

TWO NEW SPECIES OF *ASPHONDYLIA* (DIPTERA: CECIDOMYIIDAE) FROM *HALOSARCIA* SPP. (CHENOPODIACEAE) IN SOUTH AUSTRALIA

by PETER KOLESÍK*

Summary

KOLESÍK, P. (1997) Two new species of *Asphondylia* (Diptera: Cecidomyiidae) from *Halosarcia* spp. (Chenopodiaceae) in South Australia. *Trans. R. Soc. S. Aust.* 121(2), 59-66, 30 May, 1997.

Two new gall midge species are described from South Australia. *Asphondylia inflata* sp. nov. was found at Port Adelaide in swollen branches of *Halosarcia pergranulata* subsp. *pergranulata*. *Asphondylia ericiformis* sp. nov. was found at Lyndhurst, at the southern edge of the Strzelecki Desert, forming spherical, spiky galls on branches of *H. indica* subsp. *leiostachya*. Descriptions of the larvae, pupae, males, females and galls are given for both species.

KEY WORDS: Diptera, Cecidomyiidae, Adelaide, Strzelecki Desert, South Australia.

Introduction

Halosarcia is a plant genus comprising 23 species commonly called samphires. The genus is endemic to Australia except for *H. indica* (Willd.) Wilson which also occurs in Malaysia and other countries bordering the Indian Ocean (Wilson 1986). Two species of *Halosarcia* were found to be infested by two undescribed gall midges (Diptera: Cecidomyiidae) collected in South Australia during 1996. These gall midges are described in the present paper. *Asphondylia inflata* sp. nov. causes swellings of branch segments on *H. pergranulata* (Black) Wilson subsp. *pergranulata* (Fig. 1) and *A. ericiformis* sp. nov. forms spherical, spiky galls on branch segments of *H. indica* subsp. *leiostachya* (Benth.) Wilson (Fig. 2).

Halosarcia pergranulata subsp. *pergranulata* is a shrub about 0.5 m high which grows in southern Australia (except Tasmania) associated with coastlines, estuaries, swamps and margins of inland lakes (Wilson 1984). The plant forms a substantial part of the vegetation cover of saltmarsh flats north-west of Adelaide. These saltmarsh flats are areas covered by small, hardy bushes that grow on the landward side of the mangrove swamps. Areas that are regularly inundated by tides are typically dominated by *Sclerostegia arbuscula* and *Sarcocornia quinqueflora*, while areas that are only occasionally flooded are dominated by *Maireana oppositifolia* and *Halosarcia* spp. In May 1996, a large number of galls caused by *A. inflata* sp. nov. was found on *H. pergranulata* subsp. *pergranulata* at Port Adelaide, about 400 m south of the Torrens Island bridge.

Halosarcia indica subsp. *leiostachya* is a small, decumbent to erect shrub widespread along the coast and around inland salt lakes of mainland Australia (Wilson 1984). It is a common plant in the Strzelecki



Fig. 1. Gall of *Asphondylia inflata* sp. nov. on *Halosarcia pergranulata* (Black) Wilson subsp. *pergranulata*. Scale bar = 10 mm.

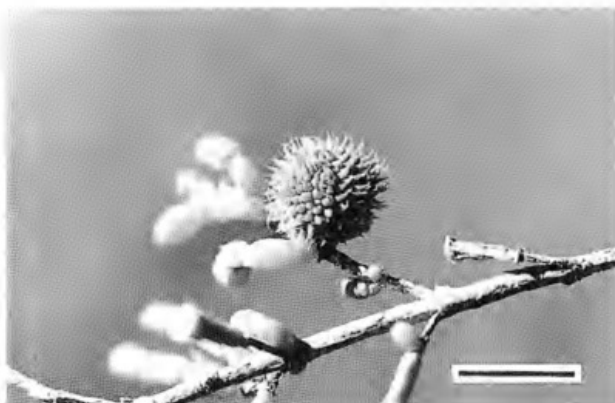
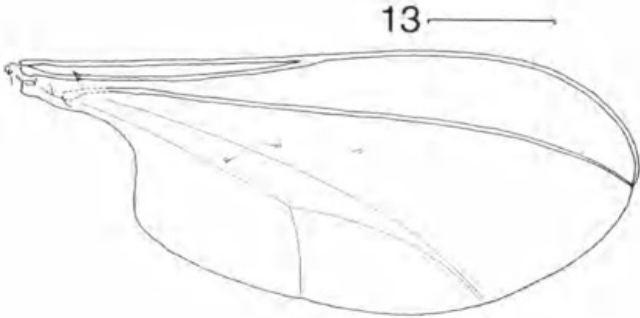
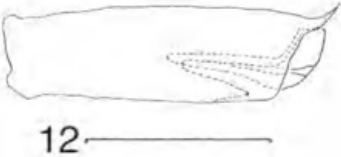
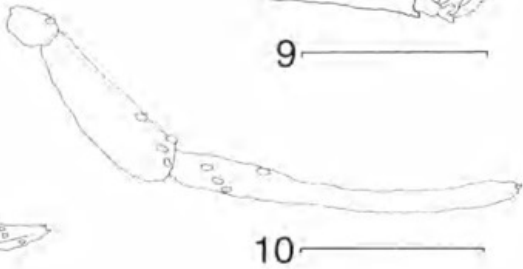
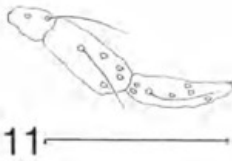
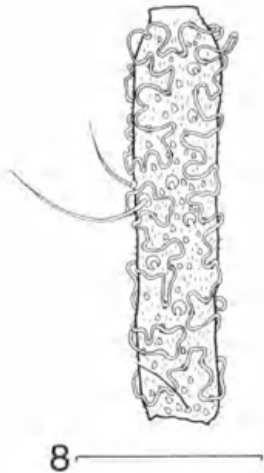
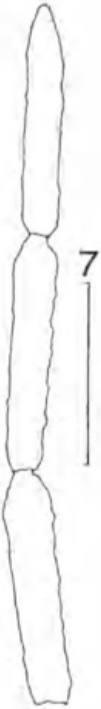
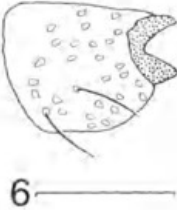
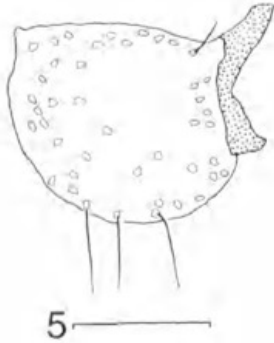
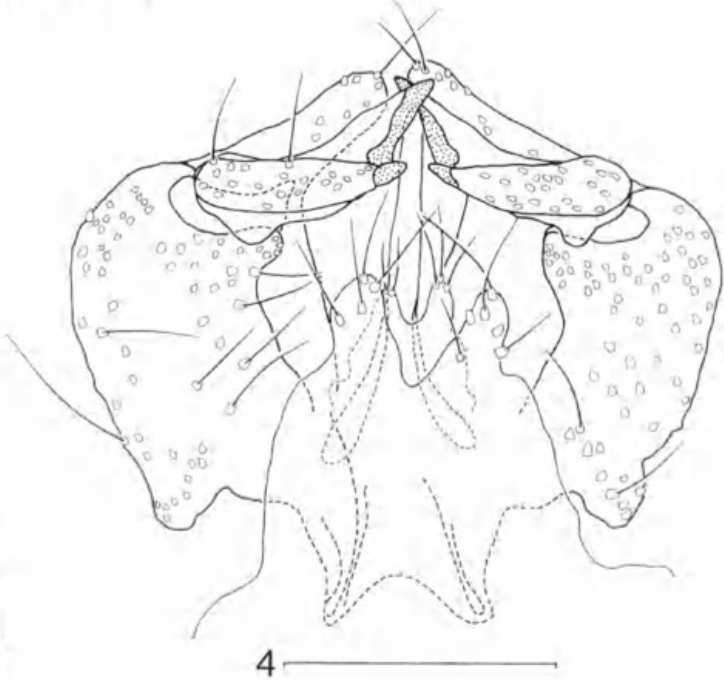
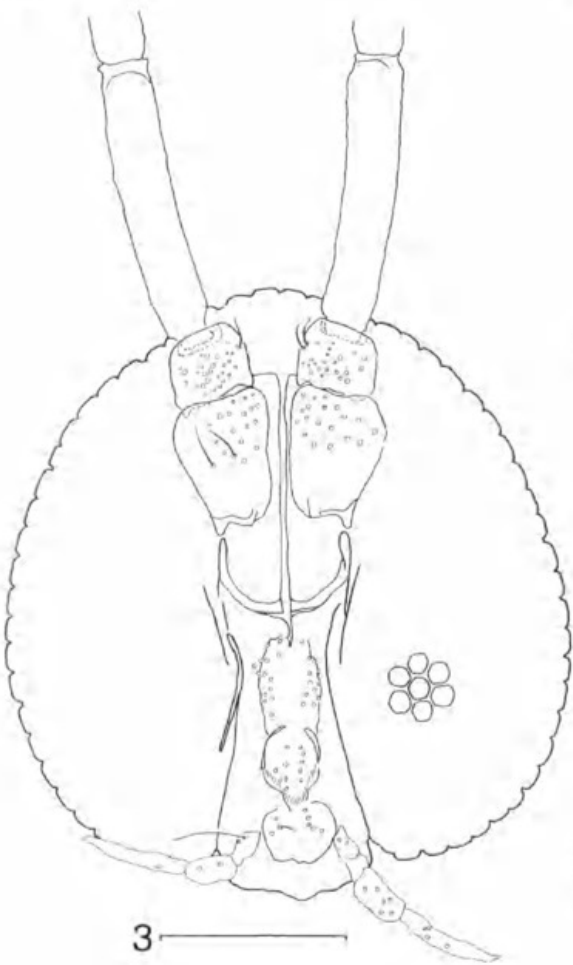


Fig. 2. Gall of *Asphondylia ericiformis* sp. nov. on *Halosarcia indica* subsp. *leiostachya* Wilson. Scale bar = 10 mm.

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Desert where it grows in a variety of habitats, including salt lake margins, open clay plains and gibber plains. It is one of the dominant plants around Lyndhurst, where, in February 1996, all examined shrubs exhibited a low to moderate infestation by the gall midge *A. ericiformis* sp. nov.

Material and Methods

Galls were sampled from *Halosarcia indica* subsp. *leiostrachya* at Lyndhurst (15.ii.1996) and *Halosarcia pergranulata* subsp. *pergranulata* at Port Adelaide (5.v.1996). The galls collected on both occasions were processed in one of two ways. A small number was cut open and the larvae preserved in 70% ethanol. A larger number of galls was kept in plastic bags and the larvae were reared to adults. Pupation took place within the galls. Plastic bags were examined daily and emerged adults preserved, together with their pupal skins, in 70% ethanol. Canada balsam mounts of type specimens for microscopic examination were prepared according to the technique outlined by Kolesik (1995a). All measurements refer to type series. The type series and other material retained in 70% ethanol are deposited in the South Australian Museum, Adelaide [SAMA] and the Australian National Insect Collection, Canberra [ANIC].

Genus *Asphondylia* Loew, 1850

Loew, 1850: Dipterologische Beiträge, 1850: 21 and 37 (as subgenus of *Cecidomyia* Meigen, 1803).

Type species: *Cecidomyia sarothamni* Loew, 1850: l.c.: 38 (des. Karsch, 1877): Revision der Gallmücken: 15).

Asphondylia is a worldwide genus that currently comprises some 260 described species (Gagné 1994). It contains species that have a ventro-distal spine on the first tarsomere, the ovipositor with large basal lobes, female flagellomeres 9–12 progressively shortened, the gonocoxite with a ventro-apical lobe and a dorsally situated gonostylus that is about as wide as long and bears two basally merged teeth.

Asphondylia inflata sp. nov.

(FIGS 1, 3–5, 7–9, 12–14, 16–18, 21, 24–27, 31, 34)

Holotype: ♂, Port Adelaide, South Australia (34°50' S, 138°30' E), emerged 6.v.1996. P. Kolesik, reared from branch gall on *H. pergranulata* (Black) Wilson subsp. *pergranulata*, gall collected 5.v.1996, 12/283 [SAMA].

Paratypes: 1♂, 3♀♀, 2 pupae, 1 pupal skin [SAMA], 1♂, 3♀♀, 1 pupa, 1 pupal skin [ANIC], all same data but emerged 5.v.–13.vi.1996; 1 larva [SAMA], collected with holotype.

Other material: 2♀♀, 13 pupal skins [SAMA], collected with holotype.

Male (Figs 3–5, 7–9, 12, 13)

Colour: sclerotized parts of body dark brown, non-sclerotized parts of abdomen orange.

Head: Antenna: scape broadest distally, length 1.5 × breadth at distal end, 1.6–1.8 × length pedicel, pedicel about as broad as long, first flagellomere 2.0–2.2 × length of scape, flagellomeres evenly cylindrical, circumfila dense, equally distributed along segments. Eye facets close together, hexagonal, eye bridge 6–7 facets long. Frons with 12–18 setae per side. Labella reduced in size, fused, laterally with 3–6 setae, setulose. Maxillary palpus 3 segmented, length of third segment, as well as total length, variable.

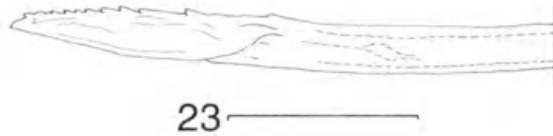
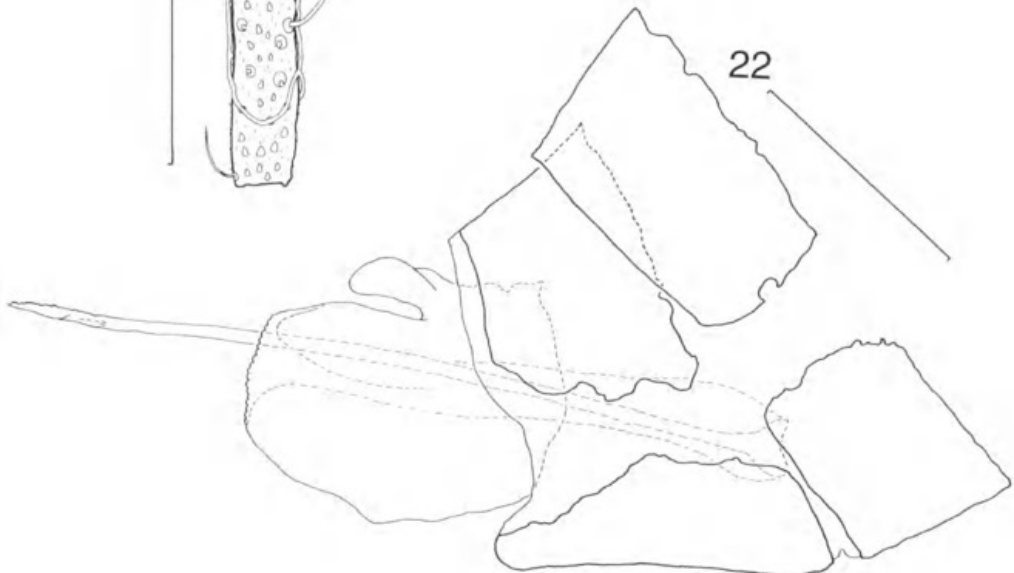
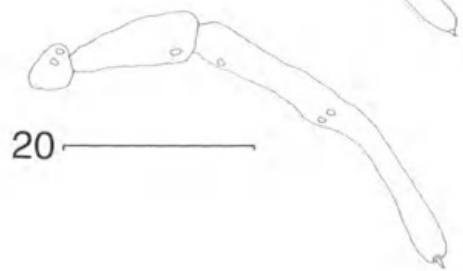
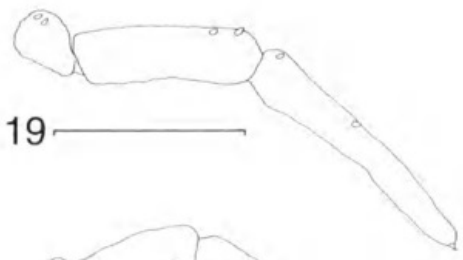
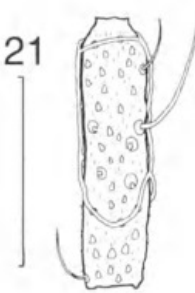
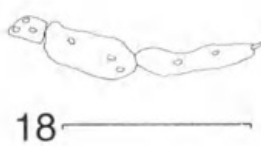
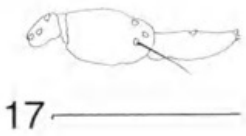
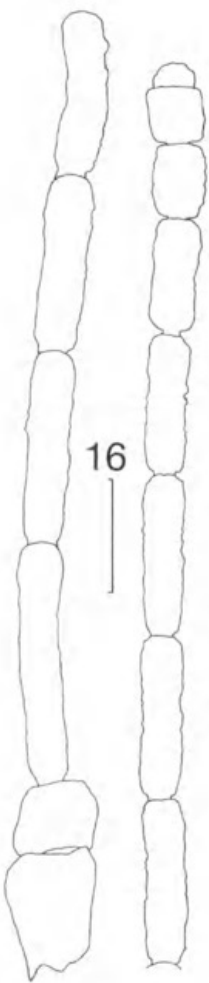
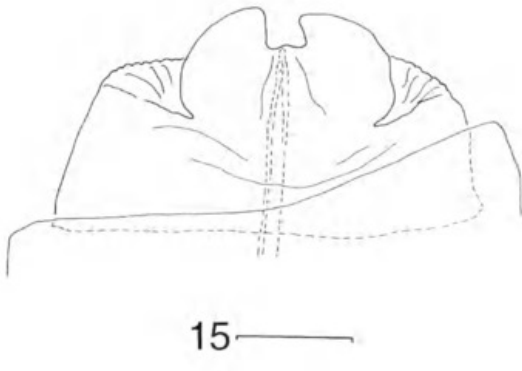
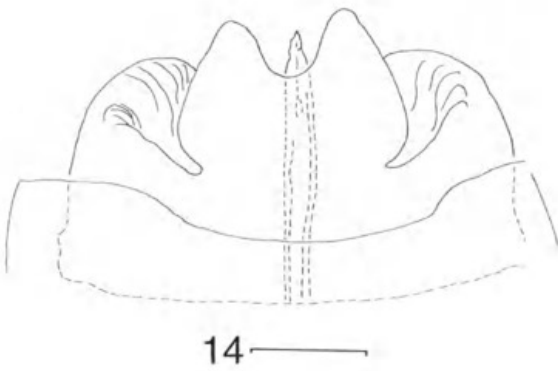
Thorax: Wing length 3.5 mm (range 3.4–3.5), width 1.4 mm (1.4–1.5). Sc cell pigmented proximally. Anepisternum and anepimeron covered with scales. Claws of all legs subequal in size, similar in shape, as long as empodia.

Abdomen: Genitalia: gonocoxites short, with long ventro-apical lobe; gonostylus with 2 unequal apical teeth, ventral about 2 × length of dorsal; aedeagus elongate and narrow.

Female (Figs 14, 16–18, 21, 24)

Frons with 9–11 setae per side. Twelfth flagellomere sometimes fused with eleventh. Circumfila comprising two longitudinal bands connected by two short transverse bands. Wing length 3.4 mm (2.7–3.7), width 1.3 mm (1.1–1.4). Seventh abdominal sternite 2.2 × (2.0–2.3) length of sixth. Genitalia: ovipositor 2.2 × (1.9–2.4) length of seventh sternite, cerci glabrous. Other characters as in male.

Figs 3–13. 3. Head of male *Asphondylia inflata* sp. nov. in frontal view. 4. Genitalia of male *Asphondylia inflata* sp. nov. in dorsal view. 5. Gonostylus of male *Asphondylia inflata* sp. nov. in posterior view. 6. Gonostylus of male *Asphondylia ericiformis* sp. nov. in posterior view. 7. Last three flagellomeres of male *Asphondylia inflata* sp. nov. 8. Sixth flagellomere of male *Asphondylia inflata* sp. nov. 9. Male *Asphondylia inflata* sp. nov. Last tarsomere with claw and empodium. 10 & 11. Maxillary palpus of male *Asphondylia ericiformis* sp. nov. 12. First tarsomere of male *Asphondylia inflata* sp. nov. 13. Wing of male *Asphondylia inflata* sp. nov. Scale bars = 100 µm 3, 4, 7–12; 50 µm 5, 6; 500 µm 13.



Pupa (Figs 25-27, 31)

Colour: abdomen orange, remaining parts dark brown. Total length 3.0 mm (2.8 - 3.3). Antennal horns serrate medially, 185 µm (141 - 191) long. Upper and lower frontal horns simple. Two pairs of papillae on lower face, one of each pair with a seta. Prothoracic spiracle broad at base, narrow on distal half, curved beyond tracheal opening at mid-length. Abdominal segments 2 - 8 with two pairs dorsal papillae, two pairs pleural papillae, and one pair ventral papillae, all papillae setose. Abdominal dorsal spines simple, prominent pair on last segment curved laterally.

Last instar larva (Fig. 34)

Colour: orange. Integument covered with dense spiculae. Length 3.0 mm. Head capsule strongly pigmented, postero-lateral extensions shorter than length of head capsule. Spatula with two long, pointed anterior teeth, shaft narrowed near middle, widened again posteriorly, surrounded anteriorly and laterally by extensive pigmented, glabrous area. Papillar pattern generally as for *Asphondylia* (Möhr 1955) except only 2 lateral papillae on each side of spatula and no terminal papillae visible on the available specimen.

Etymology

The name "inflata" is a Latin adjective for inflated, referring to the appearance of the galled branch.

Gall and biology

Branch segments of *Halosarcia pergranulata* subsp. *pergranulata* infested by this gall midge are 2 - 3 times larger than normal in volume, greyish-green and hard in contrast to the vivid, green colour and soft texture of uninfested branch segments (Fig. 1). Each gall has one to three chambers, with one larva in each chamber. The chamber wall is lined with hard, pale-green, 0.25 - 0.33 mm thick tissue.

Pupation takes place inside the gall. A circular brown area appears on the top of the gall before the pupa cuts an opening with its antennal horns. On 5 May, 1996, at Port Adelaide, the galls appeared very common in the host plant population covering several hundreds of m².

Asphondylia ericiformis sp. nov.

(FIGS 2, 6, 10, 11, 15, 19, 20, 22, 23, 28-30, 32, 33, 35)

Holotype: ♂, Lyndhurst, South Australia [30°17' S, 138°21' E], 20.ii.1996, P. Kolesik, reared from branch gall on *Halosarcia indica* subsp. *leuostachya* (Benth.) Wilson, gall collected 15.ii.1996, 121284 [SAMA].

Paratypes: 1 ♂, 2 ♀♀, 1 pupa, 1 pupal skin [SAMA], 1 ♂, 1 ♀, 1 pupa, 1 pupal skin [ANIC], all same data but emerged 25-27.ii.1996; 3 larvae [SAMA], 2 larvae [ANIC], collected with holotype.

Other material: 7 pupae, 4 pupal skins [SAMA], collected with holotype.

Male (Figs 6, 10, 11)

Frons with 6 - 8 setae per side. Wing length 3.4 mm (2.1 - 4.1), width 1.3 mm (0.9 - 1.6). Eye bridge 6 - 9 facets long. Ventral tooth on gonostylus as long as dorsal. Otherwise as in *A. inflata*.

Female (Figs 15, 19, 20, 22, 23)

Frons with 4 - 8 setae per side. Wing length 3.4 mm (2.3 - 3.9), width 1.2 mm (0.9 - 1.4). Seventh abdominal sternite 2.3 x (2.0 - 2.5) length of sixth. Ovipositor 1.9 x (1.8 - 2.0) length of seventh sternite, cerci glabrous, with line of teeth dorsally. Otherwise as in *A. inflata*.

Pupa (Figs 28-30, 32)

Total length 4.4 mm (4.1 - 4.7). Antennal horns 198 µm (154 - 214) long. Upper frontal horn simple; no other horn present. Dorsal spines of last abdominal segment about same length, straight.

Last instar larva (Figs 33, 35)

Total length 3.2 mm (2.4 - 4.8). Spatula with long, pointed anterior teeth, shaft short, broad, parallel-sided. Three lateral papillae on each side of thoracic segments, no terminal papillae visible on available specimens. Otherwise as in *A. inflata*.

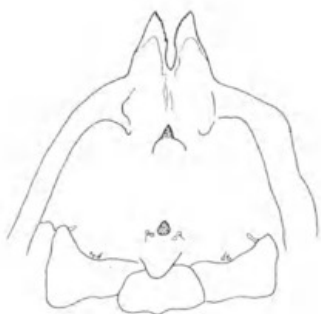
Etymology

The name "ericiformis" is a composed Latin adjective formed from "ericus" (hedgehog) and "formis", referring to the the hedgehog-shaped gall.

Gall and biology

This species transforms branch segments of

Figs 14-24. 14. Female *Asphondylia inflata* sp. nov. Basal lobes on ovipositor in dorsal view. 15. Female *Asphondylia ericiformis* sp. nov. Basal lobes of ovipositor in dorsal view. 16. Antenna of female *Asphondylia inflata* sp. nov. 17 & 18. Maxillary palpus of female *Asphondylia inflata* sp. nov. 19 & 20. Maxillary palpus of female *Asphondylia ericiformis* sp. nov. 21. Sixth flagellomere of female *Asphondylia inflata* sp. nov. 22. Female *Asphondylia ericiformis* sp. nov. End of abdomen in lateral view. 23. Female *Asphondylia ericiformis* sp. nov. End of ovipositor in lateral view. 24. Female *Asphondylia inflata* sp. nov. End of ovipositor in lateral view. Scale bars = 100 µm 14-21, 23, 24; 500 µm 22.



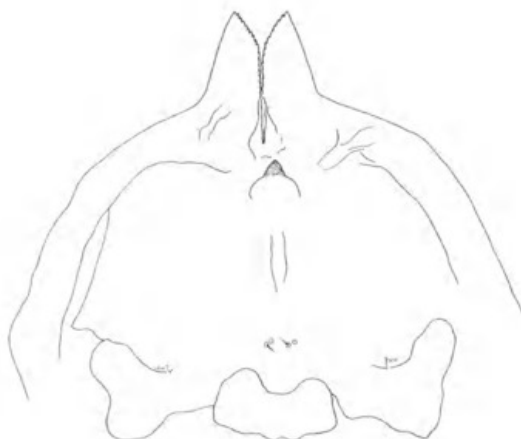
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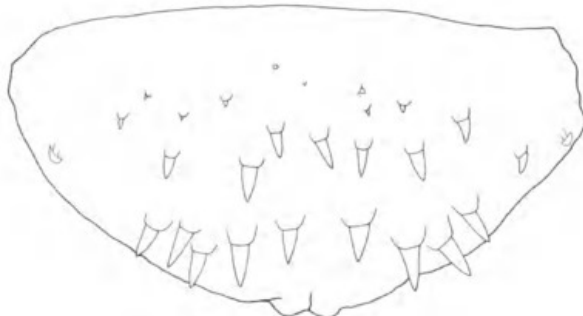
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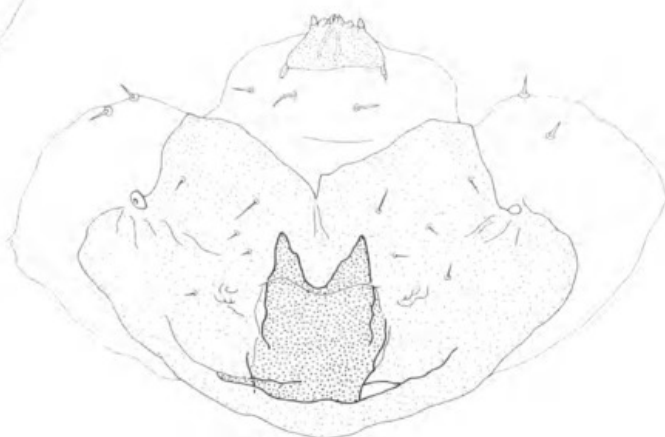
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Halosarcia indica subsp. *leiostrachya* into spherical, spiky, monothalamous galls, each occupied by one larva (Fig. 2). Outer diameter of gall 6–12 mm, inner diameter 2.0–2.5 mm. Chamber wall lined with hard, brown, 0.25–0.33 mm thick tissue.

Pupation takes place inside the gall. On 15 February, 1996, at Lyndhurst, 10 examined shrubs of the host plant bore a total of about 200 galls of the new gall midge species. The galls contained larvae or pupae.

Remarks

Four species of *Asphondylia* have been previously known to occur in Australia (Gagné 1989; Kolesik 1995b). *Asphondylia dodonaeae*, a South Australian species common in the Adelaide Hills, maliforms terminal branch stems and primary leaf veins of *Dodonaea viscosa* (Sapindaceae) (Kolesik 1995b). Two species, *A. laevis* and *A. rubicunda*, were described in the previous century from adults caught in flight in Sydney, New South Wales, and their biology is unknown (Skuse 1888, 1890). The fourth, *A. hilli*, was described from females and pupae bred from an unknown plant in Darwin, Northern Territory (Edwards 1916). These last three species, which were described superficially and can not be compared on their descriptions, are not considered in the present paper, but I plan a review of Australian *Asphondylia* spp. at a later stage.

Morphological similarities between the two new species and the fact that their respective host plants belong to the same genus, suggest a close relationship. They form a distinctive group that excludes *A. dodonaeae*. *Asphondylia dodonaeae* differs from the two new species in the following respects. Adults have prominent labella and scapes as long as broad at the distal ends. The male has a short a ventro-apical lobe on the gonocoxite, small lobes adjacent to teeth on the gonostylus and the aedeagus much shorter than the gonocoxites. The seventh abdominal sternite in the female is three times longer than the sixth. The pupa has no frontal horns, the antennal horns are triangular and serrated laterally and the prothoracic spiracle is not considerably broader at the base. The area sur-

rounding the spatula in the larva is not pigmented.

Adults of the two new species differ from each other most prominently in the shape of the gonostylus and the end of the ovipositor. The gonostylus bears teeth of unequal length and the end of the ovipositor lacks external processes in *A. inflata*. In contrast, the gonostylus of *A. ericiformis* bears teeth of equal length and the end of the ovipositor is serrated. More differences are evident in the earlier developmental stages. The pupa of *A. inflata* has both upper and frontal horns present and a prominent pair of dorsal spines on the last segment is curved laterally; in *A. ericiformis* the pupa has the upper horn only and all dorsal spines on the last abdominal segment are equally strong and straight. The larvae differ in the shape of the spatula and the number of lateral papillae, two per side in *A. inflata* but three per side in *A. ericiformis*. The two new species resemble each other in the shape of the antennal horns and prothoracic spiracles in pupae, the antennal segments in adults, the ventro-apical lobes on the gonocoxites in males and the relative lengths of the sixth and seventh abdominal sternites in females. The elongation of the ventro-apical lobe on the gonocoxite is unique to these two species and distinguishes them from the other *Asphondylia* spp.

Acknowledgments

I am grateful to P. G. Wilson, Western Australian Herbarium Como for the identification of *Halosarcia indica* subsp. *leiostrachya*. R. J. Chinnock, South Australian Herbarium Adelaide for the identification of *Halosarcia pergranulata* subsp. *pergranulata*, T. B. Reardon who led a South Australian Museum collecting trip during which *Asphondylia ericiformis* sp. nov. was discovered, A. Stark, Halle Germany for providing copies of Karsch's and Loew's papers and J. D. Gray, Department of Horticulture, Viticulture and Oenology University of Adelaide and R. J. Gagné, Systematic Entomology Laboratory USDA Washington DC for their comments on an early draft of the manuscript.

Figs 25–35: 25. *Asphondylia inflata* sp. nov. Anterior part of pupa in ventral view. 26. *Asphondylia inflata* sp. nov. Anterior part of pupa in lateral view. 27. *Asphondylia inflata* sp. nov. Prothoracic spiracle of pupa. 28. *Asphondylia ericiformis* sp. nov. Anterior part of pupa in ventral view. 29. *Asphondylia ericiformis* sp. nov. Anterior part of pupa in lateral view. 30. *Asphondylia ericiformis* sp. nov. Prothoracic spiracle of pupa. 31. Pupa of *Asphondylia inflata* sp. nov. Last abdominal segment in dorsal view. 32. Pupa of *Asphondylia ericiformis* sp. nov. Last abdominal segment in dorsal view. 33. Larva of *Asphondylia ericiformis* sp. nov. Last two abdominal segments in dorsal view. 34. Anterior part of larva of *Asphondylia inflata* sp. nov. in ventral view. 35. Head and first thoracic segment of larva of *Asphondylia ericiformis* sp. nov. in ventral view. Scale bars = 100 µm.

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