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THE DRAGONFLY SOCIETY OF THE AMERICAS

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JOURNALS PUBLISHED BY THE SOCIETY

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 prefers MS DOS based files, preferably written in WORD, WORD for WINDOWS, WordPerfect, or WordStar. Macintosh WORD disks can be handled. All files should be submitted **unformatted and without paragraph indents**. Each submission should be accompanied by a text (=ASCII) file. Other languages should be submitted only as text (=ASCII) files. Line drawings are acceptable as illustrations.

T. Donnelly (address above) is the interim editor of **ARGIA**.

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.

MEMBERSHIP IN THE DRAGONFLY SOCIETY OF THE AMERICAS

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 \$10.

The **BULLETIN OF AMERICAN ODONATOLOGY** is available by a separate subscription at \$15 for members and \$18.75 for non-members and institutions.

Cover: *Stylurus plagiatus* again. This is from Yuma, Arizona, and was drawn by Rosser Garrison, 1974

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

IN THIS ISSUE

The joys of the e-mail age are still being discovered. This winter I spent five weeks on a ship, participating in a marine geophysical cruise. In the old days I would have been almost totally out of touch, with only the occasional phone patch home arranged through a sympathetic radio operator. This time I was able to e-mail home twice a day, and I even had the almost surreal experience of exchanging dragonfly gossip while in the middle of the ocean. Several chums have started sending articles for **ARGIA** by e-mail, which enable me to load an article in the time it takes to press a few buttons. If you are not wired up yet, you probably should be.

The big news in this issue is, of course, the field meetings that we have planned for the coming year. The southeastern meeting has already been held, and it was a rousing success, as Bill Mauffray reports. The northeastern meeting will be in southern Quebec, a rich area virtually unknown to most of us. Following this will be a meeting of the Maritime provinces group in New Brunswick.

Another activity which seems to be increasing is the preparation of databases for Odonata, mainly dealing with distribution of species. In response to the dot-map project, several people have told me that they are preparing databases of some sort for their local fauna. The New England group is especially active here; I have also heard from Iowa, Kansas, and Missouri recently. Perhaps we will realize the dream of having a North American fauna in hand in the next few years.

Recent trips are always good to hear about, especially just before our own season. Bill Mauffray tells us both of the Southeastern section meeting and the status of the *Cordulegaster sayi* study, which was the focus of this year's meeting. Jerrell has another episode of his Hawaii series, which seems to be resulting in a complete overhaul of our knowledge of the endemic damselfly genus *Megalagrion*. I add a short note about a short trip to Costa Rica, which has one of the most diverse odonate faunas in tropical America. Finally, John

Michalski's long awaited part 2 of his New Guinea saga has been delivered. It fills me with my own personal nostalgia. John speaks of the large libellulid *Protorthemis* as "defining red", to which I say "Amen". However, he also mentions *Anax selysi*, which, to me, equally defines yellow. So intensely yellow was the head and eyes of one of these bugs, that Ailsa thought it had caught an especially yellow butterfly! Finally, I wax nostalgic in recounting a trip that took place more than 40 years ago!

We add a number of more serious articles. Richard Orr's account of the Odonata of Plimmers Island, near Washington DC, is provocative especially for showing us what we may learn by looking for exuviae on bridge pillars. How better can we find out the distribution of the elusive crepuscular dragonfly *Neurocordulia*?

Several correspondents have told me that they are considering or have in progress some sort of field guide. This seems to be our most pressing need, and apparently progress is being made simultaneously on several fronts.

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MARK YOUR CALENDAR FOR THE SOUTHWESTERN ANNUAL MEETING!

What: Annual meeting of the **Dragonfly Society of the Americas**, with local trips to see southwestern Odonata.

Where: Starting in **Silver City NM**, with optional trip to **Douglas AZ**

When: Meeting on 5 August. Collecting continues until 10 August or until whenever.

Motel: **Copper Manor** in Silver City. Address: 710 Silver Heights Road. Telephone: 800 853 2916 (ask for Sheila and identify yourself as part of the **Dragonfly Society of the Americas** group.) Rates: \$41 plus tax for 2 people. \$34 plus tax for single persons. All rooms have 2 double beds. The **Red Barn Restaurant** at this

motel has meeting rooms. We suggest you call Silver City NOW and get the pick of the rooms.

Annual Meeting: The annual meeting will be held Saturday evening. Subsequent evenings will be devoted to informal presentations and slide shows (providing someone brings a projector).

Outings:

- 6 August: Grapevine Campground at Gila River
- 7 August: Mangas Springs and Cliff
- 8 August: choice of above sites, or go to Douglas

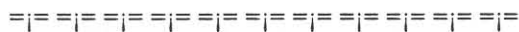
Arizona trip:

August 8: travel day to **Douglas AZ**. Motel: **Motel 6** in Douglas, 111 16th Street (602 364 2457) Rates: \$35.36 for 2 people and 2 beds. Alternative motels in Douglas: **Border Motel**, 1725 A Avenue (602 364 8491). **Travelodge**, 1030 19th Street (602 364 8434)

Outings:

- August 9: San Bernardino Ranch (King Ranch)
- August 10: Leslie Canyon

What will we see? Southwestern desert Odonata, including the recently described *Erpetogomphus heterodon*, plus many interesting species of *Argia* and *Ischnura*. In Douglas we should find *Aeshna dugesi*.



NORTHEASTERN DSA TRIP IN QUEBEC THIS YEAR ON 24-25 JUNE

Enjoy the ambiance of French Canada this year by attending the annual Northeastern **DSA** outing, which will be to Québec. During the weekend of 24-25 June we will be visiting a variety of pristine aquatic habitats around Lac Jean-Venne, near Ste. Cecile de Masham, 25 km north of Ottawa, on the edge of the Gatineau National Park. The trip will be led by Raymond Hutchinson and Benoit Menard. We will stay in cottages at Monty Wood's (the legendary Canadian dipterist) property where we can cook as well as swap tall tales from the world of dragons. One day will probably be spent at Riviere Petite Nation, about 40 km away, and the mother lode of *Ophiogomphus anomalus* (found almost entirely as exuvia).

If you are interested in this trip, please give Nick Donnelly a call at 607-722-4939 or send an e-mail to **tdonnel@bingsuns.cc.binghamton.edu**. For further information please contact Raymond Hutchinson at 819-561-3679. We will furnish more detailed information shortly before the trip.

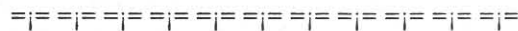


THE ATLANTIC DRAGONFLY INVENTORY PROJECT - MEETING ON 28-30 JUNE

Paul-Michael Brunelle of Halifax, Nova Scotia, has organized the **ADIP**, which has the aim of preparing an inventory of Odonata for the Maritime Provinces of Canada. Largely because of his stimulus, this region now has a substantial group of enthusiastic odonatists and there are many new records for these provinces.

The group will gather near Canoose, about 40 minutes north of Saint Stephen, on the St. Croix River of New Brunswick. for a three-day meeting on 28- 30 June. The site will be what Paul-Michael describes as a "rustic" lodge (Loon Bay) where one can rent canoes and enjoy a variety of natural habitats. The site was picked because it is close to an interesting *Neurocordulia* site, which will be one of the sites visited by the group.

This meeting will be a very good opportunity of seeing some beautiful country and meeting a new group of collectors. For further information, call Paul-Michael Brunelle at 902-422-6490, remembering that he is on Atlantic time.



NEW ENGLAND DRAGONFLY PROJECT

A communication from the Massachusetts Audubon Society announces the formation of **THE NEW ENGLAND DRAGONFLY PROJECT**. The aims of this project include creating a network of interested persons, creating a central database, promoting the conservation of dragonflies, and making the dragonflies a better-recognized component of the New England Biota.

A further goal is to hold workshops on identification, field techniques, etc. Finally, and of major interest to persons outside of New England,

a goal is to produce a guide to Odonata of New England

Persons interested in this project are asked to contact the Massachusetts Audubon Society, Center for Biological Conservation, 208 South Great Road, Lincoln MA 01773 or to phone (617-259-9500).

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OHIO GROUP TO MEET IN LAKE COUNTY

The latest issue of "**The Dragonflyer**", the newsletter of the Ohio Dragonfly Survey, tells us that the annual meeting will be on Saturday, 17 June, at the Penitentiary Glen Nature Center of the Lake County Metro Parks. There will be afternoon collecting at a selection of several sites.

This might be a good opportunity for people outside of Ohio to meet the members of the most active state group in the country. If you are interested in attending, please notify Bob Glotzhober, Ohio Historical Society, 1982 Velma Avenue, Columbus OH 43211-2497 or phone Bob at 614-297-2633.

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IT WAS NO APRIL FOOL: A BRIEF REPORT OF THE 2ND ANNUAL S.E. DSA MEETING

Bill Mauffray

A few of us gambled with the odds against good collecting weather by attending the 2nd annual Southeast regional D.S.A. met in Reidsville GA 31 March though 2 April 1995.

The original projected attendance was 30 at one time; but an assortment of health problems and scheduling conflicts resulted in that number dwindling down to about 15 just a week before the meeting. The forecast of cloudy, cold, rainy weather caused another 10 to drop out., leaving us with only five making the trip. Including Ken Tennesen, Clark Shiffer, Jerrell Daigle, Steve Krotzer and my self. The weather report, of course, was probably an "April Fools" joke by the Weather Channel.

The goal of this gathering was to re-verify the *Cordulegaster sayi* population at Gordonia Altamaha State Park, and to look for new populations. This gathering was funded by a I.O.R.I. by way of a grant from the USF&WS under their "**Status study of *Cordulegaster sayi*, a C-2 candidate for Endangered Species Status**".

I left Gainesville on Thursday morning 30-March taking highway 121 north out of Gainesville with the hope of finding a new potential site for *C. sayi* on the way up to Reidsville. Except for an area near Worthington Springs, FL nothing looked good until I arrived at a spot about 20 miles south of Reidsville. There the terrain changed from flat red clay pine lands and black water streams to sand hills with turkey oaks similar to the area at Gold Head Branch state Park in Florida. This change took place after I crossed the Altamaha River. I notice a variety of good collecting sites along highway 147 about 15 miles out of Reidsville.

I arrived in Reidsville about 3:00 p.m., checked in, and proceeded to Gordonia Altamaha State Park, which was adjacent to the motel. I checked in with the park personnel and found that Steve Krotzer had arrived about a half hour earlier. I found Steve and together, we made a quick check of the area along the lake at the dammed up end and in a field adjacent to and below the dam. The weather was fair and mild. We decided to collect at least one voucher specimen of everything we saw.

The next morning Steve and myself proceeded to Fort Stewart about 40 miles east. I had a pre-arranged appointment with their Fish and Wildlife people. I expected that we would check in and pick out some sites on the map to go check out. To my surprise, the Fort Stewart personnel had gone out earlier that week and located a dozen or so sites that had various types and amounts of seepage.

The weather was nasty, totally cloudy and misty, with expectation of the same for the next 2 days. Can you believe that we decided not even to take our nets.

The Fort Stewart Fish and Wildlife personnel, Stella Osborn and Dena Thompson took us out on a well planned coordinated tour of their sites. We looked at about a dozen sites and rated the sites by priority (For us to locate and survey these sites on our own would have taken one or even two complete seasons). We picked out 2 primary and a

Although we did not do any collecting, we did enjoy sharing some field observations on the local flora with our host who both have extensive botany backgrounds. We saw both black and red fox squirrels, some deer and various birds, but no Odonates.

That night we ate and met at the Smith's Restaurant next door to the motel; the food was fair to mediocre. We had brief business meeting and discussed a potential location for next year's S.E DSA project. It was decided that we probably would meet in McComb or Brookhaven Mississippi, to look for *Ophiogomphus australis*. We also discussed possible locations for future DSA meetings that could be nominated at the New Mexico meeting.

We next had a brief strategy meeting for the collecting for the next two days. It was decided to collect at the state park in the morning, and check out the highway 147 sites near Cobb Creek in the evening. Sunday we would go to Fort Stewart. The informal meeting was adjourned.

Although the weather forecast predicted cloudy and rainy all day Saturday, our optimism paid off. The skies were clear and the temperature about 50 when we woke up on Saturday morning, and stuff was flying around the motel already.

After breakfast at the Huddle, we collected at Gordonia Altahama all morning and collected a few dozen different species but no *C. Sayi*. We decided to go the Cobb Creek site. We couldn't find Jerrell so we left him a note on his van and went on our way. At Cobb Creek we found an assortment of goodies including *Epitheca costalis*, *E. semiaquea*, *Ischnura prognata*, and *Gomphurus hybridus*,

Jerrell showed up about an hour later, and as expected, Jerrell found the *sayi* at Gordonia Altahama. He collected 4 males. It was no April's fool either.

After looking for some more *Gomphurus*, we went back to the state park and we all collected *C. Sayi*. The habitat is a sand hill topped with turkey oaks. There were two adjacent seepage areas, one is in a heavily wooded ravine situation, the other is partially on a golf course. I speculate that the former is the breeding site.

Back by the lake we found *Enallagma vesperum* and *E. geminatum* along with *Ischnura kellicotti*, but no common zygops. Anisops of interest were 4 species of *Epitheca* including *E. Costalis*, *E. cynosura*, *E. Sepia*, and *E. semiaquea*. The only Gomphids were *Gomphus minutus* and *Gomphurus hybridus*.

The next morning, Sunday, it was clear, in the mid 40's, and breezy. Ken, Clark, and myself headed over to Fort Stewart. We decided to collect at the two primary spots selected on Friday by Steve and myself. We arrived at the first site about 10 A.M., it was still chilly but there was a lot flying around. We collected just about every early season species expected, but found no *sayi*.

We decided to go to the other site up in the northwestern corner of the Fort Stewart property. The habitat was a sand ridge cliff overlooking a large swampy area extending for a few miles with mixed pine and turkey oak on the sand ridge. We collected at several spots along the ridge top. There were several seeps flowing out of the hillside directly into the swampy area. After about an hour of collecting we found a *sayi* population. We saw about a dozen and collected a few voucher specimens.

This was a first, to pick a site from a map, get military personnel to scout it out for us, than pick the right day to go out and actually find and collect *C. Sayi*.

The population at Altahama Gordonia State Park is threatened, especially because of the golf course development and surrounding residential developments. The Fort Stewart population has a very good chance of being undisturbed. We have recommended some guidelines to the Ft. Stewart Fish and Wildlife personnel, and they have agreed to (1) prohibit "burns" during March and April to prevent the teneral adults form being destroyed, (2) limit logging around the seepage areas and (3) limit access to the site except by special permit.

I would like to personally thank the personnel at Gordonia State Park: Adren Carroll, and James Clay and the various state agencies that granted the permits. At Fort Stewart: Stella Osbourn, Dena Thompson, Tim Beaty, Larry Carlile, Silas Williams, Lee Mitchell, Linton Swindell, Colonel David R. Powers, Dirk Stevenson (now with the

Virginia Natural Heritage Program), and a newly recruited Odonatist Thomas Hilliard, with the base Forestry Dept.

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THE ODONATA INFORMATION NETWORK

Bill Mauffray

If you have Internet access, you can now access to **Odonata Information Network (OIN)**. The OIN will offer a source of general information about Odonata, organizations, events and more.

It can be accessed by logging onto the Alachua freenet, and typing "iorimenu" at the first menu prompt after the log in sequence is complete.

This is what the first menu looks like. Some of the items are still "under construction"

DRAGONFLIES AND DAMSELFLIES

(menu = iorimenu)

1. About this menu.
2. The International Odonata Research Institute
3. The Dragonfly Society of America
4. S.I.O.
5. Dragonflies at the FSCA
6. Publications of local interest
7. Say's spiketail project
8. Announcements

The Alachua freenet can be accessed by three different methods.

1. By world wide web: address <http://www.freenet.ufl.edu>. then select "Go to a Menu option" then type in "iorimenu"

2. By selecting the Alachua County Freenet from your menu if offered under a heading like "Other freenets" or "freenets" or something similar. Once

you select the menu item you will be given instructions to log on, once logged on, type in "iorimenu" from the first menu screen

3. By dialing (904)334-0200 and following the log on instructions, then typing "iorimenu" at first menu screen.

Try the first two since there are no long distance charges. Best time to access it is in the morning hours (ET). The system gets really busy at night since it is a freenet with over 10,000 subscribers.

I will provide you with updates in the future. Meanwhile if you would like additional information contact Bill Mauffray iori@freenet.ufl.edu

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PROGRESS REPORT OF THE CORDULEGASTER SAYI STUDY

Bill Mauffray

Cordulegaster sayi Selys was first sighted on 19 March, 1995 in Gainesville at the Possum Branch location off of NW 34th St. The site was checked each day as well as 7 other potential sites. To my disappointment, *C. Sayi* was seen only at the Possum Branch site.

It is interesting to note that I can find *C. sayi* within 5 minutes of arriving at the Possum Branch locality, but spend hours only a mile or two away in the same drainage area, and not find a single *C. Sayi*.

At Gold Head Branch, *C. sayi* was observed 8 April through 13 April. Clark Shiffer reported seeing an ovipositing female at the Gold Head site. His report is forthcoming and will be part of the final report to the USF&WS.

A new site was discovered earlier this year by John Milio and myself near the intersection of highway 16 and highway 225 on Camp Blanding property. John Milio reports a *C. Sayi* from that locality.

At Camp Crystal Lake, near Keystone Heights, John Milio reported a *C. Sayi*

Clark Shiffer and Jerrell Daigle spent a whole day at Torreya, and confirmed only one sighting.

The big discovery of the season, however, was the populations at Gordonia Altahama State Park and Fort Stewart, Georgia (see Article "NO APRIL FOOL")

Additional *C. Sayi* were reported from the Blackwater State Forest area by Randy Payne.

Its good to know that *C. Sayi* is alive and well; however, they are very habitat specific, and based on the data and observations so far, *C. Sayi* seems to wander not more than about a 1/2 mile from their breeding site.

The full report on the status of *C. Sayi* will be made available once completed.

ON THE SOCIAL SIDE:

Bill Mauffray

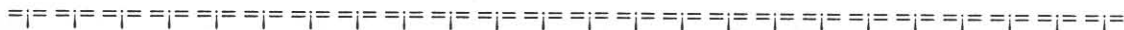
On Friday, 15 April, an impromptu gathering of Odonatists hosted by Bill and Carol Mauffray were treated to dinner at their residence in Gainesville, Florida. Included in the group were George and Juanda Bick, Minter and Margaret Westfall, Peter and Cindy Allen, and Clark Shiffer.

Peter and Cindy, of the British Dragonfly Society, were in Florida, photographing Odonata. They met up with Clark Shiffer a few days earlier. Clark came to North Central Florida after the SE DSA meeting, which was held the previous week in SE Georgia. The trio along with Bill made some valuable observations of *Cordulegaster sayi* at Gold Head Branch State Park during the preceding days before and had decided to end their stay with the dinner that Bill and his wife had organized.

The group was treated to some of the Mauffrays' Louisiana specialties, including Crawfish Etouffee and fried Crawfish tails. For dessert they had Evangeline eclair pie.

After dinner, the group was given a demo of the I.O.R.I. data base followed by a display of the newly formed Odonata Information Network on the Internet.

[I.O.R.I. is a not-for profit organization that will provide to anyone who request it, information about the insect order Odonata (dragonflies and damselflies). Archives, collections, and library located within the Florida State Collection of Arthropods at Gainesville FL, USA. Contact Bill Mauffray @ (904) 375-5903 phone/fax or e-mail iori@freenet.ufl.edu]



ODONATA OF PLUMMERS ISLAND

Richard L. Orr

9334 Farewell Road, Columbia, Maryland, 21045

Abstract: Twelve survey trips in 1994 to Plummers Island were conducted under the auspices of the National Park Service for the identification of Odonata (dragonflies and damselflies). The surveys focused on the shoreline of the island along with the collection of larval cast skins (exuviae) from the adjacent pillar of the American Legion Bridge. Thirty-four species were recorded from the surveys which increased the total number of known Odonata from Plummers Island from seventeen to forty-two. *Neurocordulia yamaskanensis*, a new record for Maryland, was identified from four exuviae taken from the American Legion Bridge pillar.

From a taxonomic and natural history point of view the 4.9 hectares of Plummers Island (Montgomery County, Maryland) is one of the most extensively studied areas in North America. This small Potomac River island situated adjacent to the American Legion Bridge (Beltway of Washington D.C.) has been under the care of the Washington Biologists' Field Club since the turn of the century. The flora and fauna of the island is well documented by more than 350 scientific articles. The island is also the type locality for at least 175 different species of plants and animals. Plummers Island has been owned by the National Park Service since 1959 but is still preserved and maintained by the Washington Biologists' Field Club as a "biologists' paradise" (WBFC, 1984).

Anyone visiting Plummers Island is reminded of the island's rich scientific history by the memorial plaques of the early scientists who studied on the island. These plaques are embedded in the lichen covered rock outcrops high above the scouring force of the Potomac River.

At each end of the island the National Park Service has erected a sign which begins by stating that Plummers Island is "The most thoroughly studied island in North America". Although this statement goes unchallenged, a review of the literature indicated that only 17 species of dragonflies and damselflies have been reported from the island (Table I). This number is significantly less than that reported from other locations along the Potomac River Corridor (Donnelly, 1961; Orr, 1994).

In 1994 a permit was granted by the National Park Service to survey for Odonata a section of the Potomac River Corridor which included Plummers Island. The island was surveyed twelve times in 1994 on May 22, 25, 29, June 5, 19, July 2, 10, 23, August 13, September 24, and October 16, 18. The survey activities were concentrated along the shoreline of the island. The periphery of the island provided a variety of aquatic habitats, ranging from a slow moving stream/pond environment on the north side to the main flow of the Potomac River along the southern shore. The island also had numerous rock outcrops that protected small coves from the full force of the Potomac River.

In addition to the island proper, Odonata exuviae from the adjacent pillar of the American Legion Bridge were recorded. The pillar was protected by the overhead freeway from the rain and semi-protected from the high winds which often funnel down the Potomac River Corridor. This protection against the weather provided an excellent site for recording Odonata emergence that could not be duplicated on the island where the cast skins were constantly being washed or blown off the rocks on which they emerged.

The pillar is located 10.2 meters from the west end of Plummers Island and is occasionally connected to the island when Potomac water levels drop (at which time the island becomes a peninsula). The pillar, in cross section, is an irregular hexagon with two 5.2 meter parallel sides and four 1.5 meter sides (two on each end facing outward).

Only the 5.2 meter side facing the river was underwater throughout the season. The substrate next to the pillar varied between silt and sand depending upon the current speed of the river. Exuviae were identified to a height of 4.6 meters which was the distance obtained by the highest climbing larva, a *Macromia illinoensis*. At the end of each survey trip all exuviae were removed from the pillar so that they would not be recounted on the subsequent visits.

The results of the Plummers Island Odonata survey are summarized in Table I. Specific information relating to the pillar emergence is presented in Table II. Based on both the historical record of seventeen species and the thirty-four species recorded from the 1994 survey excursions, the number of species of Odonata known for Plummers Island is now forty-two (Table I).

The exuviae collected from the American Legion Bridge pillar provided detailed quantitative data which otherwise was not obtainable by the usual visual search for adults and exuviae. The data indicated that only a limited number of species utilized the shaded vertical concrete pillar as an emergence site (Table II). Clubtails (Anisoptera, Gomphidae) typically emerge from a horizontal position, but *Gomphus vastus* proved to be a vigorous climber with its exuviae found high on the vertical pillar. *Stylurus spiniceps* larvae however emerged on the sand banks at the pillar's base in typical gomphid style. Although limited in number, *Argia moesta* was the only damselfly which used the pillar for emergence while other *Argia* and *Enallagma* species appeared to avoid the pillar altogether and utilized other nearby natural structures for emergence.

The two species of *Neurocordulia* would not have been recorded if only adult Odonata had been sought. *Neurocordulia* species are very secretive as adults and generally restrict their flights to short periods at dusk or dawn. The large number of exuviae (109) on the American Legion Bridge pillar attested to the abundance of the seldom observed *Neurocordulia obsoleta*. Four exuviae of *Neurocordulia yamaskanensis* were also found on the pillar. This species had not previously been known to occur in Maryland. The known range of *N. yamaskanensis* is southeastern Canada and New England with a southern extension along the Appalachians down to West Virginia and Kentucky (Walker & Corbet, 1978). The presence

of this species this far east (nearly to the coastal plain) in Maryland was unexpected.

Six Odonata species historically collected from Plummers Island were not found during the 1994 surveys. Four of the six species, *Tachopteryx thoreyi*, *Cordulegaster maculata*, *Erpetogomphus designatus*, and *Stylurus plagiatus* were observed at other nearby locations on the Potomac river during 1994 (Orr, 1994). Since these six dragonfly species have strong dispersal abilities it is reasonable to assume that they are still present, at least occasionally, on Plummers Island.

Progomphus obscurus is known from Plummers Island from a single specimen collected June 17, 1913 (Donnelly, 1961). Since no other record of this species is known from the lower Potomac River it is likely that it is no longer present. *Progomphus obscurus* is established, and at times common, at Patuxent Wildlife Research Center located northeast of Plummers Island in Maryland's Prince Georges and Anne Arundel Counties (Orr, 1995).

Hetaerina titia is a large attractive damselfly that is reported as common along the Potomac river during early fall (Donnelly, 1961). The Plummers Island surveys, along with similar surveys of other Potomac river locations, failed to find this species in 1994. The most likely explanation is that the population of this species is still present but was unusually low during 1994. Since this species superficially resembles the more abundant *Hetaerina americana* it is possible that it was simply overlooked.

The species of Odonata recorded from Plummers Island represents approximately 53% of the eighty species known to occur from the District of Columbia line to Edwards Ferry, Maryland, along the Potomac River and the bordering C&O canal (Orr, 1994). Because of the strong flight ability of Odonata, the occasional appearance of additional species on Plummers Island beyond the presently reported forty-two species is expected.

Acknowledgments: I gratefully acknowledge the assistance of Dr. Thomas Donnelly for his examination and identification of the exuviae of *Gomphus vastus* and *Neurocordulia yamaskanensis*. I also thank Dr. James Lawrey of the Washington Biologists' Field Club for

providing the history of Plummers Island. Most importantly, I express my sincere appreciation to Christopher Lea and the other personnel of the National Park Service who provided the support necessary for making this study possible.

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TABLE I Odonata recorded from Plummers Island (Historical & Present records)
ANISOPTERA DRAGONFLIES 1994 captures

ANISOPTERA	DRAGONFLIES		1994 captures
Petaluridae			
<i>Tachopteryx thoreyi</i> (Hagen)	Gray Petaltail	H,C	
Cordulegastridae			
<i>Cordulegaster erronea</i> Hagen	Tiger Spiketail	H	
<i>Cordulegaster maculata</i> Selys	Twin-spotted Spiketail	H,C	
Gomphidae			
<i>Dromogomphus spinosus</i> Selys	Black-shouldered Spinyleg	P	June - September
<i>Erpetogomphus designatus</i> Hagen	Eastern Ringtail	H,C	
<i>Gomphus vastus</i> Walsh	Cobra Clubtail	H,P	May-July
<i>Hagenius brevistylus</i> Selys	Dragonhunter	H,P	June-September
<i>Progomphus obscurus</i> (Rambur)	Common Sanddragon	H	
<i>Stylurus plagiatus</i> (Selys)	Russet-tipped Clubtail	H,C	
<i>Stylurus spiniceps</i> (Walsh)	Arrow Clubtail	H,P	July-October
Aeshnidae			
<i>Aeshna umbrosa</i> Walker	Shadow Darner	P	September-October
<i>Anax junius</i> (Drury)	Green Darner+	P	April-October
<i>Epiaeschna heros</i> (Fabricius)	Swamp Darner	P	May-August
<i>Nasiaeschna pentacantha</i> (Rambur)	Cyrano Darner	P	April-July
Macromiinae			
<i>Macromia illinoensis</i> Williamson	Illinois River Cruiser+	H,P	May-August
Corduliinae			
<i>Epithea princeps</i> Hagen	Water Prince+	P	May-August
<i>Neurocordulia obsoleta</i> (Say)	Umber Shadowfly	H,P	May-July
<i>Neurocordulia yamaskanensis</i> (Provancher)	Stygian Shadowfly	P	May
Libellulidae			
<i>Erythemis simplicicollis</i> (Say)	Eastern Pondhawk	P	May-September
<i>Libellula incesta</i> Hagen	Slaty Skimmer	P	June-September
<i>Libellula luctuosa</i> Burmeister	Widow+	P	June-September
<i>Libellula lydia</i> Drury	Whitetail+	P	May-October
<i>Pachydiplax longipennis</i> (Burmeister)	Blue Pirate+	P	April-September
<i>Perithemis tenera</i> (Say)	Eastern Amberwing	P	May-September
<i>Sympetrum vicinum</i> (Hagen)	Yellow-legged Meadowfly	H,P	July-November
<i>Tramea lacerata</i> (Hagen)	Jagged-edged Saddlebag+	P	June-September
ZYGOPTERA			
DAMSELFLIES			
Calopterygidae			
<i>Hetaerina americana</i> (Fabricius)	American Rubyspot	P	April-October
<i>Hetaerina titia</i> (Drury)	Titian Rubyspot	H	
Lestidae			
<i>Archilestes grandis</i> (Rambur)	Great Spreadwing	P	August-October
Coenagrionidae			
<i>Argia apicalis</i> (Say)	Blue-fronted Dancer	H,P	May-September
<i>Argia fumipennis</i> (Burmeister)	Violet Dancer+	P	June-August
<i>Argia moesta</i> (Hagen)	Powdered Dancer	H,P	May-September
<i>Argia sedula</i> (Hagen)	Blue-ringed Dancer	P	June-September
<i>Argia tibialis</i> (Rambur)	Blue-tipped Dancer	H,P	May-August
<i>Argia translata</i> Hagen	Dusky Dancer	P	July-August
<i>Enallagma civile</i> (Hagen)	Civil Bluet+	P	May-August
<i>Enallagma divagans</i> Selys	Turquoise Bluet	P	May-June
<i>Enallagma exsulans</i> (Hagen)	Stream Bluet	H,P	May-November
<i>Enallagma geminatum</i> Kellcott	Skimming Bluet	P	May-September
<i>Enallagma signatum</i> (Hagen)	Orange Bluet	P	May-August
<i>Ischnura posita</i> (Hagen)	Fragile Forktail	P	April-September
<i>Ischnura verticalis</i> (Say)	Eastern Forktail	P	April-August

KEY TO TABLE I

(H) historical = Historical Records

(P) resent = 1994 Records from Plummers Island

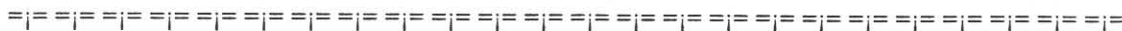
(C) orridor = not observed in 1994 on Plummers Island but recorded elsewhere along the Potomac River Corridor from the District of Columbia line to Edwards Ferry, Maryland

Note: Common names have not yet been standardized for dragonflies and damselflies. The names adopted are from Paulson & Dunkle (unpub., 1986), except for those conspicuous species which are locally known by more familiar names. These have been marked with a "+".

TABLE II Exuviae found on pillar of American Legion Bridge in 1994

	22 May	25 May	29 May	5 June	19 June	2 July	10 July	23 July	height (meters)
<i>Gomphus vastus</i>		1	1	1					0.5 to 2.0
<i>Macromia illinoensis</i>			1	1	1		3	1	0.2 to 4.6
<i>Neurocordulia obsoleta</i>		3	8		26	5	3		0.1 to 4.2
<i>Neurocordulia yamaskanensis</i>		1	3	64					1.0 to 2.0
<i>Argia moesta</i>			2	1					0.1 to 0.8

No exuviae found on 13 August, 24 September, 16 October, 18 October



BOOK 'EM, DANNO! or HAWAII 5-0 episode #3

Jerrell Daigle

"Book 'em, Danno", I said to my travel agent as she gave me my proposed 1995 Hawaii itinerary. This year, I sandwiched Oahu and the Big Island of Hawaii around my usual stopovers to Kauai and Maui. Get it! Sandwich Islands (old English name for Hawaii for you mainlanders)!

I had planned to collect with Dan Polhemus of the Bishop Museum in Honolulu, Oahu but he had to go to New Guinea on business. So, when I arrived February 25, I was on my own with only a few historical site records. My resort hotel, Rodeway Inn at Laie, was near the Kahana State Park on the windward side of Oahu. After a quick dip in the swimming pool, I retired for the night still feeling the after effects of jet lag.

The next day, stuffed with pineapples, bananas, guavas, passionfruit drinks, and pastries from the hotel, I drove to Kahana State Park and began collecting along the Nakoa foot trail. Almost immediately, I hit the jackpot at the first shady tributary up the hill. I saw a pale spot flying over the riffles but I couldn't really see what it was. I swung my net and then peered through the mesh, trying to figure out what it was that I caught. Then, it hit me! It was a damselfly all right but what species of *Megalagrion* could it be? The pale spot was actually its sky blue frons! With its black and cream thorax and rust-tipped black abdomen, it could only be *M. nigrolineatum*! This rare Oahu endemic is currently being proposed for endangered species status because of severe population crashes over the last twenty years. However, I found them common at nearly all the tributaries in Kahana State Park. Later, I got a few

more at Waihee County Park and at Omao Stream in Maunawili.

Folks, it gets better!! Flying with it was the slender red *M. leptodemas* which is also being proposed for Endangered Species status. This site is only the second site known to have the rare *M. leptodemas*! On several other smaller tributaries, I collected the blackish-blue color form of *M. hawaiiense* and the endemic libellulid, *Nesogonia blackburni*. However, I did miss the only Oahu *Anax strenuus* much to the obvious delight of a really, obnoxious red-vented Bulbul (*Pycnonotus cafer*). The only redeeming thing about that bird was that it was a new one on my list. Except for the pesky mosquitoes and that blabbering bulbul, Kahana State Park could be Paradise!!

Later that week, I hiked up the Aeia Ridge trail behind Honolulu, hoping to find the red *Megalagrion oahuense*. The naiads are truly terrestrial, living in the wet leaf litter under dense fern patches. Despite good weather, I did not see any but I did catch a male and two females of the shiny black *M. koelense* (= *M. amaurodytum*) on the trail. The naiad of this species lives in the liliaceous *Astelia* and Freycinetia leaf axils. Also, I got a couple of the endemic Kamehameha butterfly (*Vanessa tameamea*) which looks like a cross between a Red Admiral and a Painted Lady plus a couple of the green hairstreak called the Blackburn butterfly (*Udara blackburni*).

What a great start for this trip! Afterwards, on the commuter flight to the Big Island of Hawaii, I

promised myself I will come back and look for *M. oahuense* and *M. oceanicum* next year!

I have never been to the Big Island of Hawaii and let me say this about that. It is Big, Rugged Country!! It takes longer to get to places while driving over miles and miles of inhospitable lava flows. I stayed at Becky's Bed and Breakfast in Naahelu, the southernmost town in the United States. Al, the cockatoo parrot, greeted me at the door and did a nice little dance on my head! Later, we had our picture taken together as a memento.

Freshwater springs and streams are practically non-existent in this dry windy part of Hawaii. However, I knew about a tiny stream at the nearby black lava beach of Ninole. Almost immediately, I saw and caught a small, stocky red damselfly. I suspected it was *Megalagrion xanthomelas* and it was!! There were several more, including mated pairs flying along the overhanging Paspalum grasses. Despite the gusting Kona winds (35-45 mph), I was able to collect a small series over the next couple of afternoons.

Yes, I know what most of you of thinking. "What was he doing in the mornings?" I will tell you what I was doing in the mornings! I was lying on the beach getting a tan! Snorkeling! Diving! Beachcombing! After all, I was on vacation and this is HAWAII!! At night, all guests relaxed in the hot tub outside and sipped Becky's homemade wine. We marveled at the multitude of brightly shining stars and their closeness to our outstretched hands!

The Big Island of Hawaii has been dry for the last 3-4 years. Although, I collected a few *M. blackburni* and one male *M. hawaiiense* (rose-colored) from Akaka Falls, I didn't get any of the rain forest species in Volcano National Park. David Foote, the dragonfly park ranger, did pull back some *Astelia* fronds and showed me a naiad of *M. koelense* (= *amaurodytum peles*). The day was not lost as he took me to a nesting pair of the majestic "Io" or the Hawaiian Hawk (*Buteo solitarius*).

My next stop was an old favorite, Maui, and she didn't disappoint me. I stayed at the inexpensive beachfront Maui Palms Motel in Kahului. The delightful night breezes really dropped me into Slumberland making me dream of Hana Road waterfalls and its colorful *Megalagrions*.

Since I had only a few days to spend on Maui. I went back to the good spots and caught all the same species such as *M. blackburni*, *M. calliphya*, *M. hawaiiense*, *M. nigrohamatum*, and *M. pacificum* but they seemed to be more of them this year. The best spot yielded a few more of the rare terrestrial *M. nesiotes* on the East Wailua Iki stream hillsides. I think if more people explore the wooded slopes of nearby streams, we would find other populations. I did find out that the beautiful stream I was calling Kuhiwa Stream was actually Makapipi Stream on the Hana Road and any collection records should be corrected. Also, Makapipi Stream was the best place to collect the endemic King Kamehameha butterfly, have a picnic, and take a dip under a 30-foot waterfall, all within 300 feet of the road!

The last week of my trip was spent on Kauai and I stayed at Barker's Bed & Breakfast just like year. I went back to Makaleha Stream and found *Megalagrion heterogamias*, *M. oresitrophum*, *M. orobates*, and *M. vagabundum* but I didn't see any of the rare waterfall-dwelling *M. eudytum*. I was disappointed because I really wanted to get a series of this large black creature. "Well, maybe I will run into them elsewhere," I thought.

The next day, after finishing Gordon's macadamia nut pancakes, I set out for Kokee State Park. Again, just like last year, the Alakai Swamp was dry and I did not see any of the bog species, *Megalagrion paludicola*. However, the birdwatching in Kokee State Park was really fantastic! I observed the endemic Kauai Elepaio (*Chasiempis sandwichensis sclateri*), the Kauai Akikiki (*Oreomystis bairdi*), and the introduced Japanese white-eye (*Zosterops japonicus*). I saw again the beautiful red honeycreepers, the Iiwi and the Apanane.

Amidst the flooded taro fields at the Hanalei Wildlife Refuge, I managed to get pretty close to the Hawaiian Gallinule (*Gallinula chloropus sandvicensis*), the Hawaiian Coot (*Fulica americana alai*), and the exquisite Hawaiian Stilt (*Himantopus mexicanus knudseni*. All of these species were new to me!

One of the things I wanted to do on this trip was to hike all the way to Hanakapiai Falls. Last year, I went only about 3/4 of the way because I was catching *Nesogonia blackburni* at the pools in the stream itself. This time I made it and the sight of

the 280 foot cascading waterfall into the wide pool was simply spectacular and awesome!! I took time to mediate, reflect, and soak it all in literally! The water was cool but refreshing on this warm day, made hotter by the four mile hike!

I started exploring the nearby spray-splashed cliffs and I was shocked to see some large black damselflies perched precariously on mosses and liverworts. Most were out of reach of my long handled net but periodically, one would fly down within reach and I would not miss at all on this day! They were *M. eudytum*!! All afternoon, some would drop down within reach and that was a big mistake!

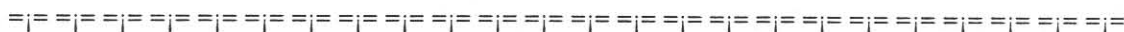
Soon I realized I still had a long hike back to the beach and reluctantly I hit the trail. About a mile before reaching the beach, I came across some trickles across the trail where I had earlier caught some *M. vagabundum*. All of a sudden, I spotted a rather husky-looking red *Megalagrion* which I thought might be *M. heterogamias* but it was perching 4 feet off the ground on a Ti branch. Very strange behavior, much unlike those two species! I quickly scooped it up and observed it closely.

It was different from any *Megalagrion* I have ever seen!! Since it had a red face and red pterostigmas, I surmised it must be the *M. kauaiense* which I

have not seen before. I caught a female and a general male a few minutes later plus three males and another female the next morning. That night, I could not make it fit the figures for *M. kauaiense* in Zimmermans' book no matter how I twisted and turned the appendages. However, it had to be *M. kauaiense* and so I let the matter drop until....drum roll, please!

Nancy Adams just sent me some Hawaiian material for identification. One of the *Megalagrions* was labeled *M. kauaiense* by Perkins, the man himself, in 1897! This specimen fit to a T the figures in Zimmermans' book! But what did I have? I just sent that specimen and my specimens to Dan Polhemus in Honolulu for verification, so I am awaiting his comments anxiously.

Regardless of the outcome of that species identification, I am ready for another trip next year. Gordon Barker has offered DSA a 20% group discount whenever we want to hold a DSA meeting there and he said the society could have the entire ranch for a whole week if we like. At this year's New Mexico DSA meeting, I will put on a dog and pony show for Kauai next year. Til then! Aloha!



NEW GUINEA CONTINUED

John Michalski

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The question a lot of people ask me is, was New Guinea dangerous? Well, the trip had its hazards but they rarely had anything to do with the native people.

I should say that I was genuinely living amongst people whose fathers had been headhunters and fierce warriors, but to tell you the truth those days seem a long way off. There is still a lot of tribal fighting going on around the country. Probably no one in New Guinea is still a cannibal (and yes, there were plenty of them not so long ago). There are probably no head hunters left, because people consider themselves Christian nowadays. But tribal disputes are still settled in uncompromising

retaliatory paybacks, and I often saw the aftermath of warfare in the form of burned-out remnants of thatched villages and so forth. Once or twice I saw whole truckloads of painted, feathered warriors, armed to the teeth with spears, arrows, axes, and a shotgun or two, heading off to settle the score somewhere down the road. One tourist I met had seen not one but two separate instances in which a person was hacked up right before his eyes. As I've said in the previous installment, the New Guineans are gracious and kind hosts, but it certainly pays to understand the local etiquette. In any case my troubles came from the environment, not the people.

I myself was in serious danger on two occasions. The first time was just as I returned from my first week in a really primitive village. Aseki is a mountain village with a grass airstrip, a police station, a mission, some corrugated general stores, and that's it. The Australian pilot flew me in on a four-seater Cessna, and told me, "I'll see you on Saturday if the weather lets me through," and after that I was on my own. I had come to Aseki to see the mummified war heroes that the Anga people perch on the high limestone cliffs overlooking their valley (It was spectacular). The plane could not get through on Saturday, and ultimately I spent nearly a week in Aseki instead of the two days I had planned on. The day after my return to the larger town of Wau, I began experiencing horrible pains, chills, and fever. It was midnight and there really was no one to help me. There was an exciting range of illnesses to choose from: malaria? cholera? typhus? amoebic dysentery? At the time it seemed most like New Guinea's particularly virulent strain of malaria and, while I don't want to upset anyone, I can't say as I'd recommend it. I was glad it wasn't dysentery though, because malaria is so much more dramatic if you're going to die in the jungle. Nothing that centers around the bowels can really be described as glamorous.

At first, you're afraid that you're going to die; after a while, you begin to wonder what's taking so long. As I lay there, alone and palpitating, I thought -- I am not making this up -- I thought, "if I'm going to die now, here on this cot, then I'm mighty ticked-off about the amount of money I've spent on dental work over the last three years." But within twelve hours, as suddenly as it came, it went away and never came back. So I guess it was just some particularly nasty gastro-intestinal ailment. I was feeling pretty normal in three days.

The second time I was really in trouble was largely my own fault. I was climbing Mount Wilhelm, the tallest mountain in Papua New Guinea (almost 15,000 feet), on my own. I was starting the climb at over 10,000 feet elevation, and the guidebook gave me the impression that the first leg of the trip was not too hard a push. At the end of this part of the hike you reach a cabin that sits on the edge of a boreal lake (a local village elder gave me the key to this cabin). The vegetation at the start of the climb is already moss forest, but the cabin is in a grassy valley of cycad trees. I figured that, since hardly anyone had ever collected in this unique place, that anything that could be caught there would likely be

new to science. I planned to stay for three or four days. But the misty climb up to the cabin was *very* steep, rather chilly, and the mist got me very wet without me noticing.

Three hours into the climb I was suffering rather badly from hypothermia and I realized I was already soaked to the skin. At that altitude it's hard work with a pack on your back, and I was so warm and sweaty at first that I just didn't notice how drizzly the weather was. Suddenly it began to get quite cold and I realized I was in trouble. Between that and the high altitude I truly began losing my mind and I began worrying that I wouldn't find the cabin before dark. It was so misty that you couldn't see more than a few dozen feet ahead of you. I had almost thirty pounds on my back and my hands and feet were completely numb. The river below roared horrifically, and over and over the trail went straight up the face of high waterfall-cliffs. At the top of each I hoped to find the plateau with the lake and the cabin, but over and over I just came to another waterfall -- some almost a hundred feet straight up. There were times when I literally dropped to the ground and wept. By now, when I lost my footing I simply fell over like a meatloaf, splashing straight into more icy water. My stamina was zero; the narrowest vine across the path would stop me dead in my tracks. A step up or down of only a foot would have me perplexed for fifteen minutes or more, standing there, trying to calculate the easiest way up or down. My mind was simply shutting down. And, if I had somehow bypassed the cabin, that could only mean that I was on my way toward the summit of the mountain, another four hours' hike uphill; this would mean my certain death on the slopes, because it was getting darker and colder by the hour (the next morning there was frost everywhere). The village seemed too far behind me to go back before nightfall.

Anyway, I finally did reach the cabin, but my hands were so numb that I could not pull the door key out of my pocket. I was simply plunging my dead hand into my pocket and yanking it out again, hoping to dislodge the key along with it. This took many minutes. Having achieved this, I then had to maneuver the key, between my two flattened palms, into position to penetrate the padlock on the door, and then to twist the key to spring the lock. Everything took forever, because I was very close to death from the exposure. Finally, I was inside. There was a cast-iron stove, but all the firewood was soaking wet from being stacked near an open

window. Nothing would burn. Fortunately I had packed a dry change of clothes, a dry towel, and my sleeping bag and matches were in plastic bags; otherwise, you would be reading my obituary right now. The only way to remove my wet clothes was to tear them apart -- because my hands could not negotiate buttons -- and then I towed myself dry, put on dry underwear, climbed into my sleeping bag, and at length got my little kerosene stove going to make a cup of coffee. I was the only man on New Guinea's highest mountain.

After fruitlessly trying to get the damp wood going by burning posters and draperies I found around the cabin (sorry, Mister Ranger!), I stumbled across a small amount of kerosene in an old drum. I soaked the wood in that and thereby got a fire going. It was a beautiful place, but the next morning I had some breakfast and got the hell out of there. I realized I was simply too vulnerable. I had survived hypothermia, but I now knew that any nasty cut, or a twisted ankle, could easily spell my doom up there. The weather was perfect on the way back, and I took lots of great pictures of all the places I almost died in on the way up.

It may sound overdrawn, but no foolin' -- I was really scared up there! The fact is, if I had gone up with a group, or even with one knowledgeable guide who knew exactly how far the cabin was, the whole thing might have been a picnic -- even with the hypothermia. It was not knowing, that was the horrible thing. If I had only been wearing my rain poncho to keep the mist off me, the whole thing might have been all right. But what a place! I look at the photos now and I can't believe it.

Okay. You want to know what I got. I'm going to whip through this, because frankly I've been going on already for a couple of pages. No Gomphids, so just forget about it. (Amazingly, the whole island of New Guinea is only known to harbor one species, the lowland *Ictinogomphus australis lieftincki*.) I saw four or five Aeschnid species, two Corduliid species, and several of most of the rest. I believe I got a specimen of just about everything I laid eyes on, with the exception of a *Dorocordulia libera* lookalike that I saw cruising over a dirt road, and some faceless Aeshnids and Corduliids that were half a mile in the air overhead.

It is devilishly hard to find odonates in PNG. It is really strange that so many waterways that look as

suitable as any stream in Asia or South America appear completely devoid of odonates. Just as Nick Donnelly had told me, many streams in PNG are eerily vacant. But why then are there Whirligig Beetles, but no odonates? Why are there Craneflies but no odonates? And what *is* it with craneflies, anyway? What are they *for*? Can anybody tell me what craneflies *DO*? I mean, apart from drawing the attention of bloodthirsty odonatists who haven't had a nibble all day. Who's responsible for craneflies? I don't blame anyone for not coming forward.

But the fact is, it is awfully hard work to find a well-populated forest stream in PNG. My impression is, that any time two drops of water meet in PNG they form a rushing mountain torrent. The country gets some of the highest rainfall anywhere on Earth, the mountains are young and *very* high and steep, and so the water is rather cold and always being flushed down a steep gradient in large volume. You have to get within a few hundred meters of the source of most streams before the situation becomes hospitable for many odonates. And in this kind of terrain, getting up to the very headwaters all the time is very hard work. And then, when you get there, the diversity appears to be very low. If I showed a photograph of any one of these streams, and said it was in Thailand or Trinidad for example, an experienced odonatist would expect 10, 15, 20 or more species on it. In PNG, many of these streams had nothing flying over them. Indeed, a mountain stream with 3 species on it was a rich location for me. I did find more rewarding places, but not often. The next stream over, only a kilometer away, would also have 3 species, but they'd be different species. But it was danged hard work getting to the next stream.

All this still doesn't explain those craneflies, but to hell with them.

In the eastern province of Morobe, I went to the village of Aseki, as described earlier. In the valley I took time to collect *Anax maclachlani* and *selysi* (*A. selysi* has a beautiful lemon-yellow head, including the compound eyes), *Orthetrum villosovittatum* and *glaucum*, and a few Coenagrionids (*Xiphiagrion* nr. *cyanomelas*, *Agriocnemis femina*) in a small pond. At a tiny waterfally stream, I found some *Huonia hylophila*, *Diplacina hippolyte* and another *Diplacina* that I can't yet identify; and *Hemicordulia ericitorum*, 2 *Argiolestes* species (*kirbyi* and *sidonia*, which I

saw together elsewhere in Morobe Province as well), and *Teinobasis scintillans*. *Huonia* and *Diplacina* are two of New Guinea's interesting genera of forest libellulids. In my opinion, *Huonia* is filling the vacancy provided by the lack of riverine Gomphidae, with its green-and-black pattern, clubbed tail, and its habit of perching on streamside boulders for a moment before flying off to the treetops again. I met up with *Teinobasis scintillans* all across the central highlands, and its color pattern varies quite a bit. *Orthetrum villosovittatum* and *Hemicordulia ericitorum* are two very widespread species throughout the mountains of New Guinea. Morobe is a province of rolling hills and jagged limestone escarpments, many of the valleys covered in grasslands that, while artificial in nature, have been maintained consistently for so long (up to 40,000 years!) that it is reasonable to consider them a natural ecological system. There are also large stands of native pine forests.

The rest of the highlands are a little different from Morobe, and while each Province has its own unique character, they are somewhat biologically homogenous as a group. In Eastern Highlands Province I collected in the forested valley around the Nupaha Trout Farm near Goroka. This exercise yielded, I think, one odonate (a *Diplacina*). Simbu Province is where I had my adventure on Mt. Wilhelm; here I got very little apart from a good series of the stocky, hairy *Ischnura acuticauda* (at its type locality), as well as *Hemicordulia ericitorum* and the more interesting *H. olympica*. In Western Highlands Province, I paused to renew myself in a hotel in Mount Hagen, where I collected *Diplacina* and *Ischnura acuticauda* again in the forest near Kunguma Village. Around Lake Kutubu, in Southern Highlands Province, I got a nice variety of things, like *Rhinocypha tinctoria*, *Teinobasis rufithorax*, *Neurobasis ianthinipennis*, and *Idiocnemis pruinescens*, a neat little purple Platycnemidid that looks a lot like North America's *Argia violacea*. Also different species of *Argiolestes* again. While I did not have the freedom to just hop off a truck and collect anywhere I felt like it, I must say that Southern Highlands Province had the most alluring assortment of forest streams that I saw on my trip. But I didn't have my own vehicle (you're a lot safer in PNG if you're in a public vehicle or truck than if you're driving a private car), and it was unreasonable to think I could pick up a good lift

any time I wanted one, so I had to pass a lot of these places up. My recommendation to the prospective visitors out there is to try to collect on the streams between the town of Mendi and the village of Pimaga, and the Lake Kutubu area in general. It looked wonderful!

I found different species of *Argiolestes* (a Megapodagrionid) in many different places, and to me they were like South America's *Heliconius* butterflies -- all cut out of the same mold, like a cookie-cutter, but then painted in different colors and patterns. They are all of the same size and shape and habits, but one is bronze with red legs, one is black with a yellow face, one has sides of robin's-egg-blue, and so on. They were different almost every single time I changed streams. In the Lake Kutubu area I also got a single specimen of *Nososticta fonticola*, a hair-thin, electric-blue and velvet black protoneurid with a fiery red abdominal tip.

After Tari I took an unplanned detour into the Star Mountains (Victor Emanuel Range) where, in Tekin, I came across the most beautiful new odonate in my young career. You remember the first time you laid eyes on *Calopteryx aequabilis*? Or otherwise you have some other species that rings this bell. Well this is a robust, *Argia*-like zygop with the build of our larger western species like *tonto* or *vivida*. It is deep, velvet black and the most intense, deep blue I can ever recall seeing; the pale antehumeral stripes are bright, leafy yellow-green, and the face is canary yellow. The whole thing is a rainbow of yellow, green and blue bands separated by black, and each color just as bold and brilliant as can be. It appears to be a new species of *Hylaeargia*, which I am calling *Hylaeargia magnifica*. I also got some of PNG's neat forest libellulids like *Huonia*, *Diplacina*, and *Nannophlebia*, all of a rich yellow-green against a black background.

Once on the Sepik River I stopped at innumerable villages, but the fauna was similar everywhere. For the most part the river sits in a broad, flat basin, 50 or more miles across; rocks and stones are so scarce that some villages have "sacred stones" that ancestors carried in from afar. I was surprised, therefore, that my first stop, the administrative center called Ambunti, was ringed with low forested mountains right down to the river! A short walk from my hotel (a hotel here is like a summer holiday cabin in Upper Michigan or the

Adirondacks) brought me to a lovely, splashy stream. Here I took many red *Teinobasis dominula*, a single *Rhinocypha tinctoria amanda*, and another species of *Argiolestes* -- this one was *A. ochrostomus*, which had hitherto been known only from an island off New Guinea's western tip, nearly a thousand miles away! Also, I saw but did not catch the incredible forest libellulid, *Protorthemis coronata*.

If you've collected dragonflies in the tropics, you've seen many electric-red libellulids. *Protorthemis* is the electric-reddest organism of any kind that I have ever seen, and if you haven't laid eyes on one of these babies in its living state then you can't possibly have any idea what I mean. *Protorthemis* defines red. It is powerfully, powerfully red.

When I first saw one in a sunny spot in the forest, perched on the end of a dead twig, I immediately said to myself, "say, that's a mighty red dragonfly". I did not catch one until some time down the road. It's the abdomen that's red, while the thorax is deep, velvet black with a wide, equally-electric yellow horizontal band cutting it in two, and the frons is bright metallic purple. The whole thing is about the size of America's *Libellula vibrans*. An amazing insect, and one that would make even the most ardent Gomphid fanatic pause (momentarily at least) before swinging, for example, at his next *Gomphus lividus*.

The rest of the Sepik was more homogeneously populated, with red *Trameas* of the *transmarina*-group, *Pantala flavescens* (also found in the mountains), *Rhyothemis princeps irene*, *Neurothemis stigmatizans*, and *Orthetrum serapia* -- there were probably *O. sabina* as well but they were extremely difficult to capture, and I did not net any that I know of.

A funny thing about the collecting was that *Orthetrum sabina*, as widespread and common as it is, provided several of the more taxonomically interesting captures of my trip. You saw the things everywhere -- but they were darned hard to net. I saw -- but I don't think I caught any -- of the ubiquitous, standard, rather smallish *sabina* in many places. I think the first one that I finally netted (in the Star Mountains along a drainage ditch) turned out to be *O. sabina viduatum*, previously known only from the Baliem Valley in Irian Jaya, several hundred miles away! Others I

caught were very large, and are probably Tony Watson's *Orthetrum serapia*. Finally, at Lake Govermas in the Sepik basin, I half-heartedly caught a couple of *sabinas* while waiting for some companions to walk back to the canoe. I am certain that these specimens represent something new. They are essentially *sabinas*, but they have very large, dorsally uninterrupted, bright white patches all along the abdomen, and the face is white as well. I am unfamiliar with this variant from anyplace else. Anybody know anything about it? I have also seen specimens from the Near East which look very different again, and it seems to me there's a good project out there for the person who wants to untangle this widespread "super-species".

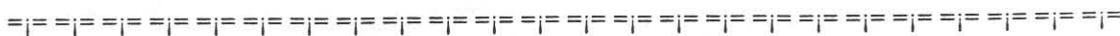
Also at Govermas, I collected a black, possibly new species of *Argiolestes*, as well as a new species of *Idiocnemis*, which I am tentatively calling *govermasensis*.

When my Sepik trip was finished I stayed a few days on the outskirts of the coastal town of Wewak. Up on a ridge next to a light tower, several species of Aeshnids and Corduliids swarmed each evening. I succeeded in catching the large *Anax maclachlani* as well as *Gynacantha rosenbergi* and *Anaciaeschna melanostoma*. Smaller species eluded me.

As must be obvious, there's much about this beautiful and fascinating country that won't fit on these pages. I recommend a trip to PNG for anyone who can scrape together the rather ponderous airfare -- once you're in PNG the trip does not have to be expensive, though it takes considerable planning to avoid spending a lot of money. As a tourist interested in cultural things, I think you should get there as soon as possible, as traditional ways are changing fast. These changes are without question beneficial for the New Guineans -- they are moving from the Stone Age into the Plastic Age with extraordinary grace and confidence; they are not merely mimicking western trappings as I have seen elsewhere -- but from a tourist's point of view, the country is definitely losing some of its exotic color. Also, certain points of interest, where they involve artistic creations or customs, are simply deteriorating and are not being replaced, because the religious beliefs have changed. For instance, the mummies at Aseki are not long for this world, and the villagers do not perform these rites any more. I was disheartened, on developing

my slides, to find that not a single picture I took at those cliffs came out properly (did I anger the

spirits?). So get there soon as you can. You won't be sorry.



COSTA RICA IN THE SPRING

Nick Donnelly

A five-week Caribbean cruise (actually a marine geophysical trip) ending in Panama gave me the opportunity of rendezvousing with Ailsa in Central America for a short tropical interlude before returning to the late winter in upstate New York. We selected Costa Rica for our trip, largely because Alonso Ramírez would be available to join us for a few days. I became interested in the place called "Rara Avis", mainly because we had heard there was good birding there and also because we couldn't find it mentioned in our guides. If it is difficult to find, it must be good. Alonso, however, had heard of it, and he arranged a five-day stay for us, including permission to collect odonates.

We met Alonso and his wife Marisol (who is also a biologist) in San Jose and set off in the direction of Guapiles to find out what this bit of tropical rain forest had to offer. The property is a privately owned tract tucked into an inside corner of the famous Braulio Carrillo National Park, which is one of the largest contiguous tracts of low- to medium-elevation rain forest in Costa Rica. The well-known biological station La Selva adjoins the property and the park to the north.

Getting to Rara Avis is not easy. Upon arriving at the little village of Horquetas we were met by a tractor pulling a trailer with benches. One doesn't drive into Rara Avis - one is towed for 12 kilometers. We were told to shed our footwear and select a pair of rubber boots to wear. I thought that I was quite used to tramping through rain forest in sneakers. Wrong. This rain forest is different.

Actually we were not destined to go all the way to Rara Avis, which is a fairly expensive, rustic lodge in the forest much favored by European tourists. We stayed instead in "El Plástico", an ex-prison camp on the edge of the forest. This is given the grand title of "Estación Biológica Sylvática". It has a dirt floor and a sign saying, "Do not wear your boots in the kitchen". Nor upstairs. The tourists who were proceeding onward to Rara Avis itself

sought relief at our place and then remounted their trailer for the punishing ride to the main lodge.

Our lodge was primitive but adequate, with a shower that operated by solar heater. How does a solar heater work in such a cloudy area? Actually, extremely well. Another mystery of the tropics.

From our front porch we could watch exotic tropical birds. There was a lovely chestnut-sided warbler flitting around in a tree by the porch during our visit, and house wrens were nesting under the eaves. [Later at Monteverde we added to our "tropical" bird list with several Wilson's warblers, black-and-white warblers, rose-breasted grosbeaks, summer tanagers, Baltimore orioles, Swainson's thrushes and Broad-winged hawks. Ah, those beautiful tropical species!] We did enjoy truly tropical birds such as scarlet-rumped tanagers, trogons, motmots, toucans, bell birds, swallow-tailed kites, hummingbirds, etc.

The road to El Plástico had been rough but fully passable by pickup. Passable, that is, except for the river we had to ford at the beginning. But beyond El Plástico the road became a spectacular elongate mud hole. I had thought that my years in the tropics had made me an expert on the subject of muddy roads. In fact, my education started on this trip. This road was the Appian Way - the Route 66 - of muddy roads. A horse could drown in some of the deeper places. How the tractor made it, even with its high clearance, I really don't know. We couldn't have walked that road, even with knee boots. If the Eskimos have 30 words for "snow", I would guess that the Costa Ricans have 60 for "mud". . . . But enough of that.

The rain forest at Rara Avis - El Plástico is immense and virtually unspoiled. There is a vast network of trails which are well marked but are very arduous. You really need those boots. Try to use Reeboks, and one of them will get sucked off

new species in that paper are so widespread (such as *Argia moesta*) that we are surprised that the original specimens came from this expedition.

It was not with such lofty thoughts that George Beatty and I set out on a month's odyssey to the southwest. I had to get to Pasadena by the 21st of September to start graduate school at Cal Tech and I had a 1947 Studebaker 2-door to get me there [Remember Raymond Loewy's sensational new post-war design?]. I suggested a joint dragonfly trip, and George snapped at the opportunity. We would share expenses and camp out and cook our meals to save money.

Why did we call it the Beatty - Donnelly expedition? He who makes up the specimen label cards gets to name the expedition. . .

We consigned my worldly possessions to the back seat of my car and put a wooden box on the roof for camping gear, which consisted of World War I pup tent halves, a modern (for the time) Coleman stove, and indescribably sordid sleeping bags and blankets. George insisted in carrying an old-fashioned wood and canvas collapsible cot; I used a cheap air mattress that actually lasted for the trip.

We set out bravely just before noon on 21 August from George's house in Plumsteadville, north of Philadelphia. After dark we had reached Strasburg, Virginia. We drove to Elizabeth Furnace [a digression - there will be lots of these. This campground in the George Washington National Forest is one of the prettiest place I have seen in that state. We have stopped there for collecting many times subsequently and I once took some excellent pictures of *Calopteryx angustipennis* there.] and decided to try out our camping technique. We found a picnic table in the dark, and prepared a spartan but hot meal. Then we cleared the picnic table, and I put my sleeping bag on it, while George found a place for his cot. My tent was strung over me and the table; and George arranged a similar shelter. This first night provided a good test; there was a violent rain storm but we emerged relatively dry in the morning. We left with somewhat dampened enthusiasm.

Our first collecting site was along the Clinch River in Tennessee. The place did not seem promising but we had to swing a net. There were a few *Argias* there, and we left shortly. But at least we had

swung our nets and the expedition was truly under way.

The second night we reached Pickett State Park in northern Tennessee. How we found the place I cannot imagine. The road down to the Big South Fork of the Cumberland was a perilous narrow, windy dirt road and the bridge across the river was a very rickety wooden span just above the water. [Digression time. I have revisited this spot and the park many times since and have grown to love it. There is a modern concrete bridge high above the river (it pays to have Howard Baker as your Senator - a digression within a digression) but you can still walk across this old bridge. One night a few years ago I walked out on the bridge to catch *Neurocordulia* and met a gray fox walking out from the other side. What he was after I can only guess.] Where were we? Oh yes, Pickett State Park. We camped in the dark. I awoke to find myself staring right at a climbing fern (*Lygodium palmatum*) a foot from my nose! It turns out that this rare fern is abundant at the park. We stayed there only long enough to get the kinks out of our bones with a few deep swings (an excellent stretching exercise).

Jamestown, the nearest town to the park, had only dirt streets and store fronts with quaint archaic English names. It was like steeping back in time. [Today there is a Wal-Mart and who knows what.] Sergeant York was from that town; you almost sensed his presence. Folks, there was rural poverty in Tennessee in those days.

It was a long way to go to California and we set out across the state. We camped the third night on a tiny side road along the banks of the Tennessee River. I dimly remember finding some Mississippian brachiopods in the limestone that I tried to be comfortable sleeping on. - always the geologist.

The next day we hit Memphis. Elvis hadn't been invented but Boss Crump had, and there was no incentive to linger. In the heat we stopped in Overton Park for a short break. There we witnessed a huge emergence of *Pantala flavescens* in a concrete pool. There were exuviae everywhere - as far as 25 feet from the pond and even 12 feet up in trees. This was not what we came for, however, and we departed hurriedly. Crossing the mighty Mississippi we found ourselves in hottest Arkansas. Neither of us had collected in the west,

and we found ourselves on the threshold of adventure. We still hadn't collecting any species that we hadn't see before and we were impatient for the action to start. Still we had reached this point in only three days - and the "interstate highway system" was still a gleam in Eisenhower's eye. This was the official "start" of our expedition!

Arkansas and Oklahoma passed quickly and with little to remember. We stopped in parks in the Ouachita National Forest in both states and then headed for Lake Texoma. Why Lake Texoma? George Bick had recently written about Oklahoma Odonates, and we wanted to see some of his localities. This seemed like a great idea at the time but it turned out to be a poor strategy. I have found many times since that it is far more difficult than one imagines to quickly visit someone else's area and find the good spots. All I remember is intense heat and sun-baked mud shorelines. We made a similar mistake when we sought out Wister in hopes of experiencing some of the magic of the place where "the boy" Frank Collins had collected *Macromia* for Mr. Williamson 47 years earlier. Alas, we saw neither Frank nor any *Macromia*.

In these states there were only a few bugs that interested us. I was especially pleased to take my first *Dromogomphus spoliatus* as well as the always welcome *Stylurus plagiatu*s. I saw a pair of these fly into a bush and caught them with my hands. There were a few hints of better bugs to come: we found lone individuals of *Dythemis fugax* and *velox* - definitely not your basic northeastern species.

At this point we realized that the end of August was the hot season in the southwest. We had never been there before - otherwise we would have realized it was really hot that year. In fact, 1954 turned out to have been one of the hottest years since the famous dust bowl days of the thirties. We thought it was always like that. To quench some of the heat we started another custom that has persisted (with me and Ailsa) to this day. We never completed a day's collecting without a stop at the local Dairy Queen.

The next day passed rapidly. We overnighed at Bonham State Park, Texas, found oodles of *Dythemis fugax*, and continued rapidly southward. As we drove through Dallas we remembered that there was an Odonatist named Alice Ferguson living there. We thought of stopping to look her

up, but decided there was no time. For some reason we were so punchy from the long, hot driving that the name "Alice from Dallas" struck us as mildly humorous. The joke was on us - or, more precisely, on George. Just a year later they met at State College and married shortly thereafter. Subsequently she became a great friend of many Odonatists and we were all later saddened by her death. Small world, as they say.

That night we made it all the way to Inks Lake State Park, which is somewhere west of Waco [but, then, what isn't]. Here we first experienced the exotic fauna of the southwest. *Telebasis salva* and *Orthemis ferruginea* actually thrilled us; I trembled with my first *Miathyria marcella*. Surely, Heaven can't be far away. The thing that intrigued us the most, however, was a small libellulid that stayed just out of reach on the lake. It looked like it would be easy to net, but as we waded out to our necks, swathed in itchy *Ceratophyllum* strands, the bug stayed just ahead of us. We finally gave up, but we wanted a specimen very badly. [Know the feeling?] At the end of the afternoon a sudden windstorm came up, and one of the critters blew into camp, perching foolishly right by George. He nabbed it, of course, but we couldn't figure out what it was. George called it "*Inksiothemis*" and thought it was terribly new. It was new - for us. It was our first *Macrodiplax balteata*.

[End of Part 1 - to be continued]

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TUMBLING DRAGONFLIES REVISITED

Richard L. Orr

Last year (*ARGIA*, Vol. 6, p. 14) I published a short note on the observation of *Anax junius* and *Cordulegaster maculata* spinning in mid air and asked if any of the *DSA* membership could comment on what was triggering this interesting behavior. I also asked if this "tumbling" behavior had been seen in other species.

In response to my inquiry, Jeff Cole of Los Angeles, California, sent me the following note:

"During a trip this past July to the Sierra Nevada mountains of California, I witnessed an individual of *Cordulegaster dorsalis* perform an aerial

tumble. My visit was to the North Fork of the Tuolomne River, fairly rich this year in *Cordulegaster*. I had already collected some, and was slowly working my way upstream when I found a male flying slowly back and forth from one bank of the stream to the other. I watched the male for about two minutes, trying to decide the best place to stand so I could net him. The individual began to make repeated dips into the water, presumably to drink. After about five or six dives at the water, the dragonfly curved upward and then downward again, forming a circle of about five to six inches in diameter. It appeared that this dragonfly wished to shake excess water from his body and wings because during the tumble, a shower of water droplets were flung away from the dragonfly's body. Shortly after the dragonfly tumbled, he left the territory he had been patrolling and sped away upstream. He did not change course in the middle of the somersault, but kept with his general heading. He did increase speed, and flew down the stream with a greater velocity than I saw him fly at just minutes before."

It is possible that Jeff's conclusion is correct since my observation of tumbling *Cordulegaster maculata* occurred right after he had touched the surface of the water. It is also possible that the tumbling *Anax junius* that I noticed at Virginia's Great Dismal Swamp had just been in contact with the water - even though I was not following it before the somersault.

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FLASH! MIGRATION STUDY NOT DEAD YET

Mike May

Dept. of Entomology, Rutgers University, New Brunswick, NJ 08903

Our efforts to accumulate data on migration of North American dragonflies have been in diapause for about the last year, but I hope they will be much more active in 1995. To bring you up to date on a couple of high points, the fall of 1993 was one with some very striking movements of *Anax junius* in the eastern U.S. On 6-7 September I was fortunate to have my first personal experience of a really massive migration of *Anax*, at Crescent Beach, FL. The main periods of flight lasted from about 7 a.m. to 11 a.m. and ended with the advent of a strong sea breeze on both days. During the peak

movements, 100-200 individuals per minute were passing along a 50 meter strip that I could observe continuously, and apparently comparable densities were present across about a 1/2 km. band from dune to marsh on the barrier island from which I watched. Even more interesting, I have reports from others that large movements of *Anax* were occurring from about 3-7 September throughout the eastern states, as far north as Ithaca, NY, possibly in response to a cold front passing through about then (but which did not reach Florida). This sort of widespread activity is just the sort of thing I hoped our DSA survey could document.

Another exciting development comes from Richard Orr in Maryland. By dint of careful observation last spring, he was able to detect the appearance and disappearance of several waves of *Anax* at ponds in early spring, apparently before local emergence. These were also correlated with frontal activity and apparently represent waves of northward migrants. Because of the absence of mass migration in the spring, I wasn't sure whether the return migration could be observed directly, but these data suggest that it can, at least some years in some places.

While it is true that I haven't been as assiduous as I should have been in promoting this effort to track migration, it's also true that, except for a few faithful correspondents, I haven't gotten much response from the DSA membership. Much of my information has come from birders. Let me renew my plea for data. Send any information you have to the address above or, if you prefer, e-mail (mimay@gandalf.rutgers.edu) or FAX (908 932-7229).

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DRAGONFLIES IN MALAISE TRAPS.

Norman F. Johnson, Department of Entomology, The Ohio State University, 1315 Kinnear Road, Columbus, OH 43212

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During nearly two years of constant use of Malaise traps at Barnebey Center, Ohio (1992-1993), a property then owned by the Ohio State University, we were surprised by consistently capturing specimens of the uncommon species *Merope tuber* Newman (Mecoptera: Meropidae). This creature was initially described early in the 19th century, but its immature stages and biology are almost completely unknown. We therefore set out to try to capture live adults in the hopes of being able to induce oviposition by females.

This property is located in southern Fairfield County at the edge of the Hocking Hills in the unglaciated portion of the state. This area is characterized by deep ravines cut into the underlying soft sandstone bedrock. Our original trap was set at the edge of such a ravine. In an attempt to capture live adult *Merope*, we removed the alcohol collecting head and replaced it with a fine-meshed bag. We use Townes-style traps, with a single collecting head. We set one of these traps at the bottom of the ravine across the small creek there. The creek at that point was approximately 2 m wide and perhaps 10 cm deep.

Since adult *Merope* are nocturnal, we returned each morning to check the traps for newly caught specimens. We were surprised to find that several large dragonflies were in the trap head and on the inner panels of the Malaise within the ravine. The dragonflies were quiescent as the mornings were cool and damp, and could simply be plucked by hand from their perches. Three specimens were retained and the remainder released. They were later identified as *Cordulegaster erronea* Hagen.

The capture of *C. erronea* seemed to be of interest, as we could find no published records of large Anisoptera being captured in Malaise traps. In addition, this species is quite rare in Ohio. Its known range is limited to only two adjacent counties in south-central Ohio (Hocking and Fairfield), and the collection points center around a very limited area where these counties meet. The Ohio Odonata Survey knows of the location of only eight other specimens. This find not only confirms the continued existence of *C. erronea* in Fairfield County, but may provide a valuable method of searching additional locations for this rare species.

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MORE ABOUT LARVAL TEE SHIRTS

George L. Harp

In ARGIA 6(3):1, Nick Donnelly speculated whether a tee shirt designed by Benoit Menard, with the larva of *Pantala flavescens*, might be a first! It reminded me of a tee shirt I had designed for my Aquatic Entomology class somewhere around 1982-83. The bright yellow shirt had *Baetisca lacustris* on the front and *Gomphus ozarkensis* Westfall (original drawing by Renn Tumblison) on the back. Don Huggins and I had not published the description of this larva yet, and I used to pose the question, "Is that tee shirt a publication?". Ultimately 48 of these were made and sent from VPI to California. I know Minter had one, a gift from one of his former students (K. Tennesen?). I wore mine to South Fork that June day in 1990 when we got real close and personal with *Ophiogomphus westfalli* Cook & Daigle. If there is sufficient interest, I could try to get some more tees made. What do you think?

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EARLY DRAGONS OF WARREN PRAIRIE

George L. Harp

Warren Prairie Natural Area is a nearly pristine wetland area in southeast Arkansas. The Arkansas Natural Heritage Commission manages this 400-acre site primarily to protect several important plant species there. For example, it is the only place in Arkansas where dwarf palmetto (*Sabal minor*) occurs, and a species of *Geocarpon* (one of the pinks) is being considered for the federal threatened or endangered list. Last December one of my graduate students, Richard Smith (honest, that's his real name) acquired the necessary permits and began to survey the aquatic macroinvertebrates of this unusual area. To assist in this effort, on 8 April Phoebe and I drove down to the Prairie after attending the Arkansas Academy of Science annual meeting, which was held in Pine Bluff. We arrived rather late, about 3:00 PM, but for the next 2+ hours I was in dragonfly heaven! *Ischnura posita* (already recorded in all 75 Arkansas counties) and *Anomalagrion hastatum* (or *I. hastata*, if you prefer) were the first two species I saw, but it picked up considerably after that. The next species I didn't recognize, and that is always intriguing. It

turned out to be *Celithemis verna*, which is known from only four counties in this state. In rapid succession, *Libellula semifasciata* (eight counties now), *Tetragoneuria cynosura*, *Lestes disjunctus australis*, *Gomphaeschna furcillata* (only the third county record), *Anax junius* and *Ladona deplanata* followed. I saw a big *Cordulegaster*, but he avoided the one swing of the net I was able to muster, and so his identification must await another day. The *G. furcillata* were a first ever capture for me. The males seemed to prefer patrolling the edge of the open wetland area, where it graded into woodland on slightly elevated ground. For me, the 1995 season began with a bang! I hope this trip augurs great things for the rest of the year.

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DO DRAGONFLIES MAKE SOUND? AND WHAT IN EARTH FOR?

Nick Donnelly

I have casually mentioned to several people over the years the possibility that dragonflies make sounds deliberately. A recent conversation with Paul-Michael Brunelle showed me that there others who have come to many of the same conclusions. I would like to expand on this notion, offer reasons for the process, and suggest themes and approaches for research.

The first question almost answers itself - of course they make sound. In fact some are fairly noisy. But is this incidental to other activities or is there a purpose to the sound production?

My earliest observation came about the year I began studying dragonflies. Walking back along the C&O Canal towpath near Washington one evening I could hardly make out the path in the dusk. I had finished collecting and the day-time noises had stilled. I heard a nearby familiar sound - wings of a dragonfly beating. Homing on the sound I swung and netted a male *Boyeria vinosa*. Then I realized that my instinctive action had been in response to the sound, which had been loud enough for me to locate the source.

Several years later I stood in a river trying to net a *Neurocordulia yamaskanensis*. I knew they were still flying late at night because I heard them all around me. I failed on this occasion to net one.

How do these dragonflies produce sound? We now know of a large variety of sound-producing mechanisms in the insect world. Stridulation by legs is well known, and wings have also been found to rub against each other and other parts of the body.

How do insects detect sound? Perhaps we have been too impressed with the "ears" of certain orthoptera which were once held to be examples of the only sort of sound-receiving organs possible. We now know that almost any part of an insect integument can receive and presumably process sound. For low frequencies we would anticipate that the exoskeleton or wings could be sound receivers. For higher frequencies, there are bristles, hairs, or even the antennae, which in Odonata are always present and for which I know of no other function.

The most common method of making sound in the Anisoptera is probably the rubbing of the base of the hind wing against the auricle, which could occur in all nearly Anisoptera except the libellulids, which lack this auricle. There have been other functions attributed to the auricle (such as guiding the female abdomen during mating), but I suggest that this device mainly produces sound. Consider that those insects that have the most prominent auricles tend to have thick, strongly braced veins bordering the anal triangle. [I have not found a name for the strong vein that forms the proximal border of the anal triangle.] I believe this vein can be pulled over the auricle much like a guitar string can be pulled over a plectrum. Some genera which are largely crepuscular (*Gynacantha* comes to mind) have both highly developed auricles and stout, bare veins. *Coryphaeschna*, which otherwise resembles *Gynacantha*, has a membranule along this vein and a less prominent auricle. Other genera (*Tetragoneuria* and *Macromia* for example) have much smaller auricles and larger membranules bordering the anal triangle. This combination seems destined to produce a muffled tone with a high frequency content in contrast with the lower frequency fundamental of the membranule-less examples. Some aeshnids (*Anax*) and corduliids (*Hemicordulia*) take the anal triangle entirely. They have a membranule and an almost nonexistent auricle. Within the generic pair *Hemicordulia* - *Procordulia* there is almost a continuum between no auricle nor anal hook, and a

modest auricle and anal hook. The character of the auricle is reflected in the anal portion of the wing.

The stridulatory interaction between wings and hard projections has another possible aspect. Paul-Michael Brunelle pointed out that the auricles of many anisops are toothed. Why? Perhaps the individual teeth produce a high frequency sound which is modulated by the basic lower frequency wing beat. The character of the teeth may produce identifiable sounds, much like crickets produce sound patterns with series of projections on their wing margins. Every species may have its own distinctive "tune".

The hooked corner of the wing may itself produce sound. I suggest that it commonly rubs against the narrow waist of the 3rd abdominal segment and produces a distinctive sound of its own. Why else would it be strongly braced in so many species? It can hardly have a useful flight mechanism considering its proximal position and low velocity during flapping. And it is not well positioned to control or prevent the formation of vortices. I have seen from time to time, in illumination which glances off the surface of the cuticle at a low angle, tiny rub marks on the abdominal cuticle which I believe are made by these hooks.

Libellulids lack the auricle and anal triangle. Are they silent? My experience in the field says not so. But they must have another sound mechanism. Some large species (*Orthemis*, *Orthetrum*, *Libellula*, for example) have a prominent ridge adjacent to the wing base and extending laterally. This crest has a strong pointy end. What is its function? If the insect flexes one or both wings forward, this projection could encounter the strongly braced and toothed costa and make a noise. Do they actually do that? I really don't know, but I claim you can hear them.

Are Zygoptera to be left out of the sonic game entirely? Perhaps not. One family, the Euphaeidae of southeast Asia, has a variety of projections on the second abdominal segment which forms a sort of a poor man's auricle. The genus *Dysphaea* has a characteristic lateral projection on the tergum, for example. *Cyclophaea* has a pair of prominent curved spines hanging downward from the tergum of the second segment. Several species of *Euphaea*, especially some of the Indonesian species, have instead a remarkably pointed lateral projection on the vesicle, which is located at the

base of the 3rd abdominal sternum. What do they do with these projections? Well, for one thing they could rub these against their hind wings if they positioned their wings properly in flight. This is not to say euphaeids make sound, but some probably can.

Anyone who doubts that zygops can position their wings during flight should watch the very common calopterygid *Neurobasis* flying up a stream. The hind wings are held apparently immobile and swept way back like a high speed jet fighter. They are flying with their front wings alone, which, because these wings are essentially invisible in the shadows, give the insect the appearance of gliding rapidly up the stream. I doubt that sound is associated with this display flight, but it illustrates just how much an odonate can manipulate its wings for purposes other than propulsion.

Why would an insect make sound? The fact that males and females are constructed differently in all but the libellulids suggest that territorial display or mating seem to be the most likely reason. If odonates display their bright colors and flight behavior during the day to establish territories, what do they do when the lights are turned out? Is this why crepuscular genera such as *Gynacantha* have such big auricles?

There may be other purposes for producing sound. Insects that forage for food or for mates after dark might find it handy to produce a sound with a large frequency range. They could sense by the frequency of the return signal whether they were about to fly into an obstruction and perhaps the size and physical character of the obstruction. This may be a little bit like the bat's sound signal which sizes up its moth prey. The lower the frequency of the returned sound, the bigger the meal. Forest birds produce songs with lower frequency contents than open-country birds because vegetation attenuates high-frequency sound. Do odonates adjust their sound to their habitat?

What can be done to test these ideas? One idea would be to find someone who deals in bird or insect sound and suggest that they record some odonate species to look at the frequency content of the signals. Also, to see whether they produce sounds constantly or only at certain times.

Another idea would be simply to examine and compare auricles and hind wings many genera to

see the relative size and character of the auricle and the presence or absence of the membranule. In other words, do the structures consistently go together? Don't forget to look for rub marks.

I don't want to carry this speculation too far, but I would like to suggest that you shut your eyes from time to time and listen to the dragonflies. Even though these insects are intensely visual, they may use other senses that we have not recognized.

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DRAGONFLIES VS. MOSQUITOES - A REQUEST FOR INFORMATION

Mike Conner, City of Davis-Public Works
23 Russell Blvd., Davis, CA 95616, (916)757-5686

Help! The City of Davis, California, will be constructing 400 acres of permanent and seasonal marsh. Mosquito control issues have been a major component in our design and will basically center around water management; however, I still anticipate significant mosquito production.

I would like to create favorable conditions for Odonata so they might help control mosquitoes. I ask Society members for any insight on plants, water depth etc. that will promote Odonata on our wetlands. The site will have limited public access with wildlife viewing blinds, informative placards and the works. If I can establish a large enough dragonfly / damselfly population, then I hope to have an informative sign on these species. Please respond by writing to the journal or by reaching me directly. Also, if you have any questions or want information on the site don't hesitate to contact me. Thank you.

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SOME NEW RECORDS OF INTEREST

A letter from Robert Cruden of the University of Iowa tells us of his collection of many species of interest in northwestern Iowa: *Aeshna multicolor*, *Argia vivida*, *A. alberti*, *Enallagma basidens*, *E. clausum*, *Stylurus notatus*, and *Celithemis elisa* all represent major range extensions. He further noted that Arthur Whedon had taken several species there in 1910 which have not been found recently: *Lestes vigilax*, *L. eurinus*, *Aeshna*

clepsydra, and *A. verticalis*. Are these now extirpated there?

Morton (Sam) Adams recently added *Gomphaeschna antilope* to the New York fauna. The specimen, a very teneral female, was collected in Ulster County and identified by John Rawlins. I have seen the specimens and congratulate Rawlins for a difficult call. Gloyd's paper on the genus is very poor for females, which are not always distinguished easily.

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RECENT PUBLICATIONS OF SPECIAL INTEREST

We have not listed New World publication citations in **ARGIA** on a regular basis. Three recently received publications are of special interest.

Garrison, R.W., 1994, A synopsis of the genus *Argia* of the United States with keys and descriptions of new species, *Argia sabino*, *A. leonora*, and *A. pima*. Transactions of the American Entomological Society 120 (4): 287-368.

This is the first comprehensive account since the old Needham and Heywood manual of 1928. Several mysterious Kennedy western species are either synonymized or clarified. The keys are excellent but the beginner will find the examination of the male appendages difficult without a good microscope. Color patterns are given for a few of the species.

Garrison, R.W., 1994, A revision of the New World genus *Erpetogomphus* Hagen in Selys (Odonata: Gomphidae). Tijdschrift voor Entomologie (137:173-269)

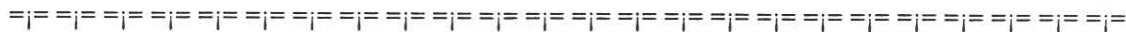
The monograph of a major gomphid genus which ranges from northernmost South America to the United States contains descriptions of several new species, including *E. heterodon* from New Mexico.

Cannings, S.G. and Cannings, R.A., 1994, The Odonata of the northern Cordilleran peatlands of North America. Memoirs of the Entomological Society of Canada (169: 89-110)

This paper is an excellent summary of several years' field study in northern British Columbia, Alberta, and the Yukon and Northwest Territories of Canada. Forty species are recorded, several being significant northern records. *Somatochlora sahlbergi* is shown to hybridize extensively. There is an excellent summary of habitat preferences of the species.

PAULSON WRITES SHOREBIRD MANUAL

For you bird enthusiasts, we note that one of our most active odonatists has published a major book on shorebirds. Dennis Paulson's "Shorebirds of the Pacific Northwest" (Univ. Washington Press, 1993) is deceptively titled. In fact it serves as a manual for all but one or two species (accidentals) found north of the Rio Grande River. Excellent illustrations (both color photos and drawings) and accompanying text will enable birders to identify all of the species that they could possibly encounter even along the Atlantic coast of the US.



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