

# Additions to the knowledge of Encyrtidae (Hymenoptera: Chalcidoidea) from Norway, with descriptions of two new species

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## Abstract

Two genera of Encyrtidae (Hymenoptera: Chalcidoidea) are for the first time recorded from Norway: *Dusmetia* Mercet, 1921 and *Prionomastix* Mayr, 1876. Six new species records for the country are presented, including two newly described taxa: *Aphycus staverlokki* Japoshvili sp. n. and *Metaphycus sannes* Japoshvili sp. n. The total number of known Norwegian species of the family is currently 156.

**Key words:** parasitoid, Sannes, Mikkelsrud, *Dusmetia*, *Prionomastix*, *Aphycus*, *Metaphycus*, *Tetracnemus*

## Introduction

Encyrtidae is one of the most species diverse families of Chalcidoidea (Hymenoptera), which is important for the biological control of insect pests (Noyes 2019). More than 400 parasitoid species have been used as biological control agents for agricultural and ornamental plant pests, particularly scale insects (Hemiptera: Coccoidea) (Greathead 1986; Neuenschwander *et al.* 1990; Noyes 1985, 2019; First author's personal data). Therefore, knowledge of the parasitic wasp fauna is becoming increasingly important. Ottesen (1993) indicates the total number of insect species recorded in Norway to be approximately 15,000, though the true number is likely closer to 23,000, including undiscovered species. He further estimates that approximately 5000 of the 8000 unaccounted species belong to the order Hymenoptera. He estimated number of

encyrtids in Norway to be 120 species. Later, based on estimation by Lars Ove Hansen (Elven, Soli, 2020), the number of chalcids known from Norway was 1750, with 780 species actually recorded from the country. So 45% of chalcids are still unknown for the fauna of Norway. Prior to this survey, 150 species of Encyrtidae have been already recorded from Norway (Hansen & Japoshvili 2018), which is 30 more than the estimate given by Ottesen (1993). Considering the more recent publications of Elven and Søli (2020) and Japoshvili (2018), we can conclude that the number of Encyrtidae in Norway is approximately 300 species.

## **Material and Methods**

Specimens were collected by Malaise traps (MT) between 2020-2022. Additional specimens were collected via sweep netting. The black malaise traps used were manufactured by Watkins and Doncaster in England. Prior to being point-mounted, specimens were dried from ethanol using hexamethyldisilazane (HMDS) to prevent shrinking. Photographs 1a-d and 2b,c were taken using a Zeiss Stemi 508 microscope equipped with an Axiocam 208 camera; photographs of slide-mounted specimens were taken using a Sony NEX-3 camera mounted on a Leica DM1000 microscope. Focus stacking was done using Combine ZM software (Hadley 2008). Several partially focused images (Figs 1g-i; 3a, h-j) were taken with a Nikon D850 mounted on a Nikon PB-5 Bellow with a Mitutoyo 20x microscope objective, then combined in the software program Zerene Stacker© (2016). Photo adjustments and plates were assembled using a combination of Microsoft PowerPoint, Adobe Photoshop and Microsoft Paint. The coordinates are given in decimal degrees (Grid: Latitude/Longitude, datum: WGS84). The faunistic divisions within Norway follow Økland (1981) and are given in bold. The new county divisions introduced on 1 January 2020 have not been implemented in this study. The morphological terms follow Noyes (2019). Data on biology and distribution is extracted from Noyes (2019). All the identifications were done by the first author. All records refer to fully labeled specimens

or slides deposited in the collection at the Institute of Entomology, Agricultural University of Georgia, Tbilisi, Georgia (IEAUG).

**Abbreviations.** AOL = distance between posterior and anterior ocelli; EL = maximum eye length; EW = maximum eye width; F1, F2, etc. = first funicular, second funicular, etc.; FV = minimum frontovertex width; FWL = maximum fore wing length; FWW = maximum fore wing width; GL = Gaster length; HW = maximum head width; HWL = maximum hind wing length; HWW = maximum hind wing width; MS = malar space [the shortest distance from the eye to mouth margin]; OD = greatest diameter of an ocellus; OCL = occipital-ocellar line; OOL = ocular-ocellar line; POL = posterior ocellar line; SL = scape length; SW = maximum scape width; TL = thorax length; OL = ovipositor length; GSL = gonostylus length; OPL = outerplate length; OPW = outerplate width; SL = scape length; SW = scape width; PL = pedicel length; PW = pedicel width; CL = clava length; CW = clava width.

## List of Species

### Genus *Aphycus* Mayr, 1876

#### 1. *Aphycus staverlokki* Japoshvili **sp. n.** (Figs 1, a-f)

Female (Holotype). Body length 1.13 mm (1.26 mm including exerted part of ovipositor (Fig. 1a), (Paratype: 1.24 mm, 1.4 mm including exerted part of ovipositor). Body orangish yellow, mesoscutum distinctly paler yellow contrasting with the rest of body (Figs 1b, c).

Head almost 0.85× as high as wide (holotype 51/60; paratype 52/60); frontovertex about 1.7× as long as wide (holotype 35/20; paratype 30/18); ocelli forming equilateral triangle (Fig. 1c).

Relative measurements of AOL, POL, OCL, OOL and OD respectively as follows: 9, 9, 6, 2, 3 (paratype: 9, 9, 6.5, 2.5, 2). Scape almost 5.3× as long as wide (Fig. 1d); pedicel 2.2× as long as wide; clava as long as funicle; pedicel and flagellum together almost 1.4× as long as head width; malar space 0.36× as long as eye; mesosoma about 1.3× as long as wide; metasoma

about 1.1× as long as wide and longer than mesosoma; mesoscutum about 0.6× as long as wide and longer than mesoscutellum; mesoscutellum about as long as wide; fore wing 2.85× as long as wide (Fig. 1e); occipital carina sharp; ovipositor exerted, and exerted part about 0.3× as long as gaster; cercus advanced to about the midpoint of the gaster ; third valvula slightly shorter than second valvifer (Fig. 1f); hypopygium almost reaching apex of gaster.

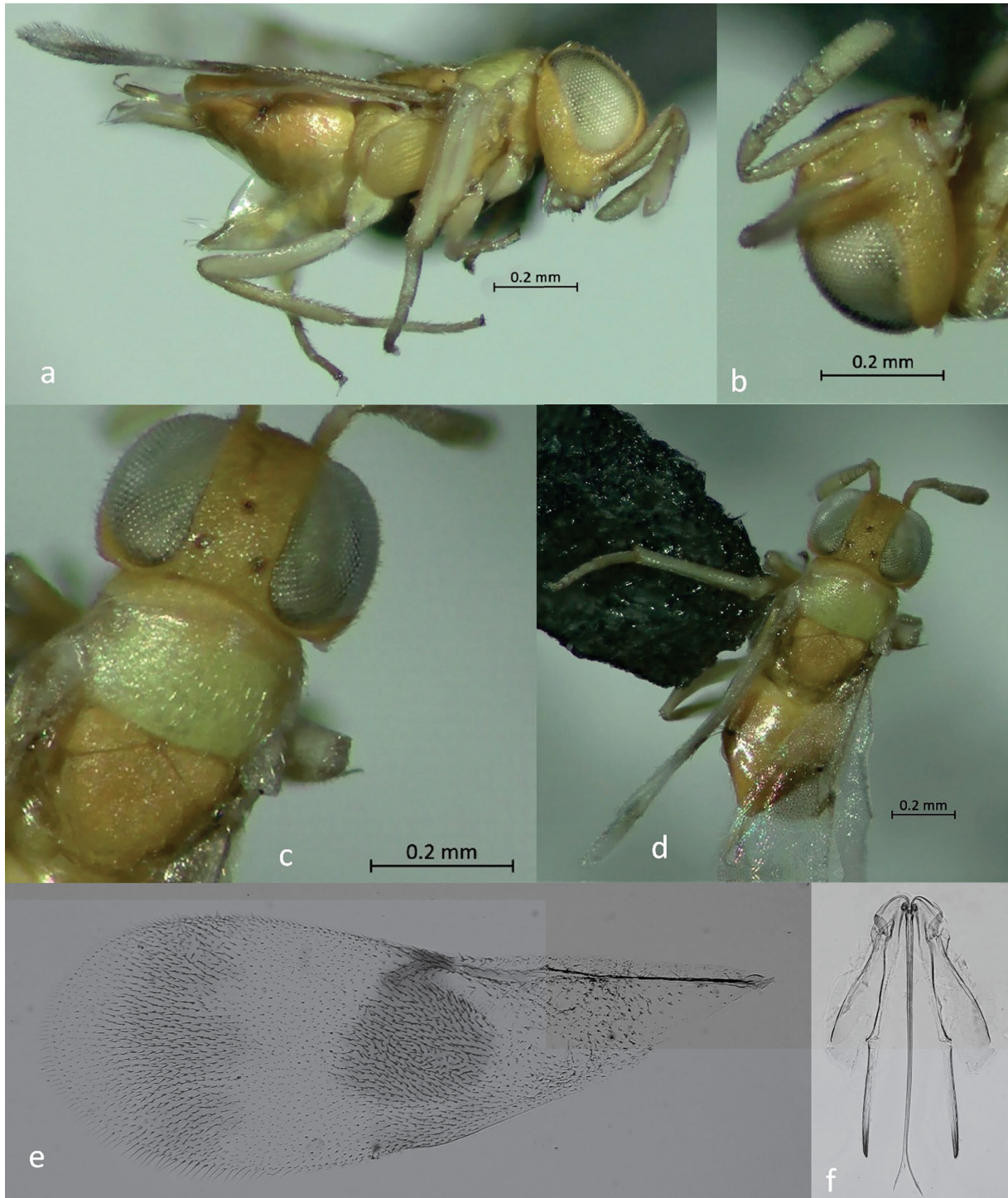
**Male:** unknown.

**Hosts:** unknown.

**Material examined:** Type material. Holotype female (IEAUG): Norway, Telemark [TEI], Drangedal: Sannes (Fig. 1), [N59.02963 E9.29547], MT: 04.viii. -22.ix.2021 (49 days), A. Staverløkk (card mounted). Paratype: female (IEAUG), same data as holotype (slide mounted).

**Comments:** Female of this new species is most similar to those *A. slavai* Myartseva, 1981 and *A. sulamanidzei* Japoshvili, 2018, however it differs from these species by the following characters: Metasoma of new species completely orange yellow, mesoscutum distinctly paler yellow contrasting with rest of body, while *A. slavai* Myartseva, 1981 has metasoma completely dark almost black, mesoscutum not contrasting with rest of body and *A. sulamanidzei* Japoshvili, 2017 has metasoma with basal half yellow, apical brown, mesoscutum distinctly paler yellow contrasting with rest of body. Head width of *A. staverlokki* **sp. nov.** is about 1/3× wide as FV, *A. slavai* about 1/4×. Exserted part of ovipositor about 1/3× as long as metasoma in new species. In *A. slavai* this character can vary between 1/3-1/4×, in *A. sulamanidzei* 1/4-1/5× respectively. Outer plate of *A. staverlokki* **sp. nov.** is about 3× as long as wide, this character in *A. slavai* is about 3.5×. Third valvula is only slightly shorter than second valvifer, while this character in both species of *A. slavai* and *A. sulamanidzei* are twice shorter.

**Etymology.** The species is named after the collector.

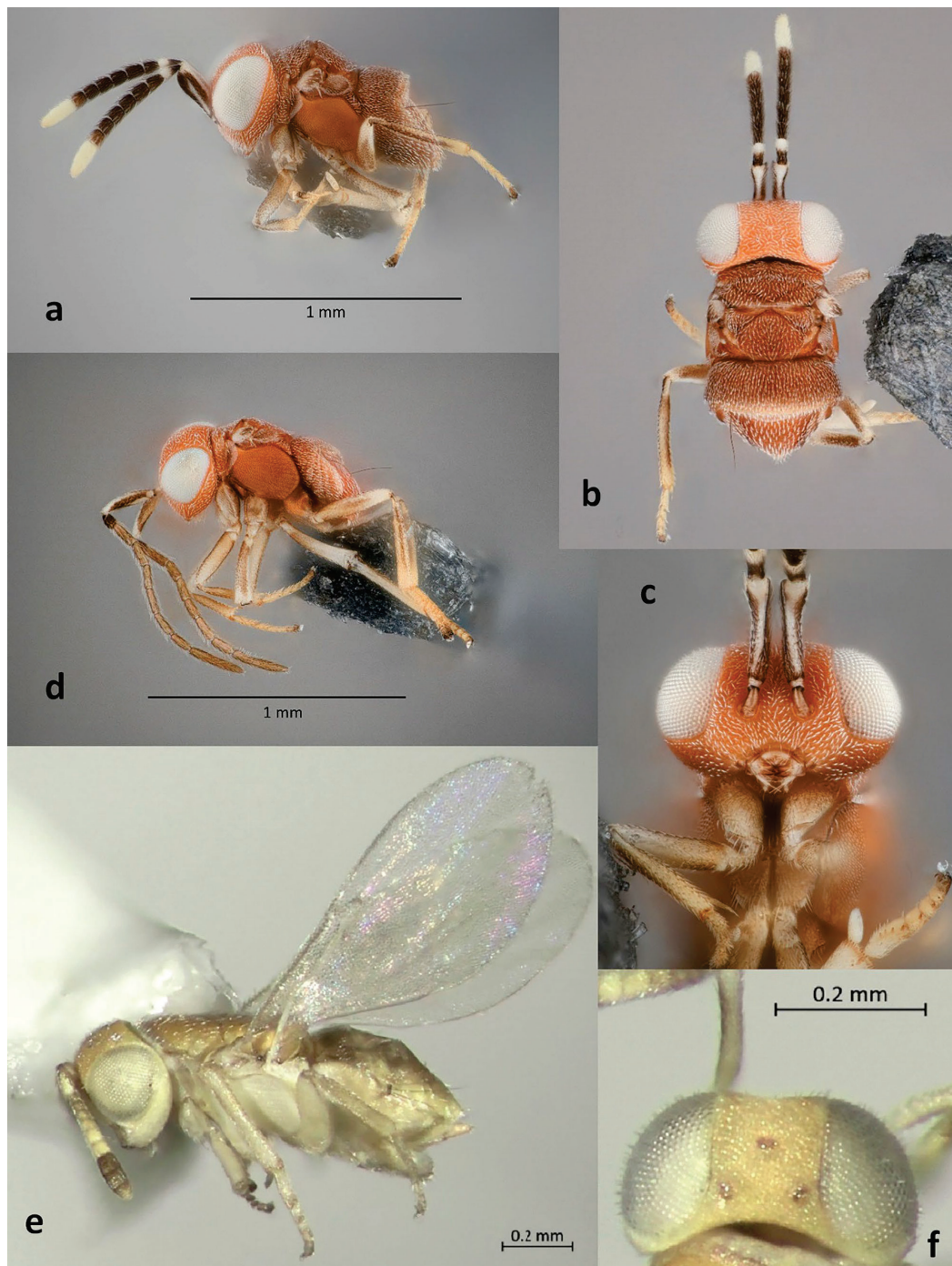


**Figure 1.** a–f: *Aphycus staverlokki* Japoshvili **sp. nov.**, female. a, lateral habitus; b, latero ventral head; c, head and mesosoma; d, dorsal habitus; e, fore wing; f, ovipositor.

**Genus *Dusmetia* Mercet, 1921**

**2. *Dusmetia pulex* (Ruschka, 1923) (Fig. 2a–d)**

**Material examined:** Norway, Telemark [TEI], Drangedal: Sannes, [N59.02963, E9.29547], 2 females (Fig. 2a-c), MT: 04.viii. –22.ix.2021 (49 days), 1 male (Fig. 2d), MT: 23.vi. –19.vii.2021 (26 days), leg. A. Staverløkk.



**Figure 2.** a–d: *Dusmetia pulex* (Ruschka, 1923), female: a, lateral habitus; b, dorsal habitus; c, face; d, male, lateral habitus; e–f: *Metaphycus sannes* Japoshvili **sp. nov.**, female: e, lateral habitus; f, head.

### **Genus *Leptomastidea* Mercet, 1916**

#### **3. *Leptomastidea bifasciata* (Mayr, 1876)**

**Material examined:** Norway Akershus [AK], Aurskog-Høland: Mikkelsrud [N59.97539, E11.66832], 1 female (Fig. 4a), MT: 1.ix.–12.ix.2022 (42 days), leg. A. Staverløkk. Agder [AAY], Risør, Søndeled: Stamsøy [N58.75097, E9.12714], 1 female, MT: 17.vii.–22.viii.2023 (36 days), leg. A. Staverløkk

**Comment:** We included this species in the list because it was previously recorded only from Hedmark southern [HES], Elverum: Starmoen (Japoshvili and Hansen, 2014)

### **Genus *Metaphycus* Mercet, 1917**

#### **4. *Metaphycus sannes* Japoshvili sp. nov. (Fig. 2e–f; 3a–d).**

Female (*Holotype*). Body length about 1.05mm (1.1mm including exerted part of ovipositor) (CPD) (Fig. 3j–k). Body from dorsal view orange yellow to dusky almost brownish, pronotum with lateral maculae, ventral side of the body, head from frontal view, genae and mesopleurons almost white. All legs immaculate. Antennal F1–3 almost brown; clava brown with light apex; scape yellow, outer aspect basal 1/3 yellow and upper 2/3 brown. Wings hyaline. Head almost as high as wide about 0.8× as high as wide; frontovertex about 2.7× as long as wide (Figs 3e, i); ocelli forming slightly acute triangle (Fig. 3i,l). Relative measurements of AOL, POL, OCL, OOL and OD respectively as follows: 9, 12, 4, 2, 3 (paratype 7, 9, 4, 2, 4); Scape almost 7× as long as wide. Pedicel about 2.6× as long as wide; clava as long as F3–6; pedicel, flagellum and clava together almost 1.6× as long as head width (Fig. 2e); occipital carina sharp; malar space 0.4× as long as eye; Mesosoma about 1.3× as long as wide; metasoma about as long as wide and shorter than mesosoma; mesoscutum 0.6× as long as wide and as long as mesoscutellum; notaular lines incomplete; fore wing about 2.4× as long as wide (Fig. 2f); third valvulae 1/3x as long as second valvifer (Fig. 3a).

**Male:** unknown.

**Hosts.** unknown

**Material examined:** Type material. Holotype: female (slide mounted) (IEAUG), Norway, Telemark [TEI], Drangedal: Sannes, [N59.02963, E9.29547], MT: 04.viii.–22.ix.2021 (49 days), leg. A. Staverløkk. Paratypes: female (IEAUG), same data as holotype (slide mounted); 2 females (IEAUG), same data as holotype (card mounted).

**Comments.** *Metaphycus sannes* sp.n. is very similar to *Metaphycus petitus* but differs with the following characters: *Metaphycus sannes* **sp. nov.** head about 2.7× as wide as FV, while *M. petitus* (Walker, 1851) it ranges between 3.4–4.7×. Scape of new species is more slender about 7× as long as wide, than in *M. petitus*, where it is about 5×. Fore wing of *M. sannes* **sp. nov.** about 2.4× as long as wide and *M. petitus* fore wing is about 2.9×. For new species ovipositor about as long as mid tibia and for *M. petitus* it is about 1.3× as long as mid tibia.

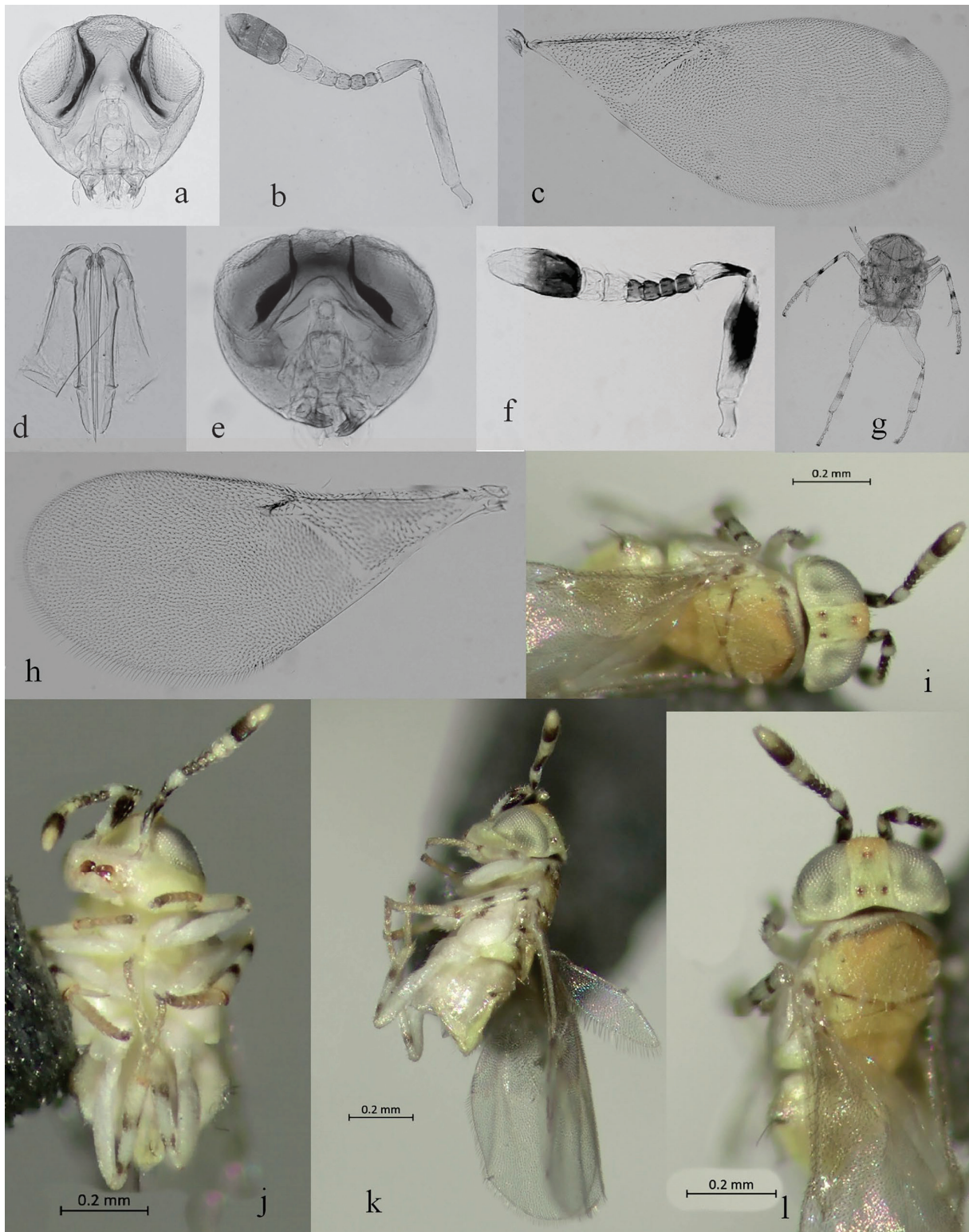
**Etymology.** The species is named after the type locality, and the name treated as a noun in apposition.

##### **5. *Metaphycus asterolecanii* (Mercet, 1923)**

**Material examined:** Norway, Telemark [TEI], Drangedal: Sannes, [N59.02963, E9.29547], 1 female (card mounted), MT: 04.viii.–22.ix.2021 (49 days), leg. A. Staverløkk.

**Comment:** Habitus photographs of the female in dorsal, ventral and lateral view, and also images of the head, antenna, mesonotum and fore wing are provided in Figs 3f–l.



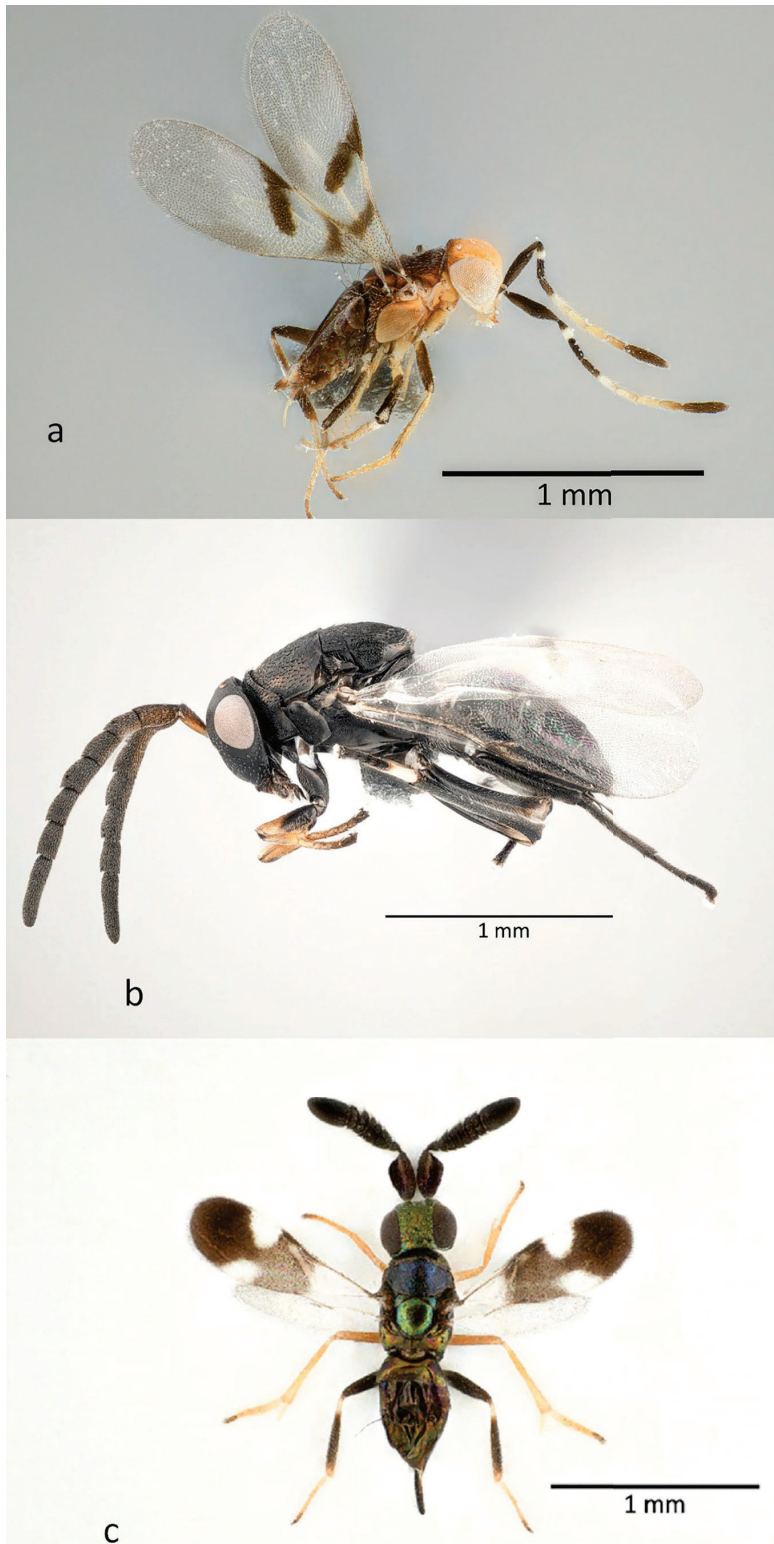


**Figure 3.** a–d: *Metaphycus sannes* Japoshvili **sp. nov.** a, head; b, antenna; c, fore wing; d, ovipositor; e–l: *Metaphycus asterolecanii* (Mercet, 1923), female: e, head; f, antenna; g, mesosoma with legs; h, fore wing; i, head, mesoscutum and antenna; j, ventral habitus; k, lateral habitus; l, dorsal habitus.

Genus *Prionomastix* Mayr, 1876

6. *Prionomastix morio* (Dalman, 1820)

**Material examined:** Norway, Telemark [TEI], Drangedal: Eikebumarka, [N59.05991, E9.30485], 1 male (Fig. 4b), MT: 16.vi.–10.vii.2020 (25 days), A. Staverløkk.



**Figure 4.** a—*Leptomastidea bifasciata* (Mayr, 1876), female, lateral habitus; b, *Prionomastix morio* (Dalman, 1820), male, lateral habitus; c, *Tetracnemus colocensis* (Erdos, 1946), female, dorsal habitus.

## Genus *Tetracnemus* Westwood, 1837

### 7. *Tetracnemus colocensis* (Erdős, 1946)

**Material examined:** 1 female (Fig. 4c), Norway, Akershus [AK], Aurskog-Høland: Mikkelsrud [N59.97562, E11.66907 +-50m], 2 females, 13.vi.2022, sweep netting, leg. A. Staverløkk.

## Conclusion

In the study, seven parasitoid species belonging to five genera were recorded in Norway. Two genera are the first records from Norway: *Dusmetia* Mercet, 1921 and *Prionomastix* Mayr, 1876. Four species *Dusmetia pulex*, *Metaphycus asterolecanii*, *Prionomastix morio* and *Tetracnemus colocensis* are new country records. Two species *Aphycus staverloeki* and *Metaphycus sannes* are described as new to science. Thus, the number of Encyrtidae species from Norway increases to 156. According to Noyes (2019), neighboring Finland and Sweden have 142 and 197 species of Encyrtidae respectively. Palaearctic fauna of genera *Aphycus* and *Metaphycus* increased with one species each and now they comprise 22 and 107 species respectively.

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