

## SIBLING SPECIES OF PHYTOSEIIDAE (ACARINA: MESOSTIGMATA)<sup>1, 2</sup>

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### ABSTRACT

A sibling species of *Athiasia arenicola* (Muma) is described and the following groups of sibling species are diagnosed and distinguished: *Proprioseius meridionalis* Chant and *P. anthurus* Denmark and Muma; *Proprioseiopsis rotundus* (Muma) and *P. cannaensis* (Muma); *Proprioseiopsis mexicanus* (Garman) and *P. lepidus* (Chant), and *P. temperellus* (Denmark and Muma); *Proprioseiopsis dorsatus* (Muma) and *P. solens* (DeLeon); *Chelaseius floridanus* (Muma) and *C. vicinus* (Muma); *Typhlodromips dentilis* (DeLeon) and *T. arenillus* (Denmark and Muma); *Neoseiulus paspalivorus* (DeLeon) and *N. mumai* (Denmark); *Phytoseius macropilis* (Banks), *P. betulae* Denmark, and *P. chanti* Denmark; *Galendromus longipilus* (Nesbitt) and *G. occidentalis* (Nesbitt); and *Athiasia arenicola* (Muma) and *A. imbricata* new species Muma and Denmark.

Sibling species are defined by Mayr et al. (1953) as "pairs or groups of closely related species which are reproductively isolated but morphologically identical or nearly so." Ideally, and according to this definition, sibling species should not be recognized until observation and experimentation have proved reproductive isolation. However, such proof is often quite difficult if not impossible to obtain.

Reproductive isolation is frequently inferred, though not always correctly so, when morphologically closely related species have distributions that exhibit allopatry. The same inference can, and has been drawn, when the nearly identical morphological species are ecologically isolated or the sexually mature stages are seasonally isolated. In these cases, the isolated forms can be brought together with some effort and experimentally demonstrated to be or not to be reproductively isolated.

An altogether different problem is posed by forms that are nearly morphologically identical but whose distributions exhibit sympatry. In this case, the species must be separated morphologically. This frequently can be accomplished by careful counts and measurements of a series of structures on specimens of the populations in question and the application of simple statistical procedures. These separations, particularly in the case of mites, cannot be experimentally proved to be or not to be reproductively isolated since males and females of the different separations cannot be exposed to each other with certainty.

Despite this difficulty in recognizing sibling species of mites, a number have been described and are recognized among the Phytoseiidae. They are identical in dorsal and ventral setation, leg chaetotaxy, and spermathecal

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and spermatodactyl form. Such sibling species can be separated only by a systematic, numerical comparison of setal form and lengths, scutal size and form, and length to width ratios of spermathecae, spermatodactyls, peritremes, etc. These do not however, include such readily distinguishable species as *Typhlodromus pyri* Scheuten and *Amblydromella rhenana* (Oudemans), which Chant (1959, 1965) stated were closely related, or *T. pyri* and *T. corticis* Herbert that differ by size, setal number, pore number, and habits as stated by Herbert (1958).

Several previously described sibling phytoseiid species with which we are familiar are diagnosed and distinguished in the following paragraphs. A sibling of *Athiasia arenicola* (Muma) is described.

*Proprioseius meridionalis* Chant, *P. anthurus* Denmark and Muma: These 2 species may be diagnosed together below the generic level as having  $L_4$ ,  $L_6$ , and  $L_8$  serrate and clavate, and  $S_2$  serrate. They may be distinguished by the much shorter  $L_4$ ,  $L_6$ , and  $L_8$  on *P. anthurus*; the smooth or faintly serrate  $L_3$  on *P. meridionalis*; and the comparatively shorter caudal setae on *P. anthurus*. They are presently indistinguishable in all other known morphological characters.

*Proprioseiopsis rotundus* (Muma), *P. cannaensis* (Muma): These 2 species may be diagnosed together below the generic level as having sacular spermathecal cervices, an elongate lateral process on the spermatodactyls, elliptical preanal ventrianal pores between the posterior preanal setae, and  $L_3$  longer than the dorsal setae. They may be distinguished by a cervix 5 times longer than wide on *P. rotundus* and only 2 to 3 times longer than wide on *P. cannaensis*; the spermatodactyl lateral process is  $1/3$  the length of the foot on *P. rotundus* and  $2/5$  the length of the foot on *P. cannaensis*; and  $L_2$  and  $L_3$  are shorter on *P. rotundus* than they are on *P. cannaensis*. *Proprioseiopsis ovatus* (Garman) is either another sibling or a senior synonym of *P. rotundus* or *P. cannaensis*. It is also possible that *Proprioseiopsis lindquisti* (Schuster and Pritchard), *P. fragariae* (Kennett), and *P. exopodalis* (Kennett) are siblings of this group but we are not familiar with them.

*Proprioseiopsis mexicanus* (Garman), *P. lepidus* (Chant), *P. temperellus* (Denmark and Muma): These 3 species are siblings that can be diagnosed as a group below the generic level as having poculiform spermathecal cervices with short nodular atria, elliptical ventrianal preanal pores that lie between the posterior preanal setae,  $M_3$  shorter than  $L_8$ , and  $L_2$  distinctly longer than  $L_3$ . Distinguishing characters for *P. lepidus* are an imbricate and creased dorsal scutum;  $L_2$  only  $1/3$  longer than  $L_3$ ; and  $L_4$ ,  $M_3$ , and  $L_8$  shorter than on the other species. For *P. temperellus*, the dorsal scutum is smooth;  $L_2$  is twice the length of  $L_3$ ;  $L_4$ ,  $M_3$ , and  $L_8$  are shorter than on *P. mexicanus*; and the preanal ventrianal pores are closer to the posterior preanal setae than to each other. For *P. mexicanus*, the dorsal scutum is smooth;  $L_2$  is twice the length of  $L_3$ ;  $L_4$ ,  $M_3$ , and  $L_8$  (particularly  $L_8$ ) are much longer than on the other species; and the preanal ventrianal pores are closer to each other than to the posterior preanal setae. We know of no other siblings of this group.

*Proprioseiopsis dorsatus* (Muma), *P. solens* (DeLeon): These 2 species may be diagnosed together below the generic level as having a macroseta and an erect seta on leg I;  $L_2$  and  $L_3$  small and subequal in size;  $M_3$  distinctly shorter than  $L_8$ ; and the spermatheca with fundibular cervix and

elongate atrium. They may be distinguished by *P. solens* having  $L_2$  and  $L_3$  more robust and longer than on *P. dorsatus*; the preanal, ventrianal pores located behind rather than between the posterior preanal setae; and the atrium of the spermatheca nearly as long as the cervix rather than only half as long. *Proprioseiopsis elongatus* (Garman) is either a senior synonym of one of these species or another sibling of the group.

*Chelaseius floridanus* (Muma), *C. vicinus* (Muma): These 2 species may be diagnosed together below the generic level as having 2 to 4 denticules on the fixed cheliceral finger,  $L_1$  distinctly shorter than  $L_4$ , the spermathecal atrium indistinct and obscure, and the spermatodactyl toe bent at a right angle to the foot. They may be distinguished by the smaller size, shorter setae, lack of distinct leg I macrosetae, more slender spermathecal cervix, and larger spermatodactyl toe on *C. vicinus*. *C. austrellus* (Athias-Henriot) may be another sibling but we are not familiar with it.

*Typhlodromips dentilis* (DeLeon), *T. arenillus* (Denmark and Muma): These 2 species may be diagnosed together below the generic level as having the dorsal scutum rugose anteriorly and reticulate posteriorly, leg IV macrosetae knobbed, spermatheca with a tubular cervix and indistinct atrium, and spermatodactyl with large distinct lateral process and distinct nodular toe. They may be distinguished by the shorter, less distinct macrosetae on *T. arenillus*, the longer, more slender spermathecal cervix on *T. dentilis*, and the broad bilobed spermatodactyl lateral process on *T. arenillus*. They are virtually indistinguishable in other known characters. We know of no other siblings.

*Neoseiulus paspalivorus* (DeLeon), *N. mumai* (Denmark): These 2 species may be diagnosed together below the generic level as having an elongate dorsal scutum with elongate imbrication between the dorsal setae, the ventral scuta distinctly imbricate and creased, a distinct macroseta on the basitarsus of leg IV, and a tiny poculiform spermathecal cervix. They may be distinguished by the longer  $L_3$ , longer leg IV macroseta, and broad spermatodactyl toe on *N. mumai*. Otherwise, the 2 species seem to be morphologically the same. There are no other known siblings.

*Phytoseius macropilis* (Banks), *P. betulae* Denmark, *P. chanti* Denmark: These 3 species may be diagnosed as a group below the generic level as having  $L_5$  and  $L_3$  as long as or longer than  $L_7$  and  $L_8$  with all 4 setae being thick and strongly serrate or dentate, the macrosetae on leg IV broadly knobbed with that on the genu distinctly longest, and the spermathecal cervix saccular. They may be distinguished by the tiny setiform clunals and much larger leg IV basitarsal macroseta on *P. chanti*; the strong subequal serrate clunals and verticals, and small equal-sized leg IV basitarsal and genual macrosetae on *P. betulae*; and the serrate but unequal-sized clunals and verticals, and the small but unequal-sized leg IV basitarsal and genual macrosetae on *P. macropilis*. We know of no other species of this sibling group.

*Galendromus longipilus* (Nesbitt), *G. occidentalis* (Nesbitt): These 2 species may be diagnosed together below the generic level as having  $M_1$  as long as or longer than  $D_2$ , the peritreme not extending forward beyond  $L_4$ , the ventrianal scutum elongate with the ventrianal pores punctate, and the spermathecal cervix slender and saccular. They may be distinguished by the overlapping dorsal setae on *G. longipilus*, the peritremes extending forward only to  $L_5$  on *G. occidentalis*, and the slightly larger size of *G. occi-*

*dentalis*. Although these species are closely related to, and in the same subgenus as *Galendromus floridanus* (Muma), *G. gratus* (Chant), *G. annectens* (DeLeon), and *G. ferrugineus* (DeLeon), they represent a distinguishable sibling group below the subgeneric level. We know of no other species of this sibling group.

*Athiasia arenicola* (Muma), *A. imbricata* new species: These 2 species may be diagnosed together below the generic level as having slender setiform dorsal scutal setae, the ventrianal scutum slightly narrower than the genital scutum, and a very narrow ectal strip of the peritremal scutum that extends posteriorly around leg IV exopodal scutum. The species are distinguished in the following diagnosis.

*Athiasia imbricata* new species

Fig. 1 to 4

DIAGNOSIS: This species may be distinguished from the closely allied *A. arenicola* by its larger average dorsal scutal size, 405  $\mu$  long as opposed to 325  $\mu$ ; by its laterally and posteriorly imbricate dorsal scutum, that on *A. arenicola* is smooth; and by having the vertical setae 2/3 rather than 1/2 the length of  $L_1$ . Measurements of the holotype and 2 paratypes produced a mean dorsal scutal length of 405  $\mu$  and a mean width of 320  $\mu$ .

FEMALE HOLOTYPE: Dorsal scutum 410  $\mu$  long and 350  $\mu$  wide, and distinctly imbricate laterally and posteriorly. All setae on the dorsal scutum are setiform, slender, and smooth with proportionate lengths as shown in Fig. 1. The sublateral setae are the same size as the dorsal setae and are visible from above. Ventral scuta and setation as shown in Fig. 2; sternal scutum much wider than long and reticulate; metasternal scuta broadly triangular; genital scutum massive and smooth; ventrianal scutum shield-shaped, nearly as wide as genital scutum, and reticulate; primary metapodal scuta elongate; caudal setae about 3 times the length of ventrolateral setae. Posterior end of peritreme and associated scuta as shown in Fig. 3. Spermatheca with fundibuliform cervix and distinct elongate atrium as shown in Fig. 4.

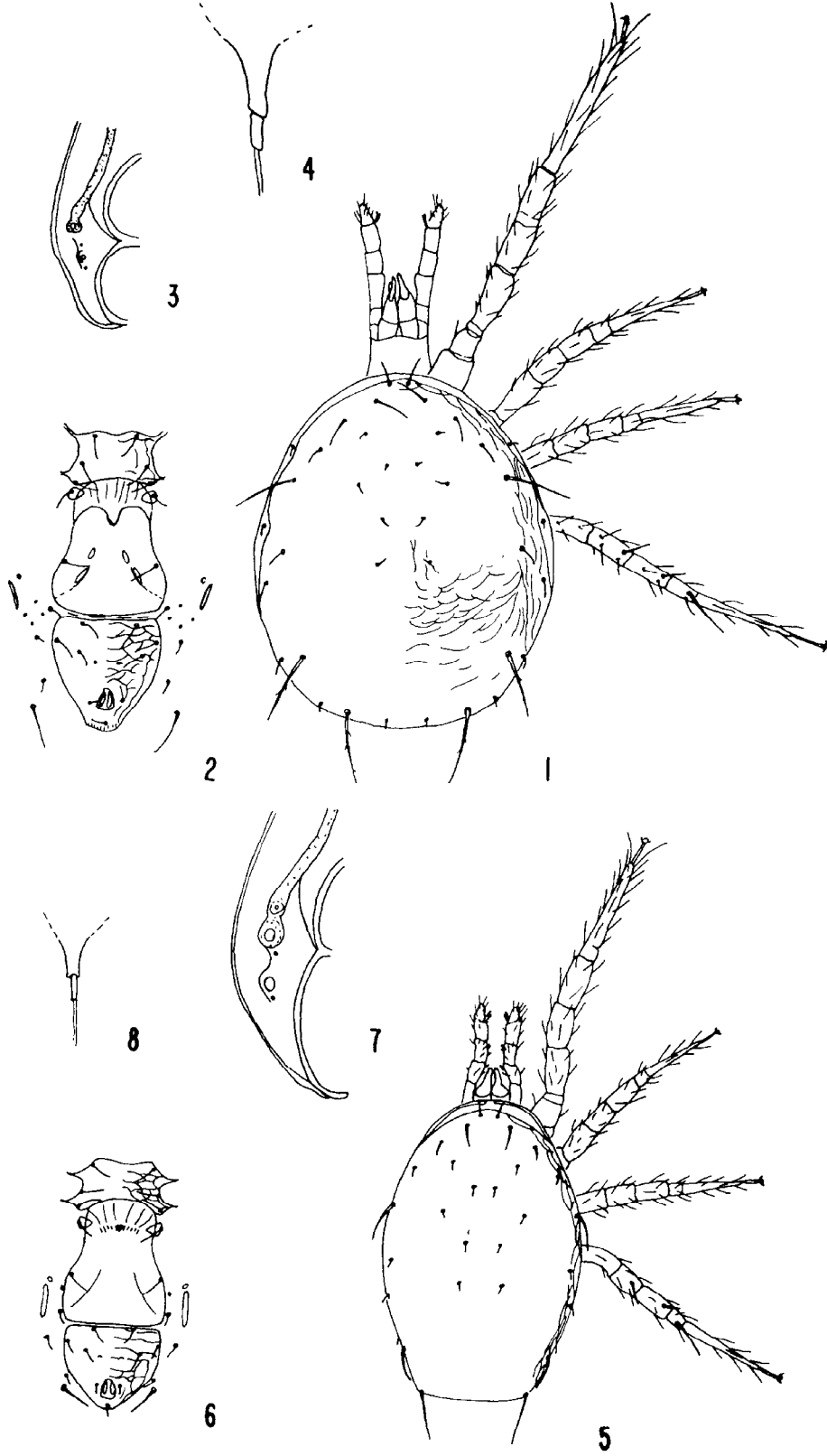
MALES: Unknown.

TYPE LOCALITY: Female holotype and female paratype from moist sand pine litter at St. Cloud, Florida on 21 September 1965 by M. H. Muma and H. L. Greene. There is also a female paratype with the same ecology, collectors, and date from Vineland, Florida.

DISCUSSION: This cryptic species was identified when routine measurements were being made to determine the size limits of *A. arenicola*. Fig. 5 to 8 of *A. arenicola* permit comparison of the 2 species. On *A. arenicola*  $S_1$  and  $S_2$  are not usually visible from above.

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Fig. 1 to 4. *Athiasia imbricata* new species. 1. Dorsal structure and setation. 2. Ventral scuta and setation. 3. Posterior peritremal and stigmatal development. 4. Spermatheca. Fig. 5 to 8. *Athiasia arenicola* (Muma). 5. Dorsal structure and setation. 6. Ventral scuta and setation. 7. Posterior peritremal and stigmatal development. 8. Spermatheca.



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