

## A review of the Eulophidae and Pteromalidae (Hymenoptera: Chalcidoidea) of Greenland

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**Abstract.** The Eulophidae and Pteromalidae (Hymenoptera: Chalcidoidea) of Greenland are revised, based mainly on material deposited at the Zoological Museum, University of Copenhagen, Denmark. Six species of Eulophidae and nine species of Pteromalidae are listed. Eight species are recorded for the first time from Greenland: *Chrysocharis pubicornis* (Zetterstedt, 1838), *Closterocerus diastatae* (Howard, 1881), *Diglyphus isaea* (Walker, 1838), *Pediobius alaspharus* (Walker, 1839) (Eulophidae); *Glyphognathus laevigatus* (Delucchi, 1953), *Seladerma* cf. *breve* (Walker, 1834), *Seladerma geniculatum* (Zetterstedt, 1838), *Trichomalopsis fucicola* (Walker, 1835) (Pteromalidae). Of the other species, four have been misidentified in the past. The status of many species is investigated, which results in the removal of one nominal taxon, *Elachertus artaeus* (Walker, 1839) **revised status** (Eulophidae), from synonymy (the species is not present in Greenland). Finally, the origin and composition of species are compared with those of other regions, especially Iceland and the Northwest Territories (including Nunavut) in Canada. Generally, Greenland has more species in common with the Palaearctic (nine) than with the Nearctic fauna (one).

**Distribution, faunistics, diversity, Hymenoptera, Entedoninae, Eulophinae, Tetrastichinae, Asaphinae, Miscogasterinae, Pteromalinae, Greenland, Nearctic region, Palaearctic region**

### INTRODUCTION

The Eulophidae and Pteromalidae (Chalcidoidea) of Greenland have received relatively little attention. Holmgren (1872) first described a single, new species from northern Greenland, *Pteromalus groenlandicus* (now Pteromalinae: *Pachyneuron* Walker, 1833), without providing any further data. Lundbeck (1897) recorded another four Pteromalidae and gave a few data concerning their distribution. The same data and an unidentified species of *Pteromalus* Swederus, 1795 were listed in Henriksen & Lundbeck's (1917) catalogue of the land-arthropods of Greenland. Bakkendorf (1955), in his review of the Hymenoptera fauna of Greenland and Iceland, essentially revised Lundbeck's material of Pteromalidae and added one species under Eulophidae, *Tetracyclos boreios* Kryger, 1942, which is now recognized as an encyrtid (Gibson & Yoshimoto 1981). Later authors (e.g. Peck 1963, Graham 1969) more or less quoted from the older literature and only two further eulophids were recorded by Buhl (1997), since Bakkendorf (1955). However, a considerable amount of new material has been accumulated in the Zoological Museum, University of Copenhagen over the past forty years. In the course of a revision of the Pteromalidae and Eulophidae for the „Manual of Greenland Entomofauna“, edited by Jens Böcher and published by the Zoological Museum, SNG, University of Copenhagen (in preparation), this material was examined. Because the handbook is primarily restricted to keys and distribution maps, discussion of status and morphology of taxa had to be dealt with in a separate paper. Such a discussion is indispensable, because it is – even in these days! – often impossible to identify chalcidoids from published keys. The name-bearing types of most species were checked which gave some new insights concerning the status

and variational limits of certain taxa. Furthermore, a comprehensive list of voucher specimens is provided. The origin and composition of Greenland Eulophidae and Pteromalidae are finally compared with those of other arctic regions as well as Europe and North America.

## MATERIAL AND METHODS

For the present paper, a total of 119 Eulophidae and 271 Pteromalidae from Greenland were examined. In addition, voucher specimens from other countries as well as name-bearing types were used for comparison. Terminology and morphology follow Gibson (1997). The material from Greenland is mounted and stored very diversely. For instance, many specimens remained for a long time in alcohol, which usually bleaches the colours and distorts proportions of the gaster. This, in turn, often hampers identification, especially in Pteromalidae. Therefore, the way of storing and mounting of specimens from Greenland is mentioned with a single letter right after the acronym of the depository. A specimen is thus either stored in alcohol (a), air dried directly after killing and mounted on a micro-pin, card point or card rectangle (d), or removed from alcohol and mounted on a card rectangle (r). Unless mentioned otherwise, drying and mounting specimens from alcohol was done by me following the method of Heraty & Hawks (1998) except for using amyl acetate instead of hexamethyldizilazane. This method successfully prevented shrivelling, even in the case of soft bodied eulophids. Specimens are deposited in the following institutions: The Natural History Museum, London, England (BMNH); Eidgenössische Technische Hochschule, Zürich, Switzerland (ETHZ); Hungarian Natural History Museum, Budapest, Hungary (HNHM); Muséum d'histoire naturelle, Geneva, Switzerland (MHNG); Natural History Museum, Prague, Czech Republic (NHMP); Naturhistoriska Riksmuseet, Stockholm, Sweden (NHRM); Natural History Museum, Bern, Switzerland (NMBE); University Museum, Oxford, England (UMO); Zoological Museum, University of Copenhagen, Denmark (ZMUC).

## RESULTS AND DISCUSSION

### List of species

(see also Tab. 1)

### Eulophidae

#### *Aprostocetus (Aprostocetus) meltoftei* Buhl, 1997

TYPE MATERIAL EXAMINED. **Greenland, North-East Greenland:** Langelandselv, 2 ♀ (ZMUC-a); Zackenberg, 9 ♀ 5 ♂ (ZMUC-r), 2 ♀ 3 ♂ (ZMUC-a), 10 ♀ 6 ♂ (NMBE-r). *A. meltoftei*, holotype ♀ labelled „APROSTOCETUS MELTOFTEI ♀ P. N. Buhl det. 1996; 8.7.96 P st. 5; HOLOTYPE [red]“ and paratypes 3 ♀, 1 ♂ from Zackenberg (ZMUC-r) [the type series was probably removed from alcohol without any further treatment before mounting on card points; all specimens are thus very badly shrivelled]. **North-West Greenland:** Thule, 2 ♀ [det. Bakken-dorf „*Tetrastichus brachycerus* Thomson, 1878“] (ZMUC-r), Thule, Blaso, 2 ♂ (ZMUC-a).

ADDITIONAL MATERIAL EXAMINED. *A. caudatus* (Westwood, 1833), many specimens from Central Europe in BMNH, NMBE; *A. meroe* Graham, 1987, paratypes 55 ♀ 2 ♂ (BMNH) from England, Southgate, Oxford and France, Mt. Ventoux; *Cirrospilus eleuchia* Walker, 1839, lectotype ♂ from Great Britain (BMNH TYPE HYM. 5.2836); *C. nymphis* Walker, 1839, lectotype ♂ from Great Britain (BMNH TYPE HYM. 5.2830); *C. oropus* Walker, 1839, lectotype ♂ from Great Britain (BMNH TYPE HYM. 5.2633); *C. rhipheus* Walker, 1839, lectotype ♀ from Great Britain (BMNH).

TAXONOMIC CONSIDERATIONS. All specimens from Greenland are conspecific with the type series of *Aprostocetus meltoftei*, which clearly belongs to the *A. caudatus* species-group of Graham (1987). However, there is some doubt concerning the validity of *A. meltoftei*. In the original description, Buhl (1997) separated the species mainly from *A. caudatus*, *A. meroe* and *A. rhipheus* (Walker, 1839), from which it is clearly distinct [he furthermore mentioned *A. pachyneuros* (Ratzeburg, 1844) and *Baryscapus chlamytis* (Ashmead, 1896), which are not related to the species in question]. Some further related species, *Aprostocetus eleuchia*, *A. nymphis*, and *A. oropus*, were not mentioned. These were included in Graham's (1987) key to the species of *Aprostocetus* Westwood, 1833 solely based on the respective lectotype males, which are very close to *A. meltoftei*. While *A.*

*eleuchia* and *A. nymphis* show some slight differences in the shape of the antenna (see Graham 1987), *A. oropus* differs from *A. meltoftei* only in the slightly larger body size of 1.37 mm (0.9–1.1 mm in *A. meltoftei*). Therefore, the latter two species might actually be the same. Given the lack of additional topotypical material of *A. oropus*, I hesitate to synonymize the two species. Because all specimens of the type series of *A. meltoftei* are very badly shrivelled, I give here some of the diagnostic characters based on the above mentioned, intact material from Zackenberg.

Female: combined length of pedicel plus flagellum 1.0–1.1 times as long as mesoscutum width; tegula only slightly darkened; mid lobe of mesoscutum about 0.9 times as long as wide, median line superficial and sometimes indistinct; propodeum medially about as long as dorsellum, only moderately deeply emarginate; gaster distorted in alcohol specimens, but apparently ovate, acute and hardly acuminate; tip of hypopygium at about 0.55 length of gaster; length 1.1–1.2 mm. ♂ : combined length of pedicel plus flagellum 1.60–1.70 times as long as mesoscutum width; scape 2.25–2.50 times as long as wide, ventral plaque confined to lower half, 0.37–0.42 times as long as scape; first funicular segment about quadrate; scutellum with submedian lines distinctly nearer to sublateral lines than to each other; length 0.9–1.1 mm.

DISTRIBUTION. *Aprostocetus meltoftei* is known only from Thule, Langelandselv and Zackenberg in northern Greenland. The latter was already mentioned by Buhl (1997).

### ***Chrysocharis pubicornis* (Zetterstedt, 1838)**

MATERIAL EXAMINED. **Greenland, West Greenland:** Sarqaq, Kapisigdlit, 1 ♀ (ZMUC-a); Tigssaluk, 1 ♂ (ZMUC-d). **South-West Greenland:** Fiskenaesfjorden, opposite Amigfik, 1 ♂ (ZMUC-a). **South Greenland:** Kap Farvel-området, Kangersuneq qingordleq, Igdlorssuit, 1 ♀ 3 ♂ (ZMUC-r); Kap Farvel-området, Kangikitsiq, Tupaussat, 1 ♀ 1 ♂ [det. Hansson] (NMBE-r), 1 ♀ 1 ♂ (NMBE-r), 2 ♀ 4 ♂ (ZMUC-r), 3 ♂ (ZMUC-a); Kap Farvel-området, Pamiagdruk, Anordliuitsiq, 1 ♂ [det. Hansson] (NMBE-r), 1 ♀ 3 ♂ (ZMUC-r), 1 ♀ 4 ♂ (ZMUC-a); eastern Narsaq community, Dolfi Lund, 1 ♀ (ZMUC-a); 1 ♂ (NMBE-d); Narssarsuaq, 3 ♂ (ZMUC-d), 1 ♀ 1 ♂ (NMBE-d), 1 ♀ 2 ♂ (NMBE-a); Upernaviarssuk, 3 ♀ 3 ♂ (ZMUC-a).

ADDITIONAL MATERIAL EXAMINED. Many specimens from Northern and Central Europe in BMNH, ETHZ, MHNG, NMBE.

TAXONOMIC CONSIDERATIONS. Specimens from Greenland fit the description of *C. pubicornis* by Hansson (1985) and the European material well.

DISTRIBUTION. *C. pubicornis* occurs in western and southern coastal areas of Greenland. The species is widely distributed in the Holarctic region (Noyes 2002), but had not yet been recorded from Greenland.

### ***Closterocerus diastatae* (Howard, 1881)**

MATERIAL EXAMINED. **Greenland, South-Greenland:** Kap Farvel-området, Kangikitsiq, Tupaussat, 1 ♀ [det. Hansson] (ZMUC-r), 1 ♀ [det. Hansson] (NMBE-r); Narssarsuaq, 1 ♀ [det. Hansson], 1 ♀ (ZMUC-r), 1 ♀ [det. Hansson] (NMBE-r).

TAXONOMIC CONSIDERATIONS. The five specimens run to *C. diastatae* in Hansson's (1995) key of those Nearctic species of *Closterocerus* Westwood, 1833, which were earlier placed in *Neochrysocharis* Kurdjumov, 1912.

DISTRIBUTION. *C. diastatae* is known only from Tupaussat and Narssarsuaq on the southern coast of Greenland. It is widely distributed in North and Central America and China (Hansson 1995, Noyes 2002), but had not yet been recorded from Greenland.

### *Diglyphus isaea* (Walker, 1838)

**MATERIAL EXAMINED.** **Greenland, West Greenland:** Nugatsiaq, 1 ♂ (ZMUC-d); Sarqaq, Kapisigdlit, 1 ♀ (ZMUC-a); Sondre Stromfjord, 1 ♀ (ZMUC-a); Svartenhuk, Svartenhavn, 1 ♂ (ZMUC-a). Umanak Fjord, Drygalskis Halvø, Kujadtlíkavsak, 1 ♂ (NMBE-d); Umanak Fjord, Qarassap nunata, 1 ♂ (ZMUC-a). **South Greenland:** Julianehaab, Eqaluit-landet, 1 ♀ (ZMUC-a); Herjolfsnes [= Ikigait], 2 ♀ (NMBE-a); Julianehaab, K'nissartu, [= Qanisartuut], 1 ♀ (ZMUC-a); Kap Farvel-området, Pamiagdúk, Anordliuitsq, 2 ♂ (NMBE-a); Narssarsuaq, 1 ♂ (ZMUC-a); Upernaviarssuk, 1 ♀ 3 ♂ (NMBE-a).

**ADDITIONAL MATERIAL EXAMINED.** Many specimens from Northern and Central Europe in BMNH, ETHZ, MHNG, NMBE.

**TAXONOMIC CONSIDERATIONS.** Specimens from Greenland fit the description of *D. isaea* by Graham (1959) and Askew (1968) and the European material very well.

**DISTRIBUTION.** *D. isaea* occurs in western and southern coastal areas of Greenland. It is widely distributed in the Palaearctic region (Noyes 2002), but had not yet been recorded from Greenland.

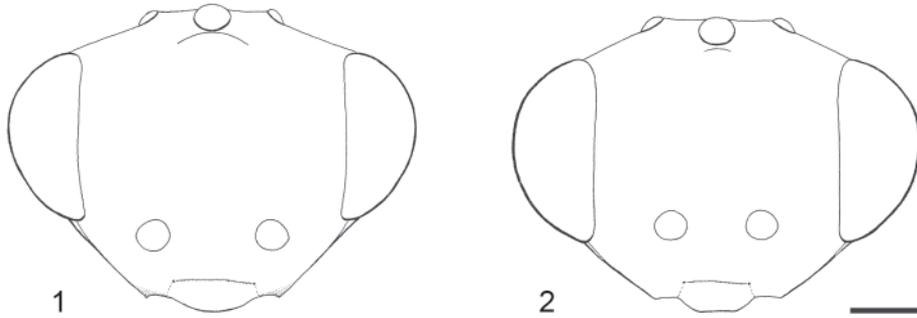
### *Elachertus fenestratus* Nees, 1834

**MATERIAL EXAMINED.** **Greenland, North-East Greenland:** Scoresbysund, Coloradodá, 1 ♀ (ZMUC-r); Zackenberg, 1 ♀ (NMBE-r), 2 ♀ [considered by Buhl (1997) as males of *Elachertus artaeus* (Walker)] (ZMUC-r, mounted by Buhl). **North-West Greenland:** Thule, Blomstersøe, 1 ♀ (ZMUC-r).

**ADDITIONAL MATERIAL EXAMINED.** *Diplolepis lateralis* Spinola, 1808, neotype ♀ from Italy [for notes concerning labels and the state of the specimen, see Bouček & Schauff (1988)] (BMNH TYPE HYM. 5.3047). *Elachertus fenestratus*, lectotype ♀ from Germany [for notes concerning labels and the state of the specimen, see Graham (1988)] (UMO). *Eulophus argissa* Walker, 1839, lectotype ♀ from Great Britain (BMNH TYPE HYM. 5.2614). *Eulophus artaeus* Walker, 1839, lectotype ♀ from Great Britain (BMNH TYPE HYM. 5.2617). *Elachertus artaeus*, *E. fenestratus*, *E. lateralis*: many specimens from Northern and Central Europe in BMNH, ETHZ, MHNG, and NMBE.

**TAXONOMIC CONSIDERATIONS.** *Elachertus fenestratus* is characterized by a straight transscutal articulation and an elongate petiole (Schauff 1985). It is thus very similar to *E. lateralis*, from which it has traditionally been separated by a darker coloration of body and coxae and a more elongate gaster (Graham 1959, Askew 1968, Zhu & Huang 2001). However, these characters proved difficult for many specimens, in particular concerning alcohol material with faded colours and distorted proportions of gaster, which is the case for all specimens from Greenland. It was therefore necessary to compare those specimens with the respective name-bearing types and some additional material. As a result, it was found that *E. lateralis* consists of two species; *E. artaeus*, which has been considered a synonym of *E. lateralis* (e.g. by Bouček & Schauff 1985, Zhu & Huang 2001), is actually a valid species. The female diagnostic characters of the three species are presented in the following key:

- 1 Head in frontal view (Fig. 1) with lower margin of toruli distinctly below level of lower ocular line; toruli separated by 2.3–2.6 times their diameter; malar space 0.55–0.58 times as long as eye height. Scape slender, about 6.0 times as long as wide and 1.05–1.11 times as long as eye height, extending to level of anterior edge of anterior ocellus. [Body olive green, legs entirely testaceous except for a dark spot on the dorso-lateral aspect of hind coxa, gaster dorsally with a large pale spot at base, ventrally almost completely pale]. ..... *Elachertus artaeus* (Walker) revised status
- Head in frontal view (Fig. 2) with lower margin of toruli at about level of lower ocular line; toruli separated by 1.8–2.0 times their diameter; malar space 0.31–0.45 times as long as eye height. Scape stout, 3.7–4.5 times as long as wide and about 0.80–0.89 times as long as eye height, not extending to level of anterior edge of anterior ocellus. .... 2
- 2 Gaster 1.2–1.4 times as long as wide; body olive green, legs entirely testaceous except sometimes for a dark spot on the dorso-lateral aspect of hind coxa, gaster dorsally with a large pale spot at base or wholly testaceous. .... *Elachertus lateralis* (Spinola)
- Gaster 1.4–1.8 times as long as wide; body dark olive green to black, legs testaceous with all coxae testaceous [lectotype] or with some of the coxae more or less infuscate, gaster dorsally often with a hardly discernible pale spot at base. .... *Elachertus fenestratus* Nees [syn. *E. argissa* (Walker)]



Figs 1, 2. (1) *Elachertus artaeus* (Walker): head in frontal view of a ♀ from southern France, Mont Ventoux (in BMNH, Baur no. 2171); (2) *Elachertus lateralis* (Spinola): head in frontal view of neotype ♀ from Italy, Albenga, Ceriale (in BMNH). Scale 0.1 mm.

The differences between *E. lateralis* and *E. fenestratus* are fuzzy, i.e. it is difficult to assign certain specimens to one or the other species. The two taxa might therefore be only colour forms of a single species. However, the specimens from Greenland are dark olive green, with only procoxa and base of ventral side of gaster testaceous. They are thus considered conspecific with the lectotype of *E. fenestratus*.

**DISTRIBUTION.** The few available records of *E. fenestratus* suggest a rather northern distribution in coastal areas of Greenland. As mentioned above, the two males recorded by Buhl (1997, sub *E. artaeus*) from Zackenberg are actually females belonging to *E. fenestratus* (Nees). This species is widely distributed in the Palaearctic region and North and Central America (Noyes 2002).

### ***Pediobius alaspharus* (Walker, 1839)**

**MATERIAL EXAMINED.** **Greenland, South Greenland:** Ivigtut [= Ivittuut], 1 ♀ (ZMUC-r).

**ADDITIONAL MATERIAL EXAMINED.** *Pediobius eubius* (Walker, 1839) species-aggregate (Dawah 1988): many specimens from Northern and Central Europe in BMNH, NMBE. *Entedon alaspharus* Walker, lectotype ♀ from England (BMNH TYPE HYM. 5.2024). *Pediobius claridgei* Dawah, 1988, holotype ♀ from England (BMNH TYPE HYM. 5.3395). *P. dactylicola* Dawah, 1988, holotype ♀ from Great Britain (BMNH TYPE HYM. 5.3397). *P. deschampsiae* Dawah, 1988, holotype ♀ from Wales (BMNH TYPE HYM. 5.3398). *P. festucae* Dawah, 1988, holotype ♀ from Wales (BMNH TYPE HYM. 5.3396).

**TAXONOMIC CONSIDERATIONS.** The female from Greenland clearly belongs to the *Pediobius eubius* species-aggregate as defined by Bouček (1965) and Dawah (1988). However, recognition of a species with the key of Dawah (1988) proved very difficult, therefore the name-bearing types had to be checked for identification. Concerning the above listed species, the female from Greenland most closely fits the lectotype of *P. alaspharus*. The former differs only in very slightly darker meso- and metatarsi, but this is considered as individual variation.

Some of the characters given by Dawah (1988) for *P. alaspharus* do not match the lectotype, hence the latter is partly re-described here: meso- and metatarsi with segments 1–3 light yellowish testaceous, segment 3 slightly darker than segments 1–2; distance between frontal fork and meeting point of scrobal grooves hardly as long as length of an eye facet; pedicel plus flagellum 0.77 times as long as head width [flagellum thus clearly *shorter* than head width, corresponding to figure 15 rather than figure 13 in Dawah (1988: 1154)]; scutellum 1.21 times as long as mesoscutum;

parastigma plus marginal vein 1.18 times as long as fore wing width [not „more than 1.3 times“ as stated by Dawah (1988: 1157)]; gaster 1.93 times as long as wide, 0.89 times as long as head plus mesosoma; length 2.53 mm.

DISTRIBUTION. *Pediobius alaspharus* was collected only in Ivittuut on the southern coast of Greenland. It is known from Northern and Central Europe (Noyes 2002), but had not yet been recorded from Greenland.

## Pteromalidae

### *Ardilea convexa* (Walker, 1833)

MATERIAL EXAMINED. **Greenland:** without locality, 4 ♀ (ZMUC-r), 10 ♀ 5 ♂ (ZMUC-a), „Fangglar pa elvbred“, 1 ♂ (ZMUC-a). **West Greenland:** Brededal, Disko, 2 ♂ (ZMUC-d); Godhavn, 1 ♂ (ZMUC-d); Ingia Fjord, Silardleq, Sagdliarutsip nunata, 1 ♂ (ZMUC-d); Nugatsiaq, 1 ♀ 1 ♂ (ZMUC-d); Qegertaksuaq, Nordre Stromfjord, 1 ♂ (ZMUC-a); Qegertasussuk, Disko Bugt, 1 ♀ (ZMUC-a); Sarqaq, 1 ♀ 1 ♂ (ZMUC-r), 1 ♂ (ZMUC-a); Sarqaq, Kapisigdlit, 1 ♂ (ZMUC-d), 2 ♀ 1 ♂ (ZMUC-a); Sondre Stromfjord, 2 ♀ (ZMUC-a); Tassiusak [= Tasiusaq], 1 ♀ [det. Bakkendorf „*Lamprotatus ?pilicornis* Thomson“] (ZMUC-d); Umanak Fjord, Qarassap nunata, 1 ♀ (NMBE-d), 1 ♀ (ZMUC-a); Unartok Kloster, 2 ♀ (ZMUC-a); Upernavik, 1 ♂ (ZMUC-a); Uvkusigssat Fjord, Pangnertoq, 1 ♀ (NMBE-d), 1 ♀ 2 ♂ (ZMUC-d). **South-West Greenland:** east Naujarssuit, Bjoernesund, 2 ♂ (ZMUC-d); Evighedsfjord, Taterat, 1 ♂ (NMBE-d); Fiskefjord, Igdllutalik, 1 ♀ (NMBE-d); Fiskenaasset, 1 ♂ (NMBE-d); Graedefjord, Islet Nugssuaq, 1 ♂ (ZMUC-d); Graedefjord, Nugssuaq, 2 ♂ (NMBE-d); Kvanefjord, Nigerdlikasik, 3 ♂ (NMBE-d); Sondre Isortoq, Bay, 1 ♀ (NMBE-d). **South-East Greenland:** Skjoldungen, 2 ♂ (ZMUC-a); Skjoldungen, „Bygden“, 4 ♀ 16 ♂ (ZMUC-a). **South Greenland:** Arsusuk, 3 ♀ 1 ♂ [det. Bakkendorf „*Lamprotatus ?pilicornis* Thomson“] (ZMUC-d); Frederiksdal, Herjolfssnes, 1 ♀ (ZMUC-a); Frederiksdal, Itiutlikasik, 1 ♀ (ZMUC-d), 1 ♂ (ZMUC-a); Gronnedal, 1 ♀ (ZMUC-d); Ipiutat, 1 ♀ [det. Bakkendorf „*Lamprotatus ?pilicornis* Thomson“] (ZMUC-d); Kap Farvel-området, Kangersuneq qingordleq, Igdllorssuit, 1 ♂ (ZMUC-r); Kap Farvel-området, Pamiagdhluk, Anordliutsoq, 1 gonander (ZMUC-r), 2 ♂ (ZMUC-r); Narssarssuaq, 1 ♀ 1 ♂ (ZMUC-d), 3 ♀ 3 ♂ (ZMUC-a); Nekamiut, 1 ♀ [det. Bakkendorf „*Lamprotatus ?pilicornis* Thomson“] (ZMUC-d); Neriak, 1 ♀ [det. Bakkendorf „*Lamprotatus ?pilicornis* Thomson“] (ZMUC-d); Tasermiut, Quinqua-dalen, 1 ♂ (ZMUC-a).

ADDITIONAL MATERIAL EXAMINED. *Miscogaster convexa* Walker, 1833, lectotype ♂ from England (B.M. TYPE HYM. 5.1927).

TAXONOMIC CONSIDERATIONS. Specimens from Greenland fit the description of *A. convexa* by Graham (1969) and the lectotype very well.

DISTRIBUTION. *Ardilea convexa* is widely distributed in coastal areas of western and southern Greenland. Before Graham (1969), it was recorded from Greenland by Lundbeck (1897) and Bakkendorf (1955) as *Lamprotatus ?pilicornis* Thomson, 1876 [misidentification]. The species is known from several countries in Northern Europe (Graham 1969, Noyes 2002).

### *Asaphes hirsutus* Gibson et Vikberg, 1998

MATERIAL EXAMINED. **Greenland:** Magdlak, A. Wegeners Halvoe, 1 ♂ (ZMUC-a). **West Greenland:** Godhavn, 1 ♂ (ZMUC-d); Ingia Fjord, Silardleq, Sagdliarutsip nunata, 1 ♂ (ZMUC-d); Kaersut, 1 ♂ (ZMUC-r); Sarqaq, Kapisigdlit, 1 ♂ (ZMUC-r), 3 ♂ (ZMUC-a); Umanak Fjord: Drygalskis Halvoe, Kujadtlivaksak, 1 ♂ (ZMUC-d), 1 ♂ (NMBE-d); Ikerasak, 1 ♂ (NMBE-d); Kangerdluarssuk, Kangerdluarssub qeqerta, 1 ♂ (ZMUC-d); Kangerdluarssuk, Kangerdlugssuakavsak, 1 ♀ 1 ♂ (NMBE-d); Qarassap nunata, 1 ♂ (ZMUC-a); Uvkusigssat Fjord, Pangnertoq, 1 ♀ 2 ♂ (ZMUC-d). **South-West Greenland:** Fiskenaasset, 2 ♀ (NMBE-d); Itivleq, eastern end, 1 ♂ (ZMUC-d); Maniitsoq (Sukkertoppen), 1 ♂ (ZMUC-d). **South Greenland:** Arsusuk, 2 ♂ [det. Lundbeck „*Isocratus vulgaris* Walker“; det. Bakkendorf „*Asaphes vulgaris* Walker“] (ZMUC-d); Ipiutat, 1 ♀ [det. Lundbeck „*Isocratus vulgaris* Walker“; det. Bakkendorf „*Asaphes vulgaris* Walker“] (ZMUC-d); Julianehaab [= Qaqortoq], 1 ♀ (ZMUC-a); Kap Farvel-området, Kangersuneq qingordleq, Igdllorssuit, 2 ♀ 1 ♂ (ZMUC-r), 1 ♀ (ZMUC-a); Kap Farvel-området, Kangikitsoq, Tupaussat, 2 ♂ (ZMUC-a); Kap Farvel-området, Pamiagdhluk, Anordliutsoq, 2 ♀ 13 ♂ (ZMUC-r), 2 ♀ 2 ♂ (NMBE-r), 2 ♀ 11 ♂ (ZMUC-a); Kussuaq, Narsaq, 1 ♀ (ZMUC-a); Sermiliarsuk, 1 ♀ [det. Lundbeck „*Isocratus vulgaris* Walker“; det. Bakkendorf „*Asaphes vulgaris* Walker“] (ZMUC-d).

ADDITIONAL MATERIAL EXAMINED. *A. hirsutus*: **Canada**: Quebec, St. Gedeon, paratype 1 ♀ (BMNH). **Italia**: South Tyrol, Dolomiten, paratype 1 ♀ (BMNH). *A. pubescens* Kamijo et Takada, 1973, paratypes 1 ♀, 1 ♂ from Japan, Hokkaido, Sapporo, (BMNH). *A. vulgaris* Walker, 1834 and *A. suspensus* (Nees, 1834): many specimens from Northern and Central Europe in BMNH, ETHZ, MHNG, NMBE.

TAXONOMIC CONSIDERATIONS. All specimens of *Asaphes* Walker, 1834 from Greenland fit paratypes of *A. hirsutus* in BMNH and the description by Gibson et Vikberg (1998) well, except that a few larger females bear 1 or 2 longitudinal sensilla on the second anellus. The specimens furthermore lack a forewing speculum and the lower posterior edge of the metapleuron is pilose, while the central part of the mesoscutum side lobe is bare. They are thus clearly distinct from the similar *A. pubescens* which has the mesoscutum entirely covered with short setae.

DISTRIBUTION. *A. hirsutus* is widely distributed in coastal areas of western and southern Greenland. It was recorded from Greenland by Lundbeck (1897) as *Isocratus vulgaris* (Walker) and by Bakkendorf (1955) and Graham (1969) as *Asaphes vulgaris* Walker [misidentifications]. *A. hirsutus* is widely distributed in the Holarctic region, where it is mostly collected at high altitudes (Gibson et Vikberg, 1998).

### *Callimerismus suecicus* Graham, 1969

MATERIAL EXAMINED. **Greenland**: „Btr. draw“ [?], 1 ♂ [det. Bakkendorf „*Cryptoprymna ater* (Walker)“] (ZMUC-d); Mestersvig, 1 ♀ (ZMUC-a); Orpigsuit, 1 ♂ [det. Lundbeck „*Spegigaster* sp.“; det. Bakkendorf „*Cryptoprymna ater* (Walker)“] (ZMUC-d); without locality, 3 ♀ 1 ♂ (ZMUC-a). **North-East Greenland**: Ellae, 1 ♀ 2 ♂ (ZMUC-a). **East Greenland**: Charcots land, 1 ♀ (ZMUC-r), 1 ♂ (ZMUC-d); Faxe so, Gaaselandet, 2 ♀ 1 ♂ (ZMUC-d). **West Greenland**: Godhavn, 2 ♂ (NMBE-d); Godhavn, 1 ♀ (ZMUC-a); Ingia Fjord, Puatdlarsiviup qorua, 1 ♀ (NMBE-d); Nugatsiaq, 2 ♀ (NMBE-d); Umanak, 1 ♀ (ZMUC-a); Umanak Fjord, Kangerdluarsuk, Kangerdlugssuakavsak, 1 ♂ (NMBE-d). **South-West Greenland**: Fiskenaasset, 1 ♂ (NMBE-d); Graedefjord, Nugssuaq, 2 ♂ (ZMUC-d); Itivleq, eastern end, 1 ♂ (NMBE-d); Kvanefjord, 1 ♂ [det. Lundbeck „*Dicyclus* sp.“; det. Bakkendorf „*Cryptoprymna ater* (Walker)“] (ZMUC-d). **South Greenland**: Gronnedal, 1 ♀ (ZMUC-a); Kap Farvel-området, Pamiagdhluk, Anordliutsoq, 1 ♀ 1 ♂ (ZMUC-r), 1 ♀ (ZMUC-a); Narssarsuaq, 1 ♀ 2 ♂ (ZMUC-d), 3 ♀ (ZMUC-a).

ADDITIONAL MATERIAL EXAMINED. *Callimerismus suecicus*, holotype ♀ from Sweden (BMNH TYPE HYM. 5.3464).

TAXONOMIC CONSIDERATIONS. Specimens from Greenland fit the holotype and the description of *C. suecicus* by Graham (1969) very well.

DISTRIBUTION. *Callimerismus suecicus* is widely distributed in coastal areas from northern to southern Greenland. It was hitherto known from Northern and Central Europe (Noyes 2002), but was also recorded from Greenland by Lundbeck (1897) as *Spegigaster* sp. and *Dicyclus* sp. respectively, and by Bakkendorf (1955) as *Cryptoprymna ater* [= *atra*] (Walker, 1833) [misidentifications].

### *Glyphognathus laevigatus* (Delucchi, 1953)

MATERIAL EXAMINED. **Greenland, West Greenland**: Umanak, 1 ♀ (ZMUC-d); Umanak Fjord, Qarassap nunata, 1 ♂ (NMBE-r). **South-West Greenland**: Sondre Isortoq, Nuk, (NMBE-d). **South Greenland**: Kap Farvel-området, Kangersuneq qingordleq, Igdlorssuit, 1 ♀ (NMBE-r); Kap Farvel-området, Kangikitsiq, Tupaussat, 1 ♀ (ZMUC-r); Kap Farvel-området, Pamiagdhluk, Anordliutsoq, 1 ♀ 3 ♂ (ZMUC-r), 1 ♀ 1 ♂ (NMBE-r).

ADDITIONAL MATERIAL EXAMINED. Holotype *Stictomischus laevigatus* (on card rectangle, entire) labelled “Foktö 1943.VIII.13. dr. Erdös; *Stictomischus laevigatus* n. V. Delucchi det.; ♀; TYPE [red]; Holotype ♀ *Stictomischus laevigatus* Delucchi lab. H. Baur 1997 [red]” [the sequence of the labels has changed and one label „17.“ is missing since Graham’s (1969: 213) quotation] (HNHM). **CROATIA**: Durmitor, 1 ♀ (NHMP). **CZECH REPUBLIC**: Bohemia, 4 ♀ 2 ♂ (NHMP). **ENGLAND**: Berkshire, Wytham, 1 ♂ (NHMP). **SWEDEN**: Skane, 1 ♀ 1 ♂ (NHMP). Holotype *Stictomischus laevis* Delucchi, 1953 (on card rectangle, entire) labelled “Közsegi h 1944.V.22. dr. Erdös; ré; 14.; *Stictomischus laevis* n. V. Delucchi det.; ♀; TYPE [red]; Holotype ♀ *Stictomischus laevis* Delucchi lab. H. Baur 1997 [red]” [the sequence of the labels has changed since Graham’s (1969: 212) quotation] (HNHM).

TAXONOMIC CONSIDERATIONS. *Glyphognathus laevis* and *G. laevigatus* are very similar and can be separated only by the combined length of pedicel plus flagellum. In *G. laevis* it is about 1.45 times as long as the head width, in *G. laevigatus* only 1.2–1.35. Other characters, such as differences in length of petiole or body colour, which were mentioned by Graham (1969), do not work consistently. Re-examination of the holotype of *G. laevis* revealed, that the particular purplish tints on head and mesosoma are most likely due to an artefact. I have seen similar colour patterns in other miscogasterines, which, for instance, turned from green to dark blue or purple after direct contact with ethyl acetate (Baur unpubl.).

Considering the length of the flagellum, the specimens from Greenland clearly belong to *G. laevigatus*. The most notable difference to continental specimens (including the holotype) lies in their considerably larger body size. Therefore the most important characters of the Greenland specimens are described and are compared with those of the holotype (in brackets).

♀: body green with purplish tints, especially in specimens remounted from alcohol [green with golden tints]; scape green, pedicel and flagellum fuscous; femora fuscous in basal three quarters, tibiae slightly infuscate; head 2.05–2.12 [2.04] times as long as wide; POL 1.30–1.43 [1.39] times OOL; scape 0.73–0.78 [0.70] times as long as eye height; pedicel plus flagellum 1.29–1.35 [1.29] times as long as head width; pedicel about as long as first funicular segment [14:13]; sixth funicular segment quadrate or slightly longer than wide [12:11]; eye 1.28–1.36 [1.30] times as high as wide; scutellum strongly convex in lateral view; frenum reticulate with areoles isodiametric; fore wing with stigma semicircular, 0.90–0.98 [0.90] times as long as high, separated by 1.25–1.35 [1.33] times its height from postmarginal vein; median carina of propodeum complete but irregular medially; plicae indicated in posterior third to half [posterior third]; petiole laterally without setae, very weakly alutaceous on upper side, 1.26–1.53 [1.30] times as long as wide; length (n=1) 2.1 mm [1.35] mm, head width 0.66–0.69 [0.51] mm, metatibia length 0.60–0.67 [0.44] mm. ♂ similar to ♀ except: POL 1.55–1.64 times OOL; pedicel plus flagellum 1.59–1.65 times as long as head width; pedicel about half as long as first funicular segment; sixth funicular segment 1.30–1.50 times as long as wide.

DISTRIBUTION. *G. laevigatus* is restricted to a few localities in western and southern Greenland. It is widely distributed in Northern and Central Europe (Noyes 2002), but had not yet been recorded from Greenland.

### *Pachyneuron groenlandicum* (Holmgren, 1872)

MATERIAL EXAMINED. **Greenland:** without locality, 2 ♂ (NMBE-r). **West Greenland:** Sarqaq, 1 ♀ (ZMUC-r), 1 ♀ (NMBE-r); Sondre Stromfjord, 1 ♀ (ZMUC-r); Umanak, 2 ♂ (ZMUC-r). **East Greenland:** Faxe so, Gaaselandet, 1 ♀ (ZMUC-d). **South-West Greenland:** Evighedsfjord, Taterat, 1 ♀ (NMBE-d). **South Greenland:** Igaliko [= Igaliku], 3 ♀ [det. Lundbeck „*Pachyneuron groenlandicum* (Holmgren)“] (ZMUC-d); Narssarsuaq, 1 ♀ (ZMUC-d); Upernaviarssuk, 3 ♀ (ZMUC-r), 2 ♀ (NMBE-r). *Pteromalus groenlandicus* Holmgren, lectotype ♀ (directly pinned, entire) designated by Hedqvist (1977) and labelled „Grönland Nordskj. Exp.; Lectotypus *Pteromalus groenlandicus* Hlmgr. K.-J. Hedqvist det. 1977 [pink]“ (NHRM); paralectotype ♂ with same data as lectotype (NHRM).

ADDITIONAL MATERIAL EXAMINED. Many specimens from Northern and Central Europe in BMNH, ETHZ, MHNG, NMBE.

TAXONOMIC CONSIDERATIONS. Most specimens fit the lectotype of *P. groenlandicum* very well. However, the three females from Igaliko are very small. Furthermore, they have a relatively short propodeum and wide petiole, the latter being slightly asymmetric in one specimen. Otherwise, they match the lectotype of *P. groenlandicum* (see Graham 1969) and are thus considered conspecific.

DISTRIBUTION. *P. groenlandicum* occurs in western, eastern and southern Greenland. Beside the original mention from North Greenland by Holmgren (1972), it was also recorded from Igaliko (South Greenland) by Lundbeck (1897) and Bakkendorf (1955). The species is widely distributed in the Palaearctic region (Noyes 2002).

### *Pteromalus* sp. [nr. *P. semotus* (Walker, 1834)]

MATERIAL EXAMINED. **Greenland:** without locality, 1 ♀ (ZMUC-d). **West Greenland:** Kangerlussuaq, 1 ♂ (ZMUC-r); Sarqaq, Kapisigdlit, 1 ♂ (ZMUC-r); Sondre Strom, Air Base, 1 ♀ 1 ♂ (ZMUC-r); Sondre Stromford, 2 ♀ 1 ♂ (ZMUC-d); Tigssaluk, 1 ♂ (ZMUC-d). **South-West Greenland:** Ameralik, Eqaluit ilordlit, 3 ♀ 4 ♂ (NMBE-d), 2 ♀ 4 ♂ (ZMUC-d); Itivleq, eastern end, 2 ♀ (ZMUC-d).

TAXONOMIC CONSIDERATIONS. All specimens belong to a single species. The female keys out at couplet 73, *P. semotus*, of Graham's (1969) key to European species of *Pteromalus* Swederus, 1795, the male at couplet 63, *P. dolichurus* (Thomson, 1878), or couplet 65, *P. semotus*. From the re-description by Gijswijt (1999), *P. sylveni* (Hedqvist, 1979) is apparently also rather close. However, the species from Greenland clearly does not belong to any European species. It is perhaps undescribed or might belong to an North American species, but this can only be decided after a revision of the Nearctic species of *Pteromalus*.

DISTRIBUTION. The species is restricted to a few localities in western and southern Greenland. The genus was already recorded from Greenland as „*Pteromalus* [s. lat.] sp.“ by Henriksen et Lundbeck (1917) and as „*Habrocytus* sp.“ by Bakkendorf (1955). However, it is doubtful, whether those species really belong to *Pteromalus* in the current sense. *Pteromalus* is one of the largest pteromalid genera and is mainly Holarctic in distribution (Noyes 2002).

### *Seladerma* cf. *breve* (Walker, 1834)

MATERIAL EXAMINED. **Greenland, North-East Greenland:** Morkefiord, 2 ♀ (ZMUC-r).

TAXONOMIC CONSIDERATIONS. The two specimens are clearly conspecific. However, both are in very bad condition with faded colours, partly collapsed mesosoma and swollen gaster. Identification is therefore very difficult, though the available evidence suggests that they may belong to the *Seladerma breve* species-group (Graham 1969). However, fresh material is necessary to confirm the identity of the species.

DISTRIBUTION. *Seladerma* cf. *breve* is known only from Morkefiord in north-eastern Greenland. The genus *Seladerma* Walker, 1834 is Holarctic in distribution (Noyes 2002), but had not yet been recorded from Greenland.

### *Seladerma geniculatum* (Zetterstedt, 1838)

MATERIAL EXAMINED. **Greenland, South Greenland:** Julianehaab, Eqaluit, 1 ♂ (ZMUC-r).

ADDITIONAL MATERIAL EXAMINED. specimens from Switzerland, England, Germany in BMNH, ETHZ, NMBE.

TAXONOMIC CONSIDERATIONS. The specimen very nicely fits the diagnostic characters given by Graham (1969) for European material.

DISTRIBUTION. *Seladerma geniculatum* was collected only in Eqaluit, southern Greenland. The species is widely distributed in Northern and Central Europe (Noyes 2002), but had not yet been recorded from Greenland.

### *Trichomalopsis fucicola* (Walker, 1835)

MATERIAL EXAMINED. **Greenland:** without locality, 1 ♀ (ZMUC-r), 1 ♀ (NMBE-r). **West Greenland:** Sarqaq, Kapisigdlit, 3 ♀ (ZMUC-r), 2 ♀ (NMBE-r).

ADDITIONAL MATERIAL EXAMINED. **England:** S.W. Cornwall, Whitesand Bay, SW 355264 21.vi.1978 leg. A. Pont (on seashore) ex puparia *Leptocera zosteræ* [= *Thoracochoeta zosteræ* (Haliday), Diptera: Sphaeroceridae], 1 ♀ 2 ♂

(BMNH); same data except ex puparia *Fucellia tergina* (Zetterstedt) (Diptera: Anthomyiidae), 1 ♀ (BMNH); **Iceland**: Kollafjörður, 1 ♀ [det. Bakkendorf „*Eurydinota leptomera* Förster“] (ZMUC). *Pteromalus fucicola*, lectotype ♀ from England (BMNH TYPE HYM. 5.2818).

**TAXONOMIC CONSIDERATIONS.** As a result of long-term conservation in alcohol, specimens from Greenland have faded colours and a strongly swollen gaster, which makes identification rather difficult. Moreover, certain ratios differ from values given by Graham (1969, sub *Eupteromalus* Kurdjumov, 1913) and several important characters were not mentioned by him. Therefore, some of the diagnostic characters are given here for the females from Greenland and the lectotype (values in brackets):

POL 1.56–1.8 [1.78] times OOL; malar space 0.66–0.7 times as long as eye height; eyes separated by 1.4–1.6 times their height; scape about as long as eye height, almost extending to level of vertex; fore wing fully developed; marginal vein 1.48–1.82 [1.56] times as long as stigmal vein. **DISTRIBUTION.** *Trichomalopsis fucicola* is recorded from a single locality, Kapisigdlit in western Greenland. Hitherto known only from Germany (Heitland 1988), Ireland (Graham 1969) and the United Kingdom (Graham 1969, Askew 1974), the species was also reported from Iceland by Bakkendorf (1955) as *Eurydinota leptomera* Förster, 1878 [misidentification].

Tab. 1. List of Eulophidae and Pteromalidae recorded from Greenland; \* = first record for Greenland, ! = misidentification

Currently used names	Names used earlier, with reference
<b>Eulophidae</b>	
<i>Aprostocetus meltoftei</i> Buhl	<i>Aprostocetus meltoftei</i> : Buhl 1997
* <i>Chrysocharis pubicornis</i> (Zetterstedt)	
* <i>Closterocerus diastatae</i> (Howard)	
* <i>Diglyphus isaea</i> (Walker)	
<i>Elachertus fenestratus</i> Nees	<i>Elachertus artaeus</i> (Walker) !: Buhl 1997
* <i>Pediobius alaspharus</i> (Walker)	
<b>Pteromalidae</b>	
<i>Ardilea convexa</i> (Walker)	<i>Lamprotatus ?pilicornis</i> Thomson !: Lundbeck 1897, Bakkendorf 1955; <i>Ardilea convexa</i> : Graham 1969
<i>Asaphes hirsutus</i> Gibson et Vikberg	<i>Isocratus vulgaris</i> (Walker) !: Lundbeck 1897; <i>Asaphes vulgaris</i> Walker !: Bakkendorf 1955, Graham 1969
<i>Callimerismus suecicus</i> Graham	<i>Dicyclus</i> sp. !: Lundbeck 1897; <i>Sphегigaster</i> sp. !: Lundbeck 1897; <i>Cryptoprymna ater</i> (Walker) !: Bakkendorf 1955
* <i>Glyphognathus laevigatus</i> (Delucchi)	
<i>Pachyneuron groenlandicum</i> (Holmgren)	<i>Pteromalus groenlandicum</i> : Holmgren 1872; <i>Pachyneuron groenlandicum</i> : Lundbeck 1897, Bakkendorf 1955, Hedqvist 1977
<i>Pteromalus</i> sp. near <i>semotus</i> (Walker)]	[?] <i>Pteromalus</i> sens. lat.: Henriksen & Lundbeck 1917; [?] <i>Habrocytus</i> sp.: Bakkendorf 1955
* <i>Seladerma</i> cf. <i>breve</i> (Walker)	
* <i>Seladerma geniculatum</i> (Zetterstedt)	
* <i>Trichomalopsis fucicola</i> (Walker)	

### General remarks

In total, six Eulophidae and nine Pteromalidae are recorded from Greenland (Tab. 1). Of these, eight species are recorded here for the first time. Concerning the considerable number of specimens examined, I expect at most a very few undiscovered species. All known species are confined to the ice-free costal areas where they were usually collected during the warmest months of the year, July and August. Most species occur in southern (latitude about 60°N) and western parts of the

Tab. 2. List of species of Eulophidae and Pteromalidae recorded for Greenland and their occurrence in Iceland, Europe, Canada, and the USA (after Noyes 2002); „x“ = present, „-“ = absent, „?“ = doubtful, „i“ = introduced, „NW-Terr.“ = Northwest-Territories (including Nunavut) in Canada

taxa	Greenland	Iceland	NW-Terr.	Europe	Canada	USA
<b>Eulophidae</b>						
<i>Aprostocetus meltoftei</i>	x	-	-	-	-	-
<i>Chrysocharis pubicornis</i>	x	-	x	x	x	x
<i>Closterocerus diastatae</i>	x	-	-	-	x	x
<i>Diglyphus isaea</i>	x	x	-	x	i	i
<i>Elachertus fenestratus</i>	x	-	-	x	x	x
<i>Pediobius alaspharus</i>	x	-	-	x	-	-
<b>Pteromalidae</b>						
<i>Ardilea convexa</i>	x	x	-	x	-	-
<i>Asaphes hirsutus</i>	x	-	x	x	x	x
<i>Callimerismus suecicus</i>	x	x	-	x	-	-
<i>Glyphognathus laevigatus</i>	x	-	-	x	-	-
<i>Pachyneuron groenlandicum</i>	x	-	-	x	-	-
<i>Pteromalus</i> sp. near <i>semotus</i>	x	-	-	-	?	?
<i>Seladerma</i> cf. <i>breve</i>	x	-	-	x	-	-
<i>Seladerma geniculatum</i>	x	x	-	x	-	-
<i>Trichomalopsis fucicola</i>	x	x	-	x	-	-

country. Remarkably, two eulophids, *Elachertus fenestratus* and *Aprostocetus meltoftei*, are known only from northern latitudes, i.e. from Thule (77°28'N) in the north-west, and Zackenberg (74°28'N) in the north-east of Greenland. While *Elachertus fenestratus* is widespread in the Holarctic region (Noyes 2002), *Aprostocetus meltoftei* has not yet been recorded elsewhere.

Because of the arctic climate in Greenland, the fauna of Eulophidae and Pteromalidae is much less diverse compared with warmer regions. However, the number species is comparable to those of the closest landmasses with a similar climate (Tab. 2). For instance, seven Eulophidae and nine Pteromalidae are present in Iceland (Noyes 2002), which is situated to the east of Greenland at a similar latitude (63°26' to 66°31'N). For the Northwest Territories (including Nunavut, Canada) to the west of Greenland, fifteen Eulophidae and five Pteromalidae are listed (Noyes 2002). The total number of species is slightly raised here, probably because the area is connected to the North American continent. Greenland and Iceland, on the other hand, are islands. They have five species in common, whereas only two Greenland species occur in the Northwest Territories (Tab. 2). From table 2 it is furthermore evident, that, beside four Holarctic species, nine species also occur in Europe, whereas only one is present in Canada and the USA. This suggests much stronger connections with the Palaearctic than the Nearctic fauna, which is surprising, because Greenland is usually considered as part of the Nearctic region (Brown et Lomolino 1998).

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