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Michael L. May & Frank L. Carle p. 1 - 35

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AN ANNOTATED LIST OF THE ODONATA OF NEW JERSEY

With an Appendix on Nomenclature in the Genus *Gomphus*

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INTRODUCTION

New Jersey is the fourth smallest of the contiguous United States and, with over 1000 people per square mile, the most densely populated. Its natural habitats are thus all more or less strongly affected by human activity. Nevertheless, it also has one of the most diverse odonate faunas of any region of comparable size in North America. To date we have recorded 172 species within its boundaries.

Perhaps the most obvious reason for this diversity is the state's varied topography. Although it lacks high mountains (the greatest elevation is 550 m), it encompasses five physiographic provinces (Fig. 1): The Ridge and Valley province in the northwest corner is dominated by the Kittatinny Ridge along the western boundary, with the broad Kittatinny Valley to the east; both are underlain by various Paleozoic sedimentary deposits. Just to the southeast are the Highlands, a southern extension of the New England Highlands province, with several parallel ridges separated by narrow valleys, all on bedrock of Precambrian gneisses, granites and metamorphic rocks. Both these provinces were almost entirely glaciated at various times during the Pleistocene and are characterized by numerous bogs and bog ponds. The Highlands Province, in particular, contains several large lakes in glacially scoured basins. Running from the southwest to the northeast, the Ramapo Fault divides the Highlands from the Piedmont. The latter is lower and of considerably gentler relief, but with a flora and fauna that is more similar to the preceding areas than to the Coastal Plain. The New Jersey Piedmont is underlain primarily by Triassic shale and sandstone, with extensive basaltic intrusions, such as the Palisades of the Hudson and the Watchung, Round Valley, and Sourland Mountains of the mid- and upper Piedmont. The advance of the last continental

ice sheet halted at the Watchungs, which, upon glacial retreat, formed the dam for Great Lake Passaic. The remnants of this lake are extensive marshlands, including the Great Swamp, Dead River lowlands, and Troy Meadows.

The southern 60% of the state comprises the unglaciated Inner and Outer Coastal Plains, on unconsolidated mixed Cretaceous and sandy Tertiary sediments, respectively. These are, of course, regions of relative low relief and elevation, with mostly sand, pebble, or clay-bottomed streams and few natural lakes; there are, however, many man-made ponds, reservoirs, and cranberry bogs. The Outer Coastal Plain encompasses the Pine Barrens, an area of extremely coarse, sandy, acid soil with Atlantic white cedar swamps and bogs along the numerous watercourses. Further details of the geology and vegetation of the state are found in Tedrow (1962) and Robichaud and Buell (1973).

Four principal drainages occur in the state. The largest is the Delaware, comprising a strip 10-30 miles wide running along the entire western border from Sussex to Cumberland County. Among its larger New Jersey tributaries from north to south are Big Flat Brook, Paulins Kill, the Pequest and Musconetcong Rivers, and Rancocas Creek; the Cohansey and Maurice River systems flow directly into Delaware Bay. The Hackensack and Passaic Rivers are tributaries of the Hudson that drain Bergen, Passaic, Essex, and northern and eastern Morris Counties while the Wallkill runs north to the Hudson from eastern Sussex County; the Passaic crosses the Watchungs in a 70 foot plunge at Great Falls. The Raritan drainage includes Middlesex, Somerset, northern Mercer, eastern Hunterdon, and southwestern Morris Counties. During the glacial maximum it flowed along the Arthur Kill to join the Passaic just before reaching the Hudson near the present site of the Statue of Liberty. Finally, a number of streams

flow independently into the Atlantic from the Outer Coastal Plain, and include the Navesink, Toms, Mullica, and Great Egg Harbor Rivers.

DISTRIBUTION OF ODONATA

Largely as a result of its physiography and coastal location, New Jersey is something of a biogeographic crossroads. Many boreal and Appalachian species find suitable habitats in the northwestern uplands. Among these are *Calopteryx amata*, *Enallagma boreale*, *Enallagma ebrium*, *Gomphus adelphus*, *Gomphus borealis*, *Gomphus spicatus*, *Lanthus vernalis*, *Ophiogomphus carolus*, *O. mainensis*, *Aeshna canadensis*, *A. tuberculifera*, *A. verticalis*, *Boyeria grafiana*, *Taeniogaster obliqua*, *Kalyptogaster erronea*, *Cordulia shurtleffi*, *Dorocordulia libera*, *Somatochlora elongata*, *S. walshi*, *S. williamsoni*, *Epitheca canis*, *Ladona julia*, *Leucorrhinia glacialis*, *L. hudsonica*, *L. proxima*, and *Libellula quadrimaculata*. Some of these species are apparently very local within the state, however. *Sympetrum corruptum* and *S. costiferum* may occasionally invade from the north and west, although established populations are apparently absent.

On the other hand, a number of southern species extend up the coast and are at or near the northern limit of their range here. Prominent among these are some characteristic Pine Barrens species, including *Calopteryx dimidiata*, *Argia bipunctulata*, *Enallagma doubledayi*, *E. weewa*, *Nehalennia integricollis*, *Gomphus (Gomphus) apomyius*, *Stylurus plagiatus*, *Progomphus obscurus*, *Gomphaeschna antilope*, *Macromia alleghaniensis*, *Somatochlora filosa*, *S. georgiana* (one record), *S. provocans*, *Epitheca costalis*, *E. semiaquea?*, *E. spinosa*, *Celithemis verna*, *Ladona deplanata*, *Libellula auripennis*, and *Libellula flavida*. Some other primarily southern species, such as *Sympetrum ambiguum*, are not mainly associated with the Pine Barrens, including several nearly restricted to coastal biotopes, notably *Ischnura ramburii*, *Enallagma durum*, *Erythrodiplax berenice*, and *Libellula needhami*.

A particularly interesting group of species apparently is confined to the northeastern coastal states and provinces, roughly from

Maryland to the Maritimes. They are principally distributed along the coastal plain or along either side of the glacial maximum, although several also extend their range into lower elevations of the Appalachians. Several have very close relatives endemic to the southeastern Coastal Plain. The origin of these species poses interesting biogeographic questions. Carle (1982) suggested that they may have arisen from populations originally isolated in glacial refugia near the present Grand Banks. They include *Enallagma laterale*, *E. pictum*, *E. recurvatum*, *Arigomphus furcifer*, *Gomphus (Gomphurus) sp.* *Aeshna clepsydra*, *Dorocordulia lepida*, *Williamsonia lintneri*, *Ladona exusta*, and *Celithemis martha*.

The lists above are not exhaustive, but most other New Jersey species are widespread within eastern North America. No named taxa are endemic to the state, although, as discussed below, it is possible that the species listed here as *Epitheca semiaquea* is distinct; if so, it may be restricted to the Pine Barrens but more likely is the same as the dark-winged *Epitheca* occurring northward along the coast to Maine and possibly Nova Scotia (Carle, 1982; May, 1995).

Finally, a pair of recently-recorded tropical wanderers is worthy of note. In the summer of 1992, both *Tramea calverti* and *T. onusta* were first recorded during what turned out to be a minor invasion of the northeast coast by these species, both of which normally occur only far to the south and southwest. Although both are extreme vagrants here, some evidence of successful reproduction by *T. calverti* was recorded, as detailed below. Certainly these records testify to the remarkable powers of dispersal of many Odonata.

It will be obvious from the county lists below that collecting effort has been far from uniform. Camden, Gloucester and Salem Counties have not been carefully explored since P. P. Calvert's day, nor have Atlantic, Monmouth, and the counties bordering the Hudson (except Bergen) at any time. While the last group is likely to be rather depauperate due to urbanization, the apparent absence of many species from the first five of these counties is surely a reflection of the absence of observers.



Fig. 1: Map of New Jersey, showing counties. Approximate boundaries of physiographic provinces (dashed lines) are superimposed, with the provinces labeled as follows: RV - Ridge and Valley, HI - Highlands, PD - Piedmont, IC - Inner Coastal Plain, OC - Outer Coastal Plain. The approximate extent of the Pine Barrens is shown by light stippling.

HISTORY

Scattered records of New Jersey Odonata are found in the 19th Century literature (e.g., Hagen, 1861, 1875, listed about 30 species from the state, including the apparently spurious occurrence of *Aeshna grandis*), but the first systematic compilation of records is that of Calvert (1900). Over the next 15 to 20 years Calvert, along with several knowledgeable amateur colleagues (notably V. A. Daecke and P. Laurent), continued to work actively in New Jersey, particularly in the Pine Barrens, Cape May, and the lower Delaware Valley. During this period he described *Enallagma daeckii* (as *Telagrion daeckii*; Calvert, 1903), *Enallagma vesperum* (Calvert, 1919; paratypes), *Nehalennia integricollis* (Calvert, 1913) and *Somatochlora provocans* (Calvert, 1903) from the state. Also, in 1910 an updated state list based primarily on Calvert's notes was published by J. B. Smith; this is the last comprehensive record of New Jersey's fauna.

W. T. Davis also made important additions to knowledge of New Jersey Odonata in the early years of the century, most notably with his compilation of species from the New York City vicinity (Davis, 1913a), which includes the description of *Enallagma recurvatum*, based in part on New Jersey material. Davis contributed a number of other significant records, particularly of *Williamsonia* (Davis, 1913b) and *Epitheca* (*Tetragoneuria*) (Davis, 1933). Subsequent to his work, however, dragonflies in the state received very little attention until quite recently. The only significant faunistic works to focus specifically on New Jersey between 1910 and 1980 were those of Montgomery (1933), Gillespie (1941) and Beatty (1945, 1946), which collectively added only four species to the state list, although they made major additions to knowledge of distribution and abundance in south Jersey. Extensive collections were made by T. W. Donnelly in the late 1950's, including an early collection of the then undescribed *Gomphus apomyius* (Which had been found earlier by George Beatty), and by F. L. Carle and H. B. White in the 1970's, but since 1946 virtually no published information appeared until the recent listing of rare and endangered species (Carle 1989), and the excellent lists for Cape May Co. (Soltesz 1991) and Cumberland Co. (Barber 1994). Our purpose here, then, is to

bring up to date our understanding of the occurrence and distribution of the dragonflies of a long neglected and surprisingly rich region.

SOURCES AND STRUCTURE OF THE LIST; NOMENCLATURE OF THE LIST

The starting point for this list is the 1910 compilation of Smith, cited above. With a few exceptions noted below, and with due allowance for nomenclatorial changes, we have confirmed the presence of nearly every species in the latter. When no other source is cited for a species below, the first state record can be traced at least back to Smith, although many of the county records may be new.

Our other literature sources are primarily those already noted, with a few additional ones cited in the accounts of species to which they pertain. State records based initially on literature sources other than Smith (1910) are listed parenthetically after the county or counties recorded there. Because of the likelihood of confusion among species, we have not included any literature records, except for the very recent lists of Barber (1994) and Soltesz (1991), for *Epitheca* (*Tetragoneuria*) *cynosura* or *E. semiaquea*, *Ladona* spp., *Lestes disjunctus* or *L. forcipatus*, *Libellula auripennis*, and *Sympetrum janae*, *S. obtrusum*, or *S. rubicundulum* (the last 3 also recorded by Carle, 1993).

We have also exhaustively searched the following collections, cited below using the acronyms given here: Academy of Natural Science, Philadelphia (ANSP); American Museum of Natural History (AMNH); Florida State Collection of Arthropods (FSCA); National Museum of Natural History, Smithsonian Institution (NMNH; records supplied by N. Adams, not all checked by us); Rutgers University (RU); and the private collections of R. Barber (RB; some records supplied by Barber, not checked), A. Barlow (AB), F. Carle (FLC), W. Cromartie (WJC), T. Donnelly (TWD; records supplied by Donnelly, not checked); M. May (MLM); J. Michalski (JCM), and H. White (HBW; records supplied by White, not checked). Our own sight records and those of Donnelly and White have been

included for species for which field identification errors are unlikely.

We most often list only county records in the species accounts but have included more complete data for all new state records or species for which no detailed data were previously recorded, as well as others that appear to be of unusual interest. When only county records are given, those from localities at a county line are credited to both counties (e.g., the mouth of Flat Brook between Sussex and Warren Counties, Stow Creek between Cumberland and Salem Counties, and the Tuckahoe River between Atlantic and Cape May Counties). Because New Jersey is a small state we list counties alphabetically rather than by region; readers should refer to Fig. 1 for county locations.

Various aspects of odonate nomenclature, and the phylogenetic relationships implied, are matters of some controversy, and in such cases we have followed our best judgment based on current evidence and practice. Our treatment of Cordulegastridae follows Carle (1983) and Lohman (1992). We follow Carle (1986) for subgenera in the large and complex genera *Gomphus*, *Progomphus*, and *Ophiogomphus* and Carle (1993) for *Sympetrum*. We also follow Walker and Corbet (1975) in placing species of *Tetragoneuria* and *Epicordulia* in *Epitheca* (FLC has reservations about doing so) but retain the former names as subgenera. We have treated Corduliinae and Macromiinae as subfamilies of Libellulidae, as in Needham and Westfall (1955), although they have been accorded family status in most recent North American literature. Ample evidence indicates that the *Macromia* group of genera should be accorded subordinate rank within the "Corduliidae" as currently conceived (e.g., Davies and Tobin, 1985) but that, even with the *Macromia* group included, the latter are paraphyletic (Carle, 1995; Carle and Louton, 1994; May, unpublished data). Retaining subfamily status can be justified, however, because these groups are monophyletic within the North American fauna and are also familiar to workers accustomed to traditional arrangements.

THE NEW JERSEY SPECIES

(New state records are indicated by an asterisk. Counties for which no certain records exist after 1960 are underlined.)

ZYGOPTERA

- CALOPTERYGIDAE

[1] *Calopteryx aequabilis* Say

MORRIS, PASSAIC (Davis, 1913a),
SOMERSET, SUSSEX, WARREN.

Dates: 6 May - 19 July

[2] *Calopteryx amata* Hagen

SUSSEX (Big Flat Brook at Crigger Road and Skellinger Road, 27 May 1985, FLC; just below the crossing of U.S. Hwy. 206, 19 June 1985, MLM); subsequently from several sites on Big Flat Brook within and just south of Stokes State Forest. Reported without complete data by Carle (1989).

Dates: 17 May - 4 July.

[3] *Calopteryx dimidiata* Burmeister (= *C. apicalis*, Smith, 1910)

ATLANTIC, BURLINGTON, CAPE MAY,
CUMBERLAND, GLOUCESTER, MERCER,
MIDDLESEX, OCEAN, SALEM.

Virtually confined to the Pine Barrens.

Dates: 24 May - 10 Sept.

[4] *Calopteryx maculata* (Beauvois)

ATLANTIC, Bergen, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
ESSEX?, GLOUCESTER, HUNTERDON,
MERCER, MIDDLESEX, MONMOUTH,
MORRIS, OCEAN, PASSAIC, SALEM,
SOMERSET, SUSSEX, WARREN.

Nearly ubiquitous on even moderately clean streams, probably present throughout the state. The Essex county record is based Calvert's (1900) record from the "Orange Mts.", an imprecise locality that could refer to Morris Co.

Dates: 23 Apr. - 14 Sept.

[5] *Hetaerina americana* (Fabricius)

ATLANTIC, CAMDEN, CAPE MAY,
CUMBERLAND, GLOUCESTER,
HUNTERDON, MERCER, MIDDLESEX,
MORRIS, OCEAN, PASSAIC, SALEM,
WARREN.

Apparently rather local in NJ.

Dates: 22 May - 29 Sept.; mostly Aug. and Sept.

- LESTIDAE

[6] *Archilestes grandis* (Rambur)

BERGEN, CUMBERLAND (Barber, 1994),
HUNTERDON, MERCER, MIDDLESEX,
MORRIS, SOMERSET.

This species has apparently extended its range from Mexico and the Southwest in this century (Gloyd, 1980) and now has been taken from as far northeast as Vermont. We have seen specimens collected as long ago as 8 Sept. 1967 in NJ (Hunterdon County, Lebanon, coll. by D. J. Prostack), where it is now widespread and locally common. Reported without complete data by Carle (1989).

Dates: 4 July - 26 Sept. Probably the latest to emerge, on average, of any zygopteran in the state with the possible exception of *Lestes congener*.

[7] *Lestes congener* Hagen

BURLINGTON, CUMBERLAND,
MIDDLESEX, MORRIS, OCEAN (Davis,
1913a), PASSAIC, SUSSEX, WARREN.

Dates: 6 July - 27 Oct. See comment on *Archilestes grandis*

[8] *Lestes disjunctus* Selys

BURLINGTON, CAPE MAY,
CUMBERLAND, MIDDLESEX, MORRIS,
SALEM, SOMERSET, SUSSEX.

Literature records of this species and *L. forcipatus* are unreliable since *L. disjunctus australis* Walker was not distinguished from *L. forcipatus* until Walkers's (1952) analysis; even now distinguishing males is no trivial task. Most NJ specimens are clearly referable to *australis*, but Morris County specimens (Picatinny Arsenal nr. Lake Denmark, 20 Sept. 1984, MLM, FLC) are closer to *disjunctus*, although with a color pattern showing some features of *australis*.

Dates: 23 Apr. - 21 Sept.

[9] *Lestes dryas* Kirby
(=*L. uncatius*, Davis, 1913a)

MORRIS (Morris Twp., marsh along Whippany River, 15 June 1990, JCM), PASSAIC

Dates: 15 June - 4 July.

[10] *Lestes eurinus* Say

BERGEN (Ramsey, 7 July 1912, AMNH),
BURLINGTON (Shamong Twp., Bear Pond, ~
4 mi. NW of Atsion, 14 June 1991, FLC), CAPE
MAY (Dennis Twp., gravel pit 0.8 km N. of
Hwy. 610, 20 June 1992, V. Elia),
MIDDLESEX (Dayton, 9, 17 July 1984, 11 July
1992, MLM, RU; Plainsboro Twp., near
McCormack Lake, 1 July 1994, FLC), MORRIS
(Great Swamp National Wildlife Refuge, 13
June 1988, 3 July 1986, JCM; Powerline Pond
near Picatinny Arsenal, 18 June - 5 July 1994,
FLC), SOMERSET (Warren Twp., Carle's
Pond, 8 July 1996 - 3 August 1979, FLC);
SUSSEX (Lost Pond, 17 June - 16 July 1993,
FLC). Reported without data by Carle (1989).

Reported by Smith (1910) only from Staten
Island. Evidently of sporadic occurrence;
apparently only the Picatinny and Lost Pond
sites represent well established populations.

[11] *Lestes forcipatus* Rambur

ATLANTIC, BURLINGTON, CAPE MAY,
CUMBERLAND, MIDDLESEX, MORRIS,
SOMERSET, SUSSEX.

May & Carle; Odonata of New Jersey

See comments under *L. disjunctus*; this is the more common of the two species in southern and central NJ.

Dates: 12 May - 2 Oct.

[12] *Lestes inaequalis* Walsh

BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MIDDLESEX, MORRIS, OCEAN, SOMERSET, SUSSEX, WARREN.

Of rather local occurrence, but not uncommon.

Dates: 12 May - 8 Aug.

[13] *Lestes rectangularis* Say

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MERCER, MIDDLESEX, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

Probably our most widespread *Lestes*.

Dates: 8 May - 24 Oct.

[14] *Lestes unguiculatus* Hagen

ATLANTIC, CAMDEN, CAPE MAY, MIDDLESEX, PASSAIC, SUSSEX.

Not recorded in NJ since early in this century, and possibly extirpated, although it could have been overlooked if highly sporadic (Donnelly, 1992).

Dates: 16 June - 6 Sept. A record for 2 Nov. from Sussex Co. (Smith, 1910) needs confirmation.

[15] *Lestes vigilax* Hagen, in Selys

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MERCER, MIDDLESEX, MORRIS, OCEAN, SALEM, SOMERSET, SUSSEX.

The common *Lestes* of the Pine Barrens, more local elsewhere.

Dates: 22 May - 5 Oct.

- COENAGRIONIDAE

[16] *Amphiagrion saucium* (Burmeister)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, UNION.

Dates: 10 May - 3 Aug.

[17] *Argia apicalis* (Say)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CUMBERLAND, GLOUCESTER, HUNTERDON, MERCER, MONMOUTH, MORRIS, SOMERSET, SUSSEX, WARREN.

Dates: 30 May - 24 Sept.

[18] *Argia bipunctulata* (Hagen)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MIDDLESEX, MONMOUTH, OCEAN, PASSAIC?

A typical species of Pine barrens bogs. The Passaic County record, from Newfoundland (Davis, 1913a), is surprising and needs confirmation.

Dates: 11 May - 16 Sept.

[19] *Argia fumipennis violacea* (Burmeister)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX? ("Orange Mts.", RU), GLOUCESTER, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, WARREN.

Our commonest *Argia*.

Dates: 11 May - 19 Sept.

[20] *Argia moesta* (Hagen)
(= *A. putrida*, Smith, 1910)

BERGEN, ESSEX, GLOUCESTER, HUNTERDON, MERCER, MIDDLESEX,

MORRIS, PASSAIC, SOMERSET, SUSSEX,
WARREN.

Dates: 5 June - 13 Sept.

[21] *Argia tibialis* (Rambur)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, MERCER, OCEAN,
PASSAIC, SOMERSET.

Fairly common in the Pine Barrens, less so on
Piedmont streams.

Dates: 5 June - 7 Sept.

[22] *Argia translata* Hagen, in Selys

BERGEN, HUNTERDON, MERCER,
MORRIS, PASSAIC, SOMERSET, SUSSEX,
WARREN.

A species of large rivers and lakes, common
along the Delaware and on some reservoirs.

Dates: 15 June - 13 Sept.

[23] *Chromagrion conditum* (Selys)

ATLANTIC, BERGEN, BURLINGTON, CAPE
MAY, CUMBERLAND, GLOUCESTER,
MIDDLESEX, MONMOUTH, MORRIS,
OCEAN, PASSAIC, SOMERSET, SUSSEX.

Dates: 7 May - 16 July.

[24] *Enallagma aspersum* (Hagen)

ATLANTIC, BURLINGTON, CAMDEN,
CAPE MAY, CUMBERLAND,
GLOUCESTER, HUNTERDON, MERCER,
MIDDLESEX, MONMOUTH, MORRIS,
OCEAN, SOMERSET, SUSSEX.

Dates: 14 May - 27 Oct.

[25] *Enallagma basidens* Calvert

BURLINGTON (Ft. Dix Military Res., Newbold
Pond, 30 June 1991, FLC; Lebanon State Forest,
Cooper Cranbury Reservoir, 30 May 1991, FLC;
Southampton Twp., Old Forge Lake at Hwy. 70,
30 May 1991, FLC), HUNTERDON (Round

Valley Reservoir, 3 Aug. 1991, MLM),
MIDDLESEX (East Brunswick Davidson's Mill
Pond, 15 May 1991, FLC, 21 May 1991, MLM;
Plainsboro Twp., McCormack Lake, 1 July
1994, FLC), MORRIS (Morristown, pond at
Service Rd. and Harter Rd., 6 Sept. 1982, JCM),
SOMERSET (Warren Twp., Carle's Pond, 24
May 1980 - 3 Oct. 1995, FLC). First reported,
without detailed data, by Carle (1989) and
Cannings (1989).

This small species has apparently spread from
the Southwest across the United States and into
southernmost Canada in this century
(Montgomery, 1966; Cannings, 1989). It is
rather locally distributed in the state in a variety
of lentic habitats, often disturbed ones.

[26] *Enallagma boreale* Selys

MORRIS (Rockaway Twp., pond adjacent to
Lake Denmark, 2 June 1988, JCM), SUSSEX
(Franklin Bog, 18 May 1988, FLC; Montague
Twp., Lost Pond, 17 May 1988, 15 May - 9 July
1993, FLC). Reported without data by Carle
(1989).

[27] *Enallagma carunculatum* Morse

BERGEN, HUNTERDON (just above Ken
Lockwood Gorge on the South Branch of the
Raritan River, 3 Aug. 1983, MLM, FLC),
MORRIS (nr. Lake Picatinny, 12 May 1992 - 10
July 1995, FLC), PASSAIC, SUSSEX.

Dates: 12 May - 5 Sept.

[28] *Enallagma civile* (Hagen)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, HUNTERDON, MERCER,
MIDDLESEX, MORRIS, OCEAN, PASSAIC,
SOMERSET.

Dates: 19 May - 29 Oct.

[29] *Enallagma cyathigerum* (Charpentier)

BERGEN (Ramsey, 20 May; Davis 1913a),
MORRIS (Bear Swamp Pond, 25 June 1993,
FLC; Lake Denmark, 10 June 1992, FLC),
SUSSEX (swamp near Franklin Bog, 18 May
1988, FLC; Ogdensburg, Heaters Pond, 18 May

May & Carle; Odonata of New Jersey

1988, FLC; Flat Brook beaver pond at Crigger Road, 9 July 1993, FLC).

It is not known whether Davis' specimen was "typical" *cyathigerum* or the form *vernale* Gloyd.

[30] *Enallagma daeckii* (Calvert)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, OCEAN.

Described by Calvert from Manamuskin, CUMBERLAND Co., as *Telagrion daeckii* and also for many years placed in the genus *Telealagma*. It is a southern species that reaches its northern limit here.

Dates: 2 June - 10 Aug.

[31] *Enallagma divagans* Selys

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, SOMERSET, SUSSEX.

Uncommon in the northern half of the state.

Dates: 8 May - 6 Aug.

[32] *Enallagma doubledayi* (Selys)

ATLANTIC, BURLINGTON, CAPE MAY, CUMBERLAND, MONMOUTH, OCEAN.

Locally common in the Pine Barrens and just to the south.

Dates: 12 May - 23 Oct.

[33] *Enallagma durum* (Hagen)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, OCEAN, SALEM.

A mainly coastal species in NJ, most often in tidal fresh waters.

Dates: 21 May - 11 Sept.

[34] *Enallagma ebrium* (Hagen)

BERGEN, MONMOUTH, MORRIS, PASSAIC (Davis, 1913a), SUSSEX.

Dates: 30 May - 23 July.

[35] *Enallagma exsulans* (Hagen)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CUMBERLAND, GLOUCESTER, HUNTERDON, MERCER, MIDDLESEX, MORRIS, OCEAN, SOMERSET, SUSSEX, UNION, WARREN.

Generally the common *Enallagma* of slow streams and rivers, although outnumbered at some Pines Barrens sites by *divagans* or *weewa*.

Dates: 25 May - 13 Sept.

[36] *Enallagma geminatum* Kellicott

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 8 May - 13 Oct.

[37] *Enallagma hageni* Walsh *

BERGEN (Mahwah Twp., bog nr. Bear Swamp Lake, 22 May 1983, RU), MIDDLESEX (East Brunswick Twp., Davidson's Mill Pond, 10 June 1991, MLM), MORRIS (Morristown, 1 July 1980, RU; outlet of Green Pond, 3 July 1985, RU; Whippany River, Washington Valley, 21 June 1988, 1 July 1982, JCM; Parsippany Twp., Old Dover Rd., 9 July 1988, JCM; Lake Denmark, 17 June 1994 - 1 July 1995, FLC), SUSSEX (High Point State Park, 7 July 1980; Culvers Lake, 23 July 1916, ANSP; Montague Twp., Mashipacong Pond, 21 June 1985, MLM; 12 June 1993, FLC; Stokes State Forest, beaver pond on Big Flat Brook at Crigger Rd., 29 June 1994, MLM; 20 June 1993 - 9 July 1993, FLC); SOMERSET (Warren Twp., Carle's Pond, 24 June 1978 - 14 July 1983, FLC).

Remarkably, this widespread species has not previously been reported from the state. It is rather local in the north, but not uncommon.

[38] *Enallagma laterale* Morse

BERGEN (Oakland Twp., Ramapo Lake, 30 May 1993, AB; 13 May 1995, FLC), MORRIS (Rockaway Twp., Picatinny Arsenal, nr. outlet of Lake Denmark, 12 May - 20 June, 1985-1995, FLC, JCM, MLM, RU, FLC); PASSAIC (W. Milford Twp., Cedar Pond, 1-9 June 1983, FLC, MLM; 16 May 1988, FLC; Ringwood, Ramapo Lake, 30 May 1993, AB); SUSSEX (Montague Twp., Mashipacong Pond, 23 May - 28 June, 1985-1995, FLC). Reported without complete data by Carle (1989).

A rare and local species within the state, but well established at Lake Denmark, where the population was studied extensively by FLC.

[39] *Enallagma pictum* Morse

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, OCEAN, SALEM.

Essentially confined to the Pine Barrens, with two records from Helmetta Pond, Middlesex County, in the so-called Spotswood Outlier of the Barrens. Otherwise known only from Long Island and the vicinity of Cape Cod.

Dates: 13 May - 17 Sept.

[40] *Enallagma recurvatum* Davis

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MONMOUTH, OCEAN (Davis, 1913a).

The allotype female was described by Davis from Lakewood. Similar in distribution to *pictum* but even more strictly confined to the Pine Barrens.

Dates: 8 May - 27 June

[41] *Enallagma signatum* (Hagen)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX.

Dates: 8 May - 25 Sept.

[42] *Enallagma traviatum* Selys

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MERCER, MIDDLESEX, MORRIS, SALEM, SUSSEX.

Dates: 24 May - 8 Sept.

[43] *Enallagma vesperum* Calvert

ATLANTIC, BURLINGTON, CAMDEN, CUMBERLAND, GLOUCESTER, MIDDLESEX, MORRIS, OCEAN, SALEM, SOMERSET, SUSSEX.

Recorded as *E. pollutum* (Hagen) before 1919, when Calvert recognized it as a distinct species based in part on NJ material.

Dates: 4 May - 22 Sept.

[44] *Enallagma weewa* Byers

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MERCER, OCEAN.

First reported by Montgomery (1930), this species is at the northern edge of its range in the Pine Barrens, where it is fairly common on tannin-stained streams.

Dates: 7 June - 7 Sept.

[45] *Ischnura hastata* (Say)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, HUNTERDON, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, SOMERSET, SUSSEX.

Previously reported as *Anomalagrion hastatum*.

Dates: 23 Apr. - 28 Oct.

[46] *Ischnura kellicotti* Williamson

ATLANTIC, BURLINGTON, CAMDEN,
CAPE MAY, CUMBERLAND,
GLOUCESTER, MIDDLESEX, MORRIS,
OCEAN, SALEM, SOMERSET, SUSSEX.

Locally distributed, strictly in association with lily pads, among which it completes its entire life cycle. It often occurs in this habitat with *Enallagma geminatum*, which males and blue females superficially resemble.

Dates: 19 May - 22 Sept.

[47] *Ischnura posita* (Hagen)
(= *Nehalennia posita*, Smith, 1910)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, MERCER, MIDDLESEX,
MONMOUTH, MORRIS, OCEAN, PASSAIC,
SALEM, SOMERSET, SUSSEX, UNION,
WARREN.

Dates: 23 Apr. - 13 Oct.

[48] *Ischnura ramburii* (Selys)

ATLANTIC, BURLINGTON, CAPE MAY,
CUMBERLAND, GLOUCESTER,
MIDDLESEX, MONMOUTH, OCEAN,
SALEM.

Another almost strictly coastal species in NJ, often found at brackish water.

Dates: 10 May - 23 Oct.

[49] *Ischnura verticalis* (Say)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, HUNTERDON, MERCER,
MIDDLESEX, MONMOUTH, MORRIS,
OCEAN, PASSAIC, SOMERSET, SUSSEX,
UNION, WARREN.

Probably our commonest and most widespread odonate.

Dates: 29 Apr. - 19 Nov.

[50] *Nehalennia gracilis* Morse

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, MIDDLESEX, MONMOUTH,
MORRIS, OCEAN, PASSAIC, SUSSEX.

Dates: 11 May - 2 Sept.

[51] *Nehalennia integrivittata* Calvert

ATLANTIC, BURLINGTON, CAPE MAY,
CUMBERLAND, GLOUCESTER, OCEAN.

Described by Calvert (1913) from Malaga, Gloucester Co., this species reaches the northern limit of its range in the Pine Barrens.

Dates: 20 June - 12 Aug.

[52] *Nehalennia irene* (Hagen)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, ESSEX, MIDDLESEX, MORRIS,
OCEAN, SOMERSET, SUSSEX.

Dates: 15 May - 3 Aug.

ANISOPTERA

- PETALURIDAE

[53] *Tachopteryx thoreyi* (Hagen)

BERGEN (Mahwah Twp., Campgaw Mountain Reservation, 2 June 1990 - 5 Aug. 1995, AB, FLC, RU), PASSAIC (sight record, Sterling Forest, 30 July 1992, Soltesz pers. com.).

First reported for the state by Carle (1989) based on an old specimen in AMNH labeled only "New Jersey". Barlow (1991) reported a large population from Campgaw Mountain Reservation; the larval seep was discovered by FLC, but it unfortunately is not protected within the reservation.

Dates: 2 June - 5 Aug.

- GOMPHIDAE

[54] *Arigomphus furcifer* (Hagen, in Selys)

BERGEN, MORRIS, PASSAIC, SUSSEX.

Locally abundant in the Highlands where males are typically found resting on lily pads.

Dates: 23 May - 13 Aug. The latter date is unusually late.

[55] *Arigomphus villosipes* (Selys)

BERGEN, CUMBERLAND, ESSEX,
MIDDLESEX, MONMOUTH, MORRIS,
PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 22 May - 15 July.

[56] *Dromogomphus spinosus* Selys

BERGEN, HUNTERDON, MERCER,
MIDDLESEX, MORRIS, PASSAIC,
SOMERSET, SUSSEX, WARREN.

Dates: 13 June - 14 Sept.

[57] *Gomphus (Gomphurus)* undescribed sp. *

MERCER (exuviae, Delaware River at Scudder's Falls, 4 June 1989, FLC); SUSSEX / WARREN (Delaware River 0.7 km S of, 27 May 1985-23 June 1994, FLC); WARREN (exuviae, Delaware River at Belvidere, 19 June 1994, FLC; exuviae, Delaware River 3.2 km S of Delaware Water Gap, 3 June 1988, FLC; exuviae, Delaware River 0.2 km S of Pequest River, 1989, FLC).

Larvae from Scudder's Falls and Belvidere thought by FLC to have drifted from upstream.

[58] *Gomphus (Gomphurus) vastus* Walsh *

MERCER (exuviae, Delaware River at Trenton, 28 June 1994, FLC), HUNTERDON (exuviae, Delaware River at Bull's Island, 4 June 1989, FLC; Stockton, Frenchtown, and Milford, 18 June 1994, FLC), SUSSEX (exuviae, Delaware River nr. Walpack Center, 22 June 1994, FLC), WARREN, (exuviae, Delaware River nr. Carpentersville, 18 June 1994, FLC).

Adults have not been taken in NJ, but the exuviae are distinctive. A single male taken in a building was reported by Calvert (1893) from Philadelphia.

[59] *Gomphus (Gomphus) abbreviatus* Hagen, in Selys

HUNTERDON (Delaware River nr. Holland, 18 June 1994, FLC), MERCER (Princeton Twp., Stony Brook at Province Line Rd., 3-9 June 1957, TWD), SOMERSET (Lamington River at Burnt Mills, 16 June 1983, FLC; 7 June 1984, MLM; exuviae, 20 May 1985; 3-7 June 1985, FLC); SUSSEX (Delaware River at DePew Rec. Area, Delaware River 1 mi. S of Van Campen Inn, 12-13 June 1994, RB; Delaware River nr. Quick's Island, 27 May 1985, 1 June 1986, 10 June 1985, FLC; exuviae, Delaware River nr. Walpack Center, nr. Montague, Quick's Island, and Mashipacong Island, 22 June 1994, FLC), SUSSEX / WARREN (Worthington State Park, 12 June 1994, RB; exuviae, Delaware River 0.7 km S of Flatbrookville, 23 June 1994, FLC), WARREN (exuviae, Delaware River at Carpentersville, Belvidere, Columbia, Delaware Water Gap, 18-19 June 1994, FLC; Pequest River nr. Butzville, 3 June 1985, 4 June 1986, FLC, exuviae, 20 May 1985, 19 June 1994, FLC). Reported by Needham and Westfall (1955) without specific data.

[60] *Gomphus (Gomphus) adelphus* Selys

SUSSEX (Stokes State Forest, Big Flat Brook near Crigger Road, 23 May - 12 June 1993, FLC; exuviae, Flat Brook nr. Walpack Center, 27 May 1985, 22 June 1994, FLC). Recorded as *Gomphus brevis* from BURLINGTON Co. (Browns Mills) by Smith (1910), but this almost certainly was *apomyius*. Reported without complete data by Carle (1989).

[61] *Gomphus (Gomphus) apomyius* Donnelly

ATLANTIC (Hammonton Twp., Albertson's Brook below US. Hwy. 206, 7 June 1984, FLC, MLM; exuviae, 1 June 1985, FLC; 19 June 1988, FLC), BURLINGTON (Friendship Branch nr. Red Lion, 30 May 1959, 4 June 1957, TWD), CAMDEN (Albertson's Brook, 7 June 1984, FLC, MLM), CUMBERLAND / SALEM (Maurice River at outlet of Willow Grove Lake, 31 May 1996, AB, MLM; possible

sight record, Stow Creek at Tattletown-Jericho Road, 3 June 1994, FLC; larvae, Scotland Run at Hwy. 55, 13 March 1996, FLC; 1/3 mile downstream from Hwy. 55, 20 March 1996, FLC), GLOUCESTER (larvae, Scotland Run at U.S. 40, April 1995, AB, 6 March 1996, 28 April 1996, FLC), OCEAN (Lacey Twp., outlet stream of Bamber Lake, 12 June 1994, R. Orr). Reported by Carle (1979, 1989) without specific data.

The Friendship Branch population apparently is no longer extant. This is one of New Jersey's most restricted and threatened Odonata.

[62] *Gomphus (Gomphus) viridifrons* Hine *

SUSSEX (exuviae, Delaware River nr. Walpack Center, at Dingman's Ferry, and nr. Montague, 22 June 1994, FLC), SUSSEX / WARREN (exuviae, Delaware River at confluence of Flat Brook, 23 June 1994, FLC), WARREN (Delaware River nr. Munka Chunk, 19 June 1994, FLC).

[63] *Gomphus (Phanogomphus) borealis*
Needham

SUSSEX (Stokes State Forest, beaver pond on Big Flat Brook at Crigger Rd., 1 June 1986, FLC, 15 June 1988, MLM; 23 May - 17 June 1993, FLC). Reported without complete data by Carle (1989).

Evidently very local in the state, but might occur elsewhere at beaver ponds.

[64] *Gomphus (Phanogomphus) descriptus*
Banks

SUSSEX (Big Flat Brook at Skellinger Road, 1 June 1986, 18 June 1988, FLC; Stokes State Forest, Big Flat Brook just below Crigger Road, 23-30 May 1993, FLC; Big Flat Brook at Walpack Center, June 1996, AB; exuviae, Delaware River nr. Walpack Center, and Dingman's Ferry, 22 June 1994, FLC), SUSSEX / WARREN (exuviae, Delaware River at confluence of Flat Brook, 23 June 1994, FLC). Reported without complete data by Carle (1989).

[65] *Gomphus (Phanogomphus) exilis* Selys

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, WARREN.

A lentic species and undoubtedly our commonest gomphid.

Dates: 23 Apr. - 12 Aug.

[66] *Gomphus (Phanogomphus) lividus* Selys
(= *G. sordidus*, Smith, 1910)

BERGEN, CAMDEN, HUNTERDON, MERCER, MORRIS, PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 30 May - 9 July.

[67] *Gomphus (Phanogomphus) quadricolor*
Walsh *

SOMERSET (Lamington River at Burnt Mills, exuviae, 20 May 1985; adults, 3 June 1985, 16 June 1983, FLC); SUSSEX (Delaware River at U.S. 206, 18 June 1994, AB; Delaware River 1 mi. S of Van Campen Inn, 13 June 1994, RB; exuviae, Delaware River at Dingman's Ferry, nr. Montague, Quick's Island, and Mashipacong Island, 27 May 1985, 1 June 1986, 10 June 1985, 22 June 1994, FLC), SUSSEX / WARREN (Delaware River at confluence of Flat Brook, exuviae, 23 June 1994, FLC, adults, 6 June 1995, MLM), WARREN (exuviae, Delaware River at Carpentersville, Phillipsburg, Munka Chunk, 18-19 June 1994, FLC; exuviae, Pequest River nr. Butzville, 20 May 1985, 19 June 1994, FLC).

[68] *Gomphus (Phanogomphus) spicatus*
Hagen, in Selys

MORRIS (Lake Denmark, 20 May - 16 June, 1985-1994, FLC; Rockaway Twp., pond on L. Denmark Rd., 2 mi. N of Hwy. 513, 10 June 1988, JCM), PASSAIC (Newfoundland, May-July [Smith, 1910]; Cedar Pond, 9 June 1983, FLC).

Because of its apparently early and short season *Gomphus spicatus* may be more widespread in northern NJ than these records indicate.

Dates: 19 May - 16 June.

[69] *Gomphus (Stenogomphurus) rogersi*
Gloyd

BERGEN (Mahwah Twp., Bear Swamp Brook, larvae, 14 May 1983, FLC; adults, 26 May 1983, FLC, 22 June 1983, MLM, RU); MORRIS (Rockaway Twp., Picatinny Arsenal, Bear Swamp Brook, 2 June 1994, larvae, 13 Sept. 1984, Picatinny Arsenal, Green Pond Brook, 23 June 1995, FLC, Burnt Meadow Brook, 24 June 1990, 26 June 1989, JCM, MLM); Passaic (Cedar Pond outflow, larvae, 27 July 1983, 16 May 1988, FLC); SUSSEX (Stokes State Forest, Big Flat Brook at Crigger Rd., 18 June 1988, 12-28 June 1993, FLC, 15 June 1988, 22 June 1990, JCM, MLM). Reported without complete data by Carle (1989).

Local but fairly widely distributed in rocky streams with some silt, especially below impoundments, in the Highlands and Ridge and Valley.

[70] *Hagenius brevistylus* Selys

ATLANTIC, BURLINGTON, CAPE MAY, CUMBERLAND, GLOUCESTER, MORRIS, OCEAN, PASSAIC, SALEM, SUSSEX, WARREN.

Dates: 24 June - 13 Sept.

[71] *Lanthus vernalis* Carle

BERGEN, MORRIS, PASSAIC, SUSSEX, WARREN.
(= *Gomphus parvulus*, Smith, 1910)

Carle (1980,1989) reported *L. vernalis* from NJ without complete data; true *parvulus* has not been found in the state, although specimens are known from Wind Gap, PA, within a few miles of the Delaware River. Here and elsewhere this species is typically found in streams harboring native brook trout populations.

Dates: 31 May - 16 July.

[72] *Ophiogomphus (Ophionuroides) anomalus* Harvey

SUSSEX (Lake Mashipacong, 3 July 1920, AMNH). Reported without complete data by Carle (1989).

The precise location of "Lake Mashipacong" is not clear; it most logically refers to Mashipacong Pond, a private enclave within High Point State Park, but the habitat is unusual for the species. Perhaps more likely is Mashipacong Island, on the Delaware River ~ 5 km south of Port Jervis, NY; *anomalus* was reported from Port Jervis (Walker, 1958) and we have seen old (1949) specimens from Milford, PA, another 5 km downriver. Recent extensive surveys have failed to rediscover the species in NJ, although exuviae have been found just upstream along the Delaware in NY and PA.

[73] *Ophiogomphus (Ophionurus) aspersus*
Morse

MORRIS (Whippany River, Washington Valley, 5 June 1982 - 21 June 1986, AB, FLC, JCM, MLM; Washington Twp., Musconetcong River at Point Mt. Rd., 4 July 1993, AB), SUSSEX (Duttonville, 8 June 1910, AMNH; exuviae, Flat Brook nr. Walpack Center, 22 June 1994, FLC), WARREN (Pequest River nr. Butzville, 3 June 1985, FLC, exuviae, 20 May 1985, 19 June 1994, FLC, larvae, 8 April 1996, FLC). Reported without complete data by Carle (1989).

[74] *Ophiogomphus (Ophionurus) carolus*
Needham

SUSSEX (Big Flat Brook at Walpack Center, 27 May 1985, FLC; exuviae, Delaware River nr. Walpack Center, 22 June 1994, FLC). Reported without complete data by Carle (1989).

[75] *Ophiogomphus (Ophionurus) mainensis*
Packard
(= as *O. johannus*, Smith, 1910)

MORRIS (Hacklebarney State Park, Black River, 21 June 1959, TWD; Washington Twp., Musconetcong River at Hwy. 57, 2 July 1993, AB), PASSAIC (Hewitt, June [Smith, 1910]), SUSSEX (Big Flat Brook at Skellinger Road, 27 May 1985 - 23 June 1994, FLC, larvae, 27 May 1985 - 8 April 1996, FLC; Big Flat Brook at Hwy. 521, 15 June 1988, MLM; Big Flat Brook at Walpack Center, 5 July 1996, AB; Little Flat Brook at Hwy. 615, 5 July 1996, AB), SUSSEX

/ WARREN (exuviae, Delaware River at confluence of Flat Brook, 23 June 1994, FLC).

[76] *Ophiogomphus (Ophionurus) rupensulensis* Walsh

BERGEN, HUNTERDON, MORRIS,
SOMERSET, SUSSEX, WARREN.

Dates: 3 June - 4 July.

[77] *Progomphus (Neaprogomphus) obscurus* (Rambur)

ATLANTIC, BURLINGTON, CAPE MAY,
CUMBERLAND, GLOUCESTER, OCEAN.

A characteristic species of sand-bottomed Pine Barrens streams.

Dates: 8 May - 13 Aug.

[78] *Stylogomphus albistylus* (Hagen, in Selys)
(= *Gomphus albistylus*, Smith, 1910)

BERGEN, CAMDEN, HUNTERDON,
MERCER, MORRIS, PASSAIC, SOMERSET,
SUSSEX, WARREN.

Dates: 3 June - 13 Aug.

[79] *Stylurus plagiatus* (Selys)

BURLINGTON, CUMBERLAND, MERCER,
MIDDLESEX, MORRIS.

In NJ mainly a species of larger streams in the lower Delaware Valley, often with some tidal influence (Barber, 1994).

Dates: 23 June - 23 Sept.

[80] *Stylurus scudderi* (Selys) *

MORRIS / WARREN (Musconetcong River at Waterloo Village, 14 Aug. 1994, AB).

Primarily a New England and Appalachian species characteristic of riffles in sandy-bottomed rivers, and evidently quite rare in NJ. Adults usually are most active late in the day over water or on vegetation along stream banks.

[81] *Stylurus spiniceps* (Walsh) *

HUNTERDON (larva, Lebanon Twp., South Branch of Raritan River, Ken Lockwood Gorge, 3 Aug. 1983, FLC; larvae, Delaware River at Stockton, Bulls Island, Frenchtown, and Milford, 28 May, 18 June 1994, FLC), MORRIS (Washington Twp., Musconetcong River at Point Mt. Rd., 2 July 1993, AB), PASSAIC (sight record, Paradise Rd., nr. Newfoundland, 23 June 1992, MLM), SUSSEX (larvae, Delaware River nr. Dingman's Ferry, and Walpack Center, 22 June 1994, FLC), WARREN (Pequest River ~ 2 km upstream from Butzville, 14 Aug - 13 Sept. 1985, FLC, MLM; Allamuchy Twp., Musconetcong River at Hwy. 609, 21 Aug. 1993, AB; Delaware River near Tocks Island, 20 Sept. 1985, FLC; larvae, Delaware River at Carpentersville, 18 June 1994, FLC).

Larvae are found in silty margins of rapid rivers; as with many *Stylurus* adults mostly fly late in the day.

- AESHNIDAE

[82] *Aeshna canadensis* Walker

BERGEN, MORRIS, PASSAIC (Davis, 1913a),
SOMERSET, SUSSEX.

Dates: July - 13 Oct.

[83] *Aeshna clepsydra* Say

BERGEN, BURLINGTON, CUMBERLAND,
MIDDLESEX, MORRIS, OCEAN, PASSAIC,
SUSSEX, WARREN.

Fairly common in the Pine Barrens and in the Highlands and Ridge and Valley, but known only from one Middlesex Co. population in the area between (South Brunswick Twp., Davdison's Mill Pond).

Dates: 14 July -30 Sept.

[84] *Aeshna constricta* Say

BERGEN (Alpine, 7 July 1965, AMNH; Mahwah Twp., nr. Bear Swamp Brook, 21 July 1990, AB), MORRIS (Chester, marsh at Black River and Hillside Rd., 16 Sept. 1987, MLM, RU, 9 Aug. - 10 Sept. 1983-1986, FLC; Morris Plains, Greystone Park, 30 August 1983, JCM;

Morris Twp., Hanover Ave. and Raynor Rd., 6, 13 Aug. 1986, JCM); SOMERSET (Warren Twp., Carle's Pond, 8 Aug. - 2 Nov., 1972-1993, FLC).

Many early records for *A. constricta* (e.g., Smith, 1910) predate Walker's description of the widespread *A. umbrosa* and probably refer to the latter species.

[85] *Aeshna mutata* Hagen

MORRIS (Rockaway Twp., Picatinny Arsenal, Powerline Pond, 30 May 1985 - 5 July 1993, FLC, Lake Denmark, 29 May 1991 - 22 June 1986, AB, JCM, MLM; Rockaway Twp., Lake Ames, 29 June 1988, AB, JCM); SOMERSET (Warren Twp., Carle's Pond, June 6-10 1993), SUSSEX (Mashipacong Bogs Preserve, 17 June 1993 - 28 June 1993, FLC). Reported without complete data by Carle (1989).

Carle (1991) described the larval habitat as small, thickly vegetated, fishless ponds.

[86] *Aeshna tuberculifera* Walker

BERGEN (Ramsey, AMNH), MORRIS (Rockaway Twp., Picatinny Arsenal, nr. Lake Denmark, 26 Aug. - 24 Sept., 1984-1995, AB, FLC, JCM, MLM; town of Budd Lake, marsh on Old Waterloo Rd., 1 - 30 Aug. 1993, AB), SOMERSET (Warren Twp., Carle's Pond, 23 Aug. - 2 Sept. 1987-1993, FLC&FLCII), SUSSEX (Mashipacong Bogs Preserve, 2 Aug. - 2 Sept. 1993, FLC), WARREN (Delaware Water Gap, AMNH). Reported without complete data by Carle (1989).

[87] *Aeshna umbrosa* Walker

BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MERCER, MIDDLESEX, MONMOUTH, MORRIS, PASSAIC, SOMERSET, SUSSEX, UNION, WARREN.

Our most widespread *Aeshna*, although seldom found in dense concentrations as other species sometimes are. Most frequent on slow, shaded streams.

Dates: 26 June - 28 Oct.

[88] *Aeshna verticalis* Hagen

BERGEN, MORRIS, OCEAN?, SUSSEX, WARREN.

The Ocean Co. record is out of the expected habitat and range and may be misidentified.

Dates: 3 Aug. - 24 Sept.

[89] *Anax junius* (Drury)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

One of our most common and widespread Odonata, probably present in every county. Migratory, often gathering in large numbers in southern Cape May Co. in the fall.

Dates: 16 Apr. - 18 Dec. Reliable sight records occurred as early as 13 Mar. 1995 in SOMERSET County (Barlow, pers. comm., 1995) and as late as 26 Dec. 1994 (CAPE MAY, Barber, pers. comm., 1995), probably related to the very warm autumn and winter weather of 1994-95. Very early and late records are almost certainly of migrant individuals.

[90] *Anax longipes* Hagen

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, MIDDLESEX, MORRIS, OCEAN, SOMERSET.

Much more local than *A. junius*, and an intermittent breeder at some sites. A long-standing population, first reported by Beatty (1945), still exists at Upton Ponds, Burlington Co.

Dates: 3 May (exuviae) - 1 Sept. The 3 May date is surprisingly early, but the exuviae, supplied by M. Darlington, are unmistakable.

[91] *Basiaeschna janata* (Say)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND,

GLOUCESTER, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, UNION, WARREN.

A very common early season species on both rivers and lakes.

Dates: 15 Apr. - 9 July.

[92] *Boyeria grafiana* Williamson *

BERGEN (Mahwah Twp., Bear Swamp Brook, between Camp Yawpaw and Ramapo River, 10 Aug. 1991 - 22 Aug. 1992, AB; larvae, 14 May 1983, FLC), WARREN (larvae, Delaware Water Gap, Dunfield Creek, 8 Apr. - July, 1985 -1996, FLC, MLM), SUSSEX (Stokes State Forest, Big Flat Brook at Crigger Rd., 29 Sept. 1990, JCM, 21 July - 10 Sept. 1993-1994, FLC, larvae, 28 June 1993, FLC; larvae, Big Flat Brook at Skellinger Road, 23 June 1994, FLC; larvae, Tillman Ravine, May 1994, FLC).

[93] *Boyeria vinosa* (Say)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, HUNTERDON, MERCER, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, WARREN.

Possibly our most common aeshnid, but under-represented in collections due to its largely crepuscular flight.

Dates: 16 May - 5 Oct.

[94] *Epiaeschna heros* (Fabricius)

ATLANTIC, BERGEN, BURLINGTON, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, MIDDLESEX, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, UNION.

This is perhaps our largest dragonfly. Breeds in swampy woodland pools and ditches, but adults range widely and are migratory.

Dates: 28 Apr. - 24 Oct.

[95] *Gomphaeschna antilope* (Hagen)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MIDDLESEX, OCEAN, PASSAIC?

Unlike *G. furcillata*, this is largely a Pinelands species; the Passaic Co. record (Newfoundland; Smith, 1910) needs confirmation.

Dates: 28 May - 14 July.

[96] *Gomphaeschna furcillata* (Say)

ATLANTIC, BERGEN, BURLINGTON, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MORRIS, OCEAN, PASSAIC, SALEM, SUSSEX, WARREN.

Dates: 23 Apr. - 9 July.

[97] *Nasiaeschna pentacantha* (Rambur)

BERGEN, CAPE MAY, CUMBERLAND, MERCER, MIDDLESEX, MORRIS, PASSAIC, SALEM, SOMERSET, SUSSEX.

It is surprising that this local but widespread species was not recorded until quite recently (Soltesz, 1991). In this area adults seem to favor slack water of streams or lakes near stream inlets.

Dates: 30 May - 19 July.

- CORDULEGASTRIDAE

[98] *Kalyptogaster erronea* (Hagen)

(= *Cordulegaster erronea* of authors)

BERGEN ("Bear Swamp", 18 July 1910, [Davis, 1913a]; Fyke Brook and tributaries, 23 June 1991 - 20 July 1994, FLC; west side of Campgaw Mtn., 20 June 1989, FLC), MORRIS (Morris Plains, 4 Aug. 1993, AB; Morris Twp., stream nr. Picatinny Rd., 17 July 1994, AB; town of Budd Lake, 7 Aug. 1993, AB).

[99] *Pangaeagaster maculata* (Selys)

(= *Cordulegaster maculata* of authors)

ATLANTIC, BERGEN, BURLINGTON, CAPE MAY, CUMBERLAND, HUNTERDON, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 23 Apr. - 28 June.

[100] *Taeniogaster obliqua* (Say)
(= *Cordulegaster obliqua* of authors)

BERGEN ("Palisades", June [Davis, 1913a]; Mahwah Twp., Bear Swamp Brook, 11 June 1992, AB), MORRIS (Rockaway Twp., unnamed tributary of Hibernia Brook, L. Denmark Rd., and Burnt Meadow Brook, 18 June 1988 - 26 June 1989, FLC, MLM; Mt. Olive Twp., seepage at Budd Lake and Smithfield Rd., 30 June - 2 July 1994, AB), SUSSEX (Lake Hopatcong, 17 June [Smith, 1910]), Mashipacong Bogs Preserve at Pine Swamp, 15 June 1995, FLC).

[101] *Zoraena diastatops* (Selys)
(= *Cordulegaster diastatops* of authors)

BERGEN, BURLINGTON? (sight record, FLC), CAPE MAY, CUMBERLAND, MORRIS, OCEAN, PASSAIC, SUSSEX, WARREN.

Dates: 14 May - 9 July.

- LIBELLULIDAE (MACROMIINAE)

[102] *Didymops transversa* (Say)

BERGEN, BURLINGTON, CAMDEN, CUMBERLAND, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 22 Apr. - 30 July

[103] *Macromia alleghaniensis* Williamson

ATLANTIC, BURLINGTON, CAPE MAY, CUMBERLAND (Barber, 1994), GLOUCESTER.

Reported by Needham and Westfall (1955) without specific data.

Dates: 9 June - 19 July

[104] *Macromia illinoensis* Walsh

The recent study of Donnelly and Tennesen (1994) suggests that the widespread southern form, *M. georgina* (Selys), is a subspecies of *M.*

illinoensis. The two taxa seem distinct in structural characters in NJ and are sympatric in Virginia and North Carolina. *Macromia georgina* was reported from the Pine Barrens by Carle (1989).

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MERCER, MIDDLESEX (*georgina*). HUNTERDON, MORRIS, PASSAIC (Davis, 1913a), SOMERSET, SUSSEX, WARREN (*illinoensis*). Old records of *illinoensis* from BURLINGTON and OCEAN Cos. probably refer to *georgina* or to *M. alleghaniensis*.

Dates: 30 May - 1 Sept. (*georgina*), 12 June - 8 Aug. (*illinoensis*)

- LIBELLULIDAE (CORDULIINAE)

[105] *Cordulia shurtleffi* Scudder *

MORRIS (Rockaway Twp., Lake Denmark, 12 May - 10 June, 1985-1994, FLC, JCM, MLM; Rockaway Twp., Green Pond, 3 July 1985, MLM, RU), SUSSEX (Franklin Bog, 18 May 1988, FLC; Montague Twp., Lost Pond, 17 May 1988, 23 May - 28 June 1993, FLC; Pine Swamp, 6 June - 28 June 1993, FLC; Mashipacong Pond, 23 May - 28 June 1993, FLC; Flat Brook beaver pond at Crigger Rd., 12-28 June 1993, FLC; Vince's Bog, 17 May 1991, RU).

This northern species is surprisingly abundant at Lake Denmark and at Lost Pond.

[106] *Dorocordulia lepida* (Hagen, in Selys)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MORRIS, OCEAN, PASSAIC, SUSSEX.

Dates: 23 May - 27 July.

[107] *Dorocordulia libera* (Selys)

BERGEN, MORRIS, PASSAIC, SUSSEX.

Dates: 24 May - 23 July.

[108] *Epitheca (Epicordulia) princeps* Hagen

BERGEN, CAMDEN, CUMBERLAND,
MERCER, MIDDLESEX, MONMOUTH,
MORRIS, PASSAIC, SOMERSET, SUSSEX.

Dates: 3 June - 14 Sept.

[109] *Epitheca (Tetragoneuria) canis*
(MacLachlan)

SUSSEX (Franklin Bog, 18 May 1988, FLC;
Montague Twp., Lost Pond, 17 May 1988, 15
May - 6 June 1993, FLC; Mashipacong Pond,
23 May 1993, FLC; Sandyston Twp., Stokes
State Forest, beaver pond on Big Flat Brook at
Crigger Rd., 15 May 1993, 27 May 1990, AB,
JCM; Lake Ocquittunk, 27 May 1990, JCM).
Reported without complete data by Carle (1989).

Commonly associated with beaver ponds and to
be expected in this habitat elsewhere in northern
NJ.

[110] *Epitheca (Tetragoneuria) costalis* (Selys)

ATLANTIC? (sight record), CAMDEN, CAPE
MAY (Soltész, 1991), CUMBERLAND,
MIDDLESEX, OCEAN, SALEM.

Reported without complete data by Carle (1989),
detailed records appear in May (1995).

Dates: 15 May - 28 June.

[111] *Epitheca (Tetragoneuria) cynosura* (Say)

BERGEN, BURLINGTON, GLOUCESTER,
HUNTERDON, MERCER, MIDDLESEX,
MONMOUTH, MORRIS, OCEAN, PASSAIC,
SOMERSET, SUSSEX, WARREN.

Extremely common and widespread north of the
Pine Barrens, but rare or absent south of
northernmost Ocean and Burlington Cos. (May,
1995).

Dates: 7 May - 4 July. A specimen from
Delaware Water Gap in the AMNH is dated 22-
24 Sept., but this is almost surely an error.

[112] *Epitheca (Tetragoneuria) semiaquea*
(Burmeister)

ATLANTIC, BURLINGTON, CAMDEN,
CAPE MAY, CUMBERLAND,
GLOUCESTER, MONMOUTH, OCEAN.

This name is assigned provisionally to the dark-
winged, stout-bodied form very common in the
Pine Barrens; what is probably the same form
occurs along the coast as far north as Nova
Scotia. At least in NJ it seems distinct from *E.*
cynosura in color, body size and proportions,
behavior, and larval spination, although the two
have been confused in the past. It is most like *E.*
semiaquea from the Carolinas but differs
consistently in pattern of wing maculation and
probably deserves at least subspecific
recognition (Carle 1982; May, 1995).

Dates: 24 Apr. - 24 June.

[113] *Epitheca (Tetragoneuria) spinigera*
(Selys)

PASSAIC (Greenwood Lake, 30 June;
Newfoundland, 28 May [Davis, 1913a]).

Not subsequently reported from the state, but we
have confirmed the identity of Davis' specimens.
The species may well occur sporadically or in
very small numbers, or be rarely collected
because of its relatively secretive behavior (Carle
1982).

[114] *Epitheca (Tetragoneuria) spinosa* (Hagen,
in Selys)

BERGEN? (reported from Great Notch by Davis
[1913a] but apparently not seen by him; this
record seems doubtful on the basis of the
otherwise known range and habitat), CAMDEN
(Gibbsboro, 11 May 1972, ANSP; Clementon,
Iona, Laurel Springs, 20 Apr. - 27 May [Smith,
1910]), CUMBERLAND / SALEM (Willow
Grove Lake and Maurice River at lake outlet,
female in transformation, 15 Apr. 1995;
patrolling males, 20 Apr. 1995, RB, 13 May
1995, MLM), GLOUCESTER (Still Run at
Hwy. 40, 27 Apr. 1995, J. Dowdell),
MIDDLESEX (Old Bridge, 23 Apr. [Davis,
1913a]).

Thought likely to be extirpated in NJ until the
1995 discovery by Barber of an apparently
established population.

Recent searches have not turned up an extant population in the Gibbsboro area, but the population near Malaga seems quite viable. Reported from historic occurrences only by Carle (1989), *T. spinosa* is among the most threatened Odonata in NJ with a preference for habitats at the edge of the Pine Barrens leaving it vulnerable to the effects of agriculture and urbanization. Information on habitat and life history is given by Carle (1991).

[115] *Helocordulia uhleri* (Selys)

ATLANTIC, BERGEN, BURLINGTON, CAPE MAY, CUMBERLAND, GLOUCESTER, MORRIS, OCEAN, PASSAIC, SALEM, SUSSEX, WARREN.

Dates: 18 Apr. - 3 July.

[116] *Neurocordulia obsoleta* (Say)

SUSSEX, WARREN.

Some of the old records from the Delaware River might pertain to the next species, which is common there, but we have confirmed adult specimens from Delaware Water Gap (AMNH) and exuviae from both counties (FLC, RB). Both species have been observed by FLC flying at dusk below the Conrail bridge near the Delaware Water Gap, but they proved impossible to capture in the dim light.

Dates: 17 June - 14 Sept. (found dead).

[117] *Neurocordulia yamaskanensis* (Provancher) *

MORRIS (Washington Twp., Musconetcong River at Point Mt. Rd., 4 July 1993, AB), SUSSEX (exuviae, Delaware River at Dingman's Ferry, nr. Montague, Quick's Island, and Mashipacong Island, 22 June 1994, FLC), WARREN (exuviae, Delaware Water Gap at Conrail Bridge, 27 May 1985; Delaware River at confluence of Flat Brook, 22 June 1994, FLC; Delaware River nr. Carpentersville, at Phillipsburg, Belvidere, Munka Chunk, Columbia, and Delaware Water Gap, 18-19 June 1994, FLC).

[118] *Somatochlora elongata* (Scudder)

SUSSEX (Montague Twp., Pine Swamp, larvae, 17 May 1988, adults, 28 June - 9 July 1993, FLC). Reported without complete data by Carle (1989).

[119] *Somatochlora filosa* (Hagen)

ATLANTIC, BURLINGTON, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, OCEAN.

Dates: 29 June - 14 Nov.

[120] *Somatochlora georgiana* Walker

BURLINGTON (Wharton State Forest, Atsion, flying over Hampton Rd., 12 July 1984, MLM; Daigle, 1994).

This single specimen was somewhat teneral, suggesting a local origin. Other individuals possibly of this species were seen at the same locality by H. White and by FLC. Larvae and adults should be sought along nearby streams as Carle (1991) found larvae in Piedmont and Coastal Plain streams in Virginia.

[121] *Somatochlora linearis* (Hagen)

CUMBERLAND/SALEM (Stow Creek at Buckhorn Road, 7-27 Aug. 1994, RB), MORRIS (larvae, Picatinny Arsenal, Area 2A stream, 17 June 1994, Bear Swamp Brook, 13 Sept. 1984, Railroad Pond, 13 Sept. 1984, FLC), OCEAN (Jackson Twp., Cassville, a larva taken 13 May 1910 [Walker, 1925]), SOMERSET (Warren Twp., Carle Stream, August 1978, FLC).

[122] *Somatochlora provocans* Calvert

ATLANTIC, BURLINGTON, CAPE MAY, CUMBERLAND, OCEAN. The species was originally described from DaCosta, ATLANTIC County, and Formosa Bog, CAPE MAY County (Calvert, 1903).

Dates: 10 June - 10 Sept.

[123] *Somatochlora tenebrosa* (Say)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MONMOUTH,

MORRIS, OCEAN, SALEM, SOMERSET,
SUSSEX.

Dates: 8 June - 9 Sept.

[124] *Somatochlora walshii* (Scudder)

BERGEN (Mahwah Twp., powerline cut on Bear Swamp Rd., 21 July 1992, AB), MORRIS (MorrisTwp., Washington Valley, marsh along Whippany River, 1 July 1982, JCM; town of Budd Lake, 3-4 Aug. 1996, AB), SUSSEX (larvae, Sandyston Twp., stream from bog on Shay Rd. above Tilman Ravine, coll. 16 May, em. 26 May 1995, MLM). Reported without complete data by Carle (1989).

Main range north of NJ, where it typically inhabits open bogs and small bog streams.

[125] *Somatochlora williamsoni* Walker

MORRIS (Rockaway Twp., end of Valley Rd. nr. Burnt Meadow Brook, 19 & 22 June 1986, JCM; Rockaway Twp., Lake Denmark, 15 June 1992 - 22 July 1995, AB, FLC; Powerline Pond, 18 June 1988 - 29 June 1994, FLC; Railroad Pond 5 July 1993 - 22 July 1995, FLC; Hanover Twp., marsh just W. of Morristown Municipal Airport, 26 June 1988, JCM). Reported without complete data by Carle (1989).

[126] *Williamsonia lintneri* (Hagen, in Selys)

BERGEN (Mahwah Twp., Campgaw Reservation, 9 May 1993, AB), PASSAIC (Patterson, 4 May [Davis, 1913b]).

This species was thought to be extirpated in and possibly never established as a breeding species in NJ. Thus the recent report by Donnelly (1993) of a capture by A. Barlow is of great interest. Nevertheless, surveys for this species of over 50 sites in northern NJ between 1988 and 1995 have not produced a single reproducing population. Otherwise the species is restricted to bogs in southern New England characterized by an extensive *Sphagnum* "soup".

- LIBELLULIDAE (LIBELLULINAE)

[127] *Brachymesia gravida* (Calvert) *

CAPE MAY ? (sight record, CAPE MAY Point, Lily Lake 22-26 Aug. 1995, J. Dowdell and others; single male, thought to be a stray), CUMBERLAND (Fortescue, Cabin Island Ponds, 3 Sept. 1994, FLC).

These are nearly the northernmost records of this species, which has also been reported just across the Delaware Bay in Delaware. It seems to be largely a saltmarsh resident in the northern part of its range.

[128] *Celithemis elisa* (Hagen)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 12 May - 8 Oct.

[129] *Celithemis eponina* (Drury)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, MERCER, MIDDLESEX, MORRIS, SALEM, SOMERSET, SUSSEX, WARREN.

Dates: 14 June - 19 Sept.

[130] *Celithemis fasciata* Kirby

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, OCEAN.

Often recorded in the literature as *C. monomalaena* Williamson, but this name is now generally considered a synonym of *fasciata* (e.g. Carle 1982)

Dates: 27 May - 9 Sept.

[131] *Celithemis martha* Williamson

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, OCEAN.

This species is similar to *C. ornata*, and the first report from NJ that clearly distinguishes the species is that of Beatty (1946). Recently Orr

(1994) questioned whether the two are indeed distinct, but MLM and FLC examined Orr's questionable specimens and consider that they can be reliably assigned to one or the other species using keys provided in Carle (1982). It is virtually confined to the Pine Barrens.

Dates: 9 May - 29 Sept.

[132] *Celithemis ornata* (Rambur)

BURLINGTON (Pemberton Twp., Upton Ponds, 29 June 1945 [Beatty, 1946]), CAMDEN (Clementon, 22 July, ANSP), SOMERSET (Carle's Pond, 10 July 1973, FLC; additional date not available, but recorded only twice over ~ 25 years).

See remarks under *C. martha*.

[133] *Celithemis verna* Pritchard

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY (Gillespie, 1941), CUMBERLAND.

A southern species found locally in the Pine Barrens with a relatively short and early flight season.

Dates: 6 June - 18 July.

[134] *Erythemis simplicicollis* (Say)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, UNION, WARREN.

Dates: 7 May - 8 Oct.

[135] *Erythrodiplax berenice* (Drury)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MIDDLESEX, MONMOUTH, OCEAN, SOMERSET.

Largely confined to salt marshes, although reported from freshwater, even bog, sites by Barber (1994). The records from Bergen and Somerset Cos. are inland (Ramsey and

Martinsville, respectively) and probably represent strays.

Dates: 16 May - 15 Sept.

[136] *Ladona deplanata* (Rambur)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MONMOUTH, OCEAN.

Literature records are not reliable because of confusion among species of *Ladona* (Carle 1982, May 1992). We recognize *Ladona* as a full genus rather than a subgenus of *Libellula*, although a thorough study of the group is necessary to resolve fully the relationships of *Libellula* and its close relatives.

Dates: 7 Apr. - 12 July.

[137] *Ladona exusta* (Say)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SUSSEX.

See note under preceding species.

Dates: 20 Apr. - 3 Aug.

[138] *Ladona julia* (Uhler)

BERGEN, BURLINGTON (reared larvae, Tabernacle Twp., Friendship, FLC), MIDDLESEX (East Brunswick, Weston's Mill Pond, 20 June 1979, MLM; Edison, 31 May, AMNH), MORRIS, PASSAIC, SOMERSET (Warren Twp., Carle's Pond, 20 May - 10 June, FLC), SUSSEX, WARREN.

Common in the Highlands, rarely extending to the Coastal Plain (BURLINGTON and MIDDLESEX Cos.); many of the northern records for *L. exusta* in Smith (1910) and Davis (1913a) may actually be of this species. Listed from NJ by Carle (1982), and reported from Lake Denmark, MORRIS Co., by May (1992).

Dates: 15 May - 24 July.

[139] *Leucorrhinia frigida* Hagen

BERGEN, BURLINGTON (Beatty, 1946),
MORRIS, SUSSEX.

Beatty's original record from Upton Ponds in Burlington Co. is unusual, as this is generally a species of northern boggy or marshy ponds. It can be locally abundant.

Dates: 15 May - 27 July

[140] *Leucorrhinia glacialis* Hagen *

MORRIS (Picatinny Arsenal at Bear Swamp Pond, 25 June 1993, FLC), SUSSEX (Mashipacong Bogs Preserve at Lost Pond, 15 June 1995, FLC).

[141] *Leucorrhinia hudsonica* (Selys)

SUSSEX (Montague Twp., Lost Pond, 17 May - 4 July 1988-1995, FLC; Franklin bog, 18 May 1988, FLC; larvae, Gerard Fen, 5 May 1995, FLC). Reported without complete data by Carle (1989).

[142] *Leucorrhinia intacta* (Hagen)

BERGEN, BURLINGTON, CAMDEN, ESSEX,
MIDDLESEX, MORRIS, PASSAIC, UNION,
SOMERSET, SUSSEX, WARREN.

Dates: 18 Apr. - 9 Aug.

[143] *Leucorrhinia proxima* Calvert *

BERGEN (Mahwah Twp., small boggy pond nr. Bear Swamp Lake, 22 June 1983, MLM), MORRIS (Rockaway Twp., Picatinny Arsenal, Lake Denmark, 4 June 1985, MLM, RU), SUSSEX (Montague Twp., Mashipacong Pond, 21 June 1985, RU).

[144] *Libellula auripennis* Burmeister

BURLINGTON (Pemberton Twp., Upton Ponds, 15 May 1990, RU; 15 June 1990, MLM), CUMBERLAND (Barber, 1994; Clark's Pond, 14 July 1994, FLC; Stow Creek pond, 24 Aug. 1994, FLC), GLOUCESTER (Franklinville, 29 June 1938 - 14 July 1939, ANSP).

Nearly all old literature records of this species actually were of *L. needhami*. Beatty (1946) reported *auripennis* from Upton Ponds but implied in an accompanying footnote that he believed they were actually *needhami*; in view of the recent records from that site, probably his original designation was correct.

Dates: 15 May - 24 Aug.

[145] *Libellula axilena* Westwood

ATLANTIC, BURLINGTON, CAMDEN,
CAPE MAY, CUMBERLAND, OCEAN.

This species, nearly at its northern limit here, occurs locally in the southern third of the state; it has often been confused with the much more common *L. incesta* and *L. vibrans*, but reliable keys for males, females and larvae are provided by Carle (1982) and Dunkle (1985). All records cited herein are based on confirmed specimens.

Dates: 4 June - 27 Sept.

[146] *Libellula cyanea* Fabricius

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
ESSEX, GLOUCESTER, MIDDLESEX,
MONMOUTH, MORRIS, PASSAIC,
SOMERSET, SUSSEX, UNION.

Dates: 18 Apr. - 24 Aug. Generally the earliest *Libellula* to emerge in southern NJ.

[147] *Libellula flavida* Rambur

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
OCEAN.

Generally a Pine Barrens species, although Davis (1913a) also recorded it from Westchester Co., NY.

Dates: 11 May - 4 Sept.

[148] *Libellula incesta* Hagen

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, MERCER, MIDDLESEX,

MONMOUTH, MORRIS, OCEAN, PASSAIC,
SOMERSET, SUSSEX, WARREN.

See remarks under *L. axilena*.

Dates: 25 May - 12 Oct.

[149] *Libellula luctuosa* Burmeister

BERGEN, BURLINGTON, CAMDEN,
CUMBERLAND, ESSEX, GLOUCESTER,
HUNTERDON, MERCER, MIDDLESEX,
MONMOUTH, MORRIS, OCEAN, PASSAIC,
SOMERSET, SUSSEX, WARREN.

Dates: 18 Apr. - 13 Sept.

[150] *Libellula needhami* Westfall

ATLANTIC, CAPE MAY (Westfall, 1943),
CUMBERLAND, MONMOUTH, OCEAN
(Westfall, 1943), SALEM.

Practically restricted in NJ to coastal areas, often
in slightly brackish water. See remarks under *L.*
auripennis.

Dates: 21 May - 20 Sept.

[151] *Libellula pulchella* Drury

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
ESSEX, GLOUCESTER, HUNTERDON,
MERCER, MIDDLESEX, MORRIS, OCEAN,
PASSAIC, SOMERSET, SUSSEX, WARREN.

Dates: 22 May - 23 Oct.

[152] *Libellula quadrimaculata* Linnaeus

BERGEN, CAMDEN?, ESSEX, MIDDLESEX,
MORRIS, PASSAIC, SOMERSET, SUSSEX.

The Camden Co. record is out of the usual range
and habitat and should be confirmed.

Dates: 15 May - 1 July.

[153] *Libellula semifasciata* Burmeister

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
ESSEX, MERCER, MIDDLESEX, MORRIS,

OCEAN, PASSAIC, SALEM, SOMERSET,
SUSSEX.

Dates: 7 May - 9 Oct. Commonly one of the
first *Libellula* on the wing; Soltesz, et al. (1995)
noted an apparent migratory influx in 1995.

[154] *Libellula vibrans* Fabricius

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
MORRIS, OCEAN, SOMERSET, SUSSEX.

A species of woodland ponds and swamps.
Immatures and females can be confused with *L.*
axilena or *incesta*, see remarks under *L. axilena*

Dates: 5 June - 7 Sept.

[155] *Nannothemis bella* (Uhler)

ATLANTIC, BURLINGTON, CAMDEN,
CAPE MAY, CUMBERLAND,
GLOUCESTER, MONMOUTH, MORRIS,
OCEAN, SUSSEX.

It is surprising that this tiny species, largely
known from the Pine Barrens in NJ, has not
been found more frequently in northern upland
bogs, since it is known from well into the
Adirondacks in NY.

Dates: 11 May - 5 Sept.

[156] *Pachydiplax longipennis* (Burmeister)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, MERCER, MIDDLESEX,
MONMOUTH, MORRIS, OCEAN, PASSAIC,
SALEM, SOMERSET, SUSSEX, WARREN.

Dates: 17 May - 20 Oct.

[157] *Pantala flavescens* (Fabricius)

ATLANTIC, BERGEN, BURLINGTON,
CAMDEN, CAPE MAY, CUMBERLAND,
GLOUCESTER, MIDDLESEX, MORRIS,
SOMERSET.

Both this and the next species are usually
common in central and southern NJ in
midsummer and apparently breed successfully.

Despite the earlier latest date, *P. flavescens* tends to be most common later than *P. hymenaea*.

Dates: 11 June - 8 Oct.

[158] *Pantala hymenaea* (Say)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, MIDDLESEX, MORRIS, OCEAN, SOMERSET, SUSSEX.

Dates: 21 May - 23 October.

[159] *Perithemis tenera* (Say)
(= *P. domitia*, pre- Needham & Westfall, 1955)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, GLOUCESTER, MERCER, MIDDLESEX, MONMOUTH, MORRIS, SALEM, SOMERSET, SUSSEX, UNION, WARREN.

Dates: 1 June - 15 Sept.

[160] *Plathemis lydia* (Drury)
(= *Libellula lydia* of authors)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SALEM, SOMERSET, SUSSEX, UNION, WARREN.

We have very serious reservations about the validity of the name *Plathemis* and are inclined to consider it a junior subjective synonym of *Platetrum* Newman, as in Schmidt (1987), because it seems obvious that the species attributed to *Plathemis* form a close, monophyletic group with the European *depressa*, the type of *Platetrum*. However, owing to uncertainty about the availability of the name *Platetrum* and the designation of the type of *Libellula* (Bridges, 1994) we continue to use *Plathemis* as a stopgap measure.

Dates: 29 Apr. - 19 Sept.

[161] *Sympetrum (Kalosympetrum) ambiguum* (Rambur)

ATLANTIC, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND.

A southern species, mostly at temporary woodland ponds and ditches. Recorded in the old literature as *S. albifrons*.

Dates: 18 June - 24 Oct.

[162] *Sympetrum (Kalosympetrum) janeae* Carle

ATLANTIC, BERGEN, BURLINGTON, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, Hudson, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, UNION, WARREN.

Our commonest and most recently described *Kalosympetrum*, it has long been confused with both *S. internum* and *S. rubicundulum*, and presumed hybrids with other *Kalosympetrum* have been reported (Carle, 1993; Barber, 1994).

Dates: 10 June - 27 Oct. A specimen in the RU collection from Somerset Co. dated 20 May 1975 may be in error.

[163] *Sympetrum (Kalosympetrum) obtrusum* (Hagen)

BERGEN (Little Ferry, 15 Aug. 1909, AMNH), BURLINGTON (Lebanon State Forest, Pakim Pond, 8 Sept. 1980, FLC), CUMBERLAND (Barber, 1994), GLOUCESTER? (Franklinville, 21 June 1940, FSCA; possible hybrid), MIDDLESEX? (Dayton, 4 Sept. 1990, MLM; New Brunswick, Rutgers Univ. Hort. Farm #3, 6 Oct. 1990, RU; possible hybrids), MORRIS (Picatinny Arsenal, Powerline Pond, 13 Aug. 1993, 26 Aug. 1994, 13 Sept. 1984), SOMERSET (Warren Twp., Carle's Pond, 5 Sept. 1977, FLC), SUSSEX (Montague Twp., Mashipacong Pond, 21 July 1994, 10 Sept. 1993, FLC), WARREN (Delaware Water Gap, date unknown, A. T. Slosson, AMNH). Reported without complete data by Carle (1982, 1993).

Some records of this species are difficult to confirm because of probable hybridization with *S. janeae* and *S. rubicundulum* (see note under *S. janeae*).

Dates: 21 June - 15 Oct.

[164] *Sympetrum (Kalosympetrum) rubicundulum* (Say)

CAPE MAY, CUMBERLAND (Barber, 1994), SOMERSET, MIDDLESEX. Reported without complete data by Carle (1982, 1993).

The situation with this species is much the same as for *S. obtrusum*, except that its range in NJ seems more restricted, being near its northern limit. Although pure *S. rubicundulum* occur on the Piedmont and Coastal Plain as far north as Cape Cod (Carle, 1993), only two specimens collected by Barber were considered clearly to be *S. rubicundulum*.

Dates: 15 - 28 Sept.

[165] *Sympetrum (Sympetrum) costiferum* (Hagen)

HUNTERDON (5 mi. N. of Ringoes, 9 Sept. 1973, E. W. Stiles, in collection of D. R. Paulson). First reported by Carle (1989) without data.

The identity of the single male specimen was reconfirmed by Paulson. The precise collection site is not certain, and since no others have been taken this may have been a stray. Donnelly (1992) reported it as sporadic in Broome Co., NY.

[166] *Sympetrum (Sympetrum) semicinctum* (Say)

BERGEN, BURLINGTON, CUMBERLAND, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, WARREN, SOMERSET, SUSSEX--.

Another species apparently experiencing large population fluctuations, at least in central and southern NJ; we found it rather commonly in Middlesex County during 1982-1984 but have not recorded it there since.

Dates: 24 June - 13 Sept.

[167] *Sympetrum (Sympetrum) vicinum* (Hagen)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, Hudson, HUNTERDON, MERCER, MIDDLESEX, MONMOUTH, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX.

Undoubtedly our most abundant and widespread *Sympetrum* in NJ, and the latest on the wing, although its relative abundance declines northward. It probably occurs in every county.

Dates: 21 June - 8 Dec. Emergence occurs from late June through early August, with scattered individuals eclosing as late as the third week of August (Nemjo, 1986); mature adults ordinarily do not appear at breeding sites until late August, however, with peak numbers present generally from mid-September through mid-October. We have seen only a few adults, these almost all immature, from mid-July through most of August, and their whereabouts at this time is unknown to us.

[168] *Sympetrum (Tarnetrum) corruptum* (Hagen)

CAPE MAY, CUMBERLAND, MORRIS, OCEAN.

Very sporadic in NJ and probably not breeding here, although egg laying has been observed in farm ponds of western Virginia (FLC). The only recent reports in NJ are of single males at two sites in Cumberland Co. in 1994 and a small and scattered influx appearing at Cape May Point and Higbee Beach, Cape May Co., 30 Sept. 1992, with individuals present for several weeks (J. Dowdell, R. Barber; vide K. Soltesz); the species is known to be migratory on the Pacific Coast.

Dates: 28 June - 28 Oct.

[169] *Tramea calverti* Muttkowski

CAPE MAY, CUMBERLAND.

Known in the eastern U.S. only as a rare stray from Mexico and/or the Caribbean until 1992, this species invaded the northeast as far north as New York City in late summer of that year (Barber, 1994; Soltesz, 1992). Although it is a

mainly tropical species, numerous mating and ovipositing pairs were observed in NJ, and at least two individuals were observed in June 1993 and another on 24 May 1994 (Cedarville Ponds, FLC), suggesting the possibility that at least a few successfully overwintered and emerged.

Dates: 24 May - 8 Oct.

[170] *Tramea carolina* (Linnaeus)

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, ESSEX, GLOUCESTER, HUNTERDON, MIDDLESEX, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX.

Like a few other species, *T. carolina* has a partly disjunct range in NJ, with few records from the Piedmont and Inner Coastal Plain. Like its congeners, however, it is partly migratory and could show up anywhere.

Dates: 30 Apr. - 29 Sept.

[171] *Tramea lacerata* Hagen

ATLANTIC, BERGEN, BURLINGTON, CAMDEN, CAPE MAY, CUMBERLAND, GLOUCESTER, HUNTERDON, MIDDLESEX, MORRIS, OCEAN, PASSAIC, SOMERSET, SUSSEX, WARREN.

Like *T. carolina*, *lacerata* is at least partly migratory but is a regular and common member of our fauna.

Dates: 27 Apr. - 23 Oct.

[172] *Tramea onusta* Hagen

CAPE MAY, CUMBERLAND (sight record; Barber, 1994).

Another tropical migrant, in this case also relatively common in the mid- south and southwestern states, that appeared along with *T. calverti* in 1992, although apparently in smaller numbers. It has not been seen subsequently.

Dates: 4 July - 29 Sept.

SPECIES DOUBTFULLY OR ERRONEOUSLY RECORDED FROM NEW JERSEY

Hetaerina titia (Drury)

Recorded without specific data from NJ by Montgomery (1947; cited in Johnson, 1973). Johnson was unable to confirm the record, nor have we. Burmeister's type locality for *H. tricolor*, a probable synonym of *titia*, is "Philadelphia", but the accuracy and interpretation of this locality is open to serious question (Beatty, et al., 1970). The occurrence of *titia* in NJ must be considered extremely doubtful.

Argia sedula (Hagen)

Listed without details by M. J. Westfall in an unpublished, mimeographed letter addressed "To Our Colleagues:" and distributed widely in the early 1970's. The occurrence of this species has never been substantiated, although it is to be expected, as it has been taken in northern Delaware and southeastern Pennsylvania (Roback and Westfall, 1967; Beatty, et al., 1970)

Enallagma pollutum (Hagen)

This is a southeastern species that probably does not occur north of Georgia. As noted above, *E. vesperum* was confused with *pollutum* until correctly distinguished and described by Calvert (1919).

Aeshna grandis (Linnaeus)

Recorded by Hagen (1875) from Bergen Hill, Middlesex County. The identification probably was correct, as Hagen must have been familiar with this European species. The specimen had been collected by a Mr. Guex of Bergen Hill and was conveyed to Hagen by Prof. Schaum of Berlin, raising the possibility that a European specimen had become mixed in with specimens from New Jersey.

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APPENDIX

Substantial disagreement and confusion continue to surround the taxonomy of North American members of the genus *Gomphus*, *sensu lato* (Needham & Westfall, 1955), despite the revised classification proposed by Carle (1986). Of the five subgenera recognized by Needham and Westfall, *Arigomphus* and *Stylurus* are almost universally considered distinct genera today and will not be discussed further. Here we attempt to deal with two sources of controversy that relate specifically to the remaining North American subgenera: 1) whether *Gomphus consanguis* and *G. rogersi*, placed in *Gomphurus* by Needham and Westfall (1955), should be removed to a separate taxon, *Stenogomphurus* Carle; and 2) the relations (and, consequently, the appropriate names) of the species groups placed in subgenera *Gomphus* and *Hylogomphus* by Needham and Westfall, both to one another and to the type of the genus, the European *G. vulgatissimus*. These systematic issues are further complicated by confusion over nomenclatorial questions. We hope to be able to clarify at least some aspects of both nomenclatorial and substantive taxonomic problems.

The principal question of nomenclature is whether *Phanogomphus* (proposed by Carle, 1986, to substitute for subgenus *Gomphus* of Needham and Westfall) and *Stenogomphurus* have been introduced by Carle (1986) in such a way as to make them available and/or valid (International Commission on Zoological Nomenclature, 1985; hereafter, the Code). The issues raised to us in the initial review of this paper are whether these taxa are properly diagnosed because they were diagnosed in a key and, in the case of *Stenogomphurus*, because it was explicitly distinguished from *Gomphurus* only in Carle (1982). We believe neither objection affects availability of the names. The Code does not proscribe the description of new taxa in a key, as in Carle (1986), and only says (in General Recommendations 23, which are not binding) that a new name should not be initially published "in ... a key, published in advance of the work that contains the description of the new taxon" (our emphasis).

A variety of conditions affecting availability are discussed in the Code in Art. 10-20, but the one

relevant to the issue of diagnosis, for names published after 1930, is Art. 13a,i, which states that a name must be "accompanied by a description or definition that states in words characters that are purported to differentiate the taxon". It does not require that the proposed taxon be specifically compared to any other particular taxon. The fourth edition of the Code probably will require that new taxa be diagnosed in part by comparison with at least one other taxon of the same rank (Kraus and Ride, 1995), but this, although not yet in force, was done in Carle's key. (It nevertheless seems wise, but is not required, that if species are transferred from an existing to a new subgenus, the new subgenus be compared with the old; Carle earlier [Carle, 1982] diagnosed both *Gomphurus* and *Stenogomphurus* at length, but that thesis is not a publication within the meaning of the Code [Art. 8c, 9] and was not cited in the descriptions of *Gomphus* subgenera in Carle [1986] - MLM). Beyond this, all names must "be treated as valid when proposed" (Art. 11d), i.e., must have been presented by their author as, in his opinion, the correct name under the Code for the taxon named, which certainly was true in this case. Genus-group names must be accompanied by designation of a type species (Art. 13b), which Carle (1986) did (*Gomphus minutus* for *Phanogomphus*, *G. consanguis* for *Stenogomphurus*). Furthermore, we know of no evidence, nor has any suggestion been made to us, that the proposed names are junior homonyms (having identical spelling) or junior objective synonyms (having the same type species) of previously proposed names. In addition, although Carle (1986), in a comment, incorrectly attributed the name *Phanogomphus* to Carle and Cook (1984), (a type-setting error for "Carle and Cook [in Carle 1986]") this does not affect the validity of the name. Thus, we believe the only basis on which either name could be invalid is as a junior subjective synonym. This is a matter of taxonomic opinion and will be discussed further below.

A peripherally relevant issue is that of the status of the name *Hylogomphus*. It was abandoned by Carle (1986) as a junior subjective synonym of *Gomphus*. Whether or not that opinion is correct, however, *Hylogomphus* probably is not now an available name (Bridges, 1994). It is usually credited to Needham (1951), but he introduced the name without any description

and with only an "indication" (i.e., that the name refers to the "brevis group" of species) that is not acceptable in publications after 1930. The first description was in Needham and Westfall (1955), but they did not designate a type species, as required by Art. 13b.

As far as taxonomic substance (i.e., whether or not *Stenogomphurus* and *Phanogomphus* are junior subjective synonyms of *Gomphurus* and *Gomphus*, respectively), we are not entirely of one mind. We both agree that *Stenogomphurus* is a monophyletic group that is phenotypically distinct from *Gomphurus*, although in the absence of a published phylogeny, MLM considers it possible (but unlikely) that recognition of *Stenogomphurus* could render *Gomphurus* paraphyletic; FLC considers the monophyly of each taxon to be well supported. FLC likewise considers *Phanogomphus*, as described in Carle (1986), to be monophyletic and distinct from *Gomphus*, although he also regards the North American species placed in subgenus *Gomphus* including various European species to be slightly more closely related among themselves than any are to *G. vulgatissimus* or to *Shaogomphus* Chao. MLM, although inclined to agree, has some doubts as to the monophyly of *Phanogomphus*, at least in the broadest sense, i.e., if taken to include all the species of Needham and Westfall's (1955) subgenus *Gomphus*.

Despite these uncertainties, we both maintain that *Stenogomphurus* can be diagnosed relative to *Gomphurus*, as can *Phanogomphus* relative to *Gomphus* (albeit with some difficulty in the second instance). All these names are used in the sense of Carle (1986). The main question is whether the characters given are decisive indicators of phylogeny. This resolves itself into the more specific questions of whether: 1) the congruent character sets given by Carle (1982, 1986) are uncorrelated; 2) the exceptions are due to convergence (especially convergence due to losses, i.e., exapomorphies of Carle [1995]) or common ancestry; and 3) incongruent uncorrelated character sets exist. Resolving these issues is beyond our scope here, but will be dealt with in Carle (In prep.); we do, however, wish, by means of the following selected tabular comparisons, to illustrate that distinguishing characters exist. We note, too, that although many of these characters might

appear to become trivial in a phenetic analysis, current research by Carle (In prep.) suggests that some may have phylogenetic implications at an even deeper level than suggested by these subgeneric comparisons. Larval characters have been added from the unpublished keys of FLC and from Louton (1982). We hope that the following tables will help to solve the practical problem of correctly placing isolated males, females, and larvae within subgenera and that they also will focus attention on the larger issue of evaluating relationships among these and closely related taxa, rather than on nomenclatorial procedure and/or the clarity with which taxa have been defined.

	<i>Gomphurus</i>	<i>Stenogomphurus</i>
Head / legs	Width of head ≤ 0.83 (usually ≤ 0.80) times length of metafemur.	Width of head > 0.9 times length of metafemur.
Wings	Anterior side of forewing triangle shorter than, or occasionally subequal to, proximal side. Wing tips hyaline.	Anterior side of forewing triangle ca. 1.2 times length of proximal side. Wing tips clouded.
Penis vesicle	Not compressed laterally near apex; receiver open ventrad, troughlike or dishlike.	Slightly compressed laterally near apex; receiver cleftlike, narrowing caudad and appearing "pinched closed" at postero-ventral end.
Anterior hamuli	Medioapical lobe not extending posteriorly as far as lateroapical lobe, the latter relatively wide along antero-posterior axis and denticulate on apical margin.	Medioapical lobe extending posteriorly well beyond the lateroapical lobe, the latter narrowed along antero-posterior axis and denticulate on subapical posterior margin.
Abdominal segment 8	1.5-1.6 times length of segment 9. Lateral rims black along apical half. Male tergal margins at least moderately expanded.	1.2-1.4 times length of segment 9. Lateral rims yellow along apical half. Male tergal margins slightly expanded.
Vulvar lamina	Lateral margins markedly concave along at least part of their length, apexes usually divergent.	Lateral margins smoothly convex along entire length, apexes approximately parallel.
Larval labium	Ligula with well developed median tooth.	Ligula without well developed median tooth.
Larval spination	Lateral spines of abdominal segment 9 at least as long as middorsal length of segment 10, lateral spines of segment 8 distinctly smaller than those of 9.	Lateral spines of abdominal segment 9 distinctly shorter than middorsal length of abdominal segment 10, lateral spines of segment 8 subequal to those of 9.

	<i>Phanogomphus</i>	<i>Gomphus</i>
Anterior hamuli	Lateroapical lobe usually distinctly spinose or hooklike, medioapical lobe often reduced, sometimes obsolete or fused	Lateroapical lobe denticulate, medioapical lobe well developed.
Posterior abdominal segments	Middorsal length of segment 9 0.81-1.60 times length of 8.	Middorsal length of segment 9 0.56-0.73 times length of 8.
Sternum of 10th abdominal segment	Males with posterior margin nearly straight. Female with midventral length >0.5 times its width.	Males with posterior margin shallowly V- or U-shaped. Female midventral length <0.5 times its width
Male cerci	Dorsoventrally flattened and markedly excavated ventrally so basolateral margin is strongly carinate; medial margin usually expanded ventromedially to form a flange or tooth clearly visible in lateral view	Not dorsoventrally flattened or markedly excavated ventrally, basolateral margin not strongly carinate; medial margin without ventromedial expansion.
Vulvar lamina	Usually < 1/3 length of abdominal sternum 9.	At least 2/5 length of abdominal sternum 9.
Larval spination	Lateral spines of segment 9 at most 1/2 as long as segment 10, lateral spines of segments 8 and 9 subequal in length. Middorsal prominence of segment 8 well developed.	Lateral spines of segment 9 more than 1/2 as long as segment 10, lateral spines of segment 8 distinctly shorter than those of 9. Middorsal prominence of segment 8 vestigial or absent.
Larval abdominal segments	Segment 9 with basal width 1.0-2.0 times middorsal length Segment 10 with middorsal length 0.6-0.9 times its width.	Segment 9 with basal width 2.8-3.5 times middorsal length. Segment 10 with middorsal length 0.3-0.5 times its width.