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Short Communication

Biology of Newly Recorded Predator *Antilochus coquebertii* of Red Cotton Bug, *Dysdercus koenigii* Fabricius (Hemiptera: Pyrrhocoridae) from Pakistan

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Authors' Contribution
RS conceived and designed the study, analyzed the data and wrote article. MR designed and supervised the study. SIAS conceived the study. MN and MR helped in writing manuscript. FM to reared the insects and collect data.

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Pyrrhocoridae, Cotton stainer, Predator, Rearing, *Gossypium hirsutum*

ABSTRACT

Dysdercus koenigii Fabricius (Hemiptera: Pyrrhocoridae) has become destructive pest of cotton since 2011. The pest causes severe lint staining and seed germination reduction problems. *Antilochus coquebertii* (Fabricius) (Heteroptera: Pyrrhocoridae) is significant predator of the genus *Dysdercus* and other members of the pyrrhocoridan family. In the present annotation, we record for the first time *A. coquebertii* in cotton growing areas of Dera Isamil Khan, Muzafar Garh and Multan districts, Pakistan.

Antilochus coquebertii (Fabricius) (Heteroptera: Pyrrhocoridae) is considered to be a voracious feeder of cotton stainers of the genus *Dysdercus* sand other members of the Pyrrhocoridan family (Dhiman, 1985; Kohno, 2003; Evangelin *et al*., 2015). It belongs to genus *Antilochus*. Twenty five species of this genus have been reported in tropical Africa including Madagascar, South and Southeast Asia, the Malay Archipelago, New Guinea, Taiwan and Japan. *A. coquebertii* is distributed in tropical and subtropical Asia, in Taiwan and Ishigaki-jima Island of Japan (Rédei *et al*., 2017; Kohno, 2003). Prevalence of *A. coquebertii* is widespread in India, where it was observed to feed predominantly on the cotton stainer *Dysdercus cingulatus* (Fabricius) (Heteroptera: Pyrrhocoridae) (Kohno, 2003; Evangelin *et al*., 2015).

In Pakistan, widespread introduction of Bt cotton caused reduction in the usage of broad spectrum insecticides against bollworms (Saeed *et al*., 2016). This modification resulted in the emergence of secondary pests like *Dysdercus koenigii* Fabricius (Hemiptera: Pyrrhocoridae), known as red cotton bug or cotton stainer (Ashfaq *et al*., 2011; Shah, 2014).

Dysdercus koenigii nourish on developing cotton bolls and mature cotton seeds and act as vector to transmit cotton staining fungus, *Nematospora gossypii* that develops on immature lint and seed (Ahmad and Schaefer, 1987; Yasuda, 1992; Jalil *et al*., 2013). Since 2011, its excessive attack has caused severe lint staining problems and diminished market price of cotton (Jalil *et al*., 2013) in Pakistan. This alarming situation invigorated studies on *D. koenigii* and its natural enemies. The aim of this report is to provide a formal record on the presence and biology of *A. coquebertii* in Pakistan.

Materials and methods

Exploratory searches were made by the Central Cotton Research Institute (CCRI), Multan Pakistan, to collect *D. koenigii* and its natural enemies from different districts of Pakistan, in order to address this problem. As a result of these searches, we recorded for the first time *A. coquebertii* from *D. koenigii* infested cotton fields of Cotton Research Station (CRS), Rata Kulachi (30' 15" 32' 17" N 70' 11" 70' 42"E) District Dera Ismail Khan,

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Ali Pur (32°56′00″N 73°13′00″E) District Muzafar Garh and Bahauddin Zakariya University Multan (30°11′52″N 71°28′11″E), Pakistan in 2012. *A. coquebertii* specimens were collected in plastic jars and brought back to the CCRI Entomology lab and efforts were made for its rearing. Voucher specimens have been deposited in laboratory of the Entomology Section of CCRI, Multan, Pakistan.

Plastic cages measuring 37.5 × 22.5 × 37.5 cm (L × W × D) having three aeration holes (7.5 ×7.5 cm) covered with fine mesh were used to rear *A. coquebertii* in the laboratory conditions (27±2ºC, 60-75% RH, 11L: 13D photoperiod). To provide substratum for oviposition, the floor of plastic cage was covered with one inch layer of sterilized soil and sand, and dry leaves with twigs of cotton crop were kept inside the cage. Petri dishes (5cm) having moistened cotton covered with filter paper were placed in the cage to maintain moisture. *D. koenigii* were provided as food on daily basis. To study the survival and the developmental period for each nymphal instar of *A. coquebertii,* 25 newly emerged instars were placed individually in plastic cups (10×10 cm) that were half filled with sterilized soil mixed with sand, and soaked cotton was placed on the soil. Every day, *D. koenigii* (3rd-5th instar) were provided as food in plastic cups individually. Five newly emerged pairs of *A. coquebertii* were placed individually in plastic cups to record reproductive biology.

Results and discussion

A. coquebertii are oval, elongate, and resembles to *D. koenigii* with the following differences. *A. coquebertii* have narrow black transverse lines on ventral abdominal side of nymphs and adults are bright red in colour without any black spot on wings. By contrast *D. koenigii* nymphs and adults have white lines on ventral side of abdomen and adults are crimson red in colour having black spots on scutellum.

A. coquebertii has five nymphal instars. Among the nymphal instars, developmental period of 1st, 2nd, 3rd and 4th instars was 6.8, 5.2, 7.4 and 7.8 days, respectively at 27±2ºC along with 60-75% RH. These instars consumed 6-7, 3-13, 3-17, 7-10 and 11-19 numbers of preys, respectively. Developmental period of 5th instar *A. coquebertii* was longer (15days) but its survival percentage was lower (54%) than other instars with consumption of approximately 30-66 prey (Table I). Total nymphal developmental period was 42.1±1.18 days. Female laid eggs on soil under leaves or in cracks in batches with an average of 61±6.82 eggs/ batch (Table II).

D. koenigii is difficult to control in the field due to rapid reproduction, high mobility and wide host range (Jalil *et al*., 2013; Kohno, 2003). Therefore, the use of the biocontrol -agent *A. coquebertii* to control *D. koenigii* should be considered because it can tolerate temperatures typical of tropical and subtropical regions (Kohno, 2003) and further the use of biocontrol-agents may be applicable not only to cultivated cotton fields, but also to wild alternative hosts. Red cotton bug appears usually at squaring and boll formation stage of cotton (our personal observation). Transgenic cotton needs pesticides only for sucking insect pests like jassid, *Amrasca devastans* (Dist.) and whitefly, *Bemisia tabaci* (Genn). Toxic impact of insecticides like imidacloprid, dimethoate etc have been studied for pirate bug, *Orius* spp. (Hemiptera: Anthocoridae), big eyed bug, *Geocoris* spp. (Hemiptera: Lygaeidae), green lacewing, *C. carnea* (Neoroptera: Chrysopidae), lady beetle, *Coccinellid* spp. (Coleoptera: Coccinellidae) (Saeed *et al*., 2016). But for *Antilochus*, impact of insecticides is not yet evaluated in Pakistan. Therefore, further research is needed to evaluate impact insecticides being applied to manage pests of cotton for said predator.

Table I. Life history traits of each nymphal instar of *Antilochus coquebertii*.

Developmental stages	Developmental period (days)	Developmental range (days)	Percent survival
Ist instar	6.8±0.17	6-8	90%
2nd instar	5.2±0.90	3-13	90%
3rd instar	7.4±1.14	7-9	85%
4th instar	7.8±0.30	7-10	77%
5th instar	15±0.71	11-19	54%

Table II. Reproductive traits of *Antilochus conquebertii*.

Pre-oviposition period (Days)	7 ± 0.71
Oviposition period (Days)	28 ± 5.78
No of pairing	6 ± 0.71
Gross fecundity	342 ± 44.11
Eggs/batch	61± 6.82

There is dire need to conduct further studies for efficient utilization of *A. coquebertii* against *D. koenigii.* Moreover, survey of alternate hosts of both the *D. koenigii* and *A. coquebertii* is also required to determine their role in harbouring pest and natural enemies. As alternate host plants may be beneficial in terms of providing alternate food source to natural enemies or detrimental being food reservoir for the pest (Saeed *et al*., 2015a, b).

Statement of conflict of interest

The authors declare there is no conflict of interest.

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