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Full Length Research Paper

Some morphological and biological features of *Megacephala* (*Grammognatha*) *euphratica euphratica* Latreille and Dejean, 1822 (Coleoptera: Cicindelidae)

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Some morphological and biological features of *Megacephala euphratica euphratica* were examined. The life table of *M. euphratica euphratica* was investigated and the net reproduction rate (R_0), length of generation (T_0) and intrinsic rate of natural increase" (r_m) were calculated in 2004 under labarotory conditions. The net reproduction rate (R_0) of *M. euphratica euphratica* (6.02), representing the total female birth rate with a mean length of generation (T_0) as 18.87 days, was determined, and the "intrinsic rate of natural increase" (r_m) was calculated as 0.0981. The duration of pre-oviposition, oviposition and post-oviposition of the species, the shortest life span of both male and female, and the lowest and highest total eggs of female were also investigated. Some morphological features, like adult description and body size of the species, collected from Izmir, Mersin and Adana provinces, in 2001 and 2010, was given.

Key words: Tiger beetle, life table, morphology, adult, Turkey.

INTRODUCTION

Members of the Cicindelidae family are one of the most widely examined insects (Pearson and Vogler, 2001). Almost 90 species of the genus, Megacephala Latreille, 1802, are known currently (Wiesner, 1992). Megacephala is considered to include seven sub-genera, but each of these is now recognised by Naviauxi (2007) as a valid genus: Megacephala latreille, 1802 – species found in open habitats in Africa; Metriocheila thomson, 1857 – a single Neotropical species; Phaeoxyantha chaudoir, 1850 – South American species; Pseudotetracha fleutiaux, 1894 – central Australian species; Australicapitona sumlin, 1992 – coastal Australian species; Tetracha westwood, 1838 – many species in the New World; and Gram-mognatha, motschoulsky, 1850 – one Palaearctic (Mediterranean) species (Gillett, 2009). *Megagacephala euphratica euphratica* Latreille and Dejean, 1822, which play key roles in food cycle as a predator species, has been studied and its geographic distribution, habitat preferences, larval burrow diameters and larval stages correlation, have been given an indicator value (Franzen, 2001; Sekeroglu & Aydin, 2002; Aydin, et al., 2005; Aydin et al., 2006; Aydin, 2006). Vulnerability of M.e.euphratica in natural and disturbed salt marsh and salt meadow habitats in Turkey was also investigated by Aydin (2011) and the species has been recommended as a vulnerable species according to IUCN (The International Union for Conservation of Nature) categories (Aydin, 2011). Here we provide one more detailed information about the net reproduction rate (R0), length of generation (T0), and intrinsic rate of natural increase" (rm) of the mentioned species. Hence adult description and its body size have been given first time with this study.

MATERIALS AND METHODS

The species of tiger beetle were sampled when they were walking in the night through the habitat with the aid of a portable fluorescent light in Göksu Delta (Mersin province) and Çukurova Delta (Adana

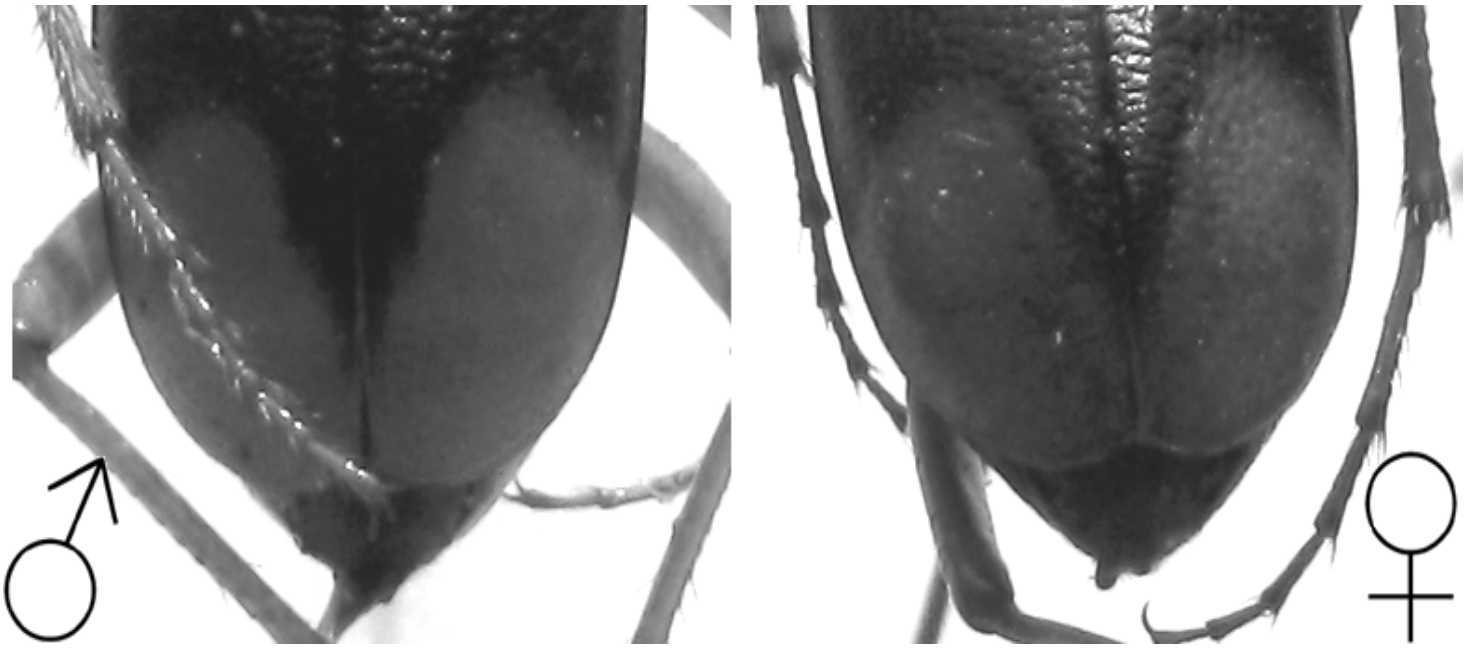

Figure 1. Maculations at the tip of elytra of *M. euphratica euphratica* with a resemblance of a heart in shape.

province). The body size was measured using 79 individual species collected from Izmir, Mersin and Adana provinces in 2001 and 2010 taken from IBM "Insect Bio-diversity Museum" in Atabey, Isparta province. Besides, some biological features, like life table, of *M. euphratica euphratica* were also given under laboratory condition (30 ± 3°C) for the first time (n = 20). During the life table study, night butterflies (frequently caught by members of the Noctuidae family by thesweeping method in the campus area of Çukurova University) were commonly given to tiger beetle as food. Life table was prepared from the observed survival and fecundity (progeny production) rates. The intrinsic rate of natural increase was calculated with the following formula (Birch, 1948):

$$\sum e^{(-rm.x)} l_x m_x = 1$$

Where, x is the actual female age (in days); e is the natural logarithmic base; l_x is the rate of survival at day x (the fraction of females surviving from age 0 until, at least, age x); m_x is the age specific fecundity rate (mean number of females born in an interval to a mother of age x); r_m is the the intrinsic rate of natural increase (females/female/day); R_0 is the the net reproductive rate ($\Sigma l_x m_x$) (the total females born in two successive generations or the rate of multiplication in one generation) and T_0 is the mean generation time $\log_e R_0 / r_m$ (Laing, 1968).

However, the life table of *M. euphratica euphratica* was investigated in 2004 in Acarology Laboratory, Plant Protection Department, Çukurova University, Adana.

RESULTS AND DISCUSSION

Adult description

M. euphratica euphratica adults are usually easily distinguished from other tiger beetles species existing in Turkey by their large body size. Adult of *M. euphratica euphratica* has the biggest body shape in all other members of Cicindelidae family. Adults length were measured between 18.0 and 22.5 mm (average of length is 20.62 mm; n = 79).

The adult is robustly built. Adult of *M. euphratica euphratica* is colorful with bodies of metallic green upper surface predominating; other colours (red, blue, yellow, black) are rare. However, the cephalon and pronotum of *M. euphratica euphratica* are smaller than the abdomen, when combined together. The cephalon is almost the same size with the pronotum. The pronotum is separated into two with median impression and these discs are protruding over the lateral depression. However, the scutellum is hidden (this is one of the understanding differences between Megacephala and Cicindela in diagnostic key).

The mouthpart adaptations reflect both the type of food and particular feeding method employed. The mandibula and maxilla are well developed as the other members of the Cicindelidae family. Mandibles are not covered by labrum and they are simply distinguished. The tips of the mandibles are black in color, but turn yellow towards the head. The compound eyes are quite large in size. The metallic green part of the elytron is almost 2/3 as long as it is wide, but the rest 1/3 part of the elytra color is yellowish. These broad heart-shaped maculations at the tip of the elytra expand in width abruptly at their front ends (Figure 1).

Leg specializations can be explained in terms of nocturnal specialization with a pale color, as well as antenna, some fraction of the mandible, labrum, paraglossae, eyes, and maxillary and labial palpus. The lateral part of

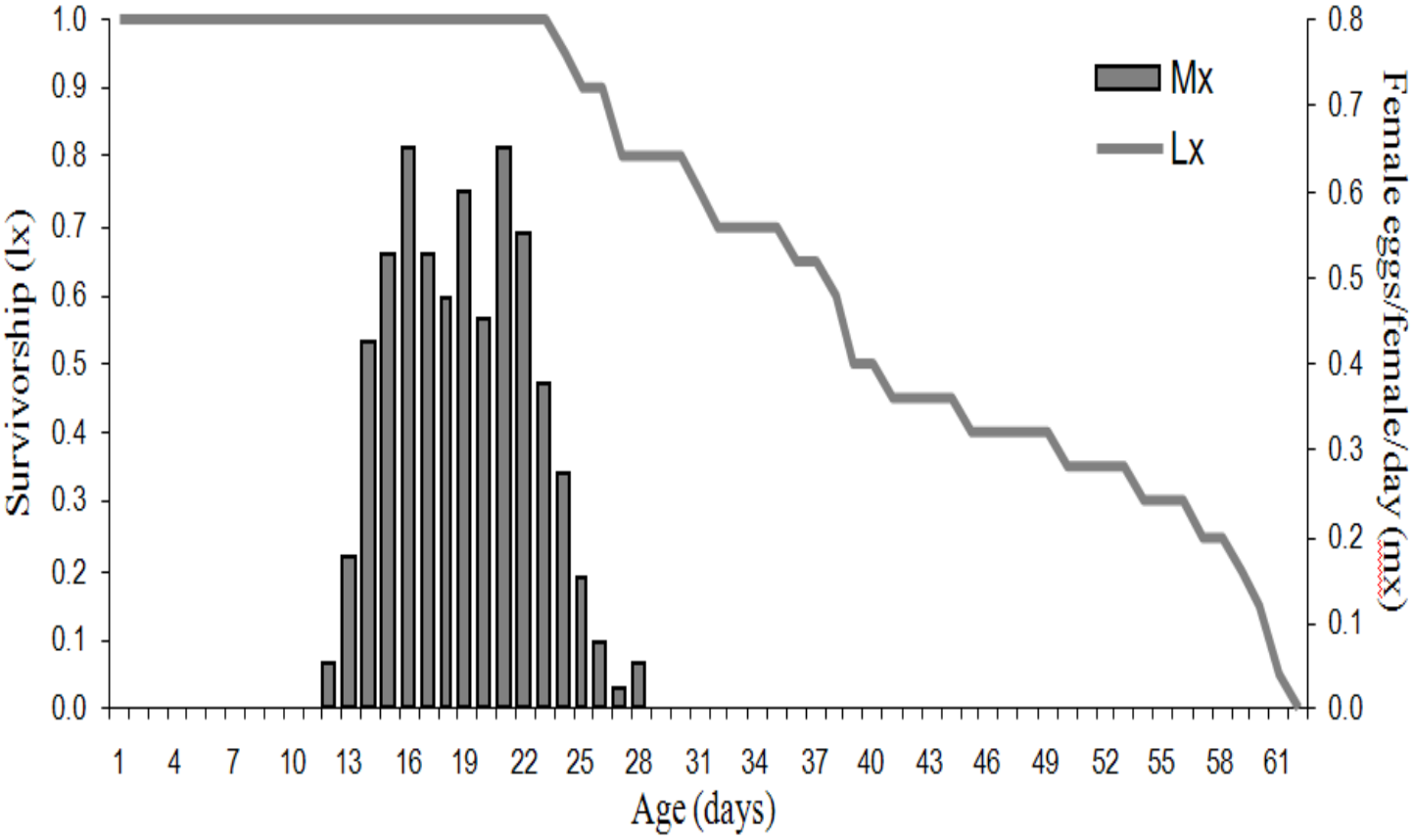

Figure 2. Age-specific fecundity (m_x) and survival (l_x) of *M. euphratica euphratica*.

the first 3 segments of sterna of the abdomen color is metallic green; however, the color is gradually turning into black in the 4th, 5th and 6th sterna, and is turning into yellow in the ¾ part of the last segment of sterna. Broad heart-shaped maculations at the tip of elytra might be used for the determination of its sub-genera. These maculations are seen differently between *M. euphratica euphratica* and *Tetracha bilunata bilunata* (Klug, 1834) in the study of Gillett (2009). Choate (2003) also declared differences in Florida species of *Megacephala* by using these maculations.

Life table

Under laboratory condition, reproduction ability of *M. euphratica euphratica* was investigated, and it was concluded that the duration of pre-oviposition, oviposition and post-oviposition lasted 15.75, 6.41 and 9.15 days, respectively. The shortest life span of the male and female was found to be 14 and 23 days, respectively (Figure 2). The total number of laid eggs of the female was highest at 25 and lowest at 3. The net reproduction rate (R_0) of *M. euphratica euphratica* (6.02), representing the total female birth rate with a mean length of generation (T_0) as 18.87 days, was determined, and the "intrinsic rate of natural increase" (r_m) was calculated as 0.0981.

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