

***Hoplopleura ramgarh* sp.nov.
and *Hoplopleura sinhgarh* sp.nov. (Anoplura: Hoplopleuridae),
parasitizing *Mus* spp. (Rodentia: Muridae) in India**

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Two new species of the genus *Hoplopleura* described here were collected during our studies on the distribution of haematophagous arthropods in India. *Hoplopleura ramgarh* sp.nov. was collected from *Mus platythrix* Bennett, 1932, in the Western Himalayan region of Uttar Pradesh, Himachal Pradesh, Jammu and Kashmir States, and from some localities along the Western Ghats in Maharashtra State. *Hoplopleura sinhgarh* sp.nov. was collected from an undetermined species of the genus *Mus* (henceforth referred to as *Mus* sp.), along the Western Ghats in Maharashtra State. Both *Mus platythrix* and *Mus* sp. are closely related and have an overlapping distribution in the Western Ghats. While a detailed study of the hosts is in progress and is likely to take some time, it is felt necessary to describe these two interesting new Hoplopleurid lice which can be easily differentiated on the basis of morphological characters.

In the following descriptions, all measurements are given in millimetres. The terminology used for head chaetotaxy is based on Kim's (1965) work, with slight modifications (Fig. 5). The illustrations were prepared with the help of camera lucida from unstained specimens mounted on slides in Canada balsam.

Both the species are named after the localities where the holotypes were collected.

DESCRIPTIONS

***Hoplopleura ramgarh* sp.nov.**

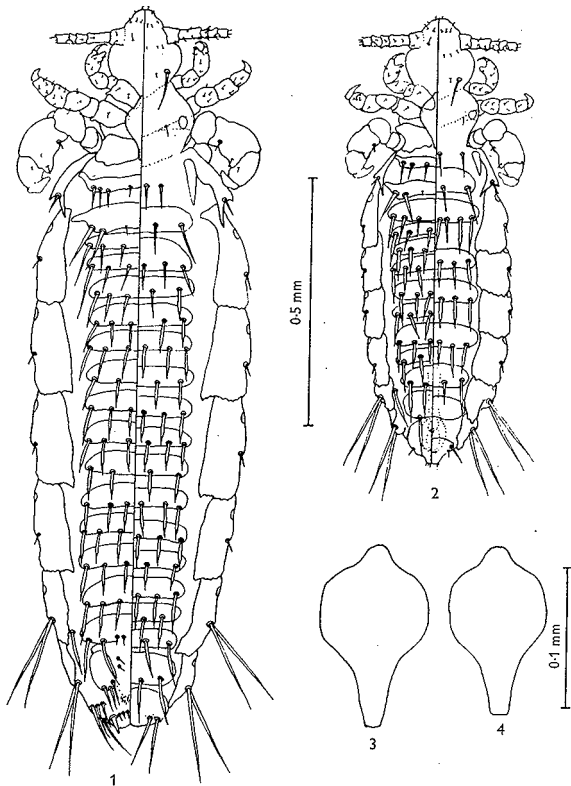
(Figs. 1-9)

Female (Figs. 1, 3, 5, 6, 8)

Total body length 1.43; range 1.28-1.52 (10 specimens).

Head (Fig. 5). Approximately 1.3 times as long as wide; postantennal region 0.8 times as long as wide; postantennal angles rounded. Antennae 5 segmented with contiguous sensoria. Preantennal region with 7 pairs of setae dorsally (OS 6 pairs, in 2 rows; PAS 1 pair), 5 pairs ventrally (CS 1 pair, VOS 4 pairs). Antennal region without AS; VPHS of medium length. Postantennal region with 10 pairs of setae, all dorsal (PoAS, OSHS, ISHS, ACHS, PDHS, ADHS and PCHS one pair each, MHS 3 pairs). PoAS present on postantennal angles. ADHS set well apart from PDHS.

Thorax. Sternal plate (Fig. 3) 0.13 long, 0.08 wide; pear-shaped, with a small

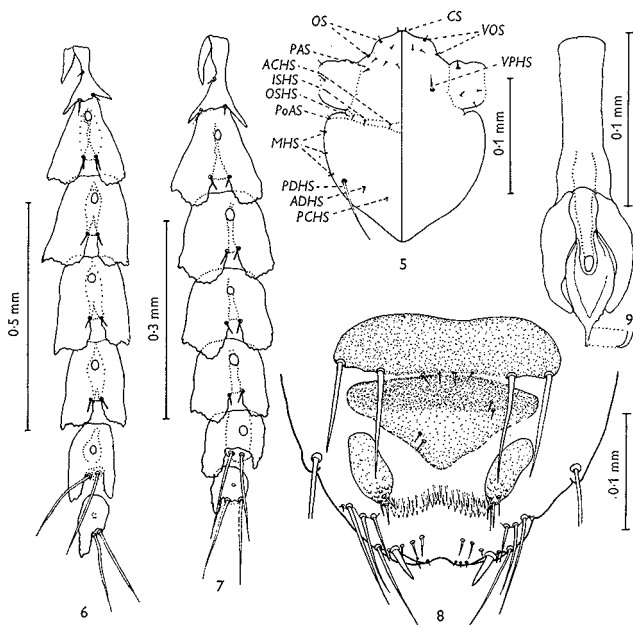


Figs. 1-4. *Hoplopleura ramgarhi* sp. nov. 1, Female, ventral and dorsal views. 2, Male, ventral and dorsal views. 3, 4, Thoracic sternal plates. 3, Female. 4, Male.

narrowly rounded process anteriorly and a longer tapering process posteriorly, truncated at tip. A pair of small, distinct lateral setae on mesonotum.

Legs. First pair smallest, claws slender and curved; second pair longer, claws strong but pointed; third pair large and robust, claws broad and flattened, bluntly pointed.

Abdomen. Dorsal. Segment II without distinct tergite; two pairs of dorsal setae. Segments III-VII with three tergites each, having 4-6 sword-shaped setae near posterior margin of each. Segment VIII with a single broad tergite, having 4 setae near posterior margin. Terminal segment with indistinct tergite, having 2 setae



Figs. 5-9. *Hoplopleura ramgarh* sp. nov. 5, Head, dorsal and ventral views. (CS, Clypeal seta; OS, oral setae; VOS, ventral oral setae; PAS, pre-antennal seta; ACHS, anterior central head seta; ISHS, inner sutural head seta; OSHS, outer sutural head seta; PoAS, postantennal head seta; MHS, marginal head setae; PDHS, principal dorsal head seta; ADHS, accessory dorsal head seta; PCHS, posterior central head seta; VPHS, ventral posterior head seta.) 6, 7, Paratergites. 6, Female. 7, Male. 8, Female terminal segments, ventral view. 9, Male external genitalia.

each side. *Ventral*. Segment II with a single narrow sternite, slender lateral extensions produced anterolaterally, articulating with corresponding paratergite; 1 pair of small setae mesially and 3 pairs somewhat longer laterally. Segment III with 4 sternites; first broad with narrow extensions produced laterally, a group of 2 enlarged setae present laterally on each side, and 2 minute setae present mesially; remaining 3 sternites usually with 6 setae each. Segments IV-VI each with 3 sternites, 5 or 6 sword-shaped setae on each. Segment VII with 2 sternites: anterior usually with 6 setae; posterior with 8 setae, outer 2 pairs long, mesial 2 pairs minute; a pair of lateral setae off the plates, between sternite and corresponding paratergite. Remaining sternites modified to form genitalia. *Lateral*. All paratergites (Fig. 6) scaly, particularly towards lobes. Paratergite II with acutely

pointed posterior angles; 1 minute seta along its dorsal margin and 2 setae on posterior cleft, both fall short of posterior angles, dorsal seta slightly longer than ventral. Paratergite III bilobed, with posterior margins serrated, dorsal lobe slightly emarginate, ventral with rounded apex; 2 small setae about half length of lobe present laterally on cleft. Paratergites IV-VI as in III, except that posterior margins of both lobes slightly emarginate with outer angles produced into points. Paratergite VII with ventral lobe narrower, dorsal lobe wider; both setae long. Paratergite VIII with well-developed dorsal lobe, ventral lobe lacking; both setae long.

Genitalia (Fig. 8). Genital plate wide anteriorly, abruptly narrows posteriorly, anterior margin sometimes fused with posterior sternite of segment VII. Two pairs of minute setae inconsistent in position. Gonopods lobed, paired, scaly towards apex, with 3 or 4 setae each. Opening of vulva situated between gonopods, beset with numerous small filamentous processes. A group of 3 long and 1 minute setae situated posterolateral to gonopods each side. Each genital lobe with a tuft of 6 setae: 1 long, 4 minute and 1 enlarged and flattened genital seta.

Anal opening terminal, anal lobes with 3 minute anal setae each side.

Male (Figs. 2, 4, 7, 9).

Total body length 1.01; range 0.92-1.07 (5 specimens).

Head, thorax and legs as in female.

Thoracic sternal plate (Fig. 4) 0.12 long, 0.07 wide.

Abdomen. Dorsal. Segment II without distinct tergite; 2 pairs of dorsal setae. Segment III with 2 tergites; anterior having 4 setae, posterior usually 9 setae. Segments IV-VI with 1 tergite each, having 6-9 sword-shaped setae. Segment VII with 1 tergite, usually having 4 setae. Segment VIII with 1 tergite, without seta. Terminal segment with indistinct tergite, having 1 long and 1 minute setae each side. *Ventral.* Segment II with a single sternite, having slender lateral extensions produced anterolaterally, articulating with corresponding paratergite, usually with 7 setae. Segment III with 3 sternites: first broad, with narrow extensions produced laterally, a group of 2 enlarged setae present laterally on each side, and two minute setae present mesially; second and third usually with 5 or 6 setae. Segments IV-VI each with 2 sternites, 5 or 6 sword-shaped setae on each. Segment VII with a single sternite, usually with 4 setae; a pair of lateral setae off the plates, between sternite and corresponding paratergite. Segment VIII with broad sternite, having 2 setae. Terminal segment with a single seta each side. *Lateral.* Paratergites (Fig. 7) as in female, except that outer angle of lobes of paratergites IV-VI not pointed. Paratergite VIII with ventral lobe small and pointed, dorsal lobe broad and rounded.

Genitalia (Fig. 9). Parameres, thickened near base; pseudopenis pointed towards tip, curved dorsally.

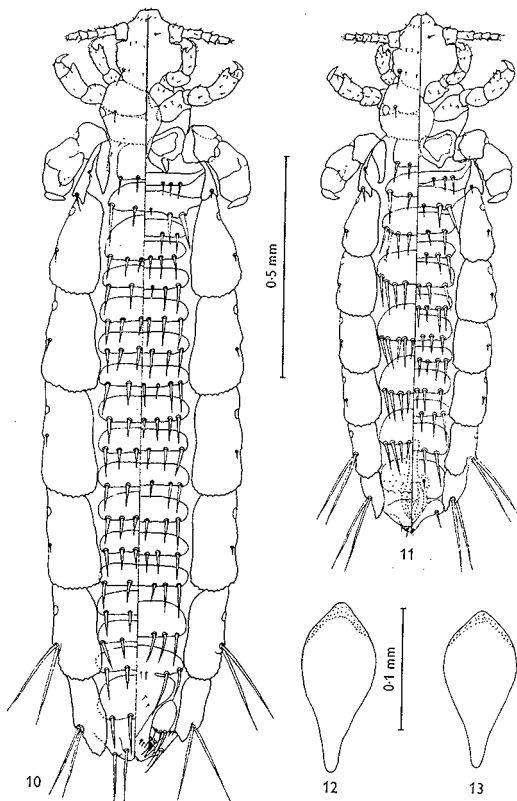
Diagnosis. Close to *H. cooki* Kim, *H. captiosa* Johnson, *H. zelotomydis* Johnson, *H. inexpectans* Johnson and *H. intermedia* Kellogg and Ferris. Both the sexes of *H. ramgarh* sp. nov. can be separated from all these by a combination of following characters. Accessory dorsal head seta (ADHS) set well apart from the posterior dorsal head seta (PDHS); dorsal seta on mesonotum not elongated; paratergite III

Table 1. *Hoplopleura ramgarh* sp. nov. specimens collected from *Mus platythrix* Bennett, 1932

V.R.C. 'A' no.	♂	♀	Locality	District	State	Altitude in metres	Date of collection	Collector
74692	—	2	Narkota (Rudraprayag)	Pauri, Garhwal Tehri,	Uttar Pradesh	760	20. v. 67	HRB
81582	—	2	Muniki Reti	Garhwal	Uttar Pradesh	460	26. x. 67	HRB
81605	—	1*	Ramgarh	Dehradun	Uttar Pradesh	610	29. x. 67	HRB
82239	1	—	Hiranagar	Sirma	Himachal Pradesh	2140	30. x. 67	SMK
88710	—	1	Beradwala	Sirmur	Himachal Pradesh	620	25. xi. 69	SMK
92493	—	2	Phalata	Udhampur	Pradesh Jammu & Kashmir	760	23. xi. 69	HRB, SMK
92542	—	1	Phalata	Udhampur	Jammu & Kashmir	760	27. xi. 69	HRB, SMK
95294	—	2	Khandala	Poona	Maharashtra	680	5. xii. 70	} SMK, ACM
95346	3†	—	Atkarvadi	Poona	Maharashtra	650	20. i. 71	
95348	—	1	Atkarvadi	Poona	Maharashtra	650	20. i. 71	
95608	—	1	Gonaudi	Poona	Maharashtra	650	31. v. 71	
95610	2	3	Gonaudi	Poona	Maharashtra	650	31. v. 71	

* Holotype.

† One specimen of these 3 males selected as allotype.



Figs. 10-13. *Hoplopleura sinhgarrh* sp. nov. 10, Female, dorsal and ventral views. 11, Male, dorsal and ventral views. 12, 13, Thoracic sternal plates. 12, Female. 13, Male.

with two paratergal setae, about half the length of paratergal lobe, placed laterally on anterior edge of median emargination; both paratergal setae of paratergite VII elongated; only one pair of abdominal setae off the plates, between paratergite VII and corresponding sternite.

Type locality. Ramgarh, Dehra Dun district, Uttar Pradesh, India.

Type material. Holotype female (V.R.C. no. A 81605), allotype male (V.R.C.

no. A 95346), paratypes 5 males, 15 females, with data as given in Table 1, deposited in collection of Virus Research Centre, Poona.

Hoplopleura sinhgarrh sp.nov.

(Figs. 10-18)

Female (Figs. 10, 12, 14, 15, 18)

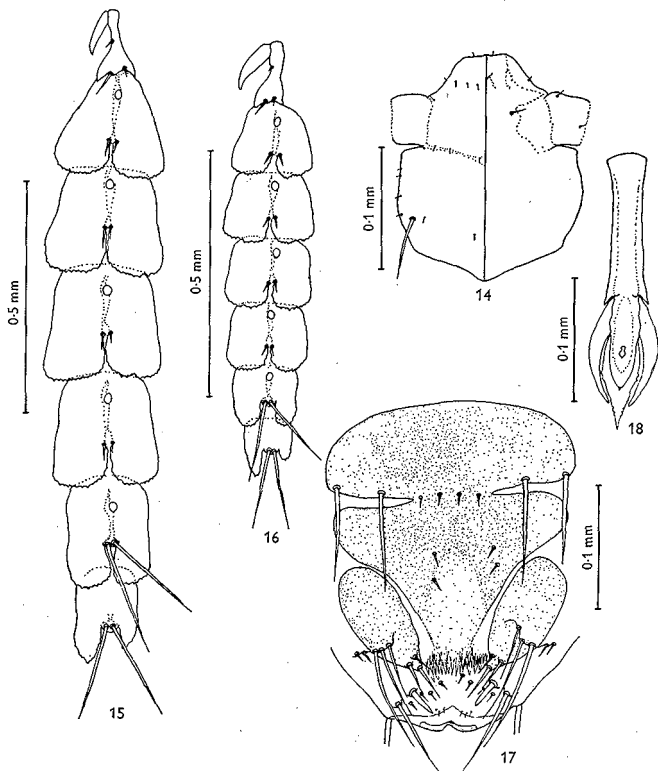
Total body length 1.77; range 1.65-1.89 (10 specimens).

Head (Fig. 14). Approximately 1.3 times as long as wide, postantennal region 0.7 times as long as wide, postantennal angles bluntly pointed. Antennae 5 segmented with contiguous sensoria. Preantennal region with 5 pairs of setae dorsally (OS 4 pairs, PAS 1 pair) and 4 pairs ventrally (CS 1 pair, VOS 3 pairs). Antennal region without AS, VPHS of medium length. Postantennal region with 10 pairs of setae, all dorsal (PoAS, OSHS, ISHS, ACHS, PDHS, ADHS, PCHS, 1 pair each; MHS 3 pairs). ADHS set some distance away from PDHS; PoAS present close to anterior MHS, posterior to post antennal angles.

Thorax. Sternal plate (Fig. 12) 0.14 long, 0.06 wide; narrowly rounded anteriorly, gradually tapering posteriorly, with rounded apex. One pair of small but distinct lateral setae present on mesonotum. *Legs*. as in *H. ramgarrh* sp.nov.

Abdomen. *Dorsal*. Segment II with a distinct tergite, having 4 setae. Segments III to VII with 3 tergites each, having 4 or 5 setae on posterior margin. Segment VIII with a single broad tergite, having 4 setae. Terminal segment with 4 setae near apex on posterior margin. *Ventral*. Segment II with a single narrow sternite, lateral extensions produced anterolaterally, articulating with corresponding paratergite, usually having 6 setae. Segment III with 4 sternites: first broad with narrow extensions produced laterally, a group of two enlarged setae present laterally on each side and 2 minute setae present mesially; remaining 3 sternites usually with 4-6 setae each. Segments IV-VI each with 3 sternites, having 6-8 setae each. Segment VII with 2 sternites: anterior broad, usually with 6 setae; posterior narrow with 8 setae, outer 2 pairs long, mesial 2 pairs minute. Remaining sternites modified to form genitalia. No setae off the plates; all setae narrowly pointed, not sword-shaped. *Lateral*. Paratergites (Fig. 15) scaly all over. Paratergite II with small, bluntly pointed posterior angles; 1 minute seta along its dorsal margin and two setae on posterior cleft, dorsal extends beyond postero-dorsal angle, ventral minute, falls short of posteroventral angle. Paratergites III-VI bilobed, each with 2 setae, set laterally on base of cleft; lobes flattened, posterior margin serrated, angles rounded; dorsal paratergal seta longer than ventral, but not extending more than half length of lobes. Paratergite VII similar to VI in shape, with 2 long setae. Paratergite VIII with both lobes acute, well developed, dorsal longer than ventral; with 2 long setae.

Genitalia (Fig. 17). Genital plate wide anteriorly, gradually narrows posteriorly, anterior margin fused with posterior sternite of segment VII. Gonopods much larger, without scales, with 3 setae each. Opening of vulva situated between gonopods, beset with numerous fine filamentous processes. A group of 3 long and 2 minute setae situated adjoining to posterior half of gonopods, each side. Each genital lobe with a tuft of 6 setae: 1 long, 4 minute, 1 enlarged and flattened genital seta.



Figs. 14–18. *Hoplopleura sinharh* sp. nov. 14, Head, dorsal and ventral views. 15, 16, Paratergites. 15, Female. 16, Male. 17, Female terminal segments, ventral view. 18, Male, genitalia.

Anal opening subterminal, anal lobes with 3 minute anal setae each side.

Male (Figs. 11, 13, 16, 18)

Total body length 1.13; range 1.08–1.20 (10 specimens).

Head, thorax and legs as in female.

Thoracic sternal plate (Fig. 14) 0.12 long, 0.06 wide.

Abdomen. Dorsal. Segment II with a distinct tergite, having 4 setae. Segment III with 2 tergites; anterior having 4 setae, posterior usually 6 setae. Segments IV–VII

Table 2. *Hoplopleura sinhgarh* sp.nov. specimens collected from Mus. sp. in Maharashtra State, India

(Each specimen was collected by SMK and ACM).

V.R.C. 'A' no.	♂	♀	Locality*	Altitude (m)	Date of collection
95345	1	2	Atkarwadi	650	20. i. 71
95347	—	5			
95349	—	1			
95350	—	1			
95351	4†	7			
95353	1	—			
95444	1	3	Sinhgarh	1270	5. ii. 71
95447	—	3			
95452	2	1			
95473	2	—			
95489	2	1	Hirdoshi	680	10. iii. 71
95533	1	2	Gonaudi	650	31. iii. 71
95566	1	—	Gonaudi	650	30. iv. 71
96846	1	1	Sinhgarh	1270	16. x. 70
96850	—	3‡	Sinhgarh	1270	16. x. 70
99035	1	—	Atkarwadi	650	5. vi. 71
99049	2	1	Khandala	680	12. vi. 71
99050	—	1	Khandala	680	12. vi. 71
99056	1	1	Khandala	680	12. vi. 71

* All localities are in the District of Poona.

† One male of these 4 selected as allotype.

‡ One female of these 3 selected as holotype.

with 1 tergite each, having 8 or 9 setae. Segment VIII with 1 tergite having a pair of very minute setae and several small teeth-like projections. Terminal segment with indistinct tergite, having a pair of minute setae on posterior end. *Ventral*. Segment II with a narrow sternite, having lateral extensions produced antero-laterally, articulating with corresponding paratergite, with 6 or 7 setae. Segment III with 3 sternites: first broad, with narrow extension produced laterally, a group of two enlarged setae present laterally on each side and 2 minute setae present mesially; second and third sternites usually with 4-6 setae each. Segments IV-VI each with 2 sternites, 6-8 setae on each. Segment VII, with a single broad sternite, having 4 setae. Segment VIII with a single broad distinct sternite having a pair of minute setae surrounded by several small teeth-like projections. Terminal segment with a distinct seta on each side. No setae off the plates. *Lateral*. Paratergites (Fig. 16) as in female except that both paratergal setae on paratergites III-VI of same size.

Genitalia (Fig. 18). Similar to *H. ramgarh* sp.nov.

Diagnosis. Close to *H. pectinata* (Cumming) and *H. brasiliensis* (Werneck). *H. sinhgarh* sp.nov. can be separated from these two and other closely related species by a combination of following characters: Accessory dorsal head seta (ADHS) set apart from the posterior dorsal head seta (PDHS); dorsal setae on mesonotum not elongated; the shape of tergal abdominal setae not sword-shaped; presence of a distinct tergite on abdominal segment II; paratergite VIII with

dorsal as well as ventral lobes well developed; no setae off the plates between sternites and corresponding paratergites. *H. sinharh* sp.nov. differs from *H. pectinata* by the absence of finger-shaped prolongations or comb on the last tergite of abdomen.

Type locality. Sinharh, Poona District, Maharashtra, India.

Type material. Holotype female (V.R.C. no. A 96850) allotype male (V.R.C. no. A 95351); paratypes 19 males and 32 females with data as given in Table 2. Holotype, allotype and paratypes (17 males and 30 females) are deposited in the collection of Virus Research Centre, Poona, 2 males and 2 females are deposited at Frost Entomological Museum, Pennsylvania State University.

DISCUSSION

Mus platythrix the type host of *H. ramgarh* has a wide distribution extending from West Pakistan in the west through almost the whole of India to Burma in the East (Ellerman, 1961). During our collections we have obtained specimens of *H. ramgarh* from Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh and Maharashtra states. *Mus* sp., the type host of *H. sinharh*, whose taxonomical status is still not decided, is represented in our collections only from Maharashtra state, where it exists in some localities, along with *Mus platythrix*.

The morphological resemblance between the 2 host species is so close that during early stages of our studies both were determined as *Mus platythrix*. The unlikelihood of the fact that two distinct but closely related species of the genus *Hoplopleura* parasitizing the same host species led us to re-examine the skin and skull characters of the host specimens. After a careful study we were able to find some small but consistent characters to differentiate the hosts from which these 2 species of lice were collected.

The important characters to distinguish the two host species are (1) the presence of dark-coloured patches on the dorsal side of hind feet and (2) slightly smaller palatal foramen in *Mus* sp. Considering these small differences in the hosts, the differentiating characters in their lice fauna are considerable. Thus the study of lice fauna has given an indication of two sibling species of mice occurring sympatrically, which otherwise would have gone unnoticed as two distinct species.

SUMMARY

Two new species of the genus *Hoplopleura* are described from two closely related species of the genus *Mus*. *H. ramgarh* sp.nov. was found parasitizing *Mus platythrix* Bennett, 1932, in the Western Himalayan region in North India and in the Western Ghats in Peninsular India. *H. sinharh* sp.nov. was found parasitizing a species of the genus *Mus*, closely related to *M. platythrix*, and occurring sympatrically with it. The exact taxonomical status of this rodent species is still under investigation. The occurrence of two distinct species of lice on closely related sympatric populations of these mice has given an indication of their being two distinct taxa, a fact later supplemented by some consistent but not easily delineable skin and skull characters.

A part of the material for the present study was collected under a scheme of Indian Council of Medical Research for the survey of Haematophagous arthropods in mountain regions of India, under the supervision of Dr T. Ramachandra Rao, former Director of the Virus Research Centre, to whom we are indebted for his help and advice. We are grateful to Dr Ke Chung Kim of Frost Entomological Museum, Pennsylvania, who has confirmed the identity of *Hoplopleura sinhgarrh* as a new species, and to Dr Phyllis T. Johnson, Center for Pathobiology, University of California, for many valuable suggestions. Thanks are also due to Dr Vijai Dhanda, Senior Research Officer, Virus Research Centre, for encouragement and advice.

ADDENDUM

A restudy of the skins and skulls of the rodents indicates that the host of *Hoplopleura ramgarrh* sp.nov. is *Mus (Leggadilla) sadhu* (Wroughon, 1911) and that of *Hoplopleura sinhgarrh* sp.nov. is *Mus (Leggadilla) bahadur* (Wroughton and Ryley, 1913), both of which were considered as subspecies of *Mus platythrix* by Ellerman (1961).

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