



Review of the systematics, biology and ecology of lice from pinnipeds and river otters (Insecta: Phthiraptera: Anoplura: Echinophthiriidae)

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Abstract

We present a literature review of the sucking louse family Echinophthiriidae, its five genera and twelve species parasitic on pinnipeds (fur seals, sea lions, walruses, true seals) and the North American river otter. We give detailed synonymies and published records for all taxonomic hierarchies, as well as hosts, type localities and repositories of type material; we highlight significant references and include comments on the current taxonomic status of the species. We provide a summary of present knowledge of the biology and ecology for eight species. Also, we give a host-lice list, and a bibliography to the family as complete as possible.

Key words: Phthiraptera, Anoplura, Echinophthiriidae, *Echinophthirius*, *Antarctophthirus*, *Lepidophthirus*, *Proechinophthirus*, *Latagophthirus*, sucking lice, Pinnipedia, Otariidae, Odobenidae, Phocidae, Mustelidae, fur seals, sea lions, walruses, true seals, river otter

Introduction

Among the sucking lice (Anoplura), the family Echinophthiriidae is the only family with species adapted to live on pinnipeds—a mammalian group that includes fur seals and sea lions (Otariidae), walruses (Odobenidae), and true seals (Phocidae) (Durden & Musser 1994a 1994b)—as well as on the North American river otter (Kim & Emerson 1974). Currently, the Echinophthiriidae comprises 5 genera and 12 species (see below).

Echinophthiriids have developed unique morphological adaptations to cope with the amphibious lifestyle of their hosts. All species possess (i) prehensile tibio-tarsal claws in the second and third pairs of legs adapted to grasping onto hairs firmly; (ii) a membranous abdomen that allows gas exchange, particularly underwater; and (iii) abdominal spiracles with a sophisticated closing device that preserves atmospheric air and prevents water entering the body during the host's immersions (Kim 1975). Morphological and biological traits and host specificity of echinophthiriids suggest that the lice must have coevolved with their hosts during the colonization of the marine environment (Kim 1975, 1985; Kim *et al.* 1975).

Studies on ecology and life cycles of echinophthiriids flourished in the 1960s–1970s, focusing on five species: two from seals—*Lepidophthirus macrorhini* and *Antarctophthirus ogmorhini* (Murray 1958, 1964, 1967; Murray & Nicholls 1965; Murray *et al.* 1965), two species from the northern fur seal—*Antarctophthirus callorhini* and *Proechinophthirus fluctus* (Kim 1971, 1972, 1975), and one from the Cape fur seal—*Proechinophthirus zumpti* (Kim 1979). Recently, Aznar *et al.* (2009) and Leonardi *et al.* (2011, 2012b) studied the ecology of *Antarctophthirus microchir* from the South American sea lion, as well as its morphology in detail (Leonardi *et al.* 2009, 2012a).

The systematics and ecology of Echinophthiriidae have not been reviewed since the 1970s and need to be re-evaluated through a modern approach. A checklist of all 12 species is provided below, as a first step towards a revision. In addition, literature records, hosts, type localities, type material, comments on current taxonomic status, and references to biological and ecological studies are provided for each species.

The taxonomy and nomenclature of the lice follow Durden & Musser (1994a), and those of the hosts follow Reeves *et al.* (2002), with the exception of the Galápagos sea lion which we regard as a full species (*Zalophus*