

A new species of *Limnohalacarus* (Acari: Halacaridae) from India

by Tapas CHATTERJEE & Cheon Young CHANG

Abstract

A new species of genus *Limnohalacarus* (Acari, Halacaridae) viz. *L. kakinadus* is described from the brackish waters of Kakinada Bay, Andhra Pradesh, India. The present species is closely allied with *L. cultellatus* VIETS, *L. inopinatus* FAIN & LAMBRECHTS and *L. australis* BARTSCH. Morphological similarities and dissimilarities among them are discussed. This is the first record of genus *Limnohalacarus* from India.

Key words: Acari, Halacaridae, *Limnohalacarus*, brackish water, India, new species.

Résumé

Une nouvelle espèce d'Halacaridae du genre *Limnohalacarus* (Acari, Halacaridae) viz. *L. kakinadus* est décrite de l'eau saumâtre Kakinada Bay, Andhra Pradesh, l'Inde. L'espèce est étroitement liée à *L. cultellatus* VIETS, *L. inopinatus* FAIN & LAMBRECHTS et *L. australis* BARTSCH. Des similarités morphologiques et les dissimilarités entre eux ont été discutées. Cette espèce est la première du genre *Limnohalacarus* en Inde.

Mots-clés: Acariens, Halacaridae, *Limnohalacarus* de l'eau saumâtre, l'Inde, nouvelle espèce.

Introduction

Halacarid mites are predominantly known from sea, but about 60 species have been found from freshwaters or brackish waters like saline lakes and estuaries. *Limnohalacarus* is the representative non-marine halacarid genus. In the present paper we describe a new species of the genus, *L. kakinadus*, collected from the Kakinada Bay, Andhra Pradesh, India. Kakinada Bay, named after the adjoining town Kakinada on the east coast of India, is a shallow water body surrounded with bars, and bound on the south with dense mangrove vegetation and extensive mud flats intercepted by network of tidal creeks, estuarine gullies and swamps, emanating from the Godavari River to the Bay of Bengal. This area is subjected to the considerable human interventions owing to agricultural practices, shrimp farming, industrialization and urbanization of the area. The sampling area was very near the confluence point of Gaderu River (a tributary of the

Godavari River) and Kakinada Bay. This is the first report of this genus from India.

Materials and methods

Materials examined in the present study were collected from the tidal flats of Kakinada Bay near the confluence point of Gaderu River, India by Dr. C. Annapurna. Samples were filtered through a nylon net (64 µm in pore diameter) after anesthetizing with 7% MgCl₂ solution for about 30 minutes, and then fixed and stored in 80% ethanol.

Halacarids were cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared using a camera lucida under a differential interference contrast microscope (Olympus BX 51) with Nomarski optics. Type specimens are deposited in the Department of Biology, Daegu University, Korea.

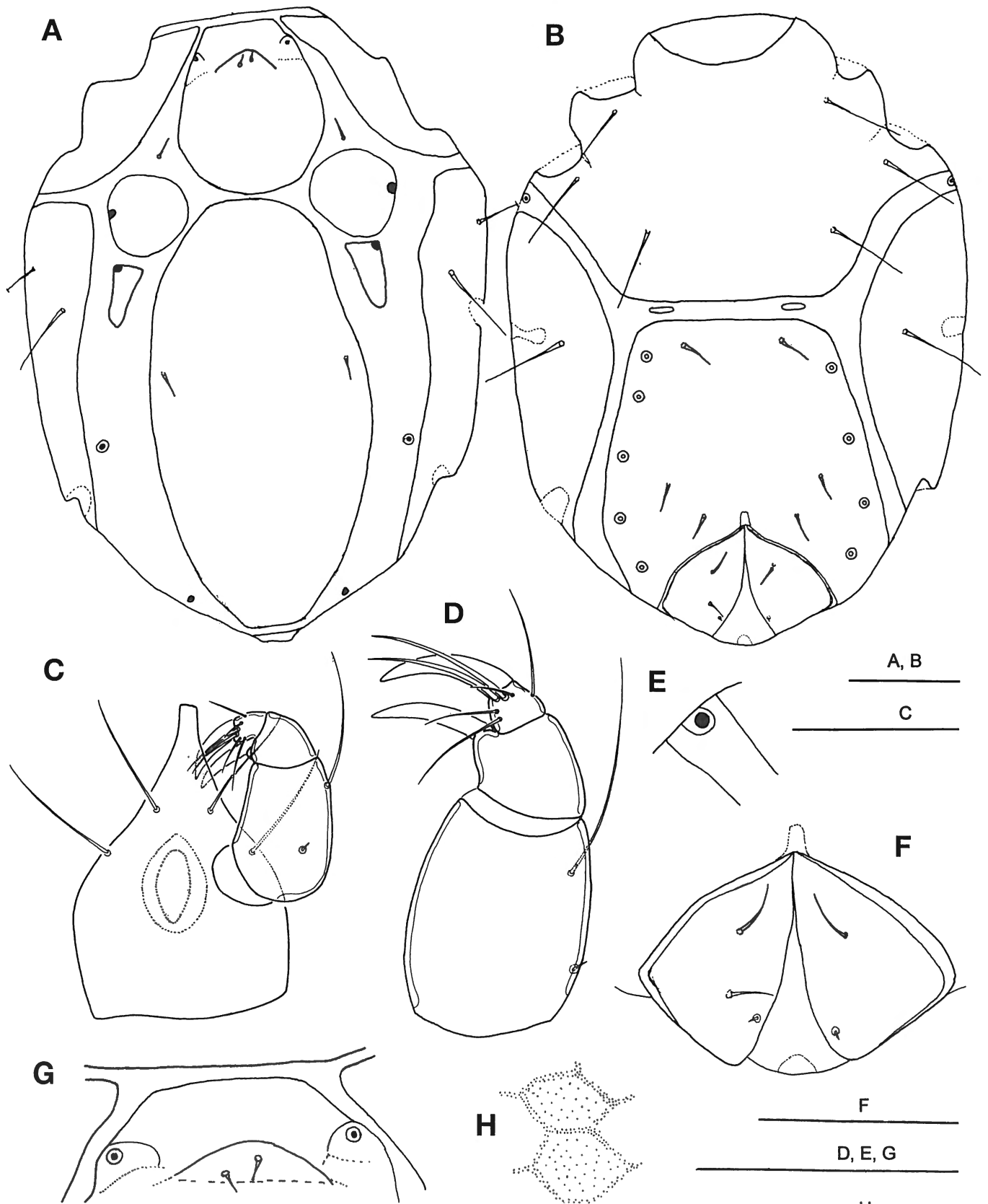
Used Abbreviations: AD – anterior dorsal plate; AE – anterior epimeral plate; GA – genitoanal plate; GO – genital opening; mc – membranous cuticle between different plates; OC – ocular plate; POC – post ocular plate; PD – posterior dorsal plate; PGS – perigenital setae; PE – posterior epimeral plate; P₁₋₄ – first to fourth palpal segment; SGS – subgenital setae.

Taxonomic part

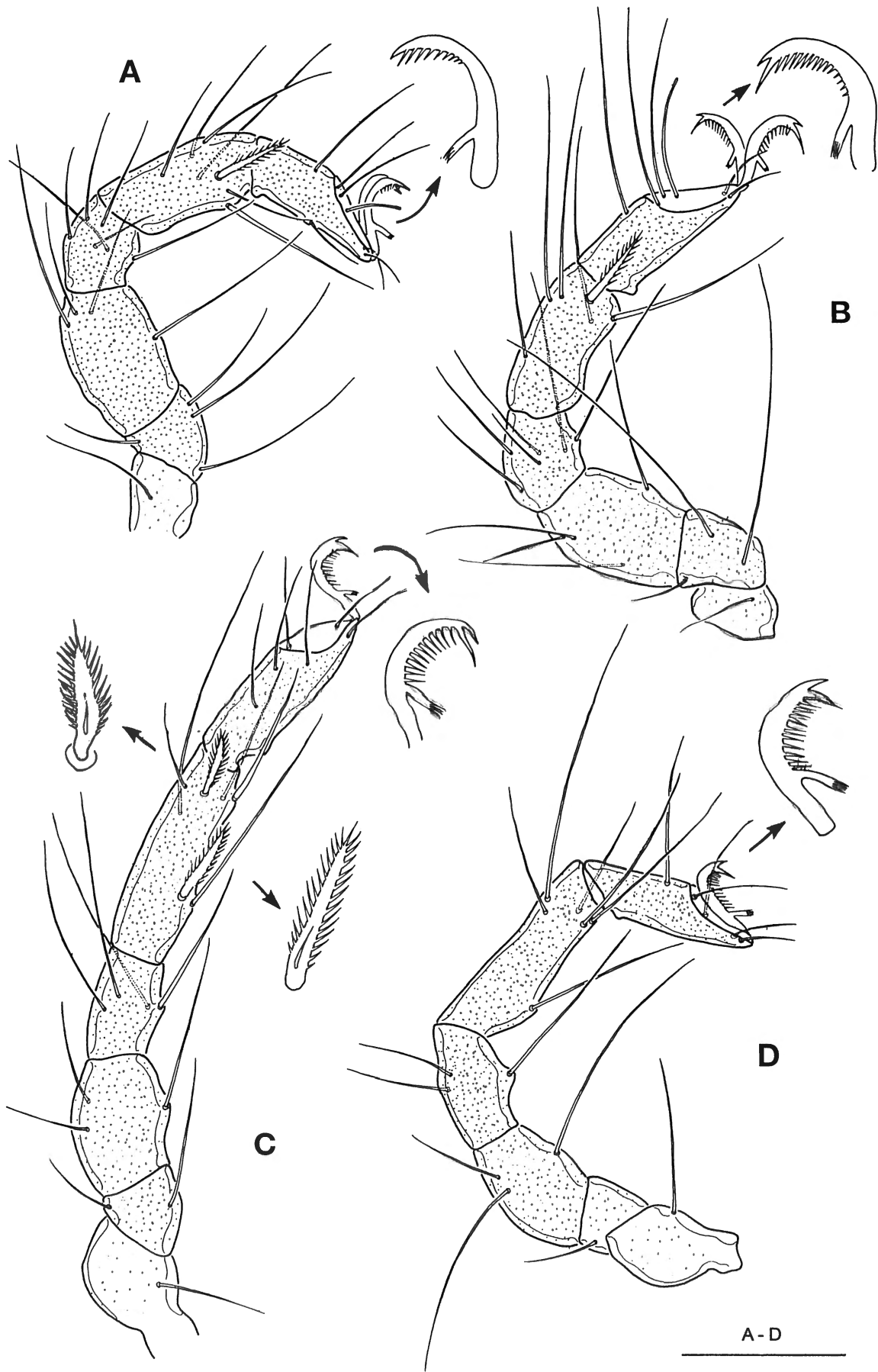
Family Halacaridae MURRAY 1877
Subfamily Limnohalacarinae VIETS 1927
Genus *Limnohalacarus* WALTER 1917
Limnohalacarus kakinadus sp. n.
(Figs. 1a-h, 2a-d)

MATERIAL EXAMINED: Holotype female (DB00032) and a paratype female (DB00033), Kakinada Bay (salinity 14.4‰), Andhra Pradesh, India, 20 November 1998, leg. C. Annapurna.

ETYMOLOGY: The specific name is taken after the Kakinada Bay, where the samples were collected.



Figs. 1A-H — *Limnohalacarus kakinadus* sp. n., female. A. idiosoma, dorsal. B. idiosoma ventral. C. gnathosoma (one side of palp not shown). D. magnified view of P₂-P₄. E. marginal gland pore on the distal area of mc between AE and PE. F. GO. G. magnified view of anterior portion of AD. H. portion of reticulation on PD. (scale bars = 50 μm).



Figs. 2A-D *Limnohalacarus kakinadus* sp. n., female. A-D. legs I-IV. (scale bar = 50 μ m)

DESCRIPTION: *Female holotype*: Idiosoma (Fig. 1a) 285 μm long, 208 μm wide. Six dorsal plates consisting of 1 AD, 2 OC, 2 POC, 1 PD. AD 77 μm long, 68 μm wide. Elevated crest present on AD anteriorly, with a pair of small setae (Figs. 1a, g). Pair of gland pores at anterolateral side of AD, just above level of elevated crest. Posterior part of AD after elevated area reticulated. OC 43 μm long, 39 μm wide on one side, while 43 μm long, 43 μm wide on other side; with a gland pore near lateral margin (Fig. 1a). POC 32 μm long, 16 μm wide on one side, while 32 μm long, 19 μm wide on other side; gland pore locating at anterolateral corner. Dorsal gland pore on mc just above level of insertion of leg IV and at posterior side of idiosoma. PD 194 μm long, 101 μm wide, about 1.9 times longer than wide. PD and OC covered with polygonal reticulation of fine pores (Fig. 1h). Paired setae present on mc between AD and OC. Pair of small setae near lateral margin of PD between level of insertion of legs III and IV.

Idiosoma 269 μm long, measuring from ventral side. AE, PE and GA separated (Fig. 1b). All ventral plates uniformly porose. AE 109 μm long and 186 μm wide. AE with 3 pairs of long setae. Epimeral process not developed. PE with 1 long ventral, 1 dorsal and 1 marginal setae. GA 146 μm long, 130 μm wide. GA bearing 5 acetabulae (suckers) on right side and 4 acetabulae on left side along lateral margin. GO 66 μm long, 79 μm wide. Distance between anterior end of GO to that of GA 93 μm , about 1.4 times GO length. Three pairs of PGS present: 1 pair near anterior margin of GA, other 2 pairs just anterior to GO. Two SGS situated on right sclerite and 1 SGS on left sclerite of GO (Fig. 1f). Pair of small platelets present on mc between AE and GA (Fig. 1b). Gland pore present marginally on mc between AE and PE, from the ventral view (Figs. 1b, e). Pair of adanal setae seen ventrally.

Gnathosoma (Fig. 1c) 93 μm long and 65 μm wide (length to width ratio about 1.4). Tip of rostrum narrow and truncate. Pair of long maxillary setae at base of gnathosoma; pair of long setae at posterior half of rostrum; pair of minute setae at tip of rostrum. Palp consisting of 4 segments. P₁ without any seta. P₂ thick, 46 μm long and 33 μm wide, with 1 long distal seta and 1 small proximal seta dorsally (Fig. 1d). P₃ 19 μm long, with 1 stout spine distoventrally, 21 μm long. P₄ short with 1 long distal spine, 3 slender setae at basal half, 1 small lateral seta and 2 thick long setae just proximal to distal spine.

Chaetotaxy of legs: trochanter 1-1-1-1; basifemur 4-3-2-1; telofemur 4-4-3-3; patella 6-6-4-3; tibia 7-6-7-6; tarsus 7-6-6-5. All leg segments ornamented with fine pores. Tibiae I and II each with 1 pectinate seta (Figs. 2a, b). Tibia III with 2 ventromedial pectinate setae (Fig. 2c). All setae of tibia IV smooth (Fig. 2d). Tarsus I with 3 long dorsal setae, 1 solenidion (16 μm long), 1 ventral seta and 2 PAS. Tarsus II with 3 dorsal setae, 1 solenidion (34 μm long), and 2 PAS, devoid of any ventral seta. Tarsus III with 4 dorsal setae and 2 PAS, the distance between two basal dorsal setae little less than height of tarsus. Tarsus

IV with 3 dorsal setae and 2 PAS. All tarsi with a small protuberance proximoventrally. All legs with 2 lateral claws. Claws of tarsus I furnished with about 8-10 small pectines distoventrally, and proximally with 2-3 pectines fusing into a tooth-like elongation. Claws of tarsi II-IV bidentate; ventrally with about 14 pectines on claws of tarsus II and 10-13 well developed pectines on claws of tarsi III and IV; proximally with 3-4 pectines fusing into a tooth-like elongation; pectines on claws of tarsi III and IV more developed than in tarsus II.

Variability: Two SGS present on right sclerite and 1 SGS on left sclerite of GO in the holotype, while both sclerites with 2 SGS in the paratype. In paratype female, idiosoma 277 μm long; PD 186 μm long, 109 μm wide (length to width ratio of PD 1.7).

Differential diagnosis and discussion

Total 12 species have been recognized in the genus *Limnohalacarus*, viz. *L. africanus* WALTER, 1935 from western Africa (WALTER, 1935; GREEN et al., 1974), *L. australis* BARTSCH, 1999 from western Australia (BARTSCH, 1999), *L. billabongis* BARTSCH, 1999 from Kakadu National Park, Northern Territory of Australia (BARTSCH, 1999), *L. capernaumi* PETROVA, 1966 from Israel (PETROVA, 1966), *L. cultellatus* VIETS, 1940 from Caribbean area (VIETS, 1940; BARTSCH, 1984), *L. fontinalis* WALTER & BADER, 1952 from central Africa (WALTER & BADER, 1952; BADER, 1967; GREEN, 1984), *L. inopinatus* FAIN & LAMBRECHTS, 1987 from South America (FAIN & LAMBRECHTS, 1987; BARTSCH, 1996), *L. lanae* GREEN, 1976 from Crater Lake of Java (GREEN, 1976), *L. major* BADER, 1968 from central Africa (BADER, 1968), *L. mamillatus* FAIN & LAMBRECHTS, 1987 from South America (FAIN & LAMBRECHTS, 1987; BARTSCH, 1996), *L. portmanni* BADER, 1967 from central Africa (BADER, 1967; GREEN, 1984) and *L. wackeri* (WALTER, 1914) from Europe (WALTER, 1914; GREEN & MACQUITTY, 1987).

These twelve species are clearly divided into two groups by the number and composition of dorsal plates as follows: a group of *L. africanus*, *L. australis*, *L. capernaumi*, *L. cultellatus*, *L. inopinatus*, *L. major* and *L. wackeri* with six dorsal plates (1 AD, 2 OC, 2 POC and 1 PD) and another group of *L. billabongis*, *L. lanae*, *L. portmanni*, *L. fontinalis* and *L. mamillatus* with four dorsal plates (1 AD, 2 OC and 1 PD). The present new species belongs to the first group.

Among the seven species with six dorsal plates, *L. major* is much bigger (465 μm long) than other congeners, and its POC are closely attached with OC, while *L. kakinadus* sp. n. is rather small (277-285 μm), and POC are clearly separated from OC. Adult female of *L. africanus* has 8-12 genital acetabulae on each side of GA, while *L. kakinadus* has 4 or 5 acetabulae on each side of GA. *Limnohalacarus kakinadus* differs from *L. wackeri* and *L. capernaumi* in having a pectinate seta on tibiae I

and II, a tooth-like elongation on all claws, and three pairs of PGS and two pairs of SGS in female, while *L. wackeri* and *L. capernaumi* do not have any pectinate seta on tibiae I and II and tooth-like elongation on claw I, and possess more than five pairs of PGS and four pairs of SGS in female.

In having the character combination of OC clearly separated from POC, all ventral plates separated, three pairs of PGS and two pairs of SGS in female, and tibiae I-III with 1-2 pectinate setae, *L. kakinadus* is closely allied with *L. cultellatus*, *L. inopinatus* and *L. australis*. However, the present species differs from them on the following points. Length ratio of PD to AD is about 2.51 in *L. kakinadus*, while about 2.74 in *L. cultellatus*, about 2.53 in *L. inopinatus* and about 2.35 in *L. australis*. Elevated crest on AD is well developed in *L. kakinadus*, while such crest is absent in *L. cultellatus*. Dorsal setae of AD are apart from anterior margin in *L. kakinadus*, but closer in *L. cultellatus* and *L. inopinatus*. Each polygon of reticulation on dorsal plates is subdivided in *L. australis*, while not subdivided in *L. kakinadus*. Females have nine genital acetabulae in *L. kakinadus*, while 14 in *L. inopinatus* and 17 in *L. australis*. Platelets are found on mc between AE and GA in *L. kakinadus*, while such platelets are absent in *L. inopinatus*. *Limnohalacarus kakinadus* has wider GO than *L. cultellatus*. Tibia IV of *L. inopina-*

tus contains a finely pectinate (or plumose) seta, while all setae are smooth in *L. kakinadus*. Claws of leg I are equipped with 2-3 small pectines distoventrally in *L. australis*, 3-4 in *L. cultellatus*, 5-6 in *L. inopinatus*, while about 8-10 in *L. kakinadus*. Pectines of claws II-IV are more stout and longer in *L. kakinadus* than in *L. cultellatus*. Claws of leg II are furnished with about 7-8 pectines ventrally in *L. cultellatus* and *L. inopinatus*, while about 14 in *L. kakinadus*. Claws of legs III-IV of *L. cultellatus* possess about 5-6 pectines ventrally (cf. VIETS, 1940, Fig. 10 III, IV), and about 7 in *L. inopinatus*, while about 10-13 in *L. kakinadus*. Pectinate setae on tibia III are much stronger and thicker in *L. kakinadus* than in *L. cultellatus*.

Acknowledgments

Thanks are due to Dr. C. Annapurna, Andhra University, India, for collection and sending material to the first author (TC). A special word of thanks to Dr. Ilse Bartsch, Forschungsinstitut Senckenberg, Germany for her helpful comments that greatly improved the manuscript. We are also thankful to Dr. Ji Min Lee, Daegu University, Korea; Dr. Ivano Morselli, Università di Modena e Reggio Emilia, Italy; Dr. G.W. Krantz, Oregon State University, USA; Dr. Hiroshi Abé, Nihon University, Japan and Dr. Marleen De Troch, University of Ghent, Belgium, for their moral support. The first author is indebted to the Brain Pool Program of KOSEF, Korea.

References

- BADER, C., 1967. *Limnohalacarus portmanni*, eine neue Süßwasserhalacaride aus dem Tanganika-See. *Revue Zoologie et de botanique Africaines*, 75: 275-281.
- BADER, C., 1968. Wassermilben aus Zentralafrika. *Annales du Musée royal de l'Afrique central, Ser. A*, 163: 50.
- BARTSCH, I., 1984. Halacaridae (Acari) von den westindischen Inseln. *Bijdragen tot de Dierkunde*, 54: 185-196.
- BARTSCH, I., 1996. Halacarids (Halacaroida, Acari) in freshwater. Multiple invasions from the Paleozoic onwards? *Journal of Natural History*, 30: 67-99.
- BARTSCH, I., 1999. Two new freshwater mites of the genus *Limnohalacarus* (Halacaridae: Acari) from Australia. *Records of the Western Australian Museum* 19: 443-450.
- FAIN, A. & LAMBRECHTS, L., 1987. Observation on the acarofauna of fish aquariums. II. A new oribatid and two new halacarid mites. *Bulletin et Annales de la Société royale entomologique de Belgique*, 123: 103-118.
- GREEN, J., CORBET, S.A. & BETNEY, E., 1974. Ecological studies on crater lakes in West Cameroon. Debundsha Lake. *Journal of Zoology*, 173: 199-223.
- GREEN, J., 1976. A new species of *Limnohalacarus* (Acari: Halacaridae) from a crater lake in Java. *Journal of Zoology*, 178: 279-284.
- GREEN, J., 1984. The occurrence of *Limnohalacarus* (Acari: Halacaridae) in Lake NO, White Nile. *Hydrobiologia*, 110: 135-136.
- GREEN, J. & MACQUITTY, M., 1987. Halacarid mites (Arachnida: Acari). *Synopsis of the British Fauna (New Series)*, 36: 1-178.
- PETROVA, A., 1966. Deux nouveaux halacariens d'Israel – *Limnohalacarus capernaumi* n. sp. et *Lohmannella heptapegoni* n. sp. *International Journal of Speleology*, 2: 355-362.
- VIETS, K., 1940. Zwei neue Porohalacaridae (Acari) aus Südamerika. *Zoologischer Anzeiger*, 130: 191-201.
- WALTER, C., 1914. Notizen über die Süßwasserformen der Halacariden nebst Beschreibung einer neuen Art. *Archiv für Hydrobiologia*, 9: 277-285.
- WALTER, C., 1935. Hydracarina, in voyage de Ch. Alluad et P.A. Chappuis en Afrique occidentale française (Dec. 1930 - Mars 1931). *Archiv für Hydrobiologia*, 28: 69-136.
- WALTER, C. & BADER, C., 1952. Mission scientifique de l'Omo. Hydracarina. *Mémoires du Muséum nationale d'histoire naturelle, sér. A*, 4: 87-236.

Tapas CHATTERJEE

Department of Biology, Indian School of Learning, I.S.M. Annexe, P.O. - I.S.M., Dhanbad-826004, Jharkhand, India
(E-mail: drtchatterjee@yahoo.co.in)

Cheon Young CHANG

Department of Biology, College of Natural Sciences, Daegu University, Gyeongsan, 712-714 Korea
(E-mail: cychang@daegu.ac.kr)