

AES Conservation Committee Species Nomination

Taxonomy

[List scientific name, author, date, synonymies; higher classification (Order: Family); and common name (provide one if not available)]

Scientific name: *Ophiomegistus michaeli* Halliday (in Derne *et al.* 2019)
(Parasitiformes: Paramegistidae)

Common name: Pygmy bluetongue mite

Description

[Provide a brief description, giving diagnostic features for identification; how it is distinguished from similar species; and an image of species]

Ophiomegistus michaeli is a large mite, dark brown in colour, and dorso-ventrally flattened (Fig. 1). The dorsal surface is covered by a single large shield that has a sparse covering of minute pointed setae, while the ventral surface bears a combination of short pointed setae and others modified into a flat paddle-shape. The genital opening of the female is on the ventral surface, protected by a complex series of sclerotised plates. The male is generally similar to the female but smaller, and its genital opening is small and circular. The anterior legs are slender and flexible, and have a mainly sensory function. The other three pairs of legs are shorter and more robust, and carry membranous pads that assist in adhesion to the host. The mouthparts are elongate and pointed, adapted for piercing the skin of the host.

Male: Dorsal shield length 580-600 micrometres, width 660-685 micrometres.

Female: Dorsal shield oval, wider (794 micrometres) than long (651 micrometres).

Similar species: The genus *Ophiomegistus* includes about 25 species that occur in Australia and southeast Asia. Different species are distinguished from each other by the number, structure, and arrangement of setae on the ventral surface. Their degree of host specificity has not yet been determined.

A full species description of *O. michaeli* can be found in Derne *et al.* (2019).



Figure 1. Ventral surface of an *Ophiomegistus michaeli* female. (Image: B. Halliday)

Distribution

[Provide an overview of the species' known or estimated current and past distribution; IBRA region; land tenure, especially for sites protected within the reserve system; and spatial map]

IBRA region: Flinders Lofty Block (FLB)

Distribution: Occurrence records for this newly described species are currently restricted to three sites within the Mid North region of South Australia (Fig. 2), one north of Jamestown, one west of Clare and one east of Burra (Derne *et al.* 2019). Distribution is likely to reflect that of its only known host, the pygmy bluetongue lizard (*Tiliqua adelaidensis*) which inhabits natural grasslands in the Mid North Region of South Australia (T. Milne 1999; Souter *et al.* 2007) over an approximate area of 7000 km² (Delean *et al.*, 2013). This lizard range once extended to the Adelaide region (Duffy *et al.* 2012).

Land tenure: Occurrence records are on privately owned land, including the Nature Foundation of South Australia's Tiliqua property and two privately owned sheep farms (north of Jamestown and west of Clare townships).

The 31 known populations of *T. adelaidensis* occur on privately owned land used to graze sheep (Duffy *et al.* 2012).

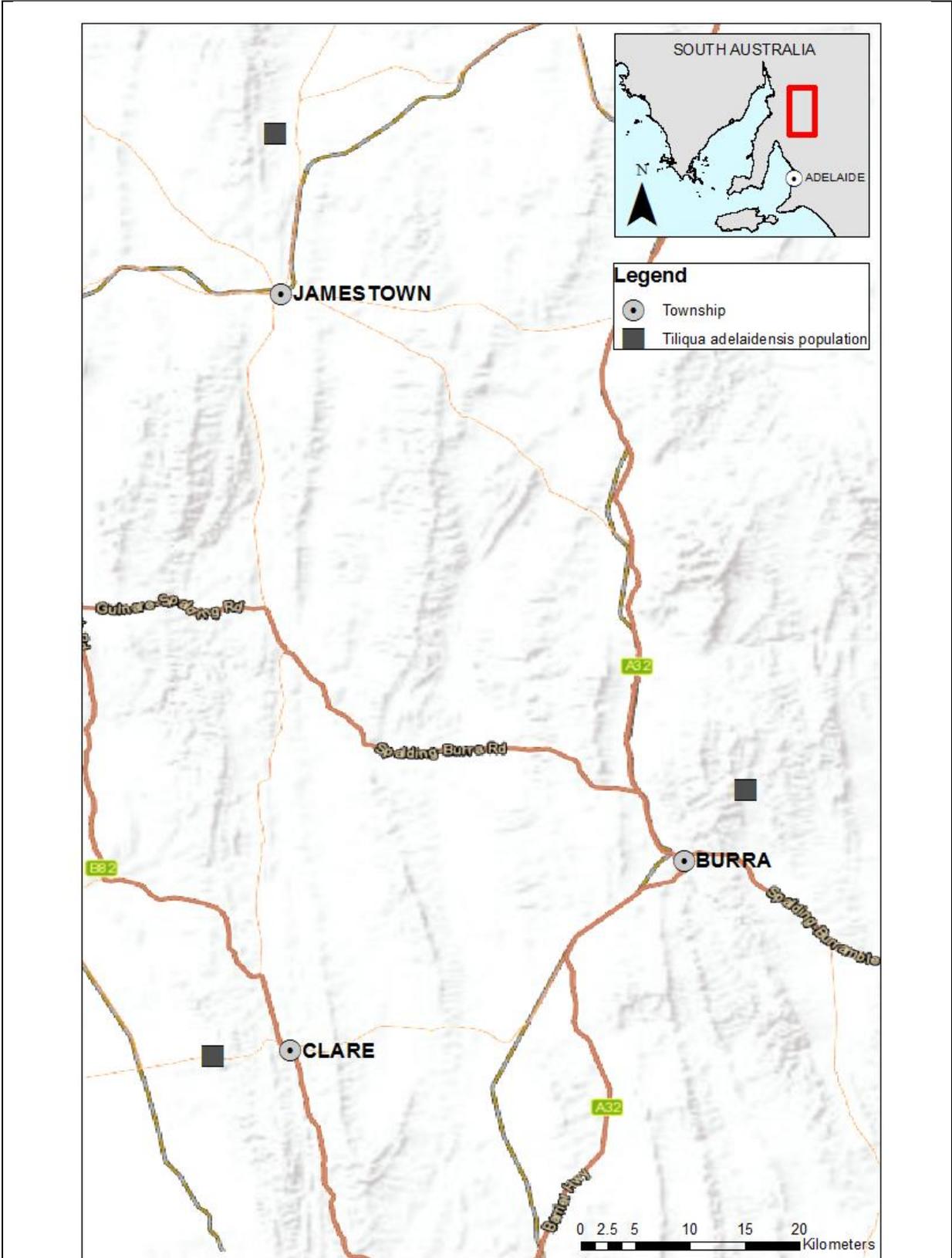


Figure 2. Approximate locations of known *Ophiomegistus michaeli* populations, reflecting that of their lizard host *Tiliqua adelaidensis* in the Mid-North region of South Australia, part of the Flinders Lofty Block IBRA region. (From Derne *et al.* (2019).

Biology

[Summarise what is known about the life history, seasonality and life cycle]

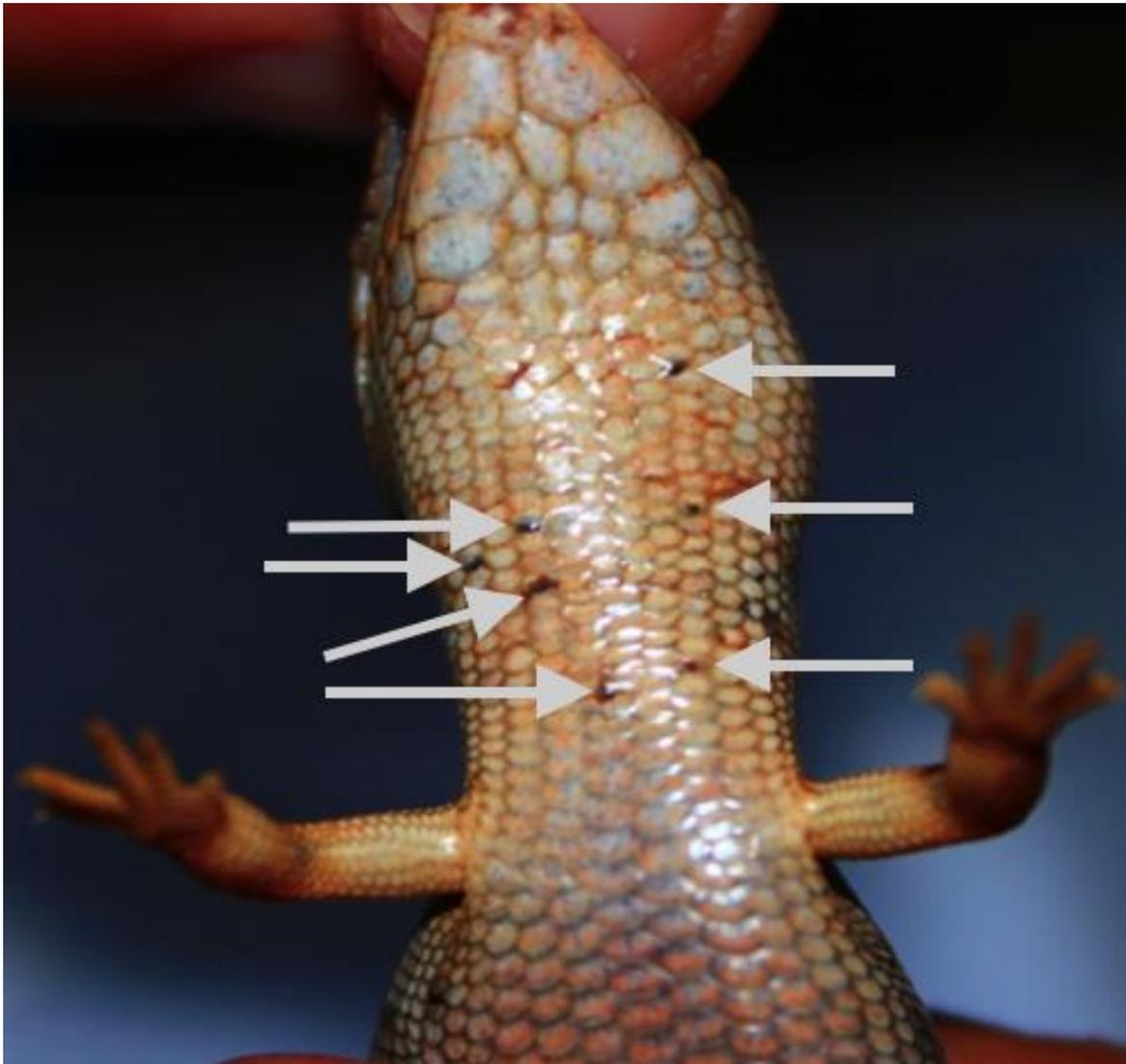


Figure 3. *Ophiomegistus michaeli* adult mites attached to ventral surface of its host, *Tiliqua adelaidensis* (Derne *et al.* (2019).

Adult mites in the genus *Ophiomegistus* have been observed attached to snake or skink hosts, in the case of *O. michaeli*, that of the pygmy bluetongue lizard (*Tiliqua adelaidensis*), a medium sized skink. The mite lodges itself under the scales of its host and pierces the skin with specialised chelicerae, presumably to obtain a blood meal (Derne *et al.* 2019) (Fig. 3). Free living *O. michaeli* have not been observed and nothing is currently known about the immature stages of this species, or indeed any other species in the genus (Klompfen & Austin 2007). We believe that the immature stages (eggs, larvae and nymph) may occur in the disused spider burrows occupied by its host. They are probably not parasitic and may feed on other small invertebrates, but that is a subject for future research. Adult mites have been observed on lizards all months between October and February, coinciding with when the host species is active and studied. No discernible seasonal patterns in the prevalence of the mite on its host species has been observed (Derne *et al.* 2019).

Ecology

[List any ecological interactions (e.g. food plants, hosts, predators)]

Adult *O. michaeli* mites attach to their skink host, *Tiliqua adelaidensis*. They have not been observed on other reptile hosts, nor free-living in the environment. They are presumed to be host specific.

Critical habitat

[Summarise breeding habitat or ecological community]

Ophiomegistus michaeli is a host specific parasite of *Tiliqua adelaidensis*, therefore host populations are essential for its survival. *Tiliqua adelaidensis* requires natural temperate grassland habitats where appropriate vertical spider burrows are present for use as refugia from thermal extremes and predators (Hutchinson *et al.* 1994, Milne *et al.* 2003, Fellows *et al.* 2009). These burrows are dug by a number of species of spider belonging to two families: Lycosidae, such as *Lycosa stirlingi* and *L. gilberti*; and Mygalomorphidae, namely *Blakistonia aurea* (Hutchinson *et al.* 1994, Fellows *et al.* 2009). Appropriate soil composition and depth are important constraints for *T. adelaidensis*-suitable spider burrows; these require unploughed native grasslands on lower footslopes and hill flanks (Souter *et al.* 2007). Native grasses which are typically found in *T. adelaidensis* habitat include brushwire grass (*Aristida behriana*), and wallaby grasses (*Austrodanthonia carphoides* and *Austrodanthonia eriantha*) (Delean *et al.* 2013), although non- native species such as wild oats (*Avena barbata*), spear grass (*Austrostipa* sp.) and Salvation Jane (*Echium plantagineum*) have also been commonly observed.

Tiliqua adelaidensis feeds on arthropods such as locusts, spiders, beetles, ants, cockroaches and also a small amount of plant matter (Fenner *et al.* 2007). Natural predators of *T. adelaidensis* include raptors, and snakes such as the Eastern Brown Snake (*Pseudonaja textilis*) (Fenner *et al.* 2008).

Key threatening processes

[If known, list evidence of decline; past, current and potential future threats and their impact]

Evidence of decline: *Tiliqua adelaidensis* is the only known host for *O. michaeli* and is listed as Endangered by the IUCN (Fenner *et al.* 2018). The following threats have been identified for this lizard host:

Past threats: Native temperate grasslands which the lizard host exclusively inhabits have undergone extensive clearing and fragmentation in South Australia (Duffy *et al.* 2012). Clearing and ploughing of grassland habitats in the Adelaide plain and the mid-north region for agriculture and urban development has resulted in the direct destruction of *T. adelaidensis*, and also the destruction of the spider burrows needed for its persistence (Hutchinson *et al.* 1994). In the case of grassland fragments that have not been ploughed or cleared, inappropriate livestock grazing regimes have furthermore been identified as a threat to the lizard's persistence.

Current threats: Current and future threats to *T. adelaidensis* and *O. michaeli* populations continue to be any form of landuse change that disrupts the grassland habitat and precludes

lizards and burrowing spiders. Recently, the development of windfarms and telecommunication infrastructure and associated roads have been an important threat to *T. adelaidensis* habitat. More generally, small, isolated populations created by habitat fragmentation are furthermore vulnerable to decline due to stochastic events such as climatic and disease events (May 1973).

Potential future threats: Modelling suggests that future climate change will cause decline in population abundances of *T. adelaidensis*, and that extinction of the species is likely in the long term unless managed translocations are undertaken (Fordham *et al.* 2012).

Community engagement and conservation management

[Identify relevant stakeholders; and any management plans or recovery teams overseeing threat abatement/mitigation actions, either underway or proposed]

Community engagement: Community engagement has been encouraged and facilitated by the recovery team of the host species *Tiliqua adelaidensis* (Duffy *et al.* 2012). Initiatives include the formation of the Pygmy Bluetongue Community Conservation Committee, the Nature Foundation of South Australia's annual lizard crawl event, and the publication of a children's book on the lizard, with associated school visits. Captive breeding programs of *T. adelaidensis* have also been undertaken by Zoos South Australia. Residents in the township of Burra and surrounding towns are generally well aware of *T. adelaidensis* and its local endemism. *Ophiomegistus michaeli* itself featured as a local example of parasitism at the South Australian Museum's 'Parasites: Life Undercover' exhibition (2018-2019).

Conservation management and actions: *Tiliqua adelaidensis* was listed as Endangered on the IUCN Red List in 1996 (IUCN 1996, Fenner *et al.* 2018). *Tiliqua adelaidensis* has been the subject of a recovery actions since 1992. The South Australian Government's Recovery Plan for the lizard, with associated recovery team, was implemented in 2012 (Duffy *et al.* 2012). The plan's overarching objectives are to research the distribution, habitat, ecology (including parasites) and management requirements of *T. adelaidensis*, as well as to raise awareness and provide evidence-based guidelines for land management.

Conservation status

[If known or evaluated, give the current listing and relevant conservation schedule or Act]

International (IUCN Red List): Not listed. Only known host, *Tiliqua adelaidensis* is listed as Endangered (Fenner *et al.* 2018).

National (EPBC): Not listed. Only known host, *Tiliqua adelaidensis* is Endangered (Duffy, Pound, & How, 2012).

State: Not listed. Only known host, *Tiliqua adelaidensis* is listed as Endangered under the Government of South Australia *National Parks and Wildlife Act 1972* (Duffy *et al.* 2012).

Proposed conservation status evaluation

[If recommendations are to be made for threatened status and listing provide justification based on IUCN Red List Criteria. For example, Criterion 2: geographic range is precarious for either extent of occurrence (EOO) and/or area of occupancy (AOO)]

We propose that *Ophiomegistus michaeli* be accorded the same conservation status as its only known host species, *Tiliqua adelaidensis*. Since parasite prevalence will rarely be 100% in a wild host population, *O. michaeli* is likely to be less common and less widely distributed than the host species.

EOO: Unknown for *O. michaeli*, though Atlas of living Australia contemporary records for the host *T. adelaidensis* are restricted to a small endemic range, approximately bound by the South Australian townships of Peterborough (North), Kapunda (South), Eudunda (East) and Bute (West). Within this range estimated extent of occupancy of some 7000 km², host populations occur on isolated fragments of native grassland (Delean *et al.* 2013) which are subject to a number of threatening processes, as described in previous sections.

AOO: Unknown, although estimated area of occupancy for *T. adelaidensis* is less than 500 km², on habitat that is severely fragmented and is subject to observed and projected continuing decline in extent and or quality (Duffy *et al.* 2012).

Scientific and/or social value

[e.g. relictual, phylogenetically distinct, keystone species, aesthetic, mediagenic, cultural, entomophagy, biophilia, economic, ecotourism]

Parasitic species are widely perceived as purely harmful to their hosts, and those not of medical significance are generally understudied. However, parasites are increasingly being recognised as key components of ecosystems in terms of biodiversity, biomass and agents of population regulation (Lafferty *et al.* 2006, Kuris *et al.* 2008, Dunn *et al.* 2009). As such, parasitic species depending on vulnerable host species are increasingly considered as vulnerable species in need of conservation themselves. Co-extinctions such as those occurring by host-parasite relationships have been identified as a major driver of biodiversity loss (Strona 2015). *Ophiomegistus michaeli*, as a host-specific parasite of an endangered species such as *Tiliqua adelaidensis* therefore appear to be likely candidates for co-extinction. The only recent discovery and description of *O. michaeli* supports the notion that our documentation and understanding of parasite diversity is nascent, and is threatened by the widespread decline of host species and their ecosystems. We advocate that efforts be made to conserve and study such parasites and the intimate relationship they have with their host.

References

[Cite all relevant information]

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