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Additional Records of Distribution and Hosts for the Bat Bug, Cimex pilosellus in Arkansas

Tim W. Steward
Arkansas State University

V. Rick McDaniel
Arkansas State University

Daniel R. England
Southern Arkansas University

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it appeared that several adult and juvenile birds had left the rookery.

Farther upstream at river mile 161.5, four adult birds were counted 1 July on a large side-channel bar. No juveniles, eggs, or nests were found, although three nests with three eggs each plus six empty nests and 16 adult birds had been observed there 26 May (Carroll Green pers. comm. 30 May 1985), and 30 adults, five flying young, and a nest with one hatching and one egg were found on 14 July 1984.

A mid-channel sandbar at river mile 240.4 provided habitat for ten adult birds. No juveniles and only one scrape with two eggs were counted. Fragments of three other eggs were discovered, possible indications that juvenile birds were on the island. The observation of an adult tern carrying a minnow also suports the possibility of young birds having been present.

A rookery located on a mid-channel sandbar at river mile 275 was the largest ternery on the Arkansas River above Little Rock. Twenty-four adults, seven juvenile birds (one of which was dead), and 36 eggs were found. Twenty nests, several of which contained eggs, were observed just downstream of river mile 275 on 4 July 1981. Closer to Fort Smith, six nests and three eggs were found in June 1958. In June 1959 two nests were discovered, and later in July, two juveniles were observed at the same site.

Downstream on a side-channel sandbar at the mouth of the Arkansas River (Mississippi River mile 582) was the second largest tern colony ever reported in the state. More than 20 adults and 70 juvenile birds were counted along a two-mile stretch of beach on the Mississippi River side of the island.

The distribution of interior least terns on the Arkansas River is determined by water levels. As terns move upriver into Arkansas, they settle only on exposed sandbars. Because sandbars on the lower reach of the Arkansas River from Little Rock to its confluence with the Mississippi River and the White River from Newport to the navigation channel often are inundated in May and early June, these lower river sections probably are bypassed by terns. Therefore, in May and June, the beginning of the tern nesting season in Arkansas, terns will be found upstream where sandbars are exposed.

The slope of the Arkansas River also has much to do with the location of terns and their rookeries. In the river's upper reach, the slope is greater — which causes the river to cut deeper into the channel, therefore creating higher sandbars. Below Little Rock, the slope is less, the river is broader, and sandbars are flatter, more spread out. Consequently, it takes less water (volume) to inundate downstream sandbars, which often can remain wet into June or early July.

Because of its location, the sandbar at the mouth of the Arkansas River is not influenced significantly by water levels on the Arkansas. Most of the island borders the Mississippi River and the rookery here actually should be considered a Mississippi River colony. However, since it was found as part of the Arkansas River survey, it is included in this report.

In contrast to the Arkansas River, sandbars on the White River are not as extensive. The channel of the White River is narrower and much more convoluted. Long, wide bends, ideal for the deposition of sand and gravel and common on the Arkansas River, are absent on the White. Sandbars on the White River, therefore, are smaller and usually are found on the inside bend of the channel. These areas normally remain under water into June. Together, the lack of sandbars and high water levels prohibit the use of the White River and its major tributaries for least tern nesting.

Colonies of interior least terns on the Arkansas River are vulnerable to several threats including high water levels, dredging operations, cattle grazing and all-terrain-vehicle (ATV) use. Of these, high water is probably the most serious threat to rookeries and the most difficult to control, given the unpredictability of Arkansas weather and the frequence of summer flooding in the state. For example, the sandbar downstream of Fort Smith that had a rookery on it in June 1981 was under water the next year. Had terns reused the island in 1982, eggs and newly hatched chicks would have been swept away. After such an experience, it might take several days or weeks before adult terns would attempt to renest. To illustrate further the potential threat, high water levels have been recorded at river mile 275, in May and June, six times in the last five years.

Considerable habitat destruction occurred at three of the five rookeries surveyed this year. The rookery at river mile 147 may have been impacted by a bulldozer leveling spoil material from a nearby dredging operation on 1 July 1985. Only one chick, no eggs, and very few scraps were found in an area which had been leveled recently. A part of the rookery apparently survived the bulldozing since eight juvenile birds were discovered in an undisturbed area on 19 July.

Dredging itself, posed no threat to tern colonies since no sandbars used by the terns were located in the navigation channel. The deposition of spoil during the nesting season, though, could cause serious problems for the Arkansas River rookeries.

Unusual as it may be, at river mile 161.5, cattle may have reduced a thriving colony of least terns and young in 1984 and on 26 May 1985 to only four adult birds by 1 July 1985. The sandbar, one of the most extensive surveyed on the Arkansas River, was covered with cattle tracks. On the other hand, eggs and juvenile birds observed in May could have developed into fledged young by July and left the sandbar along with the adult terns.

At river mile 240.4, ATVs were a serious threat to a rookery. ATV tracks criss-crossed the primary nesting area on the sandbar. Several scrapes were located, but only one scrape had eggs and no young or tracks of young were discovered. Spent rockets and fireworks also covered the area. The fourth of July, no doubt, is a peak period for ATV recreationists on the Arkansas.

The author appreciates the valuable contributions made to the interior least tern survey by the Little Rock District of the Corps of Engineers and the Arkansas Game and Fish Commission. As noted earlier, the Corps procured a helicopter and pilots for the aerial survey and provided a river-worthy boat for the lower Arkansas River survey. The Game and Fish Commission made available a truck and boat for the upper Arkansas River tern survey. The contributions of biologists Clyde Gates (Corp of Engineers) and Craig Uyeda (Game and Fish Commission) are noted with appreciation. Gates and Uyeda stayed with the survey throughout its duration and assisted in many ways.

The assistance provided by Bill Shepherd of The Arkansas Natural Heritage Commission was invaluable. Bill provided excellent guidance at every phase of the project, and his keen eyes and expert identification skills kept me from mistaking killdeer for terns. Lance Peacock of the Arkansas Nature Conservancy assisted by participating in the aerial survey. Special thanks are extended to Carol Smaniotto for typing the report.

KENNETH LEE SMITH, Arkansas Natural Heritage Commission, The Heritage Center, Suite 200, 225 East Markham, Little Rock, AR 72201.

ADDITIONAL RECORDS OF DISTRIBUTION AND HOSTS FOR THE BAT BUG, *CIMEX PILOSELLUS* IN ARKANSAS

The bag bug, *Cimex pilosellus* Harvath, is a wingless, parasitic insect approximately 6mm in length. It is a common ectoparasite of many chiropteran species. As reported by Usinger (1966, Monograph of Cimicidae, Entomol. Soc. Amer., College Park, Maryland) this insect usually stays in the roost while bats forage. It is in the roost that the insect obtains its blood meal.

The initial record of *C. pilosellus,* in Arkansas was reported by Price et. al. (1982, Proc. Ark. Acad. Sci. 37:98). This record was obtained

from a colony of *Eptesicus fuscus* in a home in Brinkley, Monroe County. For this record, specimens of the insect were collected from bats and captured by hand and from mist nets.

The authors have been conducting an extensive study of the chiropteran fauna of Southwestern Arkansas. To date the study has resulted in the collection of several hundred bats and *C. pilosellus* has been encountered on six occasions and at six new locations.

The first new record of this insect is from a well in Columbia Co., at an abandoned house site just north of the Louisiana-Arkansas border. Several bats were taken from the well by hand. Among these was a bat having two cimicides clinging to its uropatagium. In addition to the new county record, this find is notable because the bats were *Plecotus rafinesquii* and our review of the literature revealed no other report of *C. pilosellus* preying upon the eastern big-eared bat.

Bat bugs were next encountered in Sevier County. While mist netting over a rocky stream in a thickly wooded area near an open face rock quarry, sixteen bats were collected. Among the bats was an *Eptesicus fuscus* with two cimicides attached to its uropatagium. This collection was from a foraging bat substantiating that cimicides do not always remain behind in the roost when the bats leave. Additionally, these bats were collected from an area devoid of assessable human structures. All of our other records were associated in some way with human structures.

Our third new report is from Garland County. From a residence in Hot Springs, a mixed colony of *Tadarida brasiliensis* and *E. fuscus* was discovered. Although we observed many cimicides associated with the colony, they were invariably most intimately associated with *E. fuscus* rather than with *T. brasiliensis.*

The fourth new report was obtained from Calhoun County. The site was a recently demolished bridge over a shallow stream in a thickly wooded area. Of eight bats netted, one *P. rafinesquii* was found to have a cimicide attached to its right wing.

A house in Texarkana, Miller County yielded a fifth new record of *C. pilosellus.* A single cimicide was removed from the back of a *P. rafinesquii* (one of several in the house).

The most recent new record we report is from Lafayette County. From an area NE of McKamie, an additional *P. rafinesquii* was found having a cimicide attached to its uropatagium.

These six additional records of *C. pilosellus,* from scattered locations, indicate that the bats of southern Arkansas support a wide spread infestation of this ectoparasite. Interestingly, no single species is responsible for harboring *C. pilosellus* in Arkansas.

Voucher specimens from these studies have been deposited in the appropriate collections of Arkansas State University.

T. W. STEWARD, V. RICK McDANIEL, and DAN R. ENGLAND, Department of Biology, Arkansas State University, State University, AR 72467, and Department of Biology, Southern Arkansas University, Magnolia, AR 71753.

EVALUATION OF A FIN RAY SCARRING TECHNIQUE FOR INDIVIDUALLY MARKING FISH

A mark for use on fish that is inexpensive, quickly applied, permanent, and permits individual identification has been needed by fisheries scientists and fish culturists for many years. A technique for marking fish that apparently meets all of the above criteria has been previously tested on several cold-water fish species under both laboratory and field conditions in Canada (Welch and Mills, Can. J. Fish. Aquat. Sci., 38:1168-1170, 1981). We report here the results of further tests conducted at both Sooner Fish Farm, a commercial catfish farm at Washington, Oklahoma, and at the University of Arkansas at Pine Bluff Agricultural Experiment Station, with two fish species used in warm water aquaculture.

The mark is created by severing a fin ray at about mid-length with fine-pointed scissors (Fig. 1). The ray should be completely severed but care should be taken not to tear the membrane between the rays, nor remove the distal portion of the severed ray. We are normally able to weigh, measure and mark a fish a minute with this method.

The severed ray mends completely in 4 to 6 weeks, forming a bony knot (Fig. 2) that is about twice the diameter of the ray. This mark is both easily seen and felt since it is larger than the rest of the ray (Fig. 3). The mark also appears darker than the rest of the ray when viewed with transmitted light.

Marks were produced in September, 1975, on the dorsal soft-rays of bigmouth buffalo *(Ictiobus cyprinellus),* averaging 2.2 kg, prior to stocking in a 1.6-ha commercial catfish culture pond. The marks were still obvious 18 months later when the pond was harvested (Fig. 3). Unfortunately, since we were unable to examine the entire population at that time, it could not be determined if some individuals had lost the mark.

The technique was subsequently used on both a dorsal soft-ray and spiny-ray of 225 blue tilapia *(Tilapia aurea),* averaging 195 g. There was 100% mark retention on the tilapia after 6 months, by which time the fish had grown to an average weight of 405 g. The marks on both the spiny-rays and soft-rays appeared equally visible (Fig. 4).

This technique is quick and easy to use, causes little trauma to the fish, and appears to be permanent, at least within the limits of this study. While the marks are visible upon examination, they would probably be overlooked by an untrained observer.

This technique can be extremely useful to fisheries scientists as well as fish culturists. While we have only applied marks to dorsal fin rays, this technique should work equally well on any fin, and on any fish species. A simple coding system using one or more marks on various soft-rays and/or spiny-rays can be used to batch mark groups, such as brood stock from different sources or age classes, as well as to mark individual fish. We have also used this technique for the short-term (< 1 month) marking of fish. While the knot obviously doesn't have time to completely form in this time, the severed ray itself serves to identify the fish. We found, as did Welch and Mills (1981) that the main disadvantage of this technique is the potential for error in counting the fin rays when marking or reading the marks.

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