SUCKING LICE (ANOPLURA) FROM PAKISTAN MAMMALS, WITH NOTES ON ZOOGEOGRAPHY

I.A. Durden, R. Traub, K.C. Emerson

ABSTRACT: Anoplura collected from wild rodents, insectivores and canids in Pakistan are documented. Twenty-two species of lice were recovered as follows: Hoplopleura (6), Linognathus (1), Neohaeamopterus (1), Polyplax (12). At least 14 of these species are recorded from Pakistan for the first time and some significant range extensions are established. Some of the records pertain to species previously known only from the type series or from other limited collections. Zoogeographically, Pakistan's anopluran fauna has strong Palearctic affinities although elements of this fauna show clear Oriental, Ethiopian or cosmopolitan associations.

Except for records of widespread species or descriptions of new taxa, the sucking lice (Anoplura) of Pakistan are poorly known. This is surprising because contributions documenting the anopluran fauna of adjacent regions in Afghanistan (Smetana and Daniel, 1970), India (numerous papers), Iran (Kim and Emerson, 1971), southern USSR (numerous papers) and the People's Republic of China (numerous papers) are available. Mishra (1981) produced a monograph of the hoplopleurid sucking lice of the Indian subcontinent and included the Pakistan fauna only from the Indus valley eastwards to the Indian border; however, that work principally addressed the Indian fauna and no specific records for Pakistan are given.

This paper provides records of sucking lice from wild land mammals (mainly rodents) obtained in Pakistan from 1962-1979. Most specimens were collected by field teams of the Department of Microbiology, University of Maryland School of Medicine, Baltimore under the direction of Robert Traub. Additional material was collected by Robert G. Tuck, then with the Division of Mammals, National Museum of Natural History (NMNH), Washington, D.C. Collection data for the 22 species of sucking lice recovered during these surveys includes hosts, collection localities, altitude (if available) and dates, followed by remarks. Louse synonyms listed are not new but are important to this study. Host mammal names follow Honacki et al. (1982) and Anoplura classification follows Kim and Ludwig (1978). Louse and host mammal material documented here is deposited in the collections of the NMNH, Washington, D.C.

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1Department of Entomology, Museum Support Center, Smithsonian Institution, Washington, D.C. 20560
2560 Boulder Drive, Sanibel, Florida 33957

Family Hoplopleuridae Ferris

1) Hoplopleura affinis (Burmeister, 1838)
   Specimens examined: (44 collections 397,2539) ex Apodemus sp. (Rodentia, Muridae) HAZARA DIST.: Kabul valley; Soch, Naran. 2430 m and 2615 m, IX,1962, VII,1964, VII,1965 - 29 colls.; Shogran, 2385 m and 2770 m, VII,1963, VIII,1964 - 3 colls.; Burwat, 3080 m, IX,1963 - 5 colls.; Battakund, 2740 m, VII,1963 - 1 coll.; 6.4 km E of Lalazar, 2430 m, X,1962 - 1 coll.; GILGIT AGENCY: Naltar, 2985 m, VII,1964 - 4 colls.; Gupis, Kohighizar, 2360 m, VII,1964 - 1 coll.

   Hoplopleura affinis is a common ectoparasite of Eurasian field mice of the genus Apodemus. There is some confusion regarding the status of Apodemus in Pakistan (Roberts, 1977): A. syriacus (Linn.) definitely occurs in that country but A. flavicollis (Melchior) may also be present. Hosts for the above-mentioned collections were listed as Apodemus sp., A. flavicollis or A. syriacus. To avoid erroneous records, a conservative approach is taken here and all hosts are listed as Apodemus sp. Hoplopleura affinis has previously been recorded from both A. flavicollis and A. syriacus.

2) Hoplopleura alticola Mishra and Bhat, 1972.
   Specimens examined: (1 collection 29) ex Alticola roylei Gray (Rodentia, Arvicolidae) HAZARA DIST.: Kaghan valley, 4155 m, VIII,1963.

   Until now, this louse was known only from the type series taken from the vole, A. roylei, in montane regions in the Indian states of Uttar Pradesh and Himachal Pradesh (Mishra and Bhat, 1972; Mishra, 1981).


   Hoplopleura captiosa is principally parasitic on the house mouse, M. musculus and probably occurs in most areas of the world where this largely peridomestic mammal is found. It would therefore be expected to occur throughout most of Pakistan, particularly in association with human settlements.


   This louse was originally described from palm squirrels, Funambulus palmarum (Linn.), collected in India. It appears to be a widespread parasite of squirrels of the genus Funambulus (F. palmarum, F. pennanti, F. tristriatus (Waterhouse)) in India and Sri Lanka (Pratt and Stojoanovich, 1961; Kaneko, 1963; Mishra et al., 1974; Mishra, 1981). However, the specimens recorded here appear to be the first noted for Pakistan.

5) Hoplopleura merionidis Ferris, 1921.
   Specimens examined: (1 collection 37,19) ex Meriones libycus Lichtenstein (Rodentia, Cricetidae) KALAT DIST.: unspecified locality, 2320 m, X,1963.

   Hoplopleura merionidis has not previously been reported from Pakistan although it is known from neighboring regions in Iran (Kim and Emerson, 1971), the People's Republic of China (Ferris, 1921) and the USSR (Sosnina, 1982). The type series from Shaanxi (as Shensi) Province, China, was recovered from the gerbil, Meriones meridianus (Pallas), while the Iranian material was collected from both M. libycus and M. crassus Sundevall, and the USSR specimens were from both M. libycus (as M. erythrous) and M. meridianus.

6) Hoplopleura pacifica Ewing, 1924.

   Hoplopleura pacifica has an almost global distribution along with that of its domestic Rattus hosts.

7) Hoplopleura pavlovskyi Sosnina, 1951.
   Specimens examined: (1 collection 29) ex Rattus turkestanicus (Satunin) (Rodentia, Muridae) GILGIT AGENCY: Gilgit, Chinhar Bagh, 1490 m, VIII,1964.

   This species is similar to H. pacifica but whereas the dorsal apical angle of the paratergital plate of abdominal segment seven is extended in H. pacifica, no such lobe is present in H. pavlovskyi. Although H. pavlovskyi is well documented from numerous collections in Turkestan, USSR (Sosnina, 1951, 1967, 1982), this species does not appear to have been reported from other regions. The host rat, R. turkestanicus, ranges from southern Turkestan, northeastern Iran and Afghanistan to northern India and southwest China (Roberts, 1977; Honacki et al., 1982).

   Specimens examined: (1 collection 19) ex Mus saxicola Elliot (Rodentia, Muridae) SIND PROV.: Rani Kot, I,1977.

   This louse was previously documented only from several states in India as an ectoparasite of the mice, M. saxicola and M. platypteryx Bennett.
collections from *Nesokia* and *Bandicota*, these records are considered to represent accidental infestations. The type series of *P. asiatica* designated by Ferris (1923) includes specimens recovered from *N. indica* (as *N. hardwickei*) in Quetta, Baluchistan Province, Pakistan.

12) **Polyplax brachyrhyncha** Cummings, 1915.
Specimens examined: (2 collections 347.68 mm) ex *Acomys cahirinus* (Desmarest) (Rodentia, Muridae) SIND PROV.: Karachi, Khadeji Falls, XI.1976.

**Polyplax brachyrhyncha** was originally described from *A. cahirinus* from Assut, Egypt and is a common ectoparasite of this spiny mouse in that country (Johnson, 1960). It has also been recorded previously from various species of *Acomys* (principally *A. cahirinus*) from Iran (Kim and Emerson, 1971) and from North and East Africa but the present records are the first ones from Pakistan.

13) **Polyplax calomysci** Kim and Emerson, 1971.
Specimens examined: (5 collections 547.63 mm) ex *Calomyscus bailwardi* Thomas (Rodentia, Cricetidae) BALUCHISTAN PROV.: Quetta, Ziarat, 2315 m, XXI.1963 - 3 colls.; Sibi, IX.1975 - 1 coll.; Kalat, 2315 m, IX.1975 - 1 coll.

This species was previously documented only by the type series from *C. bailwardi* from Iran (Kim and Emerson, 1971). The recent host is confined to mountain steppe regions of Turkmenistan (USSR), Iran, Afghanistan and Pakistan (Roberts, 1977).

14) **Polyplax chinesis** Ferris, 1923.
Specimens examined: (5 collections 547.62 mm) ex *Meriones crassus* Sundeval (Rodentia, Cricetidae) BALUCHISTAN PROV.: 48 km SSW of Surab, IV.1965.

**Polyplax chinesis** was originally described from the gerbil, *Meriones meridianus*, from Shaanxi (as Shensi) Province, People’s Republic of China (Ferris, 1923) but has also been recorded from the southeastern USSR (Sosnina, 1982). The present collections are the first ones documented from Pakistan.

15) **Polyplax hurricanicus** Mishra 1981.

Until now, *P. hurricanicus* was known only from the type series from the gerbil, *M. hurricanicus*, in Gujarat State, India (Mishra, 1981).

16) **Polyplax kaiseri** Johnson, 1960.
Specimens examined: (1 collection 25 mm) ex *Gerbillus nanus* Blanford (Rodentia, Cricetidae) DERA ISMAIL KHAN DIST.: unspecified locality, I.1964. (12 collections 185.31 mm) ex *Gerbillus spp.* (Rodentia, Cricetidae) BALUCHISTAN PROV.: 18 km SE of Kharan, II.1965 - 7 colls.; LASBELA DIST.: 8 km S of Bala, XI.1965 - 5 colls.

**Polyplax kaiseri** is well-known from various gerbils of the genus *Ger-
bilias in North and East Africa, although Ledger (1980) has questioned records of this louse in sub-Saharan Africa. Kim and Emerson (1971) reported *P. kaiser* from both *G. rutilus* and *G. cheesemani* Thomas in Iran but the records given here represent the most easterly ones to date for this louse and the first ones for Pakistan. It is expected that *P. kaiser* also parasitizes gerbils between the North Africa and Iran/Pakistan extremes.

17) **Polyplax kondana** Mishra, 1981.

Specimens examined: (3 collections (2♂:♂, 1 nymph) ex *Miliaria melanata* (Gray) (Rodentia, Muridae)) SIND PROV: Badin, I.1977 - 2 colls.; Thatta, VIII.1975 - 1 coll.

This louse was previously documented only by the type series recovered from *Miliaria kondana* Mishra and Dhanda in Maharashtra State, India (Mishra, 1981).

18) **Polyplax paradoxus** Johnson, 1960.

Specimens examined: (1 collection (29) ex *Meriones persicus* (Blanford) (Rodentia, Cricetidae)) BALUCHISTAN PROV: unspecified locality, I.1963.

**Polyplax paradoxus** parasitizes various gerbils belonging to the genus *Meriones* in North and East Africa (Ledger (1980) questioned some of these records) and the Near East. Although *P. paradoxus* has not previously been reported from Pakistan, it has been recorded from *M. persicus* and *M. tristrami* Thomas in Iran by Kim and Emerson (1971) and Kaneko (1972), respectively.

19) **Polyplax reclinata** Nitzsch, 1864 (synonyms: deltoides Fahrenheit, 1938; shintzui Kaneko, 1957).


This species is widespread in Eurasia and Africa (including Madagascar) as a parasite of numerous species of shrews (Soricidae).

20) **Polyplax serrata** (Burmeister, 1839) (synonyms: affinis Fahrenheit, 1938; serrata paxi Eichler, 1952).

Specimens examined: (1 collection (29) ex *Citellus migratorius* (Pallas) (Rodentia, Cricetidae)) GILGIT AGENCY: Kohighazar, Phander. 1990, IX.1963.

This louse is a well-known cosmopolitan ectoparasite of the house mouse, *Mus musculus* Linn., although it is sometimes collected from other murid rodents (particularly *Apodemus* spp.). The present Pakistan record from a migratory hamster is considered atypical.

21) **Polyplax spinulosa** (Burmeister, 1839) (synonyms: *denticulatus* Nitzsch, 1864; campyloliperi Zavalea, 1945).


**Polyplax spinulosa** is a cosmopolitan ectoparasite of domestic *Rattus* and is probably widely distributed in Pakistan.

22) **Polyplax stephensi** (Christophers and Newsstead, 1906).


Clearly, *P. stephensi* is principally parasitic on the gerbil, *T. indica*. Records from other hosts cited here are presumed to represent accidental associations although the carnivore infestations could have been acquired as a consequence of recent predation on gerbils. There are numerous records of *P. stephensi* from India, and Kim and Emerson (1971) reported this species from Iran. Curiously, *P. stephensi* does not appear to have been documented previously from Pakistan although it is possible that some pre-1948 records given as 'India' actually refer to localities now within Pakistan's borders.
DISCUSSION

Twenty-two species of sucking lice, at least 14 of them new for the country, are reported here from wild land mammals of Pakistan. The large number of new records for Pakistan can be attributed to the scant literature on the Anoplura of the region. Six additional species of sucking lice have been reported from wild land mammals in Pakistan but were not recorded during the present survey. Three of these species were described from the palm squirrel, Funambulus pennantii: Hoplopleura funambuli Bilquees, H. karachiensis Khanum, and Neohaematopinus quadri Khan and Khanum; the first two were from Karachi in Sind Province (Bilquees, 1976; Khanum, 1983) and the last was from Thatta District also in Sind Province (Khan and Khanum, 1980). Two more polyplaxids, Polyplax sindensis Shafi, Samad and Rehana, from the shrew, Suncus murinus, and P. humae Khan and Khan, from the murid rodent, Cremnomys blanfordi (Thomas) have been described from the Karachi area (Shafi et al., 1984; Khan and Khan, 1985). Lastly, the linognathid louse, Linognathus vulpis Wernecke, was described from the fox, Vulpes rupPELLI (Schinz), near Karachi (Wernecke, 1952); L. vulpis has also been collected from Vulpes vulpes Linn. in Iran (Kim and Emerson, 1971). Detailed ectoparasite collections are not available for many of Pakistan’s native mammalian species and it is estimated that about 10 additional species of sucking lice actually parasitize this fauna.

The zoogeographical affinities of Pakistan’s anopluran fauna are worthy of brief consideration here. While most of Pakistan is situated within the Palearctic Region, the extreme southeastern section of the country is usually considered to be within the boundaries of the Oriental Region (Roberts, 1977). Traub et al. (1983) point out that topography and other factors such as climate, often have a profound effect on zoogeography; this is especially true for Pakistan’s diverse terrain which they categorize into an ‘Arid Southwestern Sector’, and two ‘Montane Central Asian Sectors’ of the Palearctic and an ‘Inter-Indian Sector’ of the Oriental Region.

Prediably, most Anoplura occurring in Pakistan have largely Palearctic or Oriental distributions. Three species (Hoplopleura affinis, H. merionidis, Linognathoides palaearticus) have wide, more or less exclusively Palearctic distribution patterns. Nine (Hoplopleura alticola, H. chinensis, H. funambuli, H. karachiensis, H. pavlovskyi, Linognathus vulpis, Neohaematopinus quadri, Polyplax calomysci, P. sindensis) have more limited geographical and/or altitudinal Palearctic distributions. Three species of Pakistan gerbil lice (Polyplax brachyrhyncha, P. kaiser, P. paradoxa) are principally Palearctic and are widespread across the Near and Middle East and North Africa but also extend to varying degrees into the Ethiopian Region. Six species are considered here to represent the Oriental fauna: Hoplopleura maniculata, H. ramgarh, Neohaematopinus echinatus, Polyplax humae, P. hurriancicus, P. kondana. At least two species (Polyplax asiatica, P. stephensi) are widespread in both Palearctic and Oriental Regions. The remaining five species of Anoplura are cosmopolitan or nearly so; Polyplax reclinata occurs throughout much of the Palearctic, Oriental and Ethiopian Regions; Hoplopleura capito, H. pacifica, Polyplax serrata and P. spinulosa are distributed throughout much of the world.

Many of the louse distributions outlined above clearly mirror those of their hosts. This is true for the Palearctic H. alticola/A. roylei, P. calomysci/C. baiardi (both of these associations are at high altitude), H. affinis/Apodemus sp., L. palaearticus/M. caudatus associations, the Palearctic-North African P. brachyrhyncha/Acomys sp. association, and the Oriental-Palearctic H. maniculata/Funambulus sp., H. ramgarh/Mus sp., N. echinatus/Funambulus sp., P. asiatica/Nesokia sp. and Bandicota sp., P. hurriancicus/M. hurriancius, P. kondana/Millardia sp. and P. stephensi/T. indica associations. The very widespread distributions of P. reclinata on numerous species of shrews and of the four cosmopolitan lice mainly on peridomestic murid rodents are likewise understandable. However, certain species of lice occupy ranges smaller in size than those of their hosts, possibly reflecting climatic or topographic factors. For example, P. kaiseri and P. paradoxa parasitize gerbils (Gerbillus and Meriones, respectively) from North Africa to Pakistan but have not been recorded further east despite the availability of seemingly suitable gerbil hosts. The species site trend is apparent for H. merionidis and P. chinensis both of which parasitize Meriones spp. in the southeastern Palearctic but do not extend to congeneric North African gerbils. To some extent, P. kaiseri and P. paradoxa replace H. merionidis and P. chinensis as parasites of Meriones spp. gerbils in the southwestern Palearctic. Similarly, although Rattus turkestanicus is widely distributed in the south-central Palearctic Region (Honacki et al., 1982), its characteristic hoplopleurid louse, H. pavlovskyi, has been reported only from the USSR and (now) Pakistan. The six Pakistan louse species that were not collected during this survey appear to have restricted Palearctic distributions but they are known principally from their respective type series and further collecting may reveal their presence elsewhere. Only L. vulpis is represented by more than the type collection and is known from outside of Pakistan. One of these, P. humae, is known only from Cremnomys blanfordi from the Karachi area; this murid host is known from India and Sri Lanka (neither Roberts 1977 nor Honacki et al. 1982 list it for Pakistan) and P. humae is here assumed to have Oriental affinities.

It is instructive to consider the number of anopluran species (assoc-
iated with wild land mammals) shared by Pakistan and its neighboring countries/regions. Extensive literature searches have revealed that the following numbers of species are shared as part of the 28 species reported here for Pakistan: India (15 shared species), Iran (14), southwestern USSR (10), People’s Republic of China (10), North Africa (9), Afghanistan (6). Thus, the geographically adjacent Indian (Oriental) and Iranian (Palearctic) faunas appear to be most similar to the Pakistan fauna. It must be pointed out, however, that not all of the faunas have received equal study. Overall, while the Pakistan anophuran fauna has significant Oriental and minor Ethiopian and cosmopolitan elements, this fauna principally has Palearctic affinities.

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