

Dragonflies around Olot in the province of Girona, NE Spain

Marcel Wasscher

Minstraat 15 bis, NL-3582 CA Utrecht, The Netherlands

From 18 July to 15 August 1988, dragonflies were observed in the area between Olot and Besalú in the foothills of the Pyrenees. Running water was the main habitat type visited, although a few standing waters were investigated as well. At the 24 sites visited, which were at altitudes between 200 and 400 m, a total of 27 spp. was found. Observations of a single *Trithemis annulata* (P. de Beauv.) at one site, as well as a population just outside the study area, are of considerable interest, being the most northerly records in south-western Europe at this date. The most common species found during the survey of running waters were *Calopteryx haemorrhoidalis* (Vander L.), *Platynemesis latipes* Ramb., *Onychogomphus uncatus* (Charp.) and *Boyeria irene* (Fonsc.). Diurnal activity of six species was observed: most individuals were active at the water between 13:00 and 15:00 h local time [CET]. The maximum densities of *Boyeria irene* during daytime, between 13:00 and 14:00 h, were the same as those at twilight at 21:00 h. As the days became shorter and twilight earlier, so did the latest time at which *B. irene* was observed.

Introduction

A survey of dragonflies was made in the area between Olot, a town 100 km north of Barcelona, and Besalú, a village 17 km east of Olot between 18 July to 15 August 1988. The main habitat types in this area, which is situated in the foothills of the Pyrenees, are permanent rivers and streams. All localities visited are at an altitude of 200 to 400 m. Outside the main study area, the Lago de Banyoles, a large lake near Banyoles 12 km southeast of Besalú, was visited.

Apart from the survey, the diurnal activity of dragonflies was studied on three occasions, and information gathered on the latest flying times of *Boyeria irene*.

The time used is local time (CET) which is about 110 mins later than solar time.

List of localities

A total of 24 sites was visited: 15 on streams (loc.1-15), 5 on rivers (loc.20-24) and 4 standing water localities (loc.30-33). The running water localities are shown on Fig. 1. For each locality the coordinates (from the map of Cartografía Militar de España, Olot, 38-11, 257), the dates of visits and number of species observed are given.

Streams

- 1 Rio Sant Aniol, stream N Sadernes (466-4681), 14.08.88. - [6 spp.]
- 2 Small stream near Can Llobet (467.7-4679.3), 29.07.88. - [2 spp.]
- 3 Torrente del Estanyol, small stream Can Banal, upstream section (465.5-4677.4), 18.+19.07.88. - [6 spp.]

- 4 Torrente del Estanyol, small stream Can Banal, downstream section (466.9-4677.4), 31.07., 02./05.-07./15.08.88. - [11 spp.]
- 5 Two small streams NE La Quintana (468-4677), 08.08.88. - [4 spp.]
- 6 Torrente de Castella, small stream S Montagut (465.9-4675.4), 18.07., 01.-02.08.88. - [8 spp.]
- 7 Riera de Juias (small stream) (471.2-4674.0), 26.07.88. - [9 spp.]
- 8 Rio Borro, central sections, 8 sites visited between the road Argelaguer - Besalú (472-4672) and E Salas de Llierca (472-4676), 11.08.88. - [10 spp.]
- 9 Rio Borro, downstream section near the road Argelaguer - Besalú (472-4673), 11.08.88. - [8 spp.]
- 10 Stream near Can Jou, E Beuda (477-4676) 09.08.88. - [2 spp.]
- 11 Riera Capellada near Beuda (476-4676), 09.08.88. - [3 spp.]
- 12 Stream near Fuente del Grevol (470-4672), 30.07., 15.08.88. - [9 spp.]
- 13 Torrente de Riufred, path W of stream (471-4671), 30.07.88. - [5 spp.]
- 14 Torrente de Riufred, downstream section (471-672), 30.07.88. - [5 spp.]
- 15 Riera de Riudoura, stream N Olot (457-4671), 01.08.88. - [9 spp.]

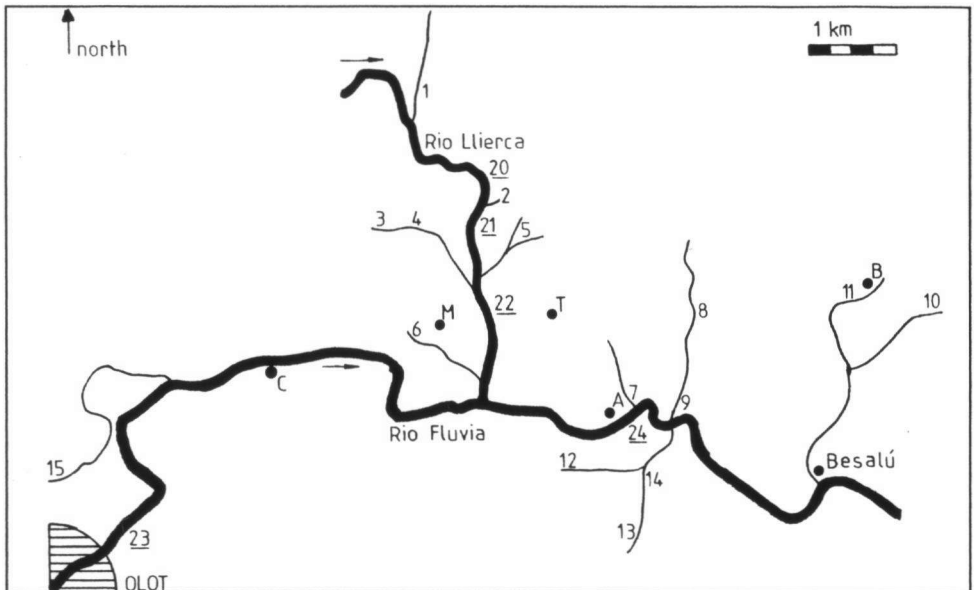


Fig. 1: Map of the survey area between Olot and Besalú, with locality numbers of the streams 1-15 and the river sites 20-25 (see text). A: Argelaguer, B: Beuda, C: Castellfolit de la Roca, M: Montagut de Fluvià, T: Tortellà.

Rivers

- 20 La Llierca, dry river bed with small pools near Can Llobet (467.6-4679.0), 29.07.88. - [2 spp.]
- 21 La Llierca, near bridge at Can Serrat del Pont (467.3-4677.5), 21.-27.07., 13.08.88. - [12 spp.]
- 22 La Llierca, near Casa del Pi (467-4676), 18.07., 02.08.88. - [2 spp.]
- 23 El Fluvià in Olot, surroundings of dam (459-4671), 20.07.88. - [5 spp.]
- 24 El Fluvià near Argelaguer (471-4673), 26.07.88. - [3 spp.]

Standing waters

- 30 Pool near Ribero de San Eualdo N Castellfolit (463-4676), 20.07.88. - [1 sp.]
- 31 Pool near rubbish dump WSW Tortella (468-4675), 02.08.88. - [8 spp.]
- 32 Small shallow pond WSW Tortella and N of loc.31 (468-4675), 02.08.88. - [4 spp.]
- 33 Small pool S Argelaguer near El Fluvià (470-4673), 26.07.88. - [5 spp.]

List of species

Twenty seven species which were observed in the study area are listed below and most of them in Table I. For each species the abundance per locality, based on the maximum number of individuals observed there, and the total numbers counted at all localities are stated. For some species, additional notes are given.

Calopteryx haemorrhoidalis (Vander Linden, 1825)

Frequent at loc. 4, 5, 7, 8, 9, 10, 12, occasionally at loc. 3, 6, 14 and rare at loc. 2, 13, 15, 20, 23. Number of individuals: 544 (353 males, 191 females). All except one female found near running waters. Highest density found at loc.7: 50 males and 50 females per 100 m river bank..

Calopteryx splendens xanthostoma (Charpentier, 1840)

Rare at loc. 12 (1 male) and loc. 23 (2 males) on 20.+30.07.88 respectively

Calopteryx virgo meridionalis Selys, 1873

Frequent at loc. 15, occasionally at loc. 1, 3, 12 and rare at loc. 6, 7, 8, 13, 14. Number of individuals: 84 males, 11 females, only found near running water. A juvenile male was seen on 19.07.88 at loc. 3. Highest numbers counted at loc.15: 35 males and 5 females per 100 m river bank. This locality, a shallow, ca. 10 m wide stream, was a somewhat strange habitat of *C. virgo meridionalis*, because only a third was shaded. Most sites of this species were smaller and much more shaded.

Sympecma fusca (Vander Linden, 1823)

Rare at loc. 20: 1 male on 29.07.88.

Lestes viridis (Vander Linden, 1825)

Occasionally at loc. 8, rare at loc. 3, 4, 5, 7, 9, 21, 24, 31. Number of individuals: 26, all except one at running waters. Highest density at loc. 8: 10 per 50 m.

Platycnemis acutipennis Selys, 1841

Occasionally at loc. 4, 21. Rare at loc. 7, 8, 9, 14, 15, 23. Number of individuals: 40 (25 males, 1 female and 7 pairs in tandem), always found near running waters. On 24.07.88 at loc. 21: a male *P. acutipennis* twice attempted to copulate with a female *P. latipes* for 20 and 30 seconds.

Platycnemis latipes Rambur, 1842

Frequent at loc. 4, 7, 8, 15, 21, 33, occasionally at loc. 9, 12, 23, 24 and rare at loc. 1. Number of individuals: 411 (209 males, 8 females, 71 pairs in tandem, reminder unrecorded), all except 10 at running waters. Three juveniles at loc. 21 on 27.07.88. Highest density at loc. 21: 29 males and 2 females and 16 pairs in tandem per 50 m shoreline. Copulation duration 50 min on 27.07.88. *P. latipes* was found in much higher numbers than *P. acutipennis* during the survey.

Ischnura elegans (Vander Linden, 1820)

Common at loc. 31, frequent at loc.33, occasionally at loc. 32 and rare at loc. 4, 21, 22. Number of individuals: 440, all except 4 at standing waters.

Ischnura graellsii (Rambur, 1842)

Occasionally at loc. 32. On this shallow pond, 5 individuals occurred together with 5 individuals of *I. elegans*. This site is very close to loc. 31.

Ischnura pumilio (Charpentier, 1825)

Occasionally at loc. 31, where 3 females were found together with very high numbers of *I. elegans*.

Pyrhosoma nymphula (Sulzer, 1776)

Frequent at loc. 3, occasionally at loc. 6 and rare at loc. 5, 12, 15. A total of 45 individuals was found including 5 pairs in tandem; all near running waters. Highest density on 19.07.88 at loc. 3: 26 individuals per 50 m.

Cercion lindenii (Selys, 1840)

Frequent at loc. 33, occasionally at loc. 24, rare at loc. 21, 23. Number of individuals: 38 (32 males and 3 pairs in tandem), 19 of them at running water.

Ceriatrigon tenellum (de Villers, 1789)

Rare at loc. 4. 1 male on 31.07.88 and another one on 05.08.88.

Table 1: Occurrence of dragonflies on 10 selected brooks and 4 rivers near Olot, Girona province. A: abundant; F: frequent; O: occasionally; R: rare.

Species	Numbers of localities														
	Brooks											Rivers			
	1	3	4	5	6	7	8	9	12	15	20	21	22	23	
<i>Calopteryx haemorrhoidalis</i>	-	O	F	F	O	F	F	F	F	R	R	-	-	R	
<i>C. splendens xanthostoma</i>	-	-	-	-	-	-	-	-	R	-	-	-	-	R	
<i>C. virgo meridionalis</i>	O	O	-	-	R	R	R	-	O	F	-	-	-	-	
<i>Sympetma fusca</i>	-	-	-	-	-	-	-	-	-	-	R	-	-	-	
<i>Lestes viridis</i>	-	R	R	R	-	R	O	R	-	-	-	R	-	-	
<i>Platycnemis acutipennis</i>	-	-	O	-	-	R	R	R	-	R	-	O	-	R	
<i>P. latipes</i>	R	-	F	-	-	F	F	O	O	F	-	F	-	O	
<i>Pyrrosoma nymphula</i>	-	F	-	R	O	-	-	-	R	R	-	-	-	-	
<i>Cercion lindenii</i>	-	-	-	-	-	-	-	-	-	-	-	R	-	R	
<i>Onychogomphus uncatus</i>	O	-	F	-	-	O	F	F	R	O	-	O	R	-	
<i>Boyeria irene</i>	-	O	F	O	R	-	O	O	O	O	-	-	-	-	
<i>Cordulegaster boltonii</i>	-	O	R	-	O	O	-	-	O	-	-	-	-	-	
<i>Oxygastra curtisii</i>	R	-	-	-	-	-	O	-	-	-	-	-	-	-	
<i>Orthetrum brunneum</i>	-	-	R	-	R	-	-	-	R	O	-	-	-	-	
<i>O. coerulescens</i>	-	-	O	-	R	R	-	-	-	R	-	-	-	-	
<i>Trithemis annulata</i>	-	-	-	-	-	-	-	-	-	-	-	R	-	-	

Onychogomphus uncatus (Charpentier, 1840)

Frequent at loc. 4, 8, 9, 13, 14, occasionally at loc. 1, 7, 15, 21 and rare at loc. 12, 22. One juvenile male and two exuviae at loc. 21 on 27.07.88. Number of individuals: 155 (146 males, 5 females and 4 unrecorded), all at running water. Not all individuals were examined. Those that were were all *O. uncatus*. There is a possibility that some *O. forcipatus unguiculatus* may have been overlooked.

Aeshna affinis Vander Linden, 1820

Rare at loc. 13: 1 male on 30.07.88 flying over the road.

Aeshna cyanea (Müller, 1767)

Rare at loc. 6, 30: 2 males.

Anax imperator Leach, 1815

Occasionally at loc. 15. and rare at loc. 31. Number of individuals: 3 males and 1 female, the males at running waters, the female at standing water.

Boyeria irene (Fonscolombe, 1838)

Frequent at loc. 4, occasionally at loc. 3, 5, 8, 9, 12, 13, 15 and rare at loc. 6. Number of individuals: 85 (68 males, 6 females, 3 pairs in tandem and 5 of unknown sex), all at running water.

Cordulegaster boltonii (Donovan, 1807)

Occasionally at loc. 3, 6, 7, 12 and rare at loc. 2, 4, 10, 14. Number of individuals: 36 (22 males, 1 pair in tandem and 5 unrecorded), all at running water. A male photographed at loc. 3 on 19.07.88, and possibly others, belonged to the ssp. *immaculifrons* Selys.

Oxygastra curtisii (Dale, 1834)

Occasionally at loc. 8 and rare at loc. 1, on 11.08.88 (4 males) and 14.08.88 (1 male) respectively. The first habitat was a slow running and few metre deep section (15x40 m') of the Rio Borro. At this locality the males flew at a height of 0.3 - 0.4 m above the water surface. They preferred to fly with a distance of 2 m to the river bank. On other parts the river was shallower and faster-flowing with riffles. The second habitat was a pool with a river running through it.

Libellula depressa Linnaeus, 1758

Rare, 1 male at loc. 21 on 20.07.88.

Orthetrum brunneum (Fonscolombe, 1837)

Frequent at loc. 31, occasionally at loc. 15 and rare at loc. 4, 6, 12, 32. Number of individuals: 23 (19 males, 2 females and 1 pair in tandem), of which 8 males at running water, the others at standing water.

Orthetrum coerulescens (Fabricius, 1798)

Occasionally at loc. 4 and rare at loc. 6, 7, 15. Number of individuals: 11 (10 males, 1 female), all at running water.

Crocothemis erythraea (Brullé, 1832)

Frequent at loc. 31, rare at loc. 9, 21, 32, 33. Number of individuals recorded: 14 (4 males and 10 unrecorded) of which only 1 flew near running water.

Sympetrum fonscolombii (Selys, 1840)

Common at loc. 31, occasionally at loc. 9 and rare at loc. 21. Number of individuals: 61 (38 males, 1 female and 11 pairs in tandem) of which 16 individuals at running water.

Sympetrum striolatum (Charpentier, 1840)

Rare at loc. 31: 3, all near standing water.

Trithemis annulata (Palisot de Beauvois, 1805)

Rare at loc. 21. 1 male on 13.08.88.

Diurnal activity

On three occasions the diurnal activity of dragonflies was studied. These observations took place at loc. 4 on 05.08.88, and at loc. 21 on 24.+27.07.88.

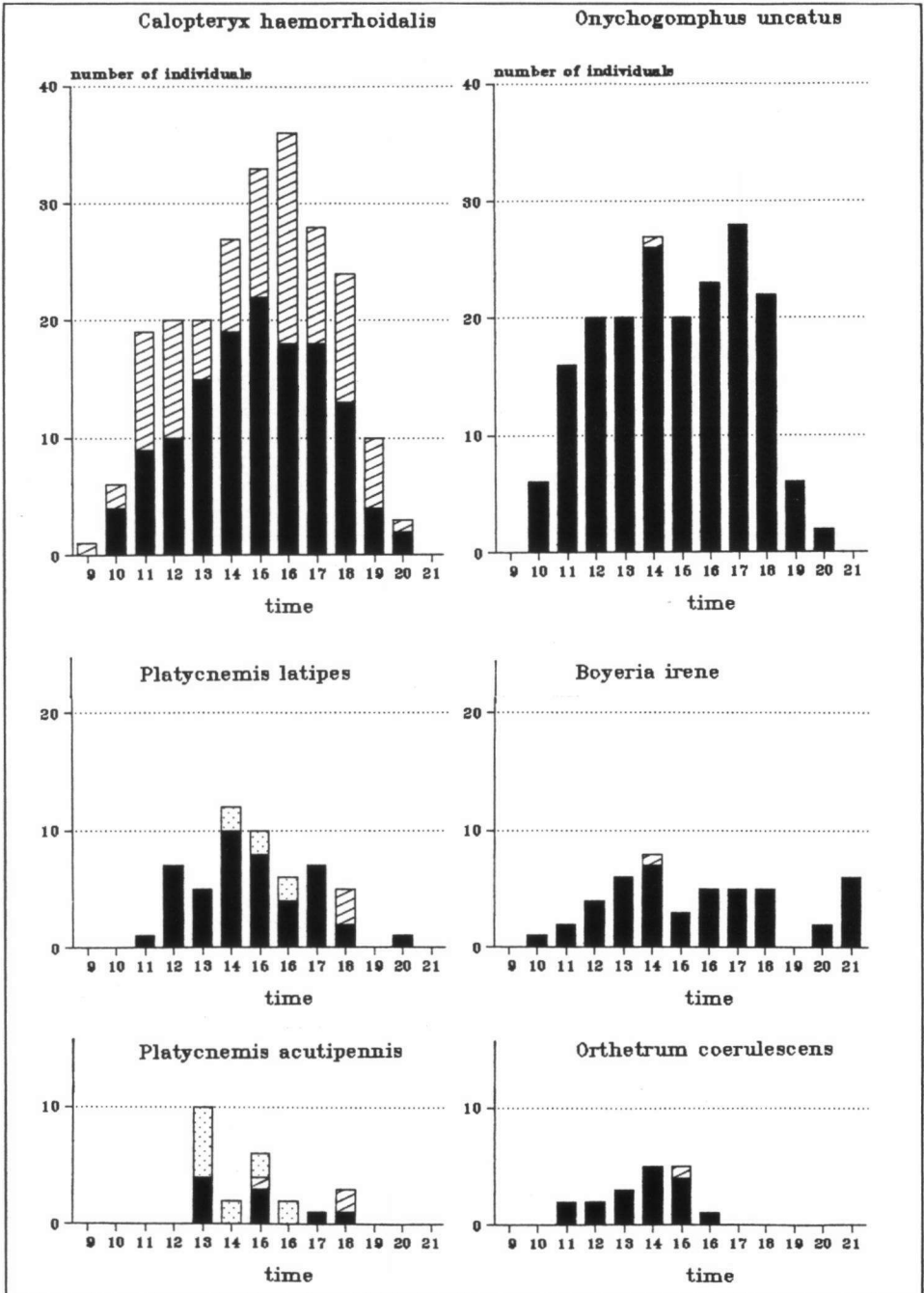


Fig. 2: Diurnal activity of six common species present at loc. 3 on 05.08.88. Black bars: males; hatched bars: females; dotted bars: pairs in tandem or copula. The time used is local time [CET].

During observations at the first locality (Fig. 2), six species, each with 3 or more individuals, were present. The two most common species were *Calopteryx haemorrhoidalis* and *Onychogomphus uncatus*. *C. haemorrhoidalis* showed a peak of the males at 15:00 h with 22 present, and a peak of the females with 18 at 16:00 h, after a minimum of 5 at 13:00 h. *O. uncatus* showed peaks at 14:00 h and 17:00 h with respectively 26 males and 1 female, and 28 males without any females. Less common were *Platynemesis latipes* with a peak at 14:00 h with 10 males and 1 pair in tandem, *Boyeria irene* with a peak at 14:00 h with 7 males and 1 female, and smaller peaks at 13:00 h and 21:00 h, both with 6 males present, *Platynemesis acutipennis* with a peak at 13:00 h with 4 males and 3 pairs in tandem, and *Orthetrum coerulescens* with peaks at 14:00 h and 15:00 h, with respectively 5 males and 4 males and 1 female.

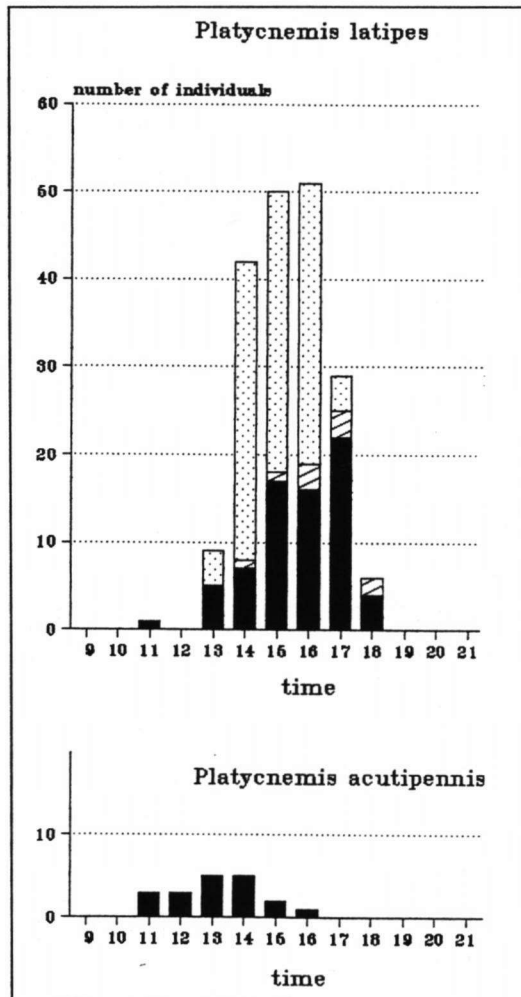


Fig. 3: Diurnal activity of *Platynemesis latipes* and *P. acutipennis* at loc. 21 on 27.07.88. Black bars: males; hatched bars: females; dotted bars: pairs in tandem or copula. The time used is local time [CET].

Thus most species were most active at the water between 13:00 and 15:00 h, during the hottest part of the day. These data show that the maximum densities during the day of *Boyeria irene* were about the same as those during twilight. During day time this species was generally active in the shade or half-shaded areas.

At the other locality, the river Llierca (loc. 21), the diurnal activity in *Platynemesis latipes* and *P. acutipennis* was observed (Fig. 3). At this site, which was half-shaded by trees, many individuals in tandem could be found ovipositing in *Eleocharis* vegetation. *P. latipes* was much more common than *P. acutipennis*. The highest numbers of the former were found at 15:30 h on 24.07.88 and at 15:00 h on 27.07.88. The last individual was seen at 19:00 h. *P. acutipennis* was active earlier in the day: at 13:30 on 24.07.88 with 5 males and 1 tandem present, and at 13:00 and 14:00 h on 27.07.88 with 5 males present. The last individual of this species was seen at 16:30 h.

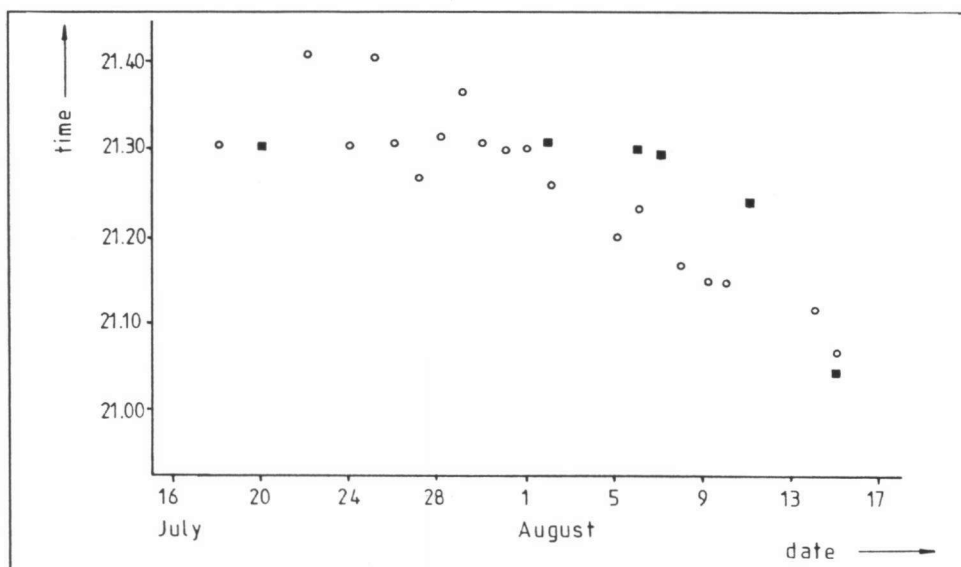


Fig. 4: Latest flight activity of *Boyeria irene* (black squares) and the start of singing Nightjar *Caprimulgus europaeus* (open dots) during twilight at loc. 3. The time used is local time [CET].

During our stay near loc. 4 from 18.07. until 15.08.88, data on the latest flight time of *Boyeria irene* at the water and the first singing time of the Nightjar *Caprimulgus europaeus* were gathered (Fig. 4). Both species are known for their crepuscular activities. It should be noted that 3-7 min before the Nightjar started to sing, hunting individuals could already be seen. Fig. 4 shows that the time, at which Nightjars started to sing and *Boyeria irene* finished flying, became earlier as the season progressed; in line with the earlier sunset.

Lago di Banyoles

Outside the main survey area I visited on 25.07.88 another locality in the province of Girona: the Lago de Banyoles, a large lake near Banyoles, 12 km southeast of Besalú. Here I found a population of *Tritthemis annulata* (15 males, 2 copulating pairs). Further species were: *Platynemesis latipes* (abundant), *Ischnura elegans* (abundant), *Ceragrion tenellum* (2 males), *Cercion linde-*

nii (abundant), *Aeshna isosceles* (3 males), *Anax imperator* (3 males), *Anax parthenope* (4 males), *Orthetrum cancellatum* (3 males), *Orthetrum coerulescens* (frequent) and *Sympetrum fonscolombii* (abundant). I also noticed 3 small, black libellulids at the northeast side of the lake. They were perching within a few metres of the shore, a few decimeters above the water. These insects were probably *Selysiothemis nigra* (Vander Linden).

Discussion

In the study area between Olot and Besalú altogether 27 species were brought on record, and three additional species were recorded at Lago di Banyoles, viz. *Aeshna isosceles*, *Anax parthenope* and probably *Selysiothemis nigra*. Out of these 30 species, only *Oxygastra curtisii* and *Selysiothemis nigra* were not reported by WENGER (1963), HEYMER (1964) and JURZITZA (1965) who made thorough surveys in the province of Girona during the 1960s. There exists an old record of *O. curtisii* by RIS (1927) from Bañolas (=Banyoles).

The first publication of a record of *Trithemis annulata* in Spain is by LIEFTINCK (1979). One male was captured at a lake near El Chapparal/Granada on 23.07.78 and is now deposited in the ITZ collection in Amsterdam, The Netherlands (leg. R. Leys, det. M.A. Liefstinck). FERRERAS ROMERO (1981) lists a series of records of *T. annulata* around Cordoba in 1978. His first record is a male captured at Rio Guadiato near Los Arenales on 20.06.78, which is a month earlier than the record published by Liefstinck. Thus Ferreras' record has to be considered the first one in Spain. GRAND (1994) outlines the expansion of this species in southwestern Europe. The records of a male on La Llerca river and the population at Lago di Banyoles show that *T. annulata* had already reached the foothills of the Pyrenees in 1988 (Fig. 5) and that these two records were the northernmost at that time.

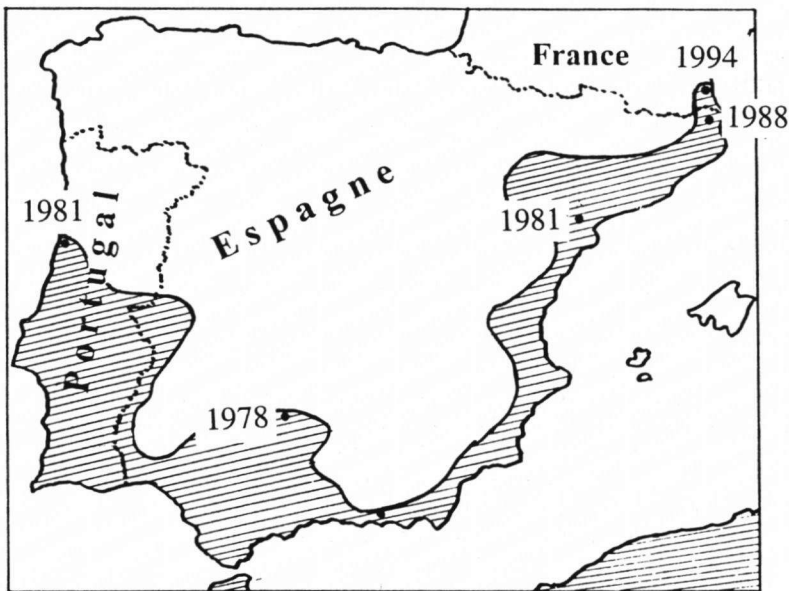


Fig. 5: Distribution map of *Trithemis annulata* in southwestern Europe, modified after GRAND (1994); the years of consecutively northernmost records are added. The years refer to records by FERRERAS ROMERO (1981), AGUIAR & AGUIAR (1983), GRAND (1990, 1994) and the present paper.

As would be expected, most dragonflies were present at the water between 13:00 and 15:00 h, the hottest part of the day. However, at the river Indre, Central France, I had noticed during a visit in 1984 that adults of *Platycnemis pennipes* (Pallas) during the hottest time of the day were not to be found near the water edge. They were only present in the shadow of a nearby forest. In *P. acutipennis* and *P. here* observed the hottest time of the day did not have a negative effect on the number of individuals. *Boyeria irene* was present at noon as well as at dusk, as was reported by MILLER & MILLER (1985) and PETERS (1987). Fig. 2 shows a gap between diurnal and crepuscular activity. This is in agreement with MILLER & MILLER (1985) and indicates a rest during the early evening. I have found no other studies which refer to the abundance during noon and dusk (Fig. 2) or to the seasonal change in the time of starting crepuscular activity (Fig. 4).

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Received: 10.06.95

Revised and Accepted: 03.07.95