

## THE FIRST RECORDED ARRIVAL OF *ANAX JUNIUS* DRURY (ANISOPTERA: AESHNIDAE) IN EUROPE: A SCIENTIST'S PERSPECTIVE

Philip S. Corbet

I.C.A.P.B., University of Edinburgh, Scotland, U.K.<sup>1</sup>

<pscorbet@creanmill.u-net.com>

Received 16 March 2000; revised 10 June 2000; accepted 19 June 2000.

Key words: Odonata, dragonfly, migration, code of practice, collecting, voucher specimens.

### Abstract

In September and October 1998 adults of *Anax junius* (Common Green Darner) were encountered in small numbers at coastal sites in southwestern U.K. Circumstantial evidence supports the inference that they reached there on winds originating from New Brunswick and Quebec, Canada in early September, a time when this species regularly migrates southwards along the Atlantic Canada and New England coasts of northeastern North America. Although identification of the specimens to species as currently defined seems secure, attempts to retain a voucher specimen were frustrated, making it impossible to re-evaluate the identification in the light of future taxonomic knowledge. Two physiological subspecific entities of *Anax junius* are currently recognized in North America and it is not known to which entity the arriving individuals belonged. Capture of a voucher specimen for The Natural History Museum, London was prevented by vigilante action on a Cornwall Wildlife Trust nature reserve at Penlee, despite prior permission to collect having been granted by the Trust. The incident was followed by wide dissemination of e-mails from an individual endorsing the vigilante action mounted against the would-be collector. Recommendations are offered for safeguarding the interests of scientists who deem it necessary to obtain voucher specimens.

### Introduction

Tightly documented reports by Pellow (1999a, b) describe sightings of *Anax junius* Drury by several observers from 9 September through 1 October 1998 at six coastal sites in southwestern U.K. (Cornwall and the Isles of Scilly). Pellow listed the taxonomic characters used to make the determinations, and (1999a) provided photographs to illustrate them. On the basis of individual observers' accounts, the Odonata Records Committee in U.K. accepted seven of the sightings, which included both sexes (Parr 1999). No voucher specimen was retained. These sightings represent the first recorded instance of *A. junius* having been encountered in Europe. The species, widespread and common in North America, has been recorded previously from the Palearctic, but apparently only from China and Kamchatka (Belyshev 1966). It remains to be seen how exceptional it is for *A. junius* to cross the Atlantic Ocean from west to east.

<sup>1</sup> Present address: Crean Mill, Crean, St Buryan, Cornwall TR19 6HA, U.K.

Unlike the Monarch Butterfly, *Danaus plexippus plexippus* (Linnaeus), which not infrequently arrives in Britain (Penhallurick 1996; Smith 1997) and, as matters now stand, can be distinguished immediately at a distance from any other butterfly likely to be encountered in Europe, *A. junius* closely resembles *A. imperator* Leach, which is widespread in Europe, including southern U.K. (Askew 1988). So previous arrivals of *A. junius* could have been overlooked. The European sightings in 1998 may reflect the increased interest in Odonata shown in recent years by birdwatchers, and also a prescient article by Parr (1998), identifying *A. junius* as a likely visitor to U.K. Inspection of weather patterns in the north Atlantic shortly before the first sighting supports the inference that the dragonflies' passage was facilitated by a strong frontal system associated with ex-hurricane Earl (Low 'E'), traceable back to New Brunswick, Canada and at its most intense between 5 and 6 September (Davey 1999a, b; Elkins 1999).

I prepared this account in response to an invitation from the Editor-in-chief of the *International Journal of Odonatology*. My aims in doing so are: to make the record readily available to the international readership; to place the record in context of what is known and suspected about the biology of *A. junius*; to explain why no voucher specimen exists; to alert scientists and reserve managers to the obstruction and intimidation that can be meted out by self-appointed vigilante groups to biologists operating under authorisation in nature reserves; and to suggest ways in which such harassment might be avoided or discouraged.

### **Biology of *Anax junius***

Unless qualified otherwise, facts or hypotheses mentioned, in condensed form, in this section are taken from the verbal portrait of *A. junius* in my book (Corbet 1999:414-417; Fig. 10.10; Tables A.10.5-7).

The range of *A. junius*, though centred in the Tropics, includes North America from Alaska to Florida, Central America, the West Indies, the Hawaiian Islands, Tahiti, China and Kamchatka. The partly disjunct nature of this distribution has been attributed to the presence in summer of storm winds although, if this is correct, the absence of *A. junius* from Japan seems to constitute an anomaly. The species is clearly an habitual migrant and has been encountered in large numbers over the sea, far from the nearest land (see Donnelly 1998).

Larvae of *A. junius* are found mainly in meso- to eutrophic, vegetated, shallow lakes and ponds. Information about the species' phenology derives almost entirely from North America, where in southern Florida (26°N) emergence occurs in every month of the year, peaking in March. Resident populations (i.e. those in which larvae routinely overwinter) occur as far north as ca 47° and 44°N, in western and eastern North America respectively. However, each year in early spring (usually during warm weather in March or April) mature adults of both sexes, the females often bearing tandem marks on the compound eyes, arrive in the middle and northern United States and southern Canada,. They probably do not reach the Maritime Provinces of Canada until May (Brunelle 2000). Such adults promptly exhibit reproductive behaviour, often

ovipositing in tandem. Sometimes their arrival can be correlated with the advent of warm, strong, southerly winds. The source of these vagrants (beyond the fact that they come from the south) is unknown; nor is it known whether contemporaneous arrivals occur in the southern U.S., because the year-round presence of resident populations there makes it impossible to detect reliably the arrival of allochthonous individuals. Likewise it remains unclear whether adults continue to arrive in the middle and northern U.S. and southern Canada after June, when local resident populations have begun to emerge. A seminal study by Trottier (1971) in southern Ontario (at ca 44°N) revealed that one pond accommodated two, temporally separated populations: a resident one, completing larval development in about 11 months, emerging from late June to mid-July and apparently returning to reproduce there when mature; and a 'summer' population, larvae of which were progeny of adults arriving in early spring and that completed development in about three months, and adults of which emerged from late July through mid-September and did *not* return to their larval habitat when reproductively mature. Observations at another habitat (at ca 40°30'N) and circumstantial observations from many other localities in eastern North America are consistent with the assumption that many adults of the summer population migrate southwards, sometimes in large aggregations, using thermals to achieve height and then northeast tailwinds to travel south. To date there appear to be no observations that suggest or reveal the destinations of these south-flying migrants. A plausible hypothesis is that summer populations of *A. junius* in North America derive from the Tropics or low-temperate latitudes and have been blown, beyond their normal range, by strong winds as soon as temperatures in spring are high enough to enable them to survive at their northerly destinations. (Perhaps adults from the same sources are blown northwards during earlier, colder weather but do not survive to appear at northerly destinations.) As an occupant of shallow pools in the Tropics, *A. junius* could be expected not to return after maturation to the habitat from which adults emerged but, as an obligate migrant, to use travelling fronts within the Inter-Tropical Convergent Zone and thus be delivered to places where rain was about to fall.

As would follow from this expectation, adults of the two kinds of population studied by Trottier in southern Ontario behaved differently after emergence, those of the first apparently returning to, and those of the second leaving, their larval habitat. Also larvae differed in their day-degree requirements for completion of development, another difference consistent with their having either temperate or tropical facies respectively. A compelling inference is that these two kinds of population constitute subspecific entities, a question that might be possible to answer using DNA analysis (Hadrys et al. 1992) or perhaps cellulose acetate gel electrophoresis (Zloty et al. 1993). To date I know of no attempt to detect physical differences between representatives of these two kinds of *A. junius*, although such differences may well exist.

### **The sightings of *A. junius* in southwestern Britain**

Sightings of adult *A. junius* in Britain in 1998 that were subsequently formally accepted by the Odonata Records Committee (Parr 1999) comprised three from Cornwall

(2 males, 1 female; from two coastal sites, one near the western limit just north of Land's End, and one at the southeastern corner of the County) and three from the Isles of Scilly (1 male, 3 females; from three islands). Given that no specimen could be recognized as an individual, and that no specimen was captured and retained, it cannot be stated with confidence how many adults contributed to these sightings, though on two counts it is reasonable to assume that several individuals were present. First, some sites where *A. junius* was seen were widely separated from one another; and second, observations made in Indiana, U.S.A. by Wissinger (1990) are consistent with the assumption that an individual arrested during migration can remain at one site for at least several days, perhaps when it fails to encounter winds conducive to continuing its journey. At the observation site in Indiana, a cohort of marked adults remained active, though immature, in a south-facing 'oldfield' (i.e. a formerly cultivated meadow) from September, the time when the southward migration of *A. junius* is most evident, to early December.

My encounter with an adult *A. junius* in U.K. was brief but memorable. Having learnt that an adult had been sighted at Penlee (50°19'N, 4°13'W) in east Cornwall, on a Nature Reserve managed by the Cornwall Wildlife Trust, and assuming (correctly) that no voucher specimen for deposition at The Natural History Museum, London had been secured, I obtained authorisation from the Chairman of the Trust Council to collect a specimen from the Reserve, and I then visited the Reserve for that purpose with a companion on 13 September 1998.

I arrived at the Reserve at ca 1230 h B.S.T. (Solar Noon being at ca 1312 h B.S.T.) to be told by an observer that *A. junius* had been seen there on 12 September "all day" and once, about an hour ago, on 13 September. The weather on 13 September was warm, a light breeze and overcast spells interrupting prolonged sunny periods. At about 1325 h, a male *A. junius* appeared near two rainwater pools (shallow depressions containing muddy water but no aquatic plants) in an open area. It was flying to and fro, apparently foraging, about 4-5 m above the ground. It showed no sign of localizing over either pool. Its flight style reminded me of *A. junius* I had watched foraging during the southerly migration in southern Ontario, Canada (Corbet 1984). I captured the dragonfly and was able to inspect it closely with a 9 x magnifying glass. The insect was a male, undamaged, post-teneral and with a violet-blue abdomen, and the wings showed no sign of darkening or wear at the apices or posterior margins. In due course I was able to compare certain diagnostic features with illustrations in books I had brought with me. The shape of the superior anal appendages, from dorsal and lateral aspects, conformed with figures in Walker (1958: Plate 19, Figs 10, 11), as did the pattern on the postfrons and vertex (Plate 14, Fig. 10). The pattern of black and violet-blue on the dorsal surface of the abdomen matched the colour photograph in Dunkle (1989: 21). After having become familiar with *A. junius* in North America, I found it a stirring experience to encounter the species again in Europe.

Notwithstanding my original intention, and for reasons given in the next section, I did not retain the male as a voucher specimen. According to Parr (1999) sightings of *A. junius* at the Penlee Reserve accepted by the Odonata Records Committee in 1998 comprised a male from 9 through 17 September and a female on 16 September. As mentioned above, it is not known whether the male sightings included more than one individual.

### The lack of a voucher specimen

On arrival at the Reserve, equipped with a long-handled net, I was told discreetly that collecting a specimen would prove unpopular with other visitors. This proved to be correct. When the male *A. junius* appeared, I readied my net and tried to place myself to attempt a capture. About a dozen people promptly gathered around me. As soon as it became evident that I intended to capture the dragonfly, I began to receive verbal abuse and threats of physical obstruction and of forcible confiscation of my net, from several persons present. These self-appointed spokesmen remained some metres away from me and spoke in a manner apparently intended to inflame the group. No one generating the abuse spoke to me directly or asked me why I needed to capture the specimen, although at the outset I had told someone standing close to me (a Trust member who did not join in the abuse) that I had been authorised by the Cornwall Wildlife Trust, the custodian of the Reserve, to obtain a voucher specimen for The Natural History Museum, London. The verbal abuse became more insulting and offensive, and included mention that the President of the British Dragonfly Society would be asked to effect my expulsion from the Society on the grounds that my actions contravened the Society's Code of Practice (which was not so). At no time was the possibility addressed that I might have a legitimate, scientific objective or that I might be complying with the Cornwall Wildlife Trust regulations applying to collecting on the Reserve, or with the British Dragonfly Society's Code of Practice on collecting dragonflies (BDS 1998). That is to say, no dialogue was invited or permitted. I chose not to respond to the abuse but focused on capturing the dragonfly and, with a fortunate overhead swing at full stretch, I netted it about 3 m above my head. The abuse then intensified. By then, having assessed probable costs and benefits, I had decided not to retain the specimen, and announced this decision, whereupon I held the dragonfly for photographers for about 20 min, before realising that it might be in danger of overheating in the sun. I then declared that, before releasing it, I needed to take it to my car (about 400 m away) to consult books that would enable me to confirm the specific identification. On hearing this, the self-appointed spokesmen became yet more abusive and accused me of deceit, alleging that this was a ruse on my part to retain the specimen "for my personal collection". At this point I was fortunate to have a companion present who went to collect the reference books. I then completed the identification, telling those who were interested what diagnostic characters I was using, and allowing them to examine the characters, before I released the dragonfly in a place that was shaded, yet conveniently located for anyone who still wished to take photographs. Before I left the Reserve, two people, both members of the Cornwall Wildlife Trust, spoke to me courteously and sympathetically.

Thus it happened that no voucher specimen was secured to make possible the subsequent re-evaluation of this unprecedented record. To many entomologists and odonatologists (e.g. Peters 2000) this will remain a source of deep regret. If morphological characters for distinguishing subtaxa of *A. junius* are ever recognised (and the existence of two distinct physiological populations in North America makes this a virtual certainty) it will be impossible to say which subtaxon was represented among these transoceanic arrivals. Likewise, if a new species similar to *A. junius* is recognised in future, the determinations made on the basis of photographs alone may

be insufficient to allow confident diagnosis of the adults arriving in southwestern U.K. in 1998. The discipline of odonatology, like that of biology in general, does not lack examples of species identifications that have subsequently had to be changed after re-examination of a voucher specimen.

### The sequel

One sequel to the obstruction I encountered at the Penlee Reserve on 13 September was that defamatory messages about me were launched on 15 and 23 September 1998, using e-mail through a U.K. wildlife mailing list. These messages, insulting to me and potentially intimidating in tone, described my personal appearance and the colour of my car, impugned my honesty and stated intentions, and incited any recipient who saw someone carrying a net to give that person the same “rough” treatment I had received at the Penlee Reserve. These two messages were sent to no fewer than 30 recipients (though not to me), the author of the messages being Steven P. Dudley (D). In one of the messages D declared that, “as the Administrator of a ‘scientific’ bird related organisation” (actually the British Ornithologists’ Union) he would not hesitate to ask his Council to terminate a member’s subscription under such circumstances. For an employee of the British Ornithologists’ Union to adopt such a position was curious indeed because the Union, in its mission statement (BOU 2000), explicitly states its support for scientific research, as indeed do the Dragonfly Society of the Americas (DSA 1996) and the British Dragonfly Society (BDS 1998) in their codes of practice. These messages from D elicited stern rebukes, addressed to him, from the President of the British Dragonfly Society, on behalf of the Board of Trustees, and from the Director of the Slater Museum of Natural History, University of Puget Sound, Tacoma, Washington, U.S.A. Another letter, sent through the e-mail list used by D and addressed to him and the other addressees, recommended moderation and dialogue, and asked whether anyone at Penlee had tried to discover why a voucher specimen was needed (they had not). The contents of D’s messages soon became known outside U.K. At no time (up to June 2000) has the originator of the messages expressed regret to me or to the Cornwall Wildlife Trust for his behaviour. Accordingly a situation of great potential danger to persons needing to retain voucher specimens remains unresolved. I should be shirking a responsibility to such persons in U.K. were I to leave the Penlee incident unaddressed, especially as experience of human behaviour repeatedly confirms that very few people overtly challenge illegal action unless it directly threatens their own immediate interests. Such inertia makes it easier for dangerous behaviour to pass unchallenged and unchecked.

The Penlee incident and its sequel pose a serious threat to the very large number of people and organisations charged with providing a secure database of the fauna (especially the invertebrate fauna) of U.K., and thereby underpinning the National Biodiversity Network – a cornerstone of nature conservation in Britain. Such people include taxonomists and others whose functioning relies on the freedom to collect voucher specimens when scientific judgement shows this to be necessary. Entomologists, for example, seldom enjoy the luxury of being able to make a *reliable*

identification by sight or photograph alone (see Greenwood 2000) and, for the overwhelming majority of insects, voucher specimens (not just one but often several, see Falk, 1991) constitute a prerequisite for secure identification, both at the time, and in the light of future developments in taxonomic knowledge. Should examples be needed to illustrate this statement, two will suffice: first, the 1901 record of an adult *Sympetrum* from Dawlish, Devon, U.K., originally identified as *S. meridionale* (Sély-Longchamps), was recently found to be *S. striolatum* (Charpentier) (Merritt et al. 1996); and second, uncertainty persists regarding historical (voucherless) records of *Aeshna constricta* Say and *A. umbrosa* Walker (described in 1908), the supposed ranges of which overlap in New England and Atlantic Canada (Brunelle 2000).

The discovery in 1999 of populations of *Erythromma viridulum* (Charpentier) in Essex, U.K. (Dewick and Gerussi 2000) provides a case in point. During the past few decades this species has been extending its range over large parts of continental northwestern Europe, leading Wasscher (1999) to alert observers to its possible arrival in U.K. Those who reported its occurrence in Essex withheld information about the location of the populations and, although taking photographs, did not retain a voucher specimen, thus denying material to scientists who might wish to re-evaluate the record then or later. A constructive approach, which could be adopted routinely in future, would have been to inform The Natural History Museum, London (in confidence if necessary) so that an appropriate expert could have decided, on scientific grounds, whether voucher specimens were needed and taken steps to obtain them. In that way, new and potentially valuable information would have been available to others without the immigrant populations being exposed to risk. (An expert could make an informed estimate of the number of specimens that could be removed without damaging the population.) The presence of voucher specimens from these newly established populations would, inter alia, open the possibility of inferring the source location in continental Europe, and of monitoring subsequent genetic divergence in the U.K. populations in years to come. Such an approach would make effective use of the spectrum of odonatological expertise in U.K. (see Peters 2000) as well as enabling observers to feed information to scientists, whose specialised work continues to make possible informed enjoyment and study of dragonflies. Such an arrangement, which could be appropriately administered by the British Dragonfly Society, would help to resuscitate the long and fruitful tradition in U.K. (at present under threat) whereby observers, both amateur and professional, contribute to the corpus of scientific knowledge.

Although there is no effective substitute for a voucher specimen of the whole animal, an option available to entomologists unable or unwilling to kill and retain a specimen, and appropriate for some types of investigation, is to detach an insect's leg, which can then be preserved for DNA analysis (Hadrys et al. 1992; Fukatsu 1999; Logan 1999). Consultation with an expert would reveal the feasibility of pursuing this option, which has already been used to trace the genetic history of individuals in the field (Fincke and Hadrys 1999). With exercise of simple precautions, an adult dragonfly can be retained in captivity for several days pending eventual release, thus providing the time needed for expert advice to be obtained.

## A way forward

Two kinds of action would seem to be required to prevent – or render less likely – recurrence of a confrontation (and its sequel) such as I have described. First, and primarily, to generate a broad, nonadversarial dialogue involving influential and respected representatives of, on the one hand, scientists and Trust managers and, on the other, those who (for whatever reasons) object to voucher specimens being collected; and second, to discipline self-appointed vigilantes – by whatever means are practicable, appropriate, effective and legal. (A perception I have encountered among some biologists is that observers who obstruct or criticise collection of study material are ‘parasites of science’ in that they benefit from – indeed rely on – specific knowledge obtained by scientists while preventing the latter from advancing such knowledge.) In the next paragraph I briefly address the first of these options, suggesting a framework within which contentious issues might be discussed and a *modus operandi* agreed at a national level. It will be for individual targets of abuse and for individual Trusts, landowners or societies to decide how to impose discipline or to proceed with the legal option, which may in some cases be necessary. The defamatory e-mails sent after the incident at the Penlee Reserve, for example, were sufficiently widely disseminated, and were sufficiently damaging to me, and thus potentially to other biological recorders, that the matter was placed in the hands of a solicitor.

The Penlee incident, though extreme, is not an isolated one. Many scientists now view with apprehension the growing number of observers, who neither need nor wish to collect a specimen, who have extended their interest from vertebrates to insects (almost exclusively insects that are large and conspicuous, such as butterflies and dragonflies) and who deem it appropriate to impose their views on others. It has now come about that those who need to collect living material for scientific study can face intimidation, abuse and obstruction when pursuing legitimate objectives. A grotesque situation has come to pass whereby, regardless of the needs of specialists or the wishes of landowners and managers, vigilantes can dictate to specialist recorders which insects can and cannot be collected as voucher specimens. As the Penlee incident shows, harassment may entail direct intervention at a field site, and/or the dissemination of defamatory messages. As Greenwood (2000) has observed, “If birdwatchers make a habit of behaving in this ill-informed and arrogant way, it will undermine the credibility of the scientific work they do.” During the Penlee incident there were conflicts of four kinds: first, the short-term interests of observers who wished to see for themselves a living example of an exotic insect in Britain vs the long-term interests of scientists; second, those who wished to supplant a code of practice adopted for one animal group with a code of practice adopted for another vs those who respect codes of practice generated by different specialist bodies; third, those who, as casual visitors to a nature reserve, wished to prevent an activity on that reserve expressly authorised by the reserve’s owner vs those who refrain from unlawful intervention; and fourth, those who favour violence and intimidation vs those who prefer meaningful dialogue. Because these conflicts are not susceptible to resolution by simple compromise, especially in a highly charged situation devoid of law-enforcement officers, a way forward that serves the interests of scientists, wildlife trusts and other landowners will depend on a policy

being agreed among appropriate special-interest bodies, and if necessary imposed by them. Such bodies will include those that, in order to safeguard the integrity of their members' scientific work, sometimes need to authorise or endorse collection of voucher specimens. Prompted by the intemperate conduct associated with the Penlee incident, discussions with appropriate bodies have been initiated, in the hope that the legitimate interests of scientists, recorders and landowners can be safeguarded by achieving consensus within a rational framework.

## Acknowledgements

I thank the following: Professor Henri Dumont, Editor-in-chief, *International Journal of Odonatology*, for inviting me to write this article; Jean Lawman and Keith Pellow for information about the sightings; Dr K. George for equating solar time to B.S.T.; and the following for having reviewed a draft of this paper: Steve Brooks, Department of Entomology, The Natural History Museum, London; Paul-Michael Brunelle, Honorary Research Associate and Honorary Research Assistant respectively, New Brunswick and Nova Scotia Museums, Canada; Andy McGeeney, Past President, British Dragonfly Society; Ruary Mackenzie Dodds, Chair, National Dragonfly Museum, Ashton; Dr Brian Eversham, Conservation Director, Wildlife Trust for Bedfordshire, Cambridgeshire, Northamptonshire and Peterborough and Chairman, Wildlife Trusts National Invertebrate Specialist Group; Dr Jeremy Greenwood, Director, British Trust for Ornithology; Stephen Jones, County Recorder for Odonata, Cornwall; Professor Ian Newton, OBE, FRS, President, British Ornithologists' Union; Dr Michael Parr, President, Worldwide Dragonfly Association; Dr D.R. Paulson, Director, Slater Museum of Natural History, Tacoma, Washington, U.S.A; Sir Richard Southwood, FRS, Professor Emeritus of Zoology, University of Oxford; and Dick Vane-Wright, Keeper of Entomology, The Natural History Museum, London. All these reviewers endorse in principle the analyses and recommendations contained in the section of this article entitled "A way forward." Unless stated, all are associated with institutions in U.K. The manuscript has been much improved by their criticisms and suggestions.

## References

- Askew, R.R., 1988. *The dragonflies of Europe*. Harley Books, Colchester.
- BDS, 1998. *Members' code of practice on collecting dragonflies*. British Dragonfly Society, Bordon, Hants, U.K. (Revised edition 2000.)
- Belyshev, B.F., 1966. [On the history of the origin of the Chinese and Kamchatka disjunctive ranges of the *Anax junius* Drury (Odonata, Insecta).] *Zoologicheskii Zhurnal* 45: 1159-1163. [In Russian, English summary.]
- BOU, 2000. British Ornithologists' Union. Web site: [www.bou.org.uk](http://www.bou.org.uk)
- Brunelle, P.-M., 2000. In litt. 30 April.
- Corbet, P.S., 1984. Orientation and reproductive condition of migrating dragonflies (Anisoptera). *Odonatologica* 13: 81-88.
- Corbet, P.S., 1999. *Dragonflies: behavior and ecology of dragonflies*. Cornell University Press, Ithaca and

Harley Books, Colchester.

- Davey, P., 1999a. Weather conditions leading to the 1998 Green Darner *Anax junius* (Drury) influx. *Atropos* 6: 8-12.
- Davey, P., 1999b. Transatlantic vagrancy. *Atropos* 7: 58.
- Dewick, S. & R. Gerussi, 2000. Small Red-eyed Damselfly *Erythromma viridulum* (Charpentier) found breeding in Essex – the first British records. *Atropos* 9: 3-4.
- Donnelly, N., 1998. More about *Anax junius* crossing the ocean. *Argia* 10(4): 6-7.
- DSA, 1996. The Dragonfly Society of the Americas. Statement of Committee on Collecting Policy. *Argia* 8(2): 36-37.
- Dunkle, S.W., 1989. Dragonflies of the Florida peninsula, Bermuda and the Bahamas. Scientific Publishers, Gainesville.
- Elkins, N., 1999. Transatlantic vagrancy. *Atropos* 7: 58.
- Falk, S., 1991. Learn from the dipterists. *Bees, Wasps and Ants Recording Society Newsletter*, Autumn: 8.
- Fincke, O.M. & H. Hadrys, 1999. Realized fitness and its consequences for parental strategies in a giant damselfly *Megaloprepus coerulatus*. International Congress of Odonatology, Hamilton, New York: 6.
- Fukatsu, T., 1999. Acetone preservation: a practical technique for molecular analysis. *Molecular Biology* 8: 1935-1945.
- Greenwood, J.J.D., 2000. Through the Director's binoculars. *British Trust for Ornithology News* 229 (July/August): 3.
- Hadrys, H., M. Bakick & M. Schierwater, 1992. Applications of random amplified polymorphic DNA (RAPD) in molecular ecology. *Molecular Ecology* 1: 55-63.
- Logan, J.A., 1999. Extraction, polymerase chain reaction, and sequencing of a 440 base pair region of the mitochondrial cytochrome oxidase I gene from two species of acetone-preserved damselflies (Odonata: Coenagrionidae, Agrionidae). *Environmental Entomology* 28: 143-147.
- Merritt, R., N.W. Moore & B.C. Eversham, 1996. Atlas of the dragonflies of Britain and Ireland. Her Majesty's Stationery Office, London.
- Parr, A., 1998. Potential new dragonflies for the British list: 1. The possible occurrence of Nearctic species in western Europe. *Atropos* 4: 18-21.
- Parr, A., 1999. Odonata Records Committee news. *Atropos* 7: 51.
- Pellow, K. 1999a. An influx of Green Darner *Anax junius* (Drury) into Cornwall and the Isles of Scilly – the first European records. *Atropos* 6: 3-7.
- Pellow, K. 1999b. Common Green Darner *Anax junius* (Drury) in Cornwall and Isles of Scilly – the first British and European records. *Journal of the British Dragonfly Society* 15: 21-22.
- Penhallurick, R.D., 1996. The butterflies of Cornwall and the Isles of Scilly. Dyllansow Pengwella, Truro.
- Peters, G. 2000. Unbekannte Bekannte: die *Anax*-species in Europa (Odonata: Aeshnidae). *Libellula* 19: 55-66.
- Smith, F.H.N., 1997. The moths and butterflies of Cornwall and the Isles of Scilly. Gem Publishing, Wallingford, Oxon.
- Trottier, R., 1971. Effect of temperature on the life-cycle of *Anax junius* (Odonata: Aeshnidae) in Canada. *Canadian Entomologist* 103: 1671-1683.
- Walker, E.M., 1958. The Odonata of Canada and Alaska. Volume 2. University of Toronto Press, Ontario.
- Wasscher, M., 1999. Identification of Small Red-eyed Damselfly, *Erythromma viridulum* (Charp.). *Atropos* 7: 7-9.
- Wissinger, S.A., 1990. In litt. 22 August.
- Zloty, J., G. Pritchard & R. Krishnaraj, 1993. Larval insect identification by cellulose acetate gel electrophoresis and its application to life history evaluation and cohort analysis. *Journal of the North American Benthological Society* 12: 270-278.