Removing Dragonflies from Mist Nets

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(Drawings by Sue Gregoire)

ABSTRACT

Increasing awareness and interest in the insect order Odonata (dragonflies and damselflies) has prompted a desire within the ornithological community to contribute to a relatively young and unexplored science. Bird banders are uniquely positioned to add to the discipline by monitoring and reporting odonates mist netted incidental to banding. Dragonfly anatomy poses challenges to the bander who wishes to maintain the structural integrity of the insect caught in a mist net. Safe extraction techniques and associated anatomy are presented.

INTRODUCTION

The insect order Odonata (toothed ones) consists of two sub-orders: Anisoptera, the dragonflies, and Zygoptera, damselflies. The smaller damselfly is a slow, weak flyer that can avoid or pass through a net easily and need not be addressed here.

The larger dragonflies excel in flight maneuverability with the power to fly forward, backward and sideways at great speed. Like birds, they hunt afield in pursuit of prey, engage in territorial disputes near “nesting” (ovipositioning) sites and some are even crepuscular. A dragonfly can show up in a net at any time of day and be either easy or very difficult to remove.

Habitat changes at our research station have resulted in increasing encounters with dragonflies in our mist nets. Research and study revealed several species to be from rare to uncommon in our area. In earlier years, most encounters were with the common species *Anax junius* (Common Green Darner) or *Libellula lydia* (Common Whitetail) to which little time for extraction was devoted.

As the species list grew, we endeavored to monitor more closely these insects and to develop techniques to remove them from mist nets without beheading or dismemberment.

MATERIALS AND METHODS

Kestrel Haven Avian Migration Observatory is a constant-effort banding station in the Finger Lakes region of New York state and has operated during spring and fall migration since 1986. Spring banding runs from mid/late April through the month of May. The fall season operates from 4 Jul through the end of November. The station is located on a 24 ha (60-ac) wildlife sanctuary consisting of a wide variety of habitats attractive to birds. During migration, banding takes place seven days a week, weather permitting, and employs 24 nets. Nets are 12X3.2 m 110 denier Spidertech nets of 30 mm mesh strung between electrical conduit poles and placed in prime locations for bird movement. We find that the heavier denier nets are both kinder to birds and easier on insects.

Over the 20 years of operation, many habitats have been enhanced. Seven fields once farmed were allowed to go fallow, and a border of pine, spruce and larch was planted on the south, west and northern boundaries. The east boundary is made up of mixed conifer and deciduous woods with a first- and second-order stream running south to north. As finances allowed, ponds were dug in five of the seven fields. Most are shallow wildlife ponds; with one being a deep swimming pond. That pond happens to be near three net lanes and is partly responsible for the increase in dragonflies caught in mist nets. Other habitat near mist nets consists of hedgerows, second-growth forest, fallow field, wood edge, small stream and pond margin. These habitats are also attractive to patrolling and hunting dragonflies.

Since the spring banding season of 2001, we have monitored, logged and reported dragonflies caught in our mist nets. In 2005, the fifth year of observing, a separate log was kept in which each encounter was noted. Data included the species, time of day, which net, and a short description on ease or

difficulty of removal and method involved. In total, 62 individuals of 16 species were extracted with only two casualties: a common *Libellula lydia* (Common Whitetail) and the state listed *Cordulegaster erronea* (Tiger Spiketail). Behavior (*Libellula pulchella* bites!) and habitat preferences shared by species became apparent.

While the vast majority of captures consisted of simple extractions, the more difficult ones involved either a wing or head wrap or strands tangled in the chewing mouthparts of the head. During the off-season, some close inspection of dragonfly anatomy revealed the reasons behind difficulties, especially in the mouth.

RESULTS

Dragonfly anatomy can be its own curse. With a seemingly disproportionately large head perched on an extremely thin neck, the consequences of mishandling a dragonfly can be dire. With mouth-parts designed for spearing, crushing, tearing and chewing, it comes as no surprise to find strands of mist net disappearing into a maw. Papery thin cellophane-like wings tear easily, leaving the insect in a state of reduced efficiency.

Most encounters are what we call "swimmers"—dragonflies that have neatly passed halfway through the net as if they were swimming their way through. These can be removed by grasping the wings together over the back and gently pulling the insect back out the same way it came in. If a majority of the six legs are through, pulling the rest of the way through the net may be easier. In this case, it is advisable to grasp the thorax gently between your thumb and forefinger, watching legs and wings closely. The chitin of the thorax is quite strong and can handle some pressure; but the legs are more delicate. The legs have spines which curve in toward the body and, in large species, can cling to the net. Wings should fold back sufficiently.

A well-wrapped dragonfly, unlike a bird, is not taken out by finding the "belly" first then working the legs and wings free. Rather, the best approach is to locate and free the wing wraps first, then thorax, head, and lastly the legs. Abdomens have no parts liable to become entangled and will follow the thorax easily. Contrary to folklore, dragonflies do not sting. Some do bite a bit, but nothing even close to a grosbeak!

DISCUSSION

We always carry a sturdy toothpick or tweezers that are tip-filed to remove any bumps and reduce tip size. These tools help us with bird wraps and can do double duty when it comes to dragonflies.

***Wing wraps* -** Each of the four wings bear strong veins along the leading edge. These veins have some flexibility and can be bent slightly if needed. The wings, although papery thin, can be held together as "handles" between fingers.

All four wings are attached to the top of the thorax. The scientific term "Anisoptera" means "unequal wings". Fig. 1 shows the narrow forewing and the wider hindwing. Notice that the hindwing is attached at the base of the leading edge, with the lower margin trailing free and following the contour of the abdomen. That lower margin has no supporting vein and is subject to tearing. It is very easy for a strand of netting to get looped under the gap here. Working a thread out and around that part of the wing is delicate work even with a tool. Fortunately, a dragonfly can still fly and function with a small tear in the wing membrane.

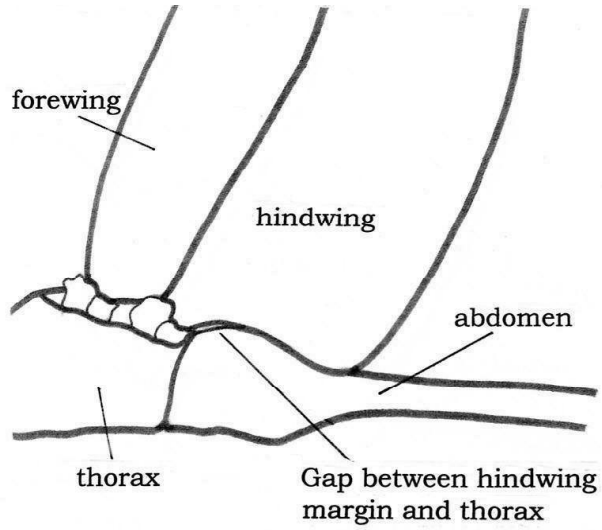

Fig. 1. Side view of a dragonfly indicating the point of wing attachment and gap between lower margin of hindwing and thorax.

Head Wraps - Fig. 2 is an "exploded" view of head through thorax with the head separated from the prothorax to illustrate the flimsy nature of the tiny neck. The area behind the eyes is deeply concave, allowing the head to swivel in multiple directions as the dragonfly visually tracks prey. The neck, through which passes nerves, blood and food, is very thin, making for an easy breaking point. When strands are looped around the head, your tweezers or toothpick come in handy. One hand can hold the wings or thorax while the other works the tool. It is alright to touch the eyes with your fingers, but try not to scratch them with a tool. It is NOT alright to twist the head more than about one-quarter turn. This seems to throw something off and the head will stay twisted, incapacitating the dragonfly.

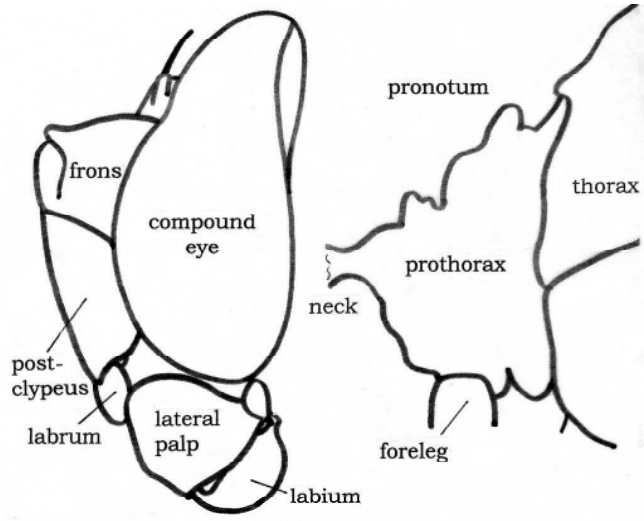

Fig. 2. Head, prothorax and thorax, with head detached to illustrate delicate nature of the neck.

The Mouth - Even a close look at the face of a dragonfly does not reveal the business end hidden behind labrum, labium and lateral palps. In Fig. 3, showing the lower portion of the face, these coverings have been separated just a bit to illustrate the layers of mouthparts. A thread disappearing into these mouthparts can be a mystery; the fear of damage high.

When the jaws are at rest, all parts are folded neatly in and away on themselves. Sometimes a dragonfly will attempt to chew its way out of a net resulting in what looks and feels like swallowed strands of netting. In Fig. 4 we have removed the anteclypeus, labrum, and labium along with its lateral palps. By doing so, the inner mouthparts are exposed, revealing the mandibles and maxillae. For the sake of illustration, the maxilla on the right has been extended to reveal the spines attached to the inner lobe.

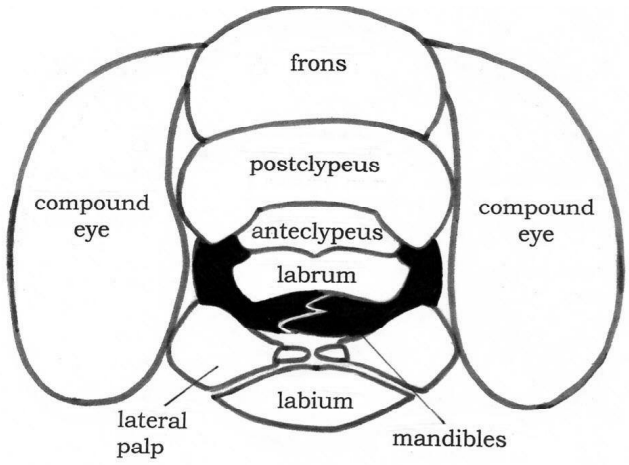

Fig. 3. Lower portion of dragonfly face.

Both mandibles and maxillae are designed to work laterally and are capable of opening quite wide to chomp on prey. The mandibles are the power-house of the mouth and are thick and strong for crushing and chewing. Somewhat blunt, they do not play a large role in entanglement; however, the maxillae certainly do.

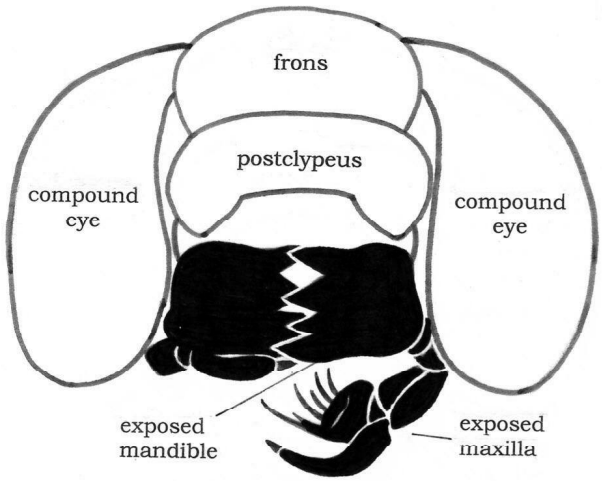

Fig. 4. Lower portion of face with cover parts removed, exposing biting and chewing mouth-parts.

The maxilla is mounted on a jointed arm that is normally folded with the spines directed toward the throat. As the mouthparts work, the maxillae flex in and out, grabbing strands of net as they work, the spines collecting and holding the mesh.

When a strand is seen disappearing into the mouth, a series of gentle tugging and slacking of the strand usually encourages the mandibles and maxillae to work, so the dragonfly can "spit out" the mesh. This is the most worrisome of wraps, and if the strand does not come free, you are forced to make the unfortunate decision to sacrifice either a strand of your net or the insect.

If a dragonfly does not fly off upon release, perch it on a branch in a sunbeam. It will grab hold and rest for a while. If the day is particularly cool, you may see the wings vibrate. This is "wing-whirring" and is the insect's way of warming the flight muscles in preparation for takeoff. If all goes well, the dragonfly will be gone by your next net check. Which, of course, is when you will have your camera.

CONCLUSIONS

Not only are the heavier denier nets kinder to both birds and insects, they have also raised our banding efficiency without any "loss of catch." The heavier denier makes dragonfly removal much easier to see and remove. With experience, time for removal is minimal. Concomitantly, 38- and 60-mm net mesh catch fewer dragonflies.

As bird banders, we are in the field much of the time and are, therefore, exposed to more than just birds. Although most of our contact with insects is with those that bite, we hope that more of the ornithological community will become familiar and involved with the field of Odontology. Dragonflies are fast becoming another "canary in the mine" whose biology serves as a bio-surveillance indicator of ecological health, with banders standing well positioned to assist in a growing and important field. In fact, many of today's prominent Odonatologists started as ornithologists and/or birders.

We welcome individual questions and comments to our website email at:

KESTRELHAVENAMO@att.net

With the burgeoning interest in Odonata (new websites) comes a proliferation of excellent field guides to dragonflies and damselflies. Most are region oriented and can be extremely helpful to banders who wish to contribute to the knowledge base. The following is a list of some of the guides to the North and the Northeast. Others can be found in the websites listed below.

Two specimens of Common Green Darners (*Anax junius*), net casualties whose bodies were donated to science and were used as reference material.

RECOMMENDED READING

Dunkle, S. 2000. Dragonflies through binoculars. New York, NY: Oxford University Press

Glotzhober, R. C. and D. McShaffrey. 2002. The dragonflies and damselflies of Ohio. Columbus: Ohio Biological Survey.

Mead, K. 2003. Dragonflies of the North Woods. Duluth, MN: Kollath-Stensaas Publishing.

Needham, J. G., M. J. Westfall and M. I. May. 2000. Dragonflies of North America. Gainsville, FL: Scientific Publishers, Inc.

Nikula, B., J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. West-borough: Massachusetts Division of Fisheries and Wildlife.

Tillyard, R. J. 1917. The biology of dragonflies (*Odonata or Paraneuroptera*): University Press, Cambridge, MA. (2004 Reprint: Elibron Classics).

Principal Websites

Dragonfly Society of the Americas
http://odonatacentral.bfl.utexas.edu/dsa1/default.htm/

International Odonata Research Institute
http://www.afn.org/~iori

Odenews
http://www.odenews.org
Contains over 200 links to international and North American regional odonate sites.

Odonata Central
http://odonatacentral.bfl.utexas.edu/