

“Q” and “A” about the Crucians Complex of *Anopheles* in North Carolina

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For some time those of us identifying mosquitoes in North Carolina have been using the terminology “Crucians Complex” when identifying species we once identified as *Anopheles crucians*, *An. bradleyi*, and *An. georgianus*. This article is designed to provide insight into what has happened to these species and to answer questions you may have about this complex and the included species. Even though we know most of you are not taxonomists we are hopeful that the following questions and answers will clarify why we should use the term “Crucians Complex” instead of trying to identify the above three species.

Question # 1. Why do we need to use the term “Crucians Complex”?

Answer. Because adult females from Alabama, Florida, Georgia, North Carolina, Mississippi, and Louisiana were investigated using molecular genetics (i.e., DNA sequences) and found to represent six species (*An. bradleyi*, and *An. crucians* A, B, C, D, and E), not the three species we thought we had (see Wilkerson et al. 2004, Journal of Medical Entomology 41: 392-401 for further information).

Question # 2. Does *An. georgianus* really exist, and which one of the six species in the Crucians Complex does it represent?

Answer. Yes, it does exist. It represents a 7th (unpublished) species in the Crucians Complex, not recognized by Wilkerson et al. (2004). *Anopheles georgianus* is an uncommon to rare member of the complex that has wing characters just like those of *An. crucians* A, B, C, D, and E, so females cannot be identified. This species is best identified using larval morphological characters.

During the WWII period and up to 1950, intensive larval surveys were widely used to target malaria vectors in the USA, and *An. georgianus* was recorded from North Carolina to Louisiana. Between 1951 and 2007 we have been unable to find any published and confirmed collection records of this species in the USA. In 2007, *An. georgianus* was collected and identified, using larval characters, in two counties in North Carolina and in one county in South Carolina in 2008. We obtained molecular genetics DNA tests for specimens from the 2007 (NC) collections and they represented a new 7th member of the Crucians Complex that we consider *An. georgianus*, and specimens of *An. crucians* D.

Question # 3. Can we identify *An. crucians*?

Answer. No! There are five species now recognized as *An. crucians* A, B, C, D, and E, and no one knows which one represents the real *An. crucians* that was described in 1828 from the New Orleans area.

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Question # 4. Can we identify *An. bradleyi*?

Answer. Not with a high level of accuracy. The larval and pupal morphological characters for brackish water *An. bradleyi* are good, but the wing character for females (base of wing vein Cu with pale scales) of *An. bradleyi* is only good for some of the specimens. This is because some specimens of *An. bradleyi* have dark scales on the base of wing vein Cu, and *An. crucians* species (A,B,C, and E) may have variable colored scales on the base of vein Cu that are only slightly darker than the pale scales on some specimens of *An. bradleyi*. *Anopheles crucians* D has previously been called a fresh water *An. bradleyi* (see Cockran et al. 1993) because its larva is very similar to that of *An. bradleyi* from brackish water. However, *An. crucians* D has very dark scales on the base of wing vein Cu.

If you still want to identify females with the base of vein Cu having pale scales as *An. bradleyi*, then you must do so recognizing that you are only correctly identifying an undetermined percentage of the *An. bradleyi* that are actually out there.

Question # 5. How many species of the complex do we have in North Carolina?

Answer. Currently we have 5 species of the complex confirmed from North Carolina.

1. *An. bradleyi* along the coast (brackish water)
2. *An. crucians* A from two counties (fresh water)
3. *An. crucians* D from three counties (fresh water)
4. *An. crucians* E from one county (fresh water)
5. *An. georgianus* from two counties (fresh water)

To date, *An. crucians* B and C have not been collected and confirmed in North Carolina.

Question # 6. Could other new members of the Crucians Complex be found in North Carolina?

Answer. Currently all of the specimens checked by molecular genetics DNA assays have been collected from below 1,000 ft elevation. We have collected *An. crucians* – like specimens from a number of western North Carolina counties at elevations above 2,000 feet, but these have not been sequenced. Potentially, a high elevation species new to the complex could occur in North Carolina.

Question # 7. How many members of the complex represent new species?

Answer. Currently there are four new provisional species. However they cannot be described until someone determines which of the *An. crucians* species (A,B,C,D, or E) actually represent the real *An. crucians*, because that name belongs to one of those five letter-designated provisional species.

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TAKE HOME.

1. If you only identify adults it is best that you call everything Crucians Complex.
2. Exception to 1, if you live along the coast you may want to identify specimens having pale scales on the base of wing vein Cu as *An. bradleyi*.
3. Currently, a number of viruses have been isolated from members of the Crucians Complex. Also, all 7 members of the Crucians Complex are presumed to bite humans, so when they are abundant they should be considered potential targets when you make control decisions.

Acknowledgments. We are grateful to Walker Rayburn, Perquimans County, NC; Chris Evans, SC DEHC, Columbia, SC; and Rick Wilkerson and Fredy Ruiz, Smithsonian Institution, Suitland, MD, for assistance with parts of this ongoing study.

NCMVCA Awards and Nominations

It is time to start thinking about someone working for you that deserves an award like the Hamilton Stevens Award or the Golden Dipper Award. The Hamilton Stevens Award is normally given to one person, however, the Golden Dipper Awards can be given to multiple deserving persons. Nominations for these awards do not have to be lengthy and should be submitted to the Awards Committee by September 15. This allows the committee time to review the nominations and confirm the nominee is a member of good standing in the association, and prepare the awards for the annual meeting in November. Be sure that you give this serious consideration. Times have been hard for many people for the last couple of years and deserving people need to be given a pat on the back for their devotion and hard work. It only takes a few minutes for a boss to prepare a letter of nomination for someone that really deserves recognition.

Only the Vice President's position is open for nominations this year. Maybe there is someone that you would like to nominate for this position. If so, send your nomination to the Nomination Committee before the annual meeting. Otherwise, be sure to attend the business meeting at the annual meeting to present your nomination.

2010 NCMVCA Annual Meeting

The 2010 North Carolina Mosquito & Vector Control Association annual meeting will take place November 17– 19, 2010 in Atlantic Beach, N.C. The meeting will take place at the Atlantic Beach Sheraton.

To make reservations go to www.sheratonatlanticbeach.com or you can call 1-800-624-8875. The NCMVCA Executive Committee is currently working on another exciting agenda for this years meeting. If anyone has any ideas for topics or suggestions for speakers, please contact Tyler McKeithan at mckeithand@apphealth.com or 828-264-4997.



TICK DRAGGING 101

By Parker Whitt

PHPM has been actively collecting ticks here in NC for a few years now. This involves pulling a “tick drag” along behind you which consists of a 3’ x 4’ cloth in which the ticks attach themselves to. Summer has come early here in NC with the temps in June being in the 90’s. I wanted to share with you a tick experience I had recently with Dr. Bruce Harrison. We had been out in the heat in Iredell County dragging and flagging for ticks all morning. In some places ticks are very common, and in others they are just tough to find. These fields where we were working looked like great tick habitat to us, but in 2 hours we only got 1 tick! These things happen, so after our lunch at the K & W we decided to go by a favorite mosquito hole of ours in Davie County on our way home. I figured since we struck out on collecting ticks, maybe we could get some nice mosquito larvae. We pulled over and Bruce began dragging the roadsides while I went into the woods to our mosquito “honey” hole. Well, Bruce got 1 tick and I got run out of the woods by hundreds of *Ae. vexans*. Unfortunately there was no water in there so I didn’t get any larvae. Those adults were way too plentiful for my taste, and they are so common I didn’t need any for my collections. So, as I got back to the roadside I started dragging along with Bruce. No ticks were turning up! Hot as heck, and no ticks...not a pleasant combination. As I was pulling my drag along the woods edge, poison ivy became very abundant. Poison ivy and I don’t get along too well. Therefore I walked right on the edge of the road and flagged in the short grass right at the road’s edge. On my first drag flip, what, 5 ticks! I called for Bruce to come over and on his first drag, 5 ticks! Right by the roadside, at 2 pm, in the extreme heat of a 93oF day, there were abundant ticks up against the hot roadside. We collected 37 ticks in 2 hours! We hypothesized that maybe the road was a barrier and too hot for the ticks to cross. Who knows? Mother Nature seems to always throw a curve ball to us. The lesson of the story...you never know what is going to happen out there. Look everywhere and enjoy our wild NC.



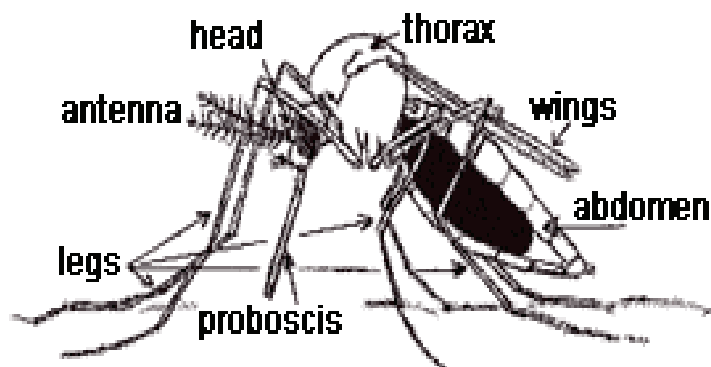
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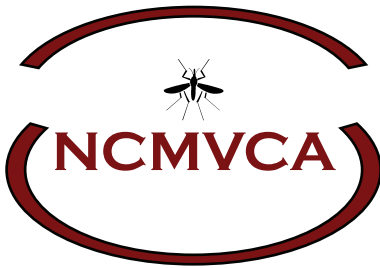
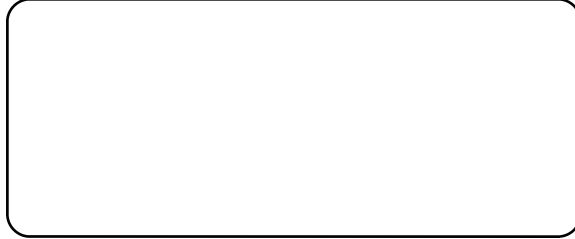
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