

# A new type of pylochelid sixth abdominal tergite (Anomura, Paguroidea) from the Upper Jurassic of Poland

R.H.B. Fraaije, W. Krzemiński, B.W.M. van Bakel, E. Krzemińska & J.W.M. Jagt

Fraaije, R.H.B., Krzemiński, W., Van Bakel, B.W.M., Krzemińska, E. & Jagt, J.W.M. A new type of pylochelid sixth abdominal tergite (Anomura, Paguroidea) from the Upper Jurassic of Poland. *In*: Fraaije, R.H.B., Hyžný, M., Jagt, J.W.M., Krobicki, M. & Van Bakel, B.W.M. (eds.), Proceedings of the 5th Symposium on Mesozoic and Cenozoic Decapod Crustaceans, Krakow, Poland, 2013: A tribute to Pál Mihály Müller. *Scripta Geologica*, **147**: 21-25, 1 fig., Leiden, October 2014.

René H.B. Fraaije, Oertijdmuseum De Groene Poort, Bosscheweg 80, 5283 WB Boxtel, the Netherlands (info@oertijdmuseum.nl); Wiesław Krzemiński, Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, ul. Sławkowska 17, 31-016 Kraków, Poland; Barry W.M. van Bakel, Oertijdmuseum De Groene Poort, Bosscheweg 80, 5283 WB Boxtel, the Netherlands; and, Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, the Netherlands (barryvanbakel@gmail.com); Ewa Krzemińska, Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, ul. Sławkowska 17, 31-016 Kraków, Poland (krzeminska@isez.pan.krakow.pl); John W.M. Jagt, Natuurhistorisch Museum Maastricht, de Bosquetplein 6-7, 6211 KJ Maastricht, the Netherlands (john.jagt@maastricht.nl).

Key words – Hermit crabs, taxonomy, new taxon, Oxfordian.

Oxfordian (Upper Jurassic) siliceous sponge-microbial reef strata in the southern Polish Uplands around Kraków have recently yielded two types of sixth abdominal tergites of pylochelid paguroids. We here add a third one, *Pylochelitergites expectatus* sp. nov. These small-sized, operculiform remains have a high preservation potential and thus allow us to document the geological history of two families of symmetrical hermit crabs, the Pylochelidae and Parapylochelidae, in some detail.

## Contents

Introduction .....	21
Systematic palaeontology .....	22
Discussion .....	24
Acknowledgements .....	24
References .....	24

## Introduction

Recently, Fraaije *et al.* (2012a) have documented several types of operculate sixth abdominal tergites of pylochelid paguroids from the Oxfordian and Kimmeridgian (Upper Jurassic) of southern Poland and southern Germany. For these small-sized, operculiform structures, those authors introduced a new (para-)taxonomy to accommodate three genera and six species. To date, Middle and Late Jurassic taxa comprise *Liocaris quadratus* Van Straelen, 1925, *Stagmacaris quenstedti* Schweigert, 2006, *Stagmaris adielklompmakeri* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a, *Stagmacaris biarcus* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a, *Pylochelitergites westbergensis* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a, and *Pylochelitergites gelasinus* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a. Previously, only carapaces of the symmetrical hermit crab family Pylochelidae had been described from strata of Late Jurassic age (Van Bakel *et al.*, 2008; Fraaije *et al.*, 2012b).

McLaughlin & Lemaitre (2009) presented a new classification for extant pylochelids and recognised three subfamilies, the Pylochelinae, Pomatochelinae and Trizochelinae. In the diagnoses of all genera then known within these subfamilies these authors supplied brief descriptions of the external morphology of the sixth abdominal tergites. Outlines of extant sixth abdominal tergites show a certain consistency within the subfamilies in being subrectangular to subquadrate in the Pylochelinae, rounded subquadrate in the Pomatochelinae and subcircular to subquadratic in the Trizochelinae.

Lately, a new family of symmetrical paguroids, the Parapylochelidae, has been erected by Fraaije *et al.* (2012c) on the basis of carapace morphology, to comprise some Late Jurassic representatives (see Fraaije *et al.*, in press) and a single extant form, *Parapylocheles scorpio* Alcock, 1894. The outline of the sixth abdominal tergite in the latter is ellipsoidal (see Forest, 1987, p. 141, fig. 42). As far as can be determined at present, the genus *Stagmacaris* Schweigert, 2006 is best assigned to the Parapylochelidae, while *Pylochelitergites* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a can be referred with some confidence to the Pylochelidae.

Over 7,000 specimens of decapod crustacean remains from about a dozen localities within the southern Polish Uplands, west of Kraków, were collected over a period of two years by the Borek family of Dąbrowa Górnicza (southern Poland). The sixth abdominal tergite presented herein originates from this collection and has been transferred to the collections of the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Kraków, Poland (ISEA).

### Systematic palaeontology

#### Infraorder Anomura MacLeay, 1838

#### Superfamily Paguroidea Latreille, 1802

#### Family Pylochelidae Bate, 1888

#### Genus *Pylochelotergites* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a

*Type species* – *Pylochelitergites westerbergensis* Fraaije, Krzemiński, Van Bakel, Krzemińska & Jagt, 2012a, by original designation.

#### *Pylochelitergites expectatus* n. sp.

Fig. 1.

*Diagnosis* – A medium-sized, very wide and smooth form of *Pylochelitergites* with long posterior notches that extend onto the anterior half.

*Derivation of name* – From Latin *expectatus*, meaning ‘[to be] expected’, in allusion to the expected discovery of more types of paguroid sixth abdominal tergite.

*Type* – Holotype, and sole specimen known, is ISEA/MP/601/1502/08, a complete tergite; maximum length and width 3.0 and 2.5 mm, respectively.

*Locality and stratigraphy* – A large disused limestone quarry at Ogrodzieniec. On ammonite evidence, the section exposed there can be dated as early and middle Oxfordian.

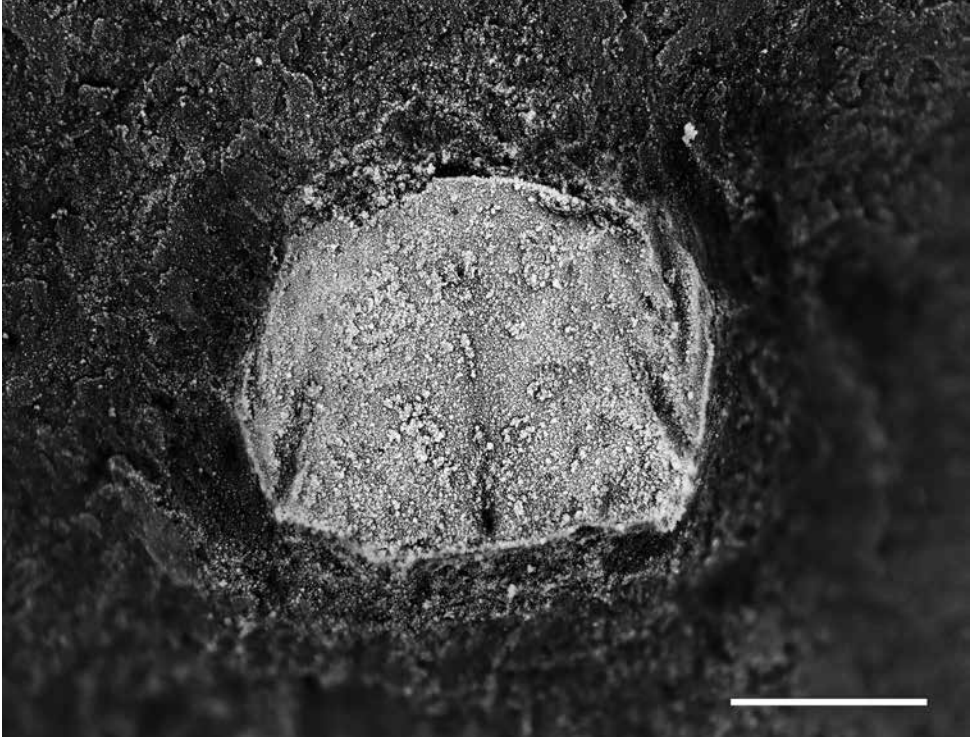


Fig. 1. *Pylochelitergites expectatus* sp. nov., ISEA/MP/601/1502/08 (holotype), lower-middle Oxfordian, Ogródzieniec, southern Polish Uplands. Scale bar equals 1 mm.

With the exception of the discontinuous *Quenstedtoceras mariae* Zone, all zones and sub-zones from the *Cardioceras cordatum* to the *Gregoriceras transversarium* zones have been documented there (Główniak, 2006; Starzyk *et al.*, 2011).

*Description* – Subhexagonal tergite, convex in longitudinal and transverse sections; faint longitudinal median groove, most pronounced on posterior half but shallowing anteriorly, with short, deep, posterior median furrow; transverse grooves absent; relatively long posterolateral notches directed centro-anteriorly, extending as shallow grooves almost to anterior rim; longitudinal groove on anterior part of lateral bulge; anterior rim slightly convex; central portion of posterior rim straight.

*Remarks* – The hexagonal outline clearly distinguishes this form from both *Liocaris* Van Straelen, 1925 and *Stagmacaris*; it appears best assigned to *Pylochelitergites*, at least for the time being. The new form can be differentiated from *P. gelasinus* in the absence of a dimpled ornament. The closest form would appear to be *P. westerbergensis*, from which the new species differs in having longer posterior notches which extend onto the anterior half. Concerning to the extant forms, the general morphology of *Pylochelitergites expectatus* sp. nov. most closely resembles that of the extant pylochelid genus *Cheiroplatea* Bate, 1888.

## Discussion

Long-term taphonomic experiments on decapod crustaceans by Krause *et al.* (2011) suggest that isolated decapod remains should be better represented in the fossil record than currently documented. Amongst brachyurans, and swimming crabs in particular, fragmentary cheliped fingers have the highest fossilisation potential. Amongst symmetrical paguroids (families Pylochelidae and Parapylochelidae), the sixth operculate abdominal tergites seem to be the elements with the highest preservational scores. The relatively small sizes and difficulties in recognition of these 'new fossils' (Fraaije *et al.*, 2012a) are probably the main biases for the current hiatus in our knowledge of assemblages of extinct decapod crustaceans.

## Acknowledgements

We thank the Borek family (Dąbrowa Górnicza, Poland) for collecting and donation of the specimen studied and Thea Fraaije-van Boom (Boxtel, the Netherlands) for assistance during a visit to the Muzeum Przyrodnicze (Instytut Systematyki i Ewolucji Zwierząt PAN, Kraków, Poland). Comments and suggestions made by reviewers Pedro Artal (Barcelona, Spain) and Guenter Schweigert (Stuttgart, Germany) improved an earlier version of the typescript.

## References

- Alcock, A. 1894. On the results of deep-sea dredging during the season 1890-1891 (continued). *Natural History Notes from H.M. Indian Marine Survey Steamer 'Investigator'*, Commander R.F. Hoskyn, R.N., commanding, Series 2. *Annals and Magazine of Natural History*, **13**: 225-245.
- Bate, C.S. 1888. Report on the Crustacea Macrura collected by H.M.S. Challenger during the years 1873-76. *In*: Murray, J. (ed.), *Zoology. Report on the scientific results of the voyage of H.M.S. Challenger during the years 1873-76 under the command of Captain George S. Nares, R.N., F.R.S. and the late Captain Frank Tourle Thomson, R.N. Wyville Thomson, C. and J. Murray (series eds.)*, **24**: xc+1-942. Neill and Company, Edinburgh.
- Forest, J. 1987. Les Pylochelidae ou «Pagures symétriques» (Crustacea Coenobitoidea). *In*: Crosnier, A. (ed.), *Résultats des Campagnes MUSORSTOM, Volume 3. Mémoires du Muséum national d'Histoire naturelle, A. Zoologie*, **137**: 1-254.
- Fraaije, R.H.B., Krzemiński, W., Van Bakel, B.W.M., Krzemińska, E. & Jagt, J.W.M. 2012a. The sixth abdominal tergites of paguroid anomurans – a newly recognized crustacean macrofossil type. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen*, **266**: 115-122.
- Fraaije, R.H.B., Krzemiński, W., Van Bakel, B.W.M., Krzemińska, E. & Jagt, J.W.M. 2012b. The earliest record of pylochelid hermit crabs from the Late Jurassic of southern Poland, with notes on paguroid carapace terminology. *Acta Palaeontologica Polonica*, **57**: 647-654.
- Fraaije, R.H.B., Klompaker, A.A. & Artal, P. 2012c. New species, genera and a family of hermit crabs (Crustacea, Anomura, Paguroidea) from a mid-Cretaceous reef of Navarra, northern Spain. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen*, **263**: 85-92.
- Fraaije, R.H.B., Krzemiński, W., Van Bakel, B.W.M., Krzemińska, E. & Jagt, J.W.M. in press. New Late Jurassic symmetrical hermit crabs from the southern Polish Uplands and early paguroid diversification. *Acta Palaeontologica Polonica* (<http://dx.doi.org/10.4202/app.2012.022>).
- Główniak, E. 2006. Correlation of the zonal schemes at the Middle-Upper Oxfordian (Jurassic) boundary in the Submediterranean Province: Poland and Switzerland. *Acta Geologica Polonica*, **56**: 33-50.

- Krause Jr, R.A., Parsons-Hubbard, K. & Walker, S.E. 2011. Experimental taphonomy of a decapod crustacean: long-term data and their implications. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **312**: 350-362.
- Latreille, P.A., 1802-1803. *Histoire naturelle, générale et particulière, des Crustacés et des Insectes*, **3**: 1-468. F. Dufart, Paris.
- MacLeay, W.S. 1838. On the brachyurous decapod Crustacea brought from the Cape by Dr. Smith. *In*: Smith A., Illustrations of the zoology 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; titted out by 'The Cape of Good Hope Association for Exploring Central Africa': together with a summary of African zoology, and an inquiry into the geographical ranges of species in that quarter of the globe. Invertebratae: 53-71. Smith, Elder & Co., London.
- McLaughlin, P.A. & Lemaitre, R. 2009. A new classification for the Pylochelidae (Decapoda: Anomura: Paguroidea) and descriptions of new taxa. *The Raffles Bulletin of Zoology*, **20** (Supplement): 159-231.
- Schweigert, G. 2006. The first cycloid arthropod from the Late Jurassic. *Zitteliana*, **A46**: 85-89.
- Starzyk, N., Krzemińska, E. & Krzemiński, W. 2011. Intraspecific variation in the Jurassic crab *Bucculentum bucculentum* (Decapoda: Homolodromioidea: Bucculentidae). *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen*, **260**: 203-210.
- Van Bakel, B.W.M., Fraaije, R.H.B., Jagt, J.W.M. & Artal, P. 2008. An unexpected diversity of Late Jurassic hermit crabs (Crustacea, Decapoda, Anomura) in Central Europe. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen*, **250**: 137-156.
- Van Straelen, V. 1925. Contribution à l'étude des crustacés décapodes de la période jurassique. *Mémoires de l'Académie royale de Belgique, Classe des Sciences*, (2)**7**: 1-462.