

Petrobius lohmanderi Agrell, 1944,
synonymized with *P. maritimus* (Leach,
1809); with notes on characters for the
separation of this species from *P. brevistylis*
Carpenter, 1913, together with records for
both species from Danish coasts
(Archaeognatha)

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Davies, L.: *Petrobius lohmanderi* Agrell, 1944, synonymized with *P. maritimus* (Leach, 1809); with notes on characters for the separation of this species from *P. brevistylis* Carpenter, 1913, together with records for both species from Danish coasts (Archaeognatha).

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On the basis of re-examination of the type series, *Petrobius lohmanderi* Agrell, 1944, is considered to be a junior synonym of *P. maritimus* (Leach, 1809). Among other features of more limited use, the form of the tip of the ninth coxite on the inner side of the insertion of the style is shown to be reliable in separating this species from *P. brevistylis* Carpenter, 1913, in both sexes and in juveniles down to about 5 mm body length. Records of the two species show that the latter species is widespread on east coasts of Denmark, while *P. maritimus* seems rarer.

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P. lohmanderi Agrell, 1944, a synonym
of *P. maritimus* (Leach, 1809)

Petrobius maritimus (Leach, 1809).

Leach, W.E. 1809, article »Entomology« in
Brewster's Edinburgh Encyclopedia, IX:
77.

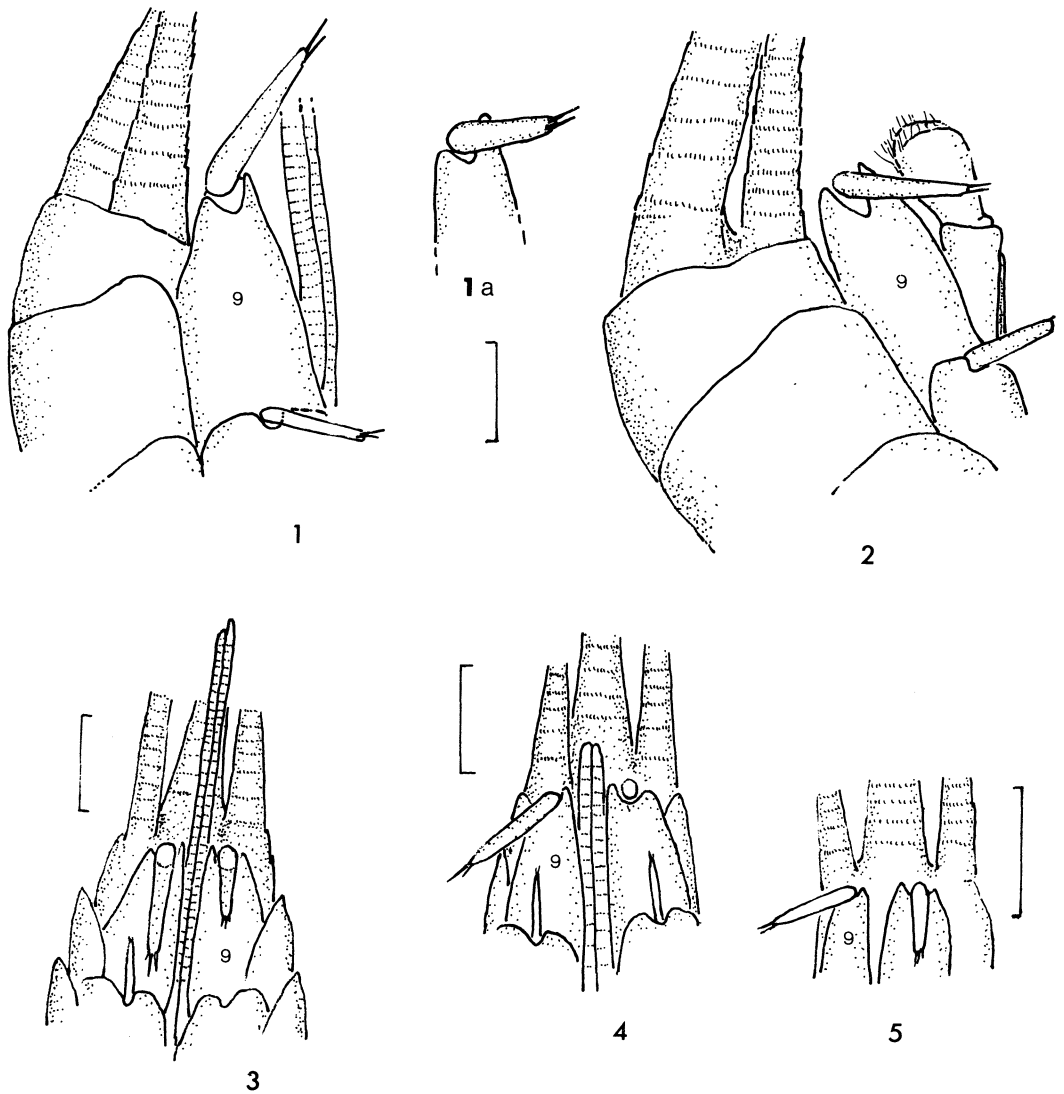
P. Lohmanderi Agrell, 1944. Syn. n.

Agrell, I. 1944. Die schwedischen Thysanu-
ren. Opusc. Ent. 9: 23-36 (description of
P. lohmanderi, pages 31-33).

I have examined the type series of *P. loh-
manderi* from the Natural History Museum,
Göteborg, consisting of three females and
one head. The material is in good condition

although somewhat decolorized as is normal
after prolonged storage in alcohol. Agrell
gave the type-locality as Fårön, Langham-
mars Hammar, Gotland, listing 4 females as
the type series, collected 21.vii.1943, from
among loose stones with sparse vegetation
on a rocky shore. He also ascribed to the
species material from 5 other localities in
southern Sweden and from Bornholm.

I have compared the type specimens in
detail with specimens of *P. maritimus* from
British and Danish localities. I can find no
differences between *P. lohmanderi* and *P.
maritimus*. Therefore I consider that
Agrell's taxon is conspecific with *P. mariti-
mus*, so the name *P. lohmanderi* is a junior
synonym of *P. maritimus* Leach in my view.

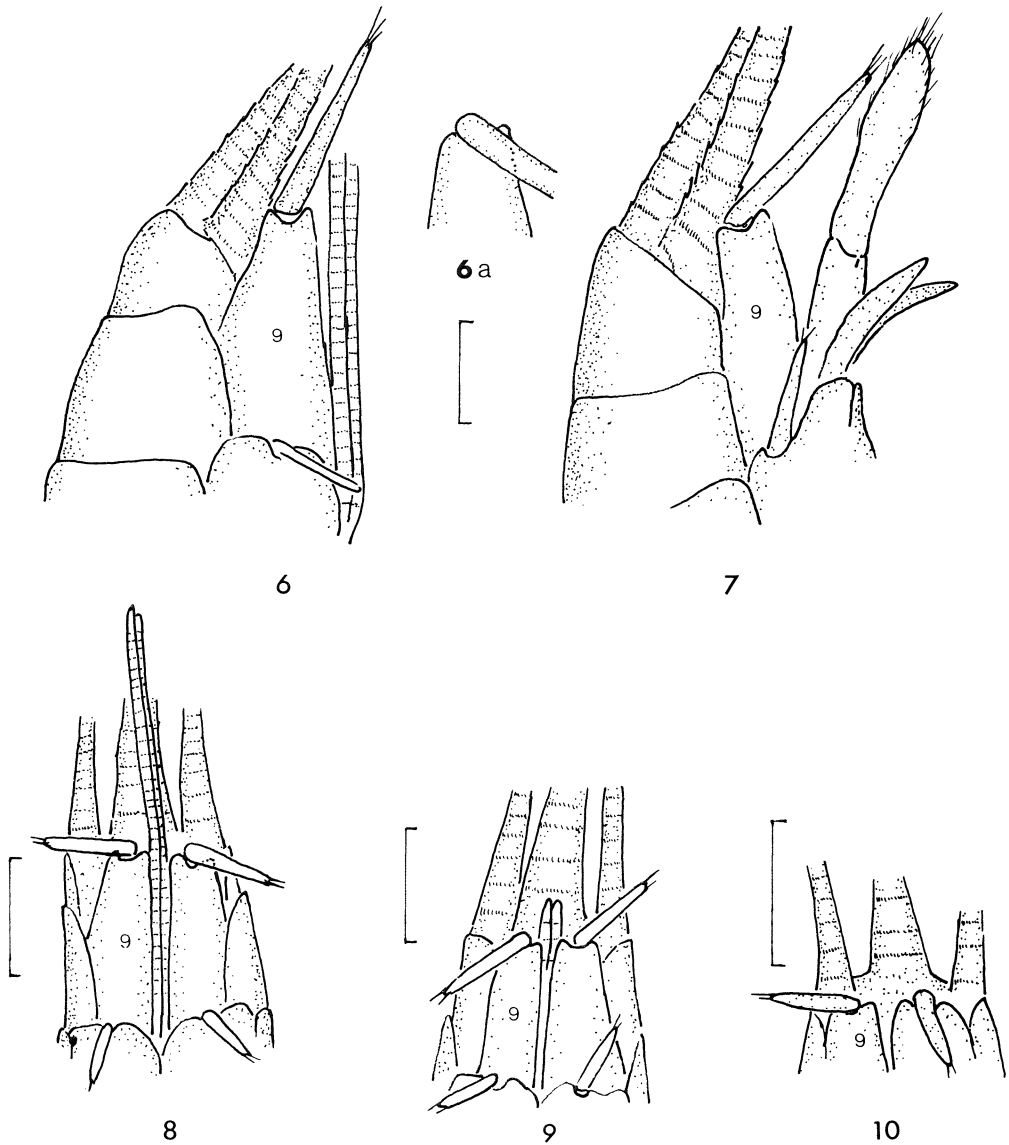


Figs 1-5. Distal abdominal structures in *Petrobius maritimus*, 1-2 in ventro-lateral, 3-5 in ventral view. 1a, tip of ninth coxite with style flexed, same specimen as Fig. 1. Ninth coxite identified with numeral '9' in each case. Scale lines, approx. 0.75 mm. Approximate body lengths of specimens drawn: Fig. 1, female, 14 mm; 2, male, 13 mm; 3, female, 11 mm; 4, female, 9 mm; 5, too young to sex, 5 mm.

The features of this species that serve to separate it from the sole other European *Petrobius* species that authors consider valid, namely *P. brevistylis* Carpenter, are discussed in a later part of this paper.

In the original description of *P. lohmanderi*, Agrell stated that the species was sepa-

rable from other *Petrobius* spp. by two characters, first by differing in the relative lengths of certain maxillary palp segments, and secondly by the red colour of the *P. lohmanderi* lateral ocelli. Measurements of lengths of maxillary palp segments in various specimens from many localities of



Figs 6-10. Distal abdominal structures in *Petrobius brevistylis*. Angles of view and other details as for Figs 1-5. Fig. 6, female, 16 mm; 7, male, 13 mm; 8, female, 9 mm; 9, female, 7 mm; 10, not sexable, 5 mm.

both *Petrobius* species show that these dimensions do not provide reliable species-separating characters, as indeed was long ago concluded by Womersley (1930). As to the second character, it is clear to me from examining many specimens that the colour of lateral ocelli in these insects is too vari-

able to enable any reliance to be placed upon this feature.

Characters for separating *P. brevistylis* and *P. maritimus*

During the past century and more, some

nine species names have been proposed for coastal north European *Petrobius*. On the basis of examination of type or topotypical material, Womersley (1930) concluded that there were in reality only two European species whose valid names were *P. maritimus* and *P. brevistylis*. *P. lohmanderi* was a supposed third species subsequently recognized, but as stated above this is now synonymized with *P. maritimus* so that the number of valid European species recognized is again reduced to two.

Since both species are rather common and widespread on coasts, provided there are rocks above high water mark or where there are man-made equivalents such as harbour walls and piers, it seems appropriate to give the means for distinguishing the two species, including a re-discovered distinguishing feature long overlooked, namely the shape of the tip of the ninth coxite. These features are gathered in Table 1, illustrated in part in Figs 1-10, and are amplified by the following remarks.

The male genitalia features separating the two species have been shown in figures in Delany (1954), Mehl (1977), and others. Since adult males (that is, those over about 9 mm body length) normally form only a minority of the total specimens collected, the features are of limited use, particularly since mixed populations of the two species do occur (Davies & Richardson 1970).

Since in Archaeognatha adults continue to moult and grow after reaching sexual maturity, variation in the length of the aedeagus relative to that of the ninth coxite occurs. In both species males thus vary in body length from 9 to 14 mm, reflecting this continued growth. The shape of the distal part of the aedeagus and the length of its hairs therefore afford more reliable features for separating the two species than does the length of the aedeagus relative to that of the ninth coxite.

Because it applies to both sexes and juveniles down to about 5 mm body length (probably second or third instars), the antennal flagellum character is more useful than the

above male genitalic features. However, the antennal character is subject to the limitation that it cannot be used with very decolorized specimens after prolonged alcohol storage, since the flagellum as a whole becomes pale. The difference between the two species can still be appreciated in partly decolorized specimens if the antennae are viewed at 20-40 X against a white background.

The most widely useful feature for species separation is undoubtedly the form of the tip of the ninth coxite (foot of Table 1), since it applies to both sexes and all sizes down to 5 mm juveniles, and is usable with decolorized material. This ninth coxite feature was partly but not clearly specified as such by Carpenter (1913) in his text (page 229) giving the original description of *P. brevistylis*, and he also partly illustrated it in accompanying figures (Plate 2, Fig. 9 and Plate 3 Fig. IX). Because Carpenter gave the character in a rather incomplete way it has been subsequently overlooked.

Distribution records for *Petrobius* spp. in Denmark

Material of the genus in the Zoological Museum of the University of Copenhagen was kindly loaned to me for re-examination. This material leads to the locality records as specified in the two lists of collections given below for the two *Petrobius* species now recognized. The distribution information so afforded is illustrated by the maps in Fig. 11.

Collection information is given in the list below in the order specified here: name of locality and sub-locality if available; date of collection as given on the label; name of collector if known; and lastly in brackets the name under which the material was originally determined. Unless otherwise stated each collection was from either stones on beaches above high water mark, or from harbour walls or piers.

Table 1. Features distinguishing the two

P. maritimus

(1) Features applying to males only, over about 9 mm body length.

Eighth coxite

Not produced into a lobe on the distal edge on median side of insertion of style (Fig. 2)

Aedeagus

Tip portion shorter, blunt and short-haired, extending little or not at all beyond end of ninth coxite (Fig. 2)

(2) Features applying to both sexes and juveniles down to 5 mm body length.

Antennal flagellum

Whole flagellum seems to be split into dark sections, each separated by a single pale joint.

Form of the tip of ninth coxite.

Distal edge of ninth coxite, on median side of style articulation, prolonged into a sharp point (Figs 1-5), such that process so formed equals the basal diameter of the style, best seen when latter is flexed as in Figs 1a, 2-5.

I. Records for *Petrobius brevistylis*.

Skagen: vi.1919, Kai L. Henriksen (as *P. maritimus*). Frederikshavn, 8 collections: 28.vii.1877, Schiødte (as *P. maritimus*); ix.1905, Th. Mortensen (as *Machilis maritima*); 5.viii.1923 (or 1873), Hy. Ussing (as *P. maritimus*); 30.viii.1912, Hj. Ditlevsen (as *P. maritimus*); 1895 (as *P. oudemansi* Carpenter); 24.vi.1905, Th. Mortensen; 1960, T. Wolff, (as *Petrobius* sp.); 30.vi.1960, T. Wolff (as *Machilis* sp.). Hirschholmene, 2 collections: South pier, 26.viii.1986, S. Langemark; North pier, 25.viii.1986, S. Langemark. Grenå: no date, Johs. Petersen. Juelsminde: viii.1930,

Petrobius species.

P. brevistylis

(1) Features applying to males only, over about 9 mm body length.

Eighth coxite

Produced into a lobe on the distal edge on medial side of insertion of style (Fig. 7).

Aedeagus

Tip portion longer, more tapering, with longer hairs, extending well beyond end of ninth coxite (Fig. 7).

(2) Features applying to both sexes and juveniles down to 5 mm body length.

Antennal flagellum

Whole flagellum dark, not divided into sections by single pale joints.

Form of the tip of ninth coxite.

Distal edge of ninth coxite, on medial side of style articulation, with shorter and blunter process (Figs 6-10), process shorter than diameter of style when seen flexed as in Figs 6a, 8-10

Anker Nielsen (as *P. balticus* Stach). Kongebroen ved Middelfart: 22.viii.1929, 25.ix.1929, S.L. Tuxen. Kongebroskoven: viii.1900, R.H. Stamm (as *P. balticus*). Græsholmene: 3.viii.1938, P. Johnsen (as *P. balticus*). Klintholm Havn: 7.ix.1979, E.S. Nielsen. Korsnæb: 6.xi.1955, Kr. Arevad (as *P. brevistylis*). Samsø: 20.v.1976, G. Winther (as *P. maritimus*). Tårbæk, 2 collections: 15.x.1928, 20.x.1929, S.L. Tuxen; 1.vi.1929, 29.ix.1929, S.L. Tuxen. Bornholm, 11 collections: Rø, 6.viii.1935, konsul R. Baug (?); Rø og Hammeren, 23.-26.xi.1892, Loverdal (?) (as *P. maritimus*); Vang, 9.viii.1929, S.L. Tuxen (as *P. balticus*); Vang, 9.viii.1929, S.L. Tuxen;

Vang, 7.viii.1929, S.L. Tuxen (as *P. lohmanderi* Agrell); Den Sorte Ovn, 21.x.1926, E. Nielsen (as *P. oudemansi*); Den Sorte Ovn, 21.x.1926, E. Nielsen; Nexø, 7.viii.1929, S.L. Tuxen (as *P. brevistylis*); Jons Kapel, ix.1972, Koch, on wet stones in a grotto (as *P. maritimus*); Helligdommen, 26.vi.1906, With; unspecified sublocality on Bornholm, 12.vii.1924. Christiansø: 6.viii.1929, S.L. Tuxen.

II. Records for *Petrobius maritimus*

Frederikshavn: vii.1919, M. Thomsen (as *P. oudemansi*). Hirsholm, 2 collections: 10.vii.1934 (?26), P. Kramp; house-wall, 26.viii.1986, S. Langemark. Maglevandsfaldet: 6.vii.1905, With. Bornholm, 2 collections: Helligdommen, 26.vi.1906, With; Jons Kapel, 25.vii.1924, E. Nielsen.

The above records and Fig. 11 show that on Danish coasts *P. brevistylis* is common in suitable sites, and seems to be particularly present on harbour or pier walls that usually are stone-built, and which represent a man-made equivalent of certain rocky shores, a type of habitat that in itself is rather rare in Denmark. In contrast *P. maritimus* is on the evidence above a much rarer species in Denmark, but interestingly is present on the smaller island of Hirsholm, and also occurs on Bornholm, an island where hard rocks occur and where *P. brevistylis* is abundant, judging by the several localities on the island at which it has been collected.

Attention is drawn to the fact that the above collections show that there are four localities in Denmark where both *Petrobius* species occur. These are: (I) The pier walls at Frederikshavn, where a single *P. maritimus* has been taken (collector M. Thomsen, see list), while eight other collections have yielded numbers of *P. brevistylis* only. (II) Hirsholm, where two specimens of *P. maritimus*, one from a house-wall, have been collected, while *P. brevistylis* occurs in both north and south piers of the small island. (III) At Helligdommen on Bornholm, on sto-

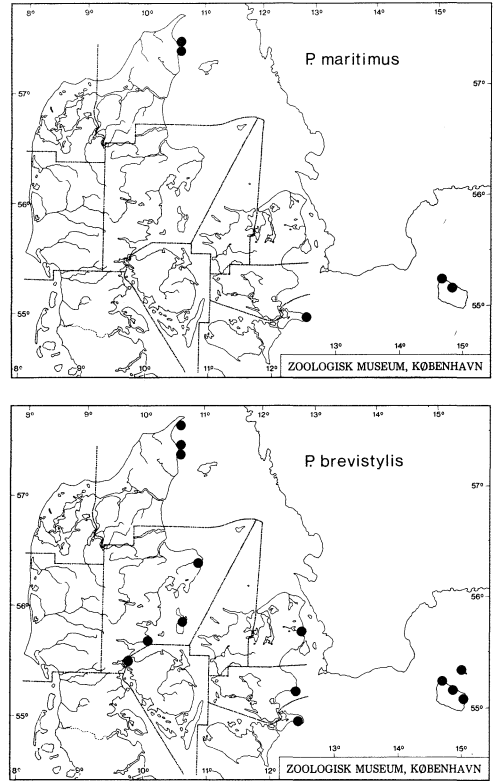


Fig. 11. Distribution of *Petrobius maritimus* and *P. brevistylis* in Denmark.

nes on this beach a single collection has yielded five *P. brevistylis* and one *P. maritimus*. (IV) At Jons Kapel, Bornholm, both species occur, with *P. brevistylis* taken on stones in grotto.

Further detailed collecting in the above localities would be necessary to determine to what extent the two species closely coexist in the same precise habitat, as they do under certain conditions on British coasts as documented from extensive collecting by Davies and Richardson (1970). However, it would seem likely that precise ecological coexistence of the two *Petrobius* species does occur on the harbour walls at Frederikshavn, and at the two Bornholm localities mentioned above.

Sammendrag

Petrobius lohmanderi Agrell, 1944, synonym af *P. maritimus* (Leach, 1809).

Klippespringere (slægten *Petrobius*) er almindelige ved klippekyster, på havnemoler og lignende steder. Der er

P. maritimus

(1) Karakterer, der kun gælder voksne hanner (over ca. 9 mm lange).

8. coxite

Bagranden ikke forlænget i en lobe medialt for stylus (Fig. 2)

Aedeagus

Spidsen kortere, stump og korthåret, når højst en smule forbi spidsen af 9. coxite (Fig. 2)

(2) Karakterer, der gælder begge køn inklusive unger ned til 5 mm længde.

Følehornets flagellum

Flagellum opdelt i mørke afsnit adskilt af et enkelt lyst led

Spidsen af 9. coxite (ses bedst, når stylus er bøjet fremad eller til siden)

Bagranden af 9. coxite forlænget i en spids medialt for stylus (Figs 1-5); spidsen ca. så lang som diameteren af stylus

I Danmark forekommer begge arter, til tider endda på samme lokalitet (lokaliteter nævnt side 57-58, udbredelseskort Fig. 11). *P. brevistylis* er dog langt den hyppigste.

beskrevet 9 arter fra Europa, men Womersley (1930) påviste, at der kun findes to arter: *P. maritimus* (Leach, 1809) og *P. brevistylis* Carpenter, 1913. *P. lohmanderi* Agrell, 1944, vises her for første gang at være synonym med *P. maritimus*.

De to arter kan skelnes på følgende karakterer:

P. brevistylis

(1) Karakterer, der kun gælder voksne hanner (over ca. 9 mm lange).

8. coxite

Bagranden forlænget i en lobe medialt for stylus (Fig. 7)

Aedeagus

Spidsen længere, mere tilspidset, med længere hår, når et godt stykke forbi spidsen af 9. coxite (Fig. 7)

(2) Karakterer, der gælder begge køn inklusive unger ned til 5 mm længde.

Følehornets flagellum

Hele flagellum mørk

Spidsen af 9. coxite (ses bedst, når stylus er bøjet fremad eller til siden)

Bagranden af 9. coxite med en stump forlængelse medialt for stylus (Figs 6-10); forlængelsen kortere end diameteren af stylus

Acknowledgements

I am particularly grateful to Göran Andersson and the authorities of the Natural History Museum, Göteborg, for the loan of the type specimens of *P. lohmanderi*; also to Henrik Enghoff for a loan of *Petrobius* material in the Zoological Museum, Copenhagen. I thank Peter Nielsen and Henrik Enghoff for their patient assistance on many points, particularly in compiling the distribution maps.

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