A CONTRAST IN THE BASKING HABITS OF THE SYMPATRIC TRIONYCHID TURTLES APALONE MUTICA AND A. SPINIFERA

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Trionychids are medium- to large-bodied turtles with a unique "softshell" morphology. They are generally highly aquatic, and typical habitats are rivers and floodplain lakes (Ernst and Barbour 1989). Most species have been reported to bask out of water at least occasionally, and most reports of basking involve sandy or muddy riverbanks (Ernst and Barbour 1989).

Two trionychids (Apalone mutica, A. spinifera) are widely distributed in North America and are sympatric over most of their respective ranges (Ernst et al. 1994). Both are reported to bask (Fitch and Plummer 1975; Graham and Graham 1997; Muller 1921; Newman 1906; Webb 1962; Williams and Christiansen 1981) but few data are available to characterize their basking habits in detail. Williams and Christiansen (1981) stated that the two species basked together primarily on shorelines of large rivers in Iowa where they were sympatric, but A. spinifera ranged further upstream into smaller rivers than did A. mutica, and often basked on submerged trees, logs, and rocks in upstream localities. In a Vermont river, Graham and Graham (1997) observed exclusive use of deadwood as a basking substrate for A. spinifera. In the present study, I detail a difference in basking substrate choice of A. mutica and A. spinifera in sympathy in three river drainages, and discuss the difference with respect to the possible importance of aggressive interactions with basking heterospecific turtles.

MATERIALS AND METHODS

Data were collected from eight replicated spotting-scope counts of basking turtles in the lower Tennessee drainage of western Kentucky, and the Pearl and Pascagoula drainages of Mississippi and Louisiana (Lindeman 1996, 1997, 1999a). The Tennessee drainage sites included 15 sites with predominantly gravel shorelines on Kentucky Lake reservoir and five sites below Kentucky Lake Dam, whereas the Pearl and Pascagoula sites were located predominantly on lotic stretches of river with sandy banks (maps in Lindeman 1996, 1997).

Each turtle identified to species was recorded according to the type of basking substrate it used (shoreline, log, branch, or stump) and the number of other turtles that shared its substrate (deadwood only). Apalone were identified to species on the basis of color patterns of the carapace and limbs (juveniles and males), or on the basis of coloration of the limbs and presence or absence of spiny projections on the anterior rim of the carapace (females; Ernst et al. 1994), which were often visible in female A. spinifera observed with the spotting scope.

RESULTS

Of 3680 total basking turtles identified to species, 45 were A. mutica and 19 were A. spinifera. Thirty-eight (84%) of the A. mutica basked on the shoreline, compared to only three (16%) of the A. spinifera (Table 1). This difference was statistically significant (binomial test of proportions, z = -4.72, P < 0.001). Much of this difference was due to the greater prevalence of A. mutica

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in the Tennessee drainage, both in the reservoir and below the dam, and its preference for shoreline basking there; however, the trend in the two southern rivers was also for more frequent use of shoreline by *A. mutica* (4 of 10 observations, 40%) than by *A. spinifera* (2 of 16 observations, 13%; Table 2). Two of seven (29%) *A. mutica* basking on deadwood shared substrates with 1–3 other turtles, while seven of 16 (44%) *A. spinifera* basking on deadwood shared substrates with 1–4 other turtles.

**DISCUSSION**

In the present study, *A. spinifera* basked more frequently on emergent deadwood than did its sympatric congener, *A. mutica*. These data extend the observations of Graham and Graham (1997) and Williams and Christiansen (1981), who noted frequent to exclusive use of deadwood as a basking substrate in populations of *A. spinifera* allopatric to *A. mutica*.

The contrast in basking habits of the two species of *Apalone* may be related to an apparent contrast in their inherent aggressiveness, if aggressiveness relates to performance during interactions with basking heterospecifics. *Apalone spinifera* is considered to be more aggressive than *A. mutica*, at least in its behavior toward humans (Vogt 1981; M. Plummer pers. comm. 1997; pers. obs. 1992–97). Trionychids basking on deadwood are frequently exposed to basking heterospecifics, particularly emydids (present study; Graham and Graham 1997). While most studies of aggression among basking turtles have concerned intraspecific interactions for emydid species (Bury and Wollheim 1973; Bury et al. 1979; Lovich 1988), interspecific aggression among emydid and kinosternid species also occurs (Lindeman 1996, 1999b). Aggressive interactions between basking *Apalone* and other species have not been reported, but because interactions often involve use of the claws of the aggressors (Lindeman 1999b), they may be particularly damaging to the soft, leathery carapaces of trionychids. Highly aggressive behavior by *A. spinifera* may allow it to protect itself more successfully from carapace damage than can *A. mutica*.

The hypothesis that *A. spinifera* is more willing than *A. mutica* to bask on deadwood occupied by emydids is further suggested by analyses of deadwood and total turtle densities in the three drainages studied (Lindeman 1999a). Deadwood density was similar in the three drainages studied, but total turtle density in the Tennessee drainage was threefold higher than in the Pearl drainage and sixfold higher than in the Pascagoula drainage. Thus the Tennessee drainage had more turtles occupying similar quantities of exposed deadwood, and it was in this drainage that *A. mutica* was most likely to be observed on shorelines rather than on emergent deadwood.

**TABLE 1.** Substrates used by basking *Apalone mutica* and *A. spinifera* in the Pearl, Pascagoula, and lower Tennessee drainages.

<table>
<thead>
<tr>
<th>Substrate</th>
<th><em>A. mutica</em></th>
<th><em>A. spinifera</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>n</em></td>
<td>%</td>
</tr>
<tr>
<td>Log</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Branch</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Stump</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>Shoreline</td>
<td>38</td>
<td>84</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 2.** A comparison of use of deadwood and shoreline as basking substrates in *Apalone mutica* and *A. spinifera* in three river drainages, in total numbers of observations for each species in each drainage. Data from the Tennessee drainage are separated according to whether they are from (A) 15 sites on Kentucky Lake reservoir, or (B) five sites on the Tennessee River below Kentucky Lake Dam.

<table>
<thead>
<tr>
<th>Drainage</th>
<th><em>A. mutica</em></th>
<th><em>A. spinifera</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deadwood</td>
<td>Shoreline</td>
</tr>
<tr>
<td>Tennessee–A</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Tennessee–B</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Pearl</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pascagoula</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>38</td>
</tr>
</tbody>
</table>
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LITERATURE CITED

Newman, H.H. 1906. The habits of certain tortoises. J.
Comp. Neurol. Psychol. 16:126–152.