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## Skeletomusculature of Scelionidae (Hymenoptera: Platygastroidea): head and mesosoma

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### Abstract

The skeletomusculature of the head and mesosoma of the parasitoid wasp family Scelionidae is reviewed. Representatives of 27 scelionid genera are examined together with 13 non-scelionid taxa for comparison. Terms employed for other groups of Hymenoptera are reviewed, and a consensus terminology is proposed. External characters are redescribed and correlated with corresponding apodemes, muscles and putative exocrine gland openings; their phylogenetic importance is discussed. 229 skeletal structures were termed and defined, from which 84 are newly established or redefined. 67 muscles of the head and mesosoma are examined and homologized with those present in other Hymenoptera taxa.

The presence of the cranio-antennal muscle, an extrinsic antennal muscle originating from the head capsule, is unique for Scelionidae. The dorsally bent epistomal sulcus and the corresponding internal epistomal ridge extend to the anterior margin of the oral foramen, the clypeo-pleurostomal line is absent and the tentorium is fused with the pleurostomal condyle. The frontal ledge is present in those scelionid genera having the anterior mandibular articulation located on the lateral margin of the oral foramen. The ledge corresponds to the site of origin of the mandibular abductor muscle, which is displaced from the genal area to the top of the frons. The protractor of the pharyngeal plate originates dorsally of the antennal foramen in Scelionidae. All scelionid genera have a postgenal bridge developed between the oral and occipital foramina. The propleural arm is reduced, muscles originating from the propleural arm in other Hymenoptera are situated on other propectal structures in Scelionidae. The profurcal bridge is absent. The first flexor of the fore wing originates from the posteroventral part of the pronotum in Scelionidae and Vanhorniidae, whereas the muscle originates

from the mesopleuron in all other Hymenoptera. The netrion apodeme anteriorly limits the site of origin of the first flexor of the fore wing. Three types of netrion are described on the basis of the relative position of the netrion apodeme and the posterior pronotal inflection. The oclucosor muscle apodeme is absent in basal Scelionidae, the fan-shaped muscle originates from the pronotum. In *Nixonia* the muscle originates posterior to the netrion apodeme. The skaphion apodeme crosses the site of origin of the longitudinal flight muscle. The lateral and dorsal axillar surfaces and the axillar carina are defined and described for the first time in Platygastroidea. The retractor of the mesoscutum is reported in Scelionidae and the variability of the muscle and corresponding skeletal structures within the family is described. The term sternaulus is redefined on the basis of the site of origin of the mesopleuro-mesobasalar muscle. The term speculum is adopted from Ichneumonidae and Cynipoidea taxonomy on the basis of the site of origin of the mesopleuro-mesofurcal muscle. The remnants of the mesopleural ridge, sulcus and mesopleural arm and pit and the putative border between the mesepisternum and mesepimeron is discussed. The mesopleural depressor of the mesotrochanter sensu Gibson 1985 originates from the anterior extension of the mesofurca and therefore the muscle is redefined and referred to in the present study as the lateral mesofurco-mesotrochanteral muscle. In *Nixonia*, *Sparasion*, *Idris* and *Gryon* both the lateral and median mesofurco-mesotrochanteral muscles are present. The lateral mesofurco-mesotrochanteral muscle is present in Platygastriidae. The second flexor of the hind wing at least partly originates from the posteriorly delimited area of the mesopectus in Scelionidae similarly to some other Proctotrupomorpha and Chalcidoidea. The serial homology of this area and the netrion is discussed. The possible serial homology of the medially elevated area of the metanotum and mesoscutellum and the usage of the term metascutellum in Apocrita is discussed with the descriptions of correlated internal structures. The anterior metanotal wing process is located on the independent humeral sclerite in Scelionidae, similar to other Apocrita except Cynipoidea. The metanotal depressor of the metatrochanter originates from the humeral sclerite in Scelionidae as well as in some other Proctotrupeoidea. The metapleuron is extended secondarily dorsally of the metapleural ridge and corresponding metapleural sulcus in Scelionidae. In Telenominae, Gryonini and Baeni the metafurca is located posteriorly on the metadiscal lamella.

**Key words:** Scelionidae, morphology, terminology, comparative anatomy, skeletomusculature, parasitoid wasps

## Introduction

Anatomical characters are an important source of data in systematic and taxonomic research, and an elaborate and arcane language has developed over the years to describe these features (for entomological terms see, e.g., Torre-Bueno 1989). Unfortunately, the specialists in different taxonomic groups have often developed independent terminologies, resulting in numerous synonymies and a general barrier to effective communication. Even though the latest edition of the Torre-Bueno Glossary of Entomology numbers over 800 pages, for only English words, new and important morphological features are continually discovered, all of which need names. The intimate relationship between form and function and the correspondence of internal and external anatomy is well known and was amply demonstrated in even the early textbooks on insect morphology (e.g., Snodgrass 1935). External structures, such as sulci and pits, are often functionally correlated with internal skeleto-muscular features. Proper recognition of homologies between structures, and of synonymies between terms, is facilitated by a consideration of both external and internal features.

This paper is a contribution toward a comprehensive examination of the internal and external morphology of the family Scelionidae (Hymenoptera: Platygastroidea). One of the goals is to reconcile the different terms used in the taxonomic literature of this family of parasitoid wasps and to coordinate with the nomenclature used for other groups of Hymenoptera. Our work builds upon the recent important contributions of numerous authors, particularly those of Gibson (1985, 1986, 1993, 1997, 1999), Ronquist (1995), Ronquist & Nordlander (1989), and Vilhelmsen (1996, 1999, 2000a, 2000b, 2003). Secondly, we seek to provide a precise nomenclature for scelionid anatomy for use in systematics, and thus to contribute to further advances in our understanding of the taxonomy and interrelationships of its constituent groups. Given the enigmatic position of the family in the Apocrita (summarized in Austin *et al.* 2005), the recognition of homologous characters with other hymenopterans will facilitate work toward a robust phylogenetic hypothesis for the entire order.