

# Additions to Cretaceous decapod crustaceans from Hokkaido, Japan—Part 1. Nephropidae, Micheleidae and Galatheidae

HIROAKI KARASAWA<sup>1</sup> and HIROSHI HAYAKAWA<sup>2</sup>

<sup>1</sup>Mizunami Fossil Museum, Yamanouchi, Akeyo, Mizunami, Gifu 509–6132, Japan (e-mail: GHA06103@nifty.ne.jp)

<sup>2</sup>Mikasa City Museum, Mikasa 068–2111, Japan (e-mail: HQH03526@nifty.ne.jp)

Received 17 January 2000; Revised manuscript accepted 16 March 2000

**Abstract.** Four new species of decapod crustaceans are described from the Upper Cretaceous Upper Yezo Group in Hokkaido, Japan. The monotypic genus *Paki* (Thalassinidea, Micheleidae) is erected with *P. rurkonsimpu* sp. nov. *Hoploparia kamuy* sp. nov. (Astacidea, Nephropidae) represents the first record of the genus *Hoploparia* from the Turonian-Santonian of Japan. *Luisogalatea* gen. nov. (Anomala, Galatheidae), erected with the type species *L. tomitai* sp. nov., contains two North American Cretaceous species, *Galathea cretacea* Stenzel and *Eomunidopsis cobbani* Bishop. *Eomunidopsis kojimai* sp. nov. (Anomala, Galatheidae) represents the first record of the genus from the North Pacific realm.

**Key words:** Crustacea, Decapoda, Hokkaido, Japan, Upper Cretaceous, Upper Yezo Group

## Introduction

The Upper Cretaceous decapod Crustacea from Hokkaido comprises nine species, *Linuparus japonicus* Nagao, 1931 (Palinura, Palinuridae), *Callianassa ezoensis* Nagao, 1941 (Thalassinidea, Callianassidae), and seven brachyurans (Collins, Kanie and Karasawa, 1993). In the present paper we describe four additional new species, one astacidean, one thalassinidean and two anomalans, from the Upper Yezo Group of Hokkaido.

The described specimens are deposited in the Mikasa City Museum (MCM) and the Mizunami Fossil Museum (MFM).

## Systematic paleontology

Infraorder Astacidea Latreille, 1802  
Superfamily Nephropoidea Dana, 1852  
Family Nephropidae Dana, 1852  
Subfamily Homarinae Huxley, 1879  
Genus *Hoploparia* McCoy, 1849

*Type species.*—*Astacus longimanus* Sowerby, 1826 by subsequent designation by Rathbun, 1926.

### *Hoploparia kamuy* sp. nov.

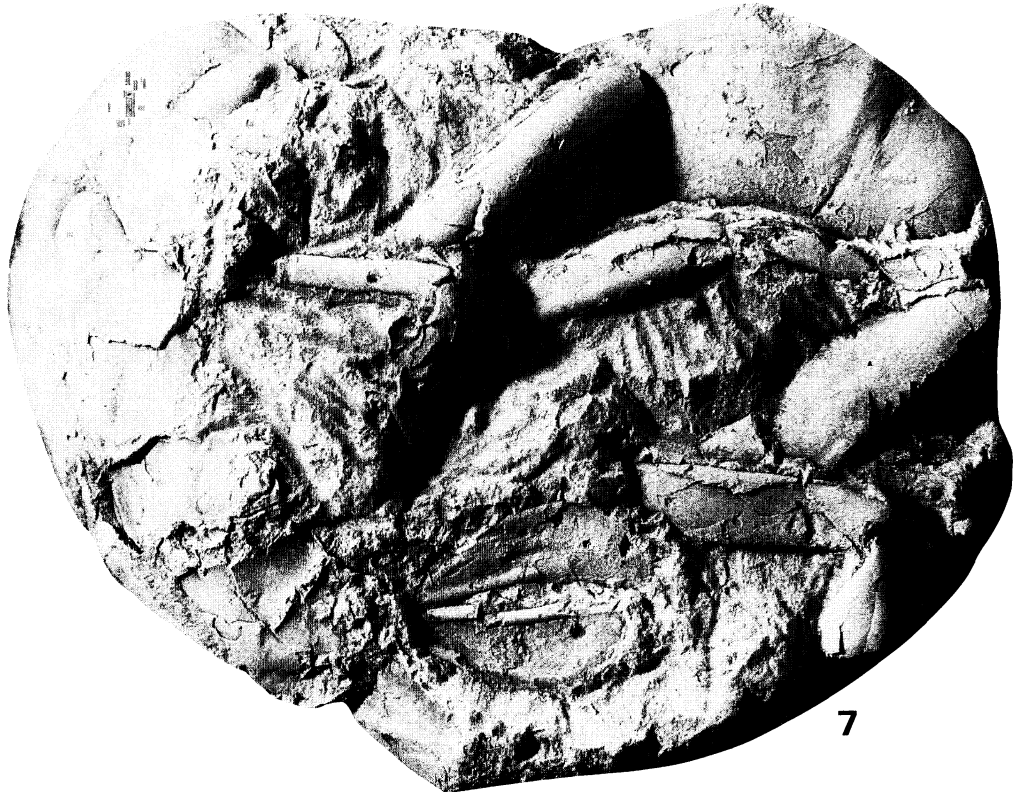
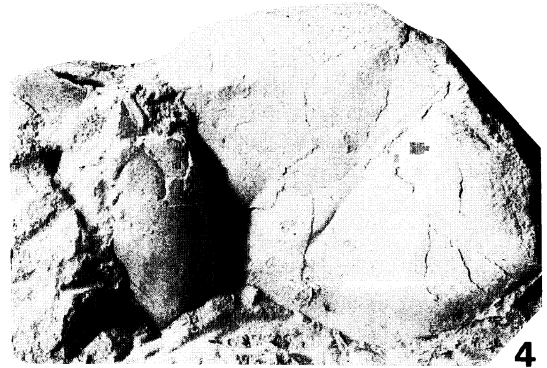
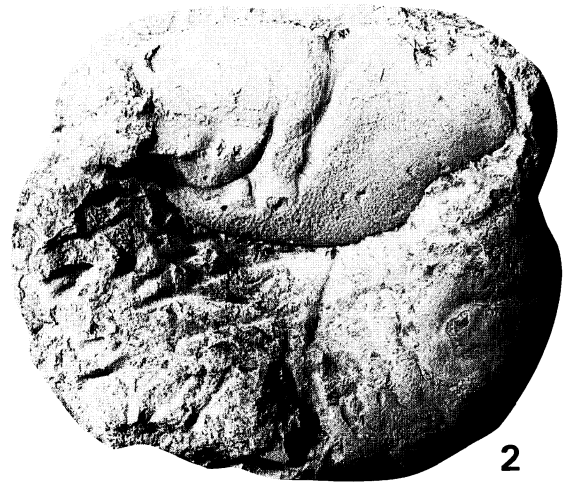
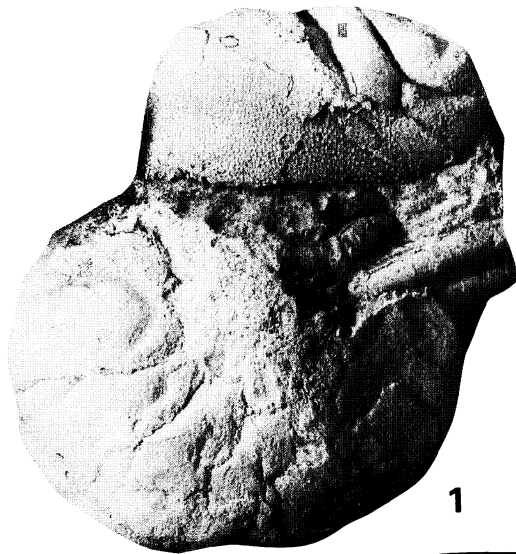
Figure 1.1, 1.2, 1.5, 1.6

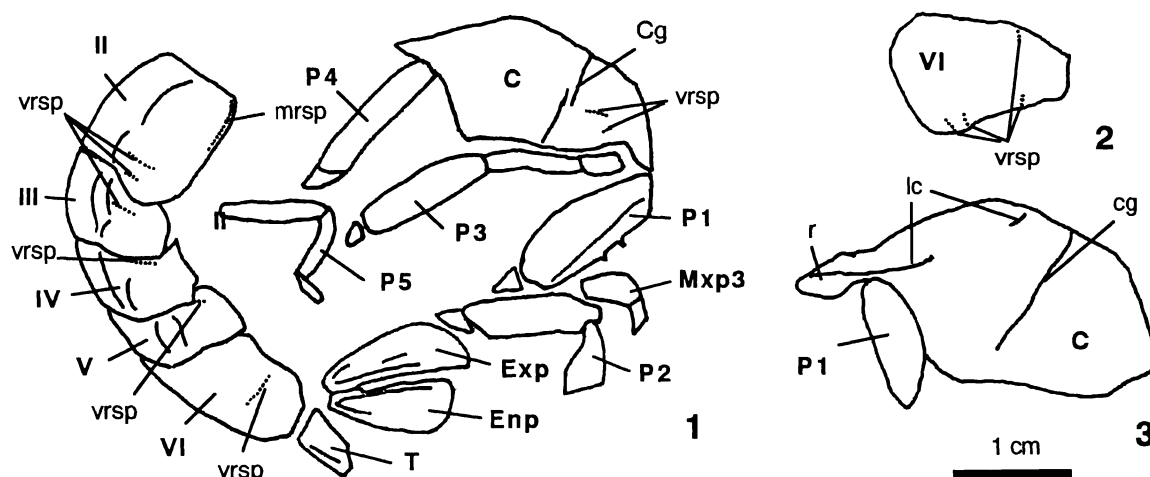
*Diagnosis.*—Moderate-sized *Hoploparia*. Carapace with well developed grooves on anterior half. Antennal region bearing antennal ridge and one postantennal spine.

Abdominal somites simple without tubercles and spines.

*Description.*—*Hoploparia* with moderate-sized body. Carapace laterally compressed. Rostrum and posterior part of carapace lacking. Surface finely granulated. Orbit small, rounded, bordered by narrow, rounded ridge. Postcervical groove well defined, deep, broad, obliquely extending ventrally, becoming shallower at junction with hepatic groove. Branchiocardiac groove weak. Intercervical groove shallow, extending anteroventrally to, but not joining cervical groove. Second intercervical groove broad, shallow, extending to cervical groove. Hepatic groove shallow, curving to join antennal and cervical grooves. Cervical groove well defined, deep, slightly arcuate, parallel to postcervical groove, extending ventrally to join antennal groove. Antennal groove weakly arcuate, well defined over prominence omega. Prominence omega well defined, triangular. Gastro-orbital groove shallow, extending to near upper part of cervical groove. Antennal region with antennal ridge and with small, forwardly directed postantennal spine. Metorbital spine present, small. Supraorbital and postorbital spines wanting.

Terga of abdominal somites 1–5 smooth, but tergum of somite 6 finely pitted; tergum of somite 1 short; somite 2 largest of all terga. All pleura of somites finely punctate. Pleuron of somite 1 reduced. Pleuron of somite 2 subrectangular; margins gently convex; anteroventral and posteroventral corners smoothly rounded; surface with marginal furrows joining transverse furrow on anterior part of tergum. Pleura of somites 3–5 triangular, transversely convex with sharp, posteroventral corners with shallow, broad marginal furrow along posterior margin. Pleuron of somite 6 reduced. Telson broken, but dorsal surface finely pitted.





**Figure 2.** *Paki rurkonsimpu* gen. et sp. nov., MCM.A539 (holotype). 1. Carapace, abdominal somites, telson, uropod and pereopods, right lateral view. 2. Abdominal somite 6, dorsal view. 3. Carapace and pereopod 1, left lateral view. **Abbreviations:** C, carapace; cg, cervical groove; Enp, uropodal endopod; Exp, uropodal exopod; lc, lateral carina; mrsp, marginal row of setal pits; Mxp3, maxilliped 3; P1, pereopod 1; P2, pereopod 2; P3, pereopod 3; P4, pereopod 4; P5, pereopod 5; r, rostrum; T, telson; vrsp, vertical row of setal pits; II, abdominal somite 2; III, abdominal somite 3; IV, abdominal somite 4; V, abdominal somite 5; VI, abdominal somite 6.

Uropodal exopod triangular in outline, finely pitted dorsally, with weakly convex lateral margin and with diaeresis.

Chelae of pereopod 1 unknown. Some pereopods preserved, slender.

**Discussion.**—The species differs from *Hoploparia miyamotoi* Karasawa, 1998, the only known Japanese species from the Maastrichtian Izumi Group, by having the carapace with an antennal ridge and with well developed cervical and postcervical grooves. *H. kamuy* sp. nov. lacks well developed ridges between terga and pleura of abdominal somites, and marginal spines of pleura of abdominal somites 3–5.

*Hoploparia kamuy* sp. nov. is most similar to *Hoploparia pusilla* Secretan, 1964, from the Campanian of Madagascar, but differs in that the carapace bears a weak hepatic groove, a straight gastro-orbital groove, and a well defined prominence omega. *H. kamuy* sp. nov. resembles *Hoploparia arbei* Aguirre-Urreta, 1989 from the Puesto El Almo Formation (Turonian-Coniacian) of Argentina, but differs by absence of two tubercles on pleura of abdominal somites and of a granulated ridge on the branchial region.

*Hoploparia kamuy* represents the first record of the genus from the Turonian-Santonian of Japan.

**Etymology.**—The specific name is formed from 'kamuy', the name of a god in the Ainu language of Hokkaido.

**Material examined.**—MCM.A609 (holotype), Loc. YEZ-16, Oyubari, Yubari City; Upper Yezo Group (Lower Santonian;

*Inoceramus amakusensis* Zone by Ando and Kodama (1998)); collected by N. Nikkawa. MCM.A536 (paratype), Loc. YEZ-17, Ponbetsuzawa, Mikasa City; the basal part of the Upper Yezo Group (Upper Turonian; *Inoceramus teshioensis* Zone by Ando and Kodama (1998)); collected by S. Matsuda.

Infraorder Thalassinidea Latreille, 1831  
Superfamily Axioidea Huxley, 1879  
Family Micheleidae Sakai, 1992  
Genus *Paki* gen. nov.

**Type species.**—*Paki rurkonsimpu* sp. nov. by monotypy.

**Diagnosis.**—Large-sized micheleid. Rostrum of carapace with rounded tip; lateral carina well developed; cervical groove distinct; *linea thalassinica* absent; anterolateral region with two vertical rows of setal pits anterior to cervical groove. Terga and pleura of abdominal somites 2–5 bounded by weak ridge; pleuron of somite 2 with two vertical rows of setal pits posteriorly and with marginal row of setal pits anteriorly; pleura of somites 3–6 with single vertical row of setal pits anteriorly; pleuron of somite 6 with two vertical rows of setal pits anteriorly and single vertical row of setal pits posteriorly. Telson rectangular with two longitudinal carinae. Uropodal exopod and endopod with median dorsal ridge and with convex margins.

**Figure 1.** 1, 2, 5, 6. *Hoploparia kamuy* sp. nov. 1. MCM.A536 (paratype), carapace, abdominal somites, telson and uropod,  $\times 2.0$ , right lateral view. 2. MCM.A609 (holotype), carapace and abdominal somites,  $\times 2.0$ , left lateral view. 5. MCM.A536 (paratype), abdominal somites and uropod,  $\times 2.0$ , left lateral view. 6. MCM.A609 (holotype), abdominal somites,  $\times 2.0$ , right lateral view. 3, 4, 7. *Paki rurkonsimpu* gen. et sp. nov. 3. MCM.A539 (holotype), carapace and eye stalks,  $\times 3.0$ , dorsal view. 4. MCM.A539 (holotype), carapace and left pereopod 1,  $\times 3.0$ , left lateral view. 7. MCM.A539 (holotype), carapace, abdominal somites, telson, uropod and pereopods,  $\times 3.0$ , right lateral view.

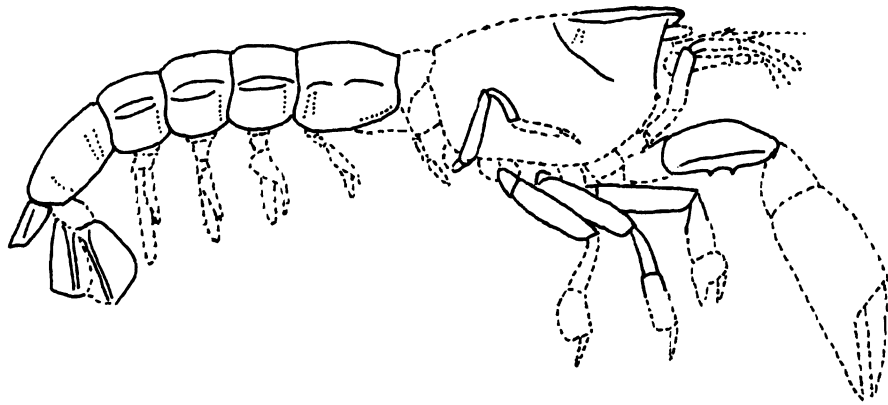


Figure 3. Reconstruction of *Paki rurkonsimpu* gen. et sp. nov.

**Discussion.**—The present new genus and species is assigned to the family Micheleidae Sakai, 1992 in the superfamily Axioidea Huxley, 1879 by lacking *linea thalassinica* on the carapace and by having rows of setal pits on the carapace and pleura of abdominal somites. According to Poore (1997) Micheleidae contains four Recent genera, *Michelea* Kensley and Heard, 1991, *Tethisa* Poore, 1994, *Meticonaxius* De Man, 1905 and *Marcusiaxius* Rodrigues and de Carvalho, 1972. The pattern of rows of setal pits on the anterior part of the carapace and the characters of propodi of pereopods 1–5 are not observed, but in the character of the remaining carapace and abdominal somites, the genus is most similar to *Meticonaxius* and *Marcusiaxius*. Two rows of pits anterior to the cervical groove on the carapace, two vertical rows of pits on the pleuron of abdominal somite 2, and rounded margins of the uropodal exopod and endopod readily distinguish the new genus from *Meticonaxius* and *Marcusiaxius*. *Paki* differs from *Tethisa* by having rows of setal pits on abdominal somites 3–5 and having an ovate uropodal exopod. The new genus also differs from *Michelea* in that the carapace bears a lateral carina and rows of pits in front of the cervical groove.

In the pattern of rows of setal pits on the abdominal somites *Upogebia rhacheochir* Stenzel, 1945 from the Turonian Britton Formation of Texas belongs to the family Micheleidae and may be assigned to *Meticonaxius* or *Marcusiaxius*. However, a well preserved carapace of Stenzel's species is needed to more precisely define the systematic position. Poore (1997: 364) described *Marcusiaxius* sp. from the Albian of Gault, Folkestone of England. Therefore, these occurrences extend the geologic range for the family Micheleidae back to the Cretaceous.

**Etymology.**—The generic name is derived from the word, 'paki', meaning shrimp in the Ainu language of Hokkaido; masculine gender.

***Paki rurkonsimpu* sp. nov.**

Figures 1.3, 1.4, 1.7; 2.1–2.3; 3

**Description.**—Large micheleid. Carapace laterally compressed. Anterior half of carapace poorly preserved. Rostrum extended anteriorly into rounded tip; dorsal surface missing. Eye stalks visible in dorsal view. Lateral carina well developed. Cervical groove distinct. *Linea thalassinica* absent. Anterolateral region with two vertical rows of setal pits anterior to cervical groove.

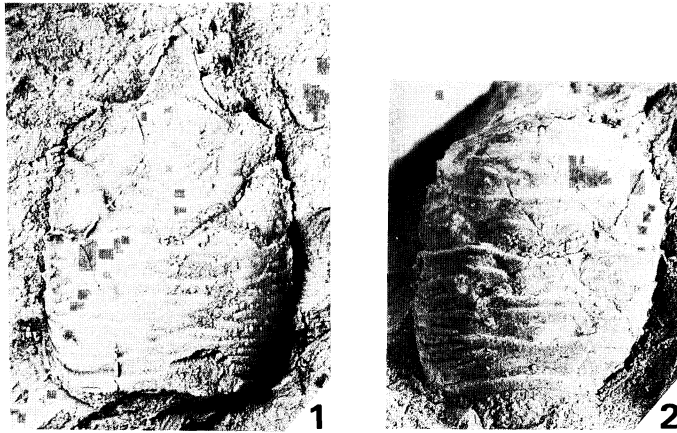
Abdominal somites 2–6 preserved. Somite 2 about 1.5 times as long as 3. Terga and pleura of somites 2–5 bounded by weak ridges. Pleuron of somite 2 with two vertical rows of setal pits posteriorly and with marginal row of setal pits anteriorly; pleura of somites 3–6 with single vertical row of setal pits anteriorly; pleuron of somite 6 reduced with two vertical rows of setal pits anteriorly and single vertical row of setal pits posteriorly. Surfaces of pleura of somites 2–5 finely punctuate. Telson rectangular, slightly wider than long, about 1/3 times as long as somite 6; lateral margin divergent posteriorly; dorsal surface with two longitudinal carinae and with two pits anteriorly. Uropodal exopod, lacking posterior half, with median dorsal ridge, convex anterolateral margin and finely serrated lateral margin. Uropodal endopod lacking anterior half, bearing median dorsal ridge and convex posterior margin.

Merus of pereopod 1 bearing convex lateral margin with longitudinal ridge and with two spines on ventral margin. Carpus and merus of pereopod 2 flattened. Propodus of pereopod 3 flattened; merus about 1.5 times as long as carpus. Merus of pereopod 4 ovate in cross section. Pereopod 5 short; merus about 1.5 times as long as carpus. Merus and carpus of maxilliped 3, slender, flattened laterally.

**Discussion.**—The species is similar to *Upogebia rhacheochir*, but differs by possessing two vertical and one marginal rows of setal pits on the pleuron of the abdominal somite 2.

**Etymology.**—The specific name is derived from the word 'rurkonsimpu', meaning a fairy living in seas in the Ainu language of Hokkaido.

**Material examined.**—MCM.A539 (holotype), Loc. YEZ-18, Kotanbetsu, Tomamae-cho, Tomamae-gun; Upper Yezo Group (Lower Campanian; *Sphenocerasmus orientalis* Zone);



**Figure 4.** 1. *Luisogalatea tomitai* gen. et sp. nov., MFM247.010 (holotype), carapace,  $\times 3.0$ , dorsal view. 2. *Eomunidopsis kojimai* sp. nov., MFM247.011 (holotype), carapace,  $\times 3.0$ , dorsal view.

collected by H. Hayakawa.

Infraorder Anomala Boas, 1880  
Superfamily Galattheoidea Samouelle, 1819  
Family Galatheidae Samouelle, 1819  
Genus *Luisogalatea* gen. nov.

*Type species.*—*Luisogalatea tomitai* sp. nov.

*Diagnosis.*—Moderate-sized galatheid. Carapace excluding rostrum, longer than wide, dorsally longitudinally gently convex. Rostrum triangular, simple, lacking lateral spines, concave dorsally; lateral margins smooth but bearing a small lateral projection on distal fifth. Lateral margin gently convex with small spines. Dorsal surface rugose without spines. Cervical and postcervical grooves well defined.

*Discussion.*—There may be, in the general outline of the carapace, similarity between *Luisogalatea* and the Tithonian-Maastrichtian genus, *Eomunidopsis* Via Boada, 1981, but absence of a median dorsal ridge on the rostrum and presence of spines on the lateral margin of the carapace readily distinguish *Luisogalatea* from *Eomunidopsis*. In *Eomunidopsis* supplementary dorsal furrows of the carapace are more or less developed.

Stenzel (1945) described two new galatheids, *Galathea cretacea* and *Galathea? limonitica* from the Pawpaw Shale (Albian-Cenomanian) of Texas. Bishop (1985) described *Eomunidopsis cobbani* Bishop, 1985 from the Campanian Larimer Sandstone of Colorado and assigned both of Stenzel's species to *Eomunidopsis*. Fraaye and Collins (1996: 323) suggested that these American species, *G. cretacea* and *E. cobbani*, having the rostrum without a median ridge, possibly belonged to *Paragalathea* Patruilius, 1959. *G. cretacea* differs from members of *Galathea* Fabricius, 1793 by having a triangular rostrum with smooth lateral margins. *Paragalathea* is characterised by having a large, broadly triangular rostrum and by having the dorsal surface of the carapace more or less tuberculate and with smooth lateral margins that diverge anteriorly. Both *G.*

*cretacea* and *E. cobbani* are transferred from *Eomunidopsis* to the present genus in that their carapaces have the genus characteristics of an acutely triangular rostrum with smooth lateral margins and without a median rostral ridge, a rugose dorsal surface, and gently convex lateral margins bearing spines. Only *Galathea? limonitica* belongs to the genus *Eomunidopsis* by exhibiting well defined carapace furrows.

*Etymology.*—The generic name is dedicated to the late Spanish paleocarcinologist, Dr. Luis Via Boada; feminine gender.

*Species included.*—*Luisogalatea tomitai* sp. nov., *Luisogalatea cobbani* (Bishop, 1985) comb. nov. from the Campanian-Maastrichtian of U.S.A., *Luisogalatea cretacea* (Stenzel, 1985) comb. nov. from the Cenomanian of U.S.A.

***Luisogalatea tomitai* sp. nov.**

Figure 4.1

*Diagnosis.*—Carapace excluding rostrum, subquadrate, dorsally longitudinally gently convex, width about 3/4 the length. Rostrum triangular, smooth dorsally with median depression; lateral margins bearing a small lateral projection on distal fifth. Orbital margin concave. Outer orbital angle weakly produced. Anterolateral angle with small spine. Lateral margin with 6 small spines. Orbitofrontal region depressed. Gastric, cardiac and branchial regions with transverse ridges and without spines. Cervical and epibranchial grooves well defined.

*Description.*—Carapace excluding rostrum, subquadrate in outline, dorsally longitudinally gently convex, width about 3/4 the length, greatest width about midlength. Rostrum triangular, gently downturned, about 1/4 as long as carapace width at the base, about 1/4 times as long as carapace length; dorsal surface smooth, with median depression; lateral margins smooth but bearing a small lateral projection on distal fifth. Orbital margin concave. Outer orbital angle weakly produced. Anterolateral angle with small spine. Lateral margin gently convex, bearing 6 small, forwardly di-

rected spines; 2 between cervical and epibranchial notches, and 4 posterior to epibranchial notch.

Orbitofrontal region depressed. Gastric region inflated; gently arched, raised edge between orbitofrontal and gastric regions; epigastric region ornamented with interrupted, transverse ridges, lacking spines, with shallow, median depression; proto- and mesogastric regions with 6 broadly rounded V-shaped ridges. Hepatic regions flattened. Cervical groove well defined, broad, deep. Cardiac region weakly marked, gently convex with 8 transverse ridges. Epibranchial regions inflated, separated from mesobranchial regions by deep postcervical grooves, ornamented with weak, transverse ridges. Other branchial regions densely decorated with interrupted transverse ridges.

*Discussion.*—*Luisogalthea tomitai* sp. nov. resembles *L. cretacea* (Stenzel) from the Pawpaw Shale (upper Albian) of Texas, but differs in having the rostrum with a smooth dorsal surface, the outer orbital angle with a weak projection, and the gastric, cardiac and branchial regions with fine ridges.

*Etymology.*—From A. Tomita who collected the type specimen.

*Material examined.*—MFM247.010 (holotype), Loc. YEZ-19, Nakafutamatagawa, Haboro-cho, Tomamae-gun; Upper Yezo Group (Santonian; *Inoceramus amakusensis* Zone by Ueda *et al.* (1961)).

#### Genus *Eomunidopsis* Via Boada, 1981

*Type species.*—*Galthea navarrensis* Van Straelen, 1940 by original designation.

*Diagnosis.*—Céphalothrax allongé, portant des crêtes transversales saillantes. Régions délimitées par des sillons bien visibles. Rostre caractérisé par sa pointe tridentée, dépourvu de dentelure sur ses bords latéraux et orné d'une carène médiane (from Via Boada, 1982).

#### *Eomunidopsis kojimai* sp. nov.

Figure 4.2

*Diagnosis.*—Carapace excluding rostrum, subquadrate, slightly longer than wide, dorsal surface moderately convex longitudinally. Orbital margin slightly concave. Outer orbital angle not produced. Anterolateral angle with small spine. Lateral margin gently convex with 8 small spines. Gastric, cardiac, hepatic and branchial regions ornamented with transverse and/or oblique ridges. Cervical and postcervical grooves well defined.

*Description.*—Carapace excluding rostrum, subquadrate in outline, about 4/5 times as wide as long. Rostrum not preserved about 1/4 as long as carapace width at the base. Orbital margin slightly concave. Outer orbital angle not produced. Anterolateral angle with very small spine. Lateral margin gently convex, armed with 8 small, forwardly directed spines; 1 anterior to cervical notch, 4 between cervical and epibranchial notches, 3 behind epibranchial notch.

Dorsal surface moderately convex longitudinally. Orbital regions flattened. Gastric region inflated; epigastric region vaulted, broadly triangular with oblique anterior ridge, interrupted, transverse ridge and median ridge behind it; proto- and mesogastric regions with 2 transverse ridges, anterior

one extending to hepatic region, gently curved ridge behind anterior one; mesogastric region with 3 gently curved ridges behind posterior transverse ridge, anterior and posterior ones shorter than middle; protogastric region with a pair of oblique ridges behind anterior transverse ridge. Hepatic regions ornamented with short, oblique ridges anteriorly. Cervical groove deep, broad. Cardiac region poorly defined with 3 transverse ridges diminishing in length posteriorly. Epibranchial region with 5 irregular, oblique ridges. Postcervical groove distinct. Other branchial regions with interrupted transverse ridges.

*Discussion.*—*Eomunidopsis kojimai* sp. nov. has close affinity with *Eomunidopsis navarrensis* (Van Straelen, 1940) from the Cenomanian of Spain, but differs by the presence of spines on the lateral margins of the carapace, and by absence of granules and tubercles on ridges of the dorsal regions. Ridges of the dorsal regions in *E. kojimai* are coarser than those in *E. navarrensis*. The new species resembles *Eomunidopsis meerssensensis* Collins, Fraaye and Jagt, 1995 from the Maastrichtian Maastricht Formation of the Netherlands. In *E. kojimai* ridges are transversely and obliquely arranged on the dorsal surface while in *E. meerssensensis* transverse ridges cover the dorsal surface.

*Eomunidopsis*, earliest known from the Oxfordian (Fraaye and Collins, 1996), is recorded from the Tithonian of Austria and Bulgaria (Via Boada, 1982), from the Cenomanian of Spain (Via Boada, 1982), from the Albian-Cenomanian of U.S.A. (Bishop, 1985) and the Maastrichtian of the Netherlands (Collins, Fraaye and Jagt, 1995). The occurrence of *E. kojimai* indicates that the genus reached Japan by the Santonian.

*Etymology.*—From Mr. T. Kojima who collected the type specimen.

*Material examined.*—MFM247.011 (holotype), Loc. YEZ-20, Wakkauenbetsugawa, Nakagawa-cho, Teshio-gun; Nigorikawa Formation (Santonian), Upper Yezo Group (Osana *et al.*, 1960).

#### Acknowledgements

We thank J. S. H. Collins (London) for reading our manuscript, T. Kojima (Hikone, Shiga), N. Nikkawa (Yokohama, Kanagawa), S. Matsuda (Mikasa, Hokkaido), and A. Tomita (Sapporo, Hokkaido) for offering us fossil specimens, and H. Hayano (Kasugai, Aichi) and T. Kaede (Inazawa, Aichi) for useful information of fossil localities. The senior author's field work was supported by a Grant-in-Aid for Scientific Research from Ministry of Education, Science, Sports and Culture (no. 0816024).

#### References

- Ando, H. and Kodama, T., 1998: Shallow-marine bivalvian faunal change during Cenomanian to Turonian, Late Cretaceous - Ponbetsu River section in the Mikasa Formation, Middle Yezo Group, Hokkaido, Japan. *Bulletin of the Mikasa City Museum, Natural Science*, no. 2, p. 1-15.
- Aguirre-Urreta, M. B., 1989: The Cretaceous decapod Crustacea of Argentina and the Antarctic Peninsula.

- Palaeontology*, vol. 32, p. 499-552.
- Bell, T., 1857: *A Monograph of the Fossil Malacostracous Crustacea of Great Britain. Part 1, Crustacea of London Clay*. Palaeontographical Society Monograph, 44 p. London.
- Bishop, G. A., 1985: A new crab, *Eomunidopsis cobrani* from the Pierre Shale of Colorado. *Journal of Paleontology*, vol. 59, 601-604.
- Boas, J. E. V., 1880: Studier over Decapodernes Slaegtskabsforhold. *Kongelige Danske Videnskabernes Selskabs Skrifter, Naturvidenskabelig og Mathematisk Afdeling (5)*, vol. 6, p. 25-210.
- Collins, J. S. H., Fraaye, R. H. B. and Jagt, J. W. M., 1995: Late Cretaceous anomurans and brachyurans from the Maastrichtian type area. *Acta Palaeontologica Polonica*, vol. 40, no. 2, p. 165-210.
- Collins, J. S. H., Kanie, Y. and Karasawa, H., 1993: Late Cretaceous crabs from Japan. *Transactions and Proceedings of the Palaeontological Society of Japan, New Series*, no. 172, p. 292-310.
- Dana, J. D. 1852: Crustacea. In, *United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842 Under the Command of Charles Wilkes, U.S.N.*, vol. 13, 1620 p.
- De Man, J. G., 1905: Diagnoses of new species of macrurous decapod Crustacea from the "Siboga-Expedition". *Tijdschrift der Nederlandsche Dierkundige Vereniging*, vol. 9, p. 587-614.
- Fabricius, J. C., 1793: *Entomologia Systematica Emendata et Aucta. Secundum Classes, Ordines, Genera, Species, Adjectis Synonymis, Locis, Observationibus, Descriptionibus*, vol. 2. vii+519 p. Hafniae.
- Fraaye, R. H. B. and Collins, J. S. H., 1996: Two new decapod crustaceans from the Portlandian of Dorset, England. *Proceedings of the Geologists' Association*, vol. 107, p. 323-326.
- Huxley, T. H., 1879 [1878]: On the classification and the distribution of the crayfishes. *Proceedings of the Scientific Meetings of the Zoological Society of London*, vol. 1878, p. 752-788.
- Karasawa, H., 1998: Two new species of Decapoda (Crustacea) from the Upper Cretaceous Izumi Group, Japan. *Paleontological Research*, vol. 2, no. 4, p. 217-223.
- Kensley, B. and Heard, R. W., 1991: An examination of the shrimp family Callianideidae (Crustacea: Decapoda: Thalassinidea). *Proceedings of the Biological Society of Washington*, vol. 104, p. 493-537.
- Latreille, P. A., 1802-1803: *Histoire naturelle, générale et particulière, des Crustacés et des Insectes*. vol. 3, 468 p. F. Dufart, Paris.
- Latreille, P. A., 1831: *Cours d'Entomologie, ou de l'histoire naturelle des Crustacés, des Arachnides, des Myriapodes et des Insectes, etc.* Annales I. Atlas, 26 p. Roret, Paris.
- McCoy, F., 1849: On the classification of some British fossil Crustacea with notices of new forms in the University Collection at Cambridge. *Annals and Magazine of Natural History, Series 2*, vol. 4, p. 161-179, 330-335.
- Nagao, T., 1931: Two new decapod species from the Upper Cretaceous deposits of Hokkaido, Japan. *Journal of the Faculty of Science, Hokkaido Imperial University, series 4*, vol. 1, p. 207-214.
- Nagao, T., 1941: On some fossil Crustacea from Japan. *Journal of the Faculty of Science, Hokkaido Imperial University, Series 4*, vol. 6, p. 86-100.
- Osanai, H., Mikami, K. and Takahashi, K., 1960: Kyowa. 1/50,000. Explanatory of the Geological Map of Japan. 59 p. Geological Survey of Hokkaido. (in Japanese with English résumé)
- Patrullius, D., 1959: Contributions à la systématique des Décapodes néojurassiques. *Revue de Géologie et de Géographie*, vol. 3, p. 249-257.
- Poore, G. C. B., 1994: A phylogeny of the families of Thalassinidea (Crustacea: Decapoda) with keys to families and genera. *Memoirs of the Museum of Victoria*, vol. 54, p. 79-120.
- Poore, G. C. B., 1997: A review of the thalassinidean families Callianideidae Kossmann, Micheleidae Sakai, and Thomassiniidae de Saint Laurent (Crustacea, Decapoda) with descriptions of fifteen new species. *Zoosystema*, vol. 19, nos. 2-3, p. 345-420.
- Rathbun, M. J., 1926: The fossil stalk-eyed Crustacea of the Pacific slope of North America. *U. S. National Museum, Bulletin*, vol. 138, 155 p.
- Rodrigues, S. de A. and Carvalho, H. A. de, 1972: *Marcusiaxius lemoscastroi*, g. n., sp. n., primeira ocorrência da família Axiidae (Crustacea, Decapoda, Thalassinidea) no Brazil. *Ciência e Cultura, Suplementa*, vol. 24, p. 357.
- Sakai, K., 1992: The families Callianideidae and Thalassinidae, with the description of two new subfamilies, one new genus and two new species (Decapoda: Thalassinidea). *Naturalists*, no. 4, p. 1-33.
- Samouelle, G., 1819: *The Entomologist's Useful Compendium, or an Introduction to the Knowledge of British Insects*. 486 p. London.
- Secretan, S., 1964: Les Crustacés décapodes du Jurassique supérieur et du Crétacé de Madagascar. *Mémoires du Muséum National d'Histoire Naturelle, Nouvelle série, Série C, Sciences de la Terre*, vol. 14, 226 p., 20 pls.
- Sowerby, J., 1826: Description of a new species of *Astacus*, found in a fossil state at Lyme Regis. *Zoological Journal*, vol. 2, p. 493-494.
- Stenzel, H. B., 1945: Decapod crustaceans from the Cretaceous of Texas. *University of Texas Publications*, vol. 4401, p. 401-476.
- Ueda, Y., Matsumoto, T. and Akatsu, K., 1961: The Cretaceous deposits in the Chikubetsu area, Hokkaido. *Science Reports of the Faculty of Science, Kyushu University, Geology*, vol. 6, no. 3, p. 15-32.
- Via Boada, L., 1981: Les Crustacés décapodes du Cénomannien de Navarre (Espagne): premiers resultats de l'étude des Galatheidae. *Géobios*, vol. 14, p. 247-251.
- Via Boada, L., 1982: Les *Galatheidae* du Cénomannien de Navarre (Espagne). *Annales de Paléontologie*, vol. 68, fasc. 2, p. 107-131.
- Van Straelen, V., 1940: Crustacés décapodes nouveaux du crétacique de la Navarre. *Bulletin du Musée royal d'Histoire naturelle de Belgique*, vol. 16, no. 4, p. 1-5.