



## Notes on the larval morphology of Pteromalidae (Hymenoptera: Chalcidoidea) species parasitoids of gall wasps (Hymenoptera: Cynipidae) in Europe

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### Abstract

A comparative study of the larval morphology and biology of *Arthrolytus glandium* Bouček, *Cecidostiba fungosa* Geoffroy in Fourcroy, *Cecidostiba geganius* (Walker), *Pteromalus bedeguaris* (Thomson), *Pteromalus hieracii* (Thomson), *Pteromalus isarchus* Walker, *Rivasia fumariae* Askew & Nieves-Aldrey and *Stinoplus lapsanae* Graham (Pteromalidae) is presented. These eight species are all parasitoids of gall wasps in Europe and are components of communities associated with different gall-wasp food guilds: galls on herbs, shrubs and oaks. Special attention was paid to larval body shape, head capsule characters, the mouthparts and especially the mandibles and the chaetotaxy of the head. Diagnostic characters of the genera are provided and except for *R. fumariae* the terminal instar larvae of all studied species are described and illustrated for the first time with scanning electron photomicrographs. Information on the biology of each species, including new rearing records, is given.

**Key words:** immature stages, SEM, chaetotaxy, body shape, mouthparts, head capsule, mandibles, cynipid galls, Aylacini, Diplolepidini, Pediaspidini

### Introduction

The cosmopolitan family Pteromalidae (Hymenoptera: Chalcidoidea), with about 3500 described species, accounts for approximately 16% of the total number of known diversity considering Chalcidoidea currently accounts about 22000 species (Noyes 2011). Pteromalids are found in most terrestrial ecosystems and display a wide range of biological strategies. Despite its high diversity and ecological importance, taxonomic knowledge of the family remains poor and it is estimated that its real diversity is much higher than is presently known (Bouček 1988; Noyes 2011). However, the relatively small group of pteromalid species that are associated with cynipid galls are comparatively well known (Nieves-Aldrey 2001; Askew *et al.* 2006, unpublished; Gómez *et al.* 2006). Pteromalids are one of the main components of parasitoid assemblages inhabiting cynipid galls (Hymenoptera: Cynipidae) and about 50 species associated specifically or secondarily with gall wasps have been recorded in the Palaearctic (Askew *et al.* 2006, unpublished; Gómez *et al.* 2006), although knowledge of the larval morphology and biology of many species remains poor.

The majority of pteromalids are idiobionts, developing as solitary or gregarious ectoparasitoids of larvae and pupae of Diptera, Coleoptera, Hymenoptera, Lepidoptera and Siphonaptera. Many species attack hosts concealed in plant tissues, such as wood-borers, stem- and leaf-miners or gall-formers. A few species of Ormocerinae are true gall inducers, such as the species of *Aditrochus* Rübsaamen, which induce galls on *Nothofagus* in South America (Nieves-Aldrey *et al.* 2009), and the much better known *Hemadas nubilipennis* (Ashmead), which induces galls on lowbush blueberry (*Vaccinium angustifolium*) in North America (LaSalle 2005). Those non-inducer pteromalids associated with galls develop as inquilines, feeding on the gall tissue, or as parasitoids feeding externally on larvae, pupae or even adults of the gall-former (Askew 1961).