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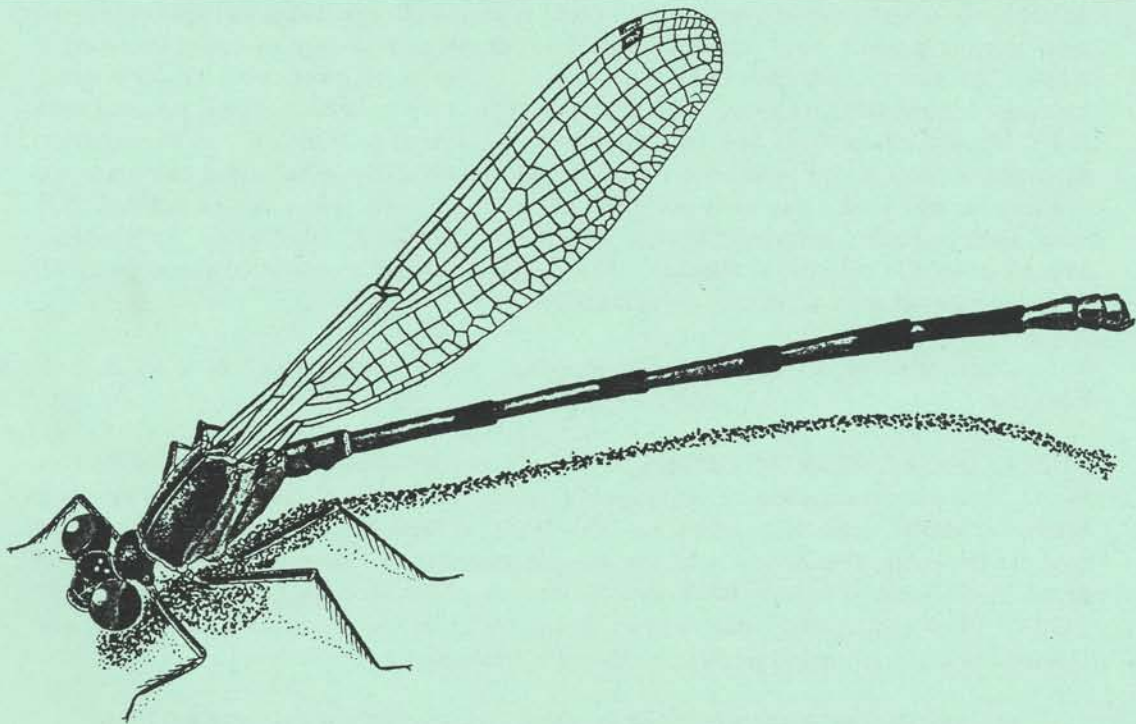
ARGIA

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V. Hellebuyck 1985

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THE DRAGONFLY SOCIETY OF AMERICA

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ARGIA, the quarterly news journal of the DSA, is devoted to non-technical papers and news items relating to nearly every aspect of the study of Odonata and the people who are interested in them. The editor especially welcomes reports of studies in progress, news of forthcoming meetings, commentaries on species, habitat conservation, noteworthy occurrences, personal news items, accounts of meetings and collecting trips, and reviews of technical and non-technical publications. Articles for publication in **ARGIA** should preferably be submitted and hard copy and (if over 500 words) also on floppy disk (3.5" or 5.25"). The editor can prefer MS DOS based files, preferably written in WORD, WORD for WINDOWS, WordPerfect, or WordStar. Macintosh WORD disks can be handled. Other languages should be submitted as text (=ASCII) files. Line drawings are acceptable as illustrations.

The permanent editor is Carl Cook. The temporary editor, starting with vol. 4, no. 2, is T. Donnelly.

BULLETIN OF AMERICAN ODONATOLOGY is devoted to studies of Odonata of the New World. This journal considers a wide range of topics for publication, including faunal synopses, behavioral studies, ecological studies, etc. The **BAO** publishes taxonomic studies but will not consider the publication of new names at any taxonomic level. Enquiries and submission of manuscripts should be made to **BAO** editor T. Donnelly, 2091 Partridge Lane, Binghamton NY 13903. Final submissions (after review) should be made on floppy disk, as above, with illustrations in final form and preferably adjusted to final size.

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Membership in the DSA is open to any person in any country. Dues for individuals are \$10 for regular membership and \$15 for contributing membership, payable annually on or before 1 March of membership year. Institutional (e.g. libraries or universities) membership is \$15 per year. All members receive **ARGIA** via surface mail at no additional cost. For delivery by first class in the U.S. there is an additional charge of \$4, and for Air Mail delivery outside the U.S. a charge of \$8.

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Cover: *Argia oenea*, by the well-known Salvadoranean artist Victor Hellebuyck

ARGIA - The News Journal of the D.S.A.

Temporary editor: T. Donnelly, 2091 Partridge Lane, Binghamton NY 13903

CARL COOK CONVALESCING

Our past president - and editor of **ARGIA** - is convalescing following surgery on 9 June. Carl will undergo extensive post-operative care in the V.A. hospital at Louisville, but he is home most weekends. He tells me that he is not feeling too badly, but that he has been left with diminished stamina. He will miss collecting this season but expects to be out swinging a net next year.

Because of his surgery, I have temporarily taken over **ARGIA**. Thanks are due to many people for assistance with this number!

I am sure all the D.S.A. membership joins with me in wishing Carl a speedy recovery!

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WHAT HAPPENED TO SPRING?

After the remarkably early spring of last year, we should have expected that there would be no repeat this year. In the northeast, the month of May was essentially lost for odonate collecting. Even larval collecting was difficult because of hazardous high waters in the local rivers and streams. The Maryland trip produced few odonates - and these were mainly teneral. A few really nice days sandwiched in the midst of really cold, wet weather do not produce many odonates.

Driving down to the Tennessee meeting was one of our wettest experiences in recent years. Torrential rains in Virginia and North Carolina prevented even thinking about collecting. The New River at the North Carolina state line was in serious flood, with inhabitants of several counties begging for disaster aid. As for Tennessee . . . I should have realized something was wrong when I saw a huge wooden ship with a pair of *Hagenius* flying on board . . .

Our post trip mini gathering in Pickett State Park suffered again from all the rain. The creeks were full and showed the devastation of the previous week all too clearly. The few odonates we saw (mainly *Tachopteryx thoreyi*) were

somewhat teneral - always a bad sign. The Clear Creek site (Morgan Co.) for swimming *Calopteryx angustipennis* was swollen and too dangerous to wade. The one specimen I saw of this species was perched rather bedraggled on a rock. However, the mid-day flight of *Neurocordulia yamaskanensis* was nearly as spectacular as it had been two years ago - rain and swollen rivers do not bother everybody. Finishing off our trip with a loop through Blacksburg and western Virginia we found - more rain! In fact we came home a day early in - you guessed it - a major torrential downpour.

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GO WEST YOUNG ODONATIST!

1993 Meeting to be in OREGON

Rarely do a group of Odonatists agree on any point, but there was nearly universal agreement that we should meet in Oregon in July 1993. The group might have been influenced by Steve Valley's excellent photos of *Tanypteryx hageni*, not to mention other species, or they could simply have been influenced by some of his habitat photos. For these reasons and more, the group has decided to head west next year. The date of the meeting has not been set, but Steve feels mid to late July is the best time. This also will be a very suitable time for people who want to drive across the country and try some collecting in the Great Plains or Rockies.

Steve has informed us that this will probably be a camping meeting. Some people will not drive but will fly and rent cars. It was pointed out that if they can bring small tents and sleeping bags on the plane, then others, including locally situated people, can supply the cooking gear. This will probably be a more enjoyable format than staying at a motel and driving many tens of miles to good collecting sites.

Please plan to come along in 1993. This promises to be a really special meeting, with some very tantalizing pre- and post-meeting opportunities as well. For more information, you can contact Steve Valley, 1165 SW Lawrence, Albany OR 97321.

On Monday morning, most of the participants either started back home or followed Nick on the postmeeting trip to Pickett State Park. Sid, Steve and I did some more searching for *O. acuminatus*, but with little luck we parted ways late Monday. On the way home I thought about how quickly our time had passed, and how poor the collecting was for those who had travelled so far to get here. Even in good weather, the type of creeks we visited in this area of Tennessee are not highly productive, a reminder of how the Southeastern U. S. can sometimes hide its diverse assemblage of dragonflies. But then I remembered the site for next year's meeting. At Saturday night's meeting, Steve Valley offered to host the next gathering in Oregon, sometime in July, and the members approved the proposal. This will be one you won't want to miss. If you plan to fly, and want to camp in Oregon, just remember that Nick was told, "Bite your tongue!"

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NORTHEAST DRAGONFLY GROUP VISITS MARYLAND

The third annual northeastern spring trip of the D.S.A. took place on 23-24 May at the Patuxent National Wildlife Refuge, near Laurel, Maryland. Our host was Richard Orr, who has been studying the refuge and its odonate fauna for several years and who has compiled an impressive list.

The Patuxent refuge is a unique habitat - a very large enclave of wild land located about mid way between Washington and Baltimore. On the refuge are substantial populations of odonates which are otherwise quite in the state (such as *Progomphus obscurus*).

The refuge is a closed area devoted to a variety of activities which generally do not include dragonfly collecting, but Richard secured the necessary permission to give us access to the entire refuge. Well, almost the entire refuge. One forbidden area is the whooping crane breeding area. In the late afternoon we were constantly diverted in mid-stalk by the hideous cries of a huge flock of these birds - probably a unique experience for all of us.

The wet, cold spring put a significant damper on our collecting. Early species such as *Helocordulia selysi* and *Tetragoneuria spinosa* had finished their flight seasons, and later species such as *Gomphus rogersi* had not yet appeared. We did collect *Nasiaeschna pentacantha*, *Cordulegaster bilineata*, and *Lestes disjunctus australis*. Our species list was

not long, and few specimens were taken, giving the U.S. dragonfly supply a needed boost.

Attending this gathering were Ken and Joyce Soltész (and family), Allen Barlow, John Michalski, Hal White, Mike May, Nick and Ailsa Donnelly, and Mark Scoville

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PLANTS STRIKE BACK!

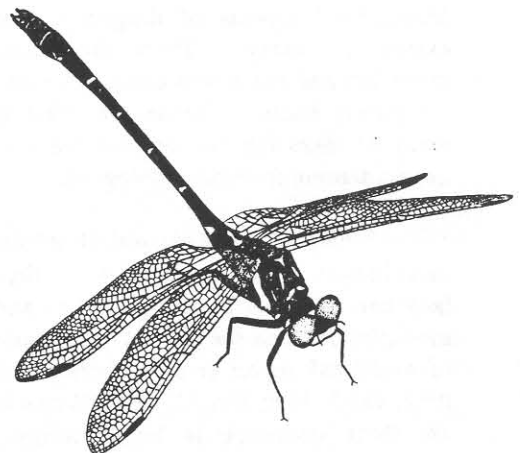
Susan Borkin has sent in this interesting note, taken from the first number of the Bulletin of the Wisconsin Natural History Society (1900).

"A rather unusual occurrence which created some little interest among local entomologists and others in August of the present year was the ensnaring of a large green dragon fly *Anax junius* Drury, by a tendril of wild balsam apple *Micrampelis lobata* Green.[Cucurbitacea].

"It is conjectured that the insect had settled upon the vine and becoming somewhat benumbed by the cool of evening, was easily entrapped by the outreaching tendril, which had wound itself quite tightly, twice about the insect's body, near the joint of the seventh and eighth abdominal segments.

"The prisoner remained quite lively for several days, often flying out to the length of its vegetable rope, until it perished at the hands of a careless observer.

"After our attention had been drawn to this curiosity, several instances of the entrapment of smaller species of the order Odonata by vine tendrils were also noted. In these cases the insects had been made prisoner by the tendrils entwining itself about their limbs." C.E. Brown



MIGRATING DRAGONFLIES IN NORTH AMERICA

Michael L. May, Dept. of Entomology, Rutgers Univ., New Brunswick NJ 08903 U.S.A.

Southern New Jersey forms a peninsula between the Atlantic Ocean and Delaware Bay, and thousands upon thousands of southbound birds are funneled to its tip at Cape May during autumn migration. The Cape May vicinity is famous for its spectacular flights of hawks and songbirds. Monarch butterflies are also abundant migrants here. Less well known, but closer to the hearts of DSA members, is the concurrent migration of *Anax junius*, *Pantala flavescens*, and *Tramea lacerata*. *Anax*, in particular, may occur in impressive numbers. Sometimes they make their way along the coast to Cape May Point, then head out over the bay toward Delaware. How many attempt or complete that journey is anybody's guess.

I first became interested in this phenomenon out of casual curiosity, then as a relatively easy source of *Anax* specimens for other purposes, and lately, inspired by the observations of Ken Soltesz and others, as an interesting problem in its own right. Piqued by recent reports in *ARGIA*, and with some prodding from Carl Cook, I've recently surveyed some of the literature on dragonfly migration, especially in North America, in hopes of determining what is known and not known about it and how some of the unknowns might be studied.

Observations of dragonfly migrations on this continent date back at least to the latter part of the last century (Calvert, 1893), and movements along the East Coast, including Cape May, as well as in parts of the Midwest, were recorded and mapped by Shannon in 1916. Nevertheless, our understanding of the most fundamental aspects of dragonfly migration is extremely scanty. Even the frequency of migration and the routes and sources of migrants are poorly known. These and other questions, many of them interrelated, deserve a great deal more attention from odonatologists.

From a purely practical standpoint, the most important question to answer at the outset is, how can migrants be recognized as such? The most obvious, and the subject of the vast majority of anecdotal report (e.g., Osburn, 1916; Borror, 1952; Cook, 1991; Daigle, 1991; Glotzhober, 1991), are those occurring in large swarms, moving

together in the same direction for sustained periods. Based on my own observations, however, I would guess that migrants more often occur as scattered individuals or small groups. These can be recognized in the fall, or at least strongly suspected, by repeated sightings of individuals in sustained, southbound flight, often along coastlines or other landmarks (including the Garden State Parkway!). Shannon (1916), Bagg (1958), and Dumont (1977) reported movements of this sort. Another possible indication of migration would be presence of aggregations in late summer/fall at southward-directed points of land, like Cape May or Point Pelee, Ontario (Corbet, 1984; Nisbet, 1960). The latter must be viewed with caution in the absence of observed directional movements though, because feeding aggregations in many species can be unrelated to long-distance migration. Wright's (1945) report of autumn feeding swarms of dragonflies along the Gulf Coast of Florida is sometimes cited as an example of migration, but my observations on the east coast of Florida, and, in fact, Wright's own interpretation, are more consistent with local movements correlated with wind-borne prey aggregations.

This raises the related question, which species migrate? Kormondy (1961) listed 7 or 8 North American migrants, and other authors add perhaps 4 or 5 others. These include scattered references to *Aeshna* spp., *Epiaeschna heros*, *Sympetrum vicinum*, and *Libellula pulchella*. For various reasons I am dubious of many of these reports. For instance, supposedly migratory specimens of *L. pulchella* seem always to be very worn, in contrast to the fresh condition of most migrants (see below). I suspect the *Libellula* may be present in swarms simply as a result of local feeding movements. In my opinion, only for *Anax junius*, *Tramea lacerata* and *T. carolina*, *Pantala flavescens*, and probably *Sympetrum corruptum* is evidence for migration persuasive. Nonetheless, movements of other species should be observed carefully and with an open mind.

Presuming that migrants can be identified, what is the frequency of migration? The answer is important because it may indicate whether migration is a regular, adaptive part of the life cycle or represents only an occasional irruption with very different, or perhaps no,

adaptive significance. The latter has been suggested by Dumont and Hinnekint (1973) for the most prominent European migrant, *Libellula quadrimaculata* (interestingly, I have not seen any unequivocal records of this species migrating in North America). They found that large migrations occurred at irregular intervals of approximately 10 years, and ordinarily followed very large mass emergences that had probably been synchronized by delays due to cold spring weather. They further hypothesized that large migratory swarms may result when non-adaptive movements are set off by "optical interaction-synchronization" (i.e., individuals that see others in flight are likely to start flying themselves) potentiated by "constant internal irritation" due to high trematode parasite loads. Mass movements of *Sympetrum corruptum* (Opler, 1971) in western North America may possibly be of a similar nature.

Undoubtedly the best study of life history of migrants in North America is that of Robert Trottier (1966, 1971), working on *Anax junius* in southern Canada, who found that near Montreal larvae probably do not overwinter at all, although they are regularly found during summer, whereas in southern Ontario both resident and migrant populations exist. The former emerge from later June through mid-July and have finished oviposition by mid August. The latter, presumably offspring of mature adults that appear in April or May, before any evidence of emergence, develop rapidly during the summer and emerge in late August through September. These observations clearly imply that migrations are a normal part of the life cycle that permits colonization of northern areas. This idea is supported by reports of apparently annual movements described along the eastern seaboard by Shannon and on the northern shores of Lake Erie by Nisbet (1960), Walker (1975) and Corbet (1984).

What routes do migrants follow, and how do they orient along them? Better data are available on this point than many others, owing, in large measure to Shannon's early work. Clearly the east coast from Maine at least to New Jersey, and probably to South Carolina and beyond, is one major flyway. Shannon's other major hypothesized pathways (based largely on observations of Monarch and other butterflies, but including sightings of Odonata) run along the north shores of Lakes Ontario and Erie, thence into Ohio (possibly this route could be extended a

bit further south based on the recent reports of Cook, 1991, and Glotzhober, 1991), along Lake Michigan and into central Illinois, and on a broad front from Minnesota into eastern Oklahoma; the last could be the source of large swarms reported in Texas by Daigle (1991) and others. These regular routes all follow obvious landmarks for much of their length, and several writers, especially Shannon (1916) and Dumont and Hinnekint (1973) emphasized the important of visual landmarks in orienting migration. On the other hand, even along well-marked flyways, dragonflies may sometimes pass over long stretches of water, such as Delaware Bay or Lake Erie (Corbet, 1984; Root, 1912), or relatively featureless plains without obvious landmarks. Corbet (1984), reporting on movements of *Hemianax ephippiger*, a well documented Old World migrant, on the plains of East Africa, suggested that their strikingly constant flight heading was due to sun-compass orientation. Also, most landmarks reported heretofore are coastlines or rivers, but Ken Soltesz (pers. comm., 1992) has relayed to me reports of apparently migrating dragonflies at hawk watches along mountain ridges in the east.

How is migration correlated with weather? This is a question that can be asked and answered at several levels. Migration itself is, in many cases, an adaptation to avoid seasonally unfavorable climatic conditions, or a response to mass emergence brought about by unusual weather or to population increases brought about by favorable weather conditions in arid regions (Dumont and Desmet, 1990). Weather may also have a profound effect on when and how migrants travel. Many insects, even strong fliers like migratory locusts, which actively maintain a constant flight heading, nevertheless actually move mostly passively with prevailing winds. Dumont (1977, 1988) and Dumont and Desmet (1990) presented evidence that *Hemianax* migrations are mainly of this type, and other tropical migrants like *Pantala flavescens* may fall into the same category. Some of these may fly at great height (Corbet, 1984). Even species that do closely follow fixed routes may take advantage of favorable winds created by particular weather patterns, much as migrating birds do. Bagg (1958) documented an apparent correlation between *Anax* migratory flight in New England and the passage, in early fall, of cold fronts that brought northeast, coastwise winds that could aid migration. Nisbet (1960) confirmed a similar phenomenon in migrants along Lake Erie.

What is the physical and physiological condition of migrants? This, again, may bear on the adaptive function of migration. Many insect migrants are pre-reproductive, with females often pre-vitellogenic; this presumably assures that when they reach a destination with conditions more favorable than at their departure point, they retain their maximum reproductive capacity (Johnson, 1969; Dingle, 1985). Migrating Odonata, too, are often described as teneral or "fresh", but numerous exceptions occur. Dumont and Hinnekint (1973) reported that a small fraction of migrating *L. quadrimaculata* in Belgium were mature and that other workers had found the bulk of *Sympetrum striolatum* migrants to be mature. The most thorough study to date is that of Corbet (1984), who found that the great majority of presumably-migrant species in Uganda and in Ontario, except *S. vicinum*, were pre-reproductive and laden with fat (the latter especially in aeshnids). I am currently investigating the condition of migrants along the New York-New Jersey coast. Although my data are still fragmentary, I have the impression that sexual maturity and fat stores increase progressively as the season advances, so that by mid-October at Cape May most individuals are mature; I've even seen a pair in tandem among what I took to be migrants. Thus it may be that individuals initiate migration as tenerals but mature en route. As noted earlier, some species apparently may migrate mainly in a mature or even worn condition, but the actual migratory status of these, at least on this continent, remains to be confirmed.

Finally (for this discussion anyway), what about spring migration? Nearly all the direct observations of North American species refer to southbound migrants in late summer and fall. Evidence of spring migration mainly consists of observations of mature individuals, mostly *Anax*, that initiate reproductive activity in northern areas in March or April, at times and places where they apparently could not have emerged (Walker, 1958; Young, 1967; Butler, et al., 1975). On the other hand, White and Raff (1970) found exuviae in central Pennsylvania that suggested that these very early individuals might at least sometimes emerge locally. Richard Orr (pers. comm., 1992) has reported large swarms of *Anax* regularly along the Texas coast in early spring, but since directional movement was not observed, it is not clear that these were migrants. It seems inescapable that northward movement

does occur, but this needs further documentation, at the very least by careful search for exuviae at sites and times when early reproductive behavior is observed.

HELP!!

Now comes the real pitch. It has occurred to me that a tremendous amount of information could be gained from observations of migrating dragonflies over a broad area and that the membership of DSA is widespread enough to be able to make this sort of observation. Therefore, I hope to enlist the aid of all DSA members to help gather data on the phenomenon. Considering the advantages of wide geographic coverage for research of this nature, I really hope to encourage this as a long term Society "project", comparable to the Seasonal Summaries. We discussed this possibility at the Collectors' Meeting in Tennessee, and most people agreed that it would be worth trying. Also, Ken Soltesz has been in touch with a number of bird observatories that conduct fall hawk watches, and several have agreed to assist. I will coordinate the project and collate and report results, but its success will depend on your participation.

To make this work, I need to hear from everyone who has observed migrants or who has any interest in the problem. Please send me a brief written summary of any observations that you may have made in the past, or that you make this season, on migrating dragonflies, especially *Anax junius*. We are in the process of preparing a standar form, but his is not yet available. Until this form is available, jot down your observations in any way that is easy for you. Reports should include as much of the following as possible: the species involved; reasons for believing that the observed individuals were migrants; approximate numbers and/or rate of passage; direction of flight; location and topography; wind direction, temperature, and other weather conditions, especially recent or concurrent passage of weather fronts. Any special circumstances or unusual behavior should be noted, too. Also relevant would be data on the seasonal periodicity of *Anax*, whether migrant or resident. This could include information on adult flight season (ideally with specific dates and approximate abundance), emergence dates, or seasonal variation in numbers and size of larvae. These could all give an indication of when adults are active and/or emerging and, together with information on migration times, perhaps suggest whether changes

were due to local emergence and mortality or to migratory movements.

If you should have the opportunity to collect migrants, it would be especially useful, although undeniably more complicated, if you could send me some of the specimens for determination of lipid content and reproductive status. Ideally these would be alive or freshly dead (less than 24 hrs. prior to shipping, kept refrigerated until shipping). They can be packed in paper or glassine envelopes that are then placed in sealed plastic bags with moist paper toweling; the bags should be placed in turn in a crush-resistant container (e.g., cardboard box), and shipped via overnight courier (2-day service OK if alive). If you do this, call first (office - 908-932-9459; home - 609-655-1834) to be sure I will be around to receive them. I will reimburse you for shipping costs. If all of the above is not feasible - no doubt true more often than not - then it would still be helpful to get thoroughly dried, but NOT acetoned, specimens (acetoning would remove lipids). These could be sent by ordinary mail and no prior notification would be necessary. Don't send any specimens you want back, as they will be reduced to fragments during lipid extraction.

Will anyone wishing to cooperate please contact me at the address above? If the response is good I will write up a summary report for publication in *ARGIA* next spring. Ideally this study should encompass several years of observations, so I hope the *ARGIA* report will be annual. Let me hear from you - this could be an opportunity for a unique study.

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ODONATA LARVAE

Guidelines for Rearing and Preservation of Reared Specimens

Ken Tennesen

FIELD:

Live larvae should be handled with care during collecting. Even though odonate larvae appear hardy injury during handling will decrease rearing success.

Transport larvae from field to the lab in plastic bags containing sphagnum moss or other types of soft, moist vegetation; do not put water in the bags. "Whirl-pak" bags work well.

Keep damselfly larvae separated from dragonfly larvae. Do not leave bags in the direct sunlight.

Greatest emergence success is achieved with final instar larvae, especially those with

wing pads already swollen or beginning to swell. Collecting of larvae just before emergence begins in nature, if possible, will be the most rewarding.

LAB:

Separate larvae into individual rearing containers partially filled with aged tap water.

Provide an emergence support, such as a piece of screening or stick. Some gomphids will emerge horizontally, so a small "bank area" in an aquarium must be provided.

Containers should have a top to prevent larvae from crawling out.

If wing pads show signs of swelling, the larvae has most likely ceased feeding. Prior to wing pad swelling, however, prey such as aquatic worms and aquatic insects (chironomids, mosquito larvae, etc.) must still be provided. Waste should be removed from the containers daily.

Check daily for emergence. Upon maturation, the larvae will slowly crawl out of the water and onto the emergence support.

For damselflies, the gills should be removed just prior to emergence. If the gills are left to dry, they can become brittle and twisted or folded over each other, making examination of their morphology difficult. The median gill and one of the lateral gills should be removed very carefully while still wet by using fine forceps. Place gills in a vial of 75-80 % ETOH (ethanol); be certain that the gills are kept in association with the emerging individual.

After the adult has emerged, and wings and abdomens are completely extended, carefully put the adult in a dark container, such as a paper bag or cardboard box. If the humidity is low, place a moistened paper towel in the bag or box.

Moisten the exuvia (with water or alcohol) and place in 75-80 % ETOH. Damselfly exuviae must be placed in the vial with the associated gills. The exuvia and adult should be kept associated.

A day or two after emergence, the adult will harden somewhat (post-teneral stage) and can be placed in the vial containing its exuvia, or treated by the acetone method and preserved dry.

The latter treatment of teneral, however, usually results in distorted and shriveled specimens which are brittle and easily broken. An alternative method to the above is to soak the adult in acetone (1/2 hour for damselflies to 2-4 hours for dragonflies) to preserve the color pattern, rinse and inject with alcohol, and then preserve in 75-80% ETOH with the exuvia.

Feeding reared adults will prolong life and improve color and hardness. This can be done by force-feeding them midges and mosquitoes with forceps, which is rather time-consuming and tedious. Also, dragonflies become quite restless after 2 days and can break their wings inside the container.

Label each specimen with locality data, the date larva was collected, and the date of emergence.

These methods of preservation can be used also with odonates found emerging in the field.

FURTHER COMMENTS ON REARING

Nick Donnelly

The above discussion on rearing is most helpful. I would like to add a few comments on techniques that have served me well for several years.

In the tropics I often search for larvae in moist habitats above the water line or on the face of tiny water falls. The habitats of damselfly larvae can be truly wondrous. In Samoa I found *Pacificgrion* larva living in the water filled cracks of a basalt flow that outcropped in a road cut. The basalt served as a aquifer, and the larvae lived within the fractures a few inches beneath the rock surface. They could be collected by carefully removing the fist-sized basalt pieces individually.

I carry two plastic centrifuge tubes for transporting larvae. These are about 4" long, 1" wide, and have a screw cap. I place a small strip of plastic screening in the vial. If I put in a larva, I add about 1/2" of water. If I have to carry them a long time, I sometime immerse them in a stream or change the water to prevent them heating up too much.

For rearing in these situations, I carry small pieces of plastic mosquito screen. These are about 9 x 12" and folded to 9 x 6" and sewn on the long and one short side. These can be quickly folded into a tetrahedral shape and fastened with two safety pins. These can be partially immersed in an aquarium, stream, or even a tray of water in a hotel room. The larva can select an aquatic or aerial habitat. I have reared several species of *Nesobasis* in Fiji using this technique.

For general rearing I make cylinders out of the same plastic netting and place them vertically in an aquarium. I close them top and bottom (*Macromia* can wander more than 100 feet before emerging; if not confined you might find them in another room!) and place several side by side in an aquarium, so they share the same water, which I keep at about 4" depth. I aerate the water and shade it to keep it fairly cool, but I have never provided a current. The larvae emerge on the plastic netting. As Ken points out, some gomphids do not want to emerge in a vertical position (though most will), or they may lose their grip in a vertical position and fall back into the water. You have to be a bit ingenious at times to provide for their needs.

I have kept my adults alive a few days in cages made of the same plastic mosquito netting, rather than in the dark. They generally hang up for long periods of time and fly very little. If they do, the plastic is soft enough to keep their wing tips from breaking, but this is a problem.

I do not like to put emerged adults in acetone, because their sclerotin is too poorly developed. I generally dry them in powerful desiccant. I place rolled pieces of tissue in their enveloped to keep them from being squashed when stored with sturdier, fully adult specimens.

Finally, I feel that collecting and rearing larvae should be an activity of every collector. The gomphids, especially, are likely to be best known by seeking out their larvae, not by the relatively inefficient pursuit of adults. When Bob Gibbs and I were at Cornell, we had larva blitzes on several local streams. On one we found 8 species of *Gomphus* (s.l.), whereas we only found one or two when prowling with our nets. We found several localities for *Stylurus scudderi* but never saw it as an adult. Around Washington I found that *Stylurus laurae* was the most

widespread stream gomphid larva, but I never took an adult. In east Texas I established several localities for *Gomphus modestus*, *G. apomyius*, and *S. laurae* before I ever found an adult. Just this year in New York I confirmed the local occurrence of the elusive *Gomphus quadricolor* by rearing a female. Finally, I threw some *Enallagma* larvae (which I took to be *exsulans*) in with some *Macromia* from the Susquehanna River, thinking they would serve as food for the larger larvae. The *Macromia* never touched them, and one emerged. It was an *antennatum*, which was a completely unexpected find in a large river!

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RESPONSE TO 'FROM THE EDITOR'S DESK -
- IS ENTOMOLOGICAL COLLECTING OVER
REGULATED?'

Richard L. Orr

In the United States as pristine or semi-pristine habitats shrink, more and more of them will come under the protection of city, county, state, federal, and private conservation groups. One of the fundamental ways to protect these areas is to limit their use to the general public to activities which have little or no impact on the plants and animals they are trying to protect. The unnecessary collecting of these organisms is usually basic to their philosophy.

The vast majority of environmentally sensitive areas in the United States are focused around native plant and aquatic habitats. Safeguarding these habitats protect not just Odonata but all organisms that occur in the area. Present trends strongly indicate that protecting native habitats (and therefore restricted use) is not only going to continue but will become more entrenched in the future.

I believe that it is not to DSA's advantage and try and swim against this current. It is very important that the DSA does not sending the wrong message to those agencies or groups which can provide access to prime Odonata habitats. It would be damaging to the society and its members if we are incorrectly perceived as lovers of collections and not of dragonflies.

The article from the Editor's Desk "Is entomological collecting over regulated?" is correct in its details but somewhat misleading in

its intent. The article assumes that Odonata collecting is being prohibited for the protection of Odonata. A few isolated cases of this does occur, but by far the major reason that collecting Odonata and other organisms is restricted (especially in the United States) is to protect a specific habitat.

One should not be misled that this is a question about the importance of collections, distribution records, or the need for scientific investigations into these wonderful insects. These organizations are attempting to protect habitat -- not trying to stop budding young scientists from making insect collections.

I have found that the vast majority of governmental agencies as well as the major conservation groups that protect these sensitive areas are usually open to having their unknown insect component determined. True, it might require a little work to obtain permission, or a permit, but I believe that it is well worth the effort considering that they are doing us a favor by protecting these habitats (including dragonflies) by being so restrictive.

A butterfly net and a pinning box has been, and will continue to be the way for developing interest in natural history for many young students. But also let us not forget that traditional ornithologists a century ago normally got started by shooting birds and collecting eggs. Bird conservation and the protection of their habitat became a success only after "birdwatching" became a national pass time. If anyone doesn't believe that this type of approach works for insects they should become familiar with the progress being made by the Xerces Society on butterfly conservation.

I suggest that the DSA adopt (with slight modifications in words) the collecting guidelines developed by the "Committee on Collecting Policy" written by the Lepidopterist Society in 1982. The easiest way to find a copy is to look in the Peterson Field guide to Western Butterflies on pages 315 through 318.

I personally would be willing to take on this project if the other members of the DSA share my beliefs.

Having a sound collecting ethic in writing and having members that are willing to adhere to it will open many more doors to

collecting, photographing, and studying dragonflies than maintaining "a freedom to collect" mentality.

What do you think?

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SOME CURATORIAL NOTES

(digested from comments of Tim Cashatt and from xeroxes of articles brought by him to the Tennessee meeting)

1. Freezing as a means of eradicating pests. Florian (Mary-Lou E. Florian, LEATHER CONSERVATION NEWS 3(1):1-17, 1986) quotes Remington (Yale Univ.), who has achieved 100 % success by holding specimens at -20°C for 72 hours. Ketcham-Troszak (1984) has found that *Dermestes maculatus* could be killed by exposures at -12°C for 48 hours, and -20°C for 4 hours. There is far more detail in the entire article. A further article by the same author is found in COLLECTION FORUM 6(1):1-7 (1990).

2. Plastic films for packaging insects. [Historical note: Needham caused to be made available at Cornell a cellophane envelope which he used in the Cornell collection. His usage brought this method to the attention of odonatists. George Beatty, whose father was a highly successful engineer of cellophane materials, devised a heavier cellophane envelope (described in Proc. North Central Branch, Ent. Soc. Amer., v. 18, p. 149-153) which has been used by most odonatists for several years.]

Tim Cashatt brought to the Tennessee meeting a short manuscript on plastic film materials suitable for insect packaging. My copy has the conclusion section badly printed, but the author suggests that cellophane should not be used. We all have experienced the severe shrinkage of this material, and we have all noticed that embrittlement causes the flap to tear rather than open smoothly. Polypropylene is recommended. Unfortunately, my copy does not reveal his opinion of polyester (Mylar-D). Mr. Taylor's address is Taylor Made Company, PO Box 406, Lima, PA.

3. Storage box materials - problems with degassing. There may be a problem with degassing of storage boxes, which can release solvents and other chemicals for years after their

fabrication. This applies both to wood and cardboard. The following references should be of interest to people interested in this sort of curating problem: (1) Catherine E. Miles, "Wood coatings for display and storage cases", STUDIES IN CONSERVATION 31 (1986) 114-124. (2) Tim Padfield, David Erhardt, and Walter Hopwood, "Trouble in store", IIC Washington Congress, Sept. 3-9 1982. Science and Technology in the Service of Conservation, 24-27. An additional paper by Susan Blackshaw did not contain any bibliographic reference.

4. Health problems with pesticides. Patricia Miller has summarized health problems in "Arsenic, Old Lace, and Stuffed Owls may be dangerous to your health: Hazards in museum collections", ILLINOIS HERITAGE ASSOCIATION, Technical Insert no 50, 4 pp. (1991). There is little about naphthalene or PDB that most of us are not already acquainted with, but there may be some surprises with other materials. This article is especially recommended with those who deal with public collections, especially collections in which volunteer persons work.

For further information on any of these topics you should contact Everett D. Cashatt, Illinois State Museum, 1920 10-1/2 St., Springfield IL 62703.

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FLORIDA COLECTING

Jerrell Daigle

In 1991 I was able to add the following new records to Gadsden, Jefferson, Leon, and Polk Counties. Also, I rediscovered *Erpetogomphus designatus*. in Liberty Co.

Gadsden Co. *Progomphus bellei* (seep off Whittle Rd. west of Greensboro)

Jefferson Co. *Cordulegaster obliqua fasciata*, *Somatochlora linearis*, *Sympetrum ambiguum*, *Argia sedula*, *Enallagma cardenium* (St. Marks R. at Hwy. 259)

Somatochlora calverti, *S. filosa* (Cody Cr. at Cody)

Enallagma divigans, *E. weewa* (Burnt Mill Cr. at Hwy. 27)

Leon Co. *Cordulegaster obliqua fasciata*, *Somatochlora georgiana* (18 May, emerging adults and exuviae), *S. linearis*, *Sympetrum ambiguum*, *Enallagma cardenium*, *E. weewa* (Gum Cr. at Hwy. 159)

Liberty Co. *Erpetogomphus designatus* (Aspalaga Landing, Apalachicola R. at Hwy. 10)

Polk Co. *Coryphaeschna adnexa* (Itchepackesassa Cr., Kraft Rd., Lakeland; 12 Sept., 1 male collected of a dozen seen.

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STATUS OF *SOMATOCHLORA HINEANA* IN ILLINOIS AND WISCONSIN

This note is a digest of reports on the status of *Somatochlora hineana* in Illinois and Wisconsin prepared by Tim Vogt and Tim Cashatt. This species was first collected in Ohio in 1929 and described in 1931. An Indiana record from Gary was made by William Kowlek in 1945. Homer Price collected additional specimens between 1949 and 1956, also in Ohio. The species was not found subsequently and was considered by many to be extinct.

In 1983 a specimen was taken in Will Co., Illinois and identified by Tim Vogt in 1987. Vogt, with Tim Cashatt and Jim Wiker visited the site from 1988 to 1991 and established the existence of a population. The species has been found, as a result of intensive surveys, at 5 sites within 9 km of each other; 23 other sites produced no records.

In Wisconsin William Smith found the species in Door Co. in 1987, and a population was discovered here in 1989. Again there were five localities where the species was found and 22 where it was not. Surveys in 1990 and 1991 in both states showed that the populations were fairly stable, at least for these two years, in spite of precipitation differences.

The species inhabits highly calcareous fens characterized by shallow dolomitic bedrock and abundant growth of narrow-leaved cat-tail (*Typha angustifolia*). Exuviae are found in small seepage streams in the cat-tails. In Illinois the species flies from about the first of June to mid July. In Wisconsin the species was found from the last week in June to the third week in July.

Where the species was found, it was the only species of the genus present.

The association between this dragonfly and the underlying bedrock is startling. Only one locality (northwestern Ohio) does not occur directly on dolomite of Niagaran age (Silurian). The belt of rock forms a continuous belt from northern Illinois and Indiana, through a corner of Illinois, and up the east coast of Wisconsin. It continues through the northern peninsula of Michigan, western Ontario, and continues east through Niagara Falls into west-central New York. The restriction of the species to this formation is not certain, but there is every reason to continue to search for this species in other areas.

The authors propose that the species be listed as Endangered in both states. They note that it is very sensitive to disturbance and suggest that habitat destruction is the major threat to the species.

References:

Cashatt, E.D., and Vogt, T.E. (1990) The Illinois 1990 status survey for the Ohio Emerald dragonfly (*Somatochlora hineana* Williamson). Report to U.D. F. & W.S., contract 14-16-0003-89-931.

_____ and _____ (1991) The Illinois 1991 survey for the Hine's Emerald dragonfly (*Somatochlora hineana* Williamson). op. cit.

Vogt, T.E. and Cashatt, E.D. (1990) The Wisconsin 1990 status survey for the Ohio Emerald dragonfly (*Somatochlora hineana* Williamson). Report to U.D. F. & W.S., contract 14-16-0003-89-933.

_____ and _____ (1991) The Wisconsin 1991 survey for the Hine's Emerald dragonfly (*Somatochlora hineana* Williamson). op. cit.

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A SECOND *WILLIAMSONIA FLETCHERI*
RECORD FROM NEW YORK

Nick Donnelly

On 3 June Judy Cameron took a second *Williamsonia fletcheri* in New York. The locality is near Paul Smiths, Franklin Co. Previously, the species was recorded only from a single specimen taken by John Gillespie at Chenango Valley State Park, close to my home. I have never been able to relocate the species at this locality, so the new record is especially interesting. The elevation is 1650 feet - close to that of Hal White's record in the White Mountains of New Hampshire.

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WISCONSIN, MICHIGAN, QUEBEC
COLLECTING

Tim Vogt, 1990

Unpublished state records are marked with an asterisk.

WISCONSIN-

Burnett County, *Gomphurus lineatifrons* *, *G. ventricosus*, *G. viridifrons* *; *Gomphus* (*Phanogomphus*) *quadricolor*; *Ophiogomphus* sp. nov., *O. anomalus*, *O. howei* *; *Stylurus amnicola*, *S. spiniceps*..

Columbia County, *Sympetrum danae*.

Dodge County, *Tramea onusta* *.

Door County, *Aeshna constricta*; *Epiaeschna heros*; *Arigomphus cornutus*, *Cordulegaster obliqua*; *Somatochlora hineana* *, *S. minor*, *S. walshi*, *S. williamsoni*; *Tramea onusta* *.

Eau Claire County, *Ophiogomphus aspersus*.

Fond du Lac County, *Enallagma traviatum* *.

Jackson County, *Chromagrion conditum*; *Ophiogomphus aspersus*; *Stylurus scudderi*; *Somatochlora incurvata*, *S. williamsoni*.

Langlade County, *Nannothemis bella*.

Marinette County, *Cordulegaster diastatops* *; *Somatochlora elongata*, *forcipata*, *S. franklini* *, *S. kennedyi*, *S. walshi*, *S. williamsoni*; *Nannothemis bella*.

Marquette County, *Aeshna mutata*.

Walworth County, *Enallagma anna* *, *Enallagma antennatum*; *Ischnura kellicotti* *, *Ischnura posita* *.

Waukesha County, *Enallagma antennatum*, *Enallagma basidens* *; *Ischnura posita* *.

MICHIGAN-

Delta County, *Somatochlora kennedyi*.

QUEBEC-

Nouveaux Quebec (Lac Mistassini), *Aeshna tuberculifera*; *Ophiogomphus colubrinus*; *Somatochlora brevicincta* (adults and nymphs), *S. cingulata*, *S. forcipata*, *S. septentrionalis*, *Leucorhinia patricia*.

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LANTHUS - A PUZZLING PROBLEM

Nick Donnelly

There are two species of the tiny eastern gomphid genus *Lanthus* - the northern *parvulus* and southern *vernalis*. The species *parvulus* ranges south at least to West Virginia and *vernalis* north to the southern border of New York. According to the observations of several odonatists, *parvulus* lives on wider brooks and perches on rocks. The species *vernalis*, on the other hand, inhabits tiny brooks, especially spring-fed brooks, and perches on leaves. While there is some habitat differentiation, it has been my experience that *parvulus* can inhabit extremely small brooks.

A recent discovery by Wayne Gall of the Buffalo Museum of Science adds to the mystery of these two species. In a very tiny spring - scarcely more than a persistent wet spot on the side of a

mountain at an elevation of 1800 feet and well within the forest of western New York (in Allegany State Park) - he found *Lanthus* emerging in late May several years ago. He collected four teneral specimens, matching them as best he could under the circumstances with their exuviae. Three turned out to be *vernalis*, and one *parvulus*!

I have studied these and several other specimens of the two species and have convinced myself that the species are distinct, based on adult morphology. Larvae, however, cannot be distinguished (based mainly on exuviae of my own reared *parvulus* and some paratypes of *vernalis* kindly supplied by Carle.), in spite of Carle's published distinction.

There are several other instances (in central Pennsylvania) of co-occurrence of the two species, but the Allegany State Park occurrence is extreme. Prior to this occurrence, we could easily have envisioned the two species isolated by habitat, with *vernalis* the upstream form and *parvulus* the downstream form. We could have further envisioned that some, or many, larvae of *vernalis* might drift downstream to emerge with *parvulus*. Gall's observation at the spring, however, suggests that some gravid *parvulus* females fly as much as a mile horizontally and hundreds of feet up into the forest to seek out the tiniest of springs - as well as ovipositing in broader, more open brooks, where larvae are more commonly found.

This observation discounts a habitat distinction between the two species and extends the habitat of *parvulus* to an very broad range. It raises a fascinating question as to how these species are differentiated in life style. Also, why do they overlap so little in range? I would appreciate hearing from others with observations on these two species, which I count as among the most interesting of the entire eastern odonate fauna.

DRAGONFLY RESERVE

The Sign, in Central Park, announces
officially - as if the intention were enough
to draw damselflies and amberwings, clubtails and
civil bluets
out of thin air, or down from the Berkshires,
to dart and zimmer among these particular reeds.
It was posted, inconspicuously, in a cluster of
yellow irises:

I thought it would say "No Trespassing,"
or "Do Not Pick the Flowers."
And perhaps they do come there,
mysteriously, the way hummingbirds are attracted
to hummingbird feeders, and we need not know
what lures them -
whether pheromones, or habitat, or simply
the invitation.

Barbara Jordan

(Do you remember David Klarberg's presentation
at the Johnson City meeting?)

REPRINT REMINDER

An extremely useful feature of our journal ODONATOLOGICA is the section containing the Odonatological Abstracts at the end of each number. The last issue (vol. 20, no. 4) contained 142 abstracts of Odonata papers, providing a convenient way to keep abreast of the literature.

The abstracts are compiled by Bastiaan Kiauta, PO Box 256, 3720 AG BILTHOVEN, NETHERLANDS. This is a difficult task and demands our cooperation.

Please do not fail to send reprints of all Odonata papers to Dr. Kiauta. Our cooperation can save him much time and expense and will benefit the entire Odonata community.

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PLEASE CONTRIBUTE TO ARGIA!

ARGIA is the newsletter of the D.S.A. and its continued success depends on contributions from the membership. The following sorts of articles are especially needed:

- Season summaries or summaries of collecting trips. These should be in narrative form rather than listing of species. We are especially interested in habitat and/or behavioral observations.
- Notices of upcoming trips, with intended dates and names of people to contact.
- Discussions of endangered status of species.
- Notes about people.
- Literature notices.
- Any other item of interest!

Submission: Please send a copy to the editor (which for the present is Nick Donnelly). Because the editor is a very poor typist it will help very much to submit articles on a floppy disk. We use MS DOS but can convert other operating systems (Macintosh, etc.). We can convert the following word processors:

- WORD for WINDOWS up to version 2.0
- WORD up to version 5.5 (MS DOS) or version 5.0 (Macintosh)
- WordPerfect up to version 5.1

- WordStar up to version 5.5
- Other: Lotus 1-2-3, dBase, RFT-DCA
- Also we can handle any Text (=ASCII) files
- We can handle any 3.5" or 5.25" floppy disk

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BULLETIN OF AMERICAN ODONATOLOGY

THE ODONATA OF NEW YORK, Thomas W. Donnelly 1(1): 1-27

DISTRIBUTION OF DRAGONFLIES AND DAMSELFLIES (ODONATA) IN FLORIDA, Sidney W. Dunkle 1(2): 29-50

ODONATA DE LA SIERRA DE HUAUCHINANGO, PUEBLA, MEXICO [Odonata of the Sierra de Huachinango, Puebla, Mexico], José A. Gómez Anaya y Rodolfo Novelo Gutiérrez (in press)

MORPHOLOGICAL AND ECOLOGICAL DIFFERENCES AMONG SPECIES OF *LADONA* (ANISOPTERA: LIBELLULIDAE), Michael L. May (in press)

COMPORTAMIENTO REPRODUCTIVO Y POLICROMATISMO EN *ISCHNURA DENTICOLLIS* Burmeister (Zygoptera: Coenagrionidae), [Reproductive behavior and polychromatism in *Ischnura denticollis*], Alejandro Córdoba Aguilar. (in press)

A CHECKLIST OF THE ODONATA OF THE DOMINICAN REPUBLIC BY PROVINCE, Jerrell James Daigle (in press)

LA NAYADE DE *ARCHILESTES LATIALATUS* DONNELLY, 1981 (ZYGOPTERA: LESTIDAE) [The larva of *Archilestes latialatus*], R. Novelo Gutierrez (in press)

ARGIA

Binghamton, New York

vol. 4 no. 2, July 1992

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