinuous. Telson trapezoidal, shorter than Somite 6, wider than long, with gently convex lateral margin. Uropod without spine; endopod subtriangular, about 1.2 times as long as wide, bearing median longitudinal and latero-marginal ridges dorsally, with sinuous distal and gently convex lateral margins; exopod obovate, much longer than endopod, 1.5 times as long as wide, bearing strongly convex distal and lateral margins, with two longitudinal median ridges dorsally; diaeresis absent. Pereiopods long, slender.

Description: Moderate-sized axiid. Carapace sclerotized, laterally compressed, with very weakly rugose. Rostrum acutely triangular, weakly downturned anteriorly, about 0.4 times as wide as long at base, continuous with supraorbital carinae; lateral margins smooth, unarmed; dorsal surface concave transversely with narrow median sulcus extending at about anterior one-third of gastric region. Outerorbital spines short, directed anterolaterally. Gastric region gently convex; median and submedian carinae absent; supraorbital carinae weak, ornamented with small, scattered tubercles; outerorbital carinae nearly straight, finely tuberculate. Antennal region with finely tuberculate, oblique antennal carina not reaching lateral carina. Cervical groove deep, well-defined. Cardiac and branchial regions just behind cervical grooves covered with small tubercles; postcervical median carina absent. Posterior margin of carapace not preserved.

Pleon elongate, sclerotized, finely punctate. Somite 1 much wider than long, trapezoidal in dorsal view, divergent posteriorly, bearing transverse dorsal groove at anterior fifth, with narrow anterolateral lobes; pleuron narrow, widened posteriorly, directed posteriorly, with gently convex ventral margin. Somite 2 much longer than somite 1; tergite bearing narrow articulate ring along posterior margin, divided from pleuron by shallow notch and groove. Somites 3–5, slightly shorter than somite 2; each tergite bearing narrow articulate ring along posterior margin, divided from pleuron by shallow notch and rather deep groove; ventral margin strongly convex, directed posteriorly. Somite 6 slightly longer than somite 5; pleuron reduced, ventral margin sinuous. Telson poorly preserved, trapezoidal, shorter than Somite 6, wider than long, with gently convex lateral margin; dorsal ornaments and posterior margin not preserved. Uropodal endopod subtriangular, about 1.2 times as long as wide, without spine; distal margin sinuous and lateral margin gently convex; dorsal surface with median longitudinal and latero-marginal ridges. Uropodal exopod obovate, 1.2 times longer than endopod, 1.5 times as long as wide, without spine; distal and lateral margins strongly convex; dorsal surface with two longitudinal median ridges; inner ridge reaching distal margin and outer one not reaching distal margin, its distal end extending at level of distal margin of endopod. Diaeresis absent.

Pereiopods long, slender. Chela of pereiopod 1 not preserved; carpus short, but longer than high, with dentate dorsal margin; merus long, flattened laterally, with unarmed dorsal and ventral margins and lateral surface. Pereiopod 2 with unarmed margins; carpus much longer than high; merus long, much longer than carpus. Pereiopods 3 and 4 poorly preserved. Pereiopod 5 much shorter than other pereiopods.

Material examined: Holotype, WMNH-Ge-1141120001, and paratype, WMNH-Ge-1141120002, from Hakotsukuri (=IZM-4 by Collins *et al*., 1993), Han-nan City, Osaka Prefecture; Mudstone of the Shindachi Formation of the Izumi Group (Maastrichtian by Kase, 1990). Paratype, WMNH-Ge-1141220002, from Yura (=Loc. Aw16 of Morozumi, 1985), Sumoto City, Hyogo Prefecture; Mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985).

Axiidae genus and species indeterminate

(Pl. 10, figs. 1a–f)

Description: Dactylus and propodus of chela of right pereiopod 1 preserved, with unarmed dorsal and ventral margins. Palm slightly longer than high, strongly converged proximally; dorsal margin strongly convex; ventral margin slightly concave; lateral surface convex, glabrous, unarmed; mesial surface weakly concave longitudinally, with low, minute granules distally. Fixed finger lacking distal part, gently deflexed ventrally to ventral margin of palm; occlusal margin gently concave; ventral margin gently convex, forming thin edge; lateral surface smooth, slightly elevated longitudinally; mesial surface shallowly grooved medially along occlusal margin, with low, minute granules near occlusal and ventral margins. Dactylus lacking distal part, dorsal margin strongly convex; occlusal margin gently concave; lateral surface smooth, slightly elevated longitudinally; mesial surface slightly concave longitudinally, ornamented with low, minute granules, shallowly grooved medially.

Discussion: The present specimen is represented by a single incomplete chela of the pereiopod 1, but it does not seem to confirm to known members from the

Izumi Group under consideration. The one possibility is considered is that it is an axiid like to the extant *Eiconaxius* Bate, 1888, and/or the Cretaceous *Schlueteria* Fritsch and Kafka, 1887, but *Eiconaxius* has a small-sized chela and the chela in *Schlueteria* is ornamented with well-developed spines and tubercles. The certain generic placement of the specimen awaits the discovery of best material.

Material examined: D1048501 from Yura (=Loc. Aw16 of Morozumi, 1985), Sumoto City, Hyogo Prefecture; Mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985).

Family Gourretiidae Sakai, 1999

Genus *Ahazianassa*, new genus

Type species: "*Callianassa*" (s.l.) *masanorii* Karasawa, 1998, by monotypy; feminine gender.

Etymology: The trivial name is derived from "Ahazi", meaning Awaji in an ancient age.

Diagnosis: see species.

Discussion: Within the original description of Karasawa (1998), it was considered best to place the species in *Callianassa* (s.l.) because of absence of the maxilliped 3, telson, and uropods. Re-examination of the type specimens and new specimens collected from the type locality suggests that the species is not a callianassid and represents a new genus, *Ahazianassa*. Members of Callianassidae have the dorsal plate of the uropodal exopod which *Ahazianassa* lacks. The new genus resembles members of Callianopsidae, Gourretiidae, and Paracalliacidae by having ovate uropods without the dorsal plate. However, the new genus differs from the genera of Callianopsidae and Paracalliacidae by absence of the cardiac prominence on the carapace and the lateral projection of the pleonal somite 6. Therefore, the new genus is placed in Gourretiidae.

Sakai (2017b) reviewed the extant taxa of Gourretiidae and recognized eight genera, *Gourretia* de Saint Laurent, 1973, *Heterogourretia* Sakai, 2017b, *Ivorygourretia* Sakai, 2017b, *Laurentgourretia* Sakai, 2004, *Ruiyuliugourretia* Sakai, 2017b, *Paracalliax* de Saint Laurent, 1979, *Plantesgourretia* Sakai, 2017b, and *Tuerkaygourretia* Sakai, 2017b, based upon characters of the maxilliped 3, pleonal somite 6, uropodal exopod, and male pleopods 1 and 2. Among these genera, Dworschak and Poore (2018) removed *Paracalliax* to Paracalliacidae. We agree with their opinion. The new genus is related to *Gourretia*, *Ivorygourretia*, and *Plantesgourretia* by lacking the lateral projection of the pleonal somite 6 and lacking of a notch of the uropodal exopod; however, *Ahazianassa* differs in that the carapace has the dorsal oval and pereiopods 1 are subequal without the meral hook. Interestingly, most of extant gourretiids lack the dorsal oval of the carapace, but the dorsal oval in *Gourretia biffari* Blanco Rambla and Liñero Arana, 1994, is weakly developed.

Karasawa (1998) suggested that in the carapace character the species has a close affinity with *Protocallianassa archiaci* (A. Milne Edwards, 1860) from the early Senonian of United Kingdom. However, *Ahazianassa masanorii* is distinguished from *Protocallianassa archiaci* in that the pereiopods 1 are subequal and the telson has a smooth dorsal surface. Within the latter species the pereiopods 1 are unequal and the telson is carinate dorsally. Most extant callianassids have the cervical groove of the carapace extending far back medially (Glaessner, 1969; Karasawa, 1998) and have the dorsal plate on uropodal exopods (Manning and Felder, 1991; Sakai, 2011; and so on). Therefore, *Protocallianassa archiaci* is not a member of Callianassidae and might be moved to other axiidean families bearing *linea thalassinica*. However, evaluation of the family placement of it is beyond the scope of this paper.

The hitherto known gourretiid has been only one, *Gourretia* sp. from the Miocene of Austria (Hyžný *et al.*, 2015). The occurrence of *Ahazianassa* extends the known geological range for the family back to the late Cretaceous.

***Ahazianassa masanorii* (Karasawa, 1998), new combination**

(Pl. 10, fig. 2–Pl. 17)

"*Callianassa*" (s.l.) *masanorii* Karasawa, 1998, p. 220, figs. 3.1–3.7.

Callianassa masanorii Karasawa; Kishimoto, 2012, p. 33, with a unnumbed figure.

Callianassa sp., Kishimoto, 2012, p. 33, with three unnumbed figures.

Diagnosis: Large-sized gourretiid. Carapace sclerotized; frontal margin with short, broadly triangular, downturned rostral spine and without lateral spine; *linea thalassinica* well defined; dorsal oval convex, about half of dorsal length; cervical groove deep, joining *linea thalassinica* at posterior third of oval; hepatic boss well defined; cardiac prominence absent. Pleon sclerotized, elongate, with smooth surface; somite 1 short, trapezoidal; somite 2 longest, bearing arcuate groove separating pleuron from tergite at posterior third, with gently convex ventral margin and rounded posterior margin; somites 3–5 bearing arcuate, posterior groove separating pleuron from tergite with gently convex ventral and rounded posterior margins; somite 6 slightly longer

than somite 5, converged posteriorly, without lateral projection. Telson about as long as wide, rectangular, with weak longitudinal median groove; lateral margin nearly straight; distal margin gently convex. Uropodal endopod oval, slightly longer than wide, with median longitudinal carina dorsally; distal margin convex. Uropodal exopod, much larger than endopod, bearing two longitudinal carinae medially, lacking dorsal plate and diaeresis; distal margin convex without notch. Pereiopods 1 chelate, subequal, dissimilar in shape, with unarmed dorsal and ventral margins. Dactylus of major cheliped curved ventrally, slightly longer than fixed finger, with pointed tip strongly hooked ventrally; fixed finger curved dorsally, with pointed tip gently hooked dorsally; palm subrectangular, converged distally, longer than high, bearing gently convex dorsal margin, nearly straight ventral margin, distal margin initially at about 90 degree angle to dorsal margin with shallow indentation just above fixed finger, and proximal margin at about 90 degree angle to ventral margin; carpus subrectangular, short, much higher than long, with nearly straight dorsal and strongly curved ventral margins; merus about equal to carpus length, rhomboidal, bearing strongly vaulted lateral surface with median longitudinal ridge, and strongly convex dorsal and ventral margins. Propodus of minor cheliped slightly smaller than that of major one, more slender in outline; dactylus elongate, nearly straight, slightly shorter than palm, with pointed tip hooked ventrally; its occlusal margin slightly sinuous, forming thin edge, without tooth; fixed finger elongate, nearly straight, slightly shorter than dactylus, with straight occlusal margin; palm subrectangular, slightly narrowed distally, much longer than high, with gently convex dorsal and ventral margins; carpus short, subrectangular. Pereiopod 2 chelate, strongly compressed laterally.

Revised description: Large-sized gourretiid. Carapace sclerotized, laterally compressed, height about half of length. Frontal margin with short, broadly triangular, downturned rostral spine and without lateral spine. *Linea thalassinica* well defined. Dorsal oval convex, about half of dorsal length. Cervical groove deep, joining *linea thalassinica* at posterior third of oval. Hepatic boss well defined. Posterior margin evenly curved without lateral lobe. Cardiac prominence absent.

Pleon sclerotized, elongate, with smooth surface; somite 1 short, trapezoidal in dorsal view, bearing dorsal transverse groove at anterior fourth, with divergent lateral margins. Somite 2 longest, about 1.5 times as long as somite 1, diverged posteriorly, with arcuate groove separating pleuron from tergite at posterior third; pleuron with gently convex ventral margin and rounded posterior margin. Somites 3–5 diminishing in size posteriorly with posterior, arcuate groove separating pleuron from tergite; each pleuron with gently convex ventral margin and rounded posterior margin. Somite 6 slightly longer than somite 5, converged posteriorly; pleuron reduced with sinuous ventral margin. Telson about as long as wide, rectangular in dorsal view, with weak longitudinal median groove; lateral margin nearly straight; distal margin gently convex. Uropodal endopod oval, slightly longer than wide, with median longitudinal carina dorsally; distal margin convex. Uropodal exopod oval, much larger than endopod, bearing two longitudinal carinae medially, without dorsal plate; distal margin convex without notch.

Antennular peduncle and antennal peduncle partly preserved. Maxilliped 3 poorly known.

Pereiopods 1 chelate, subequal, dissimilar in shape. Dactylus of major cheliped curved ventrally, about 1/3 of propodus length, slightly longer than fixed finger, with pointed tip strongly hooked ventrally; dorsal margin unarmed; occlusal margin with median and proximal teeth; mesial surface smooth; lateral surface pitted along occlusal margin. Fixed finger curved dorsally, about 1/4 length of propodus, with pointed tip gently hooked dorsally; occlusal margin smooth, gently concave, with broad median tooth; ventral margin unarmed, gently convex; mesial and lateral margins smooth. Palm subrectangular, about 0.7 times as high as long; dorsal margin gently convex, unarmed; ventral margin nearly straight, unarmed, concave at junction of palm and fixed finger; both margins converged distally; lateral and mesial surfaces smooth; distal margin initially at about 90 degree angle to dorsal margin with shallow indentation just above fixed finger; proximal margin at about 90 degree angle to ventral margin. Carpus subrectangular, short, about 0.3 times as long as propodus, about 0.4 times as high as long, dorsal margin nearly straight, ventral margin strongly curved; mesial and lateral surfaces smooth. Merus about equal to carpus length, rhomboidal in lateral view; dorsal and ventral margins strongly convex, unarmed; lateral surface strongly vaulted with median longitudinal ridge; proximal margin at about 100 degree angle to dorsal margin. Ischium about as long as merus, tapering proximally, with unarmed dorsal and ventral margins.

Propodus of minor cheliped slightly smaller and more slender than that of major one. Dactylus elongate, nearly straight, slightly shorter than palm, with pointed tip hooked ventrally; dorsal margin

unarmed; occlusal margin slightly sinuous, forming thin edge, without tooth; lateral surface with a row of small pits parallel to occlusal margin. Fixed finger elongate, nearly straight, slightly shorter than dactylus, with unarmed occlusal and ventral margins; lateral surface with row of small pits along occlusal and ventral margins; dorsal and ventral margins nearly straight; occlusal margins straight, unarmed. Palm subrectangular, slightly narrowed distally, about 0.6 times as high as long, with smooth lateral and mesial surfaces; dorsal and ventral margins gently convex, unarmed; ventral margin concave at junction of palm and fixed finger. Carpus short, subrectangular, about 1/5 of propodus length, convergent proximally, with smooth lateral and mesial surfaces; dorsal margin gently convex, unarmed; ventral margin strongly curved, unarmed. Merus slightly longer than carpus, slightly convergent proximally without ventral spine; dorsal and ventral margins slightly convex, unarmed; lateral surface gently vaulted.

Pereiopod 2 chelate, strongly compressed laterally, with unarmed margins and surfaces. Chela subtriangular, slightly longer than high. Dactylus curved ventrally, about half of propodus length. Fixed finger subtriangular, about as long as dactylus; occlusal margin gently concave and ventral margin gently convex. Palm about as long as high; dorsal and ventral margins gently arched. Carpus about as long as propodus, tapering proximally; dorsal margin gently convex and ventral margin nearly straight. Merus long, about 2.5 times as long as carpus; dorsal margin nearly straight; ventral margin gently convex. Ischium short.

Pereiopods 3–5 poorly known, compressed laterally, with unarmed margins and smooth surfaces. Dactylus of pereiopod 3 not preserved; propodus much higher than long; carpus longer than propodus, tapering proximally; merus long. Carpi and meri of pereiopods 4 and 5 long, slender.

Pleopods preserved, long, but detailed characters not observed.

Remarks: Most of *Ahazianassa masanorii* are preserved three-dimensionally within nodules. The preservation style of our material is really variable and is correspond to all types summarized by Hyžný and Klompmaker (2015) who discussed the types of the ghost shrimp preservation of Bishop and Williams (2005). The disassociated chelae of the pereiopods 1 are most abundant in nodules, but sometimes are associated with disassociated other pereiopods, the carapace, the pleon, the telson, uropods, and pleopods. It is noteworthy that nearly completed bodies are preserved. Additionally, several individuals are preserved within the same nodule (pl. 17, figs. 1a–4b). Bishop and Williams (2005) and Hyžný and Klompmaker (2015) showed that nearly-completed bodies were preserved within burrows and/or the direct association of burrows; however, our specimens have not yet been associated with burrows. The detailed taphonomic work by Ando *et al.* is now in progress; therefore, exemplars of preservation within our work are herein figured.

Material examined: Holotype, D000495, paratypes, D000506, D000507, MFM247008), and 27 additional specimens, MFM247114, MFM247115, WMNH-Ge-1141220003, WMNH-Ge-1141220005, and D1048502–1048505, and D1048507–D1048521 from Yura (=Loc. Aw16 of Morozumi, 1985), Sumoto City, Hyogo Prefecture, Mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985). 1048506 from Chikusakou (=Loc. Aw12 of Morozumi, 1985), Sumoto City, Hyogo Prefecture, Mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985). WMNH-Ge-1141220006 from Nadayamamoto (=Loc. Aw16 of Morozumi, 1985), Minamiawaji City, Hyogo Prefecture; nodule of the Shimonada Formation of the Izumi Group (early Maastrichtian; *Pachydiscus* sp. aff. *P. subcompressus* Zone of Morozumi, 1985). We have to note that two paratypes, MFM247007 and 247009, have been lost and have not yet been deposited in the Mizunami Fossil Museum.

Infraorder Brachyura Latreille, 1802
Section Eubrachyura de Saint Laurent, 1980
Superfamily Retroplumoidea Gill, 1894

Family Archaeopidae, new family

Type and sole included genus: *Archaeopus* Rathbun, 1908.

Diagnosis: see genus.

Discussion: Retroplumidae contains two extant genera, *Bathypluma* de Saint Laurent, 1989, and *Retropluma* Gill, 1894 (type genus) and nine extinct genera, *Archaeopus* Rathbun, 1908, *Costacopluma* Collins and Morris, 1975, *Cristipluma* Bishop, 1983, *Gaudipluma* Artal, Van Bakel, Fraaije, and Jagt, 2013, *Gonioplacoides* Quayle and Collins, 2012, *Loerenthoplumopsa* Schweitzer, Dworschak, and Martin, 2011 (new name for *Loerentheya* Beurlen in Lőrenthey and Beurlen, 1929), *Loerenthopluma* Beschin, Busulini, De Angeli, and Tessier, 1996, *Retrocypoda* Vía, 1959, *Serrablopluma* Artal, Van Bakel, Fraaije, and Jagt, 2013 (Feldmann and

Schweitzer, 2018).

Among these retroplumid genera, the systematic position of *Archaeopus* have been often discussed. de Saint Laurent (1989), McLay (2006), and Guinot *et al.* (2013) summarized the historical account of the systematic placement of *Archaeopus*. Rathbun (1908) erected the new monotypic genus *Archaeopus* with *Archaeopus antennatus* Rathbun, 1908, and originally placed it in Retroplumidae (Rathbun, 1908), and most subsequent workers followed her opinions (*i.e.*, Collins *et al.*, 1993; De Grave *et al.*, 2009; Schweitzer *et al.*, 2010). Glaessner (1969) moved *Archaeopus* to Palicidae Bouvier, 1898, and McLay (2006) assigned *Archaeopus* together with some species of *Costacopluma* to Palicidae, but noted that the genus should be removed to a new unnamed family. However, the anterior end of the pleon within Palicidae extends to the base of maxillipeds 3 (Guinot *et al.*, 2013), but that in *Archaeopus* reaches the sternal suture 3/4. Additionally, within Palicidae a wide frontal margin of the carapace consists of two or four lobes, upper orbital margins bear two deep fissures, lateral margins bear numerous teeth, chelae of pereiopod 1 are short, pereiopods 2–4 are extremely long, and the well-developed episternite 7 is expanded posteriorly. *Archaeopus* apparently lacks those characters. de Saint Laurent (1989) suggested that *Archaeopus*, *Costacopluma*, *Cristipluma*, and *Retrocypoda* should be excluded from Retroplumidae and should be placed in an another her retroplumoid family Costacoplumidae (an unavailable name under Art. 13.2 of ICZN (1999)). Although Guinot and Breton (2006) and Guinot *et al.* (2013) discussed about the systematic position of *Archaeopus* under Retroplumidae and/or Palicidae, but retained the status of *Archaeopus* within Retroplumidae.

Examination of the original description of the type species, *Archaeopus antennatus*, and newly and previously known material of *A. ezoensis* suggests that *Archaeopus* warrants its own new family. Within most extant and extinct taxa of Retroplumidae a flattened carapace is ornamented with well-developed dorsal ridges, the front is extremely narrow, and the dorsal regions are not well defined (de Saint Laurent, 1989; Guinot *et al.*, 2013). However, *Archaeopus* lacks these carapace characters and have an inflated carapace with well-defined dorsal regions and a wide rostrum rather than those of other retroplumid genera. Although ventral aspects of three extinct genera, *Cristipluma*, *Gonioplacoides*, and *Loerenthoplumopsa*, have not yet known, these characters among remainders have been well documented as in *Costacopluma* (Armstrong *et al.*, 2009; Collins and Ward, 2010; Martínez-Díaz *et al.*, 2016; Vega *et al.*, 2017), *Gaudipluma* (Artal *et al.*, 2013), *Loerenthopluma* (Beschin *et al.*, 1996; Van Bakel *et al.*, 2010), *Retrocypoda* (Vía Boada, 1969; de Saint Laurent, 1989), and *Serrabloplumа* (Artal *et al.*, 2013). Within these extinct and extant genera the anterior end of the sterno-pleonal cavity reaches the thoracic sternite 3, each pleonal somite bears a transverse ridge, the pleonal somite 6 of male is crescent-shaped in outline and the lateral expansions for pleonal locking and the pleon has the fused somites 3–5 (Guinot and Bouchard 1998, Guinot *et al.*, 2013). These characters of the sternum and pleon cannot be seen in *Archaeopus*. Additionally, *Archaeopus* has the median sulcus on the thoracic sternites 6 and 7, which lacks in the extant *Retropluma* and *Bathypluma*.

Archaeopidae is a monotypic family with a sole genus *Archaeopus*. The genus contains eight species from Late Cretaceous to Eocene rocks from the Pacific coast of North America and Japan (Schweitzer *et al.*, 2010; Guinot *et al.*, 2013).

Genus *Archaeopus* Rathbun, 1908

Type species: *Archaeopus antennatus* Rathbun, 1908, by monotypy.

Species included: see Schweitzer *et al.* (2010, p. 99).

Diagnosis: Carapace subquadrate, somewhat wider than long, widest at about posterior third, moderately vaulted longitudinally and transversely; front narrow, produced beyond orbits, downturned, axially sulcate; orbits very wide, sinuous, rimmed, continuing to divergent lateral margin of front, terminating in sharp, anterolaterally directed post-orbital spine, with a shallow notch laterally; infraorbital spines well developed, projected beyond outer-orbital spines; lateral margins weakly convex, diverged posteriorly, bearing short spines at about mid-length; posterolateral angle broadly concave, rimmed; posterior margin about half of maximum carapace width, weakly concave, rimmed. Dorsal surface with well-defined regions; protogastric regions with straight or arcuate ridge; mesogastric regions with transverse ridges; cardiac region sub-pentagonal, much wider than long, ornamented with transverse ridge, fringed with lobate, lateral swellings; hepatic regions with small swelling. epibranchial regions with two ovoid swellings; mesobranchial regions with oblique, discontinuous swellings; sub-hepatic region well-defined, inflated. Thoracic sternum wide, slightly wider than long, widest at sternite 5; sternal suture 2/3 complete; sternite 4 longest, narrowed anteriorly; sternites 5–7 much longer than wide with blunt episternal projections; lateral elements flattened or bearing transverse ridge; sternal sutures 3/4, 4/5, 5/6,

and 6/7 incomplete; sternites 6 and 7 with median sulcus; sternites 8 apparently small; sterno-pleonal cavity of male deep, well-defined; its anterior end rounded, weakly rimmed, reaching sternal suture 3/4. Pleon of male narrow with free somites; telson sub-trapezoidal with convex anterior margin; somite 6 trapezoidal, longest of all somites, with straight lateral margins. Pleon of female wider than that of male with free somites; medial elements inflated, separated from lateral elements by shallow grooves. Pereiopods 1 with sexually dimorphic chelae. Chelae of male subequal, dissimilar in shape; major chela with gaped fingers; propodus of minor chela slightly shorter and more slender than that of major one; both fingers not gaped, elongate. Chelae of female slightly subequal, similar in shape, much slender than those of male; propodus of chela slender, elongate; fingers not gaped. Pereiopods 2–4 slender, elongate, flattened laterally; pereiopod 3 longest. Pereiopod 5 much reduced in size, apparently short, slender, subdorsal; coxa positioned at lateral corner of posterior margin; ischium long, shorter than merus. Eyes elongate, directed laterally with eyestalks tapering distally. Buccal cavern sub-quadrangular. Maxillipeds 3 widely gaped medially.

Archaeopus ezoensis (Nagao, 1941)

(Pl. 18–Pl. 21)

Plagiolophus ezoensis Nagao, 1941, p. 97, pl. 26, figs. 1, 2.
Plagiolophus ezoensis Nagao, 1941; Imaizumi, p. 45.
Archaeopus ezoensis (Nagao, 1941); Collins, Kanie, and Karasawa, 1993 p. 304, figs. 4.3–4.7, 5.1–5.5; Kishimoto, 2012, p. 33, with 6 unnumbered figures.

Diagnosis: *Archaeopus* with weak transverse protogastric ridges (after Collins *et al.*, 1993, p. 34).

Description: Large-sized *Archaeopus*. Carapace trapezoidal in outline, almost as long as wide or slightly wider than long, widest at about posterior third, moderately arched transversely and longitudinally. Carapace of juvenile more longer than that of adult. Fronto-orbital margin about 80% maximum carapace width. Front narrow, about 20% maximum carapace width, projected well beyond orbits, downturned, with deep median sulcus; frontal margin bilobed, composed of gently convex lobes divided by V-shaped median notch. Orbit large; upper orbital margin sinuous, rimmed, bearing shallow notch laterally, continuing to slightly concave, divergent lateral margin of front, with broadly triangular, slightly anterolaterally directed outer-orbital spines; infraorbital spines well developed, projected beyond outer-orbital spines. Lateral margins weakly convex, diverged posteriorly, bearing three short spines directed anterolaterally at about mid-length; cervical notch present, shallow; posterolateral angle broadly concave, rimmed. Posterior margin about half of maximum carapace width, weakly concave, rimmed.

Dorsal surface with well-defined regions. Protogastric regions with prominent, concave-forward granular ridge which extends from mid-line to hepatic regions; short, transverse, granular swelling present behind orbit. Hepatic regions smooth, flattened, with small swelling. Mesogastric region granular posteriorly, widened posteriorly, bearing narrow, elongate anterior process, with convex posterior margin. Urogastric region narrow with concave upper margin and convex lower margin. Cardiac region sub-pentagonal, much wider than long, ornamented with transverse, granular ridge, fringed with lobate, lateral swellings. Intestinal region flattened, narrow. Cervical groove distinct, nearly straight, oblique back from margin to mesogastric region. Epibranchial regions with two ovoid, granular swellings. Mesobranchial regions with oblique, discontinuous, granular swellings. Metabranchial regions swollen. Sub-hepatic region inflated, separated from pterygostomian region by distinct groove.

Thoracic sternum wide, slightly wider than long, widest at sternite 5. Sternites 1 and 2 fused, broadly triangular, axially concave; sternal suture 2/3 nearly straight, complete. Sternite 3 short, narrow, axially depressed, strongly converged anteriorly. Sternite 4 longest, narrowed anteriorly, fused axially and sutured laterally to sternite 3; lateral regions flattened or gently inflated; sternites 4 and 5 fused axially and free laterally. Sternites 5–7 much longer than wide with blunt episternal projections. Sternite 5 narrow axially; lateral regions nearly flat; sternites 5 and 6 fused axially and free laterally. Sternite 6 with median sulcus; sternites 6 and 7 fused axially and free laterally. Sternite 7 narrower than sternite 6, deeply concave posteriorly, with median sulcus; lateral regions flattened directed posterolaterally. Sternite 8 poorly known, small in size. Sterno-pleonal cavity of male deep, well-defined; its anterior end rounded, weakly rimmed, reaching sternal suture 3/4.

Pleon of male narrow, covering sterno-abdominal cavity, with free somites. Telson appears to be sub-trapezoidal, wider than long, with convex anterior margin. Somite 6 subrectangular, longest of all somites, wider than long; lateral margins straight. Somite 5 trapezoidal, much wider than long, narrower and wider than Somite 6; lateral margins straight, converged anteriorly. Somite 4 much narrower and wider than Somite 5, with strongly converged, straight lateral margins. Somites 3 and 2 poorly preserved. Pleon of female wider than that of

male, with free somites; medial elements inflated, separated from lateral elements by shallow grooves. Telson not preserved. Somite 6 sub-trapezoildal, wider than long, with anteriorly diverged lateral margins. Somite 5 subrectangular, wider than long, about half length of Somite 6. Shape of somites 2-4 similar to that of somite 5, decreasing in width anteriorly.

Pereiopods 1 with sexually dimorphic chelae. Chelae of male subequal, dissimilar in shape; propodus of major chela about 2.2 times as long as high; fingers gaped; dactylus about half length of propodus, moderately curved ventrally, with unarmed dorsal margin and roughly serrated occlusal margin; fixed finger about as long as dactylus, deflexed ventrally, bearing longitudinal lateral groove along ventral margin, with roughly serrated occlusal margin and unarmed ventral margin; palm much longer than high, inflated laterally, with unarmed dorsal and ventral margins; carpus short. Propodus of minor chela slightly shorter and more slender than that of major one; fingers not gaped, elongate, bearing finely serrated occlusal margins, with unarmed dorsal and ventral margins. Chelae of female slightly subequal, similar in shape; propodus of chela about 3.5 times as long as high; fingers not gaped; dactylus about half length of propodus, gently curved ventrally, with unarmed dorsal margin and finely serrated occlusal margin; fixed finger about as long as dactylus, deflexed ventrally, laterally bearing longitudinal groove, along ventral margin, with finely serrated occlusal margin and unarmed ventral margin; palm much longer than high, inflated laterally, with unarmed dorsal and ventral margins; carpus short.

Pereiopods 2–4 slender, elongate, flattened laterally; pereiopod 3 longest. Pereiopod 5 apparently short, slender, subdorsal; coxa positioned at lateral corner of posterior margin; ischium long, shorter than merus.

Eyes elongate, directed laterally, with eyestalks tapering distally. Buccal cavern sub-quadrangular. Maxillipeds 3 widely gaped medially. Ischium of endopod much longer than wide, narrowing distally. Merus longer than wide, narrower and shorter than ischium. Articles of palp poorly preserved. exopod narrow, much longer than wide.

Material examined: D1048523–D1048528, D1048530, and MFM247123 from Yura (=Loc. Aw16 of Morozumi, 1985), Sumoto City, Hyogo Prefecture, mudstone of the Kita-ama Formation of the Izumi Group (early Maastrichtian; *Nostoceras hetonaiense* Zone of Morozumi, 1985). D1048522, D1048529, MFM247116, MFM247121, and MFM247122, from Nadaokawa (=Loc. IZM-2 of Collins *et al*., 1993), Minamiawaji City, Hyogo Prefecture; mudstone of the Shimonada Formation of the Izumi Group (early Maastrichtian; *Pachydiscus* sp. aff. *P. subcompressus* Zone of Morozumi, 1985). D1048522, D1048529, MFM247101, MFM247117, and MFM247118 from Nadachino (=Loc. IZM-1 of Collins *et al*., 1993), Minamiawaji City, Hyogo Prefecture; mudstone of the Shimonada Formation of the Izumi Group (early Maastrichtian; *Pachydiscus* sp. aff. *P. subcompressus* Zone of Morozumi, 1985). MFM247120 from Takinoike (=Loc. IZM-4 of Collins *et al*., 1993), Izumisano City, Osaka Prefecture; nodule of the Matsuo Formation of the Izumi Group (Campanian/Maastrichtian by Matsumoto and Morozumi, 1980).

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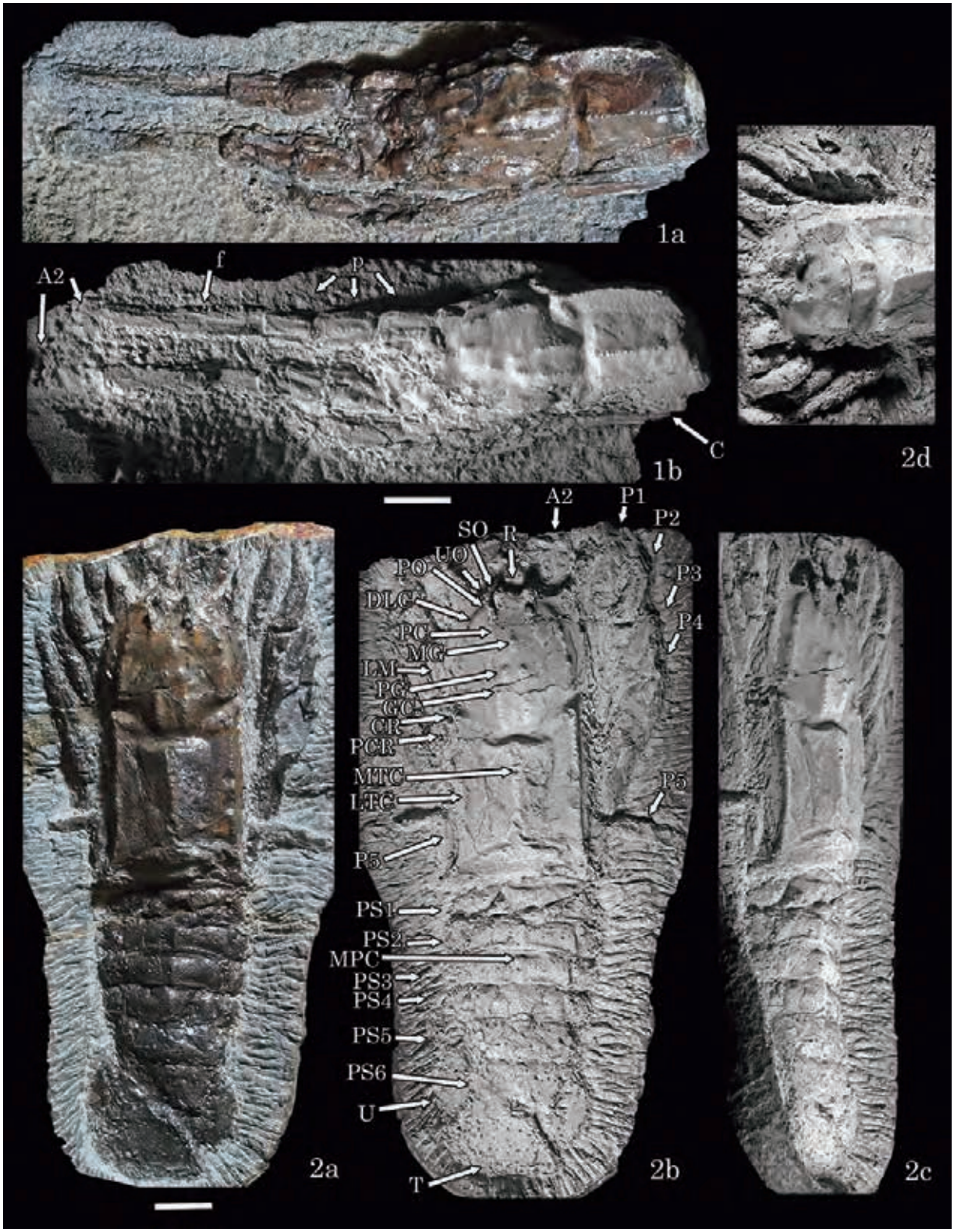
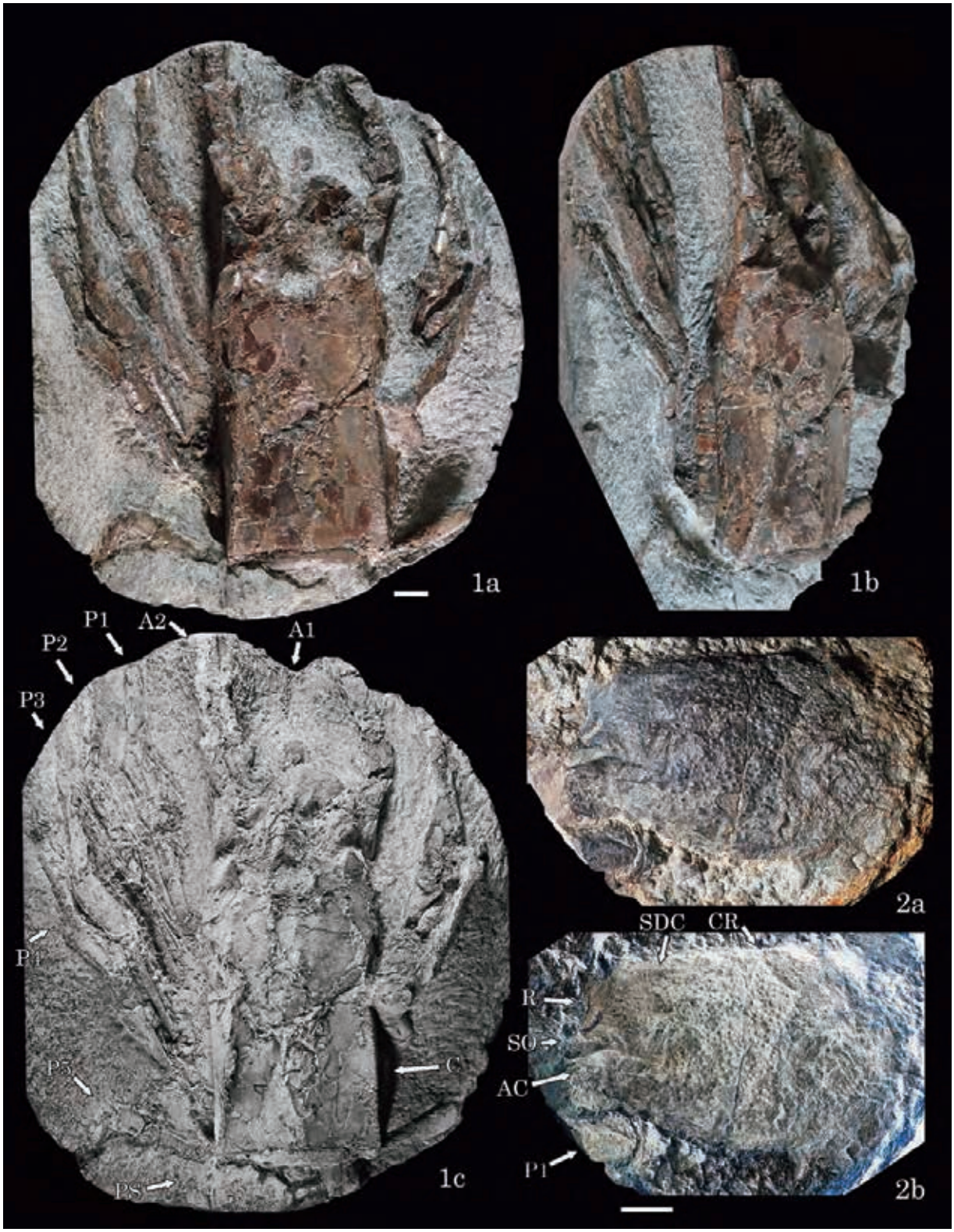
This paper is dedicated to the late Senior Researcher, Joe S. H. Collins (London).

Plate 1



1a–2d. ***Linuparus japonicus*** **Nagao, 1931.** Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***1a***, ***1b***, D1048485, carapace, antennules, antennae, and pereiopods, dorsal view. ***2a–2d***, D1048486, carapace, pleon, pereiopods, and antennae; *2a*, *2b*, dorsal view; *2c*, lateral view; *2d*, dorso-frontal view. Scale bar = 1 cm. Figs. 1b, 2b, and 2c are coated with ammonium chloride sublimate. Abbreviations: A1, antennule; A2, antenna; C, carapace; CR, cervical groove; DLC, dorsolateral carina; f, flagellum; GC, gastric carina; LM, lateral margin; LTC, lateral carina of thoracic region; MG, median gastric node; MPC, median carina of pleon; MTC, median carina of thoracic region; R, rostrum; p, peduncle; P, pereiopod; PC, postorbital carina; PCR, postcervical groove; PG, posterior gastric node; PO, postorbital spine; PS, pleonal somite; SO, supraorbital horn; T, telson; U, uropod; UO, upper orbital margin.

Plate 2

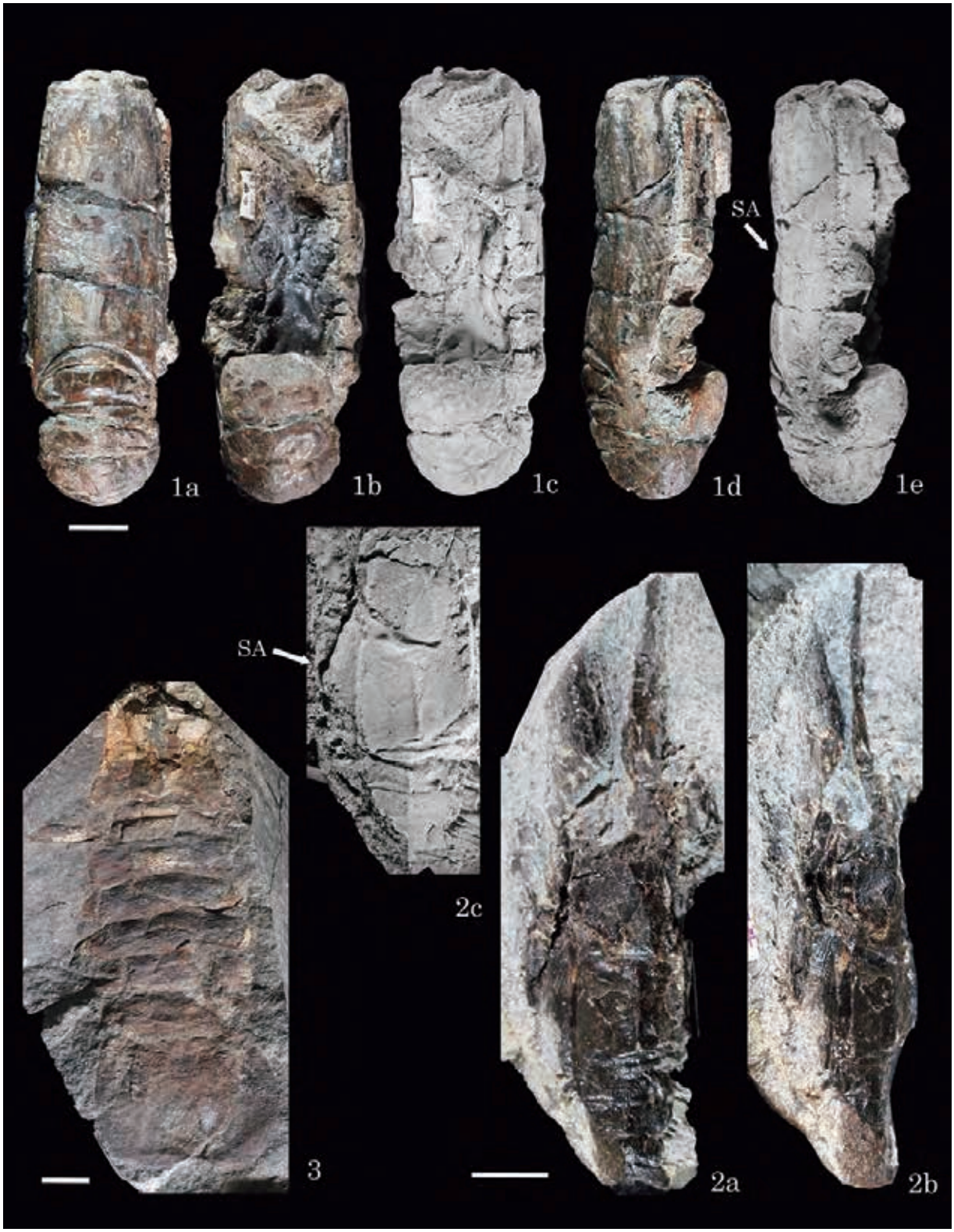


1a–1c. ***Linuparus japonicus*** **Nagao, 1931.** D1048487, carapace, antennules, antennae, and pereiopods, Shimonada Formation (early Maastrichtian) of Nadanigoro, coll. Kishimoto. *1a*, *1c*, dorsal; *1b*, lateral view. **2a, b.** ***Astacodes*** **sp.** WMNH-Ge-1141220001, carapace and pereiopod 1, from the Shimonada Formation (early Maastrichtian) of Nadayamamoto, coll. Tanaka. Scale bar = 1 cm. Fig. 1c is coated with ammonium chloride sublimate. Abbreviations: A1, antennule; A2, antenna; AC, antennal carina; C, carapace; CR, cervical groove; R, rostrum; P, pereiopod; PS, pleonal somite; SO, supraorbital horn; SDC, subdorsal carina.

Plate 3

1a–2. ***Linuparus japonicus*** **Nagao, 1931.** Shimonada Formation (early Maastrichtian) of Nadanigoro, coll. Kishimoto. ***1a–1c*****,** D1048488, carapace, pleon, and pereiopods, *1a*, *1d*, dorsal; *1b*, *1c*, lateral view. ***2a*****, *2b*****,** D1048489, carapace, pleon, telson, uropods, and pereiopods, *2a*, lateral; *2b*, dorsal view. Scale bar = 1 cm. Fig. 1e is coated with ammonium chloride sublimate.

Plate 4



1a–3. ***Linuparus japonicus*** **Nagao, 1931.** ***1a–1e*****,** D1048490, carapace, pleon, thoracic sternum, and pereiopods, Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto, *1a*, dorsal; *1b*, *1c*, ventral; *1d*, *1e*, lateral view. Shimonada Formation (early Maastrichtian) of Nadanigoro, Minamiawaji City, Hyogo Prefecture, coll. Kishimoto. *1a*, *1c*, dorsal; 1b, lateral view. ***2a–2c*****,** D1048491, carapace, pleon, antennae, and pereiopods, Seidan Formation (late Campanian) of Hirota, coll. Kishimoto, *2a*, *2c*, dorsal; *2b*, lateral view. ***3*****,** MFM247119, dorsal view of pleon, telson, and uropods, Shimonada Formation (early Maastrichtian) of Nadachino, coll. Hayano. Scale bar = 1 cm. Figs. 1c, 1e, and 2c are coated with ammonium chloride sublimate. SA indicates stridulatory apparatus.

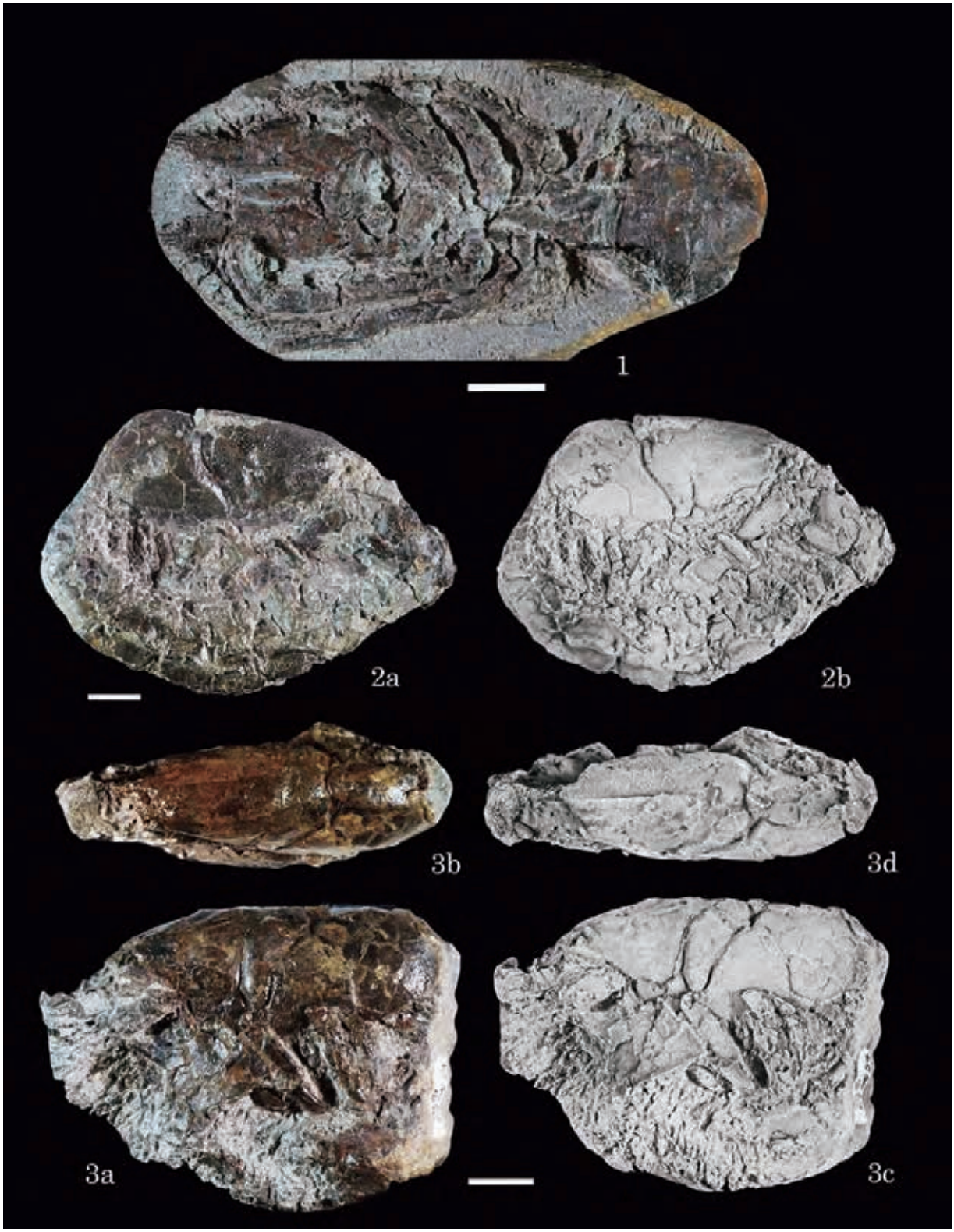
Plate 5

1a–2. *Linuparus japonicus* Nagao, 1931. Shimonada Formation (early Maastrichtian) of Nadanigoro, coll. Kishimoto. ***1a–1e*,** D1048492, carapace, pleon, telson, uropods, and pereiopods, *1a*, *1d*, *1e*, dorsal; 1b, 1c, lateral view. ***2*,** D1048493, carapace, pleon, telson, uropods, and pereiopods, *2a*. lateral; *2b*, dorsal view. Scale bar = 1 cm. Figs. 1a and 1e are coated with ammonium chloride sublimate. Abbreviations: P, pereiopod; PS, pleonal somite; T, telson; UEN, uropodal endopod; UEX, uropodal exopod.

Plate 6

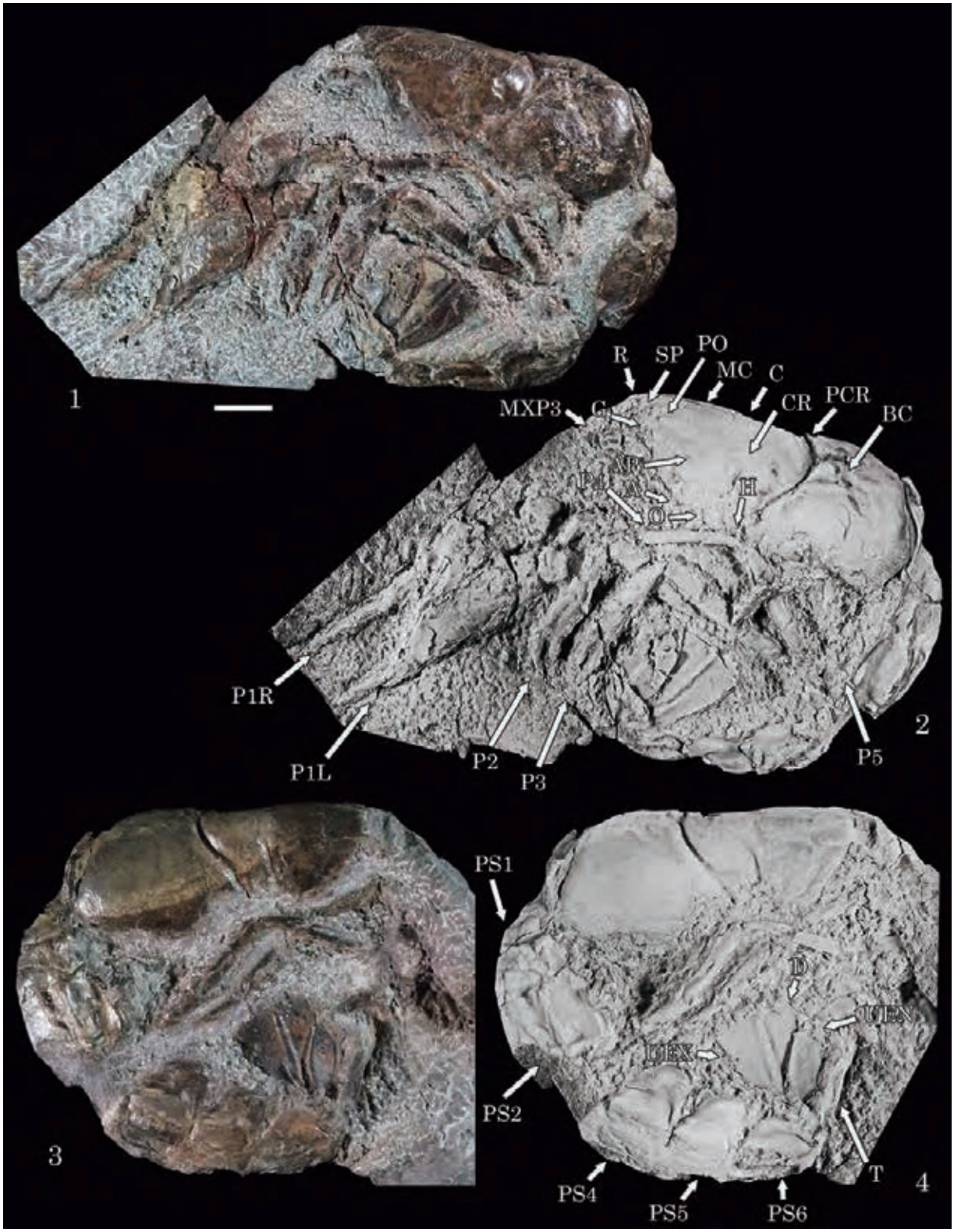
1–3c. ***Linuparus japonicus*** **Nagao, 1931.** Shimonada Formation (early Maastrichtian) of Nadanigoro, coll. Kishimoto. ***1*****,** D1048494, ventral view of thoracic sternum, antennules, maxillipeds, pereiopods, carapace, pleon, and pereiopods. ***2*****,** D10484495, ventral view of thoracic sternum, maxillipeds, and pereiopods. ***3a–3c*****,** D10484496, epistome, antennules, antennae, maxillipeds, and pereiopods, *3a*, ventral; *3b*, lateral view. Fig. 3c is a close-up image of epistome of Fig. 3a. Scale bar = 1 cm. Abbreviations: A1, antennule; A2, antenna; EP, epistome; EPM, median projection of epistome; GF, gonopore of female; MXP, maxilliped; P, pereiopod; PS, pleonal somite; TS, thoracic sternum.

Plate 7



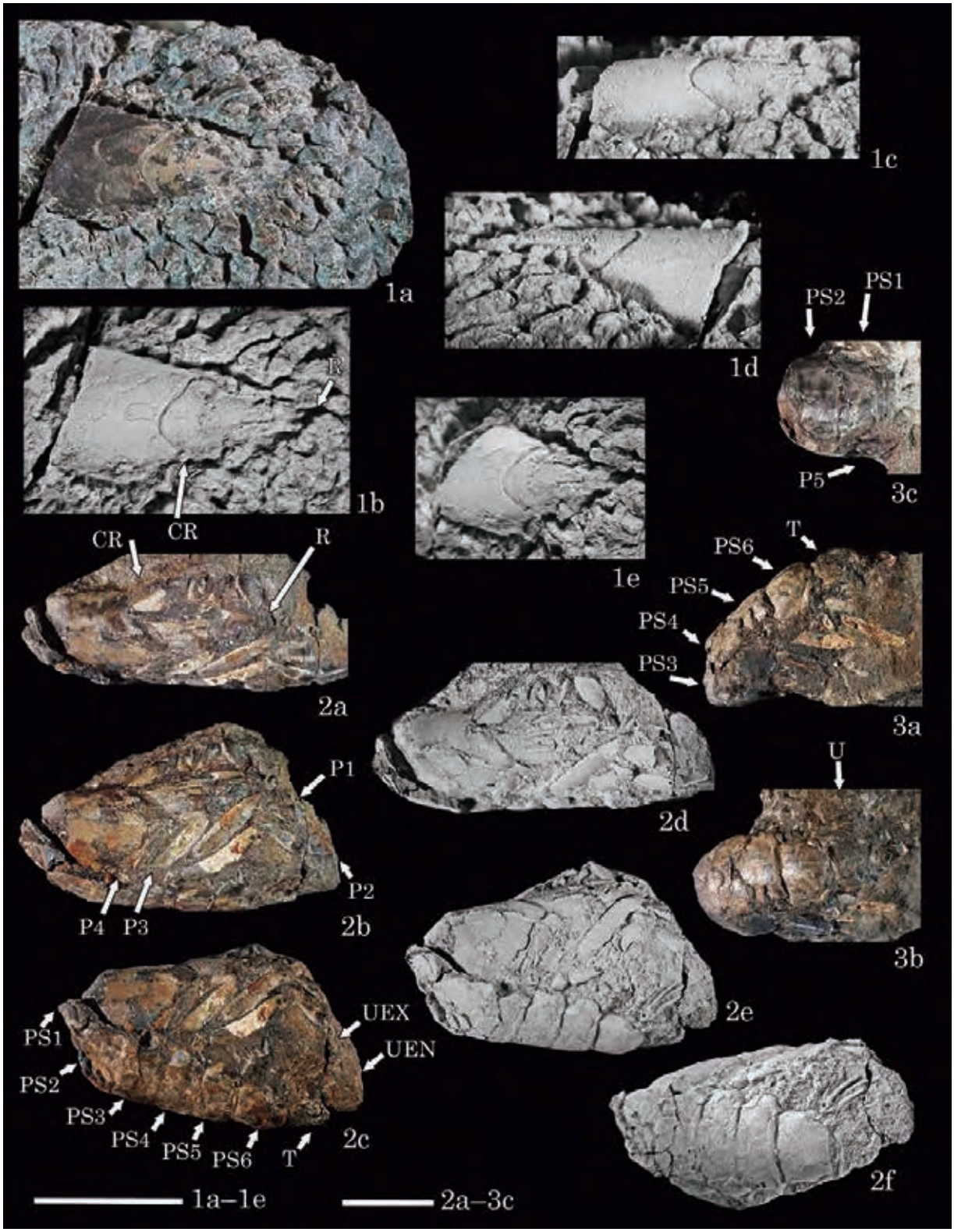
1. ***Linuparus japonicus*** **Nagao, 1931.** D1048497, ventral view of thoracic sternum, pleon, antennules, antennae, and pereiopods, Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. **2a–3d.** ***Hoploparia miyamotoi*** **Karasawa, 1998.** carapace, pleon, and pereiopods, Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***2a***, ***2b***, D1048498; ***3a***–***3d***, D1048499. *2a*, *2b*, *3a*, *3c*, lateral view; *3b*, *3d*, dorsal view. Scale bar = 1 cm. Figs. 2b, 3c, and 3d are coated with ammonium chloride sublimate.

Plate 8



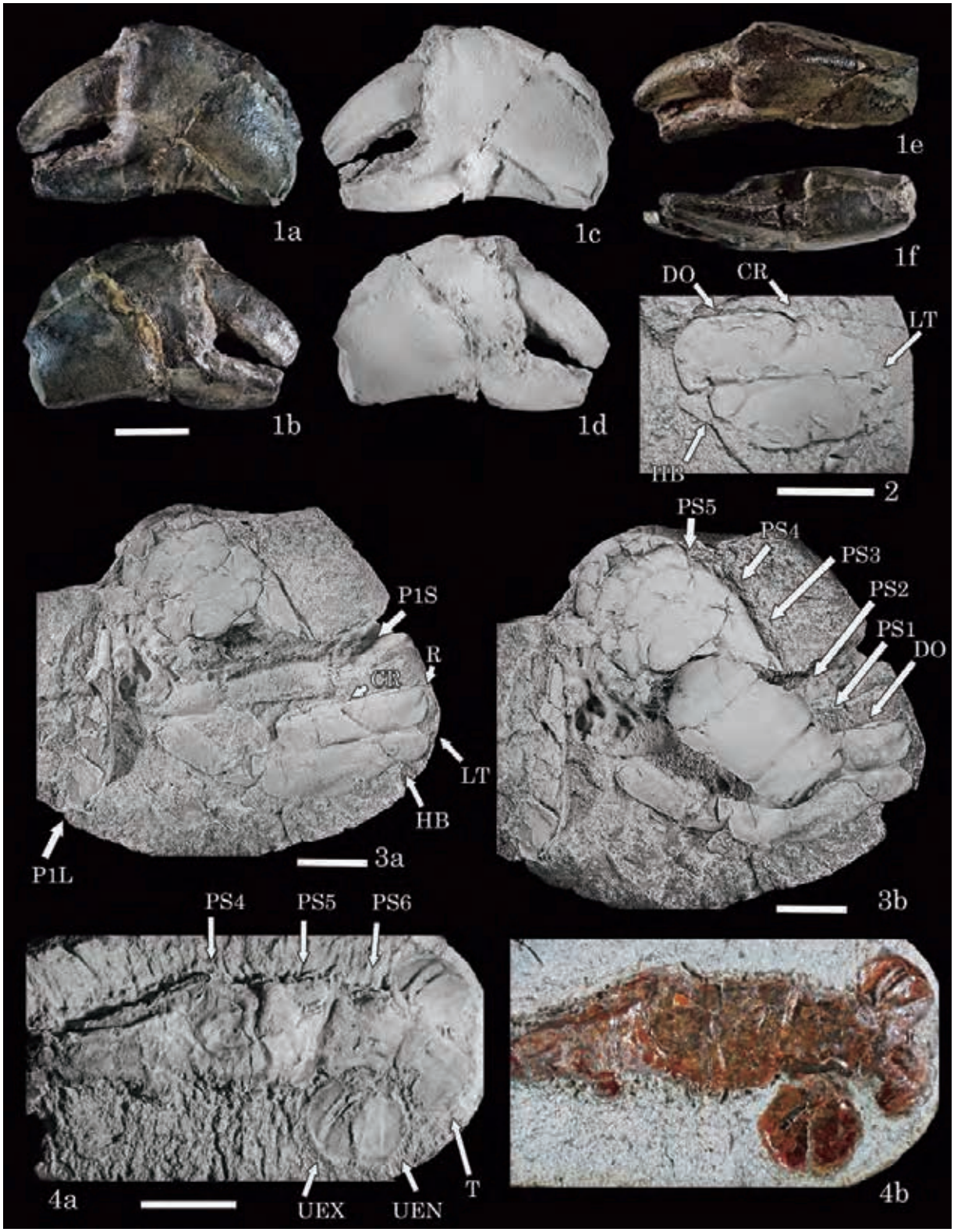
1–4. ***Hoploparia miyamotoi*** **Karasawa, 1998.** D1048500, carapace, pleon, uropod, and pereiopods, Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. Lateral view. Scale bar = 1 cm. Figs. 2 and 4 are coated with ammonium chloride sublimate. Abbreviations: A, antennal groove; AP, post-antennal spine; BC, branchiocardiac groove; C, carapace; CR, cervical groove; D, diaeresis; G, gastro-orbital groove; H, hepatic groove; MC, median carina; O, omega swelling; R, rostrum; P, pereiopod; PC, postorbital carina; PCR, postcervical groove; PO, postorbital spine; PS, pleonal somite; SP, supraorbital spine; T, telson; UEN, uropodal endopod; UEX, uropodal exopod.

Plate 9



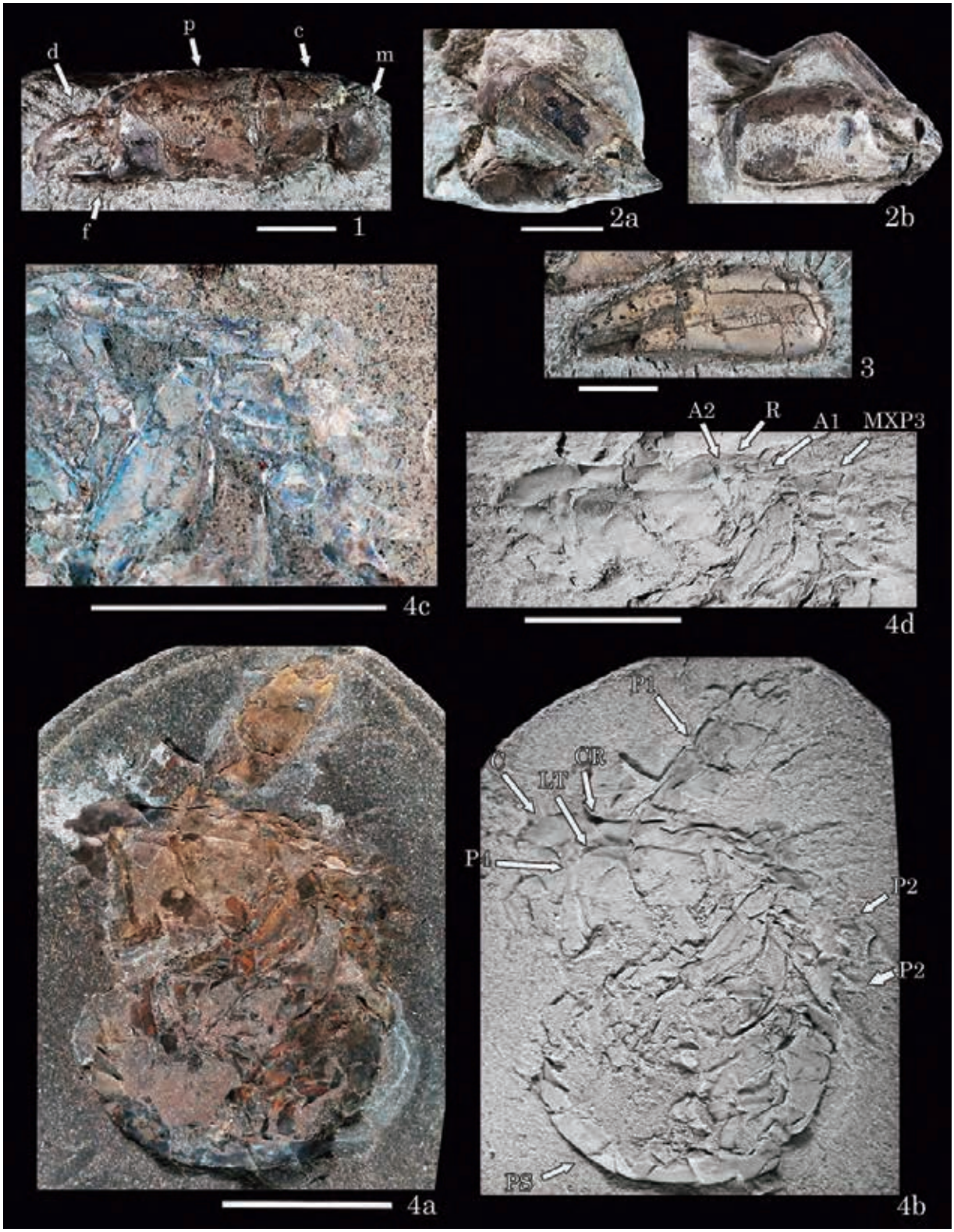
1a–3c. ***Hinecaris simplex*****, new genus and new species.** ***1a–1e*****,** WMNH-Ge-1141220002, paratype, carapace, Kita-ama Formation (early Maastrichtian) of Yura, coll. Tanaka. *1a*, *1b*, dorsal; *1c*, *1d*, lateral; *1e*, oblique-frontal view. ***2a–2f*****,** WMNH-Ge-1141120001, holotype, carapace, pleon, telson, uropods, and pereiopods, Shindachi Formation (Maastrichtian) of Hakotsukuri. *2a*, *2d*, *2d*, dorsal; *2b*, *2c*, *2e*, lateral view. ***3a–3c*****,** WMNH-Ge-1141120002, paratype, pleon, telson, uropods, and pereiopods, Shindachi Formation (Maastrichtian) of Hakotsukuri. *3a*, *3c*, dorsal; *3b*, lateral view. Scale bar = 1 cm. Figs. 1a–1e and 2d–2f are coated with ammonium chloride sublimate. Abbreviations: CR, cervical groove; R, rostrum; P, pereiopod; PS, pleonal somite; T, telson; U, uropod; UEN, uropodal endopod; UEX, uropodal exopod.

Plate 10



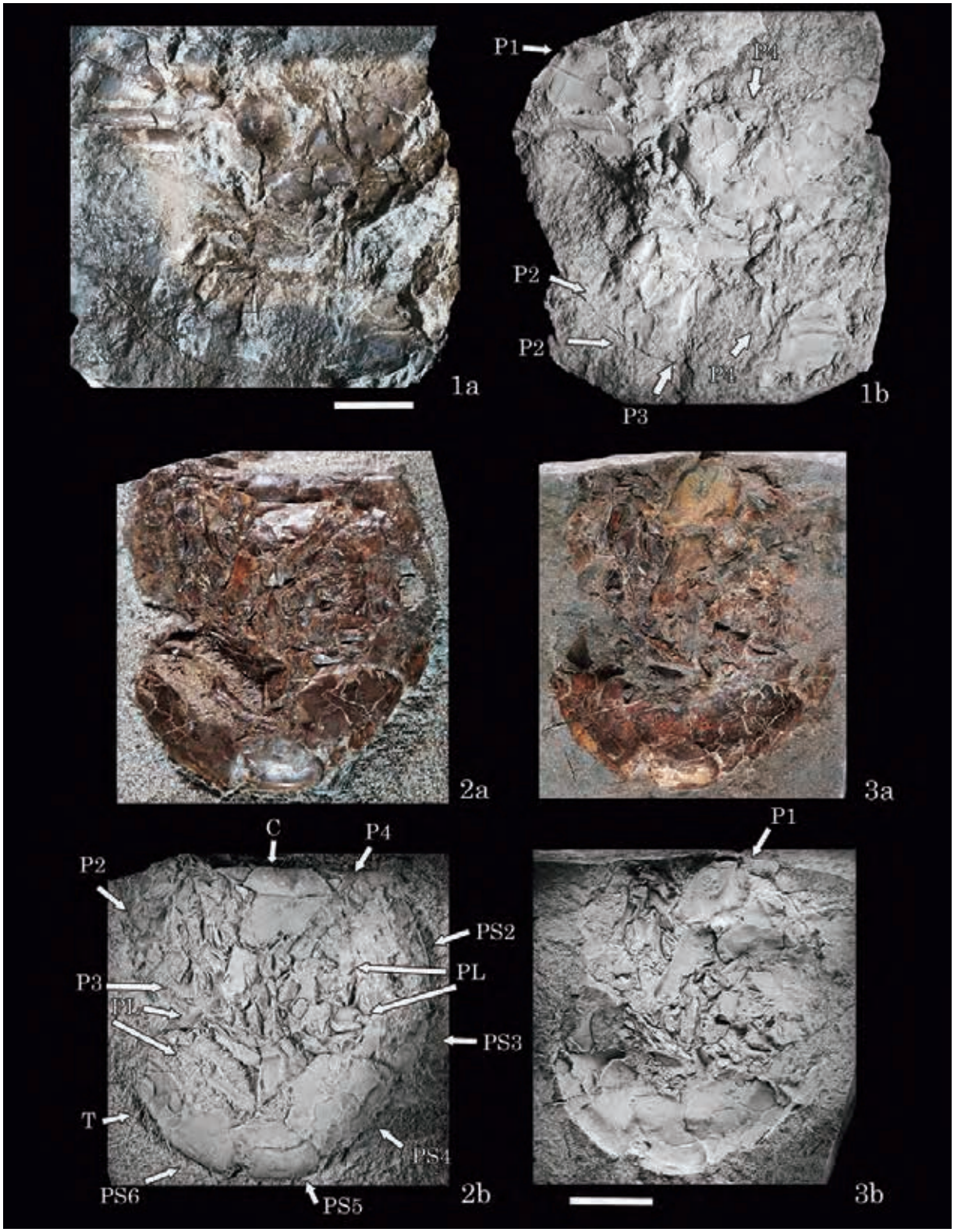
1a–1f. Axiidae genus and species indeterminate. D1048501, right pereiopod 1, Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. *1a*, *1c*, mesial; *1b*, *1d*, lateral; *1e*, dorsal; *1f*, ventral view. **2–4b.** ***Ahazianassa masanorii*** **(Karasawa, 1998),** Kita-ama Formation (early Maastrichtian) of Yura. ***2*****,** WMNH-Ge-1141220003, lateral view of carapace. ***3a*****,** ***3b*****,** D000495, holotype, carapace, pleon, and pereiopods 1, coll. Tanaka. ***4a*****,** ***4b*****,** D1048502, dorsal view of pleon, telson, and uropods, coll. Kishimoto. Scale bar = 1 cm. Figs. 1c, 1d, 2, 3a, 3b, and 4a are coated with ammonium chloride sublimate. Abbreviations: CR, cervical groove; DS, dorsal oval; HB, hepatic boss; LT, *linea thalassinica*; R, rostrum; P, pereiopod; P1L, major cheliped of pereiopod 1; P1S, minor cheliped of pereiopod 1; PS, pleonal somite; T, telson; U, uropod; UEN, uropodal endopod; UEX, uropodal exopod.

Plate 11



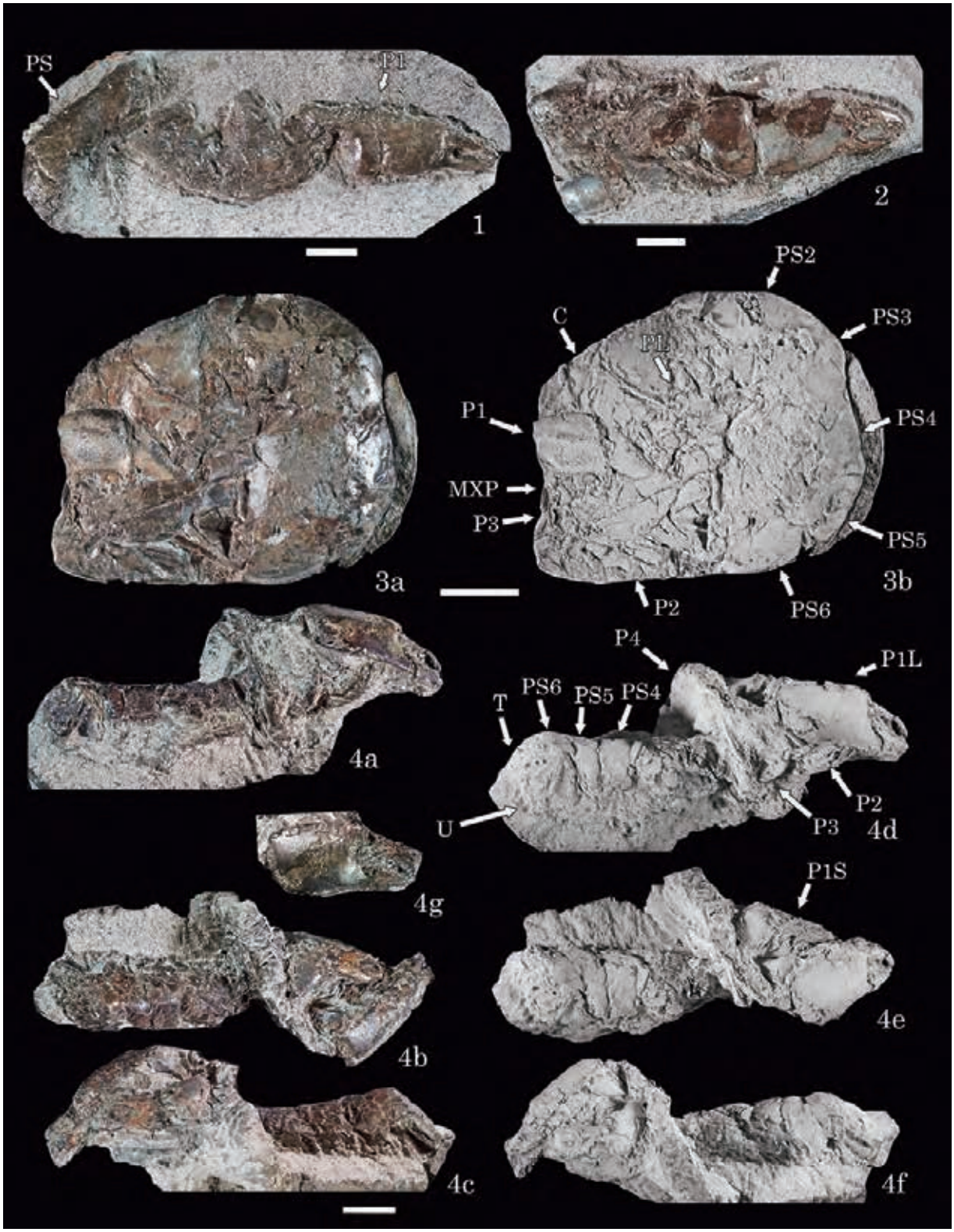
1–4d. ***Ahazianassa masanorii*** **(Karasawa, 1998),** Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***1*****,** D1048503, lateral view of major cheliped of pereiopod 1. ***2a*****, *2b*****,** D1048504, chelipeds of pereiopod 1, *2a*, dorsal; *2b*, lateral view. ***3*****,** D1048505, lateral view of minor cheliped of pereiopod 1. ***4a*****–*4d*****,** D1048506, carapace, pleon, antennule, antenna, maxilliped 3, and pereiopods. *4a*, *4b*, lateral view; *4c*, lateral view of close-up image of anterior part; *4d*, dorsal view. Scale bar = 1 cm. Figs. 4b and 4d are coated with ammonium chloride sublimate. Fig. 4c is an opposite image by Photoshop Elements 14. Abbreviations: A1, antennule; A2, antenna; C, carapace; c, carpus; CR, cervical groove; d, dactylus; f, fixed finger; LT, *linea thalassinica*; m, merus; R, rostrum; MXP3, maxilliped 3; P, pereiopod; p, palm; PS, pleonal somite.

Plate 12



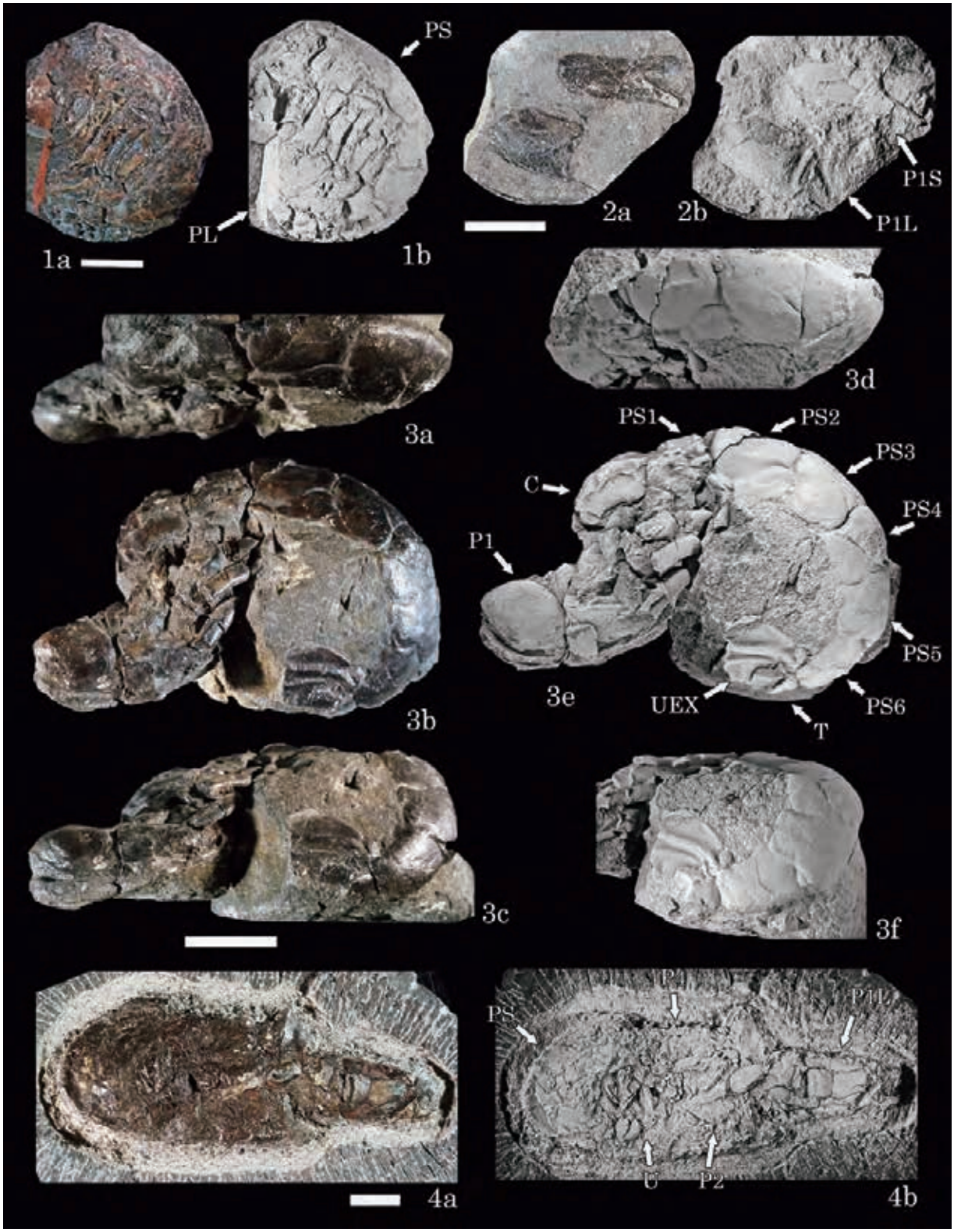
1a–3b. ***Ahazianassa masanorii*** **(Karasawa, 1998),** ***1–3*****,** Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***1a*****,** ***1b*****,** MFM247008, paratype, lateral or mesial view of pereiopods. ***2a*****,** ***2b*****,** D1048507, lateral view of carapace, pleon, telson, pereiopods, and pleopods, coll. Kishimoto. *3a*, *3b*, reversal image of cast of D1048507. Scale bar = 1 cm. Figs. 1b, 2b, and 3b are coated with ammonium chloride sublimate. Abbreviations: C, carapace; P, pereiopod; PS, pleonal somite; PL, pleopod; T, telson.

Plate 13



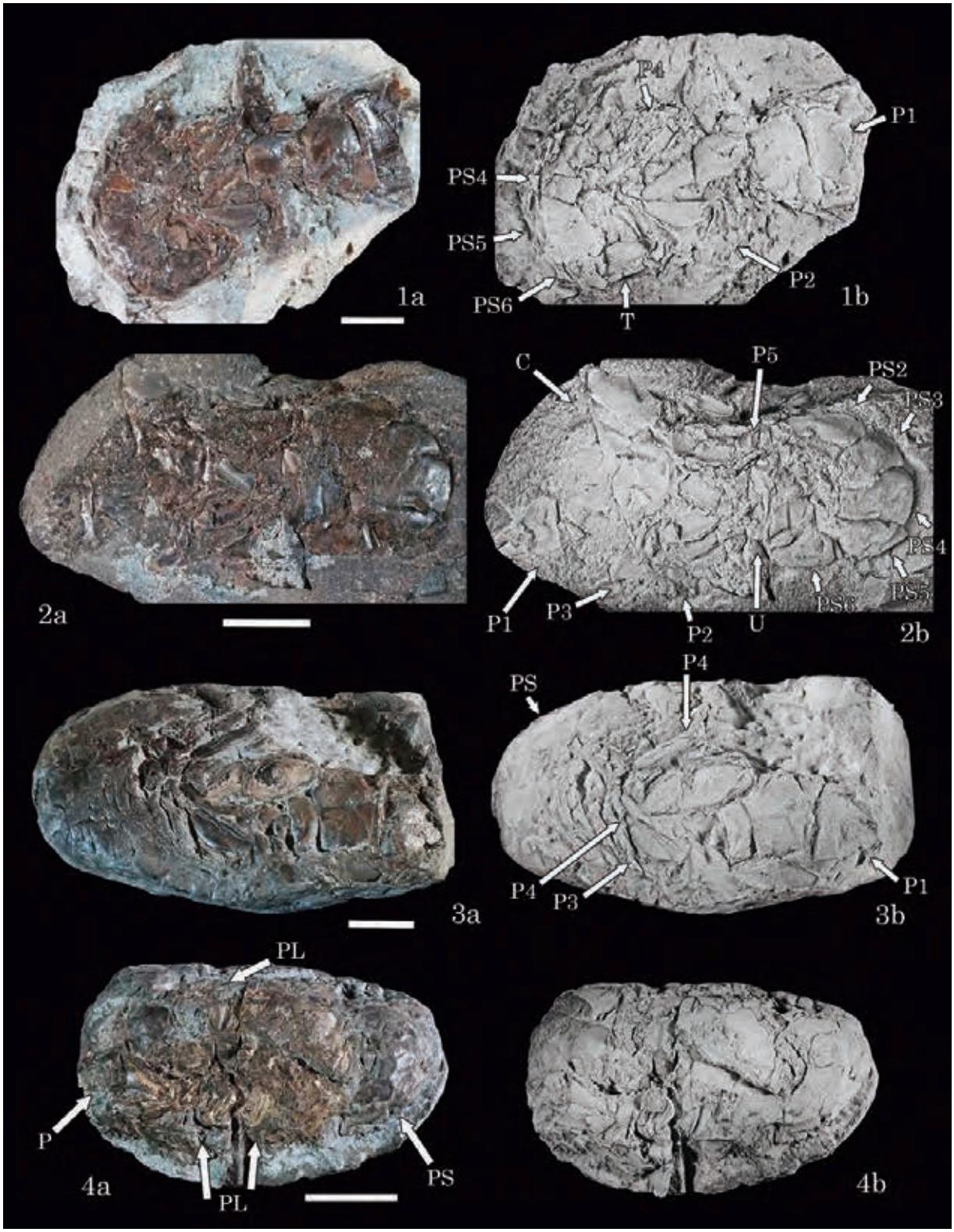
1–4g. ***Ahazianassa masanorii*** **(Karasawa, 1998),** Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***1*****,** D1048508, mesial view of minor cheliped of pereiopod 1, lateral view of pleon and other pereiopods. ***2*****,** D1048509, lateral view of major cheliped of pereiopod 1 and other pereiopods. ***3a*****, *3b*****,** D1048510, carapace, pleon, maxilliped 3, pereiopods, and pleopods. ***4a*****–*4g*****,** D1048511, pleon, telson, uropods, and pereiopods. *4a*, *4c*, *4d*, *4f*, and *4g*, lateral view; *4b*, *4e*, dorsal view. Scale bar = 1 cm. Figs. 3b and 4d–4f are coated with ammonium chloride sublimate. Abbreviations: C, carapace; P, pereiopod; P1L, major cheliped of pereiopod 1; P1S, minor cheliped of pereiopod 1; PS, pleonal somite; PL, pleopod; T, telson; U, uropod.

Plate 14



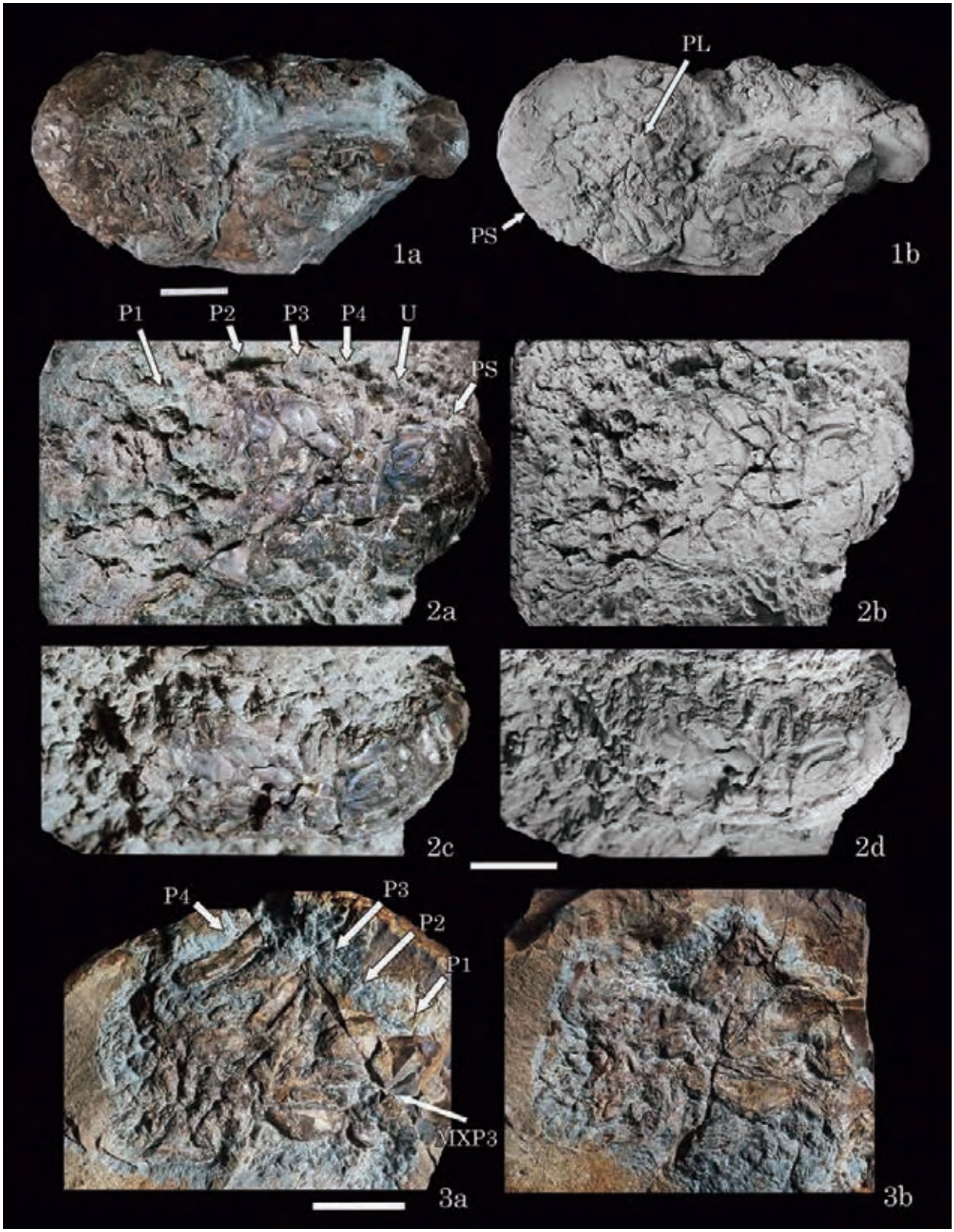
1a–4b. ***Ahazianassa masanorii*** **(Karasawa, 1998),** Kita-ama Formation (early Maastrichtian) of Yura. ***1*****,** MFM247114, lateral view of pleon and pleopods, coll. Kaede. ***2a*****, *2b*****,** D1048512, mesial view of pereiopods 1, coll. Kishimoto. ***3a*****–*3f*****,** WMNH-Ge-1141220004, carapace, pleon, telson, uropods, and pereiopods, coll. Tanaka. *3a*, *3c*, *3d*, *3f*, dorsal view; *3b*, *3e*, lateral view, coll. Tanaka. ***4a*****, *4b*****,** D1048513, lateral view of pleon, uropods, and pereiopods, coll. Kishimoto. Scale bar = 1 cm. Figs. 1b, 2b, 3d–3f, and 4b are coated with ammonium chloride sublimate. Abbreviations: C, carapace; P, pereiopod; P1L, major cheliped of pereiopod 1; P1S, minor cheliped of pereiopod 1; PS, pleonal somite; PL, pleopod; T, telson; U, uropod; UEX, uropodal exopod.

Plate 15



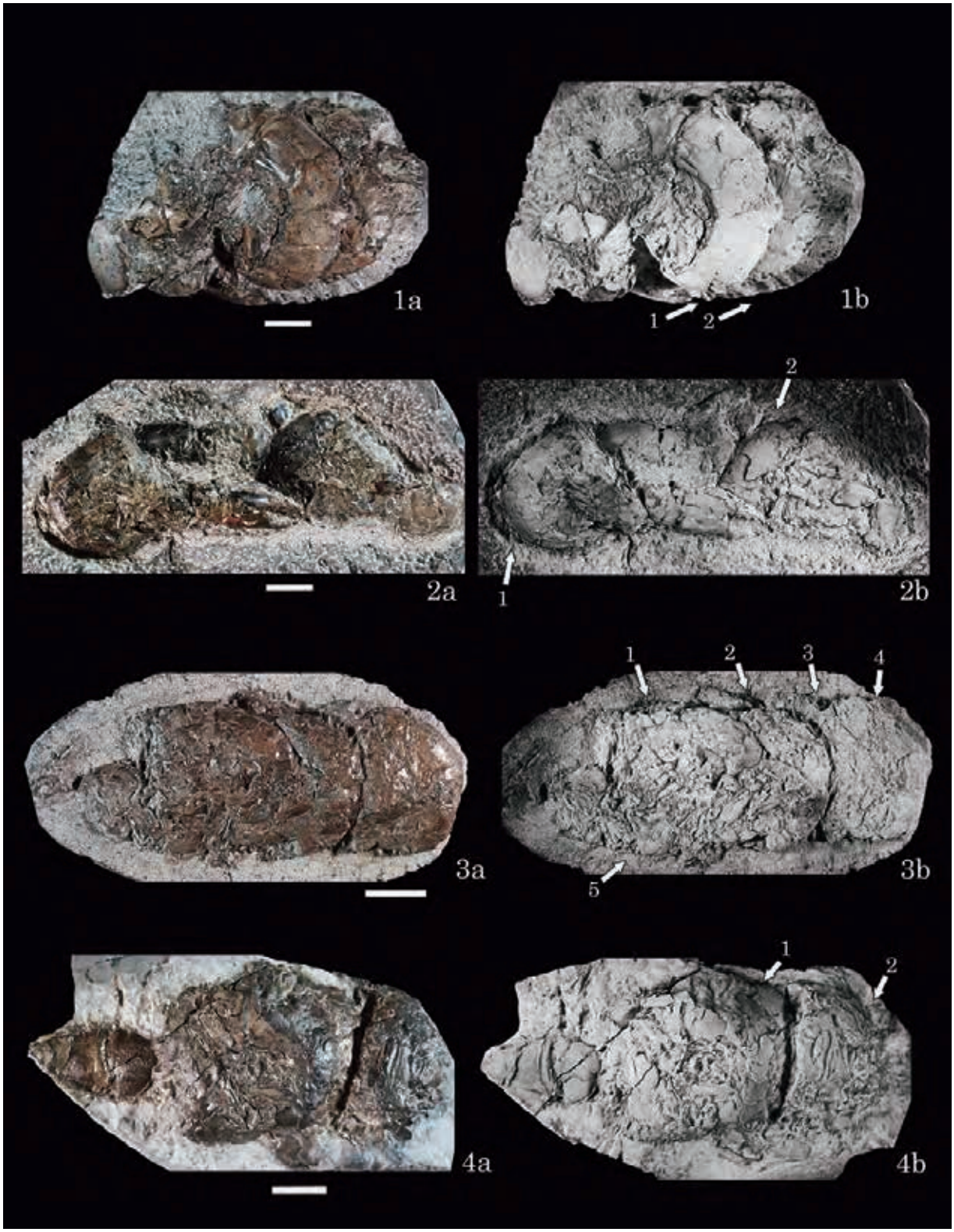
1a–4b. ***Ahazianassa masanorii*** **(Karasawa, 1998),** Kita-ama Formation (early Maastrichtian) of Yura. ***1a*****,** ***1b*****,** D1048514, lateral view of pleon, telson, and pereiopods, coll. Kishimoto. ***2a*****,** ***2b*****,** D1048515, lateral view of carapace, pleon, uropods, and pereiopods, coll. Kishimoto. ***3a*****,** ***3b*****,** D1048516, pleon and pereiopods, coll. Kishimoto. ***4a*****,** ***4b*****,** WMNH-Ge-1141220005, pleon, pereiopods, and pleopods, coll. Tanaka. Scale bar = 1 cm. Figs. 1b, 2b, 3b, and 4b are coated with ammonium chloride sublimate. Abbreviations: C, carapace; P, pereiopod; PS, pleonal somite; PL, pleopod; T, telson; U, uropod.

Plate 16



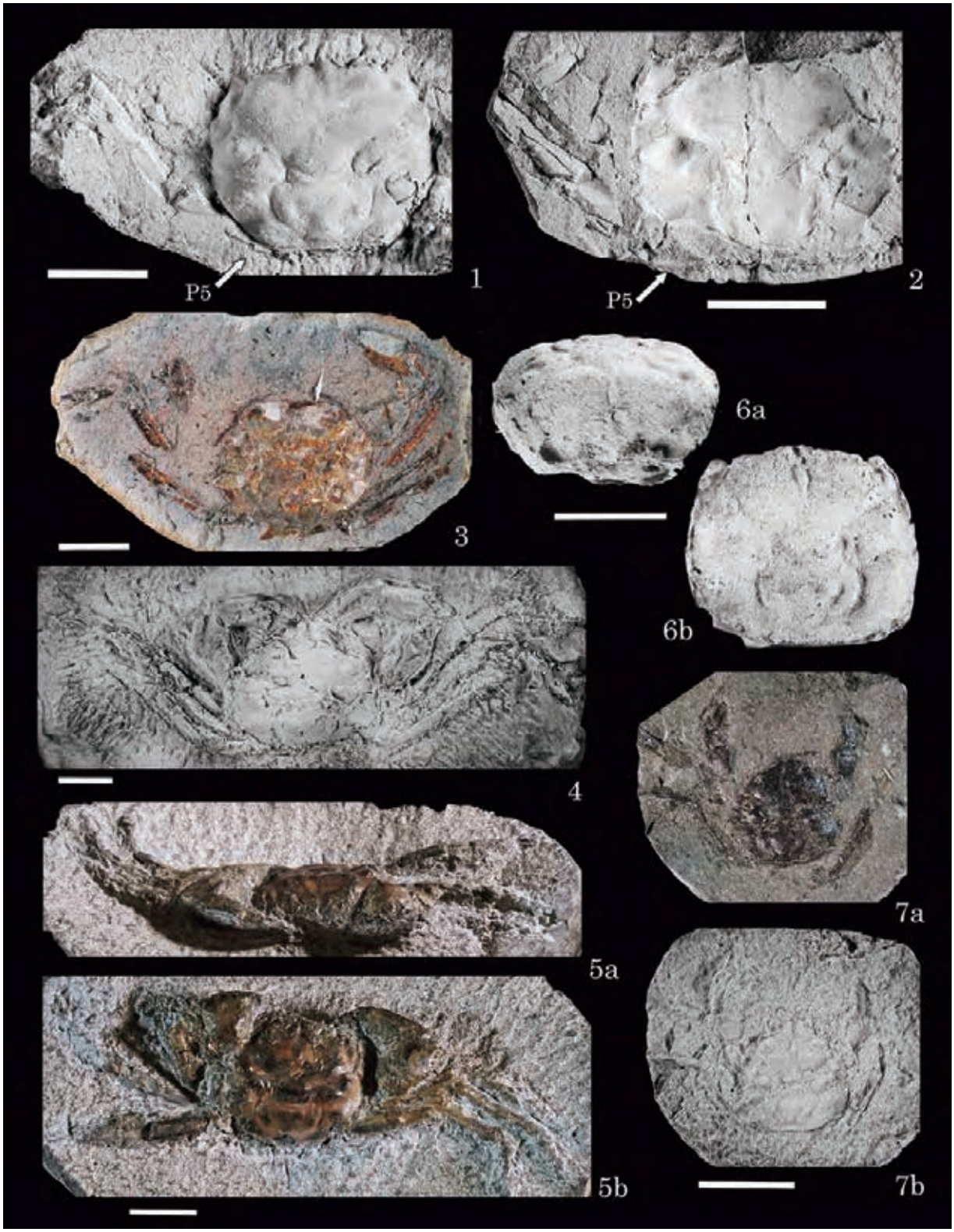
1a–3b. ***Ahazianassa masanorii*** **(Karasawa, 1998).** *1a*, *b*, *2a–2d*, Kita-ama Formation (early Maastrichtian) of Yura. *3a*, *3b*, Shimonada Formation (early Maastrichtian) of Nadayamamoto. ***1a***, ***1b***, D1048517, lateral view of pleon, pereiopods, and pleopods, coll. Kishimoto. ***2a–2d*****,** MFM214115, pleon, uropods, and pereiopods, coll. Kaede. ***3a*****, *3b*****,** WMNH-Ge-1141220006, maxilliped 3 and pereiopods, 3b is a reversal image of 3a, coll. Tanaka. Scale bar = 1 cm. Figs. 2b and 2d are coated with ammonium chloride sublimate. Abbreviations: P, pereiopod; PS, pleonal somite; PL, pleopod; U, uropod.

Plate 17



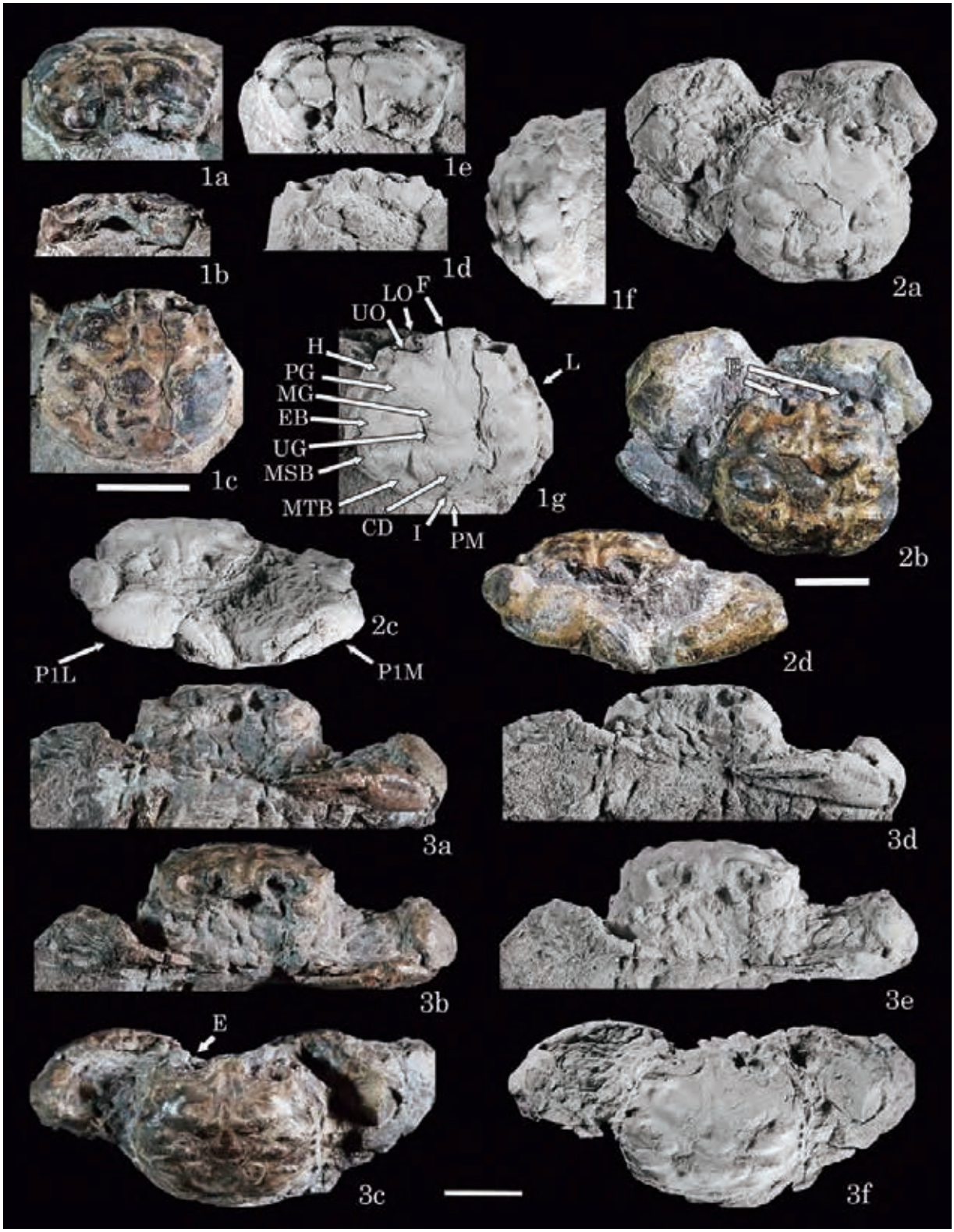
1a–4b. ***Ahazianassa masanorii*** **(Karasawa, 1998).** Examples of several individuals preserved within the same nodule, Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***1a*****,** ***1b*****,** D1048518; ***2a*****,** ***2b*****,** D1048519; ***3a*****,** ***3b*****,** D1048520; ***4a*****,** ***4b*****,** D1048521. Scale bar = 1 cm. Figs. 1b, 2b, 3b, and 4b are coated with ammonium chloride sublimate. Allows indicate each individuals.

Plate 18



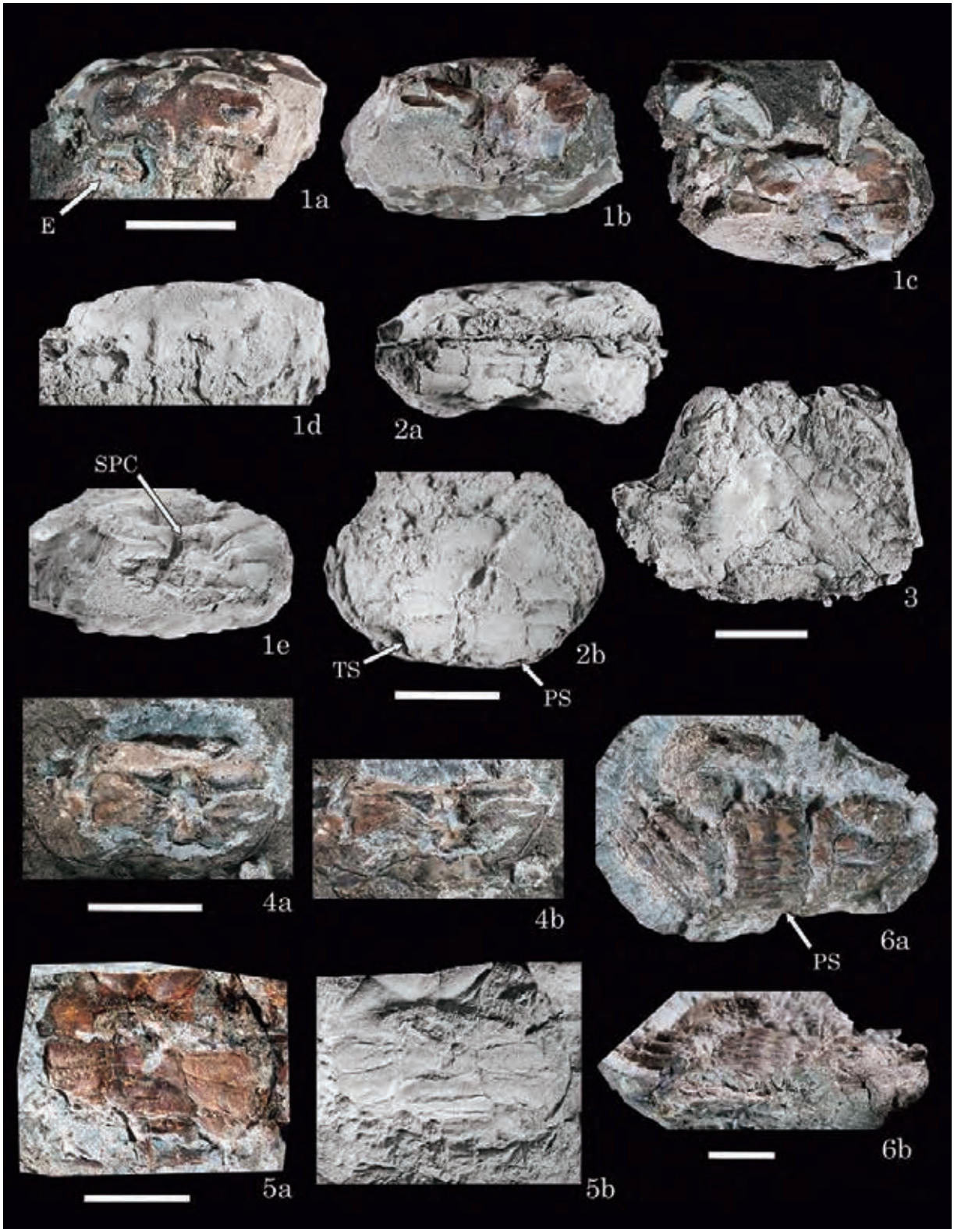
1–7b. ***Archaeopus ezoensis*** **(Nagao, 1941).** *1*, Shimonada Formation (early Maastrichtian) of Nadaokawa; *2*, *3*, *4*, Shimonada Formation (early Maastrichtian) of Nadachino; *5*, *7*, Kita-ama Formation (early Maastrichtian) of Yura; *6*, Matsuo Formation (Campanian/Maastrichtian) of Takinoike. ***1*****,** MFM247116, dorsal view of carapace and pereiopods. ***2*****,** MFM247117, dorsal view of carapace and pereiopods. ***3*****,** MFM247118, dorsal view of carapace and pereiopods. ***4*****,** D1048522, dorsal view of carapace and pereiopods, coll. Kishimoto. ***5a*****, *5b*****,** D1048523, carapace and pereiopods, coll. Kishimoto, *5a*, frontal; *5b*, dorsal view. ***6a*****, *6b*****,** MFM247120, carapace (latex cast of ESN83015), *6a*, frontal; *6b*, dorsal view. ***7a*****, *7b*****,** D1048523, dorsal view of juvenile carapace and pereiopods, coll. Kishimoto. Scale bar = 1 cm. Figs. 1, 2, 4, 6a, 6b, and 7b are coated with ammonium chloride sublimate. P5 indicates reduced pereiopod 5.

Plate 19



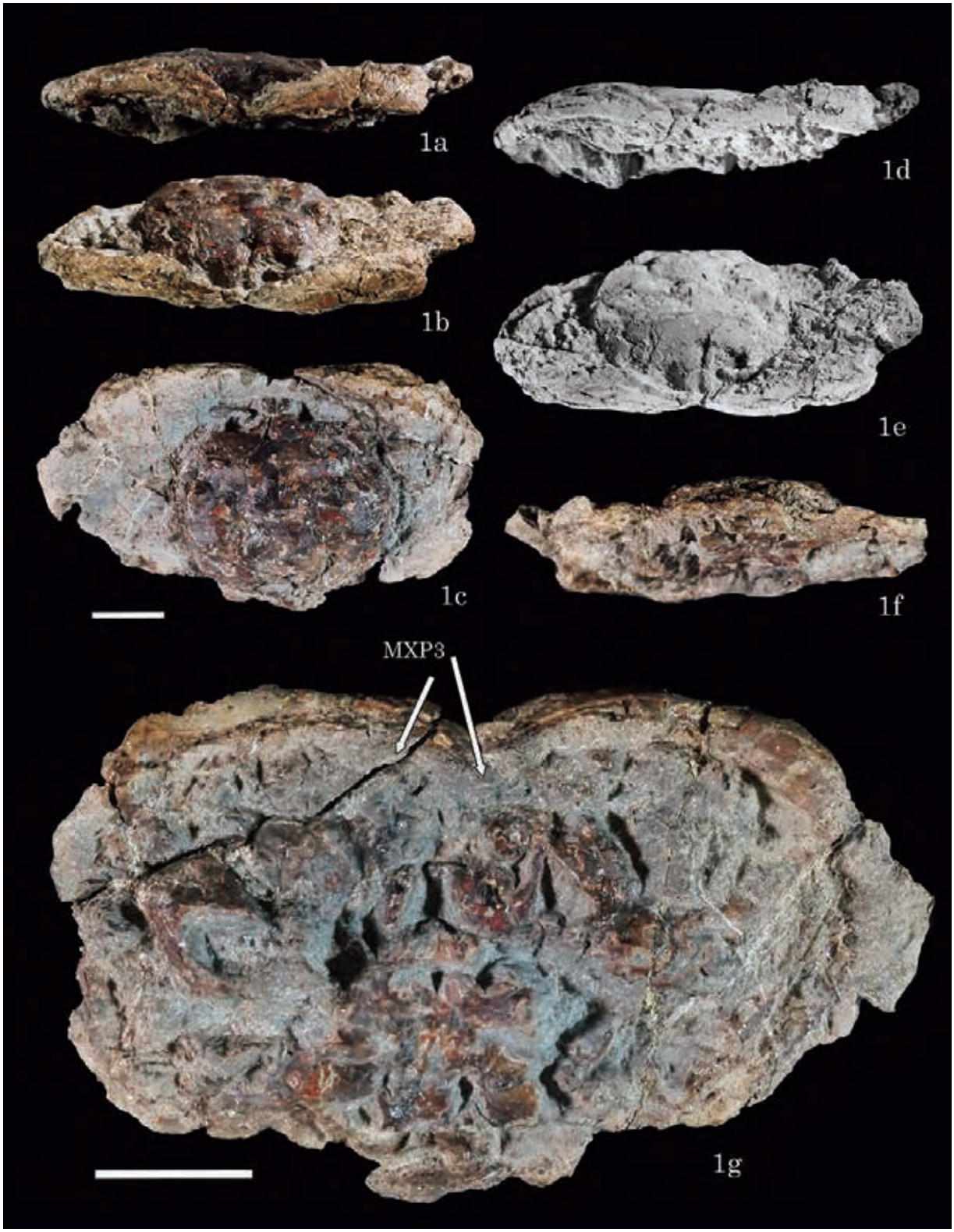
1a–3f. ***Archaeopus ezoensis*** **(Nagao, 1941).** Kita-ama Formation (early Maastrichtian) of Yura, coll. Kishimoto. ***1a–1g*****,** D1048525, carapace and pereiopods, *1a*, *1e*, frontal; *1b*, *1d*, ventral, *1c*, *1g*, dorsal; *1f*, lateral view. ***2a–2d*****,** D1048526, carapace and pereiopods of male, *2a*, *2b*, dorsal; *2c*, *2d*, frontal view. ***3a–3f*****,** D1048527, carapace and pereiopods of male, *3a*, *3d*, ventral; *3b*, *3e*, frontal; *3c*, *3f*, dorsal view. Scale bar = 1 cm. Figs. 1, 2, 4, 6a, 6b, and 7b are coated with ammonium chloride sublimate. Abbreviations: CD, cardiac region; E, eye; EB, epibranchial region; F, front; H, hepatic region; I, intestinal region; L, lateral margin; LO, lower orbital margin; MG, mesogastric region; MSB, mesobranchial region; MTB, metabranchial region; P, pereiopod; PM, posterior margin; PG, protogastric region; UG, urogastric region; UO, upper orbital margin.

Plate 20



1a–6b. ***Archaeopus ezoensis*** **(Nagao, 1941). 1, 4, 5, 6,** Kita-ama Formation (early Maastrichtian) of Yura; *2*, *3*, Shimonada Formation (early Maastrichtian) of Nadaokawa; *5*, Shimonada Formation (early Maastrichtian) of Nadachino. ***1a–1e,*** D1048528, male carapace, thoracic sternum, and pereiopods, coll. Kishimoto, *1a*, *1d*, frontal; *1b*, *1e*, posterior; *1c*, ventral view. ***2a, 2b,*** MFM247121, male carapace, thoracic sternum, and pleon (latex cast of ESN83013, *2a*, posterior; *2b*, ventral view. ***3,*** MFM247122, female thoracic sternum and pleon (latex cast of ESN83012, ventral view. ***4a, 4b,*** MFM247123, male thoracic sternum, *4a*, ventral; *4b*, posterior view. ***5a, 5b,*** D1048529, ventral view of male thoracic sternum and pleon, coll. Kishimoto. ***6a, 6b,*** D1048530, female thoracic sternum, pleon, and pereiopods, coll. Kishimoto, 6a, ventral; 6b, posterior view. Scale bar = 1 cm. Figs. 1d, 1e, 2a, 2b, 3, and 5b are coated with ammonium chloride sublimate. Abbreviations: E, eye; PS, pleon; SPC, sterno-pleonal cavity; TS, thoracic sternum.

Plate 21



1a–1g. *Archaeopus ezoensis* (Nagao, 1941). MFM247101, carapace, pereiopods, and thoracic sternum of female, Shimonada Formation of the Izumi Group (early Maastrichtian) of Nadachino. *1a*, *1d*, frontal; *1b*, *1e*, dorso-frontal; *1c*, dorsal; *1f*, posterior; *1g*, ventral view. Scale bar = 1 cm. Figs. 1d and 1e are coated with ammonium chloride sublimate. MXP3 indicates maxilliped 3.

Appendix
和文概要

和泉層群産後期白亜紀十脚目
附　アナエビ下目の 2 新属 1 新種と短尾下目の 1 新科の記載

柄沢　宏明・岸本　眞五・小原　正顕・安藤　佑介

兵庫県淡路島および大阪府に分布する上部白亜系和泉層群から産した 7 種の十脚目各種について，この機会に解説を加えることとした．しかし，解説文中に使われる用語訳は理解し難くなるため慣用的な表現に置き換え，また，図版中に一部略記を加え理解し易いものとした．また，科，属，及び種について和名が提唱されていないものが多く，適宜和名を与えることとした．

イセエビ下目　Achelata
イセエビ上科　Palinuroidea
イセエビ科　Palinuridae

ムカシイセエビ属（新称）*Astacodes*

ムカシイセエビ属の化石種は，チェコ・スイス・イギリス・アメリカ・アルゼンチン・オーストラリアの上部ジュラ系～上部白亜系よりこれまで記録がある（Aguirre-Urreta *et al*., 2012; Schweitzer *et al*., 2015）．

ムカシイセエビ属の未定種　*Astacodes* sp.

（Pl. 2, figs. 2a, b）

甲の表面は前方を向く顆粒で密に被われる．額角（R: rostrum）は緩やかに凹み縁取りがある．眼上棘（SO: supraorbital horn）は前側方向を向く三角形．胃域には弱い背面稜線（SDC: subdorsal carina）がある．頸溝（CR: cervical groove）は良く発達しＶ字型．頸溝より後方域に稜線はない．第 2 触角後方の背面域に弱い稜線（AC: antennal carina）がある．

ムカシイセエビ属の化石種としては，日本初記録であるが，甲は不完全であるため未定種とするに留めた．

ハコエビ属　*Linuparus*

ハコエビ属は，白亜紀後期に最古の記録を持ち，現生種はインド - 西太平洋から 4 種，化石種は世界中から記録があり，少なくとも 30 種以上が知られる（Kornecki *et al*., 2017, p. 284）．

ニッポンハコエビ（新称）
Linuparus japonicus Nagao, 1931

（Pl. 1; Pl. 2, figs. 1a–1c; Pl. 3–Pl. 6; Pl. 7, fig. 1）

ハコエビ属としては，中型から大型の体躯を持つ．甲（C: carapace）は亜方形で縦に長く，背面は圧平される．額角（R: rostrum）及び眼窩上縁（UO: upper orbital margin）には縁取りがある．額角は狭く，その前縁は緩やかに窪む．眼上棘（SO: supraorbital horn）は三角形で前方を向く．眼窩上縁は，緩やかに窪み，眼窩外棘は三角形で前方を向く．甲の表面には，小顆粒が散らばる．甲前部の側縁（LM: lateral margin）は適度に膨らみ小歯を刻む．内側の稜線（DLC: dorsolateral carina）は弧を描き，小歯を刻むとともに 4 本の前方を向いた短い棘がある．眼上棘の後方の前方を向く眼後棘（PO: postorbital spine）から，小顆粒をつけ縦走する稜線（PC: postorbital carina）があり，それは胃域前方中央にある低い瘤状突起（MG: median gastric node）の位置で終わる．胃域は，正中線を軸として窪み，後方の瘤状突起（PG: posterior gastric node）から伸び，弧を描く小顆粒よりなる稜線（GC: gastric carina）がある．頚溝（CR: cervical groove）は，深く，幅が広く，U 字型を呈し，中央部は横に真っ直ぐかやや膨らむ．後頸溝（PCR: postcervical groove）は浅く，頸溝と平行に走り，頸溝と後頸溝で挟まれた区画は緩やかに膨らむ．甲後部の胃域は正中線に沿って縦に膨らみ，側方はうねった窪みで囲まれる．その前縁は良く膨らみ，正中線上に稜線（MTC: median carina of thoracic region）が走る．側縁の稜線（LTC: lateral carina of thoracic region）は真っ直ぐで，小顆粒で縁取られる．頸溝後方の側面上には，発音器官として斜めに走る条線（SA: stridulatory apparatus）がある．甲後縁は窪み，稜線とその内側には深い溝が発達する．腹部は伸長し，その表面には小孔を穿つ．浅い傾斜した溝により各節の背域と側域は分けられる．腹部第 2 節（PS2: pleonal somite 2）～第 5 節（PS5: pleonal somite 5）の側域は，後方を向いた三角形で，後縁には 2 つの短い棘をつける．尾節（T: Telson）は亜方形で長く，その後方域は条線で覆われる．尾肢（U: uropod）の後方域も条線で覆われる．胸甲（TS: thoracic sternum）は三角形で後方に向かって幅が広い．第 1 触角（A1: antennule）は細く長い．第 2 触角（A2: antenna）も長く，基部（p: peduncle）は太く，鞭（f: flagellum）は極端に長く強固で曲がることはない．第 3 顎脚（MXP3: maxilliped 3）は，伸長し，口上板（EP: epistome）を越え，基節と長節の内縁には小歯を刻む．第 1 胸脚（P1: pereiopod 1）から第 2 胸脚（P2: pereiopod 2）は，それらの先端でハサミを形作ることはない．第 5 胸脚（P5: pereiopod 5）は著しく短く細い．口上板は正中線に沿って縦に膨らみ中央融合線があり 2 分される．また，その前縁には，前方を向き腹面側に向かって突出した棘（EPM: median projection of epistome）がある．

ニッポンハコエビは，北海道，岩手県，大阪府，兵庫県，及び愛媛県の上部白亜系より知られる．

ザリガニ下目　Astacidea
ウミザリガニ群 Homarida
アカザエビ上科　Nephropoidea
アカザエビ科　Nephropidae

コアカザエビ属（新称）*Hoploparia*

コアカザエビ属の化石は，世界各地の下部白亜系から中新統から知られ，65 種以上の化石種の報告がある（Kornecki *et al*., 2017, p. 277–278）.

ミヤモトコアカザエビ（新称）
***Hoploparia miyamotoi* Karasawa, 1998**
（Pl. 7, figs. 2a–Pl. 8）

甲（C: carapace）は側方から圧平され，その表面は小孔によって覆われる．額角（R: rostrum）は短く，細く，前方にのび，前方の側縁には小棘をつける．眼窩は狭く，窪み，縁取りがある．頸溝（CR: cervical groove）は良く定義され，緩やかに弧を描き腹側に向かって伸び，第 2 触角域溝（A: antennal groove）とつながる．後頸溝（PCR: postcervical groove）も良く定義されるが，肝域溝（H: hepatic groove）に向かうにつれ浅くなる．肝域溝は浅く，うねりながら第 2 触角域溝と頸溝につながる．胃域と眼窩域を分ける溝（G: gastro-orbital groove）は浅い．眼窩上棘（SP: supraorbital spine），眼窩後棘（PO: postorbital spine），後第 2 触角棘（AP: post antennal spine）はあるが小さい．頸溝，肝域溝，及び第 2 触角域溝の接合部直下の“オメガ隆起”（O: omega swelling）は良く膨らむ．甲前部には正中線上に稜線（MR: median carina）がある．甲の後部には弱い弧を描く鰓心溝（BC: branchiocardiac groove）がある．甲の後縁には縁取りがある．腹部は長く，その表面は小孔で覆われる．第 2（PS2: pleonal somite 2）～第 5 腹節（PS5: pleonal somite 5）の背域と側域は稜線により区別される．第 2 ～第 5 腹節の側域は亜方形で後方を向き，後側部の角と後縁に 1 小棘をつける．第 6 腹節（PS6: pleonal somite 6）の側域は狭い．尾節（T: telson）は後方に向かってすぼまり，その表面は小孔で覆われ，背面の正中線上に溝が走り，その両側に尾節の中央から後方に向かって伸びる溝がある．尾肢の内肢（UEN: uropodal endopod）は外肢よりも小さく，方形で，背面中央に縦走する稜線を持つ．外肢（UEN: uropodal exopod）は三角形を呈し，背面中央に縦走する稜線をつける．外肢背面の後端には横断線（D: diaeresis）があり，その後方は条線で装飾される．胸脚（P: pereiopod）は細く長く伸び．第 1 胸脚（P1: pereiopod 1）から第 3 胸脚（P3: pereiopod 3）は鉗脚を持つ．

ミヤモトコアカザエビは，上部白亜系和泉層群から知られるのみである．日本からは，この他，群馬県の下部白亜系よりカミムラコアカザエビ（*Hoploparia kamimurai* Kato and Karasawa, 2006），和歌山県の下部白亜系からナツミコアカザエビ（*Hoploparia natumiae* Karasawa *et al*., 2008），北海道の上部白亜系からカムイコアカザエビ（*Hoploparia kamuy* Karasawa and Hayakawa, 2000）が知られている．

アナエビ下目　Axiidea
アナエビ科　Axiidae

ヒネエビ属（新称）*Hinecaris*

ヒネエビ属は，模式種 *Hinecaris simplex* のみを含み創設された単型属である．

本属は，白亜紀から現生にかけて知られるアナエビ属（*Axiopsis*）に近いが，甲表面が弱いシワで覆われ，胃域の中央とその両脇の稜線を欠くことで区別される．

アナエビ科の日本産化石記録は少なく，漸新統杵島層群から *Axius*（s.l.）sp.（Karasawa and Fudouji, 2000）と上部ジュラ系相馬中村層群から *Protaxius* sp.（Kato *et al*., 2010）が知られるのみである .

ヒネエビ属（*Hinecaris*）の名称は，明治期の日根郡に模式産地の箱作があったことに由来する．また，模式種 *Hinecaris simplex* の種名は，甲前方の稜線が少なく，他のアナエビ類と比べ単純な装飾を持つことによる．

ヒネエビ（新称）*Hinecaris simplex*
（Pl. 9, figs. 1a–3c）

アナエビ科としては中位の体躯を持つ．甲表面は弱いシワで覆われる．額角（R: rostrum）は鋭角三角形で，側縁は装飾されない．額角背面には，正中線上に狭い溝があり，胃域の前方から後方 3 分の 1 位までのびる．眼窩外棘は短く，前側方向を向く．胃域は緩やかに膨らみ，中央とその両脇に位置する稜線はなく，眼窩内側から続く稜線は弱く発達する．眼窩外棘からのびる稜線はほとんど真っ直ぐにのび，小顆粒で覆われる．第 2 触角の後方には傾いた稜線がある．頸溝（CR: cervical groove）は良く定義され，その後方にいかなる稜線もつけない．腹部（PS: pleon）は伸長し，その表面は細かな小孔で覆われる．腹部第 1 節（PS1: pleonal somite 1）は短く，狭く区画された前側域を持つ．腹部第 2 節（PS2: pleonal somite 2）は，腹部第 3 節（PS3: pleonal somite 3）よりも長い．腹部第 2 節から第 5 節（PS2–5: pleonal somites 2–5）の背域と側域の後方域は，切れ込みと溝により区別され，腹縁は強く膨らんでいる．腹部第 6 節（PS6: pleonal somite 6）は，腹部第 5 節よりも長く，その腹縁はうねっている．尾節（T: telson）は，後方にむかってすぼまる台形．尾肢（U: uropod）は，棘で装飾されない．内肢（UEN: uropodal endopod）は三角形で，側縁は緩やかに膨らみ，後縁はうねっており，背面の中央部と側縁部に稜線をつける．外肢（UEX: uropodal exopod）は，楕円形で，内肢よりも十分に大きく，良く膨らんだ側縁と後縁を持つ．背面には，中央に 2 本の稜線があり，後方域に横断する線はない．第 1 胸脚から第 5 胸脚（P1–P5: pereiopods 1–5）は，細く，第 5 胸脚は極端に短い．

アナエビ科の未定属および未定種
Axiidae, genus and species indeterminate
（Pl. 10, figs. 1a–f）

標本は，左第 1 胸脚の掌部と可動指よりなる．本標本は，現生 *Eiconaxius* 属の鉗脚に似るが，はるかに大きい．また，鉗脚表面が棘や顆粒で被覆されないことを除けば，白亜紀産 *Schlueteria* 属の鉗脚にも形態的に良く似る．しかし，甲を欠くため，アナエビ科の未定属および種とするに留める．先に記載したヒネエビは，残念ながら第 1 胸脚の掌部と可動指を欠き比較ができない．

ガーレスナモグリ科（新称）Gourretiidae

アワジスナモグリ属（新称）*Ahazianassa*

アワジスナモグリ属は，模式種 “*Callianassa*”（s.l.）*masanorii* Karasawa, 1998 のみを含む単型属である．

Karasawa（1998）による “*Callianassa*”（s.l.）*masanorii* の原記載中では，甲に甲背面の卵形域とタラシナ線を持つが，第 3 顎脚，尾節，及び尾肢を欠くため，広義のスナモグリ属（*Callianassa*）に含められた．模式標本及び追加標本の検討から，本種は 尾肢の外肢に背板を持たないことが判り，そのため，スナモグリ属を含むスナモグリ科（Callianassidae）から除外される．また，尾肢が楕円形を呈するため，Callianopsidae, Gourretiidae, 及び Paracalliacidae の各属各種に比較される．しかし，Callianopsidae と Paracalliacidae は，甲の心域突起と腹部第 6 節の側縁突起を持つことが定義的特徴であり，本種はこれらの特徴を持たない．そのため，残るガーレスナモグリ科（Gourretiidae）に帰属するものとした．

ガーレスナモグリ科は，*Gourretia*，*Heterogourretia*，*Ivorygourretia*，*Laurentgourretia*，*Ruiyuliugourretia*，*Plantesgourretia* と *Tuerkaygourretia* の 7 属を含み，現生種はベネズエラ，西大西洋およびインド洋―西太平洋から知られるが，日本からの記録はない（Sakai, 2011; Sakai，2017b；Dworschak and Poore，2018）．本種は，腹部第 6 節の側縁突起と尾肢の外肢に切れ込みがないため，*Gourretia*，*Ivorygourretia*，及び *Plantesgourretia* 属に含まれる種に近いが，甲に甲背面の卵形域を持ち，第 1 胸脚は長節腹縁のカギ状突起を欠き左右不同であることから明らかに区別される．そのため，本種に対し新属 *Ahazianassa* を提唱した．なお，本属の由来は，古代における国名の淡路（アハヂ）に由来する．

ガーレスナモグリ科化石種は，オーストリアの中新統から知られるのみであったが，*Ahazianassa* の存在により，本科の起源は後期白亜紀まで遡ることとなった．

アワジスナモグリ（新称）
***Ahazianassa masanorii*（Karasawa, 1998）**
（Pl. 10, fig. 2–Pl. 17）

ガーレスナモグリ科としては大型の体を持つ . 甲（C: carapace）は比較的強固．額角（R: rostrum）は，短く，三角形で，その側部には棘をつけない．タラシナ線（LT: linea thalassinica）は良く定義される．甲背面の卵形域（DO: dorsal oval）は膨らみ，甲の中央まで達する．頸溝（CR: cervical groove）は良く発達し，肝域突起（HB: hepatic boss）は明瞭，心域突起はない．腹部（PS: pleon）は比較的強固，伸長し，その表面は滑らかである．第 1 節（PS1: pleonal somite 1）は短く，第 2 節（PS2: pleonal somite 2）は最も長い．第 2 節から第 5 節（PS5: pleonal somite 5）の側域は丸みを帯びた方形で，各節の後方は，アーチ状の溝により，背域と側域が区別される．第 6 節（PS6: pleonal somite 6）は，第 5 節よりもやや長く，側方突起をもたない．尾節（T: telson）は方形で，側縁は真っ直ぐにのび，後縁は緩やかに膨らみ，背面には浅い正中溝がある．尾肢（U: uropod）の内肢（UEN: uropodal endopod）は楕円形で背面中央に稜線がある．尾肢の外肢（UE: uropodal exopod）は内肢よりも長く，背面には縦走する 2 つの稜線があり，背板および横断線を欠き，その後縁は完縁で膨らんでいる．第 1 胸脚（P1: pereiopod 1）は鉗脚となり，背縁及び腹縁に装飾はなく，左右で不同・異型． 大鉗脚（P1L: major cheliped）の可動指（d: dactylus）先端は強く腹側に向かって曲がる．不動指（f: fixed finger）先端は緩やかに背側に向かって曲がる．掌節（p: palm）は側方から見て長方形で遠心側に向かってすぼまる．背縁は緩やかに膨らみ，腹縁はまっすぐで，遠心縁は背縁に対してほぼ直角で不動指の直上で浅く窪み，近心縁は腹縁に対しほぼ直角となる．腕節（c: carpus）は短く，真っ直ぐな背縁と強く膨らんだ腹縁を持つ．長節（m: merus）は腕節と同じくらいの長さで側方からみて菱形で，背縁及び腹縁ともに強く膨らみ，腹縁突起を欠き，縦走する稜線をつけた側面は良く膨れる．小鉗脚（P1S: minor cheliped）は大鉗脚に比べやや小さく細長い．可動指は細く真っ直ぐに伸びるが，先端は腹側に向かって曲がる．不動指も可動指と同じく細く真っ直ぐに伸びる．掌節は方形で，背縁及び腹縁は緩やかに膨らみ，遠心方向に向かってすぼまる．腕節は方形で短く，背縁は緩やかに，また腹縁は強く膨らむ．長節は腕節より長く，背縁と腹縁は緩やかに膨らみ，近心方向に向かってすぼまる．第 2 胸脚（P2: pereiopod 2）も鉗脚を持ち，鉗脚は亜三角形を呈し，指節は短く，掌節はほぼ指節の長さに等しい．腕節は掌節の約 2 倍の長さがあり，近心方向に向かってすぼまる．長節は長く，腕節のおよそ 2.5 倍の長さがある．第 3 胸脚～第 5 胸脚（P3–P5: pereiopods 3–5）は第 2 胸脚同様に細く長い．腹肢（PL: pleopod）は長い．

アワジスナモグリは，ノジュール中に立体的に保存され，第 1 胸脚の鉗脚のみの産出が多い．また，甲，腹部，第 2 胸脚から第 5 胸脚，腹肢が保存されたものもあり，関節で外れることなく残されている場合もある．さらに，同一のノジュールに複数個体が保存されているものもある（pl. 17, figs. 1a–4b）．Bishop and Williams（2005）や Hyžný and Klompmaker（2015）は，ほとんど完全な体躯の保存された化石は，巣穴内ある

いはその近くで化石化したものとした．しかし，アワジスナモグリは巣穴を伴うことのないノジュール中からの産出で他に類を見ない産状を示す．

短尾下目　Brachyura
真短尾群　Eubrachyura
ユウレイガニ上科　Retroplumoidea

ガンメンガニ科（新称）Archaeopidae

ユウレイガニ科は，11 属より構成される（Schweitzer and Feldmann, 2018）．この内，*Archaeopus* 属は，Rathbun（1908）により創設された単型属であり，原記載中ではユウレイガニ科の元に置かれ，続く研究中でもユウレイガニ科に含められる（例えば，Collins *et al*., 1993; De Grave *et al*., 2009; Schweitzer *et al*., 2010）．一方，Glaessner（1969）はこの属をイトアシガニ科（Palicidae）に移し，McLay（2006）はこれを支持した．しかし，イトアシガニ科では，腹部は第 3 顎脚の基部まで達する，額角は広く二分または四分される，眼窩上縁に 2 つの切れ込みがある，甲側縁には多数の歯状突起で装飾される，第 1 胸脚の鉗脚が著しく小さい，などの特徴を持つ．しかし，*Archaeopus* 属は明らかにこれらの特徴を欠いている．それ故，*Archaeopus* 属はイトアシガニ科に置くことが出来ない．

Archaeopus 属を除き，ユウレイガニ科の各属は，甲が平坦で，甲の分画は不明瞭であり，その表面には良く発達した稜線を持ち，額角は極端に狭い，という共通の特徴を持つ．また，現生属及び胸甲や腹部を残す化石属の中で共通する特徴としては次のものが挙げられる：胸甲の中央の窪みは第 3 胸節に達する；腹部各節には横断する稜線が発達する；オスの第 6 腹節は三日月型を呈する；腹部を固定するための側方突起をもつ；第 3 ～第 5 腹節は融合する．*Archaeopus* 属は，これらのユウレイガニ科の特徴を明らかに欠くため，本属を模式属とする単型科を創設した．

ガンメンガニ属（新称）*Archaeopus*

甲は亜方形で，やや幅が広く，甲長の後方 3 分の 1 位で最大幅となる．額（F: front）は狭く，眼窩域よりも前方に突出し，背面中央に溝があり，側縁は後方に向かって広がり眼窩上縁（UO: upper orbital margin）に続く．眼窩上縁は幅が広くうねり縁取りがある．眼窩外棘は鋭く，前側方向に向かって突出し，その基部内側に浅い切れ込みがある．眼窩腹縁（LO: lower orbital margin）に背側から見える棘があり，眼窩外棘よりも突出する．側縁（L: lateral margin）は弱く膨らみ，後方に向かって広がり，中央部に短い棘をつける．その後側縁部は窪み縁取りがある．後縁（PM: posterior margin）は甲幅の 2 分の 1 くらいで，弱くくぼみ縁取りがある．甲背面は膨れ，各域は良く定義される．未成熟個体の甲は，成熟個体に比べ縦長で甲背面各域は明瞭である．原胃域（PG: protogastric region）には，横に真っ直ぐか，あるいは弧を描く稜線があり，中胃域（MG: mesogastric region）は横断する稜線がある．心域（CD: cardiac region）は横に長い五角形で，横断する稜線があり，両側部は隆起域で囲まれる．肝域（H: hepatic region）には小隆起域がある．前鰓域（EB: epibranchial region）は 2 つの楕円形の隆起域を持つ．中鰓域（MSB: mesobranchial region）には，傾いた不連続に連なる隆起域がある．胸甲（TS: thoracic sternum）は幅が広く，第 5 胸節で最も幅が広い．第 1 胸節と第 2 胸節は融合し，三角形を成し正中線上が窪む．第 2 胸節と第 3 胸節の融合線は完全で，横に真っ直ぐ走る．第 3 胸節は短い．第 4 胸節は最も長く前方に向かってすぼまる．第 5 胸節から第 7 胸節は幅が広い．第 3 と第 4，第 4 と第 5，第 5 と第 6，及び第 6 と第 7 胸節の融合線は不完全である．第 6 及び第 7 胸節には中央に溝がある．第 8 胸節は明らかに小さい．オスの胸甲中央の窪み（SPC: sternopleonal cavity）は深く，その前縁は第 3 胸節と第 4 胸節の融合線に達する．オスの腹部（PS: pleon）は狭く，6 節ともに融合しない．尾節は亜台形，第 6 節は亜台形で，全ての腹節の中で最も長い．側縁は真っ直ぐで，前方に向かいややすぼまる．メスの腹部も各節は融合せず，オスに比べ幅が広い．中軸部は盛り上がり，側域は浅い溝で中軸部より分けられる．第 1 胸脚（P1: pereiopod 1）は鉗脚となり，性差により，形が異なる．オスの鉗脚は，異形で，大鉗脚（P1L: major cheliped of pereiopod 1）の指節は完全に閉じることなく隙間があり，小鉗脚（P1M: minor cheliped of pereiopod 1）は大鉗脚に比べ細く長い．メスの鉗脚は左右ほぼ同型，オスに比べ細く長く伸長する．第 2 胸脚から第 4 胸脚は細く長い．第 5 胸脚（P5: pereiopod 5）は第 4 胸脚に比べ，極端に短く．背側に位置する．眼（E: eye）は長く，眼柄は遠心方向に向かい，幅を減ずる．口部は亜方形．第 3 顎脚（MXP3: maxilliped 3）の近心縁は完全に接することなく隙間がある．

日本の上部白亜系より 1 種，北アメリカ太平洋岸の上部白亜系～始新統から 7 種が知られる（Schweitzer *et al*., 2010）．

ガンメンガニ（新称）
***Archaeopus ezoensis*（Nagao, 1941）**
（Pl. 18–Pl. 21）

ガンメンガニは，北海道むかわ町穂別の上部白亜系函淵層群から初めて記載された（Nagao, 1941）．本種は上述の特徴を持つほか，原胃域の横断する稜線が弱いことで他の種から区別される（Collins *et al*., 1993）．