

**ASPECTS OF THE LIFE-HISTORY OF ADULT *ISCHNURA CERVULA* (SELYS) (ZYGOP-
PTERA: COENAGRIONIDAE)**

J.E. DICKERSON¹, T. TYLER² and J.V. ROBINSON³

¹ Alcon Laboratory, 6201 S. Freeway, Fort Worth, TX 76134, United States

² California Department of Forestry and Agriculture, 835 F St, Davis, CA 95616, United States

³ Department of Biology, University of Texas, Box 19498, Arlington, TX 76019, United States

Abstract

I. cervula adults maintain a male biased sex ratio at a California stream. Mating occurs in late afternoon. Only 2 ovipositioning episodes were noted during this study, but both were by unattended females and each occurred earlier in the day than mating activity. Recapture frequency was low especially for females. The oldest male recaptured was 15d old.

Introduction

Ischnura cervula is a common western North American coenagrionid damselfly (KENNEDY, 1917; PROVONSHA, 1975; CANNINGS & STUART, 1977). Its body length ranges from 26-32 mm (CANNINGS & STUART, 1977). Little has been reported concerning its reproductive behaviour other than that females usually oviposit unattended by males (KENNEDY, 1917; PRO-

VONSHA, 1975). This report brings to seven the number of ischnuran species about which some demographic information has been obtained using mark-recapture procedures. The other six species are: *I. damula* (JOHNSON, 1975), *I. elegans* (PARR & PARR, 1971; PARR, 1973a, 1973b; HINNEKINT, 1987), *I. gemina* (GARRISON & HAFERNIK, 1981; HAFERNIK & GARRISON, 1986), *I. posita* (ROBINSON, 1983), *I. pumilio* (DAPLING & ROCKER, 1969), and *I. verticalis* (FINCKE, 1987).

Methods and results

For 30 consecutive days, between 26 April and 25 May, 1983 a population of *Ischnura cervula* was studied using mark-recapture techniques along 400 m of the north bank of Putah Creek, an elongated pond which lies along the southern boundary of the University of California campus at Davis, California, U.S.A. The pond lies within the original course of Putah Creek, is about 3000 m in length and is widened at two areas to form lagoons. It lies entirely within the University Arboretum. The study site contained both shaded and exposed areas. The pond in this area is linear and highly channelized with banks formed of aggregate enclosed in chain link. The study site was bounded on the east by a bridge crossing over the stream (just below the Arboretum headquarters) and on the west where the stream disappears into a cement culvert. Shaded areas include the eastern portion near the bridge, and a single large valley oak (*Quercus lobata*) near the middle of the site.

Individual damselflies were netted and marked on their wings using a Pilot indelible marking pen. Collection and observation times differed from day to day but primarily emphasized the period from early to mid afternoon (Fig. 1).

A total of 688 *I. cervula* were marked during this study; 592 of these were males. Fifty-nine individuals were recaptured and only two of those

recaptured were females. This constitutes a recapture frequency of 9.6% for males and 2.1% for females. The longest interval between first and last capture was 15d for a male, and the average time between first and last capture of recaptured males was 3.6d. The operational sex ratio at this habitat was 6.6:1 in favor of males.

Of the 96 newly captured and two recaptured

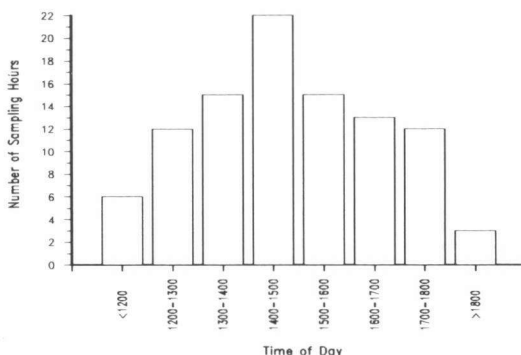


Fig. 1. The diurnal distribution of cumulative sampling efforts.

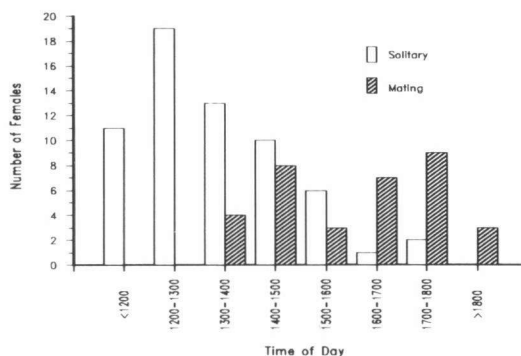


Fig. 2. The number of females collected solitary (clear bars) and while mating (striped bars).

females, 34 (or 34.7%) were engaged in mating activity. Therefore, like other ischnurans, a significant number of females may co-occupy the aquatic habitat without actively being engaged in mating. Figure 2 indicates that as the day progresses a larger fraction of the females collected were mating. The dependence of activity (i.e. mating versus not mating) on time of day is highly

significant ($G = 51.7$, d.f. = 4, $P < 0.001$). Two solitary females were observed ovipositing during this study, both were seen earlier than any mating was observed ($P < 0.001$, Fisher's Exact Test). This indicates that their eggs were probably fertilized from males which copulated with them on a previous day.

Discussion

The low recapture frequency reduces the usefulness of these data for many demographic comparisons. We believe this low frequency can be attributed primarily to the habitat studied. In *I. elegans*, PARR (1973b) found 50% fidelity to sites of the same size as ours, but which were sections of ponds. JOHNSON (1975), ROBINSON (1983, and DAPLING & ROCKER (1969) also had higher recapture frequencies for ischnurans in pond habitats. The seepage area habitat where *I. gemina* was studied also seems more discrete than our study area, and GARRISON & HAFERNIK (1981) report daily movements of less than 6 m per individual in their study.

A datum which is useful from our study is the 15d maximum longevity we recorded from 688 initial captures. ROBINSON (1983) marked approximately 3 times as many *I. posita* (2215 individuals) and had a higher recapture rate (21.7%) but never collected any individual older

than 9d. Therefore, we can conclude that the maximum field longevity of *I. cervula* exceeds that of *I. posita*.

Ischnura cervula is similar to *I. graelsii* in its diurnal reproductive patterns. Both oviposit earlier in the day than they mate (CORDERO, 1990).

References — CANNINGS, R.A. & K.M. STUART, 1977. *The dragonflies of British Columbia*, Brit. Columbia Mux., Victoria; — CORDERO, A., 1990, *Anim. Behav.*, 40: 43-48; — DAPLING, J.G. & C. ROCKER, 1969, *Bull. amat. Ent. Soc.* 29: 15-20; — FINCKE, O.M., 1987, *Odonatologica* 16: 129-143; — GARRISON, R.W. & J.E. HAFERNIK, 1981, *Oecologia* 48: 377-384; — HAFERNIK, J.E. & R.W. GARRISON, 1986, *Am. Nat.* 128: 353-365; — HINNEKINT, B.O.N., 1987, *Hydrobiologia* 146: 3-31; — JOHNSON, C., 1975, *Evol. Theory* 1: 81-90; — KENNEDY, C., 1917, *Proc. U.S. natnMus.* 52: 483-635; — PARR, M.J., 1973a, *Odonatologica* 2: 139-157; — 1973b, *ibid.* 2: 159-174; — PARR, M.J. & M. PARR, 1971, *Entom. scand.* 2: 191-204; — PROVONSHA, A., 1975, *Gt Basin Nat.* 35: 379-390; — ROBINSON, J.V., 1983, *Am. Midl. Nat.* 109: 169-174.

Received December 4, 1991