

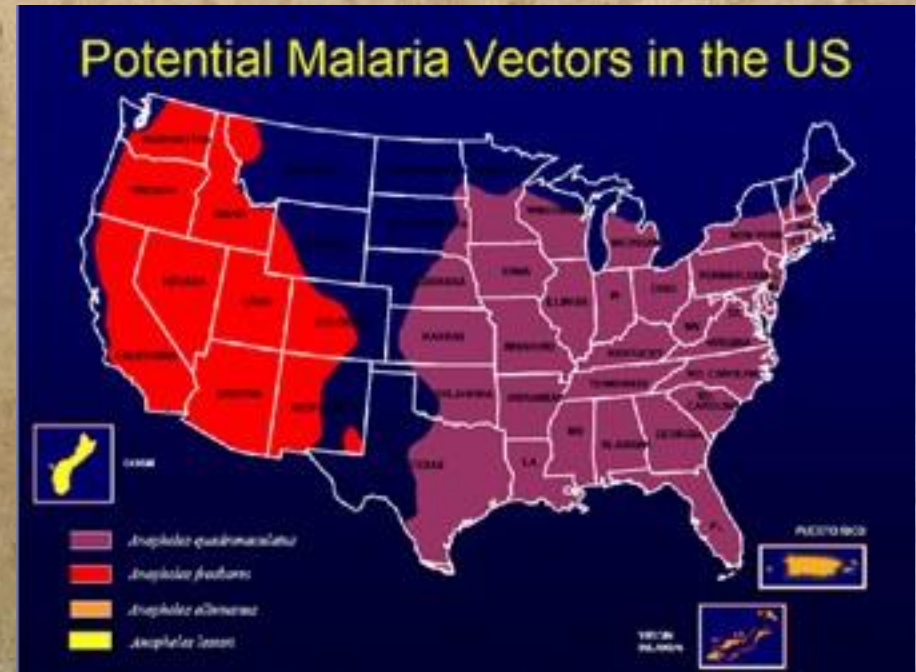
Anopheles quadrimaculatus
complex

Bet you can't have just one

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An. quadrimaculatus s.l. and Malaria

- Main potential vector of Malaria in eastern U.S.
- Since 1990, cases have been reported in
 - Florida
 - New Jersey
 - New York
 - Texas
 - Michigan
 - Virginia
 - Maryland



<http://www.cdc.gov/Malaria/features/refugees.htm>

Anopheles quadrimaculatus s.l. post-1997

- Single species became five distinct species
 - *An. diluvialis*
 - *An. inundatus*
 - *An. maverlius*
 - *An. quadrimaculatus*
 - *An. smaragdinus*
- Dr. John Reinert et al.
 - Center for Medical, Agricultural, and Veterinary Entomology, USDA, Gainesville, FL

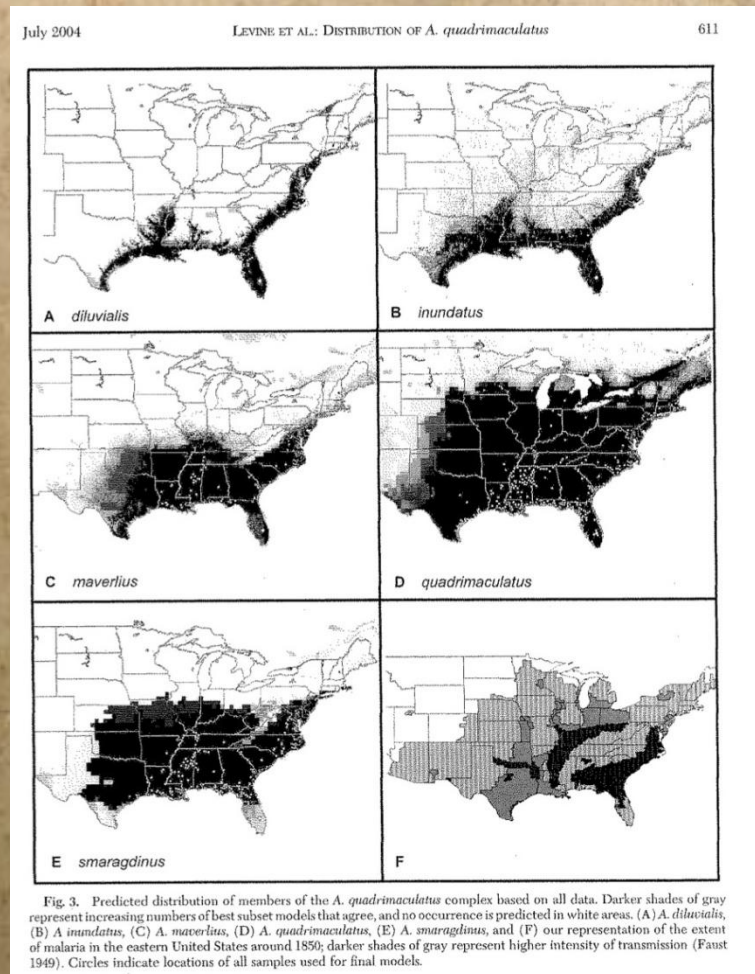


<http://wbrCouncil.org/Images/Interior/anquad1.jpg>



The Complex

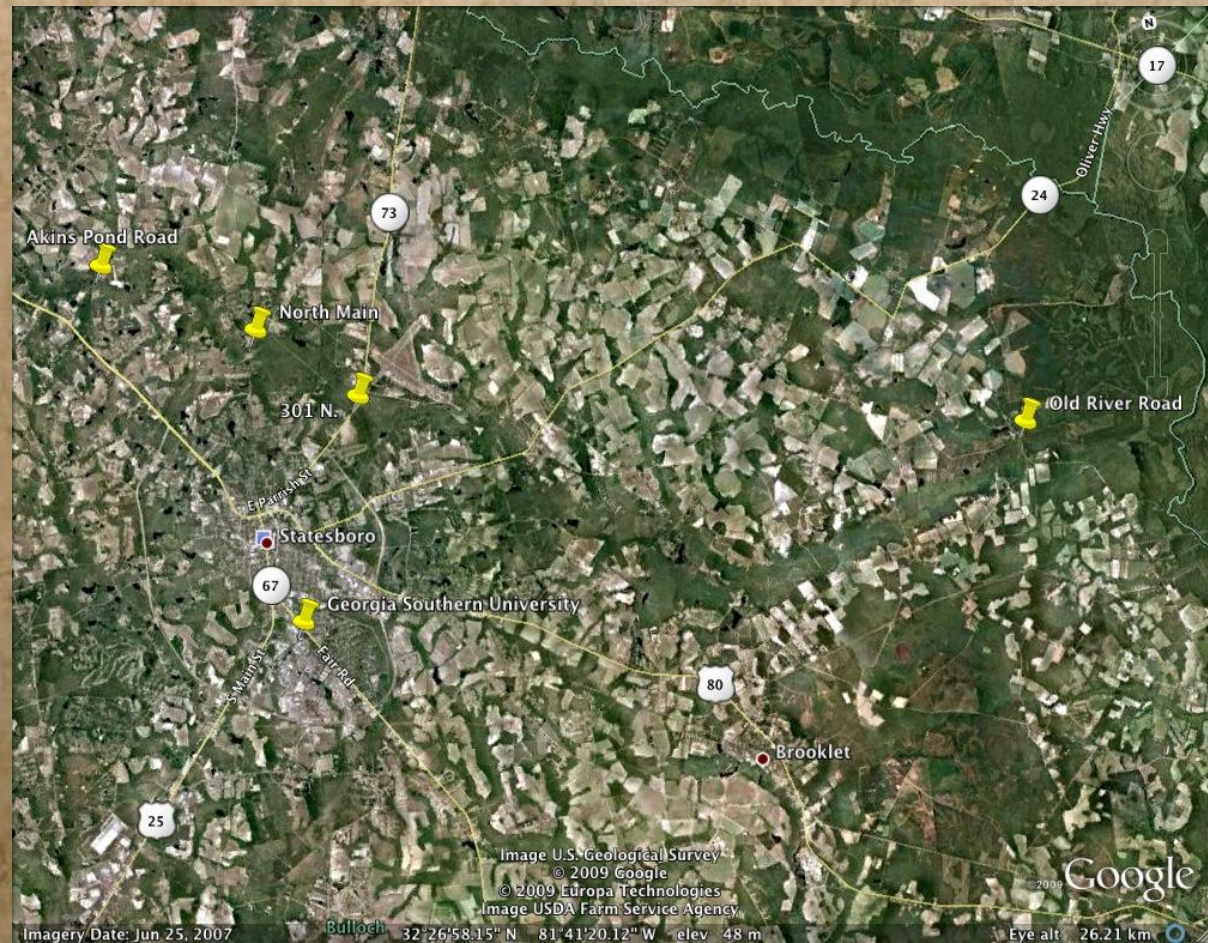
- Subtle habitat differences
- Differing ranges (projected)
- Lack of quality data concerning ranges
- Lack of data discussing population changes



The Game Plan

- Collect samples- four sites
- Bridges are sites
 - North/South
 - East/West
- Sampled in similar manner

- *Anopheles* separated from other genera
- *An. quad.* Complex processed
- Compare with samples from last 11 years



Collection Sites



The Collecting and Processing



Processing The Complex

Key to the Genus *Anopheles*

1. Wings with pale-scaled spots (Fig. 96).....2
- Wings entirely dark-scaled (Fig. 97) or with silvery or coppery apical fringe spot (Fig. 98).....5

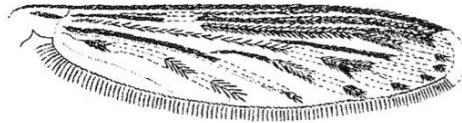


Fig. 96. Dorsal view of wing - *An. crucians*

Fig. 97. Dorsal view of wing - *An. quadrimaculatus*

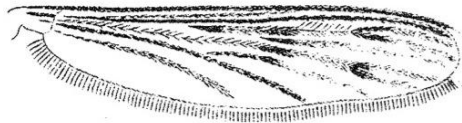
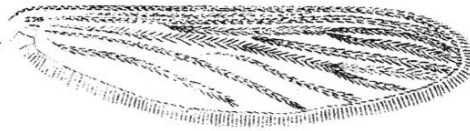


Fig. 98. Dorsal view of wing - *An. earlei*

- 5(1). Wing unspotted (Fig. 105); scutal setae length about 0.5 width of scutum (Fig. 106); small species, wing length about 3.0 mm.....*barberi*
- Wing spots of dark scales more or less distinct (Fig. 107); scutal setae mostly shorter than 0.5 width of scutum (Fig. 108); medium to large species, wing length 4.0 mm or more.....6



Fig. 105. Dorsal view of wing - *An. barberi*

Fig. 106. Dorsal view of thorax - *An. barberi*

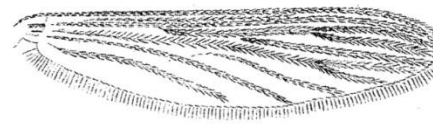
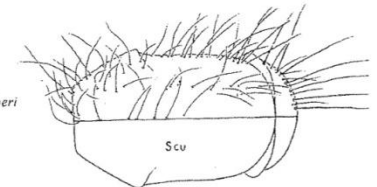


Fig. 107. Dorsal view of wing - *An. quadrimaculatus*

Processing continued

6(5). Interocular tuft with some pale setae (Fig. 109); wings with 4 distinct dark-scaled spots (Fig. 110); palpi with dark scales (Fig. 109) 7

Interocular tuft with only dark setae (Fig. 111); wing usually with dark-scaled spots indistinct (Fig. 112); segments of palpi with or without distinct pale apical bands (Fig. 111) 11

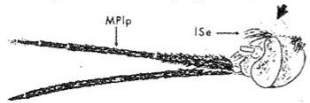


Fig. 109. Lateral view of head - *An. freeborni*

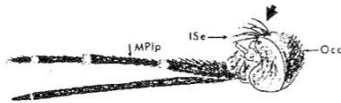


Fig. 111. Lateral view of head - *An. walkeri*

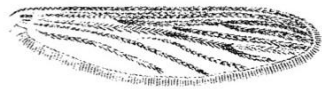


Fig. 110. Dorsal view of wing - *An. quadrimaculatus*



Fig. 112. Dorsal view of wing - *An. atropos*

7(6). Upper proepisternum usually with 2-6 setae (Fig. 113); midtibia and usually foretibia with pale scales apically (Fig. 114)..... 8

Upper proepisternum usually with 7-26 setae (Fig. 115); fore- and midtibiae dark-scaled (Fig. 116)..... 9

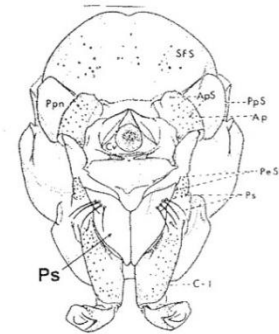


Fig. 113. Anterior view of thorax - *An. quadrimaculatus*

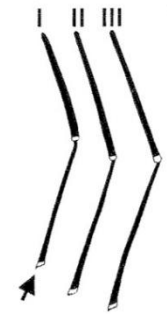


Fig. 114. Femora and tibiae - *An. quadrimaculatus*

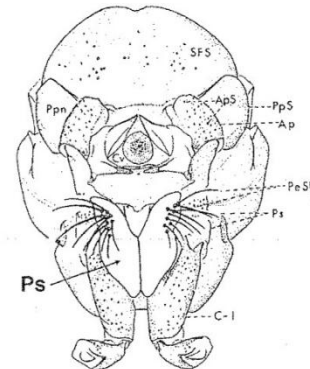


Fig. 115. Anterior view of thorax - *An. inundatus*



Fig. 116. Femora and tibiae - *An. inundatus*

Processing continued

8(7). Setae of scutal fossa usually with 21-45 setae (Fig. 117); prealar area usually with 6-12 setae (Fig. 118); interocular area usually with 7-12 setae.....*quadrimaculatus*

Setae of scutal fossa usually with 8-20 setae (Fig. 119); prealar area usually with 1-5 setae; interocular area usually with 4-6 setae.....*smaragdinus*

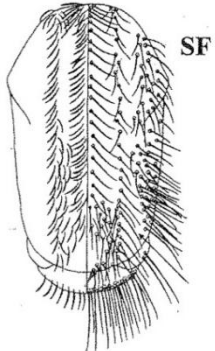


Fig. 117. Scutum - *An. quadrimaculatus*

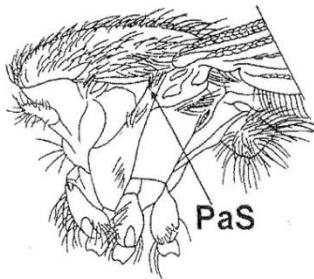


Fig. 118. Lateral view of thorax - *An. quadrimaculatus*

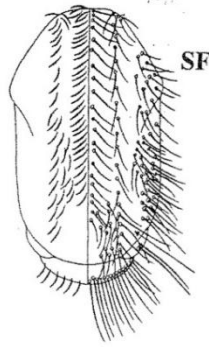


Fig. 119. Scutum - *An. smaragdinus*

9(7). Dorsocentral area without piliform scales on anterior margin (Fig. 120).....*diluvialis*
 Dorsocentral area with 2-10 golden piliform scales on anterior margin (Fig. 121).....10



Fig. 120. Scutum - *An. diluvialis*



Fig. 121. Scutum - *An. inundatus*

10(9). Fore- and midfemora with knee spots (Fig. 122); scutal fossa usually with 9-20 setae (Fig. 123); maxillary palpi often less than 1.0 length of proboscis; interocular area usually with 2-5 setae.....*maverlius*

Forefemur and usually midfemur dark-scaled (Fig. 124); scutal fossal area usually with 21-32 setae (Fig. 25); maxillary palpi 1.0 or greater than length of proboscis; interocular area usually with 6-9 setae.....*inundatus*

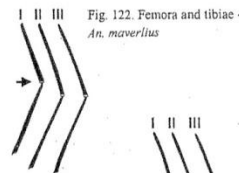


Fig. 122. Femora and tibiae - *An. maverlius*

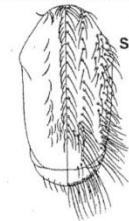


Fig. 123. Scutum - *An. maverlius*



Fig. 124. Femora and tibiae - *An. inundatus*



Fig. 125. Scutum - *An. inundatus*

Future Direction

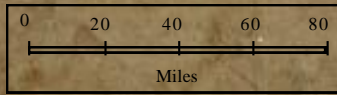
Non- <i>Anopheles</i>		<i>Anopheles</i>	
males	females	males	females
508	1499	867	1289

- Finish processing and keying out recent samples
- Process and key out previous samples
 - Roughly 2500 *Anopheles*
 - 1995-1998, 2000-2004

Mosquitoes collected from beneath bridges in Bulloch Co., GA, 1995-1998.

Mosquito species	Totals (%)	No. (%) Bloodfed	No. (%) Unfed	No. (%) Gravid
<i>Culex erratius</i>	2673 (60.4)	166 (6.2)	1793 (61.7)	714 (26.7)
<i>Anopheles quadrimaculatus</i>	1091 (24.7)	160 (14.7)	802 (73.5)	129 (11.8)
Others	142 (3.2)			

GEORGIA
Sampling Locations
(•)



Acknowledgments

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- Biology Department of Georgia Southern University
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