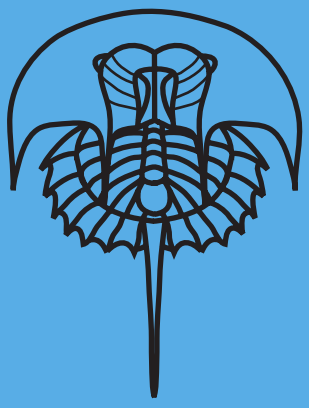

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Part R, Revised, Volume 1, Chapter 8T18: Systematic Descriptions: Superfamily Pilumnoidea

Carrie E. Schweitzer, Rodney M. Feldmann, and Hiroaki Karasawa

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PART R, REVISED, VOLUME 1, CHAPTER 8T18: SYSTEMATIC DESCRIPTIONS: SUPERFAMILY PILUMNOIDEA

Carrie E. Schweitzer,[1] Rodney M. Feldmann,[2] and Hiroaki Karasawa[3]

[[1]Department of Geology, Kent State University at Stark, cschweit@kent.edu; [2]Department of Geology, Kent State University, rfeldman@kent.edu; [3]Mizunami Fossil Museum, Japan, GHA06103@nifty.com]

Superfamily PILUMNOIDEA Samouelle, 1819

[*nom. transl.* Števčič, 2005, p. 28 *ex* Pilumnidae Samouelle, 1819, p. 86]

Carapace hexagonal, transversely rectangular, ovate, or anteriorly projected, wider than long, maximum carapace length usually between 70–80 percent maximum carapace width but may be much higher; position of maximum width variable among and within subfamilies; dorsal surface convex, in some subfamilies and genera markedly so in anterior one third; regions smooth or granular and setose, sometimes with transverse swellings; frontal margin entire, bilobate, with many lobes, or greatly anteriorly projected, front usually ranges from one-third to half maximum carapace width but may be much lower; orbits usually with two orbital notches or fissures, fronto-orbital width two-thirds to three-quarters maximum carapace width; anterolateral margins usually with spines, usually one to four, but can be entire or indistinctly lobate; gastric regions usually long; usually anterolateral and posterolateral margins distinct from one another; endostome with crests defining efferent branchial channels at least moderately developed and continuing to anterior margin of buccal cavity (Davie, 2002, p. 392); sternal sutures 4/5 and 5/6 interrupted medially; posterolateral prolongation of sternite 7 well marked; sternite 8 not visible ventrally; all male pleonal somites free, narrow, covering most of sternite 4, pleonal locking mechanism (bouton-presson) present; male genital openings coxal or coxo-sternal; male gonopod 1 slender or stout, sinuous, tip usually simple and recurved; gonopod 2 very short and sigmoid; chelae subequal or heterochelous, fingers may have black tips; pereiopods short or moderately long. [Emended from Karasawa & Schweitzer, 2006.] *Eocene* (*Ypresian*)–*Holocene*.

Family GALENIDAE Alcock, 1898

[*nom. transl.* Sakai, 1999, p. 36 *ex* Galenoida Alcock, 1898, p. 77]

Carapace wider than long, regions moderately defined; front axially notched; anterolateral margins lobed, spined, or rimmed; male pleon generally narrow, telson long or short. *Eocene* (*Lutetian*)–*Holocene*.

Subfamily DENTOXANTHINAE Števčič, 2005

[Dentoxanthinae Števčič, 2005, p. 58]

Carapace hexagonal, wider than long, regions moderately defined; front bilobed, axially notched; upper orbital margin with two fissures; anterolateral margin with lobes, spines, or rimmed; male pleon narrow, telson triangular. *Holocene*.

No fossil representatives.

Dentoxanthus Stephenson, 1946, p. 163 [**D. iranicus,* p. 164, fig. 43; M]. As for subfamily. *Holocene:* Indian Ocean.——Fig. 1,*1. **D. iranicus,* drawing of ZRC 1999.1104, Holocene, Pakistan, scale bar, 1 cm (new; drawing adapted from Ng, Trivedi, & Vachrajani, 2015, fig. 4A).

Schweitzer, C. E., R. M. Feldmann, & Hiroaki Karasawa. 2022. Part R, Revised, Volume 1, Chapter 8T18: Systematic descriptions: Superfamily Pilumnoidea. Treatise Online 161:1–13, 5 fig.

Subfamily GALENINAE Alcock, 1898

[*nom. correct*. Alcock, 1898, p. 136 *pro* Galenoida Alcock, 1898, p. 77]

Carapace wider than long, ovate; regions moderately marked, strongly vaulted longitudinally, especially in anterior one-third; front axially notched; orbits directed forward; anterolateral margins short, with three or four spines excluding outer-orbital spines; posterolateral margins long; sternal sutures 3/4 and 4/5 nearly parallel, not oriented at high angle to axis; male pleon not reaching anterior edge of base of chelipeds; telson not achieving twice the length of somite six. *Miocene* (*Tortonian–Messinian*)*–Holocene*.

Galene De Haan, 1833 in 1833–1850, p. 19 [**Cancer bispinosus* Herbst, 1783 in 1782–1804, p. 144, pl. 6,*45;* M; =*Gecarcinus trispinosus* Desmarest, 1817, p. 505; =*Podopilumnus fittoni* M'Coy, 1849, p. 166; =*Galene granulata* Miers, 1884, p. 208, pl. 20,*A;* =*Galene hainanensis* Hu & Tao, 1979, p. 147, pl. 1,*1–4, 11–13*] [=*Podopilumnus* M'Coy, 1849, p. 165 (type, *P. fittoni,* p. 166, M); =*Glyptonotus* A. Milne-Edwards, 1865, p. 332 (type, *Gecarcinus trispinosus,* M)]. As for subfamily. *Miocene–Holocene. Miocene:* Taiwan. *Pliocene:* Brunei, Philippines, Taiwan. *Pleistocene:* Java, Sarawak, Taiwan. *Holocene:* Indo-West Pacific Ocean.——Fig. 1,*2. Galene stipata* Morris & Collins, 1991, KSU D 439, cast of RGM 231348, Miocene–Pliocene, Brunei, scale bar, 1 cm (new).

Subfamily HALIMEDINAE Alcock, 1898

[*nom. correct*. Serène, 1984, p. 15, 17, *pro* Halimedoida Alcock, 1898, p. 77]

Carapace pentagonal, not much wider than long, generally smooth, regions not well defined; front projected well beyond orbits, with axial notch, otherwise straight; orbits directed anterolaterally; anterolateral margins with three or so rounded lobes excluding outer-orbital angle; chelae with large tubercles on outer surface; male pleon very narrow, long, reaching level of anterior edge of chelipeds; telson more than twice as long as any other pleonal somite. *Eocene* (*Lutetian*)*–Holocene*.

Halimede De Haan, 1835 in 1833–1850, p. 35 [**Cancer* (*Halimede*) *fragifer* De Haan, 1835 in 1833–1850, p. 36; M, ICZN Opinion 85, 1925; =*Medaeus nodosus* A. Milne-Edwards, 1867, p. 271] [=*Polycremnus* Gerstaecker,1856, p. 120 (type, *Cancer ochtodes* Herbst, 1783 in 1782–1804, p. 158, pl. 8,*54,* M)]. As for subfamily. *Pleistocene–Holocene. Pleistocene:* Japan. *Holocene:* Indo-Pacific Ocean, Red Sea.——Fig. 1,*3. H. ochtodes* Herbst, 1783 in 1782–1804, USNM 39773, Holocene, Thailand, scale bar, 1 cm (new).

Parhalimede Beschin, De Angeli, Checchi, & Zarantonello, 2016, p. 57 [**P. ornata,* p. 57, pl. 10,*3–5;* OD]. Carapace not much wider than long, carapace regions well defined, ornamented with broadly spaced tubercles on highest parts; anterolateral margins with four large spines excluding outer-orbital angle, posterolateral margin with several small spines; orbits widely rimmed, with two apparently closed fissures. *Eocene* (*Lutetian*): Italy.—— Fig. 1,*4*. **P. ornata,* holotype MCZ.3908-I.G. 361721, scale bar, 1 cm (new; photo by A. De Angeli, Associazione Amici del Museo Zannato, Montecchio Maggiore, Vicenza, Italy).

Subfamily PARAPANOPINAE Števčič, 2005

[*nom. transl*. Ng, Guinot, & Davie, 2008, p. 138 *ex* Parapanopini Števčić, 2005, p. 58]

Carapace hexagonal, wider than long, regions moderately defined; front bilobed, axially notched; upper orbital margin with two fissures; anterolateral margin crispate, sharp, with lobes, spines, or rimmed; male pleon narrow, telson triangular; small portion of sternite 8 visible in ventral view. *Holocene*.

No fossil representatives.

Parapanope de Man, 1895, p. 513 [**P. euagora*, p. 514, fig. 4; M; =*Hoploxanthus hextii* Alcock, 1898, p. 126; =*P. singaporensis* Ng & Guinot in Guinot, 1985, p. 694, pl. 2,*6–8*] [=*Hoploxanthus* Alcock, 1898, p. 125 (type, *H. hextii,* SD Ng, Guinot, & Davie, 2008, p. 138)]. As for subfamily. *Holocene:* Indo-Pacific Ocean.——Fig. 1,*5*. **P. euagora,* USNM 57788, scale bar, 1 cm (new).

Family PILUMNIDAE Samouelle, 1819

[Pilumnidae Samouelle, 1819, p. 86, ICZN Opinion 423, 1956]

Carapace hexagonal or ovate or projected anteriorly; not much wider than long, strongly vaulted longitudinally, especially in anterior half of carapace, regions poorly defined; front notched medially, with swellings or spines on either side of medial notch and inner orbital swellings, sometimes with spines adaxial to inner orbital swelling; anterolateral margin shorter than postero-

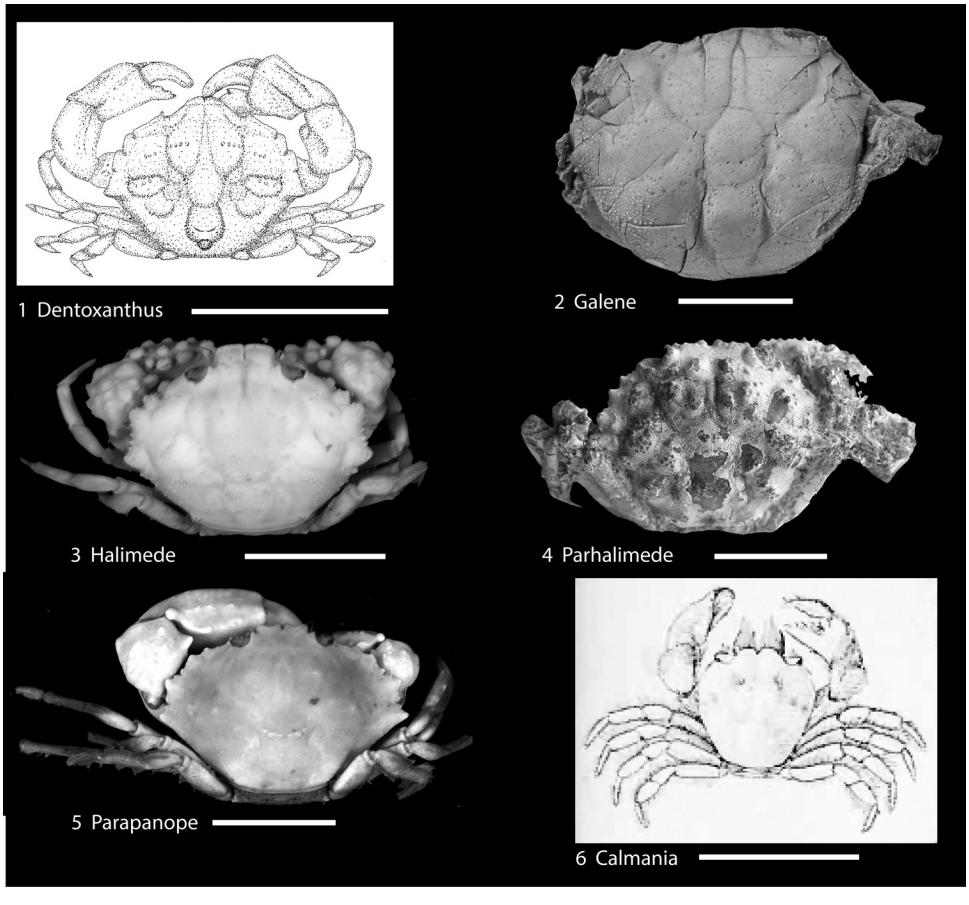

FIG 1. Galenidae, Pilumnidae (p. 1–4).

lateral margin, usually with three blunt or sharp spines as well as outer orbital swelling but may have two to four spines or be entire; protogastric regions broad; hepatic regions longer than wide; epibranchial region arcuate, ridge-like; meso- and metabranchial regions not differentiated, longer than wide; manus of major chela not longer than high, usually ornamented, sometimes narrowest in thickness near upper margin; fingers short; sternites 1–4 fused but sutures clearly visible, male pleonal somites 3–5 free. *Eocene* (*Ypresian*)–*Holocene.*

Subfamily CALMANIINAE Števčič, 1991

[*nom. transl.* DAVIE, 2002, p. 396 *ex* Calmaniini ŠTEVČIĆ, 1991, p. 125]

Carapace ranging from wider than long to slightly longer than wide; front broadly bilobed, anterolateral margins short, weakly lobed; posterolateral margins very long, much longer than anterolateral margins; carapace regions poorly defined; chelipeds stout, fingers that gape when closed; male pleon not reaching level of anterior edges of bases of chelipeds; telson not twice as long as pleonal somite 6, lateral margins subparallel. *Holocene*.

No fossil representatives.

Calmania LAURIE, 1906, p. 406 [**C. prima,* p. 407, pl. 1,*10*, M; =*Kraussia laevis* YOKOYA, 1933, p. 170, fig. 62] [=*Ralumia* BALSS, 1933b (type, *R. dahli,* M)]. As for subfamily. *Holocene:* Indo-Pacific Ocean.——FIG. 1,*6*. **C. prima,* Holocene, Indo-

Pacific Ocean, scale bar, 1 cm (Laurie, 1906, pl. 1,*10*).

Subfamily EUMEDONINAE Dana, 1853

[*nom. transl*. Neumann, 1878, p. 17 *ex* Eumedonidae Dana, 1853 in 1852–1853, p. 1422] [=Ceratocarcininae Števčić, Castro, & Gore, 1988, p. 1317; =Hapalonotinae Števčić, 2005, p. 59; =Rhabdonotini Števčić, 2011, p. 132]

Carapace hexagonal or pentagonal, flattened, usually with long projections anteriorly or anterolaterally; regions weakly developed; front bilobed or quadrilobed, projected well beyond orbits; orbits circular, small; anterolateral corner sometimes with long, projecting spine; male pleon not reaching level of anterior edges of bases of chelipeds; telson not twice as long as pleonal somite 6; pereiopods with distinctive articulation between dactylus and propodus. Symbiotic with echinoderms. *Eocene* (*Ypresian*)–*Holocene*.

Eumedonus H. Milne Edwards, 1834 in 1834–1840, p. 349 [**E. niger,* p. 350, pl. 15,*17;* M; =*Gonatonatus crassimanus* Haswell, 1880, p. 455, pl. 26,*4;* =*E. villosus* Rathbun, 1918, p. 27, pl. 13,*1*]. *Holocene:* Indo-Pacific Ocean, Red Sea, Australia.——Fig. 2,*1*. **E. niger,* holotype MNHN-IU-2000-646, Holocene, China, scale bar, 1 cm (photo by N. Mollaret, RECOLNAT, MNHN).

Harrovia Adams & White, 1849, p. 55 [**H. albolineata,* p. 56, pl. 12,*5;* M]. Carapace hexagonal, slightly wider than long, swollen dorsally, with weakly developed regions; front bilobed, with prominent inner-orbital teeth; anterolateral margin lammelliform with four teeth, with long, projecting last spine; chelipeds long, elongate, subcylindrical; pereiopods also long, elongate. *Pleistocene–Holocene. Pleistocene:* Japan. *Holocene:* Indo-West Pacific Ocean.——Fig. 2,*2. H. longipes* Lanchester, 1900, MNHN-IU-2013-479, Holocene, Indo-West Pacific Ocean, scale unknown (photo by T.-Y. Chan & C. Lin, MNHN).

Santeella Blow & Manning, 1996, p. 23 [**S. lillyae,* p. 23, pl. 5,*3;* OD]. Carapace wider than long, pentagonal, regions poorly defined; front broadly bilobed; orbits broad, rimmed, front-orbital width ~80% maximum carapace width; anterolateral margins very short, with four spines, last very small, forming blunt lobe; posterolateral margins long, slightly convex. *Eocene* (*Ypresian*): Chiapas, Mexico. *Eocene* (*Lutetian–Bartonian*): South Carolina, USA.——Fig. 2,*3*. **S. lillyae,* holotype USNM PAL 484578, Eocene, South Carolina, scale bar, 5 cm (new).

Viacarcinus Blow & Manning, 1996, p. 19 [**V. druidi,* p. 19, pl. 4,*5;* OD]. Carapace about as wide as long, regions well defined; anterolateral margins long, with one spine distal to outer-orbital angle and one long, laterally directed spine at anterolateral angle; posterolateral margins short, convex, and fungiform spines anteriorly; posterior margin straight; protogastric regions large, ovate; hepatic regions small, reduced; mesogastric, metagastric, and urogastric regions fused, cardiac region large, ovate; epibranchial regions divided into two subregions, remainder of branchial regions broadly swollen centrally. *Eocene* (*Lutetian–Bartonian*): USA (South Carolina).——Fig. 2,*4*. **V. druidi,* holotype USNM PAL 484559, scale bar, 1 cm (new).

Subfamily PILUMNINAE Samouelle, 1819

[*nom. transl*. Alcock, 1898, p. 176 *ex* Pilumnidae Samouelle, 1819, p. 86] [=Actumninae Dana, 1851, p. 128; =Heteropanopioida Alcock, 1898, p. 177; =Bathypilumnini Števčić, 2005, p. 56; =Priapilumnini Števčić, 2005, p. 56; =Danielini Števčić, 2005, p. 57]

Carapace hexagonal, not much wider than long, strongly vaulted longitudinally, especially in anterior half of carapace, regions poorly to well defined; front notched medially, with swellings or spines on either side of medial notch and inner orbital swellings, sometimes with spines adaxial to inner orbital swelling; anterolateral margin shorter than posterolateral margin, usually with three blunt or sharp spines as well as outer orbital swelling but may have two to four spines; protogastric regions broad; hepatic regions longer than wide; epibranchial region arcuate, ridge-like; meso- and metabranchial regions not differentiated, longer than wide; manus of major chela not longer than high, usually ornamented, sometimes narrowest in thickness near upper margin; fingers short; sternites 1–4 fused but sutures clearly visible, all male pleonal somites free. *Eocene* (*Ypresian*)–*Holocene*.

Actumnus Dana, 1851, p. 128 [**A. tomentosus* Dana, 1852, p. 82; SD ICZN Opinion 73, 1941; =*Cancer* (*Pilumnus*) *setifer* De Haan, 1835 in 1833–1850, p. 50, pl. 3,*3*]. Similar to *Pilumnus;* carapace convex longitudinally, regions well defined; posterolateral margin concave to accommodate pereiopods. *Miocene–Holocene. Miocene* (*Langhian*): Hungary, Poland. *Miocene* (*Tortonian*): Japan. *Pleistocene:* Japan. *Holocene:* Indo-Pacific Ocean, Red Sea.——Fig. 2,*5. A. telegdii* Müller, 1974, KSU D 153, cast of M.86.96-1, Langhian, Hungary, scale bar, 1 cm (new).

Agnocarcinus Beschin, De Angeli, Checchi, & Zarantonello, 2012, p. 68 [**A. zannatoi,* p. 68, pl. 10,*3;* OD]. Carapace hexagonal, wider than long, front broadly quadrilobed; regions well

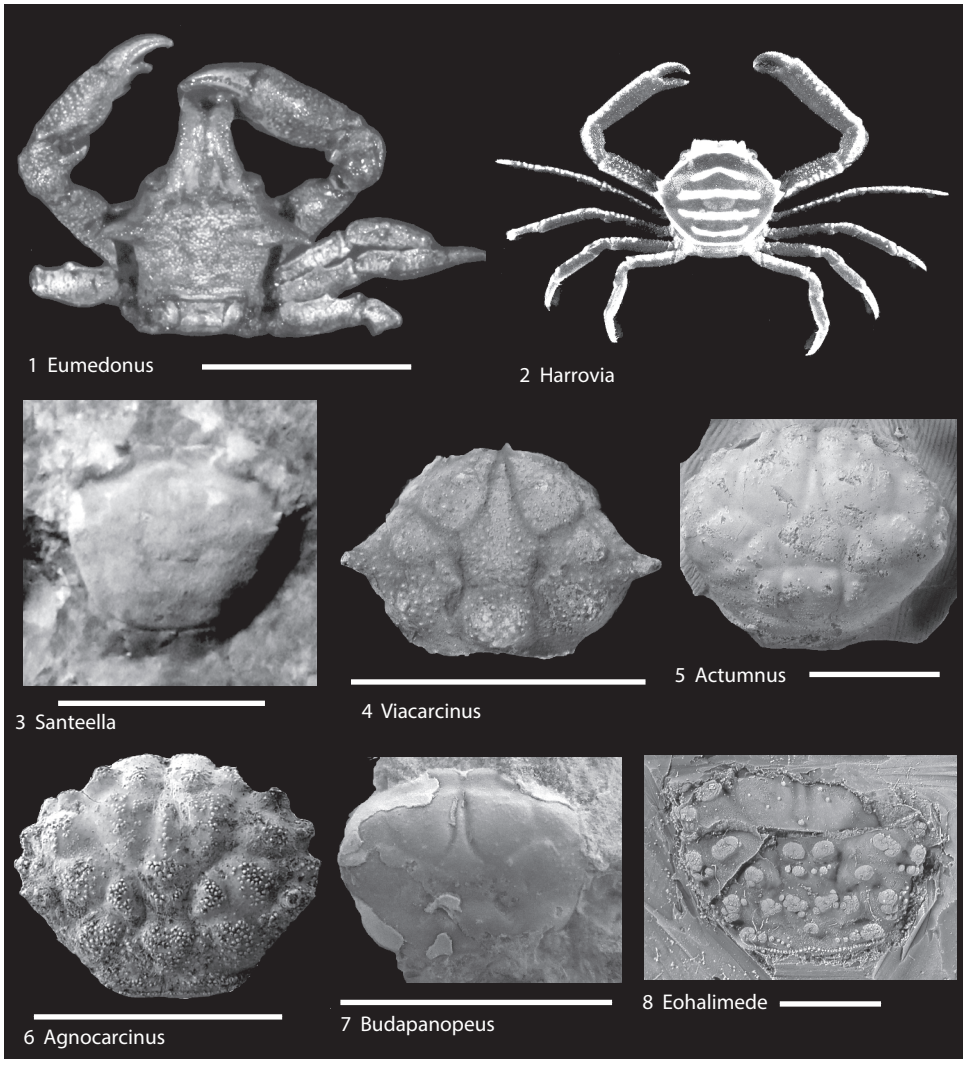

FIG 2. Pilumnidae (p. 4–5).

defined, granular in elevated areas; anterolateral margins with four lobes including outer-orbital angle; axial regions narrow. *Eocene* (*Lutetian*): Italy.——FIG. 2,*6*. **A. zannatoi,* holotype MCZ 2762-I.G.336978, scale bar, 1 cm (new; photo by A. De Angeli, Associazione Amici del Museo Zannato, Montecchio Maggiore, Vicenza, Italy).

Budapanopeus MÜLLER & COLLINS, 1991, p. 72 [**B. denticulatus,* p. 72, pl. 4,*15–16;* pl. 5,*2,7,14;* OD]. Carapace wider than long, rounded-hexagonal; regions moderately marked; front broadly bilobed; orbits shallow, rimmed; anterolateral margins with three or four blunt lobes; posterolateral margins weakly convex. *Eocene* (*Priabonian*): Hungary.——FIG. 2,*7*. **B. denticulatus,* holotype M.91-155, scale bar, 1 cm (new; photo by M. Hyžný, Comenius University, Bratislava, Slovakia).

Eohalimede BLOW & MANNING, 1996, p. 22 [**E. walleri,* p. 22, pl. 4,*7;* OD]. Carapace wider than long, hexagonal, regions moderately defined; anterior margin of carapace wide, long segment of anterior margin directed forward adjacent to outer-orbital spine; anterolateral and posterolateral margins confluent, converging posteriorly, with several lobes, margin incised where intersected by cervical groove; posterior margin with granular rim; carapace surface ornamented with bulbous, fungiform swellings. *Eocene* (*Lutetian–Bartonian*): USA (South Carolina).——FIG. 2,*8*. **E. walleri,* cast of holotype USNM PAL 484580, scale bar, 1 cm (new).

Eopilumnus Beschin, Busulini, De Angeli, & Tessier, 2002, p. 18 [**E. checchii,* p. 18, pl. 3,*4–5;* OD]. Carapace not much wider than long, hexagonal, regions well defined; front with six spines of varying sizes including inner-orbital spines; orbits large, obliquely directed anterolaterally, with stout outer-orbital spine; anterolateral margins short, with three spines excluding outer-orbital spines; posterolateral margins long, concave; posterior margin convex, wide; carapace regions ornamented with tubercles anteriorly and short, scabrous ridges posteriorly. *Eocene* (*Lutetian*): Italy.——Fig. 3,*1*. **E. checchii,* holotype I.G. 296404, scale bar, 1 cm (new; photo by A. De Angeli, Associazione Amici del Museo Zannato, Montecchio Maggiore, Vicenza, Italy).

Eumorphactaea Bittner, 1875, p. 91 [**E. scissifrons,* p. 92, pl. 2,*12;* M]. Carapace wider than long, regions well marked, strongly vaulted longitudinally and moderately vaulted transversely; front projected beyond orbits, bilobed; orbits directed anterolaterally; anterolateral margins with three or four weak lobes; posterolateral margins longer than anterolateral margins weakly convex, converging strongly posteriorly. *Eocene* (*Ypresian–Lutetian*): Italy. *Eocene:* France.——Fig. 3,*2*. **E. scissifrons,* KSU D 83, cast of holotype MBA.6644, Eocene, Italy, scale bar, 1 cm (new).

Galenopsis A. Milne-Edwards, 1865, p. 316 [**G. typicus,* p. 317, pl. 6,*1–4;* OD]. Carapace rounded-hexagonal, wider than long, surface flattened, flanks steep; front broadly bilobed; orbits round, rimmed, directed forward, long segment of anterior margin directed forward to either side of orbit so that entire anterior margin is very long; anterolateral margins short, with a few small spines; posterolateral margins very long, much longer than anterolateral margins; posterior margin wide; regions poorly marked, only urogastric and anterior portion of cardiac region defined by branchiocardiac groove. *Eocene–?Pliocene. Eocene* (*Ypresian*): Italy. *Eocene* (*Lutetian*): France, Italy, Spain, USA (Alabama). *Eocene* (*Priabonian*): Hungary, Italy. *Oligocene:* Germany. *Paleogene:* Pakistan. ?*Miocene:* Fiji. ?*Pliocene:* Italy.——Fig. 3,*3*. **G. typicus,* KSU 53, cast of MNHN F R03797, Eocene, France, scale bar, 1 cm (new).

Gecchelicarcinus Beschin, Busulini, De Angeli, & Tessier, 2007, p. 40 [**G. lorigae,* p. 40, pl. 5,*1–2;* OD]. Carapace hexagonal, wider than long, front with median notch, broadly quadrilobed; orbits square, directed forward, with two fissures; anterolateral margins with four large, triangular spines including outer-orbital spine; outer-orbital spine arched and directed axially, second spine directed forward, third and fourth spines directed anterolaterally; carapace regions well defined and ornamented with scattered granules of two size classes including a distinct convex forward row on epibranchial region. *Eocene* (*Ypresian*): Italy.——Fig. 3,*4*. **G. lorigae,* holotype MCZ 1813, scale bar, 1 cm (new; photo by A. De Angeli, Associazione Amici del Museo Zannato, Montecchio Maggiore, Vicenza, Italy).

Glabropilumnus Balss, 1932, p. 516 [**Xantho dispar* Dana, 1852, p. 75; OD; =*Pilumnus nitidus* A. Milne-Edwards, 1873, p. 249, pl. 10,*2*]. Carapace wider than long, hexagonal; front broadly bilobed and with small inner-orbital projections; orbits rimmed; anterolateral margins with four lobes separated by fissures; posterolateral margins weakly concave, about equal in length to anterolateral margins; posterior margin straight, with small posterolateral reentrants; regions weakly marked; chelae short, subequal. *Eocene–Holocene. Eocene* (*Ypresian*): Italy. *Oligocene* (*Rupelian*): Italy. *Miocene* (*Langhian*): Austria, Japan, Poland. *Pleistocene:* Japan. *Holocene:* Red Sea, Indian Ocean, tropical Pacific Ocean.——Fig. 3,*5*. **G. dispar* (Dana), specimen from Senckenberg Museum of Natural History, Frankfurt, Germany, Holocene, Philippines, scale unknown (new).

Heteropanope Stimpson, 1858a, p. 33 [**H. glabra;* SD Balss, 1933a, p. 32; =*Pilumnopeus maculatus* A. Milne-Edwards, 1867, p. 277]. Carapace wider than long, smooth, hexagonal carapace regions poorly marked; front broad, straight except for axial notch; orbits small, directed anterolaterally; anterolateral margins with four spines excluding outer-orbital spine, last spine extending onto carapace as weak keel; posterolateral margins straight; posterior margin wide, straight; chelae subequal. *Miocene–Holocene. Miocene:* Iran. *Holocene:* eastern south Atlantic Ocean, Zanzibar, Persian Gulf, Indo-Pacific Ocean.——Fig. 3,*6*. **H. glabra,* USNM 205923, Holocene, northern Indian Ocean, scale bar, 1 cm (new).

Lessinicarcinus De Angeli, 2012 (2011), p. 77 [**Titanocarcinus euglyphos* Bittner, 1875, p. 95, pl. 2,*6;* OD]. Carapace not much wider than long, regions very well defined; front with six spines. *Eocene* (*Lutetian–Bartonian*): Italy.——Fig. 3,*7*. **L. euglyphos* (Bittner), MCZ 3380—I.G. 336918, scale bar, 1 cm (new; photo by A. De Angeli, Associazione Amici del Museo Zannato, Montecchio Maggiore, Vicenza, Italy).

Lobogalenopsis Müller & Collins, 1991, p. 88 [**Galenopsis quadrilobata* Lőrenthey, 1897, p. 156, pl. 5,*3;* OD]. Carapace ovate, regions unmarked; front broad, convex; orbits very small; anterolateral margins with two broad, scallop-like lobes; posterolateral margins convex; carapace strongly vaulted transversely and longitudinally. *Eocene–Priabonian. Eocene* (*Ypresian*): Italy. *Priabonian:* Hungary, Italy.——Fig. 3,*8*. **L. quadrilobata* (Lőrenthey), KSU 142, cast of holotype deposited in MAFI, Priabonian, Hungary, scale bar, 1 cm (new).

Palladiocarcinus De Angeli & Ceccon, 2014, p. 87 [**P. brevidentatus,* p. 87, fig. 5; OD]. Carapace wider than long, regions undefined; front weakly convex, with a transverse carina; orbits circular; anterolateral margins with tiny spines. *Eocene* (*Ypresian*): Italy.——Fig. 3,*9*. **P. brevidentatus,* holotype MCZ 13/08, scale bar, 1 cm (new).

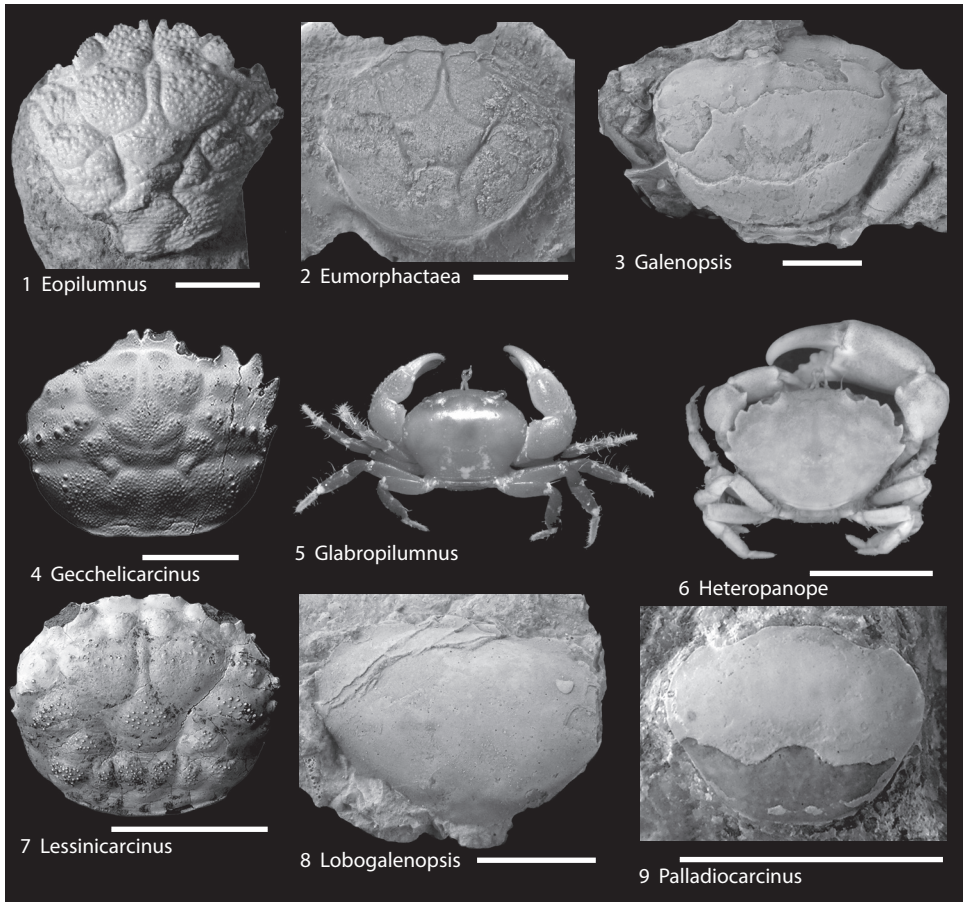

Fig 3. Pilumnidae (p. 6).

Pilummede Ossó & Clements, 2016, p. 140 [**P. penderensis,* p. 141, fig. 4A–F; OD]. Carapace not much wider than long, regions very well separated by wide, deep grooves; highest parts of regions densely granular; orbital rim granular, with two open fissures; anterolateral margins with four granular spines excluding outer-orbital angle; cardiac region wide. *Eocene* (*Bartonian–Priabonian*): USA (South Carolina).——Fig. 4,*1*. **P. penderensis,* holotype NCSM 12217, scale bar, 1 cm (new; photo by Richard Chandler).

Pilumnopeus A. Milne-Edwards, 1867, p. 277 [**P. crassimanus,* p. 278; SD Balss, 1933a, p. 33, =*Ozius* (?) *serratifrons* Kinahan, 1856, p. 118, pl. 4,*1*; =*Heteropanope australiensis* Stimpson, 1858a, p. 33; ICZN Opinion 712, 1964]. Carapace wider than long, hexagonal, strongly vaulted longitudinally; front broadly bilobed and with inner-orbital lobe; anterolateral margin with four lobes including outer-orbital lobe, first long and flattened, third and fourth spine-like; suborbital margin with spine visible in dorsal view; protogastric and branchial regions with granular, transverse ridges; sternite 8 visible in ventral view. *Miocene–Holocene. Miocene* (*Langhian*): Hungary. Spain. *Holocene:* West Africa, Indo-West Pacific Ocean.——Fig. 4,*2*. *P. makianus* Rathbun, 1931, St. 25131, Holocene, Japan, scale bar, 1 cm (new).

Pilumnus Leach, 1816 (imprint 1815), p. 321 [**Cancer hirtellus* Linnaeus, 1761, p. 493; M, ICZN Opinion 85, 1925] [=*Acanthus* Lockington, 1877, p. 32 (type, *A. spinohirsutus,* M)]. Carapace wider than long or about as wide as long, hexagonal, strongly vaulted longitudinally; front axially notched, broadly bilobed or with four spines including inner orbital spine, sometimes serrate across entire width; anterolateral margins with spines or lobes, usually between four or five including outer-orbital spine; posterolateral margin straight or slightly concave; regions well to poorly marked; covered with densely spaced setae. *Miocene–Holocene. Miocene* (*Langhian*): Austria,

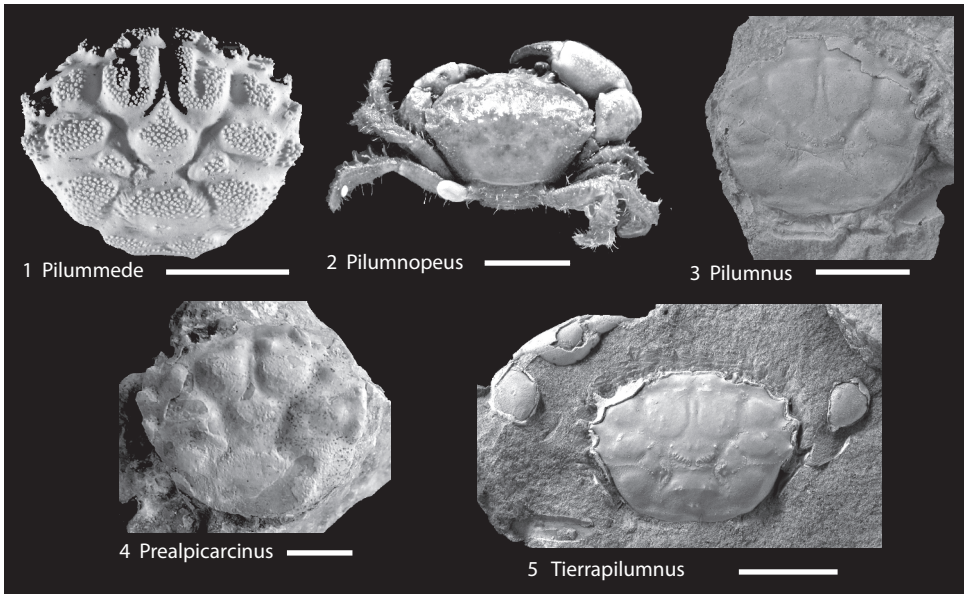

Fig 4. Pilumnidae (p. 7–8).

Hungary, Poland, Spain. *Messinian:* Italy, Malta. *Miocene:* Chile, Haiti, Japan, Malta, Sabah. *Pliocene* (*Zanclean*): Italy, Japan, UK (England). *Pliocene* (*Piacenzian*): Italy. *Pliocene:* Jamaica. *Pliocene–Pleistocene:* Panama. *Pleistocene:* Jamaica, Japan. *Holocene:* Cosmopolitan.——Fig. 4,*3*. *P. cucaoensis* Feldmann, Schweitzer, & Encinas, 2005, SGO. PI.6596, Pliocene, Chile, scale bar, 1 cm (new).

Prealpicarcinus De Angeli & Ceccon, 2015, p. 129 [**P. dallagoi,* p. 129, fig. 6; OD]. Carapace about as wide as long, carapace regions well defined, smooth; front with six weak lobes including inner orbital angles; anterolateral margins with three blunt spines excluding outer-orbital angle; cardiac region wide. *Eocene* (*Ypresian, Priabonian*): Italy.——Fig. 4,*4*. **P. dallagoi,* holotype MCV 14/07, scale bar, 1 cm (new; photo by A. De Angeli, Associazione Amici del Museo Zannato, Montecchio Maggiore, Vicenza, Italy).

Tierrapilumnus Feldmann, Schweitzer, Casadío, & Griffin, 2011, p. 107 [**T. edseli,* p. 107, fig. 11; OD]. Carapace broad, relatively flattened; four anterolateral spines excluding the outer-orbital projection, straight segment preceding the first anterolateral spine; straight bilobed front with axial notch; moderately defined carapace regions; all somites of male pleon free; chelae with smooth surface. [Feldmann & others, 2011, p. 107.] *Miocene:* Argentina.——Fig. 4,*5* **T. edseli,* holotype CADIC PI 123, scale bar, 1 cm (new).

Subfamily RHIZOPINAE Stimpson, 1858

[*nom. transl.* Alcock, 1900, p. 287 *ex* Rhizopidae Stimpson, 1858b, p. 41] [=Typhlocarcinopsinae Rathbun, 1909, p. 112; =Heteropilumninae Serène, 1984, p. 11; =Itampolinae Števčić, 2005, p. 57; =Peleianinae Števčić, 2005, p. 59]

Carapace wider than long, subquadrate, smooth, anterolateral and posterolateral margins not well separated from one another; anterolateral margins entire or with spines; front broad or narrow, bilobed; orbits shallow; male pleon usually not covering entire sternum between coxae of last pereiopods; male genital opening coxo-sternal. *Eocene* (*Bartonian*)–*Holocene*.

Arges De Haan, 1835 in 1833–1850, p. 21 [**Cancer* (*Arges*) *parallelus* De Haan, 1835 in 1833–1850, p. 52, pl. 5,*4*; M]. Large-sized rhizopine; carapace subquadrilateral, length about four-fifths its width, widest at mid-length; front-orbital margin about one-third its width; front narrow, bilobed; orbit small, circular without upper orbital notches; anterolateral margin strongly convex without notches; posterolateral margin convergent posteriorly; dorsal surface smooth, transversely convex with weakly defined regions; male pleonal somite 1 not reaching to coxae of pereiopods 5; chelipeds large, subequal. *Holocene* (fossil): Japan.——Fig. 5,*1*. **A. parallelus* (De Haan), MFM 142415-2, scale bar, 1 cm (new).

Cryptolutea Ward, 1936, p. 1 [**C. lindemanensis,* p. 1, pl. 1,*1–3;* OD] [=*Serratocoxa* Ng, 1987, p. 101 (type, *Lophoplax teschi* Serène, 1971, p. 916, OD)] Carapace rectangular, vaulted longitudinally, flattened transversely; anterolateral margin arcuate, entire; posterolateral margins parallel one another;

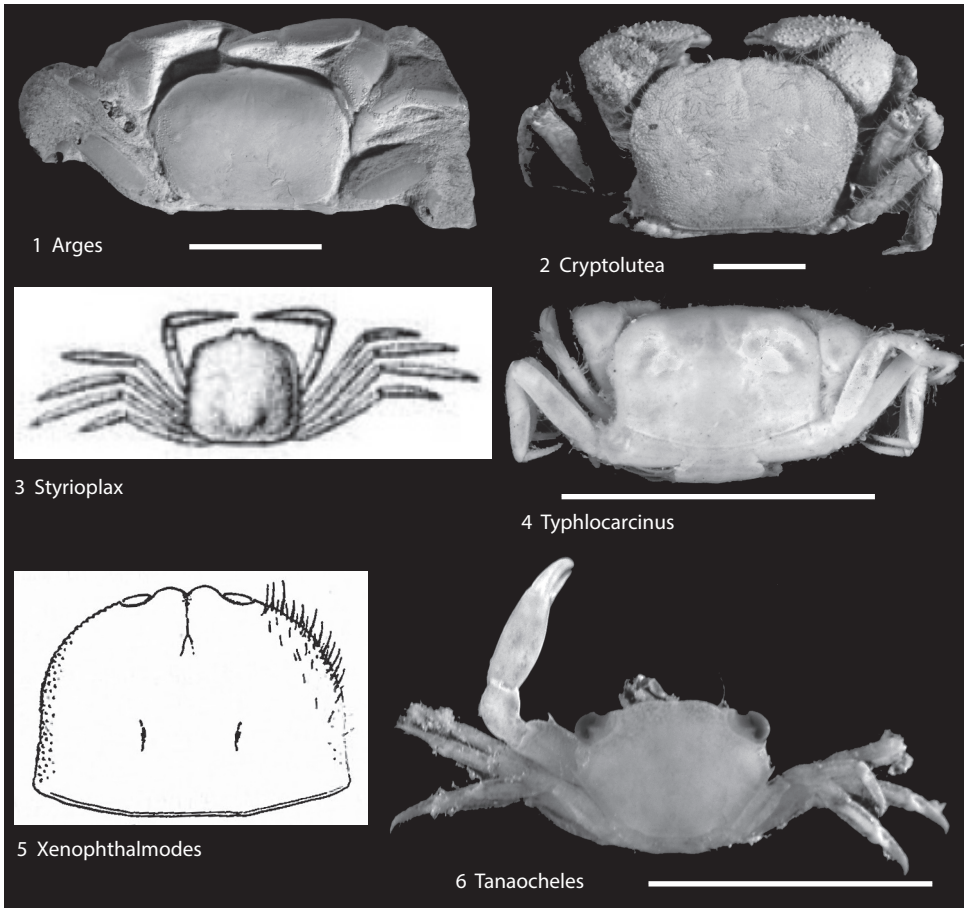

FIG 5. Pilumnidae, Tanaochelidae (p. 8–10).

epistome smooth; buccal frame rectangular; chelipeds weakly heterochelous; pereiopods 3 very long, longer than other pereiopods; first pleonal somite in males narrower than other somites. *Pleistocene–Holocene. Pleistocene:* Philippines, Sarawak. *Holocene:* Indo-West Pacific Ocean.——FIG. 5.*2. C. sagamiensis* (SAKAI, 1935), MFM 129119, Holocene, Japan, scale bar, 1 cm (new).

Styrioplax GLAESSNER, 1969, p. 527 [**Microplax exiguous* GLAESSNER, 1928, p. 195, pl. 3,*14*; M] [=*Microplax* GLAESSNER, 1928, p. 195 *non* FIEBER, 1861, p. 207 (insect)]. Carapace square, front weakly projected beyond orbits, downturned; lateral margins parallel; cardiac region defined. *Miocene* (*Burdigalian*): Austria. *Miocene* (*Burdigalian-Langhian*): Slovakia, Slovenia.——FIG. 5,*3. *S. exiguous* (GLAESSNER), Miocene (Burdigalian), Austria, scale unknown (GLAESSNER, 1928, pl. 14).

Typhlocarcinus STIMPSON, 1858b, p. 41 [**T. villosus,* p. 42; SD NG, GUINOT, & DAVIE, 2008, p. 144]. Carapace rectangular, wider than long, regions poorly defined; front bilobed, orbits small, long portion of anterior margin extending to either side of orbit so that anterior margin of carapace is very wide; lateral margins parallel; posterior margin very wide; male pleonal somite 1 not reaching to coxae of pereiopods 5; chelipeds short. *Pliocene–Holocene. Pliocene:* Japan. *Pleistocene:* Taiwan. *Holocene:* Indo-West Pacific Ocean.——FIG. 5,*4. T. craterifera* RATHBUN, 1914, USNM 46398, Holocene, Philippines, scale bar, 1 cm (new).

Subfamily XENOPHTHALMODINAE Števčič, 2005

[Xenophthalmodinae ŠTEVČIĆ, 2005, p. 60]

Carapace ovate, widest posteriorly, smooth; front narrow, bilobed; lateral margins entire; chelipeds isochelous to weakly heterochelous; male genital opening coxo-sternal; pleonal somites 1 and 3 widest, not covering entire

space between coxae of pereiopods 5. *Holocene*.

No fossil representatives.

Xenophthalmodes Richters, 1880, p. 155 [**X. moebii,* p. 155, pl. 16,*29*, pl. 17,*1–5;* OD, ICZN Opinion 85, 1925, Opinion 73, 1941)]. As for subfamily. *Holocene:* Indo-Pacific Ocean.——Fig. 5,*5* **X. moebii,* Holocene, South Africa, scale unknown (adapted from Barnard, 1950, fig. 56a).

Family TANAOCHELIDAE Ng & Clark, 2000

[*nom. transl.* Ng, Guinot, & Davie, 2008, p. 147 *ex* Tanaocheleinae Ng & Clark, 2000, p. 239]

Carapace ovate, wider than long, smooth, regions poorly marked; frontal margin wide, with axial notch; orbits oblique, directed anterolaterally, with inner-orbital spine; anterolateral margins with four spines or projections; posterolateral margins straight, merging with posterior margin; all male pleonal somites free; chelae with fingers with spoonlike tips. *Holocene*.

No fossil representatives.

Tanaocheles Kropp, 1984, p. 744 [**T. stenochilus,* p. 745, fig. 1; OD]. As for family.——Fig. 5,*6*. **T. stenochilus,* USNM 1184936, Holocene, Guam, scale bar, 5 mm (new).

ABBREVIATIONS FOR MUSEUM REPOSITORIES

CADIC: Centro Austral de Investigaciones Científicas, Paleontología Invertebrados, Ushuaia, Tierra del Fuego, Argentina

KSU D: Decapod Comparative Collection, Department of Geology, Kent State University, Kent, Ohio, USA

M: Hungarian Natural History Museum, Budapest, Hungary

MAFI: Földani Intézet (Hungarian Geological Survey), Budapest, Hungary

MBA: Humboldt-Universitat zu Berlin Museum, Berlin, Germany

MCV: Museo Civico "D. Dal Lago" di Valdagno, Vicenza, Italy

MCZ: Museo Civico "G. Zannato" di Montecchio Maggiore, Vicenza, Italy

MFM: Mizunami Fossil Museum, Mizunami, Gifu, Japan

MNHN: Muséum National d'histoire naturelle, Paris, Crustacean Collection, France

NCSM: North Carolina Museum of Natural Sciences, Raleigh, North Carolina, USA

RGM: Naturalis Biodiversity Center, Leiden, The Netherlands

SGO.PI: Museo Nacional de Historia Natural, Seccíon Paleontologia, Santiago, Chile

St.: Naturalis Biodiversity Center, Leiden, The Netherlands

USNM: United States National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA

USNM PAL: Paleobiology Collection, United States National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA

ZRC: Zoological Reference Collection, Lee Kong Chian Natural History Museum, National University of Singapore

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