nitidinerve (Sel.), *Sympetrum fonscolombei* (Sel.), *S. striolatum* (Charp.), *Trithemis annulata* (P. de Beauv.), *Zygonyx torrida* Kirby.

Entre estas especies, hay algunas que han sido citadas en Valencia por diversas autores, pero que nunca hemos visto en nuestras excursiones de muestreo: *Calopteryx virgo, Lestes barbarus, Ischnura graellsii, I. pumilio, Coenagrion coerulescens, Gomphus simillimus, Lindenia tetraphylla, Onychogomphus forcipatus, Hemianax ephippiger.*

Hay especies, como *L. tetraphylla*, que hace ya décadas que no se han visto en Valencia. Otras especies, como *Trithemis annulata*, la hemos visto en Valencia por primera vez, y para *Zygonyx torrida*, es la segunda cita en nuestra provincia.

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A TWENTYFOUR-HOURS-LASTING TANDEM IN *COENAGRION SCITULUM* (RAMB.) IN THE LABORATORY (ZYGOPTERA: COENAGRIONIDAE).

In the framework of a research on copulation behaviour in *C. scitulum* (May-June, 1992), we have reared some individuals in the laboratory, in insectaries as large as 50x50x50 cm, at room temperature and natural photoperiod. Adult *Drosophila* were constantly available as food. All specimens had been collected as newly emerged tenerals, or as last instar larvae at an artificial pond in Corrubedo, Galicia, NW Spain. About half of the sample died before reaching maturation; all others succesfully emerged and/or matured and mated in their cages, the males (N=42) living on average 16.6 days (maximum age 30).

With non-receptive females (those that did not accept copulation), the precopulatory tandem lasted significantly shorter than with receptive ones ($\bar{x}\pm SE = 19.2 \pm 6.7$ min; R = 0.6-90; N = 14; and $\bar{x}\pm SE = 24.3 \pm 5.0$ min; R = 0.5-136; N - 36; Mann-Whitney $U = 4.7$, $p < 0.001$), but in most cases it did not generally exceed the duration of several minutes. However, two males kept their females for as long as 23 h 33 min and 5 h 35 min, respectively. Both these males made repeated invitations to copulate and often attempted to take flight, but since their females were in poor condition and did not perform any copulation or flying movements, often the tandems fell to the ground of the cage. The two females died after a short time while still in tandem.

Observation of the longer lasting tandem was performed between 12:50 (time of tandem formation) and 22:40 h and between 10:00 and 12:23 h of the following day, having been suspended during the night; in the following morning the male was still grasping his motionless female and performing copulation attempts. He released her following an unintentional stroke by another (flying) female. After a quarter of an hour this male seized another female that rebelled to his grip and was released after 4 min. He died the following day at the age of 22 days.

When females are rare, and sexual competition is high, it is of advantage for the male to control the female he has happened to find, even if she is still unreceptive, in order to improve his probability to mate, which is named pre-copulatory mate guarding behaviour (G.A. PARKER, 1970, *Biol. Rev.* 45: 525-568). In several invertebrates, including insects, pre-copulatory guarding may last several hours or even days (R. THORNHILL & J. ALCOCK, 1983, *The evolution of insect mating systems*, Harvard Univ. Press). This implies that during this period the male and/or the female cannot feed. However, in damselflies, including *C. scitulum* (C. UTZERI & G. SORCE, 1988, *Atti 15 Congr. naz. ital. Ent.*, pp. 731-737), pre-copulatory guarding is not so long, since females are ready to copulate shortly after seizure. In the Odonata, there is evidence of intra-tandem communication (C. UTZERI, 1989, *Opusc. zool. flumin.* 35: 1-6), by which the partners coordinate their behaviour. Thus, in *C. scitulum* and other damselflies, unreceptive females rebel to the male grip by making vigorous movements; in this way probably producing a different stimulation to the male cerci compared to that by a receptive (motionless) female. When this occurs, the two partners may separate after a very short interval. On the other hand, if the female hangs motionless, the male will start invitation movements to copulation within a shorter or longer time. Since our males did not receive any unreceptiveness communication from their females, they continued invitation behaviour for many hours.

Another caged *scitulum* male performed 25 unsuccessful attempts to copulate in 22 min, that is 1.14 attempts per min. Assuming the same rate

for the male of the longest-lasting tandem, the latter may have flexed his abdomen more than 830 times, consuming about as much energy as 275-830 times that employed by a male for normal wheel-binding in the field (1-3 attempts). Probably energy expenditure was even higher due to its flying efforts. This unusually prolonged performance may have weakened this male, but he was still able to catch another female shortly after releasing the former, thus indicating that mating motivation was stronger than feeding motivation. Anyway, after releasing the second female, apparently he was no longer able to feed, although plenty of food was available in his box. Even though this was a long-lived individual, starvation may have helped to bring him to death.

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AGGREGATION OF OVIPOSITING TANDEMS IN ZYGOPTERA: ARE TANDEM PAIRS ABLE TO DISTINGUISH WHETHER THEY ARE APPROACHED BY SINGLE MALES OR TANDEMS?

In several zygopteran species apparently there is no inter-tandem competition for oviposition sites, so tandems may aggregate and oviposit in shared sites (e.g. E. SCHMIDT, 1926, *Konowia* 5: 134-144; W.J. CRUMPTON, 1975, *Odonatologica* 4: 149-168; – E. LOIBL, 1958, *Z. Tierpsychol.* 15: 54-81; – W. DREYER, 1978, *Odonatologica* 7: 309-321; – C. UTZERI, E. FALCHETTI & G. CARCHINI, 1983, *Odonatologica* 12: 259-278; – A. MARTENS, 1989, *Zool. Anz.* 228: 124-128; – G. REHFELDT, 1989, *Abstr. Pap. 10th Int. Symp. Odonatol.*, p. 29; – G. RÜPPELL, R. RUDOLPH & H. HADRYS, 1987, *Publ. wiss. Filmen* (Biol.) 19(20): 1-9; – A. MARTENS & G. REHFELDT, 1989, *Anim. Behav.* 38: 369-374).

Since in the Zygoptera tandem pairs display their wings to closely approaching individuals, thus inducing them to retreat (C. UTZERI, 1988, *Odonatologica* 17: 45-54) and, if persistently disturbed, may shift to another site, oviposition in communal sites suggests that tandem pairs must better tolerate to be approached by other tandems than by unpaired individuals. To test this, in 39 *Lestes virens* tandems in the field (Castel Porziano, Roma, Italy, August and September, 1989) we have recorded frequencies of the wing display, which were elicited by approaching (from 20 cm up to physical contact) unpaired or in-tandem conspecific indiviuals. In the observation site, this damselfly (1) is very abundant; (2) often ovipositis in tandem in communal sites; (3) shows a male-skewed sex ratio at the reproductive sites, so there are usually many unpaired males besides several tandems on each day; and (4) single males frequently attempt to seize either the females or the males of tandem pairs. Reactions of the approached/disturbed tandems were mainly wing fluttering by one or both partners (C. UTZERI, E. FALCHETTI & R. RAFFI, 1987, *Fragm. ent.* 20: 1-22), which was sometimes joint to a short interruption of oviposition or followed by shifting of the pairs to other sites.

125 out of 156 unpaired approachers caused one or both partners to react (wing display and/or shifting), while 31 caused no reaction; 15 out of 35 in-tandem approachers caused the same reactions, while 20 caused no reaction ($\chi^2 = 18.6$; $p<0.001$), i.e. tandem pairs significantly more often reacted to single individuals than to tandems.

Oviposition in communal sites may protect pairs from predation and from single males' interference and may also indicate good oviposition sites to other pairs (G. REHFELDT, 1989, *ibidem*; – A. MARTENS & G. REHFELDT, 1989, *ibidem*). MARTENS (1989, *ibidem*) concluded that tandems of *Coenagrion pulchellum* are attracted to oviposition sites where other tandems oviposit. Indeed, closeness of tandem pairs is likely of less disturbance to ovipositing tandems than that of single males, since the former never attempt seizure, thus neither interfering with oviposition nor with male guarding. Clues are not known in *L. virens* for discrimination between pairs and single individuals. However, from a functional point of view, to react differently to paired and unpaired individuals is the same as to distinguish the former from the latter. Apparently two paired individuals emit a "tandem-specific" stimulus, which does not equal the sum