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ABUNDANCE AND COMPARATIVE POPULATION FLUCTUATION OF ROVE BEETLES (*PAEDERUS LITTORALIS AND PAEDERUS FUSCIPES)* IN SINDH, PAKISTAN

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ABSTRACT

It is appeared that *Paederus littoralis* and *paederus fuscipes* are homogeneously distributed throughout the selected area. Population studies of *Paederus littoralis* and *paederus fuscipes* were started to determined in March, 2007 and continued until October, 2008. Over 8,000 specimens were collected from different parts of Sind province. Collections were made by hand picking method. In daylight hours, beetles were detected visually among vegetation and collected by hand picking and using an exhauster. Collections were randomly made from various host plants, mainly alfalfa and rice crops including associated weeds. The collection method also included digging to observe for the presence of the beetles in the soil cracks with a digging apparatus. *Paederus littoralis* was observed on its maximum abundance in shiny hot weathers i.e. May to July whilst *Paederus fuscipes* was abundant in comparatively less hot weathers i.e. July to September, when the *Paederus littoralis* was showing a declining tendency. Both larval and adult stages of rove beetles are voracious insect eaters and rely mainly on sucking pest complex. It is therefore; postulated that if, through conservation and manipulation strategies, both species would be encouraged to maintain a good biological control on the alfalfa and rice crops field over the year.

Key words: *Paederus littoralis,* Sind province, biological control

INTRODUCTION

Pakistan is an agricultural country and occupies an ideal geographic location on the globe; almost all seasons of a year can be observed over here. Agricultural fields are sufficient to serve the population of this country, but because of the invasion of pests agricultural fields are required special attentions for Integrated Pest Management (IPM) components research for higher productivity, (Possehl,1996; Lal, 2001).

For the control of pests, insecticides are being used continuously by the farmers in the crop fields. Routinely, pesticides application during the growing season disrupt the ecological balance (Khan *et al.*, 1995). In this connection natural enemies of pest species often face undefeatable obstacles in accomplishing chemical control in areas where powerful, broad-spectrum chemicals are used (Vollinger, 1987; Bagher-Zeenoze, 1989).

It is observed that rove beetles are expected as potential biologically controlling agent. They have been found homogeneously distributed in almost all localities in the main crops like cotton, rice, wheat, cereal, vegetables and fruits etc. (Coiffait, 1982; Nikbakhtzadeh and S. Tirgari, 2008; Holz *et al.*, 1994). If conservation measures are taken they could maintain the natural balance of the pest production in the natural ecosystem, because both larval and adult stages of rove beetles are voracious insect eaters and rely mainly on sucking pest complex *(*Frank, 1987). As reported by the Wittmeyer and Coudron, (2001) rove beetles produce a powerful toxin "pedrin" which is used by the beetle in the course of predation. This character (pedrin) is a defensive secretion active against spiders, but seems to have no insecticidal effects. In view of increasing need of biologically controlling agent for IPM measures, focusing on coleopteran species *Paederus littoralis* and *paederus fuscipes* seems to be necessary in Sindh, Pakistan. It is observed that rove beetles spend March to October as adults and during this period they are found in particularly larger population in the fields, where it can act as an effective biologically controlling agent against sucking pest complex.

Present work was started to unmask the population fluctuation over the year in order to increase productivity and to support the biological control against sucking pest complex in Sindh, Pakistan.

MATERIALS AND METHODS

Studies on *Paederus littoralis* and *paederus fuscipes* were started in March, 2007 and continued until October, 2008. Over 8,000 specimens were collected from different parts of Sind. The collections were made by hand picking method. In daylight, beetles were detected visually among vegetation and collected by hand picking and using an exhauster. The best time for collecting the beetles was found from 10:00 am to 3:30 pm. when the environment was

clean bright with around a temperature of 30°C. Daylight collections were randomly made from various host plants, mainly alfalfa and rice including weeds (Table-1). The daylight collection method also included digging to observe for the presence of the beetles in the soil cracks. The collected specimens were transferred to specimen's vials and brought to the laboratory for identification, further observations and rearing in the laboratory.

Collecting Localities

In order to collect *Paederus littoralis* and *paederus fuscipes* specimens, about the whole area was repeatedly visited during the period from March to October, from 2007 to 2008. Area along the southern shore of the Arabian Sea was found more suitable to conduct the studies. Selected area was visited vigilantly. A two week survey was conducted near the Sea shore of Katty Bander, Sindh, Pakistan, besides field inspections in the localities of Kenjhar Lake in 2007 to 2008 from May to August. Locations of all the collection sites are presented in Table-2.

RESULTS AND DISCUSSION

The rove beetle is almost about 1 cm long. The body is brownish orange. At the posterior apex, the upper surfaces of the abdomen and the head regions are dark brown to black in colour. The elytra are in dark greenish shade. During daytime, the beetle was observed crawling around swiftly. When disturbed it raised the abdomen in a threatening way like a scorpion and fly away. It can also run on water swiftly (Kellner and Dettner, 1994). Therefore, it was observed that beetles were found mainly in wet areas near canals and in damp marshy soils, among dense vegetation and field crops under irrigation, hence, the dense population of rove beetle is observed in the crops near the Kenjhar Lake. Beetles were found hibernating during early December to late January in adult stage. When the crops are harvested, the beetles move towards weeds as an alternative shelter and remain there until spring, (Table -1). There may be several generations during the year, but as indicated the winter imposes inactive state, consequently, breeding does not recommence until spring. These observations are in accordance with the Lehmann, (2007).They also reported the inactivation state of the rove beetle during the winter season. In hot arid areas, around the Jung Shahi, it was found that adults tend to remain on or near the ground, under dense foliage for the most of the day time, this observation resembles with the observations of Dettner *et al.*, (1997), they also reported that rove beetle spends the whole day under the dense foliage. During the two years (2007-2008) intensive studies of population dynamics of this insect, their population pattern has been observed as their population did not exhibit great fluctuation, (fig.1 and 2). This result is also in line with Bologna, *et al.*, (2005) and Capinera, *et al.*, (1985), who indicated that the long complicated life cycle of these insects, highly selective feeding behavior, patchy distribution and obligatory diapauses prevent any sudden increase in population. Population abundance pattern of *Paederus littoralis* and *Paederus fuscipes* was observed in selected localities of Sindh province (Table-2 and 3). During the months of March and April rove beetles were frequently seen and were homogeneously distributed throughout the selected locality, (fig. 3). During the months of May and June *Paederus littoralis was* seen on its maximum abundance (fig. 1 and 2). During the months of July to September abundance of *Paederus littoralis* resembled with the months of March and April (Table 2 and 3). In case of *Paederus fuscipes* abundance was seen on its maximum during the months of August and September.

In light of this data it can be concluded that *Paederus littoralis* were observed on its maximum abundance in shiny hot weathers i.e. May to July whilst *Paederus fuscipes* were abundant in comparatively less hot weathers i.e. July to September, when the *Paederus littoralis* was showing a declining tendency, it is therefore; postulated that if, through conservation and manipulation strategies, the both species would be encouraged their dual action could maintain a good biological control in the field over the year.

Table 1. Host Plants of *Paederus littoralis* and *paederus fuscipes.*

1	*Setaria* (Foxtail)
2	*Digitaria* sp.(Crabgrass)
3	*Lolium* sp. (Dornel)
4	*Aegilops* sp.(Goatgrass)
5	*Echinochloa crusgalli* (Barnyardgrass)
6	*Plantago* sp. (Plantain)
7	*Mentha pulegium* (Spearmint)
8	*Zea mays* (Maize or corn)

Table 2. Index of abundance of *Paederus littoralis.*

location	Month of collection	Total # specimen collected	Index of abundance
Pir Patto	March	200	69.4
Ghora Bari	April	200	69.4
Warre	May	201	69.7
Warre	Jun	208	72.2
Jokhio Goth	July	210	72.9
Sutt Pir	August	288	100
Jung Shahi	September	270	93.7
Pir Jo Goth	October	260	90.2
Pleeja Goth	March	266	92.3
Chilia	April	210	72.9
Jhirk	May	235	81.5
Sonda	Jun	238	82.6
Neelam point	July	219	76.0
Makli and Gujjo	August	265	92.0
Gharoo	September	278	75.6
DhabeeJee	October	207	71.8

I= 100Nc. Nm^{-1}; Where I = Index of abundance; Nc = Number of insects in current month;
Nm = Maximum number of insects found in any month during the study period.

Table 3. Index of abundance of *Paederus fuscipes.*

location	Month of collection	Total # specimen collected	Index of abundance
Pir Patto	March	25	71.42
Ghora Bari	April	24	68.74
Warre	May	24	68.57
Jokhio Goth	Jun	30	85.71
Sutt Pir	July	35	100
Jung Shahi	August	28	80.00
Pir Jo Goth	September	25	71.42
Pleeja Goth	October	24	68.74
Chilia	March	28	68.74
Jhirk	April	30	85.71
Sonda	May	30	85.71
Neelam Point	Jun	35	100
Makli and Gujjo	July	25	71.42
Gharoo	August	20	57.14
DhabeeJee	September	25	71.42
Bhanbore	October	24	68.57

I= 100Nc. Nm^{-1}; Where I = Index of abundance; Nc = Number of insects in current month;
Nm = Maximum number of insects found in any month during the study period

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