Odonatologica 6 (1): 1 - 5 *March 1, 1977*

LONGEVITY OF THREE LIBELLULID DRAGONFLIES UNDER SEMI–NATURAL CONDITIONS (ANISOPTERA: *LIBELLULIDAE*)

A.T. HASSAN

Entomology Research Laboratory, Department of Zoology,
University of Ibadan, Ibadan, Nigeria

Received November 14, 1975 / Revised and Accepted October 21, 1976

The longevity of *Palpopleura lucia lucia* (Drury), *Acisoma panorpoides inflatum* Sel. and *Urothemis assignata* Sel. were studied in an outdoor enclosure. All the adults of the 3 spp. used in the study emerged from an inner water cage within the outdoor enclosure. All the *U. assignata* individuals died within 6 days (♂♂ 4.36 ± 1.50, ♀♀ 4.46 ± 1.41 days) of emergence. The life span of *P. l. lucia* individuals ranged from 1 to 52 days (♂♂ 15.81 ± 12.67, ♀♀ 17.85 ± 20.08 days), while in *A. p. inflatum*, longevity ranged from 1 to 61 days (♂♂ 26.30 ± 19.93, ♀♀ 26.80 ± 19.54 days). The results obtained for the 2 latter spp. are comparable to the durations recorded for marked individuals of the same species used for territoriality study in the field.

INTRODUCTION

The longevity of adult dragonflies has been studied by various authors, using various methods: CORBET (1952), JACOBS (1955), WAAGE (1971, 1972), HEYMER (1972) and PARR & PARR (1974) used the mark-recapture method; MITCHELL (1970) used the size and colour changes in ectoparasitic mites of dragonflies; VERON (1973) used sections of the hind-legs of adults and estimated age on the basis of the number of endocuticular layers, while JOHNSON (1973) correlated age with ovarian development. In this study the estimation of the longevity of adult *Palpopleura lucia lucia* (Drury), *Acisoma panorpoides inflatum* Selys and *Urothemis assignata* Selys was achieved in a semi-natural enclosure by marking tenerals of the three species and keeping a record on each individual until it died. All the tenerals emerged from larvae which were reared in a concrete cage within the enclosure.

The outdoor enclosure, measuring 12.9 x 4.5 x 2.5 m and made of wire-netting, was constructed on a concrete base. The enclosure was supported by 32 upright planks reinforced with horizontal crossbars at the roof. A door was situated almost at the centre of one of the long sides; another inner door, made of wire-netting was erected to prevent accidental escape of flying adults. Plants, intended to provide perching and roosting sites, were planted within the enclosure. The inner concrete cage has been described elsewhere (HASSAN, 1976).

METHOD

Twenty-nine teneral adults (16 ♂♂, 13 ♀♀) of *P. l. lucia*, 52 tenerals (27 ♂♂, 25 ♀♀) of *A. p. inflatum* and 46 tenerals (22♂♂, 24 ♀♀) of *U. assignata* emerged from the concrete cage during the period of study. Within six hours of its emergence, each teneral was paint-marked with a specific coding system for subsequent identification. The method of marking was similar to that of PARR & PARR (1974). After emergence, a daily record of sighting was kept for each individual. Changes in the male teneral colour pattern were observed and the first mating of each individual recorded. Deaths were recorded with dates and causes if known.

All the adults were fed on dipterans, especially laboratory-bred houseflies (*Musca domestica*) and mosquitoes. Occasionally, small sized butterflies and other insects were provided for a varied diet as in nature.

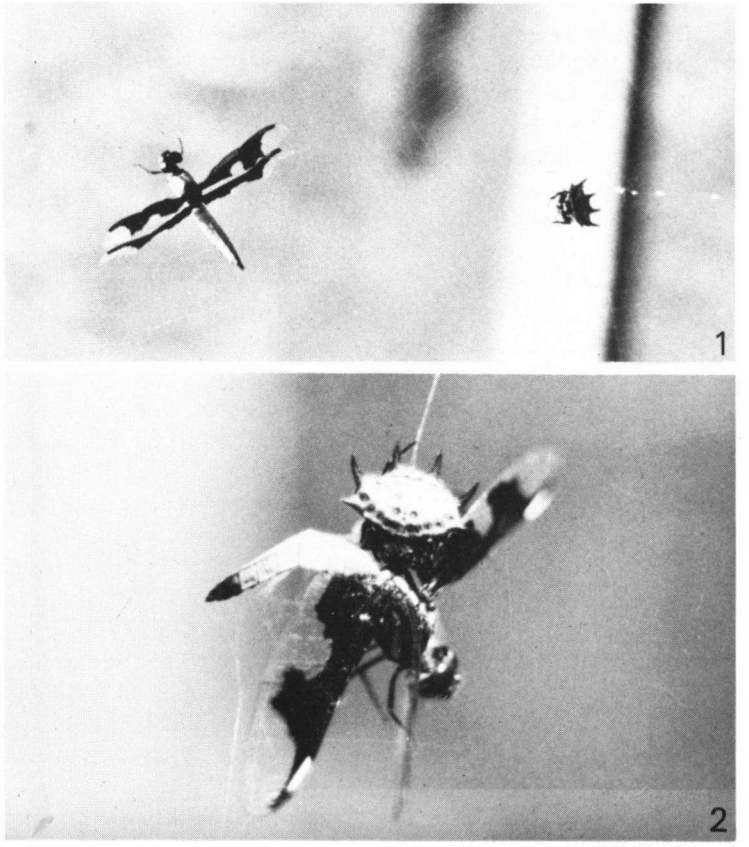
RESULTS

All the 46 individuals of *U. assignata* died within six days of their emergence (♂♂ 4.36 ± 1.50, ♀♀ 4.46 ± 1.41 days). The life span of *P. l. lucia* individuals ranged from 1 to 52 days (♂♂ 2-46 days, 15.81 ± 12.67 days; ♀♀ 1-52 days, 17.85 ± 20.08 days). In *A. p. inflatum* males lived for 1 to 57 days (26.30 ± 19.93 days), while the females' life span ranged from 20 to 61 days (26.80 ± 19.54 days).

Mating was observed in only four males and three females of *A. p. inflatum*. The ages of the males when first seen mating were 15, 13, 17 and 13 days, averaging 14.5 days; the females were 16, 18 and 15 days old, averaging 16.3 days and subsequent generation of adults was obtained from the eggs laid by these females. Mating was not observed in *P. l. lucia* and *U. assignata*. It was envisaged that the maturation period in *P. l. lucia* lasted for about nine to eleven days. All males of this species had attained the characteristic colouration of the adult at the eleventh day after emergence.

It was observed that the early deaths of many individuals of the three dragonfly species were due to the predatory activity of spiders. Spiders preyed on 8 of the 29 individuals of *P. l. lucia*, on 17 of the 52 individuals of *A. p. inflatum*

and were responsible for the death of 16 out of the 46 individuals of *U. assignata*. Figure 1 shows a *P. l. lucia* adult being entrapped in a web of *Gastrochanter* sp., while Figure 2 illustrates this spider preying on the trapped *P. l. lucia*. In the field, spiders were observed to be the worst predators of dragonflies. In addition, disused webs were potent sources of danger to the dragonflies. Two *P. l. lucia* and three *A. p. inflatum* were also killed by lizards, *Agama agama*, during the study.



Figs. 1-2. *Palpopleura lucia lucia* (Drury) just trapped in the web of a *Gastrochanter* sp. (1), and preyed on by the spider (2).

DISCUSSION

Various authors utilising different methods have obtained results indicating that dragonfly adults are generally not long-lived. CORBET (1957) obtained a maximal life span of about 60 days for *Anax imperator*. OOSTERWAAL & MUILWIJK (1971) concluded that the adult life span of *Lestes sponsa* appears to last up to four weeks; WAAGE (1971, 1972) obtained a maximal adult life span of 47 days for *Calopteryx maculata*; and HEYMER (1972) obtained a 30-39 days life span for *C. haemorrhoidalis*. All these are temperate dragonflies. However, working in Zaria, Nigeria, PARR & PARR (1974) obtained a life span of at least 49 days for *Nesciothemis nigeriensis*, a medium sized libellulid. These results are within the limits of a two months' life span for adult dragonflies.

Results for *P. l. lucia* (maximum life span of 46 days for males, 52 for females) and *A. panorpoides inflatum* (maximum life span of 57 days for males, 61 for females) thus compare with the previous information on longevity. It was not possible to determine the longevity of *U. assignata* adults because all individuals died within 6 days of emergence. Death of some probably resulted from the habit of bouncing against the wire-nettings, particularly the roof, an indication that the large cage was not adequate for their flight range. Although the type of cage used was not specified, ADETUNJI & PARR (1974) reported deaths a day or two after emergence of *Brachythemis leucosticta* reared in captivity.

The maturation (pre-reproductive) period in teneral *A. p. inflatum* has been estimated to average 11 days for males and 14 for the females, based on observations on the colour changes in tenerals. In *P. l. lucia*, this phase was estimated to last about 10 days in both sexes. The period obtained for these two dragonflies, 10 - 14 days, is within the range that other workers have observed in the field. JACOBS (1955) obtained an 8-14 day maturation period for males, 13-14 for females of *Plathemis lydia*; CORBET (1957), 7-12 for *A. imperator*; WAAGE (1972) 11 for *C. maculata*; HEYMER (1972) 10 for *C. haemorrhoidalis*; and PARR & PARR (1974) 12-15 days for *N. nigeriensis*. It appears from the above information that the males mature more quickly than the females, which is also partially supported by the result obtained in this study. This is perhaps of behavioural significance, since males arrive early at water to establish territories.

There is some degree of correlation between the results obtained in this study and in that of HASSAN (1974) using the mark-recapture method. Marked mature males of *P. l. lucia* were resighted for up to 31 days after marking, those of *A. p. inflatum* up to 32 days. Granted 10 to 17 days for the ages of the libellulids before marking, the criteria for choosing such marked males being the brilliant reflection of their wings, a life span of between 41 and 48 days for *P. l. lucia* and 42 to 49 days for *A. p. inflatum*, is arrived at. These figures, although

lower than the values obtained in this study, are close bearing in mind the fact that the marked adults were already some days old in their reproductive phase and that the estimation of their ages before marking was subjective.

ACKNOWLEDGEMENTS

I am indebted to Prof. S. AFOLABI TOYE (Department of Zoology, University of Ibadan) for supervising the Ph.D. programme from which this paper is derived. I am also grateful to Prof. P. S. CORBET (Department of Zoology, University of Canterbury) and Prof. M.J. PARR (Department of Biology, University of Malawi) for information on handling and techniques used for marking teneral dragonflies.

REFERENCES

ADETUNJI, J.F. & M.J. PARR, 1974. Colour change and maturation in Brachythemis leucosticta (Burmeister) (Anisoptera: Libellulidae). *Odonatologica* 3 (1): 13-20.

CORBET, P.S., 1952. An adult population study of Pyrrhosoma nymphula (Sulzer) (Odonata: Coenagriidae). *J. Anim. Ecol.* 21: 206-222.

CORBET, P.S., 1957. The life history of the Emperor Dragonfly, Anax imperator Leach (Odonata: Aeshnidae). *J. Anim. Ecol.* 26: 1-69.

HASSAN, A.T., 1974. Studies on the ecology, behaviour and life history of libelluline dragonflies. Thesis, Univ. Ibadan.

HASSAN, A.T., 1977. Studies on the larval development of Palpopleura lucia lucia, Acisoma panorpoides inflatum and Urothemis assignata (Anisoptera: Libellulidae) in a semi-natural environment. *Nig. J. Ent.* 1 (2). (In press).

HEYMER, A., 1972. Comportements social et territorial des Calopterygidae (Odon. Zygoptera). *Ann. Soc. ent. Fr.* (N.S.) 8 (1): 3-53.

JACOBS, M.E., 1955. Studies on territorialism and sexual selection in dragonflies. *Ecology* 36: 566-586.

JOHNSON, G., 1973. Ovarian development and age recognition in the damselfly, Argia moesta (Hagen, 1861) (Zygoptera: Coenagrionidae). *Odonatologica* 2 (2): 69-81.

MITCHELL, R., 1970. The use of parasitic mites to age dragonflies. *Amer. Midl. Nat.* 82: 359-366.

OOSTERWAAL, L. & J. MUILWIJK, 1971. Het libellenonderzoek op het Oppad. *Trientalis* 23 (1): 3-9.

PARR, M.J. & M. PARR, 1974. Studies on the behaviour and ecology of Nesciothemis nigeriensis Gambles (Anisoptera: Libellulidae). *Odonatologica* 3 (1): 21-47.

VERON, J., 1973. Age determination in adult Odonata. *Odonatologica* 2 (1): 21-28.

WAAGE, J.K., 1971. Aspects of the reproductive behaviour and ecology of Calopteryx maculata (Beauvois) (Odonata: Calopterygidae) and a study of its reproductive isolation from Calopteryx aequabilis Say. Thesis, Univ. Michigan, Ann Arbor.

WAAGE, J.K., 1972. Longevity and mobility of adult Calopteryx maculata (Beauvois, 1805) (Zygoptera: Coenagriidae). *Odonatologica* 1 (3): 155-162.