STUDIES ON LICE INFESTING DOMESTIC ANIMALS AND BIRDS

BY

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "STUDIES ON LICE INFESTING DOMESTIC ANIMALS AND BIRDS" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship, or other similar title, of any other University or Society.

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CERTIFICATE

Certified that this thesis, entitled "STUDIES ON LICE INFESTING DOMESTIC ANIMALS AND BIRDS" is a record of research work done independently by Shri. M.C. Mohan under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship, or associateship to him.

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INTRODUCTION

INTRODUCTION

The success of livestock industry depends on the health of animals. Health is impaired by various disease producing agents including parasites. Among parasites ectoparasites constitute a large number. Lice are very important ectoparasites. Lice infestation causes intense irritation and restlessness leading to low feed intake and consequently poor growth and production.

Economic loss from lice infestation of animals is very great. Patton and Cragg (1913) observed that the animals harbouring 'blue cattle lice', Linognathus vituli, in large numbers were thin and weak and the hide of such animals was sometimes seriously damaged. Bishopp (1921) remarked that the annoyance due to biting lice of goats Damalinia caprae retarded the growth of kids and impaired the condition of flesh of goats; he also remarked that most obvious loss was reduction of mohair clip. The irritation produced by the lice induced much rubbing which caused pulling and matting of the mohair. It seems that there is a great loss through actual cutting of the hairs by the lice themselves.

Damalinia ovis was found to reduce the wool quality significantly when they were present in large numbers. The economic loss was calculated to be 10 - 15 per cent in an year. (Keetle et al., 1974).

In a survey Devaney (1976) could prove that infestation of layers with Menacanthus stramineus reduced the egg production upto 46 per cent and caused an average hen weight upto 400 gms. There was also significant decrease in the clutch size and feed consumption of infected hens.

In India, particularly in Kerala, not much work appears to have been undertaken on lice infesting livestock. Hence the present study with the following objectives has been taken up:

1. To study the incidence of lice infestation in domestic animals and birds.
2. To study the specific identity of the lice encountered.
3. To assess the comparative efficacy of various insecticides against lice infestation.

MATERIALS AND METHODS

MATERIALS AND METHODS

Collection, preservation and identification of lice

The lice were collected from animals and birds brought to the veterinary hospitals at Trichur, Mannuthy and Angamaly, and also from animals and birds brought to the College of Veterinary and Animal Sciences for post mortem examination. Collections were made from the animals and birds belonging to various farms in Mannuthy. Collections were also made from the animals brought to Municipal slaughter house, Trichur. The investigations spread over a period of fourteen months from February 1978 to March 1979.

The lice were usually collected from the animals and birds by means of a fine forceps. In case of live birds, since the lice were fast moving, they were anaesthetised using chloroform before being collected. Regarding the dead birds their bodies were washed with water into a basin and the lice were collected after sieving the latter. Nits were collected after locating them with the aid of a hand lens.

After collection the lice were transferred to tap water. With the help of a binocular dissection microscope good specimens were selected for preparation of permanent mounts, which were made by usual methods. Some of the specimens were stained for better clarity. The specimens were speciated from morphological features and from micrometyy.

The intensity of lice infestation was obtained by counting lice from 12 sites in the body. This was repeated thrice and the average was calculated.

Photographs

Photomicrographs of permanent mounts were taken.

Experimental infection of birds with lice

Experimental infection in birds were set up by allowing the uninfested birds to mingle with the infested ones. Another method was to attach feathers heavily infested with nits to the body of the healthy birds. Birds aged 3 months were choosen for experimental infection.

Assessing the efficacy of insecticides

Goats and poultry belonging to University Farms at Mannuthy and having natural infection of lice were selected and segregated for the treatment trials. Each of them was then divided into two groups. Lice count of each animal and bird was then taken. This was done by counting lice from 12 sites in the body. This was repeated thrice. Then the average was calculated. Then the individual average and group average were calculated. The insecticides were applied to one group of animals and birds maintaining the other group as untreated control. Post-treatment average lice counts taken in the same manner as the pre-treatment counts. With these two values the reduction

percentage was worked out. Thus the comparative efficacy of different insecticides were arrived at.

The efficacy of the insecticides against nit were determined by examining the treated groups of birds and animals after two to four weeks of treatment for observing the newly formed adults.

The animals and birds were carefully observed after treatment for toxic symptoms if any.

INCIDENCE OF LICE INFESTING DOMESTIC ANIMALS AND BIRDS

REVIEW OF LITERATURE

Lice infestation is a very common condition among domestic animals and birds. Regarding the incidence of lice infestation in cattle and buffaloes Railliet (1895) reported the occurrence of Linognathus vituli mainly in young stock. He recorded the incidence of the same species from beef cattle in British Columbia. He also observed that Haematopinus eurysternus occurred in the body, principally in the region with long thick hairs and where the tongue of animal could not reach.

Craufurd-Benson (1941) recorded the maximum population density of this species in February - March. Damalinia bovis was found to be the most widely distributed one. Haematopinus eurysternus, Linognathus vituli and Solenopotes capillatus were recorded by the same author. The study on the seasonal variation and regional distribution of cattle lice - H.eurysternus was made by monthly examination at Copper Field Research Station, Great Britain by the same author. He found that minimum population level reached in June, July and August and the maximum in February and March.

Sayin (1960) made a taxonomic survey of cattle lice in Ankara Province in 1956-1957. Of 1022 cattle examined, 402 were found to be infected, the commonest species being Linognathus vituli and Haematopinus eurysternus. The number

increased in autumn and reached a maximum in winter and early spring. The first three species were more common on young than on mature animals.

Lewis (1967) recorded the incidence of Linognathus vituli and Damalinia bovis in cattle during Spring and Summer in Willametee valley of Oregon. In Polland, a survey by Piotrowski (1967) of Phthiraptera in 7568 cattle revealed the occurrence of biting lice - D.bovis and sucking lice - Haematopinus eurysternus, L.vituli and Solenopotes capillatus. The general incidence recorded was 15 per cent. More than 43 per cent of cattle examined were considered to be heavily exposed to lice infestation. Soulsby (1968) recorded H.quadripertusus as a parasite of cattle in only Queensland and New Guinea and the Solamen Islands. Singh and Chabra, (1974) stated that about 80.5 per cent of the 734 buffaloes examined were infested with H.tuberculatus as a tail louse in Texas, Alambama, Florida and Peureto Rico.

Ourmazidi and Baker (1974) examined 317 hides of cattle immediately after slaughter in the period from October-December, 1973. One hundred and twenty nine (39.5 per cent) were infested with lice, 28 per cent with Haematopinus eurysternus, 4.9 per cent with Linognathus vituli, 23.3 per cent with Solenopotes capillatus and 2.4 per cent with Damalinia bovis. They got similar results from a survey of

137 cattle and 326 hides from different parts of Irish Republic and Northern Island in October-December, 1973 in Dublin abattoir.

Menon (1953) recorded the incidence of H.tuberculatus in India. He stated that this species was present in considerable numbers throughout the year, but prevalent during the winter season. A drop in their density was noticeable immediately following the rains. During March, April and May tne infestation was heavy and during June-October, it was low.

Chaudhuri (1976) reported the occurrence of Haematopinus tuberculatus, H.eurysternus and Linognathus vituli in India. The author observed that the cattle became lousy when they remained inside sheds during winter. The infestation decreased during the summer months when they go out in sun for grazing. He stated that H.quadripertusus was very commonly encountered. This pest was common in some areas of Karnataka and Maharashtra. The occurrence of H.tuberculatus on buffaloes was also studied by him in detail. The incidence of this pest in the plains of Northern India was highest in February and very low in June and July. The population started increasing in August and began to decline by the end of March.

Lice infestation in sheep and goats was recorded all over the world. Keetle (1974) found that sheep-body lice

Damalinia ovis, were normally present in low numbers in summer, built up in autumn, peaked in winter and declined in spring. Body lice preferred sites along the mid-sides and back of the host and occurred least frequently on the abdomen. It was observed by him that Linognathus stenopsis and Damalinia caprae occurred more in diseased than in healthy goats.

In India Menon (1953) recorded the occurrence of Damalinia caprae from goats and D.ovis from sheep. He stated that lice was found on goats throughout the year in large numbers. The density was noticed to reduce considerably during the hot summer months of May and June. One thousand three hundred and thirty seven lice were collected from goats during 1946-47, when the peak infestation was in April. He stated that the peak period in the following year (1947-48) was in October. In June 1947, the population density was noted to reduce considerably.

Garg (1974) studied the distribution of lice on goats in February. He found that both Linognathus stenopsis and Damalinia caprae were in plenty on the back. The former did not occur on the face and head. Occurrence of L.stenopsis, L.africanus and D.caprae in goats throughout India was reported by Chaudhuri in 1976. He observed that in the plains of Northern India the density of sucking lice (Linognathus sp.) was maximum during February and March and

was minimum during June to August. The population of biting lice - D.caprae, was maximum during September to January and minimum during March to July.

Incidence of Haematopinus suis in India has been studied by Chaudhuri (1976).

Trichodectes canis infestation was found to be rare in May-July in India. Maximum incidence was recorded in cold months (Menon, 1953). Heterodoxus longitarsus in dogs was recorded by Bedford (1932).

Elephants get infested with only one species of louse ie, Haematomyzus elephantis. In 1880, Piaget collected H.elephantis from an young elephant for the first time. They showed a preference for the soft skin behind the ears and also for the rugged tip of the tail. In some instances they were found in considerable numbers. Ferris (1931) reported the occurrence of H.elephantis from African elephants in Zoological gardens of Rotterdam. Kane et al. (1976) recorded H.elephantis infestation on six Asian elephants in Missouri.

Raghavan et al. (1968) found that three elephants in Nehru Zoological park showed signs of dermatitis severe in one case with pruritus dryness of the skin, scale formation on the neck, ears, abdomen and tail. Close examination revealed large numbers of lice all over the body.

Chandrasekharan et al. (1972) reported a case of Haematomyzus elephantis infestation from a male tusker about 15 years old. The louse was found on the tail and also on the folds of skin in the auxilliary region and on the base of the ears, in abundance.

Singh and Chabra (1974) in a survey on the incidence of arthropod pests of domestic animals and birds observed that the lice were found on the animals throughout the year. The incidence varied between 43.9 per cent and 96.8 per cent; being lowest in July and highest in February.

Peters (1931) was the first to study on the occurrence of Mallophaga on poultry and Lipeurus tropicalis was described by him for the first time. He has recorded the incidence of lice from domestic fowls in Bahama Islands, Caicos Islands, Venezeula and Liberia and also from fowls in Africa. Emerson (1956) recorded the occurrence of Menacanthus cornutus for the first time from United States of America. Murray and Gorden (1969) noted that the number of Mallophaga declined in the spring, remained low during the summer and increased during the winter. El-Kifl et al. (1973) in a survey on ectoparasites made from May 1966 to April 1967 in Sharkia Governate one of the most important poultry rearing areas in Egypt, collected 4369 bitting lice of seven species at co-centers throughout the year in addition to other ectoparasites. The

Mallophaga collected were Cuclotogaster heterographa, which showed no preference for any kind of birds, Goniocotes gallinae and Menopon gallinae which preferred pegions, fowls, turkeys and Menacanthus cornutus and Columbicola columbae which preferred geese. Lice were plenty from June to August and scarce from November to February.

Lunkashu (1974) in a survey on ectoparasites of poultry from spring to autumn during 1971-72 on poultry farms in Brichany, Nisoreny and Rezina Districts of Soviet Moldevia, examined 99 birds and found Mallophaga on 55 per cent of them. He collected more than 25000 specimens representing 9 species. Goniocotes maculatus was found only rarely and that too for the first time in Soviet Union. Other species collected were Menopon gallinae, Menacanthus cornutus, M. pallidulus, Goniodes dissimilis, Goniocotes gallinae, Cheliopistes meliagridis and Cuclotogaster heterographa.

Kellog and Paine (1914) studied the incidence of Mallophaga on poultry in India. They reported that the incidence of Menacanthus stramineus, Lipeurus caponis and Goniodes gigas was high in Gaya District in Bihar. Lipeurus caponis was recorded by the same authors in Calcutta from domestic fowls. Ansari (1943) recorded the incidence of Goniocotes maculatus from India. He reported the prevalence

of Lipeurus tropicalis and Menopon gallinae in Punjab. These two species were apparently wide spread in India. At Muktheswar, it was proved, by the same author, to be a serious pest of fowls. He considered Goniodes gigas as a quite common species, and has collected various consignments of this species from fowls in various parts of India.

Menon (1953) stated that lice infestation was severe in poultry in India during 1947-48, when Menopon gallinae, Goniocotes hologaster and Lipeurus heterographus were occurring in large numbers. During 1946-47 all the three species mentioned above were found in smaller numbers, especially during the winter months. Generally the incidence of M.gallinae was more in winter and less in summer, whereas that of G.hologaster was more in summer and less in winter.

Chaudhuri (1962) reported the incidence of Mallophaga in poultry. The important species were Menopon gallinae, Menacanthus stramineus, Gallipeurus heterographus, Goniodes dissimilis, G.gigas, Gonicotes gallinae and Lipeurus tropicalis. Kumar and Sahai (1974) reported the incidence of lice infestation on domestic fowls in Patna and Bihar. The species encountered were M.stramineus, Menopon galliae, Lipeurus caponis, G.gigas, G.dissimlis, Cuclotogaster heterographa and L.tropicalis which was found on 70 per cent of birds examined.

RESULTS

The present investigations was confined to domestic animals and birds in and around Trichur. In this study, lice infestation was noticed in cattle, buffaloes, goats, dogs, elephants and poultry. As already mentioned, the period of study was from February 1978 to February, 1979.

As regards the incidence of lice in cattle, maximum incidence was observed during December to February and minimum during August to October (Table I) Chart I). Similarly in the buffaloes the incidence was highest during December to February, but the lowest was during July to September (Table 2) Chart I). In goats, the highest incidence was during March and the lowest was during May to July (Table 3) Chart I). In poultry, the incidence was variable between the exotic breeds and desi fowls. In the former, the maximum incidence was noticed in March and minimum in October whereas in the latter, the maximum was in January and minimum in November (Table 4 & 5, Chart II).

Regarding the incidence of species of lice encountered in animals and birds, in cattle two species Viz. Haematopinus quadripertusus and Linognathus vituli were found to occur. The former was having maximum incidence and the latter was having the minimum. Out of 212 cattle examined, 94 (44.34 per cent) were infested with H.quadripertusus and 7 (3.47 per cent) with L.vituli (Table 1).

In buffaloes, only one species viz. Haematopinus tuberculatus was encountered. Out of 153 buffaloes examined 76 (49.67 per cent) were positive for this species of louse (Table 2).

In goats, two species viz. Linognathus africanus and Damalinia caprae were found to occur. Out of 460 goats examined 293 (63.69 per cent) were positive for L.africanus and 274 (59.57 per cent) were positive for D.caprae (Table 3).

In poultry four species of lice viz. Menacanthus stramineus, Menopon gallinae, Goniodes gigas and Lipeurus caponis were found to occur in both exotic breeds and desi fowls. Out of 1130 exotic birds examined 498 (44.07 per cent) were harbouring M.stramineus, 111 (9.82 per cent) with M.gallinae, 6 (0.53 per cent) were infested with G.gigas and 399 (35.31 per cent) were harbouring L.caponis (Table 4). In desi fowls, out of 286 birds 151 (52.80 per cent) were infested with M.stramineus, 184 (64.34 per cent) were infested with M.gallinae, 71 (24.83 per cent) were infested with L.caponis, and 127 (44.41 per cent) with G.gigas.

Intensity of lice infestation in cattle was maximum in January and February and Minimum in August and September (Table 6). In goats the maximum intensity was noticed in February and March, and minimum in April and May (Table 7). Maximum intensity in the case of poultry was in March and the minimum was in October (Table 8).

The site of infestation in each host varied with the species of lice involved. In cattle Haematopinus quadripertus was located mainly in the tail switch, whereas Linognathus vituli was located mainly around the horns and on the neck. In buffaloes, the only species, H.tuberculatus was located mainly on the tail switch and also on the sides of neck and abdomen. The nymphal stages of H.quadripertusus and H.tuberculatus were found on the vulval lips. In goats, Linognathus africanus, one of the two species encountered on the shoulders and neck region, whereas the other - Damalina caprae was present mainly on the poll region and also on the long haired regions of hind limbs and on the back. Heterodoxus longitarsus was the only species encountered in dogs and it was found all over the body. Elephant louse - Haematomyzus elephantis was found mainly on the soft skin behind the ears and also on the tail tip. In poultry Menacanthus stramineus was found on the skin, Lipeurus caponis in between the barbules of long wing feathers and feathers on the neck, Menopon gallinae on the shaft of the feathers on the back and Goniodes gigas on the feathers of neck and around the vent.

Nits of lice infesting animals were found glued on to the hairs and those of lice infesting poultry were found glued on to the feathers.

DISCUSSION

From the present studies it is evident that lice infestation is a very common condition among domestic animals and birds in and around Trichur.

As regards the incidence, maximum incidence of cattle lice is during December to February and minimum during August to October. These findings are more or less in conformity with those of Craufurd-Benson (1941), Sayin (1960) and Chaudhuri (1976). But in the case of buffaloes, contrary to the findings of Menon (1953) the incidence was found to be highest during December to February and lowest during July to September. In goats, the highest incidence was during February and March and the lowest during May to July. This observation is in close agreement with that of Chaudhuri (1976) with regard to Linognathus africanus and is in quite disagreement with him in the case of Damalinia caprae, which according to him occurred maximum in the months of September to January, whereas in the present findings the maximum incidence was during February and March.

In the case of poultry, in exotic breeds, maximum incidence was noticed in March and minimum in October and in desi fowls, maximum was in January and minimum was in November. This observation is more or less in agreement with that of Menon (1953) and Murray and Gorden (1969) who

observed maximum incidence in winter months and minimum in summer months.

Regarding the incidence of species of lice, in cattle, Haematopinus quadripertusus was found to have maximum incidence and Linognathus vituli was found to have minimum incidence. This finding was in agreement with that of Ourmazidi and Baker (1974), who made similar observations with regard to thse two species of lice in cattle.

In buffaloes concurring with the findings of previous workers (Garg, 1961., Menon, 1953 and Chaudhuri, 1976). Haematopinus tuberculatus was the only species of lice encountered in the present findings.

In goats incidence was more for Linognathus africanus than for Damalinia caprae although the difference being very narrow. No data are available from literature for comparison.

With regard to the incidence of lice infestation in poultry, about 50 per cent of birds examined in the present studies were found to be infested with one or more species of lice. This finding is in agreement with that of Lunkashu (1974) who also found that slightly more than 50 per cent of birds were infested with lice. In the present studies, Menacanthus stramineus and Menopon gallinae were the common species encountered in exotic and desi fowls respectively. This is contrary to the findings of Chaudhuri (1962) who found Lipeurus tropicalis to be the commonest species of lice in fowl.

In partial agreement with Craufurd-Benson (1941), maximum population density of lice in cattle was during the months of January and February, and minimum in September. In the case of poultry lice, maximum population density was in March and minimum during October. But this finding was contrary to that of Menon (1953) who found maximum intensity in winter months and minimum in summer months.

Table 1. Incidence of lice on cattle

Year	Month	Temperature Max:	Temperature Min:	R.H. (%)	No.of animals examined	Haematopinus quadripertusus No.of animals infested	Haematopinus quadripertusus Percentage of incidence	Linognathus vituli No. of animals infested	Linognathus vituli Percentage of incidence
1978	February	84.4	78.0	60.5	12	8	66.66	2	16.67
,,	March	90.6	81.2	58.0	28	12	42.85	-	-
,,	April	89.7	82.5	64.3	9	3	33.33	-	-
,,	May	87.3	80.5	75.0	23	8	34.78	-	-
,,	June	78.9	74.0	78.9	12	4	33.33	-	-
,,	July	81.3	71.0	78.5	23	9	39.13	4	17.39
,,	August	79.5	74.2	78.8	13	1	7.69	-	-
,,	September	83.0	77.1	77.3	13	2	15.38	1	7.69
,,	October	84.1	78.0	77.2	18	4	22.22	-	-
,,	November	82.7	76.0	73.9	15	7	46.66	-	-
,,	December	81.8	75.8	69.8	14	10	71.42	-	-
1979	January	84.5	75.5	64.8	10	7	70.00	-	--
,,	February	86.2	77.4	69.1	22	19	86.36	--	-
		212			212	94	44.34	7	3.47

(Concl.)

Table 2. Incidence of louse infestation in buffaloes.

Year	Month	Temperature		R.H. (%)	Number of animals examined	Haematopinus tuberculatus	
		Max:	Min:			No. of animals infested	Percentage of incidence
1978	February	84.4	78.0	60.5	12	10	83.33
,,	March	90.6	81.2	58.0	13	8	61.53
,,	April	89.7	82.5	64.3	8	3	37.50
,,	May	87.3	80.5	75.0	14	8	57.14
,,	June	78.9	74.0	78.9	10	3	30.00
,,	July	81.3	71.0	78.5	7	2	28.57
,,	August	79.5	74.2	78.8	12	3	25.00
,,	September	83.0	77.1	77.3	17	4	23.52
,,	October	84.1	78.0	77.2	12	4	33.33
,,	November	82.7	76.0	73.9	10	7	70.00
,,	December	81.8	75.8	69.8	17	13	76.47
1979	January	84.5	75.5	64.8	10	6	60.00
,,	February	86.2	77.4	69.1	11	5	45.45
					153	76	49.67

(Concl.)

Table 3. Incidence of lice on goats

Year	Month	Temperature		R.H. (%)	No. of animals examined	Linognathus africanus		Damalinia caprae	
		Max:	Min:			No.of animals infested	NPercentage of incidence	No. of animals infested	Percentage of incidence
1978	February	84.4	78.0	60.5	62	54	87.09	54	87.09
,,	March	90.6	81.2	58.0	75	75	100.00	75	100.00
,,	April	89.7	82.5	64.3	62	21	33.87	18	29.03
,,	May	87.3	80.5	75.0	25	4	16.00	2	8.00
,,	June	78.9	74.0	78.9	22	7	31.81	4	18.18
,,	July	81.3	71.0	78.5	21	4	19.04	-	-
,,	August	79.5	74.2	78.8	20	8	40.00	7	35.00
,,	September	83.0	77.1	77.3	22	14	63.63	12	54.54
,,	October	84.1	78.0	77.2	49	34	69.38	30	61.22
,,	November	82.7	76.0	73.9	20	14	70.00	14	70.00
,,	December	81.8	75.8	69.8	18	10	55.55	10	55.55
1979	January	84.5	75.5	64.8	13	8	61.53	8	61.53
,,	February	86.2	77.4	69.1	51	40	78.43	40	78.43
					460	293	63.69	274	59.57

(Concl.)

Table 4. Incidence of lice on exotic breeds of poultry

Year	Month	Temperature		R.H. (%)	No. of birds examined	Menacanthus stramineus	
		Max:	Min:			No. of birds infested	Percentage of incidence
1978	February	84.4	78.0	60.5	30	18	60.00
,,	March	90.6	81.2	58.0	18	18	100.00
,,	April	89.7	82.5	64.3	26	15	57.69
,,	May	87.3	80.5	75.0	15	12	80.00
,,	June	78.9	74.0	78.9	20	7	35.00
,,	July	81.3	71.0	78.5	18	7	38.88
,,	August	79.5	74.2	78.8	200	120	60.00
,,	September	83.0	77.1	77.3	100	47	47.00
,,	October	84.1	78.0	77.2	450	130	28.88
,,	November	82.7	76.0	73.9	35	20	57.14
,,	December	81.8	75.8	69.8	30	12	40.00
1979	January	84.5	75.5	64.8	44	18	40.91
,,	February	86.2	77.4	69.1	144	74	32.64
					1130	498	44.07

Menopon gallinae		Goniodes gigas		Lipeurus caponis	
No. of birds infested	Percentage of incidence	No.of birds infested	Percentage of incidence	No.of birds infested	Percentage of incidence
--	--	-	-	-	-
--	--	-	-	14	77.78
5	19.22	-	-	20	76.92
-	--	-	-	12	80.00
-	--	-	-	7	35.00
4	22.22	-	-	7	38.88
-	--	-	-	68	34.00
12	12.00	-	-	58	58.00
63	14.00	-	-	108	24.00
1	2.86	-	-	18	51.43
-	-	-	-	13	43.33
8	18.18	3	6.82	21	47.73
18	12.50	-	-	53	36.81
111	9.82	6	0.53	399	35.31

(Concl.)

Table 5. Incidence of lice on Desi fowls.

Year	Month	Temperature		R.H. (%)	Number of birds examined	Menacanthus stramineus	
		Max:	Min:			No. of birds infested	Percentage of incidence
1978	February	84.4	78.0	60.5	20	12	60.00
,,	March	90.6	81.2	58.0	24	21	87.50
,,	April	89.7	82.5	64.3	28	14	50.00
,,	May	87.3	80.5	75.0	13	8	61.54
,,	June	78.9	74.0	78.9	42	20	47.62
,,	July	81.3	71.0	76.5	20	16	80.00
,,	August	79.5	74.2	78.8	19	4	21.05
,,	September	83.0	77.1	77.3	20	6	30.00
,,	October	84.1	78.0	77.2	18	9	50.00
,,	November	82.7	76.0	73.9	12	6	50.00
,,	December	81.8	75.8	69.8	23	9	39.13
1979	January	84.5	75.5	64.8	10	2	20.00
,,	February	86.2	77.4	69.1	37	24	64.86
					286	151	52.80

Menopon gallinae		Goniodes gigas		Lipeurus caponis	
No.of birds infested	Percentage of incidence	No.of birds infested	Percentage of incidence	No.of birds infested	Percentage of incidence
14	70.00	12	60.00	7	35.00
23	95.83	15	62.50	14	58.33
20	71.43	14	50.00	4	14.29
10	76.92	7	53.85	3	23.08
21	50.00	12	28.57	10	23.81
16	80.00	10	50.00	-	-
14	73.68	8	42.11	4	21.05
10	50.00	10	50.00	7	35.00
13	72.22	11	61.11	7	38-89
8	38.89	3	16.67	-	-
13	56.52	-	-	-	-
10	100.00	4	40.00	3	30.00.
32	86.49	21	56.76	12	32.43
184	64.34	127	44.41	71	24.83

(Concl.)

Table 6. Intensity of lice infestation on cattle.

Year	Month	Temperature(°F) Max:	Min:	R.H. (%)	No.of animals examined	Average no.of lice/animal Neck for (2 loc)	Abdomen for (2 loc.)	Limbs for (4loc.)	Perineal region for (2 loc.)	Tail for (2loc.)	Intensity
1978	February	84.4	78.0	78.0	8	15	10	22	18	32	8.08
,,	March	90.6	81.2	58.0	12	5	2	10	13	17	3.92
,,	April	89.7	82.5	64.3	3	5	-	4	14	20	3.58
,,	May	87.3	80.5	75.0	8	6	-	-	12	18	3.00
,,	June	78.9	74.0	78.9	4	4	4	2	8	14	2.67
,,	July	81.3	71.0	78.5	9	-	7	4	-	17	2.33
,,	August	79.5	74.2	78.8	1	-	4	-	2	13	1.58
,,	September	83.0	77.1	77.3	2	-	2	-	7	10	1.58
,,	October	84.1	78.0	77.2	4	-	4	7	-	14	2.08
,,	November	82.7	76.0	73.9	7	2	3	4	-	21	2.50
,,	December	81.8	75.8	69.8	10	7	4	-	22	42	6.25
1979	January	84.5	75.5	64.8	7	4	-	10	34	49	8.08
,,	February	86.2	77.4	69.1	19	4	-	7	28	38	6.42

(Concl.)

Table 7. Intensity of lice infestation on goats.

Year	Month	Temperature(°F) Max:	Min:	R.H. (%)	No.of animals examined	Average number of lice/animal Neck for (2 loc.)	Abdomen for (2 loc.)	Limbs for (4 loc.)	Perineal region for 92 loc.)	Tail for (2 loc)	Intensity
1978	February	84.4	78.0	78.0	20	24	15	65	18	18	11.66
,,	March	90.6	81.2	58.0	20	48	24	84	34	12	16.83
,,	April	89.7	82.5	64.3	15	10	12	31	9	4	5.50
,,	May	87.3	80.5	75.0	4	18	12	28	12	3	6.08
,,	June	78.9	74.0	78.9	20	22	19	38	12	4	7.91
,,	July	81.3	71.0	78.5	4	20	14	34	8	-	6.33
,,	August	79.5	74.2	78.8	8	30	20	38	10	4	8.50
,,	September	83.0	77.1	77.3	10	42	28	42	18	2	11.00
,,	October	84.1	78.0	77.2	20	22	10	24	13	8	6.41
,,	November	82.7	76.0	73.9	10	32	14	46	12	2	8.83
,,	December	81.8	75.8	69.8	10	28	20	64	21	5	11.50
1979	January	84.5	75.5	64.8	8	26	32	52	12	4	10.50
,,	February	86.2	77.4	69.1	20	32	29	68	24	19	14.33

(Concl.)

Table 8. Intensity of lice infestation on poultry.

Year	Month	Temperature(°F) Max:	Min:	R.H. (%)	No. of birds examined	Average no.of lice/bird Neck for(2 loc.)	Breast for (2 loc.)	Back for(2 loc.)	Vent for(2 loc.)	Wings for(2 loc.)	Legs for (2 loc)	Intensity
1978	February	84.4	78.0	78.0	23	16	4	12	13	4	3	4.33
,,	March	90.6	81.2	58.0	20	16	6	14	28	5	8	6.5
,,	April	89.7	82.5	64.3	20	12	5	23	22	2	5	5.7
,,	May	87.3	80.5	75.0	25	20	6	15	18	3	2	5.3
,,	June	78.9	74.0	78.9	20	10	3	11	10	4	2	3.3
,,	July	81.3	71.0	78.5	25	6	4	3	9	4	5	2.5
,,	August	79.5	74.2	78.8	20	5	3	4	10	-	-	1.8
,,	September	83.0	77.1	77.3	23	3	4	4	9	3	4	2.2
,,	October	84.1	78.0	77.2	25	2	5	6	8	-	-	1.7
,,	November	82.7	76.0	73.9	20	3	4	11	12	4	2	3.0
,,	December	81.8	75.8	69.8	25	9	6	8	6	3	-	2.6
1979	January	84.5	75.5	64.8	20	10	5	4	10	4	1	2.8
,,	February	86.2	77.4	69.1	20	13	9	9	17	5	4	4.7

(Concl.)

MORPHOLOGY OF LICE INFESTING DOMESTIC AMIMALS AND BIRDS

REVIEW OF LITERATURE

The morphological details of Linognathus vituli was first described by Osborn (1896). Ferris (1951) gave a detailed account of species affecting cattle and buffaloes with a key for identifying the species of Haematopinus. Melany and Kim (1974) described Haematopinus quadripertusus and H.eurysternus in detail. They also presented the important distinguishing features of the above species.

Patton and Cragg (1913) gave a detailed account on the morphological features of Haematopinus tuberculatus occurring on buffaloes in India. Menon (1953) described H.tuberculatus as a robust species of buffaloes. He studied the important morphological characters and stated that the abdomen was pigmented and had projecting pleurae, anterior legs were as strong as the others, and a bunch of haris was present on each side of abdominal segments behind each stigmal plate. The same author has described the characters of Linognathus vituli also.

Sen and Fletcher (1962) gave a key to identify the genera of lice infesting cattle and buffaloes. Chaudhuri (1976) furnished a detailed account on the important distinguishing characters of lice found on cattle and buffaloes. He gave the approximate measurements of Linognathus vituli,

Haematopinus quadripertusus and H.tuberculatus. Ferris (1951) described the morphological details of Linognathus species affecting sheep and goats. He also gave a key to identify species of Linognathus.

Menon (1953) briefly described the characters of Damalinia caprae, Linognathus stenopsis and L.ovillus. Chaudhuri (1976) clearly described the external morphological characters which help in the identification of lice occurring in goats (L.stenopsis, L.africanus and D.caprae).

Osborn (1896) described the head, thorax, and legs of Damalina equi as bright reddish brown or chest nut brown and the abdomen as dusky yellow colour, with about eight transverse dusky bands occupying the central or anterior portions of these segments and extending from the middle line a little more than half way to the margin. Sen and Fletcher (1962) gave a key to the identification of lice affecting equines.

A description of Haematopinus suis has been given by Sen and Fletcher (1962). Chaudhuri (1976) studied the external morphological features and mentioned the characters of identification of hog louse - H.suis.

Harrison (1916) described in detail the morphological characters of Heterodoxus longitarsus.

Ferris (1931) gave a detailed morphological description of elephant louse - Haematomyzus elephantis. Mukergi and Sen Sharma (1955) gave a detailed account on the morphology of elephant louse and its phylogenetic affinities and origin. He had described the head and mouth parts in detail. Sen and Fletcher (1962) described in detail the morphological features of H.elephantis.

Osborn (1896) described all the lice infesting poultry in detail. Kellog and Paine (1914) described Lipeurus caponis and Menopon gallinae from domestic fowls.

Ansari (1943) described lice infesting domestic fowls in Punjab. He described the important differenciating features of Menacanthus stramineus, Menopon gallinae, Goniodes gigas, G.dissimilis, Lipeurus caponis, L.tropicalis, and Goniocotes hologaster. Menon (1953 & 1954) gave the morphological details of lice occurring on poultry in Utter Pradesn. He described Menopon gallinae, Goniocotes hologaster, and Lipeurus heterographus. Ansari (1955) produced a synoptic table for the determination of Mallophaga infesting domestic fowl. (Gallus Gallus domesticus). He has described all the species of Mallophaga occurring on poultry in India. Alwar and Lalitha (1960) gave a brief description of lice occurring on domestic fowls, ducks and guinea fowls. Lice occurring on poultry and ducks was

MORPHOLOGY OF LICE INFESTING DOMESTIC ANIMALS AND BIRDS

Lice infesting cattle

Haematopinus quadripertusus (Farenholtz, 1916).

(Female (Plate I, Fig.1).

The total body length was 4.47 mm, ranging from 3.21-5.36 mm. The head was 0.79 mm long, range 0.65-0.85 mm and 0.05 mm wide, range 0.45-0.54 mm. Head was small and slender with distinct occular points. The antennae were five jointed and filiform. The clypeus was distinctly sclerotized; occiput and ocular sinuses were strongly sclerotized and the hair distribution was sparse.

Thorax was much wider than head, and measured 0.52 mm in length, range - 0.42-0.69 mm, and 0.99 mm in width, range 0.85-1.07 mm. Thorax was heavily pigmented with distinct notal pit.and sternal plate.

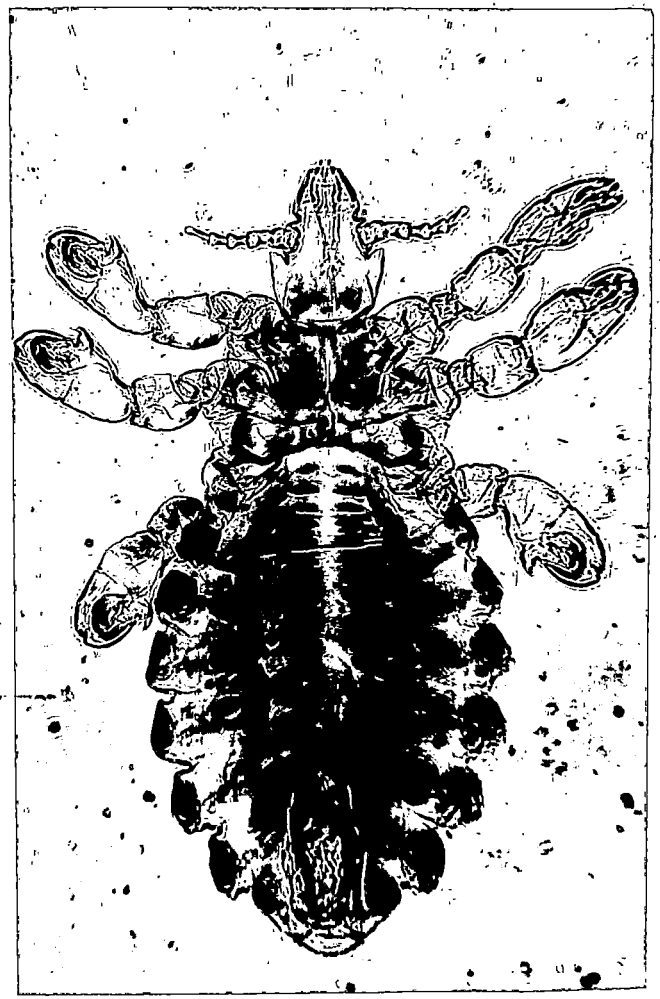
Abdomen was 3.15 mm long, range 2.13-3.82 mm and 2.33 mm wide, range 1.64-2.88 mm. It was membraneous, leathery and wrinkled, with distinct paratergites and spiracles on the segments IIIrd-VIIIth. The paratergits were rounded with only two posterior setae. The tracheal trunks of the abdomen were extremely thick.

The gonopods were long, narrow with diverging inner margins and long posterior setae on the margin.

Planche I

Fig 1

Fig 2



Male. (Plate I, Fig.2).

Smaller than the female with similar characters. Total body length was 3.37 mm, range 3.05-3.78 mm. The head measured 0.73 mm in length, range 0.70-0.76 mm, and 0.44 mm in width, range 0.40-0.46 mm. Thorax was 0.42 mm long, range 0.36-0.49 mm and 0.96 mm wide, range 0.88-1.01 mm. The abdomen measured 2.22 mm in length range 1.99-2.53 mm and 1.43 mm in width, range 1.34-1.53 mm. Abdomen was smaller with lateral sclerotized plates large and distinct, and venter with slightly sclerotized median plates. Subgenital plates bore three to four anterior setae.

In the genitalia, the basal apodeme was weakly sclerotized anteriorly. Parameres were fused posteriorly into a sharp point, surrounding endotheca and aedeagus.

Nits. (Plate II).

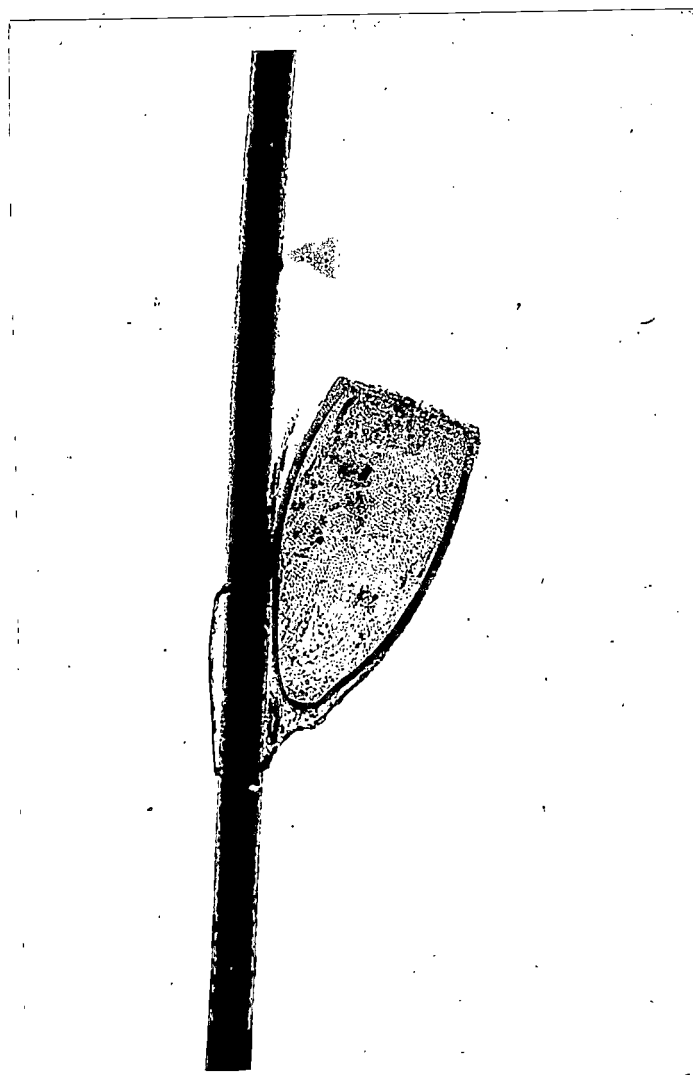
The nits were conical in shape and were found glued to the hair shaft. Length was 1.43 mm and width was 0.73 mm. (Measurements are furnished in the table 9).

Linognathus vituli (Linnaeus, 1758).

Female. (Plate III. Fig.1).

Body length was 2.02 mm, range 1.77-2.36 mm. Head was long, conical and the antennae were situated on the anterior one third and was five joined. Head measured 0.42 mm in

Plate II



length, range 0.38-0.48, and 0.18 mm in width, range 0.15-0.21 mm.

Thorax was 0.25 mm long, range 0.21-0.30 mm, and was 0.32 mm wide, range 0.23-0.38 mm. The first pair of legs were distinctly smaller than the second and third pairs. The sternal plate was absent.

Abdomen measured 1.35 mm in length, range 1.18-1.58 mm, and 0.77 mm in width, range 0.51-1.00 mm. Abdomen was membraneous and ovate. One row of hairs was present on each of the abdominal segments, both dorsally and ventrally. The spiracles were seen externally as rings on the border of the abdomen.

The gonopods slightly convergent posteriorly with numerous setae around the apex.

Male. (Plate III, Fig.2).

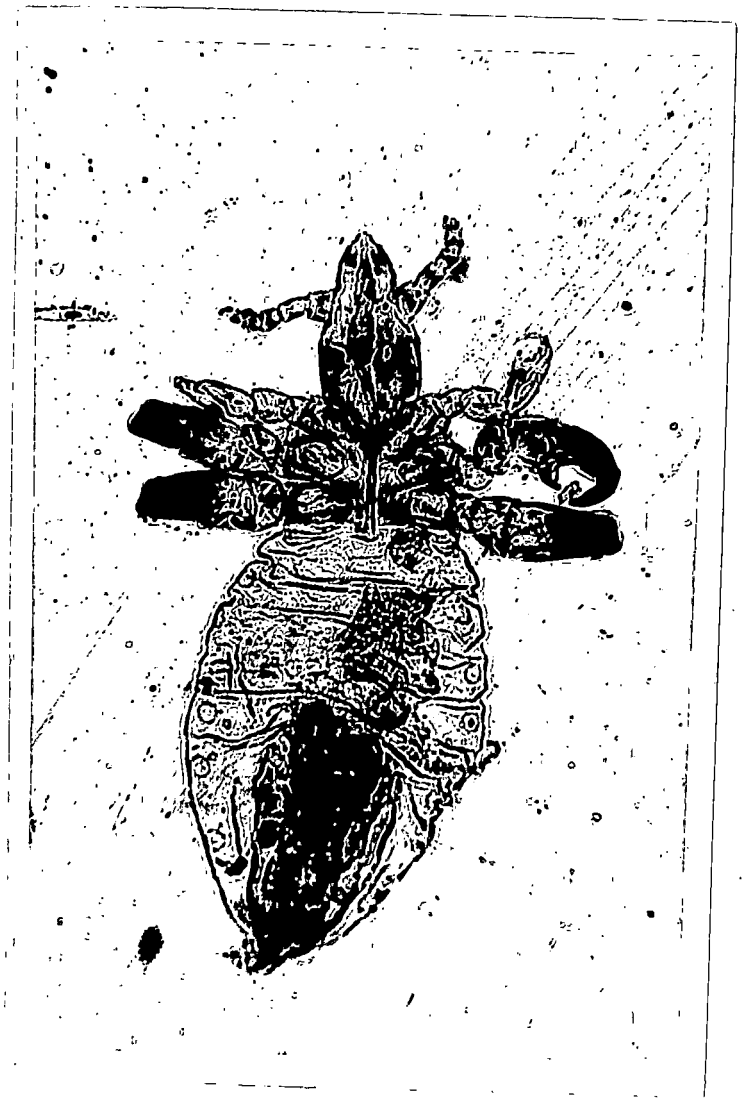
Characters similar to the female. Body length was 1.30 mm, range 1.10-1.50 mm. Head measured 0.29 mm, range 0.23-0.35 mm. Thorax was 0.18 mm long, range 0.15-0.21 mm and 0.24 mm wide, range 0.21-0.28 mm. The abdomen measured 0.83 mm in length, range 0.72-0.94 mm, and 0.60 mm in width, range 0.48-0.72 mm.

The genitalia possessed a basal plate, long and slender. The parameres were slightly curved and pointed at the posterior portion. (Measurements are furnished in the table 9.).

Plate III

Fig 1

Fig 2



Louse infesting buffaloes

Haematopinus tuberculatus (Burmeister, 1838)

Female. (Plate IV. Fig.1).

Body measured 4.42 mm in length, range 3.90-4.67 mm. Head was 0.88 mm long, range 0.85-0.90 mm and 0.65 mm wide, range 0.62-0.68 mm. Head was short and abruptly constricted at the posterior end. Antennae were filiform with five segments.

Thorax was 0.55 mm long, range 0.51-0.57 mm, and 1.03 mm wide, range 0.98-1.07 mm. The thoracic sternal plate was subsquare.

The abdomen was broad and was 2.49 mm long, range 2.54-3.20 mm, and 2.45 mm wide, range 2.05-2.79 mm. The paratergites were enlarged bearing a tuft of eight (five or more) posterior setae. The body of the louse was robust and was highly pigmented.

Two sclerotized areas were found between the gonopods, partially overlapping.

Male.(Plate IV Fig.2).

Body measured 4.26 mm in length, range 4.02-4.53 mm. Smaller in size than the female, but similar in characters. Head was 0.76 mm long, range 0.73-0.78 mm, and 0.69 mm wide, range 0.49-0.75 mm. Thorax was 0.60 mm long, range

Planche IV

Fig 1

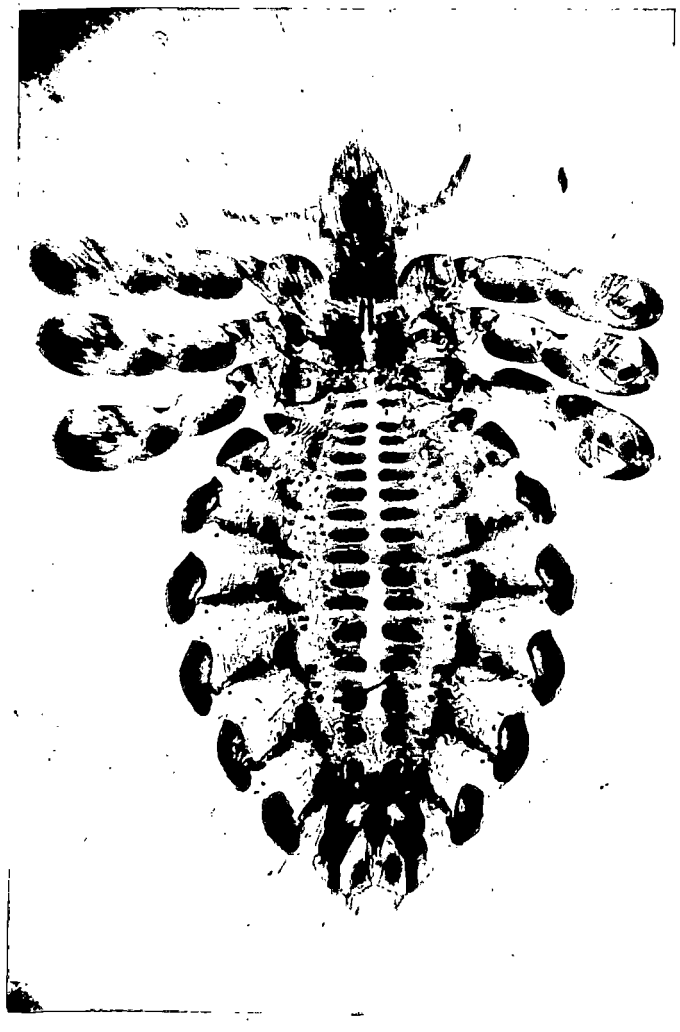
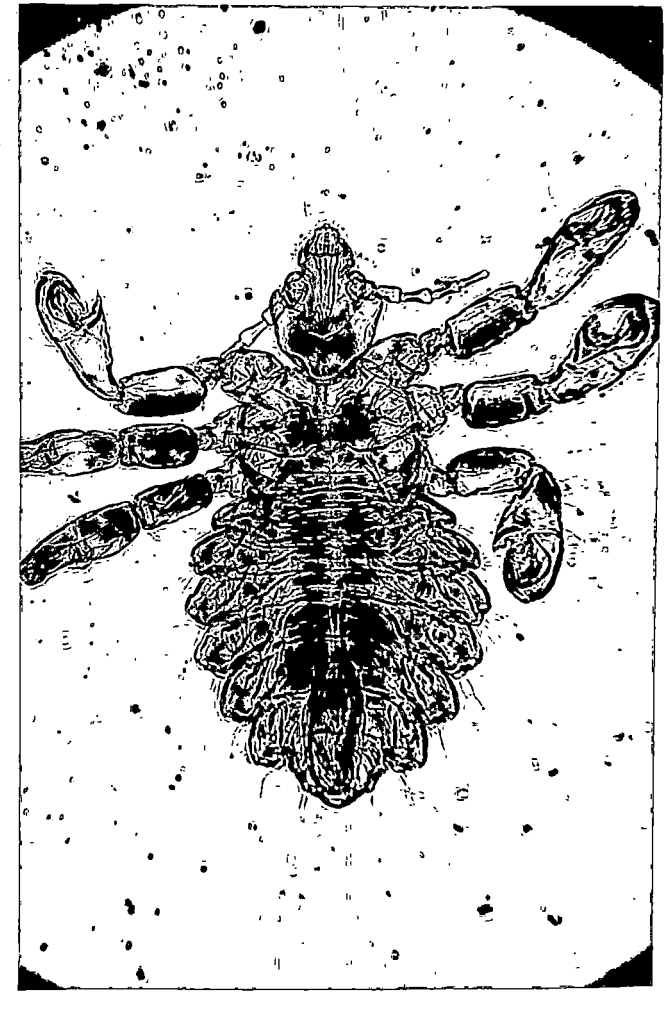


Fig 2.



0.49-0.66 mm, and 1.01 mm wide, range 0.88-1.08 mm. Abdomen measured 2,80 mm in length, range 2.80-3.09 mm and 1.59 mm in width, range 1.55-1.64 mm.

Gonopods were same as in case of Haematopinus quadripertusus. (Measurements are given in the table 10).

Lice infesting goats

Lingnathus africanus (Kellogg and Paine, 1911).

Female (Plate V. Fig.1).

Body measured 2.12 mm in length, range 1.85-2.21 mm. Head was 0.36 mm long, range 0.31-0.39 mm, and 0.26 mm wide, range, 0.19-0.28 mm. The hind portion of the head was strongly and angularily convex. Antennae were filiform and five jointed. Mouth parts were located at the anterior most portion of the head.

Thorax measured 0.33 mm in length, range 0.31-0.39 mm, and 0.38 mm in width, range 0.32-0.42 mm. The first pair of legs was considerably smaller than the IInd and IIIrd pairs. The dorsal setae were short and stout.

Abdomen was large, elongate and oval. When engorged with blood, the colour appeared dark blue. It measured 1.43 mm in length, range 1.23-1.56 mm, and 0.94 mm in width, range 0.82-1.07 mm.

Genitalia had a median genital plate. The apical lobes were found to be short.

Plate V

Fig 1

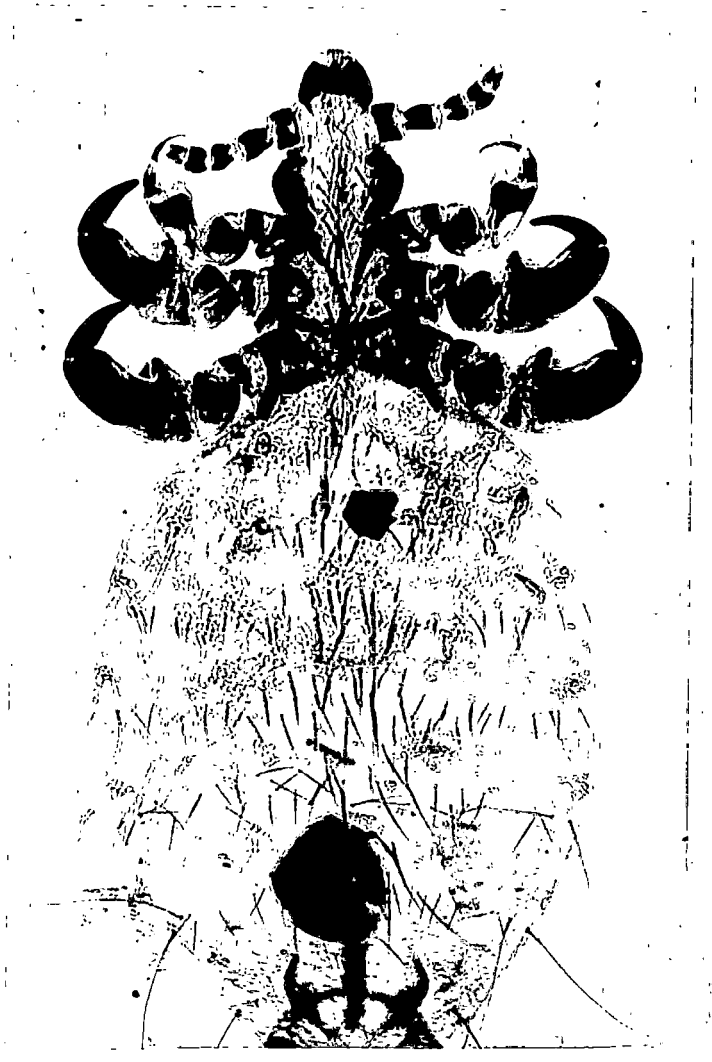
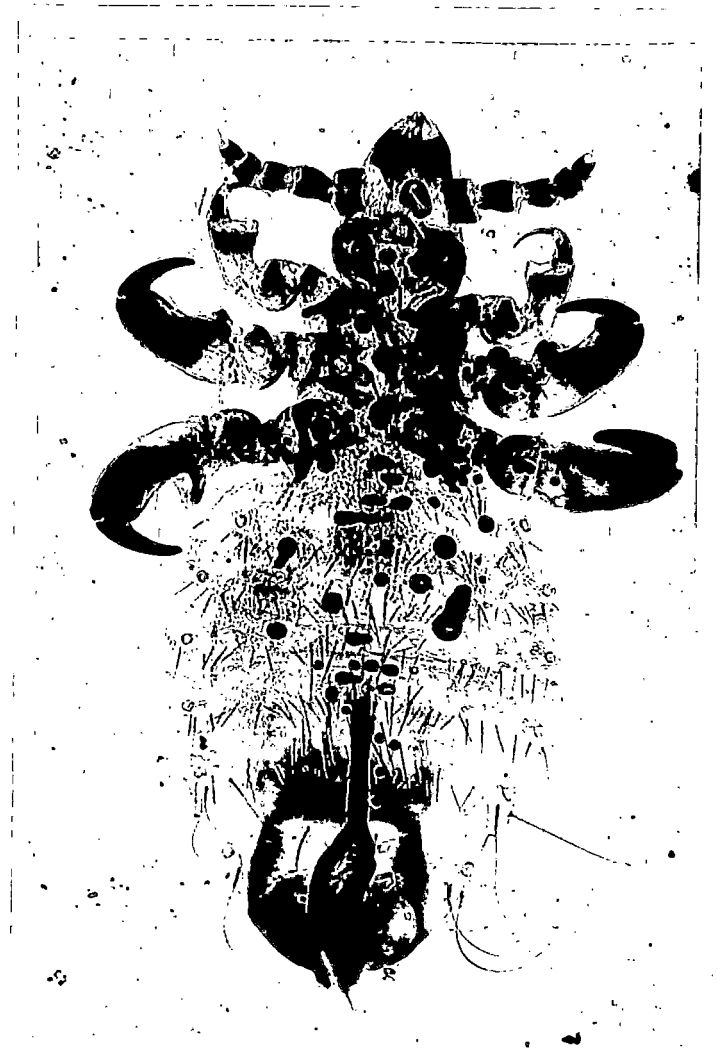


Fig 2



Male (Plate V. Fig.2).

Smaller than the female, but similar in characters. Body length was 1.56 mm, range 1.52-1.56 mm. The males were less hairy than the females. Head measured 0.34 mm in length range 0.26-0.36 mm and 0.15 mm in width, range 0.14-0.16 mm. Thorax was 0.26 mm in length, range 0.24-0.28 mm, and 0.30 mm in width, range 0.28-0.31 mm. Abdomen was 0.95 mm in length range 0.95-0.96 mm and 0.87 mm in width, range 0.85-0.88 mm.

The parameres of the genitalia were slightly curved outwards at the middle and converged at the tip. The pseudo-penis was long. (Measurements are furnished in the table 11).

Damalinia caprae (Gurlt, 1843).

Female. (Plate, VI, Fig.1).

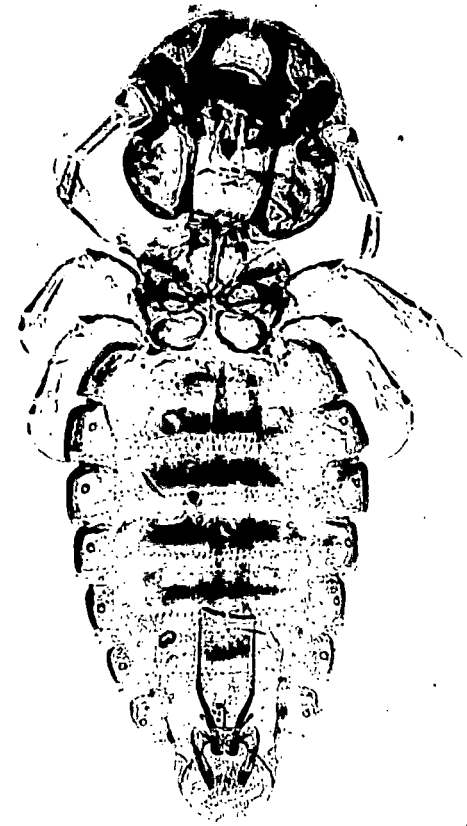
Body measured 2.04 mm in length, range 1.74-2.20 mm. The head was flat, considerably longer than thorax and was shield shaped. The mouth parts were of biting type and was arranged vertically to the body. Antenae were filiform and three joined. Length of the Head was 0.45 mm, range 0.42-0.49 mm and the width was 0.50 mm, range 0.44-0.52 mm.

The thorax was 0.25 mm long, range 0.16-0.37 mm and 0.35 mm wide, range 0.30-0.37 mm. Legs were long and slender. Tarsi were two segmented and single clawed.

Plate VII

Fig 1

Fig 2



The abdomen was large and the abdominal tergites possessed transverse median sclerites. One row of setae were present on each segment. Abdomen measured 1.32 mm in length, range 1.15-1.33 mm and 0.81 mm in width, range 0.75-0.88 mm.

Male. (Plate VI, Fig.2).

Similar to the female in characters. Length of the body was 1.76 mm, range 1.75-1.77 mm. Head was 0.42 mm long, range 0.41-0.42 mm, and 0.43 mm wide, range 0.42-0.44 mm.

Thorax was narrower than that of the female and measured 0.27 mm in length, range 0.27-0.28 mm, and 0.32 mm in width, range 0.31-0.32 mm. Abdomen was 1.06 mm long, range 1.06-1.08 mm and 0.70 mm wide, range 0.70-0.71 mm.

Nits. (Plate VII).

Smaller, oval in shape. The length was 0.86 mm and width was 0.71 mm. (Measurements are given in the table 11).

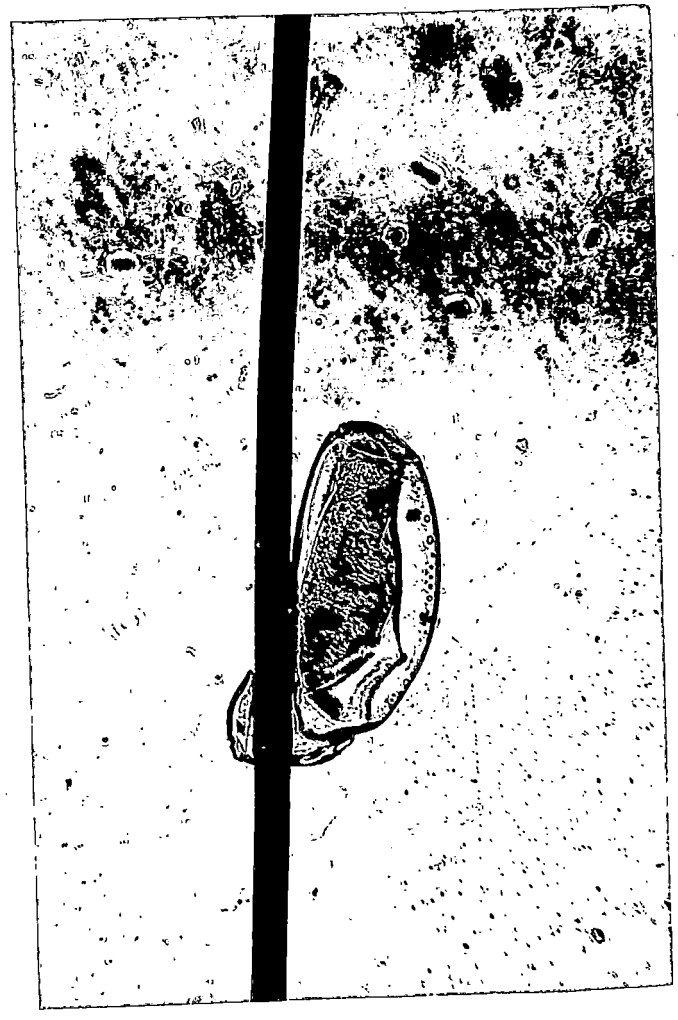
Louse infesting dogs

Heterodoxus longitarsus (Piaget, 1880).

Female. (Plate VIII, Fig.1).

A slender yellowish species measuring 2.48 mm in length, range 2.30-2.69 mm . The head was triangular with rounded forehead and subtriangulare temporal lobes. The length of the head was 0.38 mm, range 0.36-0.42 mm and the width was 0.58 mm, range 0.57-0.61 mm. The antennae were five joined

Plate VII



and the palpi were four segmented. There was a pair of strong, ventral spine like procell arising from the base of the palpi.

Thorax consisted of pro and ptero thorax. The total length was 0.57 mm, range 0.49-0.62 mm, and 0.48 mm in width, range 0.46-0.49 mm. Legs were long and the femora was heavy. The femora had a row of small hairs on the dorsal aspect. Tarsi were long and bore two claws.

The abdomen was narrow in proportion to the length and terminated dorsally in a single pair of gonopodial processes. Each abdominal segment possessed a row of hairs dorsally and ventrally. The abdomen measured 1.53 mm in length, range 1.44-1.64 mm, and 0.89 mm in width, range 0.89-1.20 mm.

Male. (Plate VIII, Fig.2).

Body was 2.26 mm long, range 2.03-2.47 mm. All other characters similar to the female except that it was smaller in size. The head was 0.36 mm in length, range 0.36-0.37 mm and 0.53 mm in width, range 0.49-0.55 mm. The thorax measured 0.58 mm in length, range 0.49-0.68 mm and 0.43 mm in width, range 0.36-0.46 mm. Abdomen was 1.31 mm long, range 1.18-1.42 mm and 0.82 mmwide, range 0.79-0.87 mm. (Measurements are furnished in the table 12).

Plate VIII

Fig 1

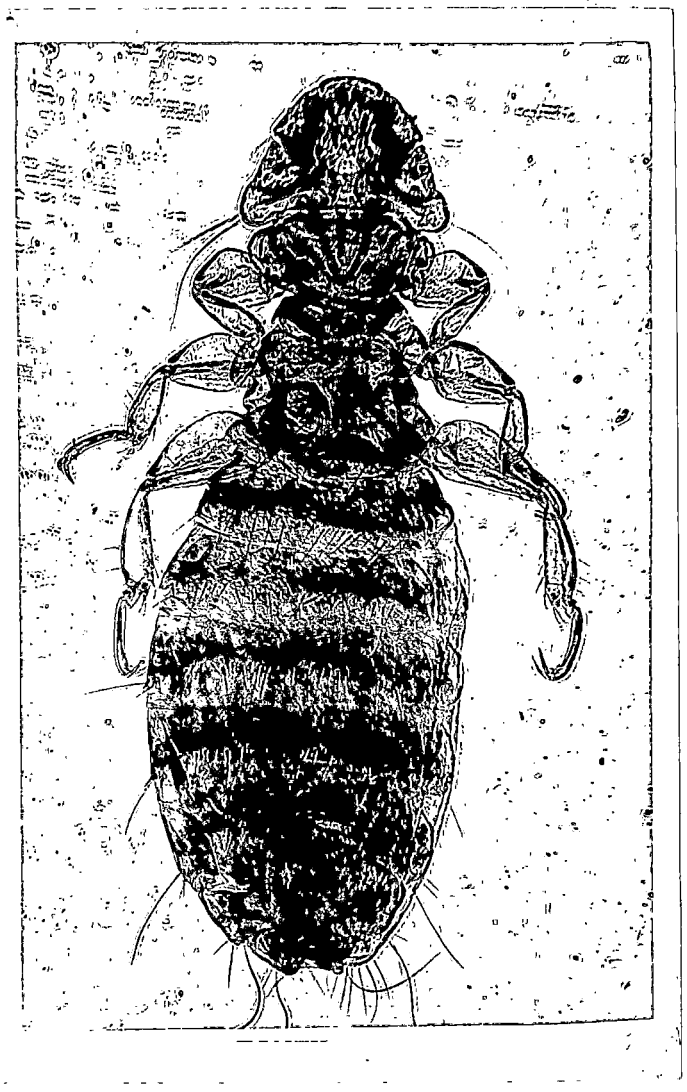
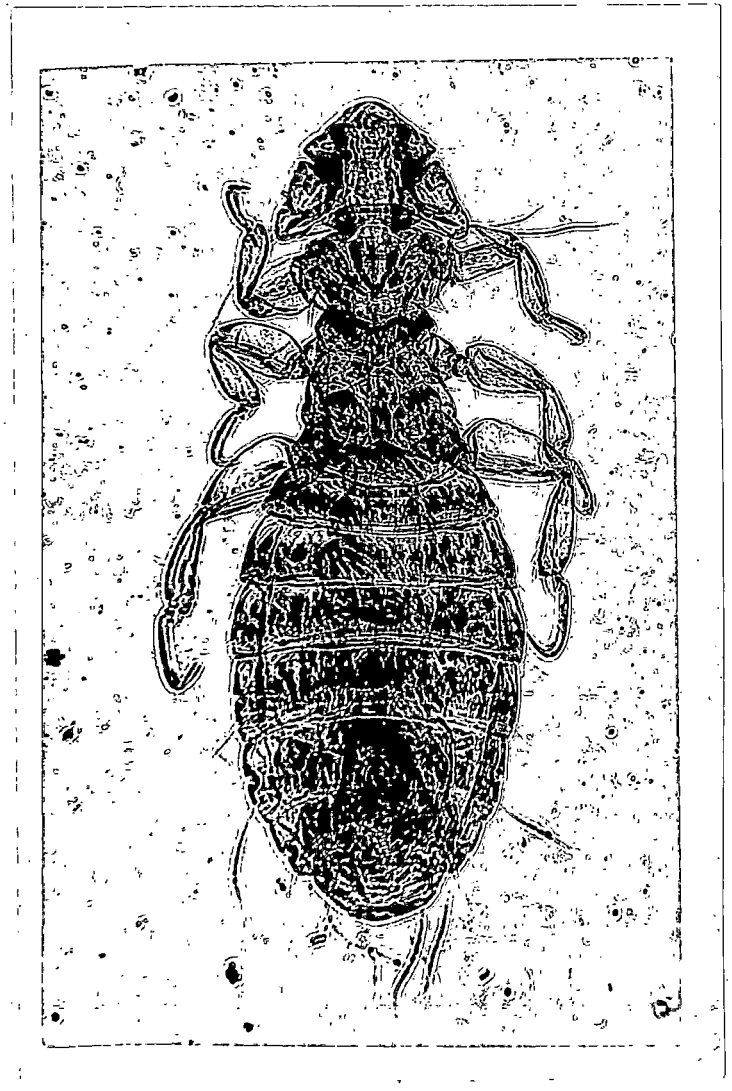


Fig 2



Louse infesting elephants

Haematomyzus elephantis (Piaget, 1869).

Female. (Plate IX, Fig.1).

Body measured 2.66 mm in length, range 2.39-2.96 mm. The head was 0.88 mm long, range 0.83-0.99 mm. It was triangular in outline. The dorsal and ventral surfaces were arched except at the anterior end beyond the level of the eyes, where the ventral surface became flat. The dorsal surface was strongly chitinized and dark brown in colour. The head was prolonged into a proboscis or rostrum, which was a uniformly cylindrical tube. The apex of the rostrum was pigmented and bore the mouth parts. The antennae were five joined and filiform.

Thorax was dark brown in colour and measured 0.36 mm in length, range 0.31-0.43 mm and 0.76 mm in width, rage 0.71 - 0.81 mm. The thorax consisted of pronotum, mesonotum and metanotum. The legs were peculiar in that each had a slender claw and no foot pad.

The abdomen measured 1.42 mm in length, range 1.25-1.55 mm and 1.29 mm in width, range 1.12-1.29 mm. It consisted of eight segments, which were sharply delimitted at the lateral margin by intersegmental constrictions. Each abdominal tergite consisted of a median and two lateral plates, which lie on either side. The median plate was separated from

Plate IX

Fig 1

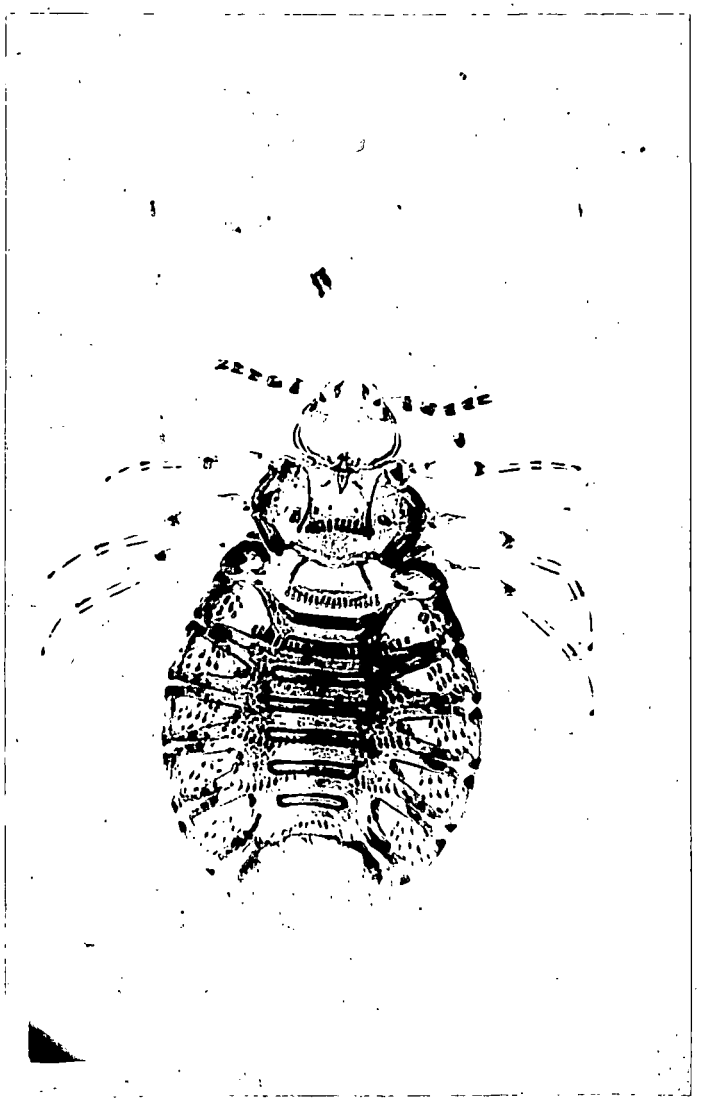
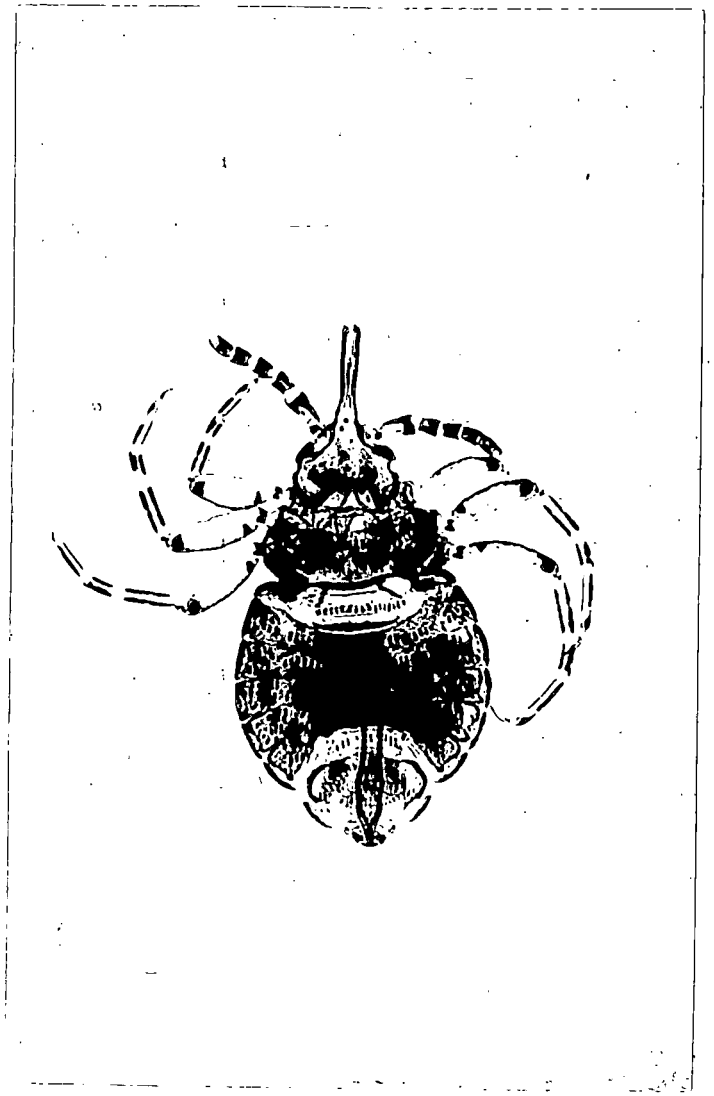


Fig 2



the lateral plates by a membraneous area. The genital opening was on the ventral side of the seventh segment. A pair of valves was present in the genitalia. Each valve had a broad posterior blade. Slightly curved narrow apodeme lies in the seventh segment. The posterior portion of the blade was provided with numerous long setae.

Male. (Plate IX, Fig.2).

Body measured 2.09 mm in length, range 2.05-2.12 mm. The head was 0.83 mm long, range 0.81-0.84 mm, and 0.42 mm wide, range 0.41-0.43 mm. Thorax was 0.27 mm long, range 0.25-0.28 mm, and 0.63 mm in width, range 0.16-0.65 mm. The abdomen was comparatively slender and was 0.99 mm long, range 0.99-1.00 mm, and 0.92 mm wide, range 0.90-0.94 mm. The mid-dorsal tergite of the first segment was broad. Lateral tergite was absent. Of the two mid-dorsal tergal plates in the segment, the first remained free and the second segment became fused laterally with the lateral tergites of the same segment. In the subsequent segments, from the third to the sixth, the mid-dorsal tergites were fused together.

Genital plate was absent. The genitalia consisted of a basal plate, a pair of parameres, a single median phallic sac and a sclertic plate. (Measurements are given in the table 13).

Lice infesting poultry

Menacanthus stramineus. (Nitzsch, 1818).

Female.)(Plate X, Fig.1).

Body was dark yellow in colour and measured 2.13 mm in length, range 1.97-2.42 mm. Head was small and triangular with five hairs and three setae on each side. Head was 0.34 mm long, range 0.29-0.47 mm, and 0.51 mm wide, range 0.49-0.52 mm. It was round anteriorly with the greatest width at the temples. Lateral margin either side was slightly excavated and it revealed a deep slit just in front of the eye. Antennal fossa was also quite deep. Antenna was four segmented. The mandibles were placed close to the anterior margin of the head.

Thorax consisted of pro and ptero thoracic portions. Prothorax measured 0.30 mm in length, range 0.29-0.32 mm, and 0.52 mm in width, range 0.45-0.56 mm, where as the pterothorax was 0.22 mm long, range 0.20-0.24 mm, and 0.56 mm wide, range 0.50-0.60 mm. Prothorax was large, protruded and lateral angles were rectangular with a spine. Pterothorax was sub-rectangular and broad with hairs similar to that of the abdomen. Sternum possessed clusters of long hairs. Second and third femora was heavy, with hairs on the inner and outer margins. Posterior femora had a patch of setae on the ventral surface. Tibia was longer than the femora and was covered with hairs.

Plate X

Fig 1

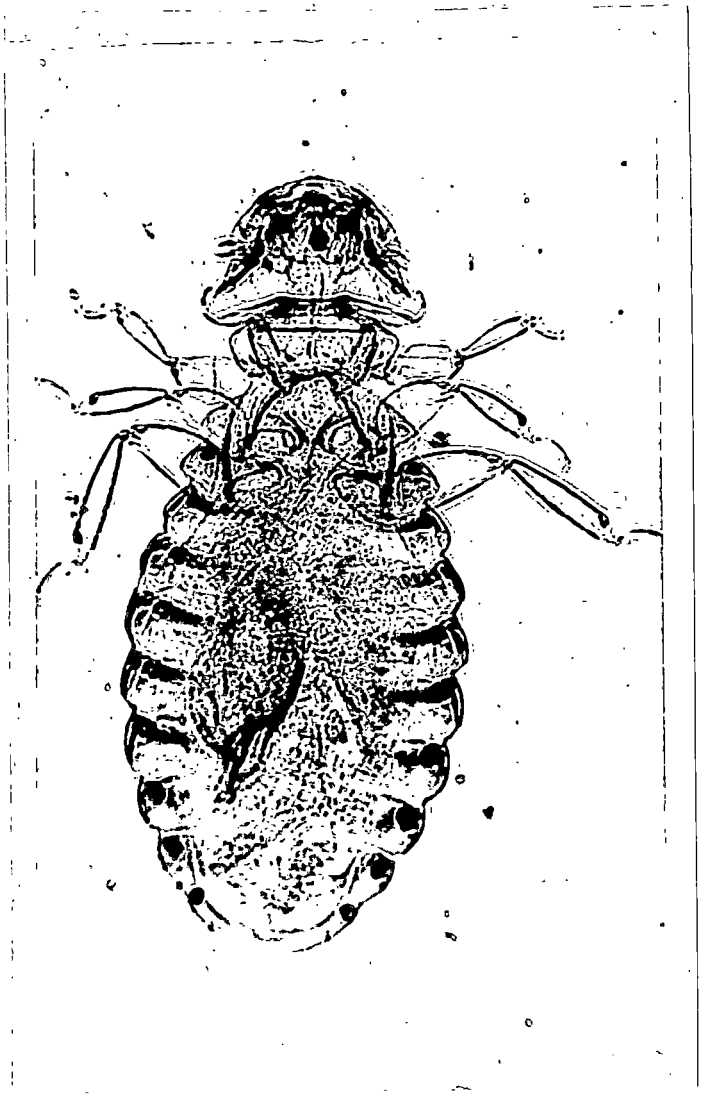
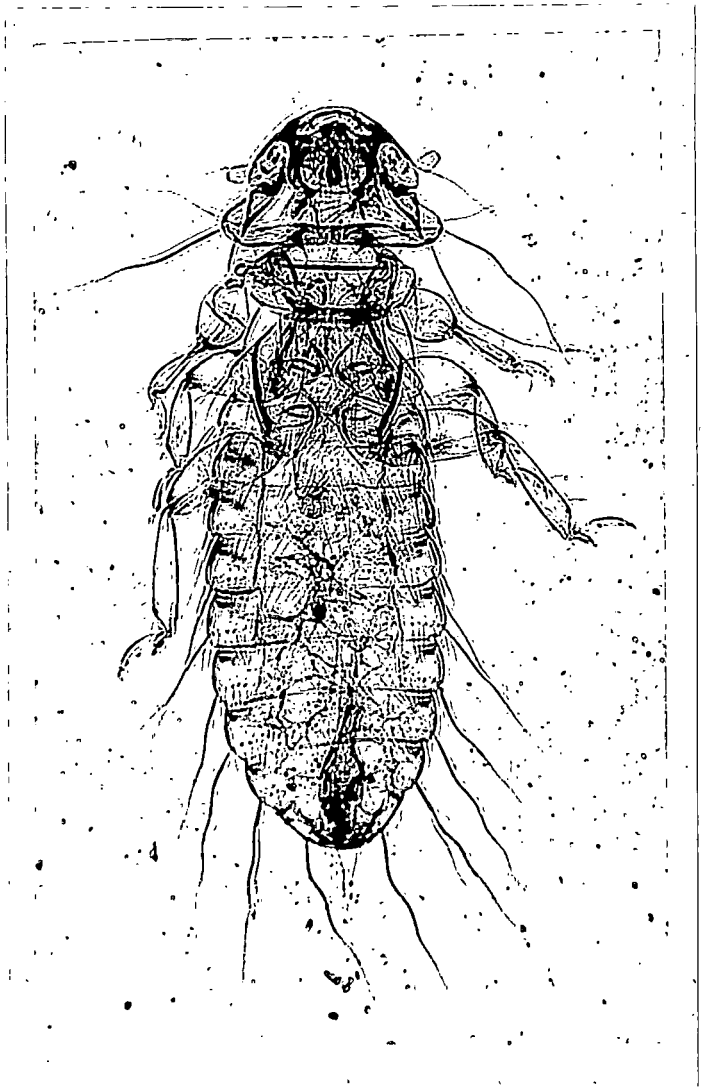


Fig. 2



Abdomen measured 1.28 mm in length, range 1.19-1.39 mm, and 0.80 mm in width, range 0.78-0.85 mm. It was ovate with a group of setae and three long hairs on the posterior angles. Each segment carried two rows of hairs on the dorsum.

Vulva was small and concave with two transverse bands.

Male. (Plate X, Fig.2).

Body measured 1.06 mm in length, range 1.82-2.08 mm. Head was 0.29 mm long, range 0.28-0.29 mm, and 0.47 mm wide, range 0.45-0.48 mm.

Thorax was smaller than that of the female. Prothorax was 0.30 mm long, range 0.26-0.34 mm, and 0.50 mm wide, range 0.48-0.53 mm. The pterothorax measured 0.25 mm in length, range 0.25-0.30 mm, and 0.56 mm in width, range 0.51-0.62 mm.

Abdomen was narrow and 1.11 mm long, range 1.08-1.15 mm. and 0.51 mm wide, range 0.51-0.53 mm. Other characters were similar to that of the female.

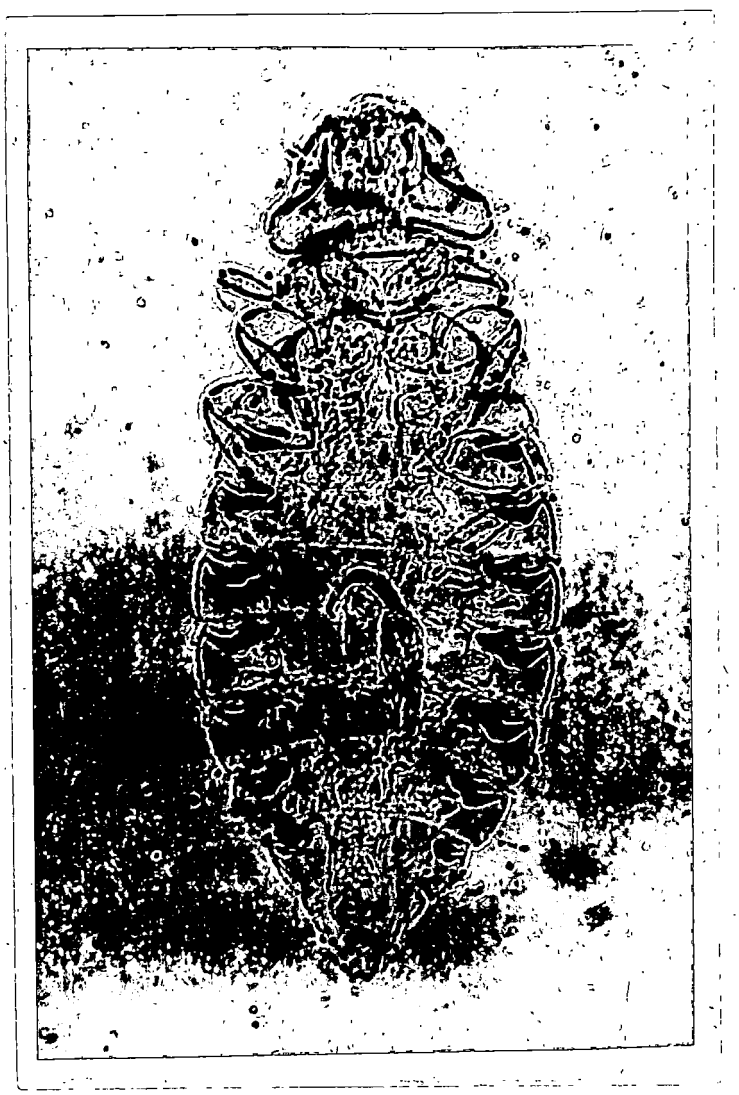
Paramers of the genitalia were heavy at the base and curved twice. (Measurements are furnished in the table 14).

Menopon gallinae (Linnaeus, 1758).

Female. (Plate XI).

This species was pale yellow in colour and smaller than Menacanthus species. Total length was 2.10 mm, range 0.97-2.21 mm. Head was triangular, more or less rounded, with one to two hairs in the anterior margin. It measured 0.29 mm

Plate XI



in length, range 0.28-0.32 mm, and 0.50 mm in width, range, 0.48-0.52 mm. Ocular invagination was distinct. Temples were small, rounded laterally and possessed four hairs and several marginal setae. Occiput was concave with two to four setae.

Thorax consisted of pro and pterothoracic regions. Prothorax was 0.43 mm long, range 0.41-0.46 mm and 0.34 mm wide, range 0.32-0.35 mm. Pterothorax was 0.17 mm in length, range 0.16-0.18 mm and 0.47 mm in width, range 0.44-0.49 mm. Prothorax was protruded, with five hairs and a spine in the lateral acute angle. Pterothorax was short and broad, diverging laterally and concave posteriorly with a series of long hairs. Legs were concolourous with the body and were robust. Posterior femora possessed a group of hairs and the tibia were longer than the femora and was well furnished with hairs.

Abdomen was elongate and oval with one to three hairs, and a spine in the posterior angles. A single transverse row of hairs was present on each abdominal segment. The length of the abdomen was 1.12 mm, range 1.12-1.25 mm, and the width was 0.80 mm, range 0.77-0.83 mm.

The second segment was elongate with a fringe of short hairs.

Plate XII

Fig 1

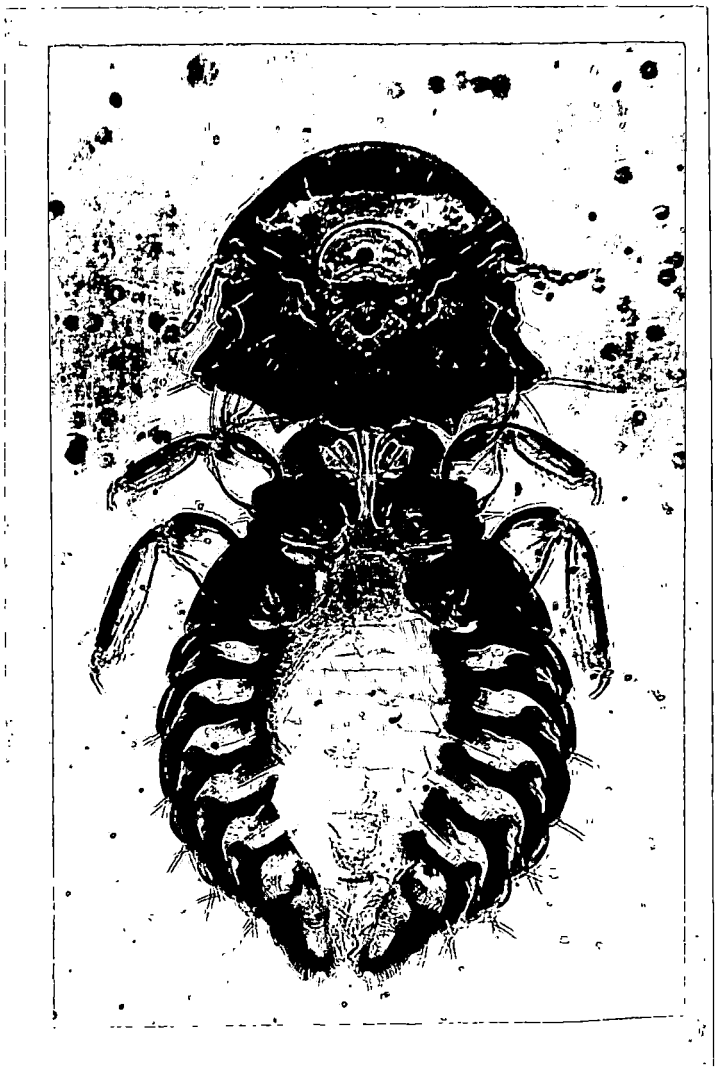


Fig 2.

Male.

But for smaller in size, characters were similar to that of the female. Body measured 1.82 mm in length, range 1.64-1.92 mm. Head was 0.31 mm long, range 0.27-0.33 mm and 0.45 mm wide, range 0.42-0.47 mm.

The prothorax was 0.16 mm long, range 0.15-0.17 mm and 0.37 mm wide, range 0.35-0.38 mm. The pterothorax was 0.16 mm in length, range 0.13-0.16 mm and 0.46 mm in width, range 0.45-0.47 mm.

Abdomen measured 1.20 mm in length, range 1.09-1.20 mm and 0.67 mm in width, range 0.66-0.69 mm.

Genitalia was simple with a short basal plate, feably sclerotized and the parameres were long, club shaped, sub-parallel with a double curve. Endomeral plate was ablong with marginal thickenings.(Measurements are furnished in the table 14).

Goniodes gigas (Tachenburg, 1869).

Female. (Plate XII, Fig.1).

This was a strong and stout species. Body length was 3.05 mm, range 2.41-3.48 mm. General body colour was smoky-grey with tawny black pleural plates.

The head was 0.91 mm long, range 0.81-0.97 mm and 1.18 mm wide, range 1.05-1.86 mm. It was almost as broad as long.

Plate XIII

Fig 1

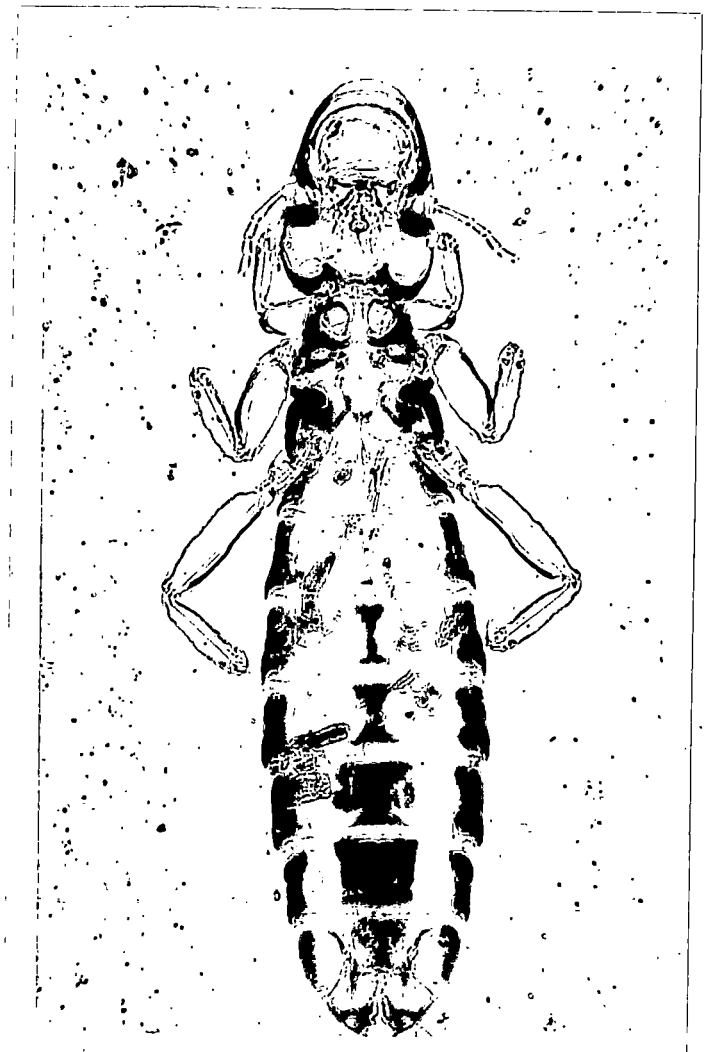
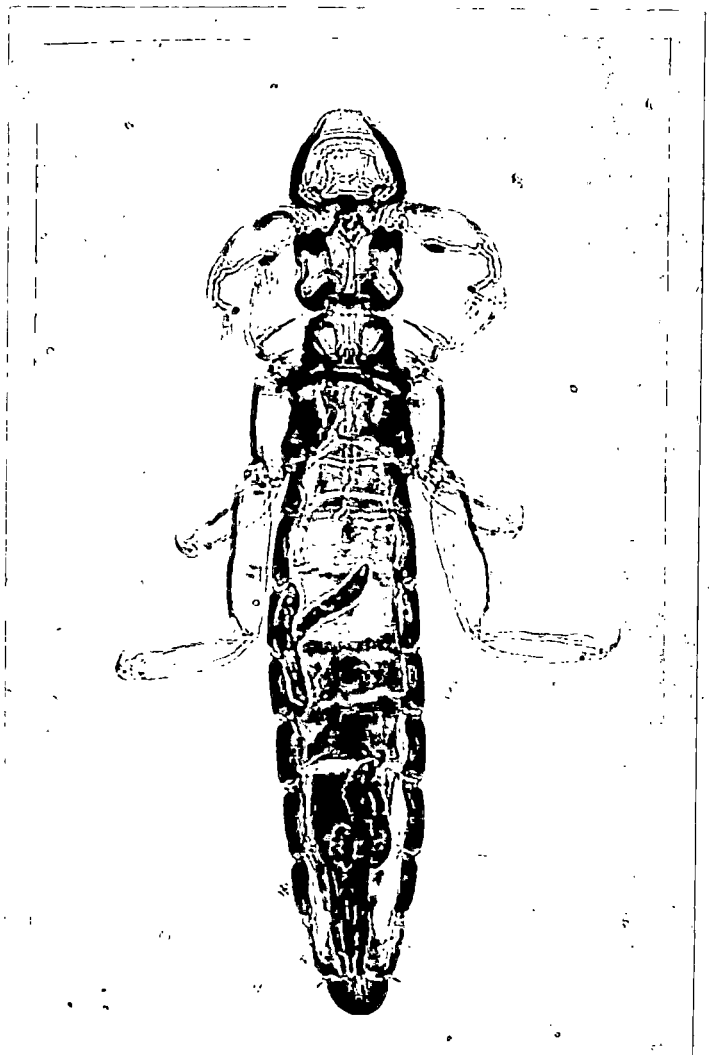


Fig 2



The fore head was with rounded temples, inwardly oblique and the angles were protruding. The trabaculae were short, blunt and rigid. Antennae were filiform and five segmented.

Thorax measured 0.76 mm in length, range 0.18-0.89 mm, and 1.04 mm in width, range 0.78-1.15 mm. Prothorax was rectangular and the pterothorax was projecting laterally and obtusely angulate posteriorly.

Abdomen was 1.36 mm long, range 0.92-1.62 mm and 1.49 mm wide, range 1.20-1.69 mm. It was broad and orbicular. Posterior segments were concave and terminal segment was truncate and globular. Pleural plates were well developed and dark brown in colour. Median region was hairy.

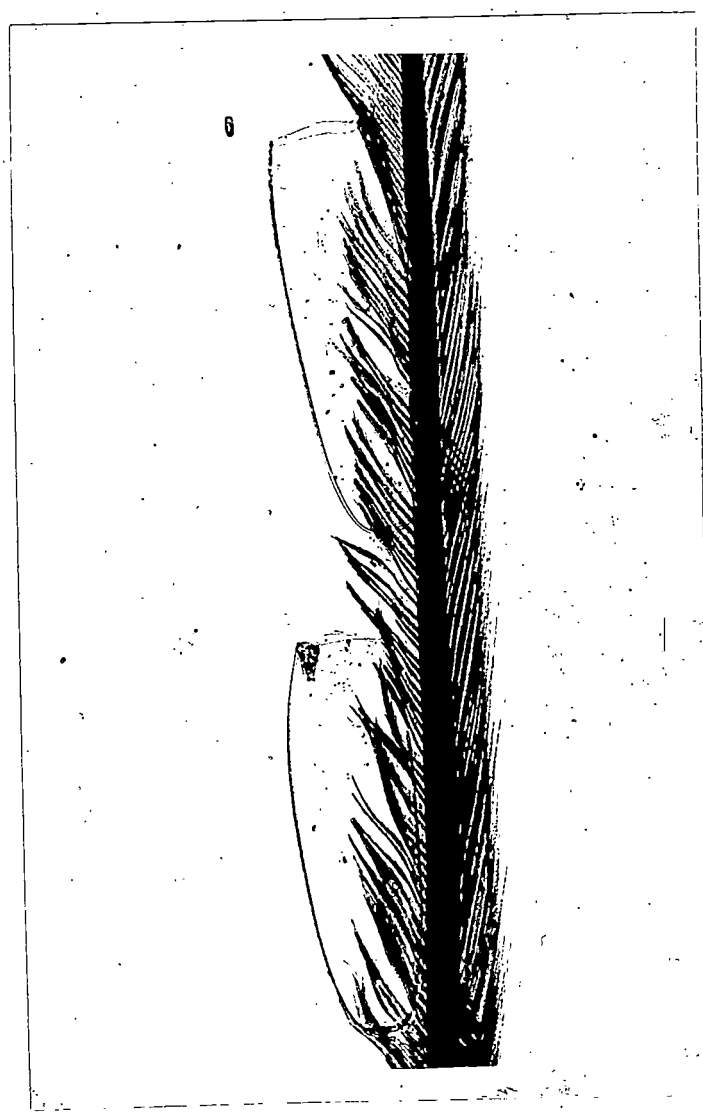
Male. (Plate XII, Fig.2).

Body length was 2.36 mm, range 2.15-2.54 mm. The head was 0.72 mm long, range 0.66-0.79 mm, and 0.87 mm wide, range 0.82-0.90 mm. The first segment of the antenna was stout.

The thorax was 0.64 mm long, range 0.54-0.72 mm, and 0.87 mm wide, range 0.75-1.08 mm. Other characters were similar to that of the female.

Genitalia was very long, narrow and extending as far as the abdominal segment II. It was straight with sub-parallel

Plate XIV



side. Endomeral plate was short. Parameres were relatively small and harpoon shaped. (Measurements are given in the table 14).

Lipeurus caponis (Linnaeus, 1788).

Female. (Plate XIII, Fig.1).

This species was elongate and very dark in colour. Body length was 2.37 mm, range 2.24-2.46 mm. Head was 0.50 mm long, range 0.49-0.52 mm and 0.35 mm wide, range 0.34-0.36 mm The forehead was slightly angulate. The trabeculae were small. Antennae were well built and filiform. The temples were founded.

The prothorax was small and 0.12 mm in length, range 0.20-0.24 mm, and 0.36 mm in width, range 0.34-0.37 mm. The pterothorax was longer than the prothorax (Length 0.30 mm, range 0.29-0.32 mm, width 0.34 mm, range 0.33-0.38 mm). The meso-thoracic suture and the posterior angle were projecting. The last thoracic segment was found to carry a tuft of long hairs on either side.

The abdomen was 1.45 mm long, range 1.33-1.51 mm and 0.46 mm wide, range 0.42-0.54 mm. It was oblong with subparallel side upto the seventh segment and then sloped to the tip. Terminal segment was emarginated. The body markings were very conspicous. Pleural plates were marginal and tergal plates were confined to the middle of the abdomen and were divided.

Male. (Plate XIII, Fig.2).

Body was 2.05 mm long, range 1.89 mm. The head was 0.44 mm long, range 0.38-0.46 mm and was 0.26 mm wide, range 0.23-0.30 mm. The first antennal segment was largest with a hook like process, located in the dorsal half (inferior margin). Second segment was smaller than third segment and fourth segments put together.

The thorax consisted of pro and ptero thoracic regions. Prothorax was 0.24 mm long, range 0.22-0.26 mm and 0.35 mm wide, range 0.34-0.37 mm. The pterothorax was 0.30 mm long range 0.29-0.33 mm, and 0.37 mm wide, range 0.35-0.38 mm.

Abdomen was 1.27 mm long, range 1.20-1.44 mm, and 0.33 mm wide, range 0.31-0.42 mm.

Genital armature was elongate and the basal plate was long, tapering anteriorly to a rather bluntly pointed extremity. The posterior end was broad, articulating with a pair of short, slender and tapering parameres. Preputial sac was well formed, membraneous and beset with numerous recurved denticles.

Nits. (Plate XIV).

They were elongate and whitish in colour. They were seen adhered between the barbules.

Table 9. Measurements of lice infesting cattle.

Parts measured	Female				Male			
	Length		Width		Length		Width	
	average	range	average	range	average	range	average	range
Haematopinus quadripertusus								
Body	4.47	3.21-5.36	2.33	1.64-2.88	3.37	3.05-3.78	1.43	1.34-1.53
Head	0.76	0.65-0.85	0.50	0.45-0.54	0.73	0.70-0.76	0.44	0.40-0.46
Thorax	0.52	0.42-0.69	0.99	0.85-1.07	0.42	0.36-0.49	0.96	0.88-1.01
Abdomen	3.15	2.13-3.82	2.33	1.64-2.88	2.22	1.99-2.53	1.43	1.34-1.53
Linognathus vituli								
Body	2.02	1.77-2.36	0.77	0.61-1.00	1.30	1.10-1.50	0.60	0.48-0.72
Head	0.42	0.38-0.48	0.18	0.15-0.21	0.20	0.23-0.35	0.16	0.12-0.20
Thorax	0.25	0.21-0.30	0.32	0.23-0.38	0.18	0.15-0.21	0.24	0.21-0.28
Abdomen	1.35	1.18-1.58	0.77	0.61-1.00	0.83	0.72-0.94	0.60	0.48-0.72

All measurements in mm. (concl.)

Table 10. Measurements of louse infesting buffaloes.

Haematopinus tuberculatus

Parts measured	Female				Male			
	Length		Width		Length		Width	
	average	range	average	range	average	range	average	range
Body	4.42	3.90-4.67	2.45	2.05-2.79	4.25	4.02-4.53	1.59	1.55-1.64
Head	0.88	0.85-0.90	0.65	0.62-0.68	0.76	0.73-0.78	0.69	0.62-0.75
Thorax	0.55	0.51-0.57	1.03	0.98-1.07	0.60	0.49-0.66	1.01	0.88-1.08
Abdomen	2.99	2.54-3.20	2.45	2.05-2.79	2.89	2.80-3.09	1.59	1.55-1.64

All measurements in mm.

(Concl.)

Table 11. Measurements of lice infesting goats.

Damalinia caprae.

Parts measured	Female				Male			
	Length		Width		Length		Width	
	average	range	average	range	average	range	average	range
Body	2.04	1.74-2.20	0.81	0.75-0.88	1.76	1.75-1.77	0.70	0.70-0.71
Head	0.45	0.42-0.49	0.50	0.44-0.52	0.42	0.41-0.42	0.43	0.42-0.44
Thorax	0.25	0.16-0.37	0.35	0.30-0.37	0.27	0.27-0.28	0.32	0.31-0.32
Abdomen	1.33	1.45-1.33	0.81	0.75-0.88	1.06	1.06-1.08	0.70	0.70-0.71

Linognathus africanus

Body	2.12	1.85-2.21	0.94	0.82-1.07	1.56	1.52-1.59	0.87	0.85-0.88
Head	0.36	0.31-0.39	0.26	0.19-0.28	0.34	0.32-0.36	0.15	0.14-0.16
Thorax	0.33	0.31-0.39	0.38	0.32-0.42	0.26	0.24-0.28	0.30	0.28-0.31
Abdomen	1.43	1.23-1.56	0.94	0.82-1.07	0.95	0.95-0.96	0.87	0.85-0.88

All measurements in mm.

(Concl.)

Table 12. Measurements of louse infesting dogs.

Heterodoxus longitarsus.

Parts measured	Female				Male			
	Length		Width		Length		Width	
	average	range	average	range	average	range	average	range
Body	2.48	2.30-2.69	0.98	0.89-1.20	2.26	2.03-2.47	0.82	0.79-0.87
Head	0.38	0.36-0.43	0.58	0.57-0.61	0.36	0.36-0.37	0.53	0.49-0.55
Thorax	0.57	0.49-0.62	0.48	0.46-0.49	0.58	0.49-0.68	0.43	0.36-0.46
Abdomen	1.53	1.44-1.46	0.98	0.89-1.20	1.31	1.18-1.42	0.82	0.79-0.87

All measurements in mm.

(Concl.)

Table 13. Louse infesting elephants.

Haematomyzus elephantis

Parts measured	Female				Male			
	Length		Width		Length		Width	
	average	range	average	range	average	range	average	range
Body	2.66	2.39-2.96	1.29	1.12-1.45	2.09	2.05-2.12	0.92	0.90-0.94
Head	0.88	0.83-0.99	0.45	0.35-0.49	0.83	0.81-0.84	0.42	0.41-0.43
Thorax	0.36	0.31-0.43	0.76	0.71-0.81	0.27	0.25-0.28	0.63	0.61-0.65
Abdomen	1.42	1.25-1.55	1.29	1.12-1.45	0.99	0.99-1.00	0.92	0.90-0.94

All measurements in mm.

(Concl).

Table 14. Measurements of lice infesting poultry.

Menacanthus stramineus

Parts measured	Female				Male			
	Length		Width		Length		Width	
	average	range	average	range	average	range	average	range
Body	2.13	1.97-2.42	0.80	0.78-0.85	1.96	1.82-2.08	0.51	0.51-0.53
Head	0.34	0.29-0.47	0.51	0.49-0.52	0.29	0.28-0.29	0.47	0.45-0.48
Prothorax	0.30	0.29-0.32	0.52	0.45-0.56	0.30	0.26-0.34	0.50	0.48-0.53
Pterothorax	0.22	0.20-0.24	0.56	0.50-0.60	0.25	0.21-0.30	0.56	0.51-0.62
Abdomen	1.28	1.19-1.39	0.80	0.78-0.85	1.11	1.076-1.15	0.51	0.51-0.53

Menopon gallinae

Body	2.10	1.97-2.21	0.80	0.77-0.83	1.82	1.64-1.92	0.67	0.66-0.69
Head	0.29	0.28-0.32	0.50	0.48-0.52	0.31	0.27-0.33	0.45	0.42-0.47
Prothorax	0.43	0.41-0.46	0.34	0.32-0.35	0.16	0.15-0.17	0.37	0.35-0.38

Pterothorax	0.17	0.16-0.18	0.47	0.44-0.49	0.16	0.13-0.16	0.46	0.45-0.47
Abdomen	1.21	1.12-1.25	0.80	0.77-0.83	1.20	1.09-1.26	0.67	0.66-0.69

Goniodes gigas

Body	3.05	2.41-3.48	1.49	1.20-1.69	2.36	2.15-2.54	1.19	1.09-1.25
Head	0.91	0.81-0.97	1.18	1.05-1.86	0.72	0.66-0.79	0.87	0.82-0.90
Thorax	0.76	0.68-0.89	1.04	0.78-1.15	0.64	0.54-0.72	0.87	0.75-1.08
Abdomen	1.36	0.92-1.62	1.49	1.20-1.69	1.0	0.95-1.06	1.19	1.09-1.25

Lipeurus caponis

Body	2.37	2.24-2.46	0.46	0.52-0.54	2.05	1.89-2.26	0.33	0.31-0.42
Head	0.50	0.49-0.52	0.35	0.34-0.36	0.44	0.38-0.46	0.26	0.23-0.30
Prothorax	0.21	0.20-0.24	0.36	0.34-0.37	0.20	0.20-0.22	0.29	0.28-0.30
Pterothorax	0.30	0.29-0.32	0.34	0.33-0.38	0.27	0.26-0.28	0.42	0.40-0.43
Abdomen	1.45	1.33-1.51	0.46	0.42-0.54	1.27	1.20-1.44	0.33	0.31-0.42

All measurements in mm.

(Concl.)

REVIEW OF LITERATURE

Moore et al.(1959) found that 0.5 per cent Sevin 50 E.C.(I-naphthyl N-methyl Carbanate) and 0.1 per cent Malathion as sprays to be effective in destroying the lice affecting goats. They also found that the animals to be free of lice upto four months after the treatment. Darrow (1973) found that resin neck collars impregnated with 5-10 per cent Nuvan (dichlorvos) controlled Damalinia limbatus and D.crassipes within five weeks. Taylor et al. (1974) stated that Malathion as a spray was effective against lice infesting goats. Chaudhuri (1976) reported that 0.05 per cent Malathion spray destroyed goat lice and kept the animals free of lice for 12 to 18 weeks.

Ranu (1956) used one per cent Malathion for application on walls and four per cent to the litter to control chicken louse (Menacanthus stramineus, Menopon gallinae, and Goniocotes gigas). The efficacy of 0.5 per cent Sevin emulsion and 0.5 per cent dust against poultry lice was promising (Kraemer, 1959). Hoffman (1960) found that Malathion as one per cent emulsion and five per cent dust was effective in controlling poultry lice. Five per cent Sevin dust was also reported to be useful by the same author. Rodriguez and Riehl (1960) reported that four per cent Malathion dust applied to natural wallows was useful for the control of

M.stramineus, Goniocotes gallinae, Menopon gallinae lipeurus caponis and Cuclotogaster heterographus.

Trials were conducted by Ranjan and Bhatnagar (1967) and found out that one per cent Nuvan (dichlorvos) was effective in controlling poultry lice. Srivastava (1970) reported that Sevin, Nuvan and Malathion was found to be efficient for the control of poultry lice. He used one pound of five per cent Sevin per 100 birds and 4-5 per cent Malathion dust on the litter.

Chellappa et al. (1977) reported on the comparative efficacy of Malathion, Sumithion and Nuvan spray for the control of poultry lice. He found that Malathion and Nuvan were similar in effect.

RESULTS

The comparative efficacy of three insecticides viz. Malathion-50 E.C.(0,0 dimethyl phosphorodithioate of mercapto succinate - marketed by PESTICIDES INDIA as 'Malthox'), Sevin-50 E.C.(Carbaryl - marketed by Union Carbide) and Nuvan-100 (dichlorvos - marketed by CIBA-GEIGI) was evaluated by spraying them on lice infested goats and poultry. Goats were with natural infection of Linognathus africanus and Damalinia caprae, and poultry were with artificial infections of Menacanthus stramineus and Lipeurus caponis. The insecticides were applied at the concentrations prescribed by respective firms. As already mentioned, the percentage of efficacy of each insecticide has been arrived at by calculating the reduction in lice counts after insecticide application. The results were compared with those of non-treated control groups.

Out of three insecticides tried, 0.05 per cent Nuvan was found to be superior to Malathion 0.2 per cent and Sevin one per cent in its efficacy against goat lice (Table 15). Similarly against poultry lice also 0.05 per cent Nuvan was 100 per cent effective. The efficacies of Malathion (0.2 per cent) and Sevin (1 per cent) were 91.85 per cent and 82.61 per cent respectively (Table 16).

DISCUSSION

Comparative Efficacy of Insecticides against Goat Lice

Nuvan

As 0.05 per cent (0.038 per cent dichlorvos) spray, Nuvan was found to be 100 per cent effective against Linognathus africanus and Damalinia caprae. This is in conformity with the findings of CIBA - GEIGY who also obtained an effective control of sucking and chewing lice with this insecticide at the given concentration.

Malathion

As 0.2 per cent spray Malathion was 94.12 per cent effective against Linognathus africanus and Damalinia caprae. This is contrary to the findings of Chaudhuri(1976) who got complete elimination of goat lice with a lesser concentration (0.05 per cent) of the insecticide. But the present findings partly agrees with the findings of Moore et al. (1959) who also used a higher concentration (0.1 per cent) of the insecticide for destroying the goat lice.

Sevin

As one per cent spray, Sevin was 94.12 per cent effective against Linognathus africanus and Damalinia caprae. This is contrary to the findings of Moore et al. (1959) who could destroy the goat lice using a lesser concentration (0.5 per cent) of the insecticide.

From the above results it can be concluded that out of three insecticide used, Nuvan 0.05 per cent solution as a spray is superior to Malathion (0.2 per cent) and Sevin (1 per cent) in destroying the lice commonly affecting goats. No such trials for assessing the comparative efficacy of these insecticides against goat lice seems to have undertaken so far.

Comparative Efficacy of Insecticides against Poultry Lice

Nuvan

At concentrations of 0.05 per cent Nuvan was 100 per cent effective against the common poultry lice - Menacanthus stramineus and Lipeurus capoins. But Ranjan and Bhatnagar (1967) had to use a higher strength of 0.5 to 1 per cent for an effective control of poultry lice with Nuvan.

Malathion

At a strength of 0.2 per cent Malathion was 91.85 per cent against the above two species of lice in poultry. But according to Hoffman (1960) one per cent Malathion is required for controlling the poultry lice.

Sevin

A concentration of one per cent of Sevin gave only 82.61 per cent control of the above mentioned species of lice in poultry. But this is in contradiction with

Kramer (1959) since he got a promising result with 0.5 per cent Sevin.

From the above details, it is evident that 0.05 per cent Nuvan is superior to 0.2 per cent Malathion and one per cent Sevin in controlling the poultry lice. But this is contrary to the findings of Chellappa et al. (1977) who found Nuvan and Malathion, both at a concentration of 0.125 per cent to be equal in their efficacy in controlling poultry lice.

Table 15. Comparative efficacy of insecticides against goat lice.

(Linognathus africanus & Damalinia caprae)

Insecticide	Pretreatment counts. (Group average)	Post-treatment counts (Group average)			Reduction	Efficacy (%)
		1st day	7th day	14th day		
Malathion (0.2%)	12.48	-	-	0.95	11.53	94.12
Sevin (1%)	12.25	-	-	0.72	11.53	94.12
Nuvan (0.05%)	14.59	-	-	-	14.59	100.00
Control	12.50	12.68	11.50	12.60	-	-

In each group 24 goats were included and 12 goats were kept in the untreated control group.

(Concld.)

Table 16. Comparative efficacy of insecticides against poultry lice.

(Manacanthus stramineus & Lipeurus caponis)

Insecticide	Pretreatment counts. (group average)	Post-treatment counts (Group average)			Reduction	Efficacy (%)
		1st day	7th day	14th day		
Malathion (0.2%)	6.38	-	-	0.52	5.86	91.85
Sevin (1%)	5.29	-	-	0.92	4.37	82.61
Nuvan (0.05%)	6.25	-	-	-	6.25	100.00
Control						

In each group 24 birds were included and 12 birds were kept in the untreated control.

(concl.)

SUMMARY

SUMMARY

Incidence of lice infestation in domestic animals and birds in and around Trichur was studied during 1978-79. In cattle the highest incidence was during December to February and lowest during August to October. In buffaloes the maximum incidence was observed in months of December to February and minimum during July to September. Goats were infested more during March and less during May to July. In poultry the incidence varied with the breed. In exotic breeds maximum incidence was during March and minimum during October, and desi fowls had maximum during January and minimum during November.

In cattle two species of lice were found to occur - Haematopinus quadripertusus and Linognathus vituli of which H.quadripertusus showed 44.34 per cent incidence and L.vituli only 3.47 per cent. Haematopinus tuberculatus was the only species encountered in buffaloes, which showed 49.67 per cent of incidence. Linognathus africanus and Damalinia caprae were the two species occurred in goats and showed 63.69 per cent and 59.57 per cent incidence respectively. In poultry four species of lice were encountered. They were Menacanthus straminieus (44.07 per cent in exotic and 64.34 per cent in desi fowls), Menopon gallinae

(9.82 per cent in exotic and 64.34 per cent in desi fowls) Goniodes gigas (0.53 per cent in exotic and 44.41 per cent in desi fowls) and Lipeurus caponis (35.31 per cent in exotic and 24.83 per cent in desi fowls).

A significant difference was observed in the intensity of lice infestation in animals and birds between seasons. All species of lice collected from animals and birds were found to occur in locations where they normally occur.

The morphology of all the species of lice and nits encountered was studied in detail.

The comparative efficacy of Nuvan (dichlorovos), Malathion and Sevin against goat lice (Linognathus africanus) and Damalinia caprae) and poultry lice (Menacanthus stramineus and Lipeurus caponis) has been assessed by using naturally infected animals and experimentally infected birds. The insecticides were applied at concentrations prescribed by the respective firms. Out of three insecticides tried, Nuvan 0.05 per cent was found to be superior to Malathion 0.2 per cent and Sevin one per cent, and its efficacy was 100 per cent against the lice of animals and birds.

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STUDIES ON LICE INFESTING DOMESTIC ANIMALS AND BIRDS

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ABSTRACT OF A THESIS

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ABSTRACT

In a study on the lice of animals and birds in and around Trichur and their control, cattle was found to be infested with *Haematopinus quadripertusus* and *Linognathus vituli*, buffaloes with *Haematopinus tuberculatus*, goats with *Linognathus africanus* and *Damalinia caprae*, dogs with *Heterodoxus longitarsus*, elephants with *Haematomyzus elephantis* and poultry with *Menacanthus stramineus* *Menopon gallinae*, *Goniodes gigas* and *Lipeurus caponis*. Their incidence and intensity were maximum in winter and minimum in summer. Their morphology has been described in detail. For their control, Nuvan, Malathion and Sevin were tried and Nuvan (0.05 per cent) was found to be superior to the other two insecticides, with 100 per cent efficacy.