

**NOTE**

**DISTRIBUTION, HOSTS AND FEEDING  
BEHAVIOR OF *PHAROSCYMNUS*  
*PHAROIDES* (MARSEUL) (COL.:  
COCCINELLIDAE), A PREDATOR OF  
DIASPIDID SCALES IN FARS PROVINCE:**

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**ABSTRACT**

Distribution and hosts of *Pharoscygnus pharoides*, a predator of armored scale-insects of family Diaspididae, were recorded in Fars province. Life stages and feeding capacity of this species were studied at  $27\pm 2^{\circ}\text{C}$ ,  $60\pm 5\%$  RH and 16 h photoperiod. Time required for the beetle to complete the developmental stages was  $32.65 \pm 1.56$  days when fed on adult female date palm scale, *Parlatoria blanchardi* Targ. The average scale consumption during larval periods was  $111.63 \pm 26.37$ , whereas adult female and male consumed  $1254.70 \pm 128.90$  and  $912.60 \pm 105.85$  scales, respectively. Survival and fecundity rates of the predator were determined.

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انتشار، میزبانها و رفتار تغذیه‌ای (*Pharoscygnus pharoides* (Marseul)  
شکارچی شپشکهای سپردار در استان فارس (Col.: Coccinellidae)

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چکیده

انتشار و میزبانهای *Pharoscygnus pharoides*، شکارچی حشرات سپردار خانواده Diaspididae در استان فارس در این مقاله گزارش شده است. مراحل زندگی و ظرفیت تغذیه‌ای این گونه در شرایط  $27 \pm 2$  درجه سانتی گراد،  $60 \pm 5$  درصد رطوبت نسبی و ۱۶ ساعت روشنایی مورد مطالعه قرار گرفت. زمان لازم جهت کامل کردن مراحل رشد وقتی که شکارچی از حشرات کامل ماده شپشک خرما، *Parlatoria blanchardi*، تغذیه می‌کرد،  $32/65 \pm 1/56$  روز بود. متوسط تغذیه در دوران لاروی  $111/63 \pm 26/37$  شپشک بود در حالیکه حشرات کامل ماده و نر به ترتیب  $1254/70 \pm 128/90$  و  $912/60 \pm 105/85$  شپشک مصرف کردند. میزان بقاء و باروری این شکارچی مشخص گردید.

INTRODUCTION

*Pharoscygnus pharoides* (Marseul) was collected during the course of survey of coccinellid fauna and their hosts in Fars province, Iran (15). Apart from its prey (7, 11, 15), locality records (7, 11, 13, 14) and phenology (10), little has been published concerning the biology and feeding behavior of this species. It was considered to be an effective

predator of armored-scale insects in Israel (5,8). Most species of *Pharoscymnus* are described and recorded from warmer parts of Palearctic and Ethiopian regions (3, 4, 14, 15), and are well known throughout these regions as a polyphagous predator of diaspidid scales (1, 4, 5, 12).

The present work was undertaken to study the distribution and hosts of *P. pharoides* throughout the Fars province. Biology, feeding capacity, and age specific survival of the predator on date palm scale were investigated under laboratory conditions, in order to develop a method for its mass rearing and evaluate its effectiveness as a predator.

## MATERIALS AND METHODS

The beetles were collected in 1991 and 1992 by shaking tree branches and leaves over a white tray, from which they were gathered by an aspirator, and also by direct picking from tree trunks and branches. The scales found in the proximity of the predator were collected for identification.

The biology and feeding capacity of *P. pharoides* were studied in the laboratory at  $27\pm 2^{\circ}\text{C}$ ,  $60\pm 5\%$  RH and a 16 h photoperiod. Adults were collected from orchards at Bajgah Experiment Station, 15 km north of Shiraz and on date palm leaflets in Jahrom in March 1992, and reared on date palm leaflets severely infested with *Parlatoria* scales, in a  $30\times 18\times 8$  cm plastic box, covered with a screen lid.

To determine the developmental stages of the insect, one newly hatched larva was introduced into a clear Petri dish ( $4.5\times 1.5$  cm), containing a moistened filter paper and a piece of date palm leaflet with excess adult female *Parlatoria blanchardi*. First, 2nd, 3rd and 4th larval instars and adults received 5, 5, 10, 20 and 50 scales/day, respectively. Daily consumption, developmental time for each stage, and age-specific

mortality were recorded. Twenty individuals of each stage were examined in each experiment.

The fecundity of the beetles was determined by placing single pairs in a clear Petri dish (9.5×2 cm), with a piece of date palm leaflet, infested with adult female scales, and a moistened filter paper. The fecundity rate, mx, (the mean daily reproduction rate of the beetle) was determined for 20 females. The survival rate, lx, (the proportion of individual insects at each stage still alive each day) was determined for 20 individuals at each stage.

## RESULTS AND DISCUSSION

*P. pharoides* preyed on *Lepidosaphes malicola* Bor. on *Malus* spp. and *Salix* sp. in Shiraz; *Tecaspis asiatica* (Arch.) on *Amygdalus* sp., *Prunus* sp., and *Fraxinus excelsior* in Firouzabad, Estahban, and Shiraz, and *Aonidiella orientalis* (New.) on *Citrus* spp. in Barooss. It is known to prey on several other species of armored scale-insects including *Aonidiella aurantii* (Mask.), *Parlatoria pergandii* Comst., *P. blanchardi* and *Asterolecanium phoenicis* Rao. in Israel (7, 9).

Mean duration of developmental stages of *P. pharoides*, feeding on date palm adult female scales is shown in Table 1. The average preoviposition period was 4.5 days. The average egg to adult duration was  $32.65 \pm 1.56$  days. The mean daily egg-laying rate reached a peak of 9.4 on day 15 after female emergence and declined afterwards (Fig. 1). More than 50% of eggs were laid during the first third of life span. The gross reproductive rate was 3.6 eggs per day and 266.8 eggs per entire life span. The latter is somewhat lower than that reported for *P. numidicus* (9) but higher than that reported for *P. simmondsi* (1). The eggs were laid singly or in groups of 2-3 under covering of dead or alive adult female scales.

Table 1. Duration of developmental stage of *Pharoscymnus pharoides* reared on date palm adult female scales, *Parlatoria blanchardi*, at  $27\pm 2^{\circ}\text{C}$ ,  $60\pm 5\%$  RH and 16 h photoperiod.

Life stage	Duration in days (mean <sup>†</sup> ± SD)
Egg	6.50 ± 1.15
Larva 1	5.21 ± 1.25
Larva 2	4.00 ± 1.01
Larva 3	4.31 ± 0.85
Larva 4	4.20 ± 0.36
Prepupa	2.00 ± 0.15
Pupa	6.50 ± 0.55
Adult female	50.20 ± 17.00
Adult male	55.50 ± 18.50

† Means of 20 determinations.

The mortality of 1st and 2nd instar larvae were 12 and 4 percent, respectively (Fig. 1). This may be due to unsuitability of the food for the young larvae. In *P. numidicus*, the first instar larvae had some difficulties with feeding on adult female scales of *P. blanchardi* and 22% of these larvae died before reaching the next instar (9). The same occurred for 1-day-old larvae of *Chilocorus bipustulatus*, which had almost 50% mortality, when they offered adult female scales of *Chrysomphalus aonidium* (16).

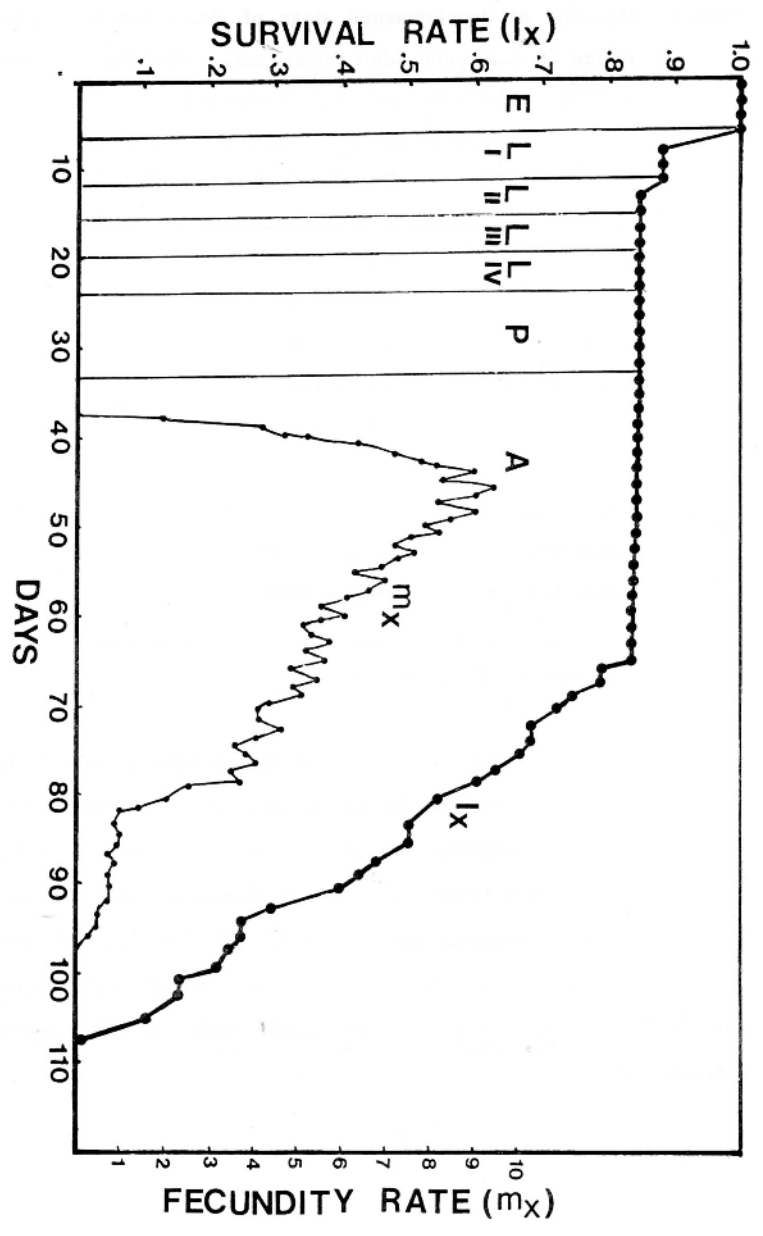


Fig. 1. Survival and age specific fecundity rates of *Phoroscymus pharoides* (Marscul) reared on adult female scale, *Parlatoria blanchardi* Targ., under laboratory conditions. Means of 20 determinations. (E, eggs; L<sub>I</sub> to L<sub>IV</sub>, larval stages; P, prepupa and pupa; A, adult).

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Feeding rate of 2nd, 3rd and 4th stage larvae increased 1.89, 3.99 and 7.40 fold, respectively, over the 1st-stage larvae. Moreover, total consumption of all larval stages was 111.63 scales, of which 51.82% was consumed by the 4th stage larvae. Kehat (9) reported that the average daily feeding capacity of *P. numidicus* larvae on *Parlatoria blanchardi* at 27°C and 75% RH was 162.4 and 138 for female and male larval stages, respectively. It seems that the larvae of *P. numidicus* are more voracious than *P. pharoides* larvae. Fourth instar larvae and adults of *P. simmondsi* consumed 3 and 5 adult female scales of *A. orientalis* per day, respectively (1). In the present study 4th instar larva and adult male and female consumed 13.6, 17.2 and 25.5 scales per day, respectively. This difference in feeding capacity may be due to characteristics of the species or to the differences in size or nutritional value between the females of different species of scales. The larvae did not feed during the inactive period, shortly before and after ecdysis. The average daily consumption of females and males was 1254.7 and 912.6 scales, respectively. Such differences in the preying ability of different sexes have also been reported in other species of coccinellids (2, 6, 16).

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## LITERATURE CITED

1. Ahmad, R. and M.A. Ghani. 1973. The biology of *Pharoscymnus simmondsi* Ahmad (Coleoptera, Coccinellidae). Tech. Bull. Comm. Inst. Biol. Contr. 16:5-10.
2. Bodenheimer, F.S. and H.Z. Klein. 1936. The ecology of *Coccinella septempunctata* L. in Palestine. Tava Wa'arez. 4:113-122.
3. Fürsch, H. 1979. Insects of Saudi Arabia, Coleoptera: Fam. Coccinellidae. Fauna of Saudi Arabia. 1:235-248.
4. Fürsch, H. 1985. The southern African species of *Pharoscymnus* Bedel and *Pharopsis* Casey (Col.: Coccinellidae). J. Entomol. Soc. Southern Africa. 48:223-231.
5. Ghani, M.A. and R. Ahmad. 1967. Biology of *Pharoscymnus flexibilis* Muls. (Col.: Coccinellidae). Tech. Bull. Comm. Inst. Biol. Contr. 7:107-111.
6. Hodek, I. 1967. Bionomics and ecology of predaceous Coccinellidae. Ann. Rev. Ent. 12:79-104.
7. Kehat, M. 1967. Survey and distribution of common lady beetles (Coccinellidae) in date palm trees in Israel. Entomophaga. 12:119-125.
8. Kehat, M. 1967. Studies on the biology and ecology of *Pharoscymnus numidicus* (Coccinellidae), an important predator of the date palm scale *Parlatoria blanchardi*. Ann. Soc. Ent. Fr. 3:1055-1067.
9. Kehat, M. 1968. The feeding behaviour of *Pharoscymnus numidicus* (Coccinellidae), predator of the date palm scale *Parlatoria blanchardi*. Ent. Exp. and Appl. 11:30-42.



10. Kehat, M. 1968. The phenology of *Pharoscymnus* spp. and *Chilocorus bipustulatus* L. (Coccinellidae) in date palm plantation in Israel. *Ann. Epiphyties*. 19:605-614.
11. Kehat, M. and S. Greenberg. 1970. Survey and distribution of lady beetles in citrus groves in Israel. *Entomophaga*. 15:275-280.
12. Mills, N.J. 1981. Essential and alternative foods for some British Coccinellidae (Coleoptera). *Entomologist's Gaz.* 32:197-202.
13. Smirnoff W.A. 1956. Les *Pharoscymnus*. Service de la defense des Végétaux, Travaux originaux, Rabat 9:1-38.
14. Soylu, O.Z. and N. Ürel. 1977. Investigation on the parasites and predators of insects injurious to citrus orchards in the region of south Anatolia. *Bitki Koruma Bülteni*. 17:77-112.
15. Yazdani, A. 1990. The coccinellids (Coleoptera, Coccinellidae) fauna of Fars province. M.Sc. Thesis. Shiraz University. 145 p.
16. Yinon, U. 1969. Food consumption of the armored scale lady beetle *Chilocorus bipustulatus* (Coccinellidae) *Ent. Exp. Appl.* 12:139-146.