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STUDIES ON NON-INSECT ENEMIES OF LAC, WITH SPECIAL REFERENCE TO SQUIRRELS AND BIRDS AS SERIOUS SEASONAL PREDATORS

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(*With a text figure*)

INTRODUCTION

One of the factors limiting production of lac is the prevalence of its enemies estimated to account for a destruction of over 40% of living lac cells in an average crop (Negi 1942). Most of these enemies are themselves insects and they fall under either of the two categories, namely parasites and predators. The former belong to the superfamily Chalcidoidea and number eight in all. The damage done by all these parasites put together does not normally exceed ten per cent of the lac cells. The predators, on the other hand, do considerable damage to lac crops, and the larvae of the two important lepidopterous predators, *Eublemma amabilis* Moore and *Holcocera pulverea* Meyr, together have been known to damage thirty to thirty-five per cent of lac cells. The loss caused by the predatory larvae of lacewing flies (*Chrysopa madestes* Banks and *C. lacciperda* Kimmins, etc.) is comparatively low, but instances are not lacking of outbreaks on an epidemic scale resulting in severe damage to young developing crops. Apart from the commonly prevalent insect enemies enumerated above, and the damage caused by them, serious attention to a new type of damage was drawn from 1940 onwards when partial artificial defoliation of *palas* (*Butea monosperma*) in *Baisakhi* crop (Negi 1942) succeeded in considerable measure in preserving broodlac against summer heat and drought, and it was found that many of the lac cells so saved were damaged by some enemies. As a result of investigation, a few enemies other than insects have been recently noted which cause serious damage at the most critical time of the crop. This paper incorporates investigations carried out on these new non-insect predatory enemies.

LOCALITY, TIME OF OCCURRENCE, AND TYPE OF DAMAGE

This new type of damage to lac cells is being observed on *palas* (*Butea monosperma*) every year in the Bihar Government Forest at Kundri (Palamau District) and it is characterised by both the time of occurrence and its nature. Kundri experiences a very severe summer with the day temperature sometimes shooting up to 120°F. in May–June; hence, at Kundri the Baisakhi crop suffers to a great extent every year, particularly from the point of view of brood preservation. Towards the end of May, and in June, a very heavy mortality of lac insects occurs due to the intense summer heat and only a very low percentage of the

insects survives the effect of heat. It is about this time that the new type of damage to the small percentage of surviving female lac insects is observed. Thus the damage occurs at a very critical time of the crop and a considerable part of the small quantity of surviving broodlac is lost.

As regards the nature of damage, it is quite typical in that the mature cells are broken open and the living female insects inside pulled out and devoured. More often the insects are completely removed from the tests, but occasionally portions of their bodies are left behind. The resinous test-covering is normally found opened with a horizontal or vertical circular cleavage with the result that the lac-encrusted twig looks as if partially scraped. On twigs where all the lac cells have been damaged, only nearly semi-spherical cups of the lower portion of the lac tests are found attached to the twig as shown in the figure. In a few cases, the cleavage is rather irregular also.

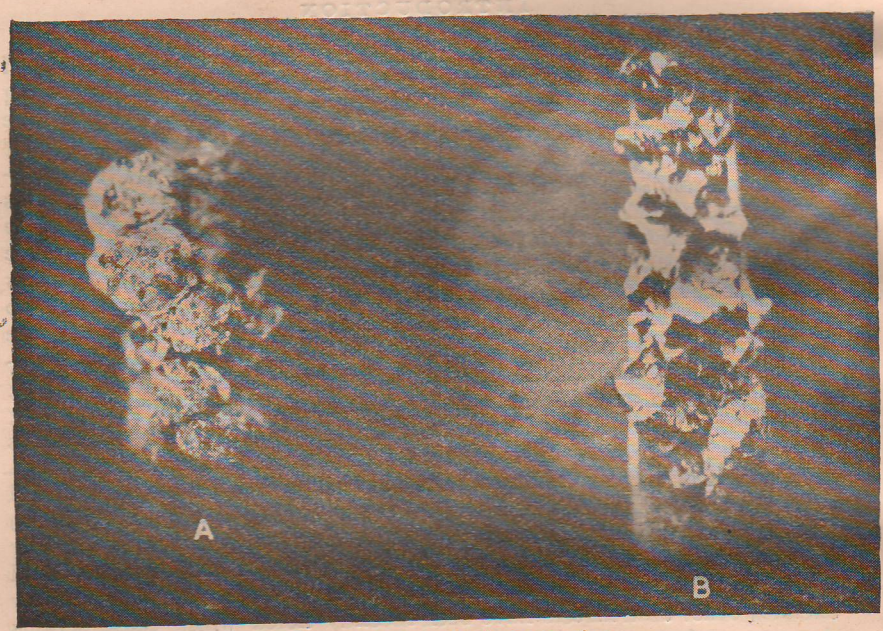

Fig.—Lac encrustation on twigs

A. Free from damage B. Damaged

In addition to such damage observed on the *Baisakhi* crop, a similar type of damage is also noticed in the maturing *Katki* crop to a limited extent at Kundri, and it is mostly confined to spots showing predator damage. At the Institute field area in Hesal near Ranchi, *Kusum* crops also show similar damage, particularly the maturing *Jethwi* crop in June-July. On *Kusum* and in *Katki* crop where the encrustation is comparatively more continuous, the damaged portion of lac sticks looks as if partially scooped out with a sharp instrument. In the case of *Kusum*, damage is not merely confined to mature lac while still on the trees, but was observed somewhat even more pronounced in broodlac sticks that were tied on to the trees for infection. In several cases the

damage was also caused to broodlac enclosed within 60 to 80 mesh brass wire net baskets which had been cut open at places.

Method of Study

The fact that the broodlac and the brass wire net baskets used to enclose them were both damaged was an indication that rodents like squirrels that could climb the trees, could possibly be chiefly responsible for such type of damage. Similarly, birds that possess strong beaks, like woodpeckers, could also possibly inflict such damage to the exposed lac. In the past, both these animals were suspected to cause some accidental and practically negligible damage (Glover 1937). Moreover, as these animals are seen freely visiting the lac-bearing trees at the time when the damage is also noticed, detailed investigations on their connection with it were initiated during the summer of 1954 and continued during 1955 and 1956 at Kundri Forest where the damage is of a very serious nature. To determine the culprits responsible, three methods of study were employed, namely, examination of gut contents, field observations on their behaviour, and artificial feeding of captives. The last method was employed only in the case of squirrels and woodpeckers.

Examination of Alimentary Canal

During the period of study 50 squirrels and 58 birds were collected by shooting, in either June or October, at the time of maturity of the *Baisakhi* and *Katki* crops respectively. The specimens were preserved in four per cent formalin so that their stomach contents could be carefully examined in the laboratory for the presence of lac insects, lac resin pieces and other insects associated with lac cultivation. The examinations were carried out very thoroughly part by part of the entire alimentary canal of these specimens. In all 36 squirrels and 58 birds belonging to 16 species were examined. The summary of the results is furnished in Tables I and II, separately for squirrels and birds respectively.

Examination of the stomach contents showed that the squirrels and birds had consumed a variety of food from both animal and vegetable sources. The food inside the stomach was in different stages of digestion. Most of the vegetable matter was in an advanced state and could not be correctly identified. Whenever lac insects were found, they were observed to be either entire or almost entire, or in fragments if they had undergone digestion. Nevertheless, the strongly chitinised portions of anal tubercle and the brachial tubes attached to such fragments could be clearly made out and they served to count the number of insects consumed correctly.

Squirrels. All the 50 specimens shot during the two seasons were the common Fivestriped Palm Squirrel (*Funambulus pennanti* Wroughton). The results of examination of their stomach contents (Table I) reveal that squirrels of the June seasons had consumed lac insects in fairly large numbers. Adult female lac insects, ranging between 1 and 134 in number, were traced in the stomachs of 20 out of 26 (76·9%) squirrels of the June season, the majority being found either entire or practically entire. Lac larvae ranging between 1 and 14 in number were found in 10 specimens. Small broken pieces of lac resin in

considerable quantity were found in as many as 19 specimens. Further, whenever adult female lac insects had been consumed in sufficient numbers, eggs from them were found freely floating in good numbers in the wash liquid of the stomach contents. Thus, evidence was available in 23 cases out of 26 (88·5%) that squirrels had tampered with the lac crop in the June season.

The fact that adult female lac insects are found in large numbers and also almost entire in form, along with small pieces of lac cells in the stomach contents of the squirrels of the June season, is a clear indication that during this season these animals have gnawed open the mature lac cells and pulled out and devoured the lac insects whole. This is also in corroboration of the typical nature of the damage to lac sticks described above and found about this time of the *Baisakhi* crop.

Among other insects associated with lac, which were traced in June specimens of squirrels, were two heads of lepidopterous larvae in a mutilated condition, in two specimens. One of them resembled *H. pulverea* and the other *E. amabilis*. In a third specimen two trunks of a caterpillar resembling *E. amabilis* were found. The vegetable matter consumed was comparatively less in quantity and, among other things, included some seeds and also probably the pulp of *Jamun* fruit (*Eugenia jambolana*).

The stomach content analysis of squirrels of the October season revealed that adult female lac insects had been consumed in fewer numbers, varying from 2 to 7, and again by a fewer number of individuals. Only 3 out of 10 specimens of the October season had consumed adult female lac insects, whereas lac predators had been consumed by as many as 5 specimens and in fairly large numbers, ranging between 1 and 57. This clearly indicates that during the October season squirrels visit the maturing lac crop mainly for the lac predators. This again is in corroboration of the fact that damage to broodlac then is comparatively less and limited to areas of predator infestation. Thus, in the October season the damage to lac appears to be more of an incidental nature.

Birds. In all 58 birds representing 16 species were collected for the purpose of stomach content analysis, as follows :

Species	*No. of specimens examined*
Mahratta Woodpecker [*Dryobates mahrattensis* (Latham)]	... 11
Goldenbacked Woodpecker [*Brachypternus benghalensis* (Linn.)]	... 10
Redvented Bulbul [*Molpastes cafer* (Linn.)]	... 5
Rufousbacked Shrike [*Lanius schach* (Linn.)	... 6
Coppersmith [*Megalaima haemacephala* (Müller)]	... 3
Wood Shrike [*Tephrodornis pondicerianus* (Gmelin)]	... 1
Jungle Babbler [*Turdoides somervillei* (Sykes)]	... 1
House Sparrow [*Passer domesticus* (Linn.)]	... 4
Indian Pitta [*Pitta brachyura* (Linn.)]	... 1
King Crow (*Dicrurus macrocerous* Vieillot)	... 3
Common Iora [*Aegithina tiphia* (Linn.)]	... 2
Common Weaver Bird [*Ploceus philippinus* (Linn.)]	... 1
Crow-Pheasant [*Centropus sinensis* (Stephens)]	... 1
Golden Oriole [*Oriolus oriolus* (Linn.)]	... 1
Common Myna [*Acridotheres tristis* (Linn.)]	... 2
Small Minivet [*Pericrocotus peregrinus* (Linn.)]	... 6
Total	... 58

The results of the examination (Table II) revealed adult female lac insects to be present in the stomachs of 4 out of 10 specimens of the Goldenbacked Woodpecker, one out of 11 specimens of the Mahratta Woodpecker, and 1 out of 5 specimens of the Redvented Bulbul. The number of adult lac insects taken ranged from 1 to 11 in the case of Goldenbacked Woodpecker, and 22 and 5 respectively in the case of Mahratta Woodpecker and the Redvented Bulbul. Lac larvae in small numbers were recovered from the two species of woodpecker, the Redvented Bulbul, Rufousbacked and Woodshrikes, Coppersmith, House Sparrow, King Crow and Small Minivet, suggesting that they had been picked up accidentally while pecking at the bark in search of food. Broken resinous pieces of the lac test were observed only in the case of the woodpeckers, the Rufousbacked Shrike and the Redvented Bulbul, and it is suggestive of the fact that these birds had deliberately opened the lac test in search of their insect food which may be either the adult lac female or the predatory enemies of the lac insects.

Of the other insects associated with lac, two heads of lepidopterous larvae resembling *E. amabilis* were recovered from one specimen of Mahratta Woodpecker, and one head resembling that of *H. pulverea* from one specimen of the Rufousbacked Shrike. Two *E. amabilis* larvae were traced in a second specimen of the Mahratta Woodpecker. A third specimen had consumed as many as 32 larvae, 12 pupae and one adult of *E. amabilis* and 3 pupae of *Elasmus claripennis*.

It is of interest to note here that the birds were generally found only in small numbers in the forest, and the individuals under each of the species were still fewer. This, as well as the fact that they do not devour the lac insect in large numbers, clearly indicates that the damage to broodlac by birds is only minor, and the major part of the observed damage, particularly in the summer season, is inflicted by the squirrels.

Field Observations on Squirrels and Birds at Kundri

General observations on the habits and behaviour of the above, and the way they damage the lac crop, were started in June 1954 and detailed observations were made during the day-time from 5 a.m. to 7 p.m. in June 1955, in the summer season when maximum damage is done.

Squirrels. These animals come out of their hiding places at day-break and are found actively feeding in the cool early hours of the morning. They run about freely on the ground nibbling at some thing or other here and there, and also quite often climbing up the *palas* (*Butea*) trees. They are seen to nibble at the earthen termite tunnels found on the ground or the tree-trunks. When alarmed they immediately run up the nearest tree and hide themselves in the bushy branches. Being very active, shy and alert, it was difficult to observe their normal behaviour in the field. As the day becomes hotter, their activity also slows down, and they are rarely seen on the ground between 10 a.m. and 4 p.m. They were, however, sometimes seen during midday on the tree-tops resting on the branches, with limbs outspread and completely relaxed. While thus resting it is hardly possible to detect their presence on the tree. They become active again towards the evening and are either found on the ground or going from tree to tree in search of food. They seem to be less active during cloudy and rainy days.

In Kundri forest it is generally noticed that on the trees adjoining the cultivated fields the lac insects thrive in larger numbers and there is also a comparatively greater concentration of squirrels near such trees along the edge of the fields. After about 10 days hunting and shooting of the squirrels in the area, it was noticed that their population had considerably decreased and that they were rarely seen in the locality.

This species litters at least once[1] during June–July as young ones were noticed in June and four just-born blind ones were recovered from a nest on a *palas* tree in July.

Mode of feeding on lac crop: On about half a dozen occasions, observations were made from a distance [without binoculars], when the squirrels were feeding on lac encrustations. They move about the twig bearing lac, and now and then stop to feed. They bite on a fairly large number of cells on a twig before proceeding to the next. They visit almost every twig on a branch and do considerable damage to the lac cells, sometimes almost completely eating away all the cells found on the twig. Usually they feed on the top branches rather than on the lower ones, and again they prefer twigs with thick foliage as these provide sufficient cover for them to feed unobserved. Lac on shoots having lac cells neither too closely situated nor too sparse, were damaged more often than the rest.

In addition to direct observations made from a distance, the shoots on which the squirrels were feeding were collected and examined immediately after shooting the animals. The damage was observed to be quite fresh and wet smears of the 'blood' of the lac insects on the damaged encrustations was also clearly visible. Besides, the animals shot also showed the red lac dye stain on the mouth, the tongue, the paws and sometimes on the belly as well, thus confirming that the squirrels feed on live mature lac insects.

Birds. The birds frequenting the Kundri area are the common species found in scrub-and-bush country, light deciduous forests and orchards, etc.; they include both those strictly arboreal and those essentially ground-loving in habit. At Kundri these birds were found to be very active from 5 to 8 a.m. and again later in the day from 5 to 7 p.m. During the interval they were found resting in bushes or on tree branches, and showed little activity and hardly moved from place to place. They were also less active during cloudy and rainy weather. Unlike in the case of squirrels, the birds were found more concentrated in the interior of the forest than along the border. They became rarer even in the interior after a few days of disturbance by shooting. They seemed to have shifted to an undisturbed corner of the forest.

Damage to lac: As far as could be observed, no bird except the woodpeckers was seen pecking at the lac encrustation. Twigs on which they were found sitting did not show any damage to the lac cells. Even woodpeckers were normally seen to peck on the trunk or thick branches of the tree where there was no lac encrustation at all. In one instance, however, a specimen of the Goldenbacked Woodpecker was

[1] For breeding habits of the Fivestriped Squirrel, see Bannerji (*JBNHS* 53 (2) : 261; 54 (2) : 335. Eds.).

seen pecking at a twig bearing lac. The bird was immediately shot and the twig examined for damage. Three to four cells on the twig were freshly damaged and lac dye stain was quite wet on the cells. The damage to the cell was not of the type as noticed in the case of the squirrels but the cleavage was somewhat irregular and more vertical than horizontal. The shot specimen was also immediately examined. The beak and tongue showed the stain of the lac dye, and the stomach contents freshly devoured lac (adult female) insects numbering 8 in all.

Artificial Feeding of Captives

This procedure was adopted for the squirrels and woodpeckers caught alive. Captives confined in cages were offered fresh lac sticks now and then along with some of their normal food, like the fruits of *Ficus glomerata*. In the case of squirrels, almost all the cells on the sticks had been completely damaged and the lac insects inside eaten. The typical damage as found under natural conditions on the trees was exactly reproduced, thus establishing beyond doubt that the squirrel is the chief agent responsible for such damage to mature living lac insects.

The woodpeckers also did damage the lac cells and pecked out the adult female insects, but the damage was characteristically different from that of the squirrels in being more vertical and irregular.

Assessment of Damage

As there was a distinct difference in the extent of damage done to the lac crops between trees with better survival and those with poorer survival of lac cells, the assessment was carried out separately on these two groups of trees. The damage was assessed in 1955 and 1956 in the summer season when serious losses occur.

Damage on the basis of lac-bearing twigs: Twenty-five trees at random were selected from each of these two groups (with better survival and poor survival) and all the lac-bearing twigs were cut entire and were classified into one of the following categories according to the damage noticed:

(i) Twigs with all cells dead.
(ii) Twigs with dead and living cells but showing no damage at all.
(iii) Twigs with dead and living cells but showing damage of living cells less than 10%.
(iv) Twigs with dead and living cells but showing damage of living cells between 10 to 25%.
(v) Twigs with dead and living cells but showing damage of living cells between 25 to 50%.
(vi) Twigs with dead and living cells but showing damage of living cells above 50%.

The number of twigs under each category are recorded in Table III (*a*) and (*b*) separately for the two groups of trees. Table III (*c*) gives the figures when all the fifty trees were treated together as one sample representing the whole area.

It is seen from figures under III (*c*) that the twigs showing complete mortality were more (28·1%) in the 1955 summer, as a result of the more

severe summer heat then experienced. Directly correlated with this is also the fact that the percentage of twigs damaged is more in the severe summer of 1955 (i.e. 47·8%). Between the two groups of trees with better and poorer survival of lac on them, the damage is heavier on the former than on the latter in both the years. This observation is again in corroboration of the field observations that there was a greater concentration of squirrels near trees having more living lac insects on them.

Damage on the basis of count of cells: For this purpose, three twigs at random from each of the 25 trees under the two groups were selected for stick examination, and the grown-up dead, damaged and living cells were counted. The results are given in Table IV (*a*, *b* and *c*) for the two groups separately and also together when treated as one.

From figures under IV (*c*), it is seen that percentage of mortality of cells was 76·1 in the 1955 summer as against 57·9% in 1956 summer since the latter was comparatively milder. Correspondingly, the percentage of cells damaged out of those living, was 58·4 in 1955 as against 32·8 in 1956. thus establishing that the damage is also more severe if the summer is severe, and that this results in very acute shortage of broodlac.

A comparison of the percentages of damaged cells under *a* and *b* in Table IV shows again similar trends, namely, that the damage was more on trees with better survival of lac resulting from a greater concentration of the squirrels.

Summary

It has been observed for the past several years that female lac insects in *Baisakhi*, and to a small extent *Jethwi*, crops are damaged by certain agencies in summer towards crop maturity. This damage is typical in its nature and time of occurrence. Some damage of this type is noticed also in the case of brood used for infection. The investigations were undertaken in Kundri forest in Palamau District of Bihar where this damage occurs in a very serious form.

The Common Fivestriped Palm Squirrel (*Funambulus pennanti* Wr.) and some species of birds were the only animals found in the locality at the time the damage to the lac occurred, and were suspected of being responsible. In order to ascertain whether they were directly involved the investigations were approached from three angles. Firstly, squirrels and birds visiting the lac bearing trees at the time of damage were shot for examination of their stomach contents. They were collected in June and October when *Baisakhi* and *Katki* crops mature. Secondly, careful observations were made on their behaviour in the field in June, when the maximum damage occurs, to determine whether they feed on lac. Thirdly, captive squirrels and woodpeckers were artificially fed with fresh mature lac sticks to see whether similar type of damage was reproduced.

Both examination of stomach contents of 36 specimens and actual field observations revealed that the squirrels feed voraciously on the lac insects in the June season. Of the specimens examined 76·9% (of June season) had consumed adult female lac insects, as many as 134 insects being found in one specimen. Finally, artificial feeding of the captives clearly demonstrated the typical nature of damage done, and established

the link between the damage noticed on the trees and the mature lac insects, lac larvae and eggs found in the stomachs of these animals.

The stomach analysis of 58 birds belonging to 16 species revealed that woodpeckers and bulbuls also damage the maturing lac crop to a small extent.

Having established that the squirrels, and to some extent also birds, do the damage to the maturing lac cells, the extent of damage was assessed in the 1955 and 1956 summer seasons on the basis of both the number of twigs and actual count of cells damaged in representative samples. It was found that the damage to twigs and the cells was more on trees with better survival than on those with heavier mortality of cells (poor survival). In the crop as a whole, lac cells on as many as 28·1% of the twigs were completely dead. Of the rest of the twigs bearing both dead and living cells, up to 47·8% showed damage by squirrels and birds in the 1955 summer. In June–July 1956, when the summer was comparatively milder than in the previous year, the corresponding figures were 22·7% and 29·3% respectively.

Estimation on the basis of lac cells for the entire area revealed that there was a mortality of the mature cells up to 76·1% in 1955 and 57·9% in 1956 due to heat, and of the surviving females as many as 58·4% in 1955 and 32·8% in 1956 had been damaged by these agencies. Thus it may be seen that the damage is all the more acute in view of the heavy mortality of lac cells due to heat.

It is difficult to suggest control measures for preventing this damage. Poison baiting will be uneconomical in large forest areas and also unsafe since domestic animals enter such areas for grazing purposes. It has, however, been found that if the squirrels and birds are regularly shot for about a week, they leave the area. In the case of damage to brood and wire-net baskets, it has been possible to avert this by enclosing them within fairly cheap bamboo baskets that may last for two or three seasons.

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TABLE I

RESULTS OF EXAMINATION OF ALIMENTARY CANAL CONTENTS OF **Squirrels**

Specimen No.	Stomach contents pertaining to lac					Other insect species associated with lac	Remarks
	Pieces of lac resin	Lac larvae	Adult female insects				
			Entire or almost entire	In fragments	Total		
1	2	3	4	5	6	7	8
	JUNE 1954 SPECIMENS						
1	6	14	17	3	20	...	Eggs of lac insect in plenty in stomach and duodenum.
2	...	1	7	...	7	1 head of lepidopterous larva resembling *E. amabilis*.	...
3	3	...	3	1	4	...	Few eggs of lac insect in stomach.
4	3	7	...	...	...	...	...
5	Large no. (not counted)	1	72	...	72	...	Eggs of lac insect in plenty in stomach.
6	29	3	33	19	52	...	Eggs of lac insect in plenty throughout the alimentary canal.

7	37	...	97	37	134	...	Do.
8	223	1	75	34	109	2 lepidopterous larvae without heads, resembling *E. amabilis*.	Do.
9	Few (not counted)	1	28	1	29	...	Eggs of lac insect found in good no. in stomach.
10	38	5	58	1	59	1 head of lepidopterous larva resembling *H. pulverea*.	Eggs of lac insect in plenty in stomach and colon-rectum.
11	...	...	1	...	1	...	...
12	68	6	61	...	61	...	Eggs of lac insect in plenty in stomach.
13	...	...	...	...	...	...	...
14	...	...	...	...	...	...	Very few eggs of lac insect in stomach.
15	4	...	...	...	...	...	...
16	89	8	2	16	18	...	Eggs of lac insect in plenty in ileum and colon-rectum.
	JUNE 1955 SPECIMENS						
1	2	...	4	1	5	...	Few eggs of lac insect in stomach.
2	Large no. (not counted)	...	61	24	85	...	Eggs of lac insect in plenty throughout the alimentary canal.
3	15	...	16	4	20	...	Do.
4	3	...	1	...	1	...	...

TABLE I—(*contd.*)

Specimen No.	Stomach contents pertaining to lac					Other insect species associated with lac	Remarks
	Pieces of lac resin	Lac larvae	Adult female insects				
			Entire or almost entire	In fragments	Total		
1	2	3	4	5	6	7	8
5	...	...	1	2	3	...	Some eggs of lac insect found in stomach.
6	13	...	45	5	50	...	Eggs of lac insect in plenty in stomach.
7	1	...	1	...	1	...	...
8	...	...	...	...	...	...	...
9	7	...	8	1	9	...	Eggs of lac insect in plenty in stomach.
10	...	...	...	...	...	...	...
	OCTOBER 1955 SPECIMENS						
1	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...

3	15	...	1	1	2	1. *Eublemma* larvae ... 32 2. *Eublemma* pupae ... 3 3. *Holcocera* larvae ... 22	...
4	10	Few (not counted)	3	4	7	1. *Eublemma* larva ... 1	Good number of eggs of lac insect in stomach.
5	...	...	...	...	...	1. *Eublemma* larvae ... 2	...
6	10	...	6	1	7	...	Some eggs of the lac insects in stomach.
7	...	...	...	...	...	1. *Eublemma* larvae ... 8 2. *Holcocera* larvae ... 2	...
8	...	...	...	...	...	1. *Eublemma* larvae ... 3 2. *Holcocera* larva ... 1	...
9	...	11	...	...	...	...	...
10	...	5	...	...	...	...	...

TABLE II

RESULTS OF EXAMINATION OF ALIMENTARY CANAL CONTENTS OF **Birds**

Specimen No.	Name of Bird	Stomach contents pertaining to lac					Other insect species associated with lac	Remarks
		Pieces of lac resin	Lac larvae	Adult female insects				
				Entire or almost entire	In fragments	Total		
1	2	3	4	5	6	7	8	9
	JUNE 1954 SPECIMENS							
1	Mahratta Woodpecker (*Dryobates mahrattensis*) ...	1	3	...	...	...	2 heads of lepidopterous larvae resembling *E. amabilis*	...
2	Do. ...	...	...	...	...	...	...	...
3	Do. ...	...	3	...	...	...	...	...
4	Do. ...	...	3	...	...	...	...	...
5	Do. ...	...	5	...	...	...	...	...
1	Goldenbacked Woodpecker (*Brachypternus benghalensis*)	...	6	...	...	...	*Holcocera* eggs—4	...
2	Do. ...	...	...	...	..	...	...	...
	Do. ...	...	9	...	...	...	...	...

1	Redvented Bulbul (*Molpastes cafer*) ...	...	7	...	...	...	...	...
2	Do. ...	...	...	...	...	...	...	...
3	Do. ...	...	...	...	...	...	...	...
1	Rufousbacked Shrike (*Lanius schach*) ...	1	...	...	...	...	1 head of lepidopterous larva resembling *H. pulverea*	...
2	Do. ...	...	4	...	...	...	...	...
3	Do. ...	...	...	...	...	...	...	...
1	Coppersmith (*Megalaima haemacephala*) ...	...	2	...	...	...	...	...
2	Do. ...	...	11	...	...	...	...	...
1	Wood Shrike (*Tephrodornis pondicerianus*) ...	...	2	...	...	...	...	...
1	Jungle Babbler (*Turdoides somervillei*) ...	...	...	...	...	...	...	...
1	House Sparrow (*Passer domesticus*) ...	...	1	...	...	...	...	...
1	Indian Pitta (*Pitta brachyura*) ...	...	...	...	...	...	...	...
1	King Crow (*Dicrurus macrocercus*) ...	...	2	...	...	...	...	...
	JUNE 1955 SPECIMENS							
1	Mahratta Woodpecker (*Dryobates mahrattensis*) ...	...	...	...	...	...	...	...

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TABLE II—(*contd.*)

Specimen No.	Name of Bird	Stomach contents pertaining to lac				Other insect species associated with lac	Remarks
		Pieces of lac resin	Lac larvae	Adult female insects			
				Entire or almost entire	In fragments	Total	
1	2	3	4	5	6	7	8	9
	JUNE 1955 SPECIMENS—(*contd.*)							
2	Mahratta Woodpecker (*Dryobates mahrattensis*)	...	...	...	...	...	...	...
3	Do.	...	...	...	...	...	...	...
4	Do.	...	...	...	...	...	...	...
1	Goldenbacked Woodpecker (*Brachypternus benghalensis*)	...	2	1	3	4	...	...
2	Do.	...	...	...	...	...	...	...
3	Do.	...	6	...	...	...	...	...
4	Do.	...	...	...	...	...	...	...
5	Do.	Few (not counted)	18	5	3	8	...	...

1	Redvented Bulbul (*Molpastes cafer*) ...	...	...	...	...	...	...	...
1	Rufousbacked Shrike (*Lanius schach*) ...	...	3	...	...	...	...	...
2	Do. ...	...	1	..	...	...	...	...
3	Do. ...	...	5	...	...	...	...	...
1	House Sparrow (*Passer domesticus*) ...	...	...	..	...	...	...	...
2	Do. ...	...	..	...	...	...	...	...
3	Do. ...	...	...	...	...	...	...	...
1	King Crow (*Dicrurus macrocercus*) ...	...	1	...	...	...	...	...
2	Do. ...		1	...	...	...	...	...
1	Common Iora (*Aegithina tiphia*) ...	...	...	...	...	...	...	...
1	Common Weaver Bird (*Ploceus phiilppinus*) ...	...	...	...	...	...	...	...
1	Crow Pheasant (*Centropus sinensis*) ...	...	...	...	...	...	...	..
1	Golden Oriole (*Oriolus oriolus*) ...	...	...	...	...	.	...	...
1	Common Myna (*Acridotheres tristis*) ...	...	...	...	...	...	...	...
2	Do. ...	...	...	...	...	...	...	...

TABLE II—(*contd.*)

Specimen No.	Name of Bird	Stomach contents pertaining to lac					Other insect species associated with lac	Remarks
		Pieces of lac resin	Lac larvae	Adult female insects				
				Entire or almost entire	In fragments	Total		
1	2	3	4	5	6	7	8	9
	JUNE 1955 SPECIMENS—(*contd.*)							
1	Small Minivet (*Pericrocotus peregrinus*) ...	...	...	...	...	...	...	...
2	Do. ...	...	3	...	...	...	...	...
3	Do. ...	...	2	...	...	...	...	...
4	Do. ...	...	3	...	...	...	...	...
5	Do. ...	...	...	...	...	...	...	...
6	Do. ...	...	...	...	...	...	...	...
	OCTOBER 1955 SPECIMENS							
1	Mahratta Woodpecker (*Dryobates mahrattensis*) ...	31	3	3	19	22	*Eublemma* larvae ... 2	...
2	Do. ...	(Few; not counted)	...	...	...	...	*Eublemma* larvae... 32 *Eublemma* pupae ... 12 *Eublemma* adult ... 1 *Elasmus* pupae .. 3	...

1	Goldenbacked Woodpecker (*Brachypternus benghalensis*)	31	157	2	9	11	...	...	...	...
2	Do. ...	6	13	...	1	1	...	...	...	...
1	Redvented Bulbul (*Molpastes cafer*) ...	18	...	3	2	5	...	...	...	...
1	Coppersmith (*Megalaima haemacephala*) ...	...	...	...	...	...	...	...	...	...
1	Common Iora (*Aegithina tiphia*) ...	...	...	...	...	...	...	...	...	...