LATAGOPHTHIRUS RAUSCHI, NEW GENUS AND NEW SPECIES
(ANOPLURA: ECHINOPHTHIRIIDAE) FROM THE RIVER OTTER (CARNIVORA: MUSTELIDAE)²

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Abstract: This paper presents the descriptions of a new genus and new species, Latagophthirus rauschi, collected from the river otter, Lutra canadensis pacifica Rhoads, in Coos County, Oregon. The family Echinophthiridae is redefined, and a key to the genera is provided. The evolutionary significance of Latagophthirus is also discussed.

The sucking lice of the Echinophthiridae were previously known only from marine carnivores of the order Pinnipedia. The echnophthirids are so highly specialized that their affinities are quite obscure. The Echinophthiridae include 4 distinct genera: Antarctophthirus Enderlein (6 species), Leptophthirus Enderlein (2 species), Echinophthirus Giebel (monotypic), and Prosconophthirus Ewing (2 species) (Kim et al. 1974).

No anopluran has ever been found on the insipid carnivores except for Linyphiatus on the Canidae.

Latagophthirus are primarily lice of the Artiodactyla, mainly Bovidae, Giraffidae, and Cervidae. The sucking louse described in this paper is the first finding of an "indigenous" species from the insipid Carnivora.

Dr. R. L. Rausch of the Arctic Health Research Center, U. S. Public Health Service made the material of this new taxon available for study. The specimens were collected by Mr. Chris Maser of the University of Puget Sound in Tacoma, Washington, and Mr. James E. Tabor of the Oregon State University, Corvallis, Oregon, from 1 male and 1 female of Lutra canadensis pacifica Rhoads in Coos County, Oregon. Mr. Tabor has examined 11 more otters and found no lice. The senior author has made further efforts to collect more specimens from the river otter and the sea otter. Two hides of the river otter, Lutra canadensis (Schreber), collected in Luzerne Co., Pennsylvania, were made available for study by the Pennsylvania Game Commission. No lice were obtained from these hides. The California Department of Fish and Game provided us with 4 hides of the sea otter.

Echydra latris (Linnaeus), for study. Again, they harbored no lice.

In this paper the descriptions of a new genus and new species, Latagophthirus rauschi, are presented, and the family Echinophthiridae is redefined. A key to the genera of the Echinophthiridae is provided. The evolutionary significance of Latagophthirus is also discussed.

LATAGOPHTHIRUS, n. gen.

Description: Anoaplarous without external evidence of eyes and sclerotized abdominal plates. Head moderately sclerotized; antennae not sexually dimorphic, 3-segmented in only known species; the 2 sensilla very small and closely associated together on terminal segment; terminal segment about as long as or slightly longer than basal segment; occipital apophysis not strongly developed. Thorax dorsally with strongly sclerotized phragmata; mesothoracic phragmata connected across the notum; natal pit indistinct; sternal plate absent. Leg: Tarsi: Forelegs small and weak, with unmodified tarsi and acominate claws; mid- and hindlegs very large, stout and similar in shape and size, each with modified tibia-tarsi and blunt claws. Abdomen completely membranous, larger and oval, without distinct tergite, sternal or paratergal plates; dorsally and ventrally densely covered with setae, pegs, and scales; 6 spiracles present, each with a specialized closing apparatus and very small spiracular opening; 5 without definite gonopods, and 5 with genital apodemes. V-shape pseudopenes and elongated parameres.

Type-species: Latagophthirus rauschi, n. sp., by monotypy.

Latagophthirus is closely related to but is distinctly different from Antarctophthirus, by having the 3-segmented antennae in both nymphal and imaginal stages. In Latagophthirus no trace of the natal pit is found on the thoracic dorsum and the occipital apophyses are not developed. The spiracular atrium is slender and tubular, as in Antarctophthirus, but the spiracular opening is extremely small.

The name Latagophthirus is derived from Gr. latis, -ager, -us (otter) and Gr. phthir, -os, m. (louse), meaning the otter louse.

Latagophthirus rauschi, n. sp. FIG. 1-7

Type data: Holotype ♂, allotype ♀, and 35 paratypes which include 2 ♀♀, 4 ♀♂ and 29 nymphs, ex Lutra canadensis pacifica Rhoads, 1.6 km NE of Broadbent, Coos Co., Oregon (T 29 S, R 12 W, cent. Sec. 28, elevation 15 mi), 20.VII.1971, Chris Maser & James E. Tabor (Rausch 39741). These specimens were found on the head and neck of the
host. Holotype and allotype and several paratypes are deposited in the collection of the National Museum of Natural History, Smithsonian Institution, and some paratypes are deposited in the collections of The Frost Entomological Museum, The Pennsylvania State University and the K. C. Emerson Entomological Museum, The Oklahoma State University, Stillwater, Oklahoma.

Description: 
♀ [Fig. 2-5]: Total body length 1.50 mm (♂, n = 3). Head about as wide or wider than long; anterior margin slightly concave. Postantennal and posteroventral angles not developed, but lateral margins strongly convex; occiput lightly sclerotized, with weakly sclerotized epipharynx; dorsal anteriorly with numerous peg-like setae mixed with weak normal setae and posteriorly with 2 long lateral principal setae, pegs and normal setae of various sizes; venter with 2-3 diagonal rows of pegs and 4 long setae on each side. Antennae short and 3-segmented; each segment heavily sclerotized; basal and 2nd segments each with 1 distinct peg-like seta, terminal segment slightly longer than basal segment, with 2 small sensilla and 6-8 peg organs. Thorax about as long as head, with many setae of various lengths and shapes both dorsally and ventrally, but without scales; mesothoracic phragma long but not reaching mesothoracic phragma; mesonotal phragma continuous across notum; notal pit indistinct; metathoracic phragma poorly developed; pronotal area with 2 diagonal rows of pegs and long setae; mesonotal phragma very small, anteriorly with 22 spiniform setae; no normal setae on head; sternum with pegs and setae. Legs: Forelegs small and weak with unmodified tibiae and arista-like claws; mid and hindlegs very large, stout and similar in shape, each with modified tibia-tarsus, tibial thumb and blister claws; forecoxa with subapical spur; mid- and hindcoxae each with a seta. Abdomen large and oval, without distinct tergites, sternites and paratergites; 6 spiracular openings present on segments 1 to 6; dorsoventrally irregularly arranged rows of setae of various sizes and shapes including pegs and scales, and particularly in the posterior 1/2 with dense scales; venter with irregularly arranged rows of setae of various sizes and shapes, and the posterior 1/5 with scattered scales; variable in size and shape but usually pointed at apex; anal segment not prolonged. Genitalia [Fig. 4]: Basal apodemic short and broad; parameres short and slender, with pointed apex; pseudopenis V-shaped and rounded at apex; endosoma heavily sclerotized and posteriorly flattened; epandrium sclerotized.

♀ [Fig. 1]: Total body length 1.59 mm (♂, n = 4). Head, thorax, legs and abdomen as in ♀ except for usual sexual dimorphism. Forecoxa without subapical spur. Genitalia [Fig. 2] without distinct genital plate, gonopods and apomastyca; genitalic area elevated; genital opening surrounded by numerous setae; no special genital setae present.

Nymph 1: Unknown.

Nymph 2: [Fig. 7]: Total body length 1.64 mm (♂, n = 3), range 0.974-1.14 mm. Head about as wide or wider than long; labriform area sclerotized; postantennal and posteroventral angles not developed; anterior 1/2 of head with pegs and normal setae; posterior head with long setae mixed with a row of pegs. Antennae 3-segmented; terminal segment slightly longer than basal segment, with 2 small sensilla; basal and 2nd segments each dorsally with a peg. Thorax dorsally with sclerotized phragmata; all phragmata connected; mesothoracic phragmata separated medially; pronotum with 5 or more pegs and normal setae, and monotonous and metanotum each with 2 pegs. Legs in adults. Abdomen short and oval, with no indication of tergites, sternites or paratergites; spiracles indistinct; dorsally with setae, pegs and scales; venter with almost no scales.

Nymph 3: [Fig. 6]: Total body length 1.50 mm (♂, n = 11), range 1.18-1.62 mm. Body with setae, pegs and scales, denser than in nymph 2. Head, thorax and abdomen same as in nymph 2, unless mentioned otherwise. Head ventrally with 35 or 40 pegs and 6-8 long setae. Thorax with larger number of pegs and setae. Abdomen almost circular and densely covered with normal setae, pegs and scales; ventrally with scattered scales in addition to pegs and setae; female nymph with 2 converying rows of normally-sized "key setae."

Remarks: This species is named after Dr. R. L. Rautsch for his contribution to Arctic parasitology.

Family ECHINOPHTHIRIDAE

Description: Large Amphipods; body thickly beset with various setae, spiniform setae, scales and pegs, in addition to regular setae. Head with no external eyes and long setae; antennae 3-6 or 3-segmented, ocipital apophyses elongated, either divided or entire. Thorax with well-developed phragmata; monotonous phragma connected across dorsum, usually enclosing notal pit; no external plate present. Legs: Mid and hindlegs large and similar in size and shape, with tibial claw; tibial thumb elongate, with several short, blade-like peg-like apical setae;
foregut small and slender, with acuminac claw except in Echinophthiridae which have large foregut similar to mudlugs. Abdomen comprises mesentaria of heath or leathery with numerous plates and usually with various types of setae including pegs and scales; 6 species, small and of distinctive type, each with a long, slender dorsal abdominal chamber and a long, slender appendage. Genus: \( \text{d} \) with large basal spines and well-developed parameres; pseudosetulae \( U \) or \( V \) long, \( V \) often acutely pointed, \( \bar{V} \) none and no genal lobe; genal plate poorly developed; no distinct \( \text{e} \) spines; \( \text{f} \) spines present; vagina surmounted by thick patches of long setae.

Type-genus: Echinophthirius Gietschel, 1871. [Type-species: \( \text{E. heretius} \) (Ollers)].

**Key to Genera of Echinophthiridae**

1. Antennae 3-segmented; on \( \text{luna} \) (river otter)...
   - **Echinophthirius** Kim & Emerson
   - **Lag transpose** Kim & Emerson
   - **Antarcticophthirius**
   - **Lepidophthirius**

2. Foregut small and slender, with acuminac claw, completely different from other legs...
   - **Legs** all of same size and shape, with stout claws; on phocine Phocidae (various seals)...
   - **Echinophthirius** Gietschel

3. Abdomen without scales; \( \bar{V} \) with genal setae horizontally arranged; \( \bar{U} \) pseudosetula \( U \)-shaped, antennae 4-segmented; on Callianassus, Antennophthirius (for seals) and occasionally Varitopus (sea hounds)...
   - **Prochinophthirius** Econis

Abdomen with scales and pegs in addition to regular setae; \( \bar{U} \) pseudosetula \( V \)-shaped or not focally apical...

4. Body moderately slender; heire ther than those of other Echinophthiridae, adult antennae 3-segmented; thorax narrowly connected to abdomen; with patches of genital setae convergingly arranged; \( \bar{U} \) pseudosetula on a wide range of Phocidae...
   - **Antarcticophthirius** Econis
   - **Lepidophthirius** Econis

**Note on evolution of Echinophthiridae**

The life of the Echinophthiridae are exclusively parasitic on aquatic carnivores, namely Pinipedia and aquatic Mustelidae. They are highly specialized and have unique morphological traits which are not found in other groups of Anoplophora. Morphological adaptation is striking in spiketails, setae and abdomen. The spicular structure is highly modified with an elongated atrial tube and a sophisticated closing apparatus, and the abdomen is completely membranous and covered with various types of setae; namely, plumose setae, spiniform setae, pegs and scales (Kim 1971). This morphological uniqueness must be an evolutionary manifestation of the continuous selection and adaptation by the sucking lice of the aquatic carnivores to 2 contrasting environments.

The Echinophthiridae are quite host-specific. Prochinophthirius is found exclusively on the Arctocephalinae (fur seals), and Echinophthirius is exclusively parasitic upon the phocine Phocidae. Lepidophthirius is found on the monachine Phocidae. Antarctophthirius is the most diverse genus and includes 6 known species from a wide range of pinniped hosts (Kim et al. 1974). Lag transpose is the only species known from Labra condensata, the manateel known to harbor sucking lice.

Because of the behavior of pinnipeds, loose transmission is rather difficult between 2 host species. There is very little opportunity for 2 seals or 2 different pinniped species to come in contact with each other (Kim 1974). On land, pinnipeds occupy their distinct territory for each species and aggregate exclusively in their territory, although occasional interspecies contacts are possible.

These facts on morphological traits, host specificity and loose transmission strongly suggest that the echinophthirid species must have evolved with the pinnipeds and aquatic fissipeds, after the ancestral carnivores ventured into aquatic habitats. Unquestionably, this biological specialization is the result of adaptation to the aquatic environment by the Echinophthiridae, as the sucking lice are essentially terrestrial insects.

Hopkins (1949) defined primary infestations as those which date back at least from the period when the group of hosts diverged from the ancestral stock.

In primary infestations almost every member of a given group of mammal is infested with lice closely related to those found on other members of the group. Secondary infestations, according to Hopkins, comprise those infestations originating after divergence of a host group from its parent stock. Hopkins also discussed at length the concept of secondary absence. This refers to instances whereby in a given group of hosts the distribution of parasites which at some time in the past was widespread is now discontinuous, resulting from extinction of the parasite throughout some or a majority of its host range.

Although Hopkins speculated that the lack of "indigenous" lice on land carnivores represents a secondary absence of what was once a primary infestation in the Carnivora, there has been no previous corroborative evidence to support his view. In view of the difficulty of loose transmissions among different host species and the likelihood of contact between pinnipeds and terrestrial mammalian hosts, the forerunners of the Echinophthiridae can be presumed to have originated on the fissiped ancestors of seals before they adopted a marine life. The linking of a new pinniped louse on an aquatic fissiped carnivore lends support to the thesis that the Echinophthiridae are the highly specialized descendants of a group of ancient primary parasites of the Carnivora, and that the absence of this group on land fissipeds is a case of secondary absence.

**Lag transpose**, which are occasionally found on the Canidae, are primary parasites of the Artiodactyla. Of 49 known species of Lag transpose, only 4 species are found on the Canidae, and thus the occurrence of Lag transpose on the Canidae must also be considered secondary and rather recent.

**Prochinophthirius** is the most generalized taxon among 12 species of the Echinophthiridae. This louse lacks typical scales, although spiniform setae and pegs are present. Prochinophthirius, as exemplified by **P. fluctus**, differs from other echinophthirid species by inhabiting the fur and underfur, essentially equivalent to a terrestrial environment. The generalized morphology and specific habitat preference strongly suggest that Prochinophthirius may be the most primitive group of the known echinophthirid species. Furthermore, the fur seals are considered the most primitive otarid seals (Kim et al. 1974).

**Lag transpose** has 3-segmented antennae, which is unique among echinophthirids, and lacks a distinct natal pit. Although many morphological features are similar to those of Antarctophthirius, it is uncertain at this time whether Antarctophthirius is a descendent of Prochinophthirius or Antarctophthirius stock or of entirely different lineage with convergent morphological similarities.

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**Literature Cited**


