# OBSERVATIONS ON THE REDUVIID POPULATION OF WESTERN GHATS

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Reduviids constitute an important group of predatory, entomosuccivorous bugs and many of them are known to predate upon insect pests and regulate the population level of other insects including many pests. They are the original inhabitants of the tropical rain forest. However their current abundance in the scrub jungles (dry evergreen forests) is indicative of the fact that the present day scrub jungles were once an integral part of the tropical rain forest.

In the present study the population dynamics of reduviids in the Sunkankadai scrub jungle ($77^0$ 26'E and $8^0$ 16'N) an eastwardly directed offshoot of the Western ghats was studied. The study revealed 8 species of reduviids belonging to 3 sub-families and 4 genera. Among the eight species collected 6 belonged to the sub-family Harpactorinae and one each to the sub families Reduviinae and Echtrichodiinae. The scrub jungle experienced two monsoon showers, one during October and November (North-East monsoon) and another during June and July (South-West monsoon).

## Materials and Methods

Six observation unit areas were selected at random at 95m altitude. Each observation unit area included roughly about 75 to 150 liftable stones and the surrounding area including grassland, herbs and shrubs. Since these reduviids (except *S. minusculus, C. obscurus, R. fuscipes* and *Coranus* Sp) live in concealed microhabitats, such as underneath stones and litter, all the stones in the six observation unit areas were lifted and the reduviids found underneath were counted, once in a fortnight. Records were maintained separately for males, females and nymphal instars. In order to maintain the microhabitat intact, extra care was taken to replace the stones in their respective original locations after observation. Since, *S. minusculus, C. obscurus* and *Coranus* Sp. and *R. fuscipes* were found either actively flying or were found alighting on wild grass (*Cymbopogan* Sp. ) and herbs they were collected with the help of a sweeping insect net. Meteorological data, such as rainfall, humidity, wind velocity and temperature were maintained simultaneously. The approximate density of their staple prey population, such as Camponotine ants (*Camponotus compressus* Fabricius) termites (*Odontotermes obesus* Rambur) Carabid beetles, plant bugs and grasshoppers were also noted concurrently.

## Results

The meteorological data is given in Table-1. The pattern of populations fluctuation was as follows (Tables 2-4).

### *Sphedanolestes minusculus*

The peak population of *S. minusculus* was registered from November to February followed by a slight decline during May and June. But again the population increased and was maintained at a steady level during the subsequent months (August to October). The peak population levels coincided with low temperature and high humidity and relatively abundant prey population.

### *Rhynocoris kumarii*

The peak adult population was recorded during April and nymphal instars showed two peaks, one during July and another during November to December. The prey populations, mainly termites were abundant during these periods.

### *Edocia slateri*

Two peaks were recorded in the population of *E. slateri* one during February and another during August.

### *Rhynocoris fuscipes*

There were two peaks in the population. The first peak population was observed from January to April and the second peak during October and November.

### *Nechaematorrhophus therasii*

The population was highly fluctuating with two peaks one between February and April and another between September and November. There was a sudden disappearance of *N. therasii* during June and July. The predator populatioon never coincided with the prey population.

### *Rhynocoris longifrons*

The first peak in the adult *R. longifrons* population was observed during February and the second peak between August and September.

### *Coranus obscurus*

*C. obscurus* was at its peak population levels during January, April, September and November. During March it totally disappeared and the maximum temperature was recorded during this period.

### *Coranus* sp.

The population of *Coranus* sp was highly fluctuating from August to December and was completely absent from March to July. The population levels never coincided with either abiotic or abiotic factors and highly independent of the factors that governed the population of the other reduviids. The only parallel that could be drawn between the population and the obiotic factors was that they were relatively abundant during November and December when the temperature was low, relative humidity was moderate and rainfall was heavy.

## Discussion

The study of the population dynamics of eight species of reduviids in the Sunkankadai scrub jungle clearly revealed the fact that the reauviid population was regulated and governed by both biotic and abiotic factors. Ambrose (1980) and Ambrose and Livingstone (1987) based on their studies on the population dynamics of assassin bugs from peninsular India opined that the reduviid population was solely regulated by prey population. But the abiotic factors viz. rainfall, optimum humidity and moderate or optimum temperature appeared to be essential for maintaining a good prey population as well as predatory reduviid population of these eight species in Sunkankadai scrub jungle. A similar view was also reported by Haridass (1985), Vennison and Ambrose (1991),

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Kumaraswami and Ambrose (1992). The reproductive activities of reduviids are restricted to the rainy seasons which synchronise with the availability of abundant and specific prey types along with many other abiotic factors like moist soil, relative humidity and optimum temperature, (Haridass, 1985).

The influence of biotic and abiotic factors on reduviid population was well exemplified by *R. longifrons* population which showed the peak levels during February and September when the temperature and relative humidity were moderate. Further the prey population of termites (*O. obesus*) and black ants (*C. compressus*) were at their peak during February and September. Milne (1962) proposed a theory that the prey population was a density dependent factor for the predator and the present study partly corroborates Milne's theory. Nicholson (1958) and Clark *et al* (1978) considered the prey density as the primary factor in regulating the predator population. Kumaraswami (1991), found that harpactorine population clearly coincided with the caterpillar population.

Another interesting observation was that the succeeding months after monsoon showers, had peak populations of most of the reduviids studied. This might be due to the fact that ground inhabiting reduviids lay their eggs in or on the soil and these eggs need moisture for their further development (Haridass, 1985, Vennison and Ambrose 1990). Hence at the commencement of the monsoon showers, the eggs hatched and there was an increase in the nymphal population immediately after the showers and the adult population attained peak levels in the succeeding months. This was exactly noticed in *R. longifrons* population. The months of June and July experienced heavy monsoon showers. It was observed that during these months there was only a marginal population of *R. longifrons*. However during the succeeding months of August there was a peak nymphal population and a subsequent peak adult population during September. There was a clear correlation between monsoon showers and the appearence of both peak nymphal and peak adult populations. It was found that the post embryonic developmental period from first instar to adult in *R. longifrons* was about 55 days. Now that the relation could be established thus immediately after June, July monsoon showers the gravid females laid their eggs and these eggs along with the previously laid eggs that were till then dormant due to lack of moisture, hatched and that led to a peak nymphal population during August and subsequent peak adult population during September after completing the post embryonic development. The peak nymphal and adult population during February could also be related to the monsoon showers during October and November (North-East monsoon).

Thus the reproductive activity seemed to be triggered by the monsoon showers when the eggs are laid and they hatched, influenced by the moisture prevailing during this season. This caused an immediate increase in the nymphal population. The adult population attained peak levels during the succeeding months after completing their post embryonic development. Similar observations were made in non reduviids and reduviids. Cherian and Brahmachari (1941) observed similar trend in the pentatomid predator *Andrallus spiridens* (Fabr.). Vennison and Ambrose (1991) also found that the availability of abundant prey types which was a direct outcome of conducive abiotic factors like rainfall, optimum humidity and temperature in turn triggered reduviid population.

The complete absence of *Coranus* sp from March to June could be related to none of the biotic or abiotic factors. It was apparently clear that someother factor might be playing a key role in regulating their population levels. Andrewartha and Birch (1969) correlated the dispersal of the predators to their migration in search of prey. Ambrose and Livingstone (1978, 1989) also reported similar migrations which also determined the population structure of reduviids. Chitty (1960) maintained that the population level in a habitat was kept constant by the genetic factors of the species concerned. Pimental (1961) considered this as a genetic feed back to the maintenance of population level of a particular species.

Thus the population dynamics of the eight species in Sunkankadai scrub jungle could be categorised into two population groups ie., the first group comprising of *R. longifrons*, *R. fuscipes*, *R. kumarii*, *S. minusculus*, *C. obscurus* and *E. slateri* which was governed by both biotic and abiotic factors and the second group comprising of *N. therasii* and *Coranus* sp which appeared to be governed by neither biotic nor abiotic factors.

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Table: *1 Meteorological data recorded at Sunkankadai scrub jungle from November 1990 to December 1991.*

| Year | Month | Temp°C Max. | Temp°C Min. | Relative Humidity (%) Max. | Relative Humidity (%) Min. | Rainfall (mm) | Wind velocity (km/h) |
|---|---|---|---|---|---|---|---|
| 1990 | Nov | 30.9 | 23.7 | 79.6 | 71 | 400.1 | 14.4 |
| | Dec | 30.6 | 23.4 | 73.8 | 60.4 | 53.5 | 18.9 |
| 1991 | Jan | 30.3 | 24.2 | 75 | 68.4 | 68.8 | 18.6 |
| | Feb | 29.3 | 21.8 | 80.4 | 62.5 | 7.3 | 14.8 |
| | Mar | 33.2 | 25.8 | 72.4 | 63.8 | 57.8 | 13.7 |
| | Apr | 31.9 | 24.9 | 70.9 | 60.5 | 1.0 | 12.1 |
| | May | 32.9 | 27.3 | 78.3 | 72.6 | 23.3 | 15.06 |
| | Jun | 28.9 | 24.5 | 82.7 | 77 | 437.5 | 17.6 |
| | Jul | 29 | 24.7 | 82.8 | 75.1 | 165.2 | 15.7 |
| | Aug | 29.9 | 24.6 | 79.5 | 63.5 | 2.1 | 19.12 |
| | Sep | 31.3 | 25.2 | 81.8 | 74 | 1.2 | 19 |
| | Oct | 30.3 | 24.4 | 86 | 71 | 6 | 15 |
| | Nov | 30.9 | 24.2 | 71 | 68 | 83.6 | 15 |
| | Dec | 30.2 | 23.5 | 72 | 67.1 | 14.7 | 19.4 |

Table: *2 Population dynamics of* R. kumarii *and* R. fusipes *in the Sunkankadai scrub jungle*

| Year | Month | *R. Kumarii* N | M | F | *R. fuscipes* N | M | F | Preylevel A | T | PB | B | G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | Nov | 10 | - | - | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 2 |
| | Dec | 10 | - | - | 2 | - | - | 4 | 3 | 2 | 1 | 2 |
| 1991 | Jan | - | - | 1 | 2 | 1 | 5 | 4 | 3 | 1 | 1 | 1 |
| | Feb | 1 | - | 2 | 1 | 1 | 3 | 4 | 4 | 3 | 2 | 1 |
| | Mar | 3 | - | 1 | 3 | 1 | 3 | 2 | 2 | 1 | 1 | 1 |
| | Apr | 3 | 8 | 9 | 2 | 2 | 6 | 3 | 2 | 2 | 2 | 1 |
| | May | 5 | 5 | - | - | 1 | - | 2 | 1 | 2 | 2 | 3 |
| | Jun | 5 | 1 | 2 | - | - | 2 | 3 | 4 | 2 | 2 | 4 |
| | Jul | 10 | 1 | 2 | - | - | - | 2 | 1 | 1 | 4 | 2 |
| | Aug | 9 | - | 1 | - | - | 1 | 3 | 2 | 1 | 1 | 3 |
| | Sep | - | 3 | 3 | - | - | 2 | 4 | 3 | 1 | 1 | 1 |
| | Oct | 8 | 3 | 3 | - | 1 | 2 | 2 | 1 | 3 | 1 | 1 |
| | Nov | 7 | - | - | - | 2 | 3 | 3 | 3 | 3 | 3 | 2 |
| | Dec | 7 | 2 | 3 | - | 2. | - | 4 | 3 | 2 | 1 | 1 |

Prey Level : 1 to 4 = lowest to highest level
A -Ant, T -Termite, PB -Plant Bug, B -Beetle, G -Grasshopper
Predator : N -Nymph, M -Male, F -Female.

Table: *3 Population dynamics of* S. minuscules, R. longifrons *and* Coranus obscurus *in the Sunkankadai scrub jungle.*

| Year | Month | *S. minusculus* M | F | *R. longifrons* N | M | F | *C. obscurus* N | M | F | Prey level A | T | PB | B | G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | Nov | - | 3 | 4 | 1 | - | 1 | - | 3 | 4 | 2 | 3 | 2 | 2 |
| | Dec | - | 3 | 3 | 3 | 4 | - | - | 1 | 4 | 3 | 2 | 1 | 2 |
| 1991 | Jan | 3 | 2 | 3 | 1 | 4 | - | 1 | 3 | 4 | 3 | 1 | 1 | 1 |
| | Feb | 3 | 3 | 10 | 8 | 16 | 3 | - | 1 | 4 | 4 | 3 | 2 | 1 |
| | Mar | 1 | 1 | - | 2 | 5 | - | - | - | 2 | 2 | 1 | 1 | 1 |
| | Apr | 2 | 3 | 1 | 2 | 7 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 1 |
| | May | - | - | - | - | - | - | - | 1 | 2 | 1 | 2 | 2 | 3 |
| | Jun | - | 1 | 2 | 1 | 2 | 2 | - | 3 | 3 | 4 | 2 | 2 | 4 |
| | Jul | 2 | - | - | - | 1 | - | - | 2 | 2 | 1 | 1 | 4 | 2 |
| | Aug | 2 | 2 | 10 | 3 | 5 | - | - | 1 | 3 | 2 | 1 | 1 | 3 |
| | Sep | 2 | 2 | 10 | 12 | 18 | - | 1 | 4 | 4 | 3 | 1 | 1 | 1 |
| | Oct | 2 | 3 | 1 | 4 | 2 | 1 | - | - | 2 | 1 | 3 | 1 | 1 |
| | Nov | 1 | 3 | 10 | 1 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 |
| | Dec | 1 | 3 | 2 | 3 | 4 | - | - | 1 | 4 | 3 | 2 | 1 | 1 |

Prey Level: 1 to 4 = lowest to highest level
A -Ant, T -Termite, PB -Plant Bug, B -Beetle, G -Grasshopper
Predator : N -Nymph, M -Male, F -Female.

Table: *4 Population dynamics of* E. slateri, N. therasii *and* Coranus *sp in the Sunkankadai Scrub Jungle*

| Year | Month | *E. slateri* M | F | *N. therasii* Adults | *Coranus* Sp. M | F | Prey level A | T | PB | B | G |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | Nov | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 3 | 2 | 2 |
| | Dec | - | 1 | 1 | 1 | - | 4 | 3 | 2 | 1 | 2 |
| 1991 | Jan | - | - | - | - | 1 | 4 | 3 | 1 | 1 | 1 |
| | Feb | 3 | 4 | 10 | 1 | 1 | 4 | 4 | 3 | 2 | 1 |
| | Mar | 1 | 2 | 3 | - | - | 2 | 2 | 1 | 1 | 1 |
| | Apr | - | 1 | 5 | - | - | 3 | 2 | 2 | 2 | 1 |
| | May | - | - | 1 | - | - | 2 | 1 | 2 | 2 | 3 |
| | Jun | - | 2 | - | - | - | 3 | 4 | 2 | 2 | 4 |
| | Jul | 1 | 1 | - | - | - | 2 | 1 | 1 | 4 | 2 |
| | Aug | 1 | 4 | 1 | - | 1 | 3 | 2 | 1 | 1 | 3 |
| | Sep | - | 3 | 10 | - | 3 | 4 | 3 | 1 | 1 | 1 |
| | Oct | - | 4 | 2 | - | 1 | 2 | 1 | 3 | 1 | 1 |
| | Nov | 1 | - | 1 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| | Dec | 2 | 1 | 1 | 1 | 2 | 4 | 3 | 2 | 1 | 1 |

Prey Level: 1 to 4 = Lowest to highest level
A -Ant, T -Termite, PB -Plant Bug, B -Beetle, G -Grasshopper
Predator: N -Nymph, M -Male, F -Female