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ORIGINAL ARTICLE

Review of the North American *Tarphiota* Casey, with a description of a new seashore-inhabiting *Atheta* species exhibiting convergent characteristics (Coleoptera: Staphylinidae: Aleocharinae)

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Abstract

A review of the North American species of the genus *Tarphiota* Casey is presented. Three species are recognized: *T. densa* (Moore), *T. fucicola* (Mäklin), and *T. geniculata* (Mäklin). They occur on the sandy beaches of the Pacific coast. A new coastal species of *Atheta,* found on the seashore and exhibiting certain convergent characteristics to *Tarphiota,* is described from the Atlantic coast: *A. novaescotiae* Klimaszewski and Majka, sp. nov. All Canadian species are provided with diagnoses, genitalic illustrations and digital photos of their habitus in dorsal and lateral view. A key is presented to distinguish the species. New data on the natural history of *A. novaescotiae* are presented and briefly discussed.

Key words: bionomics, Canada, coastal species, North America, rove beetle, taxonomy.

INTRODUCTION

During the examination of aleocharines from Nova Scotia, we discovered an interesting new seashore species. The species bears a superficial resemblance to members of the genus *Tarphiota* Casey. After character analysis it became evident that the new species belongs to *Atheta* Thomson (see discussion under *A. novaescotiae*), and that the external similarities to *Tarphiota* are the result of living in similar environments. In the present paper we describe this new *Atheta* species and review Nearctic species of the genus *Tarphiota*.

Mäklin (1852) described *Tachyusa fucicola* from Kodiak and *Homalota geniculata* from the Sitka Aleutian Islands in Alaska. Mäklin (1853) subsequently transferred *T. fucicola* to *Homalota* Mannerheim. The two species have been formally transferred to the genus *Tarphiota* Casey by Lohse and Smetana (1985), but Casey (1910) also believed that these species belonged to *Tarphiota*. Casey (1893) described the new Nearctic genus *Tarphiota* from the coast of California to accommodate *T. pallidipes* Casey, 1893, which was recently considered by Ahn (1996) as a synonym of *T. fucicola* (Mäklin). Casey (1910) later described six additional species of *Tarphiota* from the Pacific coast of America, five of which have been synonymized by Fenyes (1920) and one by Ahn (1996) with either of the two valid species *T. fucicola* (Mäklin) and *T. geniculata* (Mäklin). Ahn (1996) revised the Nearctic species and provided new information for the two valid Nearctic species. Moore (1978) described a new species, *Salinamexus densus*, from Sonora and Baja California Sur in Mexico. This species was later transferred to the genus *Tarphiota* by Ahn (1999).

MATERIALS AND METHODS

Some 110 adults of the genus *Tarphiota* and 994 specimens of the new *Atheta* species from the Nearctic region were examined. Some specimens were dissected, and the genital structures dehydrated in absolute alcohol, transferred to xylene, mounted in Canada balsam

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on celluloid microslides, and pinned with the specimens from which they originated. The body images were generated using an image processing system.

The pictures were taken through a stereo-microscope (SMZ-U; Nikon, Tokyo, Japan) with a ProgRes 3012 digital camera (Jenoptik Laser, Jena, Germany) set at a resolution of 3856 × 2900 pixels. Image sets of 15 scans were taken of the specimen at various focal planes. These image sets were then processed through Auto-Montage V3.04 software (Syncroscopy, Frederick, MD, USA) to produce a completely in-focus image. Further enhancing and cleaning of the images was carried out with Adobe Photoshop software (Adobe Systems, San Jose, CA, USA).

Conventions

All information related to the material examined is provided in the main body of text. Canadian localities are listed under province or territory. Abbreviations of the collections used in the text are: CAS, California Academy of Sciences, San Francisco, CA, USA; CNC, Canadian National Collection of Insects, Agriculture and Agri-Food Canada, Ottawa, Ontario, Canada; LFC, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, Sainte-Foy, Quebec, Canada; NSNR, Nova Scotia Department of Natural Resources Insectary, Shubenacadie, Nova Scotia, Canada; NSPM, Nova Scotia Museum of Natural History, Halifax, Nova Scotia, Canada; SEM, Snow Entomological Museum, The University of Kansas, Lawrence, KS, USA; UHC, University of Helsinki, Helsinki, Finland; USNM, Smithsonian Institution, United States National Museum of Natural History, Washington, DC, USA; ZMH, Zoological Museum, Helsinki, Finland.

Terminology mainly follows that used by Ahn (1996, 1997, 1999). The ventral part of the median lobe of the aedeagus is considered that with the foramen mediale of the bulbus.

SYSTEMATICS

Tribe Athetini Casey (1910)

Genus *Atheta* Thomson (1858)

Atheta Thomson (1858): 36; Strand and Vik (1964): 327; Benick and Lohse (1974): 124; Seevers (1978): 107; Lohse *et al.* (1990): 188; Gusarov (2003b): 29.

Type species: *Aleochara graminicola* Gravenhorst, fixed by the International Commission on Zoological Nomenclature (1961).

Diagnosis. The limit of the genus is not well established and varies considerably depending on authors (see discussion in Gusarov 2003b: 29). We have followed here the broad definition of *Atheta* similar to that proposed by Benick and Lohse (1974: 124), as follows: body slender, subparallel and loosely articulated; length 1.0–5.0 mm (usually 2.0–4.0 mm); body black, brown or bicolored with yellowish-brown elytra; body pubescent with several macrosetae on pronotum, elytra and abdomen; postgenal carina present and incomplete to entire; pronotal hypomeron visible laterally for at least two-thirds of pronotal length; mesocoxae approximately contiguous; mesosternal process slender, attaining one-third to middle of mesocoxae; metasternal process short, obtusely subtriangular; isthmus approximately equal to metasternal process; tarsal formula 4-5-5; median lobe of aedeagus with entire or subdivided "athetine" bridge in subapical part of tubus; spermatheca consisting of spherical or moderately elongate capsule and long and thin stem which is sinuate and hooked or looped posteriorly.

Atheta novaescotiae Klimaszewski and Majka, sp. nov.

(Figs 1,2,7–11,18)

Description. Body subparallel, length 3.0–4.0 mm, dark brown to black, opaque (Figs 1,2), integument with strong microsculpture consisting of isodiametric sculpticells; head 1.2 times as wide as long with postocular carina present (Fig. 2); eyes moderately large; antennal segments 5–10 slightly to strongly transverse and incrassate (Fig. 1); pronotum slightly trapezoidal in shape, approximately one-third broader than long and one-fifth narrower than elytra (Fig. 1); elytra almost twofold as broad as length of the suture (Fig. 1); abdomen subparallel.

Male: Tergite VIII emarginated medially and with two small lateral teeth (Fig. 10). Sternite VIII broadly rounded apically. Median lobe of aedeagus broadly oval in dorsal view and with two large sclerites in the internal sac (Fig. 7), tubus short and narrowly elongate in lateral view (Fig. 8), bulbus lacking crista apicalis (Fig. 8).

Female: Tergite VIII truncate apically with minute emargination. Sternite VIII broadly rounded apically. Spermatheca with tubular capsule bearing deep apical invagination, stem long, sinuate and looped posteriorly (Fig. 11).

Etymology. The specific name *novaescotiae* (a noun in the genitive case) derives from the provincial name of Nova Scotia, Canada, where the original series of this species was found.

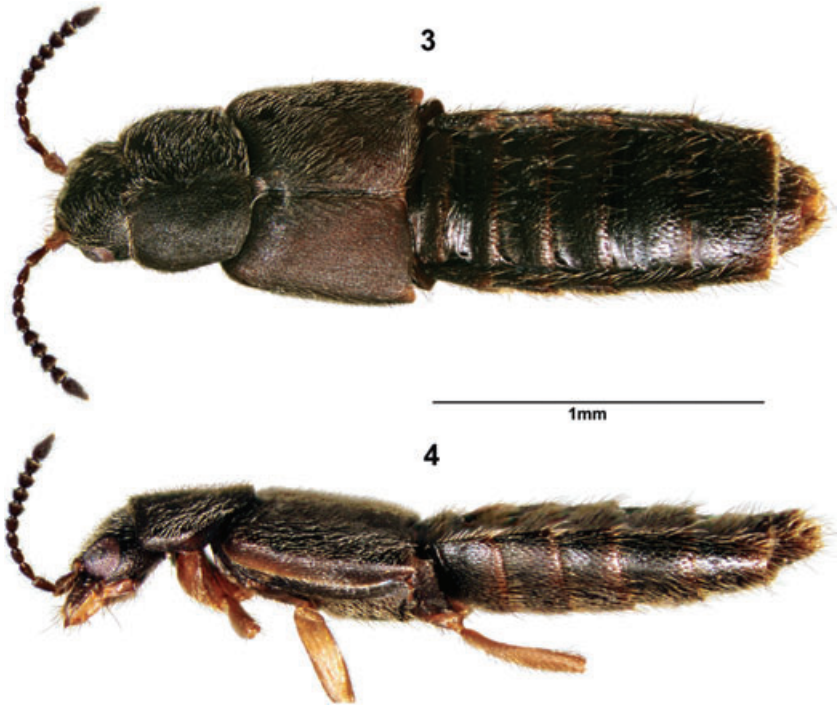
Figures 1,2 *Atheta novaescotiae* sp. nov. **1** Dorsal view; **2** lateral view (based on the holotype).

Distribution. Known from seashores in Nova Scotia and Newfoundland, Canada, and Saint-Pierre et Miquelon, France (Fig. 18).

Remarks. *Atheta novaescotiae* may be readily distinguished from all known North American *Atheta* species by having very strongly pronounced body microsculpture (Figs 1,2), a feature commonly found in species of four athetine genera living in seashore habitats in America north of Mexico (*Adota* Casey, *Pontomalota* Casey, *Psammostiba* Yosii and Sawada, and *Tarphiota* Casey; Casey 1893; Seevers 1978; Gusarov 2003a). It also has a distinctly shaped median lobe of the aedeagus (Figs 7,8), apical margin of male tergite VIII (Fig. 10) and the spermatheca, bearing long and thin stem (Fig. 11). This species does not occur in the Palearctic region (Benick & Lohse 1974; Strand & Vik 1964).

Atheta novaescotiae bears strong external and habitat similarities to *Tarphiota* as defined by Ahn (1996). The superficial external similarities of *A. novaescotiae* to species of *Tarphiota* are presumably due to the convergent adaptations to life in a marine seashore environment. *Atheta novaescotiae* bears certain external similarities to some species of *Dinaraea* Thomson (e.g. *D. arcana* (Erichson) and *D. subdepressa* (Bernhauer)). The male of *A. novaescotiae* has male tergite VIII almost identical to that of *D. arcana*, but the genitalia are different. The spermathecae of *Dinaraea* are also of a different shape, with short, club-shaped capsules, and slightly sinuate stems that are narrowly coiled posteriorly (fig. 201 in Lohse *et al*. 1990).

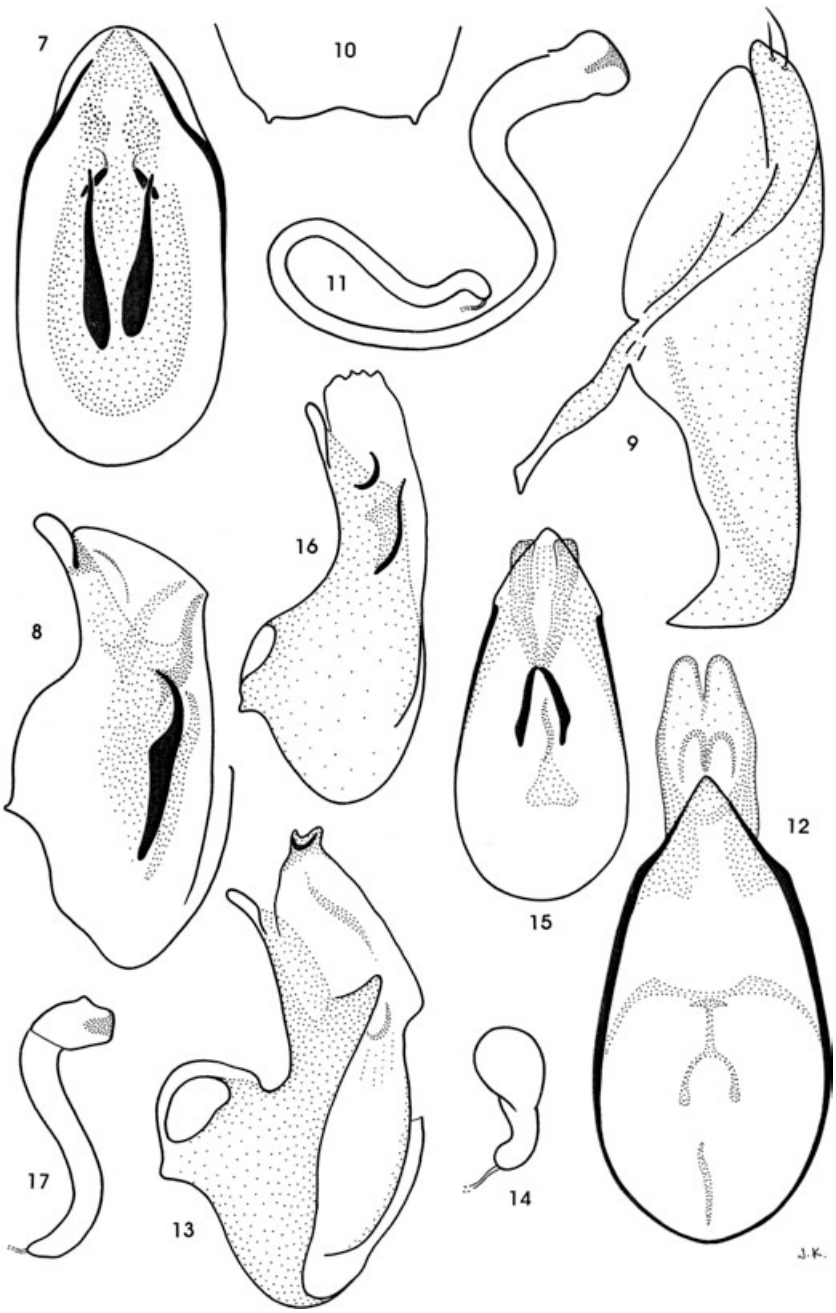
The presence of the species on Sable Island is particularly interesting and worthy of note. The island is a 35 km sand bar located near the edge of the continental shelf 160 km from the nearest point of continental North America. An endemic species, *Trichlochmaea sablensis* (Brown 1969; Chrysomelidae), and flightless species such as *Ephalus latimanus* (LeConte 1854; Tenebrionidae) and *Negastrius delumbis* (Horn 1891) (Elateridae) are found on the island (Howden 1970; Wright 1989). The presence of *T. sablensis* indicates a reproduc-



Figures 3,4 *Tarphiota fucicola* (Mäklin). **3** Dorsal view; **4** lateral view.

Figures 5,6 *Tarphiota geniculata* (Mäklin). **5** Dorsal view; **6** lateral view.

tively isolated population persisting on Sable Island (and/or other off-shore refugia) for a sufficiently long period of time for speciation to occur from the closely related *T. vacinii* (Fall 1924). The presence of flightless taxa (160 km from the present continental coastline) might indicate that these species spread to this location during an era when continental-shelf land bridges existed.



Figures 7–17 Outline drawings of genital structures. **7–11** *Atheta novaescotiae* sp. nov.; **12–14** *Tarphiota fucicola* (Mäklin); **15–17** *Tarphiota geniculata* (Mäklin). **7** Median lobe of aedeagus in dorsal view (length 0.2 mm); **8** median lobe of aedeagus in lateral view (length 0.2 mm); **9** paramere (length 0.4 mm); **10** apical part of male tergite eight (length 0.1 mm); **11** spermatheca (length 0.2 mm); **12** median lobe of aedeagus in dorsal view (length 0.2 mm); **13** median lobe of aedeagus in lateral view (length 0.2 mm); **14** spermatheca (length at most 0.1 mm); **15** median lobe of aedeagus in dorsal view (length 0.17 mm); **16** median lobe of aedeagus in lateral view (length 0.17 mm); **17** spermatheca (length 0.2 mm).

Between 20 000 and 21 000 BP, the Wisconsin era glaciation began to recede, with ice-sheets retreating from the continental shelf of Nova Scotia. By 14 500 BP, significant portions of the banks (Brown's, Baccaro, Emerald, and Sable Island; Banquereau Bank remained glaciated until somewhat later) on the Scotian Shelf were ice-free, and portions of them remained so until approximately 8000 BP. Much of George's Bank (only approximately 25 km across the North-east Channel from Brown's Bank) was ice-free during the last phase of Wisconsin glaciation (Fader 1989; King 1996; Shaw & Gareau 2002). A number of authors (Howden 1970; Hamilton & Langor 1987; Wright 1989) have discussed the possibility that this network of banks served as a

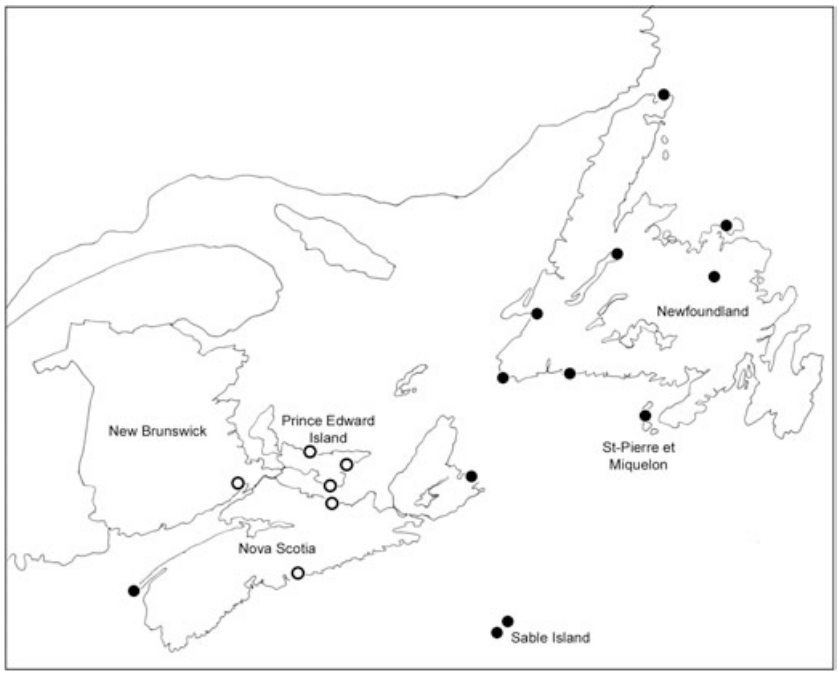


Figure 18 Distribution of *Atheta novaescotiae* Klimaszewski and Majka, sp. nov. (●) Sites where the species has been found; (○) sites where suitable habitat has been searched but no specimens were located.

conduit of species from George's Bank refugia to Sable Island, Cape Breton, and possibly Newfoundland. In the case of the flightless *E. latimanus*, the evidence is particularly compelling given that the species is otherwise absent from Canada (Bousquet & Campbell 1991), but is found in New England. This pathway of colonization is well established in the case of the "coastal-plain" flora of Nova Scotia (Keddy & Wisheu 1989).

A salt-tolerant, coastal, beach-drift species such as *A. novaescotiae* would be a good candidate for such a mode of dispersion and colonization. Its presence at both Glace Bay, Nova Scotia and Port aux Basques, Newfoundland, on both sides of the Cabot Strait, might indicate either wind- or water-borne transmission across this body of water.

Holotype. ♂ (NSPM), Canada, labeled "**Nova Scotia**, Cape Breton Co., Glace Bay Beach, 6.vii.1994, J. M. Francis and V. Jessome".

Paratypes. Canada: **Nova Scotia:** 2♂2♀ (NSPM), Cape Breton Co., Glace Bay Beach, 6.vii.1994, J. M. Francis & V. Jessome; 1♂1♀ (NSNR), Digby Co., Pond Cove, Brier Island: 22.vi.2003, J. Ogden & K. Goodwin; 2♂10♀ (NSNR), 1♂1♀ (LFC), 24.vi.2003, J. Ogden & K. Goodwin; 1♀ (NSNR), 26.vii.2003, J. Ogden & K. Goodwin; 1♂ (NSNR), 28.vii.2003, J. Ogden & K. Goodwin; 2♂2♀ (NSPM), Nova Scotia Camp, Sable Island: 22.iv.1976, B. Wright; 1♂ (NSPM), freshwater pond at West Light, 13.vi.1977, B. Wright; 1 sex? (NSPM), 30.vi.2004, no. 5, Z. Lucas; 51 sex? (NSPM), Sable Island Station, 1.vii.2004, no. 7, Z. Lucas; 4 sex? (NSPM), Sable Island, north beach; 10.vii.2004, no. 15, seashore, Z. Lucas; 336 sex? (NSPM), Sable Island, north beach, 12.vii.2004, no. 18/19, Z. Lucas; 117 sex? (NSPM), Sable Island, south beach, 16.vii.2004, no. 26, Z. Lucas; 62 sex? (NSPM), Sable Island, south beach; 1.viii.2004, no. 63/64, Z. Lucas; 87 sex? (NSPM), Sable Island, south beach, 2.viii.2004, no. 67, Z. Lucas; 205 sex? (NSPM), Sable Island, East Spit; 2.viii.2004, no. 71, Z. Lucas. **Newfoundland:** 2♂2♀ (UHC), Port aux Basques, no. 58, 30.vi.1949, C. Lindroth; 2♂3♀ (UHC), Port aux Basques, no. 94, 30.vi.1949, E. Palmen; 25♂35♀9sex? (UHC), Burgeo, no. 61, 20.vi.1949, E. Palmen; 4♂5♀, 2sex? (UHC), Fogo, Tilting, no. 268, 30.vi.1951, C. Lindroth; 4♂ (UHC), Stephenville Crossing, no. 72, 6.vii.1949, C. Lindroth; 1♂1sex? (UHC), C. Lindroth; 1♂ (UHC), Gander, no. 308, 1.ix.1949, E. Palmen; 1♀1sex? (UHC), Raleigh, no. 99, 17.vii.1949, C. Lindroth; 3♀ (UHC), Cow Head, no. 129, 7–8.viii.1949, Lindroth; 2♀ (UHC), Kitty's Brook, no. 256, 19.viii.1949, E. Palmen. **Saint-Pierre et Miquelon:** 1♂1sex? (UHC), Miquelon, no. 351, 8–10.viii.1951, C. Lindroth.

Bionomics. Atheta novaescotiae is most frequently found at the upper end of the littoral zone on sandy, oceanic beaches similar to the reported habitats of the species of *Tarphiota* described from the Pacific coast of North America (Ahn 1996, 1999). A variety of organic matter accumulates in this zone and forms the basis for a community of beetles and other invertebrates that live in this material. On Brier Island, in the Bay of Fundy, the seaweed deposited is primarily *Ascophyllum nodosum* (Linné) Le Jolis and *Fucus vesiculosus* Linné. Also present in significant quantities are various dead marine invertebrates, fish, windblown terrestrial invertebrates, and other organic material from terrestrial origins. Specimens were captured in pitfall traps and pan traps set amongst the cobbles around and beneath this strand-line organic material.

On Sable Island the species is very abundant in this zone, congregating particularly on dead seabirds (gulls, terns, alcids, and others), on decomposing seaweed, and on bones and decomposing tissue of gray seals (*Halichoerus grypus* (Fabricius)), which have been deposited by wave and tidal action on the strandline at the upper end of the littoral zone. Other closely associated Coleoptera that are abundant in this habitat include (on both Sable and Brier Islands) Histeridae: *Baeckmanniolus dimidiatipennis* (LeConte, 1824), *Hypocaccus fraternus* (Say, 1825); Tenebrionidae: *Blapstinus metallicus* (Fabricius, 1801); and Staphylinidae: *Creophilus maxillosus* (Linnaeus, 1758); (on Brier Island) Staphylinidae: *Aleochara litoralis* (Mäklin, 1853); and Hydrophilidae: *Cercyon littoralis* (Gyllenhal, 1808); and (on Sable Island) Nitidulidae: *Omosita colon* (Linnaeus, 1758); and Silphidae: *Thanatophilus lapponicus* (Herbst, 1793). Additionally, on Sable Island *A. novaescotiae* is found in substantial numbers on horse dung when it is deposited on the beach (Sable Island has a population of wild horses that varies from 200 to 350 individuals). Collections of Coleoptera on horse dung slightly further inland from the coast (Sable Island is less than 1.5 km wide) did not include specimens of *A. novaescotiae*, indicating their close association with the seashore environment.

Detailed habitat information for the specimens collected in Newfoundland is lacking; however, all the collection sites (with the exception of specimens collected from Gander and Kitty's Brook) are from coastal localities.

Although the ecology of some of the species found in this microenvironment is still insufficiently known (apparently most are either detritivores or carnivores), this complex of beetles occupies a defined niche and exploits a particular trophic resource. With two trophic groups represented, the complex may not represent a feeding guild in the strict sense defined by Root (1967) as: "A group of species that exploit the same class of environmental resources in a similar way." However, the reliance on beach drift detritus as the basis of the food chain, and the particular niche characteristics of this environment may indicate they are closer to a guild niche (Terborgh & Robinson 1986) or trophic guild (Yodzis 1982). Simberloff and Dayan (1991) point out that a plethora of related concepts (feeding guild, functional group, clique, trophic guild, guild niche, etc.) are in current use. Not all of these are unambiguously defined or consistently employed. There is, however, considerable interest in identifying such units because there is growing evidence that they may be fundamental ecological units with emergent properties and "will become the standard currency of ecologists in their efforts to understand community relationships of many kinds" (Terborgh & Robinson 1986).

To date, limited investigation in appropriate habitats has found *Atheta novaescotiae* at three locations in Nova Scotia: Brier Island at the mouth of the Bay of Fundy, on the Atlantic coast of Cape Breton (Glace Bay), and on Sable Island; in a number of southern, western, and northern coastal localities around the entire perimeter of Newfoundland (except for the Avalon Peninsula) and on the island of Miquelon (a French territory south of the island of Newfoundland) (Fig. 18). Comparable investigations in similar habitats on Caribou Island and near Halifax in Nova Scotia, at locations on both the Northumberland Strait and Gulf of St. Lawrence shores of Prince Edward Island, and at Mary's Point, on the New Brunswick shore of the upper Bay of Fundy, have not found the species. There are, however, many suitable sandy-shore habitats in the region that remain to be investigated. The fact that it occurs amongst beach drift, and would appear to have a tolerance to immersion by sea water, would indicate a ready potential mode of dispersion as such material is re-floated by wave or tidal action and moved to other parts of the coast.

Current occurrence data show that adults are present from April to August.

Genus *Tarphiota* Casey (1893)

Tarphiota Casey (1893): 332 (1910): 74; Fenyes (1920): 254; Bernhauer and Scheerpeltz (1926): 596; Blackwelder (1952): 374; Hatch (1957): 145; Moore and Legner (1975): 489 (1976): 535; Seevers (1978): 132; Lohse and Smetana (1985): 286, 287, 291; Ahn (1996): 177 (1997): 81; (1999): 191.

Type species: *Tarphiota pallidipes* Casey [=*T. fucicola* (Mäklin)], by original designation (Casey 1893).

Diagnosis. This genus can be distinguished by the following combination of characters: tarsi usually 4-5-5-segmented (see comments below); body subparallel, opaque (Figs 3–6), integument, particularly on forebody, with strong hexagonal microsculpture consisting of slightly raised sculpticells and giving an impression of coarse granulation; antenna with segments I–III elongate, IV quadrate to slightly elongate, V–VII quadrate or slightly transverse, appearing somewhat bead-shaped, and VIII–X slightly to strongly transverse, terminal segment elongate (Figs 14–17); mandible asymmetrical, each with blunt apex (Ahn 1996: fig. 4), right mandible with median tooth, prosteca well developed; labrum transverse (Ahn 1996: fig. 2); galea and lacinia elongate (Ahn 1996: fig. 5); galea with inner surface membranous, apex with long filiform setae, outer surface corneous; lacinia bearing a comb of well-separated spines followed by a small dense patch of setae; maxillary palpus four-segmented, terminal segment slender (Ahn 1996: fig. 5); labial palpus three-segmented (Ahn 1996: fig. 6); ligula bifid and Y-shaped (Ahn 1996: fig. 6); head without neck and without postocular carina (Figs 4,6), pubescence directed mediad (Figs 3,5); pronotum with pubescence directed apically along median line of disc and laterad along arcuate lines on the sides (Figs 3,5); elytra elongate, with pubescence directed obliquely posterad (Fig. 3); mesocoxae narrowly separated; mesocoxal cavities unmargined posteriorly; meso- and metasternal process narrowly elongated and pointed apically, meeting in about half length of the mesocoxae; pro- and mesotibiae with strong row of spines.

Male: Tergite VIII truncate apically or with shallow median emargination. Sternite VIII broadly rounded. Median lobe of aedeagus broadly oval in dorsal view, crista apicalis of bulbus well developed, internal sac with fine structures (Figs 12–16). Paramere with small apical lobe (Ahn 1996: fig. 11).

Female: Tergite VIII truncate apically. Sternite VIII broadly rounded apically.

Remarks. Ahn (1997) properly classified genus *Tarphiota* in tribe Athetini. He also suspected a potential close affiliation of this genus with *Thinusa* and *Pontomalota*, which together probably form a monophyletic group among the Athetini. The synapomorphies of these genera would include integument with strong microsculpture and isodiametric, strongly convex sculpticells, strong yellow pubescence of a characteristic pattern (Figs 3–6), front and middle tibiae with a row of spines, unmargined mesocoxal cavities, mandibles with blunt apex, and mentum with V setae (Ahn 1997).

Ahn (1999) transferred *Salinamexus densus* Moore, 1978, to the genus *Tarphiota* and cited a tarsal formula for the species as 4-4-5. We have examined the female holotype of *Salinamexus densus* and confirmed the accuracy of Ahn's statement. All other species of that genus have the tarsal formula 4-5-5.

It is interesting to note that the shape of the spermathecae is quite diverse in *Tarphiota* and lacks a consistent pattern. This may imply a strong divergence of species included.

Bionomics. Species of *Tarphiota* inhabit the mid- to upper littoral zone of fine-grained sandy beaches and are associated with decaying seaweed (Ahn 1996).

Geographic distribution. Western coast of North America, from Alaska to Baja California Sur and Sonora in Mexico.

Key to adults of Nearctic *Tarphiota* species

The present key was prepared mainly based on Ahn (1999).

1 Antenna yellow, shorter than the combined length of head and pronotum; tarsal formula 4-4-5; median lobe of aedeagus and spermatheca as in figs 1 and 3 in Ahn (1999); known from shores of Mexico . . . . . *Tarphiota densa* (Moore)

– Antenna dark brown, longer than the combined length of head and pronotum (Figs 3,5); tarsal formula 4-5-5; median lobe of aedeagus and spermatheca differently shaped (Figs 12–7) 2

2 Three penultimate antennal segments approximately twofold as broad as long (Figs 5,6); body smaller, length 2.0–2.6 mm (Fig. 5); genitalic structures as illustrated (Figs 15–17) . . . . . *Tarphiota geniculata* (Mäklin)

– Three penultimate antennal segments quadrate to slightly transverse (Figs 3,4); body larger, length 2.9–3.4 mm (Fig. 3); genital structures differently shaped (Figs 12–14) . . . . . *Tarphiota fucicola* (Mäklin)

Tarphiota densa (Moore)

Salinamexus densus Moore (1978): 115.
Tarphiota densa (Moore): Ahn (1999): 191.
Tarphiota hirsutula Casey (1910): 75. Synonymized by Fenyes (1920): 254.

Diagnosis. Body subparallel, length 3.0 mm, dark brown, opaque, integument appearing granulose, microsculpture strong with approximately hexagonal

microcells; head 1.1-fold as wide as long; pronotum approximately one-fourth broader than long; elytra approximately 1.5-fold as long as pronotum; abdomen broadly arcuate laterally and slightly broadened posteriorly.

Male: Tergite VIII truncate apically and with long pubescence (Ahn 1999: fig. 5); median lobe of aedeagus with tubus broadly arched and slightly sinuate subapically in lateral view (Ahn 1999: fig. 1); paramere as illustrated (Ahn 1999: fig. 2).

Female: Spermatheca with slightly elongate capsule bearing deep apical invagination, stem slender and looped posteriorly (Ahn 1999: fig. 3).

Bionomics. Intertidal species associated with decaying seaweed.

Distribution. Known from seashores (Gulf of California) of Sonora and Baja California Sur in Mexico (Ahn 1999).

Remarks. *Tarphiota densa* bears close resemblance to *T. geniculata*, from which it differs by having yellow and shorter antennae, 4-4-5 segmented tarsi, yellow-brown legs and the genital features. *Tarphiota densa* is the only species of *Tarphiota* with 4-4-5-segmented tarsi, the same tarsal formula as in species of *Thinusa* Casey.

Specimens examined. Mexico: ♀ (holotype; CAS), labeled "Sonora, 15 miles south-east of Guayamas, 24 April 1974, on beach, Derham Giuliani coll[ection]."

Tarphiota fucicola (Mäklin)

(Figs 3,4,12–14)

Tachyusa fucicola Mäklin (1852): 306; Bland (1865): 406.

Homalota fucicola (Mäklin): Mäklin (1853): 182.

Tarphiota fucicola (Mäklin): Casey (1893): 333; Bernhauer and Scheerpeltz (1926): 596; Hatch (1957): 145; Moore and Legner (1975): 489; Lohse and Smetana (1985): 286; Ahn (1996): 179.

Tarphiota debilicollis Casey (1910): 75. Synonymized by Fenyes (1920): 254.

Tarphiota pallidipes Casey (1893): 333. Synonymized by Ahn (1996): 179.

Diagnosis. Body subparallel, length 2.9–3.4 mm, dark brown to black, opaque, integument appearing granulose, microsculpture strong with isodiametric microcells (Figs 3,4); head 1.2-fold as wide as long; eyes moderately large (Fig. 4); antennal segments 5–10 quadrate to slightly transverse and not incrassate (Fig. 3); pronotum slightly trapezoidal in shape, approximately one-fourth broader than long and almost one-third narrower than elytra (Fig. 3); elytra nearly twofold broader than length of the suture (Fig. 3); abdomen subparallel.

Male: Tergite VIII truncate apically, apex sometimes slightly emarginated. Sternite VIII broadly rounded at apex. Median lobe of aedeagus broadly oval in dorsal view (Fig. 12) and with narrowly elongate and pointed apically tubus (Fig. 13), crista apicalis of bulbus well developed (Fig. 13).

Female: Tergite and sternite VIII broadly rounded apically. Spermatheca extremely small, scarcely visible, at most 0.1 mm long, consisting of sac-shaped capsule and short L-shaped stem (Fig. 14; also Ahn 1996: fig. 9). The shape and size of spermatheca in this species is profoundly different from those of the other known species of the genus.

Bionomics. Intertidal species associated with decaying seaweed found in the mid-littoral zone.

Distribution. Known from seashores, from Alaska to California (Ahn 1996).

Remarks. The shape and size of spermatheca, the enlarged crista apicalis of bulbus of the median lobe, the quadrate antennal segments VIII–X, and the broad body are inconsistent with these features in other members of the genus *Tarphiota*.

Specimens examined. USA, **Alaska**: ♀ (lectotype designated by Lohse and Smetana 1985); ZMH), labeled "Kodiak, Holmberg, *Homalota fucicola* Mäkl.; Lohse fix.1983"; 2♀ (paralectotypes; ZMH): Kodiak, Holmberg, *Homalota fucicola* Mäkl[in]; Canada, **British Columbia:** 9♂18♀, 2 sex? (CNC, LFC); 4♂9♀ (CNC), 2 sex? (LFC), Queen Charlotte Is., 12.8 km South Tlell River Bridge, 17.vii.1983, J. M. Campbell; 3♂6♀ (CNC), Louise Is., Skedans, 6.viii.1983, J. M. Campbell; 1♂1♀ (CNC), NW corner of Graham Is., Lepas Bay, 16–17.viii.1983, J. M. Campbell; 1♀ (CNC), 3.5 km Tow Hill, 22.viii.1983, J. M. Campbell; 1♀ (CNC), Rennell Sound, Bonanza Creek, 4.viii.1983, J. M. Campbell; 1♂ (CNC), Tlell, 17.v.1983, J. M. Campbell.

Tarphiota geniculata (Mäklin)

(Figs 5,6,15–17)

Homalota geniculata Mäklin (1852): 308; Bland (1865): 404.

Tarphiota geniculata (Mäklin): Casey (1893): 334; Bernhauer and Scheerpeltz (1926): 596; Hatch (1957): 145; Moore and Legner (1975): 489; Lohse and Smetana (1985): 291.

Tarphiota insolita Casey (1910): 76. Synonymized by Fenyes (1920): 254. *Tarphiota litorina* Casey (1910): 75. Synonymized by Fenyes (1920): 254.

Tarphiota seditosa Casey (1910): 76. Synonymized by Fenyes (1920): 254.

Diagnosis. Body subparallel, length 2.0–2.6 mm, dark brown to black, opaque, integument appearing granulose, microsculpture strong with isodiametric microcells (Figs 5,6); head 1.2-fold as wide as long; eyes moderately large but smaller than in the other two species (Fig. 6); antennal segments V–X slightly to strongly transverse and incrassate (Fig. 5); pronotum approximately rectangular in shape, approximately one-fifth broader than long and one-sixth narrower than elytra (Fig. 5); elytra approximately one-third broader than length of the suture (Fig. 5); abdomen subparallel.

Male: Tergite VIII truncate and slightly concave apically. Sternite VIII broadly rounded apically. Median lobe of aedeagus narrowly oval apically (Fig. 15) and with arched and narrowly elongate tubus in lateral view (Fig. 16), bulbus with small crista apicalis (Fig. 16).

Female. Tergite VIII emarginated apically, emargination broadly V-shaped. Sternite VIII broadly rounded apically. Spermatheca with slightly elongate capsule bearing deep apical invagination, stem moderately broad and sinuate (Fig. 17; also Ahn 1996: fig. 12).

Bionomics. Intertidal species associated with decaying seaweed found in the mid-littoral zone.

Distribution. Known from seashores, from Alaska to California (Ahn 1996).

Specimens examined. USA, **Alaska:** 1 sex? (lectotype by designation of Lohse and Smetana (1985); ZMH), labeled "Sitka, Holmberg, *Homalota geniculata* Mäkl., type no.2234, Lohse's designation 1983"; 1♂1♀ (paralectotypes; ZMH), Sitka, Holmberg, C 14478, Sitka, Holmberg, C 14479; Canada, **British Columbia:** 8♂13♀, 25 sex? (CNC), Queen Charlotte Is., 3.5 km SW Tow Hill, 22.viii.1983, J. M. Campbell; 1♀, 2 sex? (CNC), Tlell, 17.vii.1983, J. M. Campbell; 1♂5♀, 7 sex? (CNC), 1 sex? (LFC), NW corner of Graham Is., Lepas Bay, 17.viii.1983, J. M. Campbell.

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