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LIFE TABLE OF THE PREDATORY WOLF SPIDER *Lycosa pseudoannulata*

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ABSTRACT

The wolf spider, *Lycosa pseudoannulata* Boes. et Str. is a potential predator of Rice hoppers in the tropics. The present research aims at constructing life tables of the predator under simulated conditions, using the cephalothorax width for fixing the nymphal instars. The spider passed through 10 instars to reach the adult stage. Cannibalism was found to be the most adverse factor affecting the population build up of *L.pseudoannulata* Only 11.43 per cent of the juveniles could reach the adult stage.

KEY WORDS : *Lycosa pseudoannulata*, Life Table, Rice Hoppers.

Much has been written about the attributes the ideal natural enemy and, by implication, of the best candidate natural enemy in a classical biological control programme. Chief among these postulated attributes has been specificity against the target pest, or at least a strong preference for it. Because the majority of parasitoids are relatively (sometimes absolutely) host specific, whereas most predators are regarded as polyphagous, it is generally contended that predators are, with few compelling exceptions, poor candidates in classical biological control. Thompson (1951) and Nentwig (1986) have found that arthropod predators vary greatly in their specificity, ranging from extreme stenophagy to varying degrees of oligophagy. Among the spider groups, the wolf spiders (Lycosidae) are notoriously polyphagous (Greenstone, 1989). The present study aims to throw some light on the biology and life table parameters of *Lycosa pseudoannulata* Boes. et Str. which is a voracious predator of rice hoppers and thereby to determine its efficacy as a biocontrol agent. The increase in the carapace width was taken as a criterion for fixing the instar which eventually helped in formulating the life table of the spider.

MATERIALS AND METHODS

Morphometric measurements

The width of the cephalothorax was measured as described by Tikader (1980) using an objective micro meter scale with a camera lucida (tube type). The objective micrometer was placed under binocular at the same height as that of the specimen (1mm mark comes into focus only at that height). But in doing this, the adjustment knobs of the binocular were not moved. The micrometer scale was placed on two plastycene balls and pressed down till it came into focus. This one mm was recorded on paper, and this scale showed the measurement.

Life table of *L.pseudoannulata*

Investigations were conducted in micro-plots at the Paddy Breeding Station, Coimbatore. The experiment was an adapatation of the method fostered by Easwaramoorthy and Nandagopal (1986). Micro- plots of one sq.m. were planted with rice seedlings at 15 x 20 cm. When the seedlings established, the plots were painstakingly examined, all predators were removed and infested with five pairs of one day old *Nilaparvata lugens* per hill 30 days after transplanting. The plots were than fortified with nylon mosquito netting over iron frames. In each plot, one *L.pseudoannulata* female with juveniles clustering over her was released. The discarded ovisacs of these females were than

Table 1. Morphometric measurements of *L.psudoannulata*

Instar	Width of cephalothorax (mm)
I	0.627 ± 0.027
II	0.869 ± 0.042
III	1.110 ± 0.037
IV	1.235 ± 0.053
V	1.565 ± 0.067
VI	1.996 ± 0.062
VII	2.406 ± 0.073
VIII	2.850 ± 0.069
IX	3.185 ± 0.115
X	3.662 ± 0.079
Adult	3.865 ± 0.118

dissected out to count the number of unhatched eggs (pale coloured) and dead eggs (out of shape and crumpled). The data were summarised in a life table based on the model of Harcourt (1969). The number of eggs which did not hatch due to various reasons and the number of spiderlings that died or disappeared were tabulated and *k* values were calculated for each category of loss based on Varley and Gradwell's (1960) method. These values were summed up over intervals to determine

Table 2. Life table of the wolf spider *L. pseudoanulata*

Age interval (x)	No. living at beginning of x (lx)	Factors responsible for dx (dxf)	Number dying during x (dx)	dx as a % of lx (100qx)	k
Egg	905	Infertility	116	12.81767	0.05957
		Desiccation	72	7.95580	0.036003
		Sub total	188	20.77348	0.093778
Juveniles					
I instar	717	Cannibalism	10	1.3947	0.006099
		Diseased	5	0.69735	0.003039
		Unkonwn	3	0.41841	0.001820
		Sub total	18	2.51046	0.010905
II instar	699	Cannibalism	83	11.8741	0.054896
		Diseased	50	8.440629	0.038297
		Unkonwn	36	5.150214	0.022963
		Sub total	178	25.46494	0.116157
III instar	521	Cannibalism	10	1.919385	0.008416
		Unkonwn	4	0.767754	0.003347
		Sub total	14	2.681714	0.011764
IV instar	507	Cannibalism	50	9.861932	0.045091
		Diseased	23	4.536489	0.020162
		Unkonwn and escape	41	8.086785	0.036622
		Sub total	114	22.48520	0.101876
V instar	393	Cannibalism	86	21.88295	0.107254
		Unkonwn	19	4.834605	0.021520
		Sub total	105	26.71755	0.128775
VI instar	288	Cannibalism	45	15.625	0.073786
		Diseased	34	11.80555	0.054558
		Unkonwn	18	6.25	0.028028
		Sub total	87	33.68055	0.156373
VII instar	191	Cannibalism	37	19.37172	0.093512
		Diseased	12	6.282772	0.028180
		Unkonwn	11	5.759162	0.025460
		Sub total	60	31.413654	0.147452
VIII instar	131	Cannibalism	9	6.870229	0.030911
		Diseased	3	2.290076	0.010061
		Sub total	12	9.100305	0.040972
IX instar	119	Cannibalism	25	21.00840	0.102419
		Unkonwn and escape	6	5.042016	0.022468
		Sub total	31	26.050416	0.124887
X instar	88	Cannibalism	2	2.272727	0.009984
		Diseased	3	3.409090	0.015063
		Unkonwn	1	1.136363	0.004963
		Sub total	6	6.818181	0.030011
Adult		82		k	0.963004

Number of females 28.

Number of eggs produced 1863. Trend index (N_2/N_1) = 2.065193

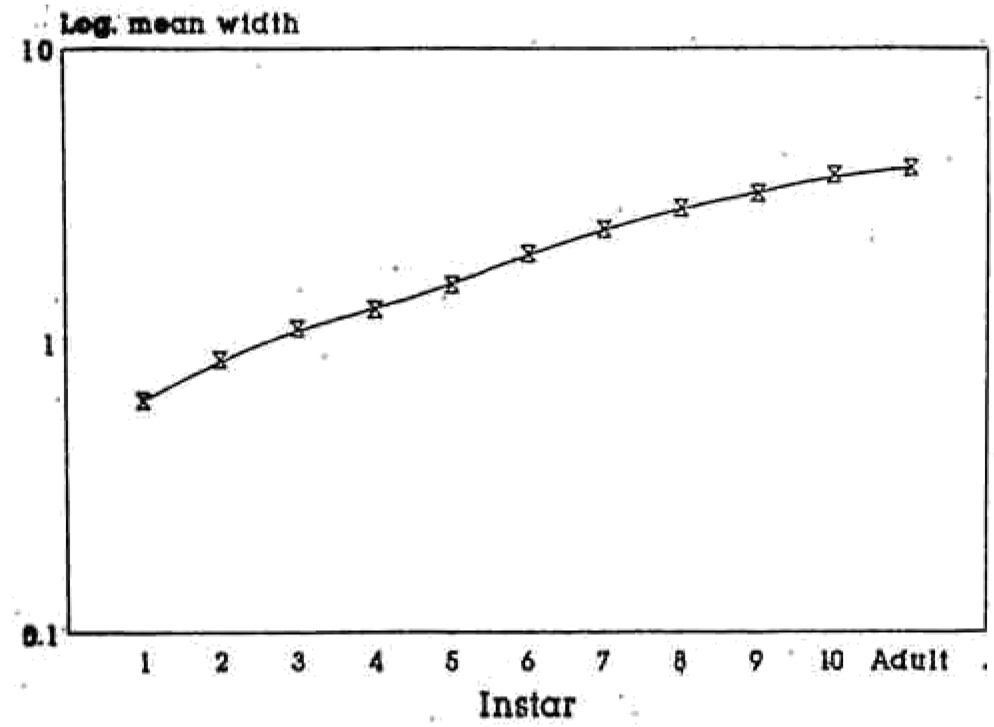

Fig.1. Carapace width related to growth stages of *Lycosa pseudoannulata*

the contribution of each factor to a change in cohort density (Varley *et al.*, 1973).

RESULTS AND DISCUSSION

The mean carapace width for each instar (not separated by sex) is shown in Fig 1 and it had an almost linear relationship. The carapace widths for the wolf spider are outlined in table 1. This is in compliance with the findings of Sekiguchi (1945) and Ross *et al.* (1982).

The summary of the life table of the wolf spider*L.pseudoannulata* is presented in the table 2. It could be seen that about 21 per cent of the eggs failed to hatch due to various reasons during the first generation. The egg mortality was mainly due to infertility (12.82 %) and desiccation (7.96%). No parasities were found to emerge from the egg sacs.

Table 3. Survivorship of the cohorts of the wolf spider *L.pseudoannulata*

Stage	Causes for mortality	k	Per cent
Egg	Infertility	0.05957	6.23
	Desiccation	0.036003	4.15
	Sub total	0.093778	9.35
Juveniles	Cannibalism	0.532368	55.28
	Disease	0.16936	17.59
	Unknown	0.167191	17.36
	Sub total	0.869172	90.26
	Total	0.963004	100.00

Barrion and Litsinger (1981a,b) also reported the absence of parasitiation in lycosids. This could be ascribed to the habit of the lycosids to carry the egg sacs by means of spinnerets. Temperature fluctuations might also have catered to reduction in the water content of eggs leading to egg mortality (Palanichamy and Pandian, 1983).

Of the juveniles which began to disperse, two per cent failed to reach the next instar. The mortality was primarily due to cannibalism which prevented 1.3 to 21.88 per cent of the juveniles from reaching the adult stage. According to Bristowe (1941), the worst enemies of spiders were themselves. Chiu *et al.* (1974) also reported that cannibalism often mainfested when there was scant supply of food. Barrion and Litsinger (1981b) opined that *L.pseudoannulata* is strongly cannibalistic and this has been the critical limiting factor in the mass culturing of *L.pseudoannulata* (Thang *et al.*, 1988).

Diseases accounted for 0.70 to 11.80 per cent mortality of juveniles while escape and other unknown factors were also responsible for mortality. Barrion and Litsinger (1981a) recorded the fungus *Gibella leiopus* occuring in the spider *C.formosana*. Only 11.43 per cent of the dispersing juveniles reached the adult stage under confinement. Regardless, there was a positive trend index (2.065193) indicating the build up of population (Table 2).

To determine each factor's ultimate contribution to survivorship of population of the cohorts, their *k* values were summed over the development period and expressed as a percentage over the total (Table 3). Despite all these adverse effects, a positive trend index was noticed indicating population build up.

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EFFECT OF NITROGEN AND PHOSPHORUS ON GROWTH AND YIELD OF SOME VARIETIES OF PEA

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ABSTRACT

The varieties tested were significantly different among themselves for all growth and yield characters. Nitrogen levels influenced the time for first flowering, the time marketable maturity, pod lengths, pod yield per plot, 100- seed weight and shelling percentage significantly but phosphorus levels had significant influence on pod yield per plot only. The interactions (V x N x P) were found to be significant for most of characters.

KEY WORDS : Nitrogen, Phosphorus, Effect, Pea

Pea (*Pisum sativum* L.) is a widely grown protein rich and nutritious vegetable crop in India. Application of fertilizers, particularly nitrogen (N) and phosphorus (P) to pea affects its yield substantially. N requirement of the high yielding ... and P is known to enhance the activity of *Rhizobia* and thus atmospheric nitrogen fixation. The most of the Indian soils are deficient in these two nutrient elements. The present study was undertaken to find out suitability of some pea varieties for the mid-hill conditions of