

- *O. walli* Fraser: 1 ♂, 1 ♀, Sg. Gombak area, 6-IV-1963; - 1 exuviae, Sg. Tangli, 15-V-1963, J. Furtado leg.; - 1 exuviae, Sg. Gombak, 22-V-1963, J. Furtado, leg.; - 1 ♂, Kelantan, Sg. Nengiri, 31-VII-1963, J. Furtado, leg.; - 1 ♂, Cameron Highlands, Road 16th mile, 18-II-1964

- *Phaenandrogomphus asthenes* Lieft.: as published by LIEFTINCK (1964)

CORDULIIDAE

- *Macromia arachnomima* Lieft.: as published by LIEFTINCK (1971)
- *Procordulia artemis* Lieft.: 1 ♂, Cameron Highlands, Mt Batu Berincang, 12-III-1963

LIBELLULIDAE

- *Hylaeothemis clementia* Ris: 2 ♂, Selangor, Templer Park, 12-13th mile, 11-IV-1963
- *Orthetrum pruinosum schneideri* Forst.: 1 ♂, Selangor, Kepong Forest Research Institute, 24-III-1963; - 1 ♂, Selangor, Genting Simpah, 5-IV-1963. - (Note: the status of this subspecies is still unclear as LIEFTINCK, 1954, placed Malayan specimens under *O. p. neglectum*)

Discussion

This note provides 24 additional names to the list prepared by LIEFTINCK (1954). BROOKS (1981) reported on 3 of the species named in our list, viz. *V. amethystina*, *M. quadratus* and *H. clementia*. Records of a further 8 species published elsewhere are as follows. KEMP (1989) reported on *Lestes dorothea* and *Prodasineura autumnalis*; VICK (1993) *Nepogomphus modestus* and *Mortonagrion aborense*, both from Fraser's Hill, and KARUBE (1994) reported *Chlorogomphus arooni* from the Cameron Highlands.

In addition, several new species have been described. KARUBE (1990) described *Asiagomphus xanthenatus*, from Fraser's Hill. New species from

the Cameron Highlands were *Drepanosticta berinchangensis* (KEMP, 1994) and *Chlorogomphus yoshihiro* (KARUBE, 1994). It is interesting to note that a number of new species and records were published from the two popular Malaysian hill resorts.

Acknowledgements - The first author wishes to acknowledge Dr JAN KRIKKEN for his invaluable help in providing a conducive environment for work during her stay at Leiden Museum. Encouragement and interesting discussions with Professor and Mrs BASTIAAN KLAUTA are very much appreciated. She would especially like to thank Mr JAN VAN TOL and Ms STANS KOFMAN for making her stay in the Netherlands both pleasurable and memorable.

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Received November 28, 1994

BRIEF NOTES AND RECORDS

VERTICAL STRATIFICATION DURING EMERGENCE IN ODONATES

Emergence is a crucial event in the life of larval dragonflies. This is the only moment during their development in which larvae are immobile, and therefore are susceptible of damage or predation. Careful site selection should be expected. In his comprehensive study of the life history of *Anax*

imperator, P.S. CORBET (1957, *J. Anim. Ecol.* 26: 1-69) showed that larvae prefer certain parts of the shore for emergence. This produces great concentrations of emerging individuals in some spots, to the extent that some emerging larvae can be damaged by other emerging individuals climbing on them (see pl. 2B in CORBET, 1957, *loc. cit.*). S.D. GRIBBIN & D.J. THOMPSON (1990,

Freshw. Biol. 24: 295-302) and S. BENNETT & P.J. MILL (1993, *Odonatologica* 22: 133-145) studied the emergence of *Pyrrhosoma nymphula* and found that exuviae could be very close, but never so close as to produce competition for emergence sites or damage. To my knowledge, Corbet's data are the only to indicate intraspecific competition for emergence sites in Odonata.

During field work on a man-made pond at Salcedo (Pontevedra, NW Spain) during 1985 and 1986, I noticed that the exuviae of several species seemed to be located at a characteristic height on their substrate.

This fact suggested a possible case of avoidance of interspecific competition for substrates. The pond was almost rectangular, 60 × 10 m, formed at an abandoned excavation for a highroad. Due to this origin, the pond had walls of concrete 4 m high on the longer sides, with emergent vegetation only on the shorter sides. This reduced the available supports for emerging dragonflies mainly to patches of *Digitaria paspaloides*, *Cyperus vegetus* and *Typha latifolia*. During opportunistic visits to the pond I collected all the exuviae I could find and measured the height above water to the nearest cm (or the estimated

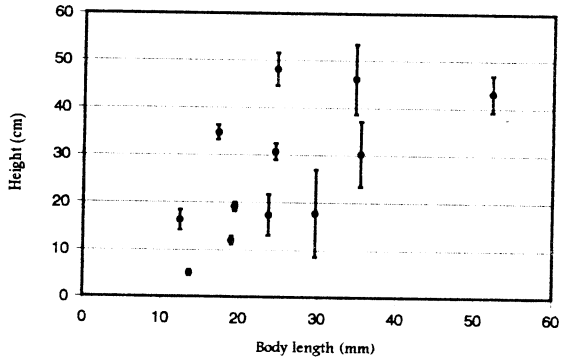


Fig. 1. The relationship between larva size and height on the substrate for the emergence in some Odonata species. – [Mean ±SE]

distance covered by larvae that emerged on inclined substrates), and the height above the ground and the distance travelled for those exuviae found far from the water. I also measured some of the exuviae to the nearest mm (total length, excluding caudal lamellae in Zygoptera). Given the difficulty of locating enough exuviae of some species, data from measurements made during 1985 and 1986 at several other ponds (*L. virens*, *A. mixta*, *O. cancellatum*) and rivers (*P. latipes*, *B. irene*, *O. uncatus*) in the province of Pontevedra are also presented.

Figure 1 shows the relationship between mean

Table I – The localization of exuviae of some Odonata

Species	Height on the substrate (cm)		Distance from water (cm)*		Body length (mm)
	mean±SE (n)	range	mean±SE (n)	range	
<i>Ischnura graellsii</i>	5.09±0.59 (85)	1-46	**	–	13.61±0.25 (39)
<i>Lestes viridis</i>	19.12±0.91 (423)	3-132	52.36±13.49 (14)	10-175	19.37±0.21 (23)
<i>L. virens</i>	11.98±0.83 (103)	2-48	**	–	18.96±0.37 (5)
<i>Platynemis latipes</i>	16.31±2.11 (16)	6-34	**	–	12.40±0.40 (2)
<i>Boyeria irene</i>	46.08±7.38 (24)	8-177	120.0 ±70 (2)	50-190	34.67±1.38 (3)
<i>Anax imperator</i>	43.08±3.87 (36)	10-96	35.00±8.66 (3)	20-50	52.21±0.70 (15)
<i>Aeshna mixta</i>	30.25±6.87 (4)	lost data	**	–	35.40±1.30 (4)
<i>Gomphus pulchellus</i>	17.75±9.18 (4)	5-45	**	–	29.68±0.25 (8)
<i>Onychogomphus uncatatus</i>	17.40±4.27 (5)	11-34	**	–	23.70±0.00 (1)
<i>Orthetrum cancellatum</i>	48.07±3.47 (45)	10-119	134.02±9.59 (42)	20-270	24.65±0.37 (13)
<i>Libellula depressa</i>	30.70±1.73 (37)	14-57	45.25±11.78 (12)	5-120	24.51±0.20 (29)
<i>Sympetrum striolatum</i>	34.73±1.56 (146)	5-132	49.33±5.23 (40)	10-150	17.14±0.09 (141)

* Only for individuals that emerged far from the water

** All exuviae were found on emergent vegetation

larva body length and mean height above the water (or ground for individuals emerging far from the water). There is a significant positive correlation between both variables ($r=0.62$, $n=12$, $P=0.033$). Larger species tended to climb further on the substrate. The correlation between body length and distance covered by larvae on the ground, for the species in which some individuals emerged far from the water is not significant ($r=-0.10$, $n=6$, $P=0.851$). Table I shows that there is great variation within species: for instance in *I. graellsii*, some larvae climbed just 1 cm above water, but one exuvia was found at a height of 46 cm. A. CORDERO (1988, *Limnética* 4: 11-8) analysed the present data for *Lestes viridis* and showed that most exuviae were found at a height of 6-20 cm, but one was found at 132 cm. P.S. CORBET (1962, *A biology of dragonflies*, Withersby, London, p. 103), presents observations of exceptional individuals of several Odonata: the maximum distance travelled by a dragonfly larva for emergence is 45 m, and the maximum height 6 m. My data are modest in comparison with these records, but indicate that some species, specially libellulids, have a tendency to travel far from water, while others climb only on the emergent vegetation (Tab. I).

The present observations suggest that larvae select their emergence sites with care, probably testing several supports beforehand, as P.S. CORBET (1962, *loc. cit.*, p. 101) describes for *P. nymphula*. Possible explanations for the positive correlation between larva size and height of emergence site could be that larger species need to climb more to be far enough from water for wing expansion, to avoid predators or to find a suitable microclimate. Another explanation could be to avoid interspecific interference during emergence. Nevertheless this last explanation seems unlikely because it could produce intraspecific competition. P.S. CORBET (1962, *loc. cit.* p. 103) indicates that larvae of *Sympetrum striolatum* normally travel only 15-30 cm from water and climb 7-12 cm. J. d'ANGUILAR, J.-L. DOMMANGET & R. PRÉCHAC (1985, *Guide des libellules d'Europe et d'Afrique*, Delachaux & Niestlé, Neuchâtel-Paris, p. 175) indicate that *Lestes viridis* climbs 40-60 cm for emergence. Both values are very different from my observations. In the same way P.S. CORBET (1952, *J. Anim. Ecol.*

21: 206-222) found that most *P. nymphula* larvae climbed about 2 cm above the water surface, while F.C. FRASER (1944, *Ent. mon. Mag.* 80: 92) found exuviae in trees at 6-9 m from the pond and 2 m from the ground. S. BENNETT & P.J. MILL (1993, *loc. cit.*) indicate that when emergence densities were high, larvae of *P. nymphula* tended to climb more on trees (up to 3 m), but suggest that this could be more a search for warmer sites than a case of competition for emergence supports, because supports were plentiful. Probably part of the divergences between studies is due to the fact that the availability of supports of diverse heights is different between habitats. If the vertical stratification of larvae that I have found is a matter of avoidance of interspecific competition, then we can test this hypothesis comparing the range of heights for the same species at communities with different species diversity. A. CORDERO, Area de Ecología, Universidade de Vigo, E.U.E.T. Industrias Forestais, Avda. Buenos Aires s/n, ES-36002 Pontevedra, Galicia, Spain

ODONATA OF THE KÖYCEĞİZ-DALYAN NATURE RESERVE AREA IN SOUTHWESTERN TURKEY, WITH *LINDENIA TETRAPHYLLA* (VANDER L.), NEW TO THE TURKISH FAUNA (ANISOPTERA: GOMPHIDAE)

The köyceğiz-Dalyan region is an important wetland zone in SE Turkey. It is legally protected since 1988. From the hydrobiological point of view, the importance of this area is mainly due to the occurrence of a wide variety of aquatic habitats, supporting a number of valuable biotic communities.

The centre of the system is the ectogenic, krenogenic and meromictic Lake of Köyceğiz, with the Dalyan Channel System between the lake and the Mediterranean Sea. Also included are 3 mesohaline lakes, connected with the Köyceğiz Lake and with the Dalyan Channel, as well as several streams, discharging into the Lake, and the small Iztuzu Lake, situated close to the shore line and characterized by fluctuations in its salinity. For an account of the complex aquatic ecosystem, reference is made to e.g. N. KAZANCI et al. (1992, *Zool. Middle East* 6: 109-126), where the bibliography is also listed. The insect fauna of the region is still largely unexplored.