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ABSTRACT.

A taxonomic investigation of the interstitial mites collected from Nobska Beach, Woods Hole, Massachusetts, revealed that representatives of the suborders Mesostigmata, Trombidiformes, and Sarcoptiformes are present. Members of the family Rhodacaridae (Mesostigmata) were the most common in all samples, the Halacaridae (Trombidiformes) somewhat less. Acaridae and Oribatei (Sarcoptiformes) were very rare. Detailed study of the family Rhodacaridae revealed the presence of 5 genera of which 4 have been previously described, but are reported for the first time from this area. The new genus and species *Psammonsella nobskae*, is characterized by the presence of 5 pairs of long simple but unequal setae arranged in a crescentic pattern at both sides of the anterior margin of the noetocephale, and by fusion of the ventri-anal plates with the petritremal plates, in both sexes.

INTRODUCTION.

Although much is known about the taxonomy of soil and marine mites, the study of the interstitial mites has received very little attention, except for the work of Halbert (1920), Willmann (1935), Newell (1947), Evans & Browning (1953), and Delamare-Deboutteville (1960), who studied the interstitial marine fauna in limited regions.

1. This paper is contribution 1583 of the Woods Hole Oceanographic Institution. The author wishes to express her gratitude to the authorities of this institution for granting her a fellowship and extending to her the facilities to work. She is especially indebted to Drs. Robert R. Hessler and Howard L. Sanders for their valuable suggestions and help during the preparation of the manuscript.

Study of the literature reveals that the only work so far done on the interstitial mites from the East Coast of the United States is that of Newell (1947) who mainly devoted himself to subtidal mites. His description of the intertidal mites is restricted chiefly to the family Halacaridae. The present study is the first taxonomic investigation of the interstitial mites collected from Nobska Beach, Woods Hole, Massachusetts, where detail study of the family Rhodacaridae led to establishment of a new genus and revealed the presence of species not previously reported from this area.

**Methods.**

Nobska Beach is a quartz sand beach, situated southeast of Woods Hole. Samples were collected from the mid region of the intertidal zone. After removing the top two inches of sand, samples were taken to a depth of twelve inches. The sand was collected in a pail and swirled with sea water to put the interstitial organisms into suspension. The water was then filtered through a fine sieve of 0.074 millimeter mesh. The residue from the sieve was examined in fresh condition, and animals were collected, sorted out, and preserved in 70% alcohol. Permanent mounts of the material collected were made in Hoyer's medium, which proved to be satisfactory.

**Mite fauna of Nobska Beach.**

The material examined from the interstitial marine sand of Nobska Beach chiefly is represented by three main groups of the order Acarina: suborder Mesostigmata, suborder Trombidiformes and suborder Sarcoptiformes. The record of mites is given in Table I. Among the three suborders, Mesostigmata were the most common in all the samples. From the suborder Trombidiformes, *Halacarus anomalus* was very common, and the members of the Sarcoptiformes were very rare.

Suborder Mesostigmata: — This suborder is represented by two families: Rhodacaridae and Uropodidae. The Rhodacaridae is represented at Nobska Beach by five genera including the new genus to be described below.

*Rhodacarus pallidus* Hull, 1918. This species was first recorded by Hull (1918) from a rocky shore at Malhide, Ireland, then by Halbert (1920) from the same area. Later on, Willmann (1935) redescribed this species from the salty coastal ground water of Kiel Bay. *Rhodacarus pallidus* from Nobska Beach is exactly the same in structure and in dimension as from Kiel Bay, but is smaller than the female from Ireland.

*Rhodacaropsis inexpectatus* Willmann, 1935. This species was recorded from salty coastal ground water of Kiel Bay, by Willmann (1935). Specimens from Nobska Beach conform to the original description in all structural features, except for a slight change in the shape of the sterni-genital plate of the male and the sternal plate of the female. In the American specimens, the posterior margin of these
plates is blunt, not pointed as in the European species as described by Willmann. The female measures 0.530 mm in length and 0.200 mm in breadth, the male 0.390 mm in length and 0.175 mm in breadth, which also agrees very well with the Kiel Bay specimens.

Saprolaelaps subtilis Leitner, 1946. This species was rare in the samples from Nobska Beach and was represented mostly by developing stages. Leitner found this species in a compost pile of decaying vegetation, as opposed to the interstitial marine sand environment of the present report. The median groove in the anterior margin of the posterior dorsal shield of the female is nearly the same as that described by Leitner, and the other structures are exactly the same.

Cyrtolaelaps (Gamaselliphis) sp. Gamaselliphis, was described as a new subgenus of Cyrtolaelaps sens. lat. by Ryke from South Africa. An undescribed species of Gamaselliphis was represented in samples from Nobska Beach by two males.

The fifth representative of the family Rhodacaridae is the new genus and species Psammonsella nobskae, which will be described in detail later in this paper.

The family Uropodidae was represented by one species. No specific identification was possible due to lack of material.

Suborder Trombidiformes: — This suborder is represented at Nobska Beach by a single family, Halacaridae, which is exclusively marine. The most common species found at Nobska Beach is Halacarus anomalus Trouessart, 1894. It is an arenicolous form found commonly both in Europe and the East coast of North America (see Newell, 1947). Other members of this family more rarely found in the interstitial marine sand of Nobska Beach were Halacarus sp., Copidognathus sp., and Rhombognathides sp. Their presence in small numbers in the intertidal region may be due to the fact that they are mainly subtidal forms.

Another species of the family Halacaridae, being reported here is Isobactrus setosus (Lohmann) 1889, which was found on rocks, submerged in water at low tide level at one end of Nobska Beach. The male of this species is very rare. In a total of 34 adult specimens collected along with 11 developing stages, no male was found. Newell (1947) also did not find any male in his collection from the East coast of North America. The only record of the presence of a single male is by André (1939). It is probable that this species may reproduce parthenogenetically in this region, as was postulated by Newell.

Suborder Sarcoptiformes: — This suborder was rarely found in my samples, and no identification was made because of the paucity of material. The supercohort Acaridiae was represented by two adults belonging to two different genera. Members of the supercohort Oribatei belonged to a single species.

Psammonsella nobskae n. sp.

(With 12 text figures).

Types: — U.S. National Museum... Holotype female; and allotype male, 3-1-2-7. Holotype female and allotype male are deposited in the Division of
Myriopoda and Arachnida of the United States National Museum. One additional female and one male (catalogue No 545) are deposited in the Gray Museum of the Marine Biological Laboratory, Woods Hole. Paratypes are in author's collection.

Female: — Body length 0.350 mm, breadth 0.150 mm, leg I length 0.330 mm.

Dorsal shield (Fig. 1) divided into two separate shields — anterior dorsal shield (notocephale) and posterior dorsal shield (notogaster), measuring 0.200 mm long, 0.190 mm wide, 0.150 mm long, 0.140 mm wide, respectively. Notocephale well sclerotized, but covered with round and oval patches of weak sclerotization; 23 pairs of setae; two types if setae distinguishable — small spine-like, and long simple setae; the latter situated near anterior margin on both sides of notocephale, arranged in crescentic pattern. Well sclerotized posterior dorsal shield reticulated into definite pattern of interconnecting punctate lines (Fig. 1a); margin of weak cutical provided with both large and small marginal spines; entiere shield covered by 20 pairs of setae. Notocephale and notogaster connected by membraneous cuticle forming transverse groove opposite coxae IV.

**Table I.**

<table>
<thead>
<tr>
<th>List of mites, collected from Nobska Beach.</th>
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</thead>
<tbody>
<tr>
<td>Specimen recorded</td>
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<tr>
<td>Suborder Mesostigmata</td>
</tr>
<tr>
<td>Family Rhodacaridae</td>
</tr>
<tr>
<td><em>Rhodacarus pallidus</em></td>
</tr>
<tr>
<td><em>Rhodacaropsis inexpectatus</em></td>
</tr>
<tr>
<td><em>Saprolobolops subtilis</em></td>
</tr>
<tr>
<td><em>Cyrtolaelaps (Gamaselligesis)</em> sp.</td>
</tr>
<tr>
<td><em>Psammonsella nobskae</em> gen. n., sp. n.</td>
</tr>
<tr>
<td>Family Uropodidae (1 sp.)</td>
</tr>
<tr>
<td>Suborder Trombidiformes</td>
</tr>
<tr>
<td>Family Halacaridae</td>
</tr>
<tr>
<td><em>Halacarus anomalus</em></td>
</tr>
<tr>
<td><em>Halacarus</em> sp.</td>
</tr>
<tr>
<td><em>Copidognathius</em> sp.</td>
</tr>
<tr>
<td><em>Rhombognathides</em> sp.</td>
</tr>
<tr>
<td><em>Isobractrus</em> setosus</td>
</tr>
<tr>
<td>Suborder Sarcoptiformes</td>
</tr>
<tr>
<td>Supercohort Acaridiae (2 spp.)</td>
</tr>
<tr>
<td>Supercohort Oribatei (1 sp.)</td>
</tr>
</tbody>
</table>
Tritosternum (Fig. 2) consists of basal portion which is longer than broad and distal pair of long smooth lacinae. Three pairs of prae-endopodal plates behind tritosternum; middle plate larger and broader than other two; anterior plate small, more or less triangular in shape; posterior plate very narrow, as large as middle one (Fig. 2). Sternal plate broader than long, the endopodal plates being fused with it, ornamented with fine spots and provided with 3 pairs of sternal setae.

Figs. 1-5. — Psammonsella nobskae, n. gen. & n. sp. female. Figs. 1, 1a, 2, 2a from Holotype; Figs. 3-5 from Paratype. — Fig. 1, Dorsum, Fig. 1a, ornamentation of notogaster; Fig. 2, venter; Fig. 2a, ornamentation of ventri-anal plate; Fig. 3, chelicera; Fig. 4, tectum; Fig. 5, hypostome.
Behind sternal plate lies pair of reduced metasternal plates, bearing single pair of setae. Genital or epigynial plate more or less bell-shaped, also covered by small spots and provided with pair of genital setae which are situated inside posterior border of genital plate. Between posterior inner border of coxae IV and genital plate lies pair of organs, each of which carries rounded head and long tail. Behind coxae IV is pair of horn-like structures which forms anterior border of ventri-anal plate. Ventri-anal plate combined with peritremal plates, covered with articulate pattern of punctate lines (Fig. 2 a); 17 setae including 2 para-anal and 1 post-anal spine-like setae. Exopodal plates II and III free, situated in region between coxae II and III; and III and IV. Pair of stigmata is just behind exopodal III; long peritremes reach forward to behind coxae I, entering into anterior dorsal shield and passing along anterior margin of notocephale.

Female chelicerae well chitinized and conspicuous. Fixed digit-multidentate, bearing dorsal seta at exterior border and cluster of setae at ventral margin; gland-like structure with two ducts which open into fixed digit; movable digit tridentate (Fig. 3). Tectum consists of smooth distal end and finely toothed base (Fig. 4). Hypostome (Fig. 5) consists of bifid, bushy epipharynx and well developed hypopharynx, accompanied by corniculi which arise anterolaterally; salivary stylus is present on each side of corniculi. Pedipalps (Fig. 6) as in other mesostigmatic mites with five segments attached ventrolaterally to capitulum; trochanter provided with 2 simple setae; femur bearing 4 setae — 2 dorsal and 1 ventral simple setae, and 1 dorsal spine-like setae; genu provided with 5 setae — 3 simple setae situated dorsally and 2 setae on lateral side; one of the lateral seta has three branches (Fig. 6 a); specialized seta of palptarsus three pronged (Fig. 6 b), as in all members of Rhodacaridae).

Male: — Body length 0.300 mm, breadth 0.150 mm, leg I 0.330 mm.

Dorsal shield as in female divided into two — anterior dorsal shield (notocephale) measuring 0.160 mm long, and 0.190 mm broad, and dorsal shield (notogaster) is 0.140 mm long and 0.140 mm broad. Number and arrangement of setae on both plates similar to female, as is also true for reticulate surface pattern. Tritosternum, and praec-andopodal plates as in female (Fig. 7). Sterngigital plate elongated, reaching back to coxae IV, broadest anteriorly; at anterior border is situated male genital aperture, as characteristic for the family; 5 pairs of setae, endopodal plates fused with it. Free second and third exopodal plates, situation of stigmata and peritreme, and fusion of peritremal plates with ventri-anal plate as in female. Number and arrangement of ventri-anal setae similar to female pattern; reticulation pattern of ventri-anal plate slightly different (Fig. 7 a).

Chelicerae slightly smaller in male (Fig. 8); fixed digit finely dentate, provided with ventral seta; movable digit unidentate, carrying narrow spermatophoral process which is as long as digit itself; distal end of this process free; no glandular structure in male chelicerae. Tectum and hypostome similar to female, except that anterior projection of former more pointed (Fig. 9).
Each leg of both sexes provided with ambulacral apparatus i.e. with claws and pulvilli. Leg I of male and female which is longest of all legs, has differently shaped tarsus I (Fig. 10); meta-tarsus absent. Leg II of female provided with prominent projection, or epiphysis, at anterior margin of trochanter (Fig. 11). Leg II of male armed; (Fig. 12), femur provided with stout spur; genu with thumb-like projection; tibia with stout spine.

Figs. 6-12. — *Psammonsella nobshae*, n. gen. & n. sp.
Figs. 7, 7a from Allotype; Figs. 6, 6a, 6b, and 8-12 from Paratype. — Fig. 6, female pedipalpe; Fig. 6a, lateral seta of genu of pedipalp; Fig. 6b, specialized seta of palptarsus; Fig. 7, male venter; Fig. 7a, ornamentation of ventri-anal plate; Fig. 8, male chelicera; Fig. 9, male tectum; Fig. 10, female leg I; Fig. 11, female leg II; Fig. 12, male leg II.
Affinities: — The presence of three pronged specialized setae on the palptarsus, the divided dorsal shield, the male genital aperture at the anterior border of stern-genital plate, and the male chelicerae modified for transfer of the spermatophore during copulation, are the characters which suggest the *Psammonsella nobshae* should be included in the family Rhodacaridae. *Psammonsella* is best distinguished from other genera of this family as follows: 23 pairs of setae on the notocephale, of which 5 pairs are long, simple but unequal setae arranged in crescentic pattern on both sides of anterior region; vertical setae short and spine-like; notogaster with 20 pairs of setae; marginal setae distinguished into two types — moderately long spine-like setae, followed by small spine-like setae; three pairs of pre-endopodal plates; ventri-anal plate fused with peritremal plates in both sexes; genu of pedipalp provided with 3 branched seta; male chelicerae with short spermatophoral process; leg II of male armed.

REFERENCES


