



## New look at the lobster *Eryma greppini*, OPPEL, 1861 (Crustacea, Decapoda, Erymidae) from the Middle Jurassic of France and Switzerland

Sylvain Charbonnier, Alessandro Garassino, Günter Schweigert, Denis Audo, and Sophie Fernandez

With 5 figures

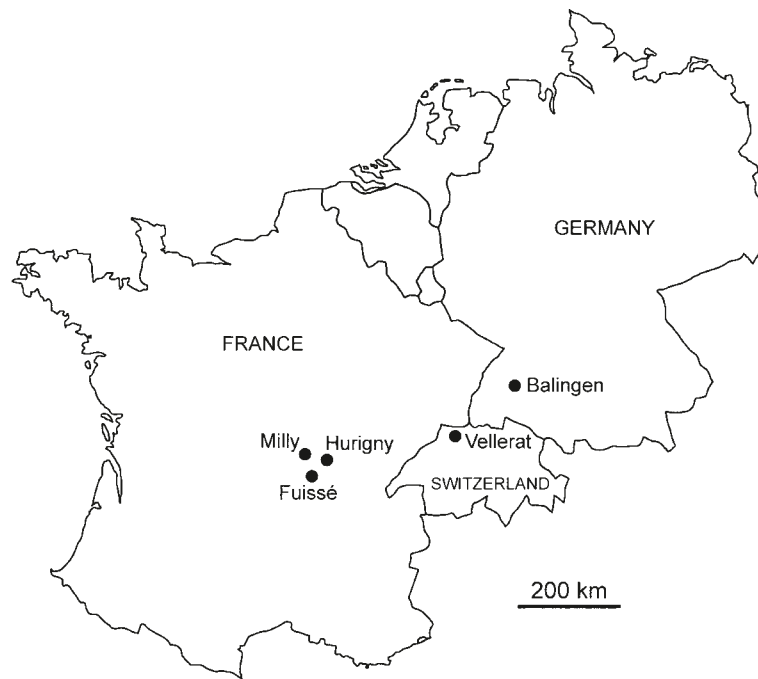
**Abstract:** Erymid lobsters (Decapoda, Erymidae) are a relatively abundant family of decapod crustaceans with a presumed conservative morphology. For these reasons, numerous species of erymids have been synonymized with others by early efforts to review the family. *Eryma greppini* OPPEL, 1861, is one of these. A well-preserved specimen of erymid lobster assigned to this species has recently been traced in the palaeontological collections from the Université Claude Bernard Lyon 1 (France). Study of this specimen and examination of the type material of *Eryma greppini*, *Eryma affinis* FERRY, 1865, and *Eryma bedeltum* (QUENSTEDT, 1857) lead us to consider *Eryma greppini* to be a valid species, characterized by a peculiar pair of dorsal domes. A lectotype is herein designated for *Eryma greppini*. This study is a first step toward the necessary revision of erymid lobsters and proves the importance of taxonomic studies based on type material.

**Key words:** Crustacea, Erymidae, *Eryma*, lobsters, preservation, lectotype, Jurassic, Bathonian, France, Switzerland.

### 1. Introduction

The Jurassic is an important period for the decapod crustaceans with a major diversification of reptantian crustaceans, lobsters in particular (WAHLE et al. 2012; KLOMPMAKER et al. 2013). Glypheoid, erymoid and polychelidan lobsters are relatively abundant and diverse in Jurassic deposits of Europe (e.g., VAN STRAELEN 1925; FÖRSTER 1966; GARASSINO & SCHWEIGERT 2006; CHARBONNIER & GARASSINO 2012; CHARBONNIER et al. 2013). However, a great number of these lobsters are known only from Konservat-Lagerstätten such as at Osteno (Sinemurian, Italy; GARASSINO 1996), La Voulte-sur-Rhône (Callovian, France; CHARBONNIER 2009; CHARBONNIER et al. 2010), and from the renowned Solnhofen Lithographic Limestones (Kimmeridgian-Tithonian, Germany; SCHWEIGERT et al. 2000; GARASSINO & SCH-

WEIGERT 2006; AUDO et al. 2014). Some fossil lobsters do not come from localities with exceptional preservation but may present connections between carapace and pleon or carapace and pereopods such as in the Aalenian of France (HYŽNÝ et al. in prep.) or in the Oxfordian nodules of France (CHARBONNIER et al. 2012). Unfortunately, most of the time, only isolated carapaces or chelae are usually found (e.g., SCHWEIGERT 2013), which makes difficult the specific determination and the identification of intraspecific variations and of possible sexual dimorphism and/or heterochely. Erymid lobsters (Erymidae VAN STRAELEN, 1925) do not constitute an exception to the rule and the knowledge of the group is mainly based upon the carapace. Between 1840 and 2014, more than 150 species of erymid lobsters have been described (see FÖRSTER 1966; DE GRAVE et al. 2009; SCHWEITZER et al. 2010) and nu-



**Fig. 1.** Location of the studied specimens: *Eryma greppini* OPPEL, 1861, from Hurigny (France) and Vellerat (Switzerland); *Eryma bedeltum* (QUENSTEDT, 1857), from Balingen (Germany); *Eryma affinis* FERRY, 1865, from Fuissé and Milly-Lamartine, near Hurigny (France).

merous systematic problems have accumulated in the literature: problems of nomenclature, species validity, type species designations, synonymies, type material having been lost during the wars in the twentieth century, heterogeneity in the descriptive terminologies and misquotations of previous studies.

The last global contribution on erymid lobsters was that of FÖRSTER (1966) who emphasized the fact that the members of the family Erymidae – notably the genus *Eryma* MEYER, 1840 itself – present an extremely conservative and constant morphology throughout the time. As a consequence, since FÖRSTER (1966), studies dealing with erymid lobsters remained purely descriptive and lacked in-depth reviews of the group or taxonomic work on previously described species. This situation leads to a situation that can be called the “erymid problem”: the conception of the whole group remains uncompleted.

The present work illustrates this tenuous situation, by the rediscovery of a well-preserved specimen of erymid lobster from the Middle Jurassic of France and Switzerland, which is accompanied by numerous taxonomic issues, highlighting the necessity of a major revision of erymids.

## 2. Previous work and material

Erymid lobsters from the Middle Jurassic of France and Switzerland have been subject of systematic studies since the 19<sup>th</sup> century. They were discussed by ÉTALLON (1859, 1861), OPPEL (1861, 1862), MORIÈRE (1882, 1888), MÉCHIN (1901), LISSAJOUS (1907, 1923), HÉE (1924), VAN STRAELEN (1925), FÖRSTER (1966), CRONIER & COURVILLE (2004), and CHARBONNIER et al. (2010).

LISSAJOUS (1907) published a well-preserved erymid lobster collected by his wife in the Bathonian limestones from Hurigny (Saône-et-Loire, France) (Fig. 1). This specimen has recently been traced in the palaeontological collections of the Université Claude Bernard Lyon 1 (Villeurbanne, France), by the first author. The re-determination of this specimen leads the authors to revise the following species: *Eryma greppini* OPPEL, 1861, *Eryma affinis* FERRY, 1865, and *Eryma bedeltum* (QUENSTEDT, 1857).

The studied material is composed of (1) specimen FSL 170597 (LISSAJOUS coll.) (Figs. 2-3) published by LISSAJOUS (1907), (2) type material of *Eryma greppini* (MJSN Col.Del.1 & Del.475, GREPPIN coll.) (Fig. 4)

from the Bathonian of Vellerat, Delémont (Jura, Switzerland), (3) type material of *Eryma affinis* (syntypes MNHN.F.A29727, A29728, A29731; DE FERRY coll.) from the Bathonian of Fuissé and Milly-Lamartine (Saône-et-Loire, France), and (4) type material of *Eryma bedeltum* (lectotype GPIT/43/53-5; designation by FÖRSTER 1966: 97) (Fig. 5) from the Bajocian of Balingen (Baden-Württemberg, Germany). One of the co-authors (G. SCHWEIGERT) noted that, concerning the lectotype of *E. bedeltum*, this specimen must come from an ironoolitic bed of the Middle Jurassic. In the vicinity of Balingen only the Subfurcatenoolith Bed (Upper Bajocian, Niortense Zone) of the Ostreenkalk Formation shows exactly this lithology.

**Institutional abbreviations:** FSL, Université Claude Bernard Lyon 1 (Villeurbanne, France); GPIT, Department of Geosciences University of Tübingen (Germany); MJSN, Musée jurassien des sciences naturelles (Porrentruy, Switzerland).

**Anatomical abbreviations:** Mx3, third maxilliped; P1–P5, pereopods 1 to 5; s1–s6, pleonal somites 1 to 6.

### 3. Systematic palaeontology

Order Decapoda LATREILLE, 1802

Superfamily Erymoidea VAN STRAELEN, 1925

Family Erymidae VAN STRAELEN, 1925

Genus *Eryma* MEYER, 1840

**Type species:** *Macrourites modestiformis* SCHLOTHEIM, 1822, by subsequent designation of GLAESSNER (1929: 150).

*Eryma greppini* OPPEL, 1861

Figs. 2–4

- 1861 *Eryma Greppini* OPPEL, p. 357.  
 1862 *Eryma Greppini*. – OPPEL, p. 27–28, pl. 4, figs. 8–9.  
 1907 *Eryma Greppini*. – LISSAJOUS, p. 66.  
 1923 *Eryma affinis*. – LISSAJOUS, p. 35–37, pl. 1, fig. 4.  
 1925 *Eryma Greppini*. – VAN STRAELEN, p. 245–247, fig. 114.  
 1928 *Clytia Greppini*. – BEURLEN, p. 168.  
 1928 *Clytia Greppini*. – GLAESSNER 1929, p. 116.  
 1966 *Eryma* sp. – FÖRSTER, pl. 14, fig. 13.  
 1977 *greppini*. – WANNIER & PANCHAUD, p. 931.  
 2004 *Eryma greppini*. – CRÔNIER & COURVILLE, p. 1007.

**Type material:** Lectotype herein designated, MJSN Col. Del.475 (GREPPIN coll., Fig. 4A–D) and paralectotype MJSN Col. Del.1 (GREPPIN coll., Fig. 4E–F).

**Type locality:** Vellerat, Delémont, Jura, Switzerland.

**Type horizon:** Calcaire roux sableux (Middle Jurassic, Bathonian).

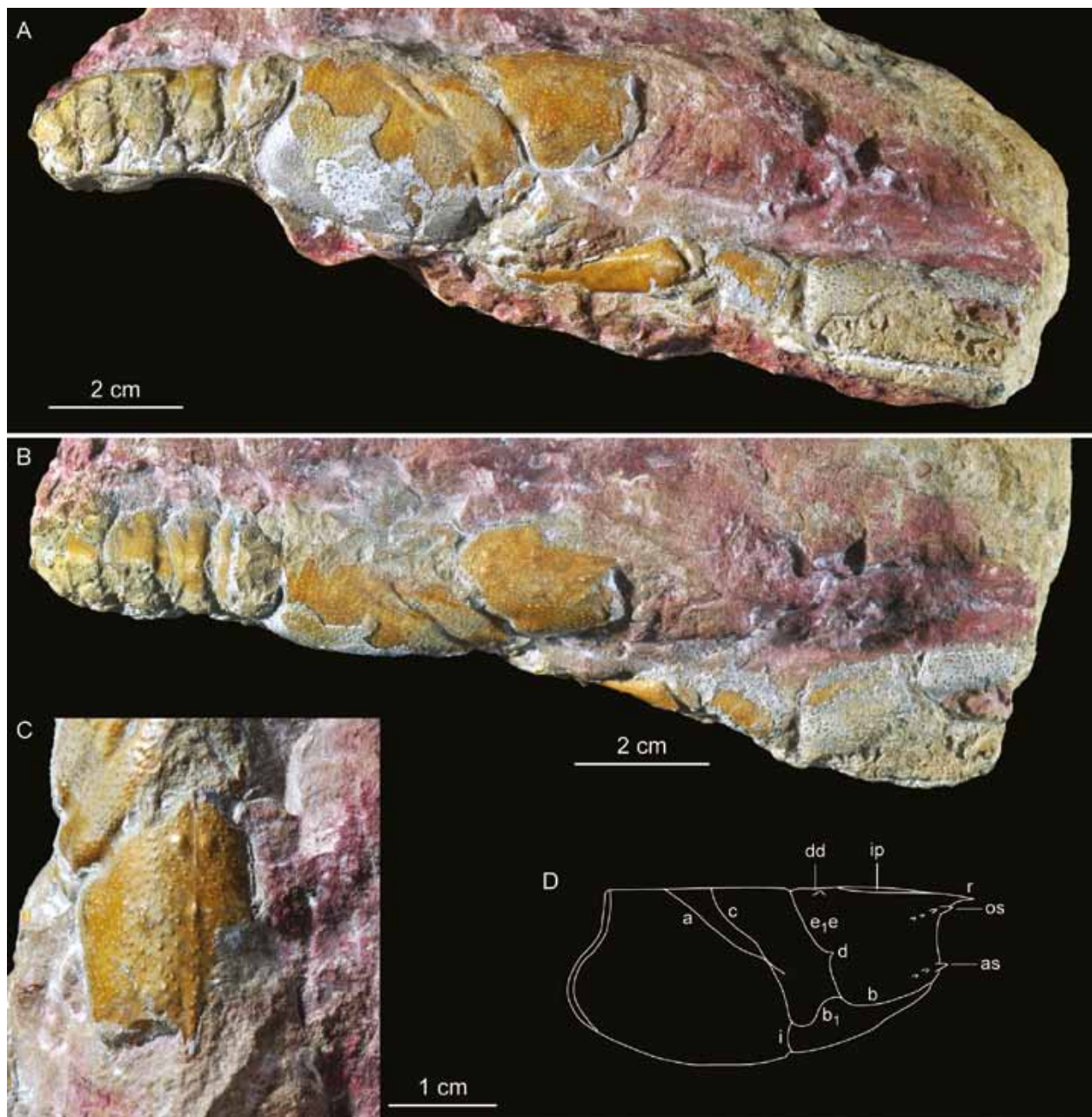
**Studied material:** Type material of *Eryma greppini*; specimen FSL 170597 (LISSAJOUS coll.) from the Bathonian of Hurigny (Saône-et-Loire, France), and figured by LISSAJOUS (1907, 1923).

**Emended description:** Carapace. – Cylindrical carapace with well-marked dorsal midline; distinct fusiform intercalated plate, slightly tuberculate; two dorsal domes (dome-shaped structures) located on each side of the dorsal midline, at mid-distance between the posterior extremity of intercalated plate and intersection of cervical groove with dorsal line; anterior cephalic margin with large orbital notch limited by strong orbital and antennal spines; antennal-ptyergostomial area with strongly convex ventral margin; branchial region with very rounded ventral margin; posterior margin rimmed by a deep groove; spineless rostrum, pointed and dorsoventrally flattened; cephalic region with two divergent rows of tubercles: (1) orbital row defined by 4–5 coarse granules and a strong orbital spine anteriorly, and (2) antennal row defined by 3–4 weak granules and strong antennal spine anteriorly; very deep cervical groove, oblique, intercepting dorsal margin at angle of about 55°; cervical groove ventrally joined to antennal groove, delimiting very wide cephalic region; antennal groove rounded ventrally, forming slightly raised antennal lobe; short and deep gastro-orbital groove originating as a slight median anterodorsal inflexion of the cervical groove; postcervical and branchiocardiac grooves subparallel and both joined to the dorsal margin; postcervical groove joined medially to branchiocardiac groove (with a very short ventral extension); branchiocardiac groove strongly inclined, joined ventrally to hepatic groove; concavo-convex hepatic groove joined to cervical groove; inferior groove convex posteriorly, joined to hepatic groove.

Ornamentation of carapace. – Variable in aspect, according to which cuticle layers are preserved: finely granular endocuticle (lectotype and specimen FSL 170597) and finely pitted exocuticle (specimen FSL 170597), both aspects may in fact correspond to diverse degrees of abrasion of carapace ornamentation.

Pleon. – Poorly preserved s1–s6; smooth s2–s5 terga ornamented with sparse granules; s2–s5 pleura with slightly rounded ventral margins and marginal transversal groove; tail fan not preserved.

Thoracic appendages. – Mx3 represented only by one indistinct fragment; chelate first pereopods, appearing homochelous; stout, subrectangular P1 merus with smooth outer surface; strong, triangular P1 carpus with wide distal extremity connected to strong P1 propodus; P1 carpus with tuberculate surface; P1 propodus with laterally flattened palm showing tuberculate outer surface; P1 fingers (index and dactylus) distinctly longer than palm; narrow occlusal opening; index (fixed finger) incurved inward, with smooth occlusal margin and tuberculate inner and outer surfaces; dactylus slightly incurved, with occlusal margin bearing a single row of strong rounded teeth decreasing in size distally; dactylus with finely tuberculate inner surface and finely pitted outer surface; palm with wide fold located at the base of articulation of dactylus; P2–P5 unknown.



**Fig. 2.** *Eryma greppini* OPPEL, 1861, subcomplete specimen FSL 170597 (LISSAJOUS coll.) from the Bathonian of Hurigny (Saône-et-Loire, France). **A** – Right lateral view showing in connection carapace, pleon and first pereiopod. **B** – Dorsal view. **C** – Detail of the cephalic region showing the intercalated plate and the pair of dorsal domes, dorsal view. **D** – Line drawing of the carapace with groove pattern. Abbreviations: a, branchiocardiac groove; as, antennal spine; b, antennal groove; b<sub>1</sub>, hepatic groove; c, postcervical groove; d, gastro-orbital groove; dd, dorsal dome; e<sub>1</sub>e, cervical groove; i, inferior groove; ip, intercalated plate; os, orbital spine; r, rostrum. Photographs: C. LEMZAOUDA.

**Comments:** Our examination of the type material of *Eryma greppini* confirms that the morphological characters of this species are those of *Eryma*. Indeed, the carapace groove pattern is diagnostic of *Eryma*: the cervical groove is oblique, the gastro-orbital groove is short with one single

branch, and the postcervical groove is joined only medially to the branchiocardiac groove. The intercalated plate is also a typical character preserved in many erymid lobsters. Moreover, the wide cephalic region shows two inclined rows of tubercles with distal antennal and orbital spines



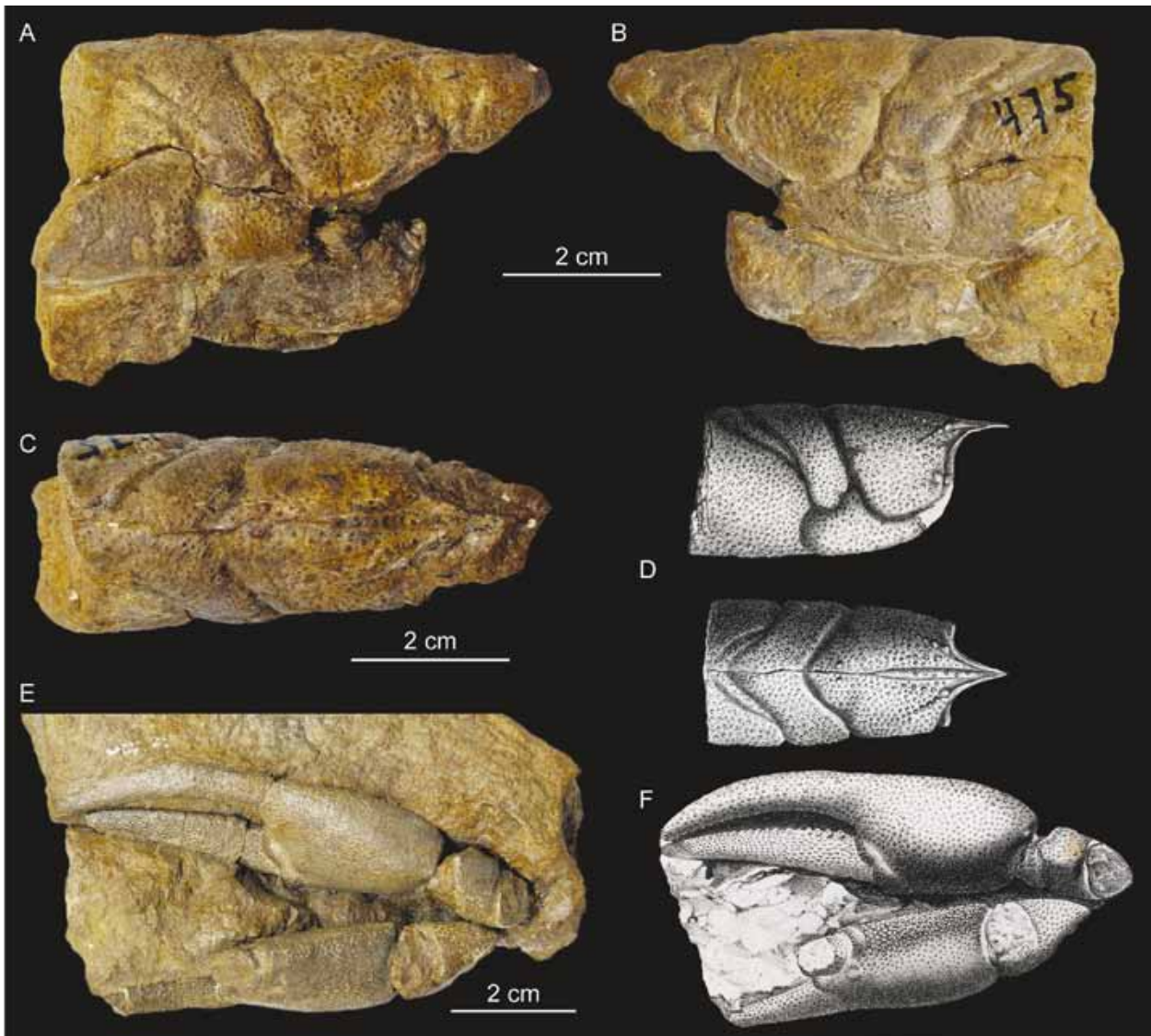
**Fig. 3.** *Eryma greppini* OPPEL, 1861, specimen FSL 170597 (LISSAJOUS coll.) from the Bathonian of Hurigny (Saône-et-Loire, France). Line drawings by S. FERNANDEZ (MNHN scientific draftman).

respectively. The first pereopods are massive and shows the typical pattern of chelate appendages, notably with laterally flattened palms and elongate fingers.

After OPPEL (1861), the original type material was composed of two syntypes (Fig. 4). We consider it important to select a lectotype for *Eryma greppini* because OPPEL (1861) did not designate a holotype. This is the carapace MJSN Col.Del.475 (GREPPIN coll.) from Vellerat, Switzerland (Fig. 4A-D). In our opinion, carapaces carry more significant taxonomic characters and are therefore more potent in discriminating a species than chelae, whose shapes are highly affected by ecological parameters.

#### 4. Discussion

LISSAJOUS (1907) figured specimen FSL 170597 from the Bathonian of Hurigny (Saône-et-Loire, France). He identified this specimen as *Eryma greppini*, but with some doubts. LISSAJOUS (1923) figured a second time the same specimen and then identified it as *Eryma affinis* FERRY, 1865. Examination of the three syntypes of *Eryma affinis* (MNHN.F.A29727, A29728, A29731; DE FERRY coll.) shows that (1) the pair of dor-



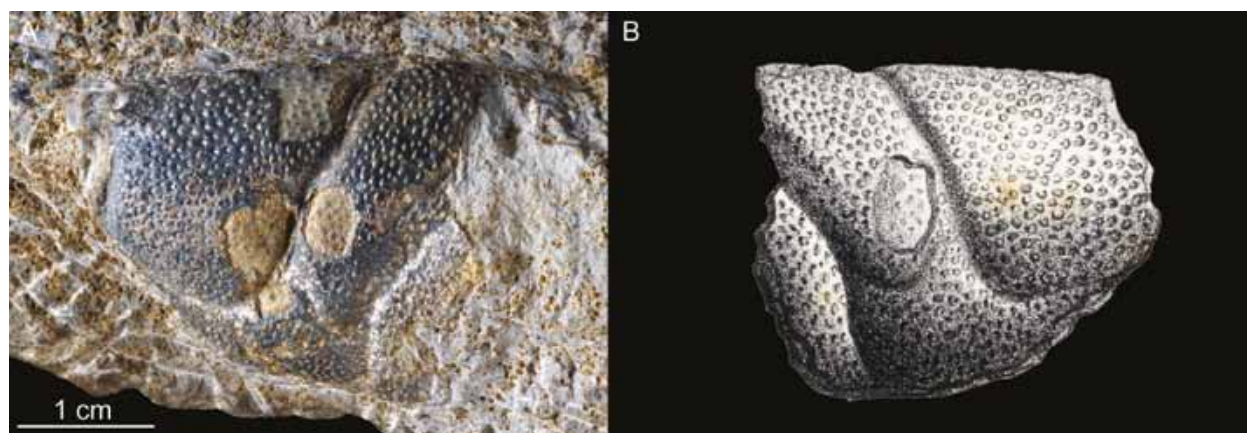
**Fig. 4.** Type material of *Eryma greppini* OPPEL, 1861, from the Bathonian of Vellerat, Delémont (Jura, Switzerland). **A-D** – Lectotype herein designated MJSN Col.Del.475 (GREPPIN coll.), carapace in right lateral (A), left lateral (B) and dorsal (C) views, and original figures (D) by OPPEL (1862: pl. 4, fig. 9a,b). **E-F** – Paralectotype MJSN Col.Del.1 (GREPPIN coll.), pair of first chelae, inner view (E), and original figure (F) by OPPEL (1862: pl. 4, fig. 8). Photographs: D. BECKER.

sal domes located near the intercalated plate is absent in *E. affinis*, and (2) the carapace endocuticle is pitted in *E. affinis* and finely granular in *E. greppini*. The identification proposed by LISSAJOUS (1923) is therefore erroneous.

According to VAN STRAELEN (1925), and after the examination of the type material of *Eryma greppini*, specimen FSL 170597 is identified as *Eryma greppini* based upon the following characters: pair of dor-

sal domes, similar carapace ornamentation, P1 chelae with identical design (index with smooth occlusal margin and dactylus with a row a strong occlusal teeth).

FÖRSTER (1966) synonymized a wide array of erymid species with *Eryma bedeltum* (QUENSTEDT, 1857) including *Eryma greppini* and also the aforementioned specimen. This synonymy was questioned by CRÔNIER & COURVILLE (2004) and maintained by SCHWEITZER et al. (2010).



**Fig. 5.** Lectotype GPIT/43/53-5 of *Eryma bedeltum* (QUENSTEDT, 1857) from the Bajocian in the vicinity of Balingen (Baden-Württemberg, Germany). **A** – Fragment of carapace in left lateral view. **B** – Original figure by QUENSTEDT (1857: pl. 53, fig. 5), the view is reversed due to the lithographic process. Photograph: P. HAVLIK.

FÖRSTER (1966) also designated specimen GPIT/43/53-5 figured by QUENSTEDT (1857: pl. 53, fig. 5) to be the lectotype of *Eryma bedeltum*. This lectotype consists of a poorly preserved carapace with only the cephalic, pterygostomial and hepatic regions and part of the cardiac region (Fig. 5). The differences of preservation between the lectotypes of *E. bedeltum* (fragment of carapace with preserved exocuticle) and *E. greppini* (internal mold of complete carapace) are relatively significant and it is difficult to argue in favour of a synonymy or of a separation between the two species. However, the two strong rounded tubercles located on each side of the dorsal midline near the posterior extremity of the intercalated plate observed in *E. greppini* seem to be effectively absent of the cephalic region of *E. bedeltum*. This character is sufficient to distinguish the two species and to maintain *E. greppini* as valid. Also, it appears that the inferior groove is less curved on *E. bedeltum*. In conclusion, we highlight that the presence of the pair of dorsal domes near the intercalated plate is unique among all the species of *Eryma* and additionally confirms the validity of *Eryma greppini*.

## 5. Conclusion

Based upon a specimen figured by LISSAJOUS (1907), the present study elucidates the true nature of *Eryma greppini*, known only from three specimens. It recognizes an independent specific status of *Eryma greppi-*

*ni*, which has been for a long time regarded as a junior subjective synonym of *Eryma bedeltum*. This study highlights that an examination of the type material of all type species is necessary. Such a fundamental and systematic review is inevitable, returning to the original primary bibliographical data.

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#### Addresses of the authors:

SYLVAIN CHARBONNIER, DENIS AUDO, SOPHIE FERNANDEZ, Muséum national d'Histoire naturelle, Département Histoire de la Terre, CP 38, UMR 7207, Centre de Recherche sur la Paléobiodiversité et les Paléoenvironnements, CNRS-MNH-UPMC, 57 rue Cuvier, 75005 Paris, France;  
e-mail: scharbonnier@mnhn.fr

ALESSANDRO GARASSINO, Museo di Storia Naturale di Milano, Sezione di Paleontologia degli Invertebrati, Corso Venezia 55, 20121 Milano, Italy;  
e-mail: alegarassino@gmail.com

GÜNTER SCHWEIGERT, Staatliches Museum für Naturkunde, Rosenstein 1, 70191 Stuttgart, Germany;  
e-mail: guenter.schweigert@smns-bw.de

