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STEFANO DOMINICI ⁽¹⁾, GIOVANNI PASINI ⁽²⁾, ALESSANDRO GARASSINO ⁽³⁾

REAPPRAISAL OF *COELOMA ISSELI* RISTORI, 1886 FROM THE PLIOCENE OF SAN VENANZIO (EMILIA-ROMAGNA, ITALY)

Abstract - S. DOMINICI, G. PASINI, A. GARASSINO, *Reappraisal of Coeloma isseli Ristori, 1886 from the Pliocene of San Venanzio (Emilia-Romagna, Italy)*.

Subject of this note is a reappraisal of *Coeloma isseli* Ristori, 1886 from the Pliocene of San Venanzio (Modena, Emilia-Romagna, Italy) based upon the type series, including only the specimens housed in the Museo di Storia Naturale di Firenze, as reported by Ristori himself. Although the studied specimens have a poor state of preservation of the front and anterolateral margins, some characters, such as the shape of carapace, the orbits, the supra-orbital margin, the epibranchial regions, and the shape of the thoracic sternum, are shared with *Geryon* Krøyer, 1837 (Geryonidae Colosi, 1924) to which we tentatively assigned the species *Coeloma isseli*. Therefore, the new combination *Geryon isseli* (Ristori, 1886) is herein proposed. Finally, a comparison with the other genera of the family is herein provided.

Key words - Crustacea, Decapoda, Geryonidae, systematics, Cenozoic, taxonomy, Pliocene, Emilia Romagna, Italy

Riassunto - S. DOMINICI, G. PASINI, A. GARASSINO, *Rivalutazione di Coeloma isseli Ristori, 1886 del Pliocene di San Venanzio (Emilia-Romagna, Italia)*.

Oggetto di questa nota è la rivalutazione di *Coeloma isseli* Ristori, 1886 del Pliocene di San Venanzio (Modena, Emilia-Romagna, Italia) basata sulla serie tipo che include solo gli esemplari depositati al Museo di Storia Naturale di Firenze, come riportato da Ristori stesso. Sebbene gli esemplari studiati abbiano la fronte e i margini anterolaterali non ben conservati, alcuni caratteri, quali la forma del carapace, le orbite, il margine sopra-orbitale, le regioni epibranchiali e la forma dello sterno toracico, sono condivisi con *Geryon* Krøyer, 1837 (Geryonidae Colosi, 1924) al quale la specie *Coeloma isseli* è tentativamente assegnata. Perciò la nuova combinazione *Geryon isseli* (Ristori, 1886) è qui proposta. Infine, si fornisce un confronto con gli altri generi della famiglia.

Parole chiave - Crustacea, Decapoda, Geryonidae, sistematica, Cenozoico, tassonomia, Pliocene, Emilia Romagna

INTRODUCTION

Ristori (1886) reported several specimens of brachyuran crustaceans assigned to *Coeloma isseli* from San Venanzio (Modena), collected by Francesco Coppi and donated to the Museum of Natural History of Florence in 1886 (Fig. 1). Coppi was a paleontologist and

paleoethnologist from Maranello (Modena), author of studies on the paleontology and stratigraphy of the Miocene and Pliocene around his hometown, in the northern Apennines (Caleffi, 2007). The first catalogues of fossils he published mention several collecting sites, included San Venanzio, but he did not report the presence of decapod crustaceans (Coppi, 1869, 1872). Coppi (1882) announced, at the meeting of the Modena Society of Naturalists, the finding in “yellowish marls” at San Venanzio of marine “brachyuran crustaceans” and “spatangoid” echinoderms associated with a rich and diverse continental paleoflora. Three years later, the relative abundance of those fossils was communicated to the Modenese scientific community: «The site of San Venanzio, Maranello [...] is characteristic for the specificity of fauna and flora from which I have on the whole 442 samples which include 260 phyllites, 84 crustaceans, 80 echinoderms, 18 pteropoda» (meeting of January, 18, 1885: Coppi, 1885, translated by the authors). An indeterminate selection of the 84 fossil decapods were sent to Giuseppe Ristori, in Florence. Ristori (1886) described *Coeloma isseli* Ristori, 1886 apparently based only on the Florence specimens and recognizing, notwithstanding the imperfect preservation, that they belonged to one and only species. 15 specimens presently hosted at the Museo di Geologia e Paleontologia, Università di Firenze, were identified as belonging to the original Coppi collection (e.g., Fig. 2B). An undetermined part of the San Venanzio carcinological material is also housed at the Museo di Paleontologia, Università di Modena (Caleffi, 2007), but was not available for study. Therefore, the reappraisal of *C. isseli* is herein based exclusively upon the type material deposited in the Florence Museum.

The geology of San Venanzio was briefly described by Giambattista Brocchi as a marly unit passing upward to sandstones, with no information on the fossils (Brocchi, 1814). Pantanelli & Santi (1895) drew a geological map of the area, assigning these deposits to the Lower Pliocene. In a recent geological map (Gasperi *et al.*, 2006), the section of San

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Venanzio is included within the sedimentary succession of the Argille Azzurre Fm. which accumulated in a tectonically active basin set in the outer part of the Apennine thrust belt between the Lower Pliocene and the lowermost Middle Pleistocene. This unit consists of a fully marine, largely uniform succession of grey-blue mudstones with thin intercalations of siltstone and fine-grained sandstone (Sestini, 1970; Ricci Lucchi *et al.*, 1982; Fusco, 2007).

Abbreviation – Museo di Geologia e Paleontologia, Università di Firenze; the acronym “IGF” stands for “Istituto Geologico di Firenze”.

SYSTEMATIC PALAEOONTOLOGY

Superfamily Portunoidea Rafinesque, 1815
Family Geryonidae Colosi, 1924
Genus *Geryon* Krøyer, 1837

Type species - *Geryon tridens* Krøyer, 1837, by original designation and monotypy [a subjective junior synonym of *Cancer trispinosus* Herbst, 1803].

Included fossil species - *Geryon manningi* Feldmann, Schweitzer & Encinas, 2010 (early Pliocene, Chiloe Island, Chile).

Geryon isseli (Ristori, 1886) n. comb.
Figs 1-3

Coeloma isseli Ristori, 1886, p. 119, pl. 2, fig. 10.
Coeloma rupeliense; Stainier, 1887, p. 87.
Coeloma issel [sic]; Tettoni, 1923, p. 161.
Coeloma? isseli; Glaessner, 1929, p. 120.
Coeloma isseli; Delle Cave, 1981, p. 48.
Coeloma isseli; De Angeli & Garassino, 2006, p. 48.
Coeloma isseli; Schweitzer *et al.*, 2010, p. 137.

Type material - Holotype IGF 959E, illustrated by Ristori (1886, pl. 2, fig. 10), is herein figured for the first time (Fig. 1A).

Note - Ristori (1886) figured just one specimen IGF 959E (pl. 2, fig. 10) that can be considered holotype for the ICZN (1999, rule 16F).

Type locality - San Venanzio, Modena (Emilia-Romagna, northern Italy).

Geological age - Pliocene (Cenozoic).

Note - Ristori (1886: 119, pl. 2, fig. 10) described and figured *Coeloma isseli* based upon an unspecified number of specimens from the Pliocene clays of San Venanzio located in the surrounding of Modena (Emilia-Ro-

magna, Italy). The check of the carcinologic collection allowed to identify 14 brachyuran specimens, originally part of the Coppì collection, acquired by the Florentine museum (now Museo di Geologia e Paleontologia) in 1886 and presumably forming the type series.

Among the specimens in his hands, Ristori figured only one nearly complete specimen (IGF 959E). The author did not provide any indication or repository number for the other specimens in the Coppì collection, which he however considered for the description. Indeed, Ristori (1886: 120) reported that «l'addome è perfettamente simile a quello di altre specie di *Coeloma* (the pleon is perfectly similar to that of the others species of the genus *Coeloma*)» and «in nessun esemplare studiato la bocca, lo pterigostoma e il branchiostergite sono ben conservati» («in none of the specimens observed the mouth, pterygostome, and branchiostegite are well preserved» – translated by the authors). Therefore, it is difficult to check morphological characters based upon the sole described and figured specimen, preserved in dorsal view (Fig. 1). However, we selected some specimens from the type series in dorsal (IGF 962E, 966E, 967E, 969E, 970E, 971E, 105104) and ventral [IGF 960E, 963E, 964E, 965E (part-counterpart), 968E] views that allowed an emended description of the species *Coeloma isseli*.

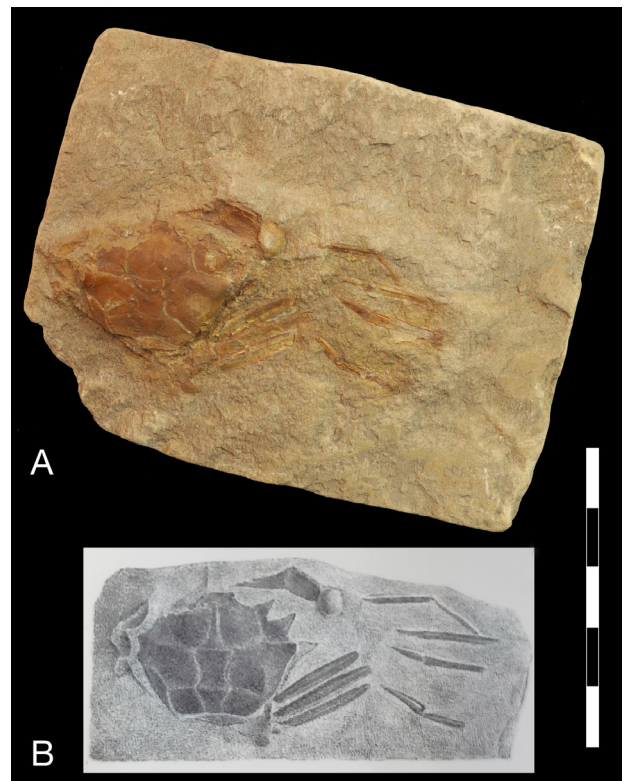


Figure 1. *Geryon isseli* (Ristori, 1886) n. comb. A) Holotype, IGF 959E, dorsal view. B) Holotype figured by Ristori (1886: pl. 2, fig. 10). Scale bar equals 5 cm.



Figure 2. *Geryon isseli* (Ristori, 1886) n. comb. A) IGF 964Ea, ventral view. B) Slab backside of specimen IGF 964Ea, with original label printed by Francesco Coppi; two handwritings can be recognised, one possibly dated to the 19th century (compare with Caleffi 2007, p. 66), the second by L. Delle Cave. C) 966E, dorsal view. D) IGF 965, ventral view. E) IGF 965, ventral view (counterpart of the same specimen). Scale bar equals 5 cm.

Emended description - *Carapace*. Carapace hexagonal, wider than long, widest at level of epibranchial angle, flattened transversely and vaulted longitudinally; front narrow, poorly preserved; orbits wide; rimmed supra-orbital margin apparently with fissures indistinct (as preserved); outer-orbital spines directed forward; anterolateral margins poorly preserved; posterolateral margins nearly straight, about twice as long as anterolateral margins; posterior margin straight, rimmed; posterolateral reentrant shallow; epigastric regions longitudinally ovoid; protogastric regions weakly inflated; subtriangular mesogastric region elongate anteriorly, longer than wide; metogastric region indistinct; narrow urogastric region; cardiac region elongated, inverted subpentagonal; narrow intestinal region; branchial regions indistinct; epibranchial regions with arcuate inflated transverse ridges; branchiocardiac groove deep, defining margins of metogastric and urogastric regions; dorsal surface apparently smooth (as preserved). *Thoracic appendages*. P1 homochele; subtriangular short P1 carpus; P1 palm, longer than wide; smooth upper and lower margins of P1 palm; subtriangular P1 index; elongate hook-shaped P1 dactylus, slightly longer than index; occlusal

margins of P1 dactylus and index smooth; P2-P5 long and slender with terminal pointed dactylus. *Thoracic sternum*. Sternum broad, ovate; sternites 1-3 fused; subsquare sternites 4; sternal suture 3/4 well marked; sternal sutures 5/6 and 6/7 incomplete; sternal suture 7/8 complete; subrectangular sternites 5-8. *Pleon (male)*. Small subtriangular telson, situated partially on fourth and partially on fifth sternites; s6 trapezoidal, almost wide as long; s1-s5 poorly preserved. Cephalic appendages not preserved.

Discussion - Ristori (1886: 120) tentatively accommodated the studied specimens to *Coeloma* A. Milne-Edwards, 1865 based upon «lo studio paziente che ho fatto di tutti quelli esemplari, mi ha fornito dati di qualche valore per concludere che il genere fossile, a cui questa forma di crostaceo più si avvicina, è il genere *Coeloma*» («the careful study of these specimens provided me some data to affirm that the closer genus is *Coeloma*» – translated by the authors). However, Glaessner (1929: 120) did not concur with this systematic assignment, reporting this species in dubitative form as *Coeloma? isseli*. After Glaessner, nobody revised this species. Indeed, Delle Cave (1981: 48) listed only the material related to *Coeloma isseli* as follows:



Figure 3. A) *Geryon isseli* (Ristori, 1886) n. comb., IGF 961Ea, ventral view. B) Goneplacid indeterminate, IGF 961Eb, dorsal view. C) *Goneplax rhomboides* (Linnaeus, 1758), IGF 968E, ventral view. D) *Geryon isseli* (Ristori, 1886) n. comb., IGF 105104, dorsal view. Scale bar equals 5 cm.

«IGF 959E, syntype, (pl. 2, fig. 10), internal mould of the carapace, with some legs; IGF 960E until IGF 971E, syntypes; all the material is much damaged». De Angeli & Garassino (2006: 56) reported the same series of syntypes and finally Schweitzer *et al.* (2010) confirmed the assignment of *Coeloma isseli* of the material described by Ristori (1886), without discussing the systematic position of this species.

Recently, Schweitzer *et al.* (2021) discussed the systematics of Portunoidea, providing an updated diagnosis of *Coeloma* A. Milne-Edwards, 1865, as follows: «Carapace hexagonal, wider than long, length about three-quarters carapace width, flattened transversely and vaulted longitudinally; front narrow, with four blunt spines including inner orbital spines which are directed anterolaterally, about 20 percent maximum carapace width; orbits very wide, with beaded rim, upper-orbital margin biconcave, with two fissures; fronto-orbital width about 80 percent maximum carapace width; outer-orbital spine directed forward; anterolateral margins with three spines excluding outer-orbital spine; posterolateral margins nearly straight, about twice as long as anterolateral margins; posterior

margin straight, rimmed; posterolateral reentrants shallow; epigastric regions longitudinally ovoid; branchiocardiac groove deep, defining margins of meta-gastric and urogastric regions; regions uniformly granular».

Based on this diagnosis, the reappraisal of the specimens assigned to *Coeloma isseli* by Ristori (1886) did not highlight the main distinctive characters of the genus (as currently construed), such as the front with four spines including inner orbital spines, supra-orbital margins with two fissures, and anterolateral margins with three spines (excluding outer-orbital spines). Therefore, we rule out the belonging of the species described by Ristori (1886) to *Coeloma*.

We point out that *Coeloma* was assigned by Schweitzer *et al.* (2021) to the Polybiinae Paulson, 1875 (Carcinidae MacLeay, 1838). However, based on WoRMS (AphiaID: 1616634 – urn: lsid:marinespecies.org:taxname: 1616634), *Coeloma* is assigned to the Geryonidae Colosi, 1924.

Although we exclude the belonging of the Ristori's species to *Coeloma*, the few observed characters, such as the hexagonal carapace, the orbits wide with fissures indistinct (as preserved), the regions weakly defined, the epibranchial regions with arcuate transverse ridges, and the suture delimiting sternites 3 and 4 well marked, are diagnostic of the Geryonidae based on the diagnosis of the family provided by Schweitzer *et al.* (2021). Three genera, *Geryon* Krøyer, 1837, *Archaeoplax* Stimpson, 1863, and *Chaceon* Manning & Holthuis, 1989 are reported in the fossil record based on the list provided by Schweitzer *et al.* (2021). As we have already highlighted, the poor state of the preservation of the studied specimens hinders a comparison with the above-mentioned genera and consequently a precise systematic assignment of *Coeloma isseli*. In particular, diagnostic characters like the front and the anterolateral margins with spines, are not visible. However, the few observed characters, such as the shape of the carapace, the supra-orbital margin, the epibranchial regions, allow a tentative comparison. The species differs from species of *Archaeoplax* in having carapace rectangular, supra-orbital margin sinuous, and the posterolateral reentrant wide. It differs from species of *Chaceon*, according to the diagnosis provided by Manning & Holthuis (1989), by its wide orbits, compared to the shallow and rounded orbits.

The Ristori's species shares with the species of *Geryon* the hexagonal carapace, the wide orbits, the supra-orbital margins with indistinct fissures, the posterior margin straight and rimmed, the epibranchial regions with arcuate transverse ridges, and the sternal suture 3/4 well marked. In conclusion, based on these shared characters we tentatively assign the Ristori's species to *Geryon*, proposing the new combination *Geryon isseli*.

Geryon manningi Feldmann *et al.*, 2010 from the early Pliocene of Chiloé Island (Chile) is the sole fossil species of the genus known to date in the fossil record. Although the state of preservation of the Chilean species hinders a precise comparison with *Geryon isseli*, *G. manningi* can be differentiated for the orbits with distinct medial projection, the posterolateral margins convex, the prominent protogastric regions with transverse swellings, and meso- and metagastric regions not differentiated. Moreover, the two species occupied widely-separated regions.

Colmenero *et al.* (2023) report two extant species of *Geryon*, *G. longipes* A. Milne-Edwards, 1882 and *G. trispinosus* (Herbst, 1803) as widespread in the Mediterranean Sea and adjacent Atlantic waters, and in the Eastern Central Atlantic waters off the northern European coasts respectively. Both species share with *G. isseli* the arcuate transverse ridges in the epibranchial regions, but the poor preservation of the front and anterolateral margins in the fossil form prevents a deeper insight on the relationships between the three taxa. Pending confirmation by more complete fossil specimens, the new proposed combination *Geryon isseli* supports for the first time the presence of *Geryon* from the Pliocene of Italy.

Remarks on the Coppi's specimens - The complete, incomplete, and crushed 14 specimens belonging to the Coppi collection, besides the holotype, could be the original specimens reported by Ristori (1886: 119) and therefore they could represent the original type series. We cannot verify this hypothesis, however, for two reasons: Ristori did not provide the exact number of specimens, nor their catalogue numbers, which were instead introduced by Delle Cave (1981). Five specimens [IGF 960E, 963E, 964E, 965E (part-counterpart), 968E] are exposed in ventral view or very compressed dorso-ventrally showing overlapped and crushed dorsal and ventral parts. Therefore, it is not clear how they could be compared with the holotype (IGF 959E), dorsally preserved (Fig. 1). Moreover, the specimen IGF 968E shows elongate P1 merus and rounded pleon close resembling those of the females of *Goneplax rhomboides* (Linnaeus, 1758) (Fig. 3C). Seven specimens, preserved in dorsal view (IGF 962E, 966E, 967E, 969E, 970E, 971E, 105104), could be compared with the holotype by the general shape of the carapace and its ornamentation (Figs 2C, 3B, 3D). Based upon the comparison between the above-mentioned specimens and the holotype, the former could tentatively be assigned to *Coeloma isseli*. Moreover, the specimen IGF 961Eb in dorsal view seems to have larger, straight front and more rounded carapace, so as to better fit the characters of a goneplacid crab (Fig. 3B).

Note - One additional specimen collected by F. Coppi and assigned to *Coeloma issel* [*sic*] was reported by Tettoni (1923: 161) from the same type locality (Guizzaga creek, San Venanzio, Modena) and housed in the Museo Geologico dell'Università di Modena (MGUM, catalogue number unknown) (De Angeli & Garassino, 2006: 56). Unfortunately, this specimen was never figured, preventing a direct comparison with Ristori's material in order to verify its assignment.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest neither known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

- BROCCHI G., 1814. *Conchiologia fossile subappennina*. Milano, Stamperia Reale, 1, 240 pp.
- CALEFFI N., 2007. *Grandi, belle e rarissime specie. La vita e le ricerche di Francesco Coppi*. TEM, Modena, 157 pp.
- COLMENERO A., SERRA B., LAGARES C., ROJO-FRANCÀS E., PÉREZ-GIL J., MESTRES F., ABELLÓ P., 2023. *Genetic variability and connectivity in the Western Mediterranean populations of the Bathyal Crab Geryon longipes*. Diversity 15: 534. doi: 10.3390/d15040534
- COLOSI G., 1924. *Una specie fossile de Gerionide (Decapodi brachiuri)*. Bollettino della Società dei Naturalisti in Napoli, s. 2 35: 248-255.
- COPPI F., 1869. *Catalogo dei fossili miocenici e pliocenici del modenese*. Annuario della Società dei Naturalisti in Modena 4: 163-228.
- COPPI F., 1872. *Studii di paleontologia iconografica del modenese. Parte prima. I petrefatti classe dei molluschi cefalati*. Cappelli, Modena, 41 pp.
- COPPI F., 1882. *Nota di contribuzione alla flora fossile modenese e di una anomalia*. Atti della Società dei Naturalisti di Modena, Rendiconti delle adunanze 1: 33-37.
- COPPI F., 1885. *Nota di contribuzione alla flora pliocenica modenese*. Atti della Società dei Naturalisti di Modena, Rendiconti delle adunanze 2: 113-115.
- DE ANGELI A., GARASSINO A., 2006. *Catalog and bibliography of the fossil Stomatopoda and Decapoda from Italy*. Memorie della Società italiana di Scienze naturali e del Museo civico di Storia naturale di Milano 35 (1): 3-88.
- DELLE CAVE L., 1981. *Catalogue of type specimens in the invertebrate palaeontological collections of the Museum of Geology and Palaeontology of the University of Florence. (Italy). Crustacea, Decapoda*. Atti della Società Toscana di Scienze Naturali, Memorie, Serie A 88: 43-50.

- FELDMANN R.M., SCHWEITZER C.E., ENCINAS A., 2010. *New decapods from the Navidad Formation (Miocene) of Chile*. *Journal of Crustacean Biology* 25: 427-449.
- FUSCO F., 2007. *Vegetation response to Early Pleistocene climatic cycles in the Lamone valley (Northern Apennines, Italy)*. *Review of Palaeobotany and Palynology* 145 (1-2): 1-23.
- GASPERI G., PRETI D., BATELLI G., PANINI F., PIZZAILOLO M., 2006. *Carta Geologica d'Italia a scala 1:50.000. Foglio N. 219 "Sassuolo"*. (Ed. 2005) S.EL.CA., Firenze.
- GLAESSNER M.F., 1929. *Crustacea Decapoda*. In Pompeckj F.J. (ed.), *Fossilium catalogus*, 1: Animalium, 41. W. Junk, Berlin. 164 pp.
- HERBST J.F.W., 1782-1804. *Versuch einer Naturgeschichte der Krabben und Krebse nebst einer systematischen Beschreibung ihrer verschiedenen Arten*. 1 [1782-1790]: 1-274; 2 [1791-1796]: i-viii, iii, iv, 1-225; 3 [1799-1804]: 1-66. (G.A. Lange, Berlin; J.C. Fuessly, Zürich).
- KRØYER H., 1837. *Geryon tridens, en ny krabbe*. *Naturhistorisk Tidsskrift*, s. 1 1 (1): 10-21.
- LINNAEUS C., 1758. *Systema Naturae Per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, Cum Characteribus, Differentiis, Synonymis, Locis*. 1: 1-824. Holmiae (Laurentius Salvius).
- MANNING R.B., HOLTHUIS L.B., 1989. *Two new genera and nine new species of geryonid crabs (Crustacea, Decapoda, Geryonidae)*. *Proceedings of the Biological Society of Washington* 102 (1): 50-77.
- MACLEAY W.S., 1838. *On the brachyurous decapod Crustacea brought from the Cape by Dr. Smith*. In Andrew Smith, *Illustrations of the Annulosa of South Africa; consisting chiefly of figures and descriptions of the objects of natural history collected during an expedition into the interior of South Africa, in the years 1834, 1835, and 1836; fitted out by "The Cape of Good Hope Association for Exploring Central Africa"*: 53-71. Smith, Elder and Company. London.
- MILNE-EDWARDS A., 1865. *Monographie des Crustacés de la famille Cancériens*. *Annales des Sciences Naturelles (Zoologie)* 3 (5): 297-351.
- MILNE-EDWARDS A., 1882. *Rapport sur les Travaux de la Commission chargée par M. le Ministre de l'Instruction Publique d'étudier la faune sous-marine dans les grandes profondeurs de la Méditerranée et de l'Océan Atlantique*. *Archives des missions scientifiques et littéraires* 9 (3): 1-59.
- PANTANELLI D., SANTI V., 1896. *L'Appennino modenese: descritto ed illustrato con 153 incisioni, una carta geografica ed una geologica*. Treves, Bologna, 5 voll., 1166 p.
- PAULSON O., 1875. *Studies on the Crustacea of the Red Sea with notes regarding other seas. Part 1. Podophthalmata and Edriophthalmata (Cumacea)*. Kul'zhenko S.V. Kiev. 1-164 [Translation published for The National Science Foundation, Washington, D.C. and Smithsonian Institution, U.S.A., by the Israel Program for Scientific Translations, 1961.]
- RAFINESQUE C.S., 1815. *Analyse de la nature, ou tableau de l'univers et des corps organisés*. Barravecchia, Palermo, 224 pp.
- RICCI LUCCHI F., COLALONGO M.L., CREMONINI G., GASPERI G., IACCARINO S., PAPANI G., RAFFI S., RIO D., 1982. *Evoluzione sedimentaria e paleogeografica nel margine appenninico*. *Bologna*. In: Cremonini G., Ricci Lucchi F. (eds), *Guida alla geologia del margine Appenninico-Padano*: 17-46. Pitagora, Bologna.
- RISTORI G., 1886. *I crostacei brachiuri e anomuri del Pliocene italiano*. *Bollettino della Società Geologica Italiana* 5: 93-128.
- STAINIER X., 1887. *Coeloma rupeliense, Brachyure nouveau de l'argile rupélienne*. *Annales de la Société Géologique de Belgique* 14: 86-96.
- SCHWEITZER C.E., FELDMANN R.M., GARASSINO A., KARASAWA H., SCHWEIGERT G., 2010. *Systematic list of fossil decapod crustacean species*. *Crustaceana Monographs* 10: 1-222. doi: 10.1163/ej.9789004178915.i-222
- SCHWEITZER C.E., FELDMANN, R.M., KARASAWA H., 2021. *Part R, Revised, Volume 1, Chapter 8T15: Systematic descriptions: Superfamily Portunoidea*. *Treatise Online* 151: 1-40. doi: 10.17161/to.vi.15392
- SESTINI G., 1970. *Postgeosynclinal deposition*. *Sedimentary Geology* 4 (3-4): 481-520.
- STIMPSON W., 1863. *On the fossil crab of Gay Head*. *Boston Journal of Natural History* 7 [1859-1863]: 583-589.
- TETTONI W., 1923. *Crostacei pliocenici dell'Appennino Modenese*. *Atti della Società Naturalisti e Matematici di Modena* s. 6 1 (53): 160-162.

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