The previously untagged CNS animal was given two yellow Rototags (FL1951, FL1953) and a monel tag (AAK973) on the trailing edge of the front flippers. Over-the-curve carapace length was 84 cm. The clutch of 125 eggs was partially depredated (25% loss) by raccoons at the time of laying. Protective screening placed over the nest cavity prevented further predation, but the remaining eggs did not develop. The propensity for sea turtle eggs from raccoon-depredated nests to hatch has been shown for loggerheads (McMurtray 1983) and may account for the hawksbill clutch failure.

LITERATURE CITED

Carr, A., H. Hirth, and L. Ogren. 1966. The ecology and migrations of sea turtles 6: the hawksbill turtle in the Caribbean Sea. Am. Mus. Novit. 2249:1-29.

Lund, F. 1978. Atlantic hawksbill. pp. 24-25. McDiarmid, R. W. (ed.). Amphibians and Reptiles. Rare and Endangered Biota of Florida, Vol. 3, University of Florida Press.

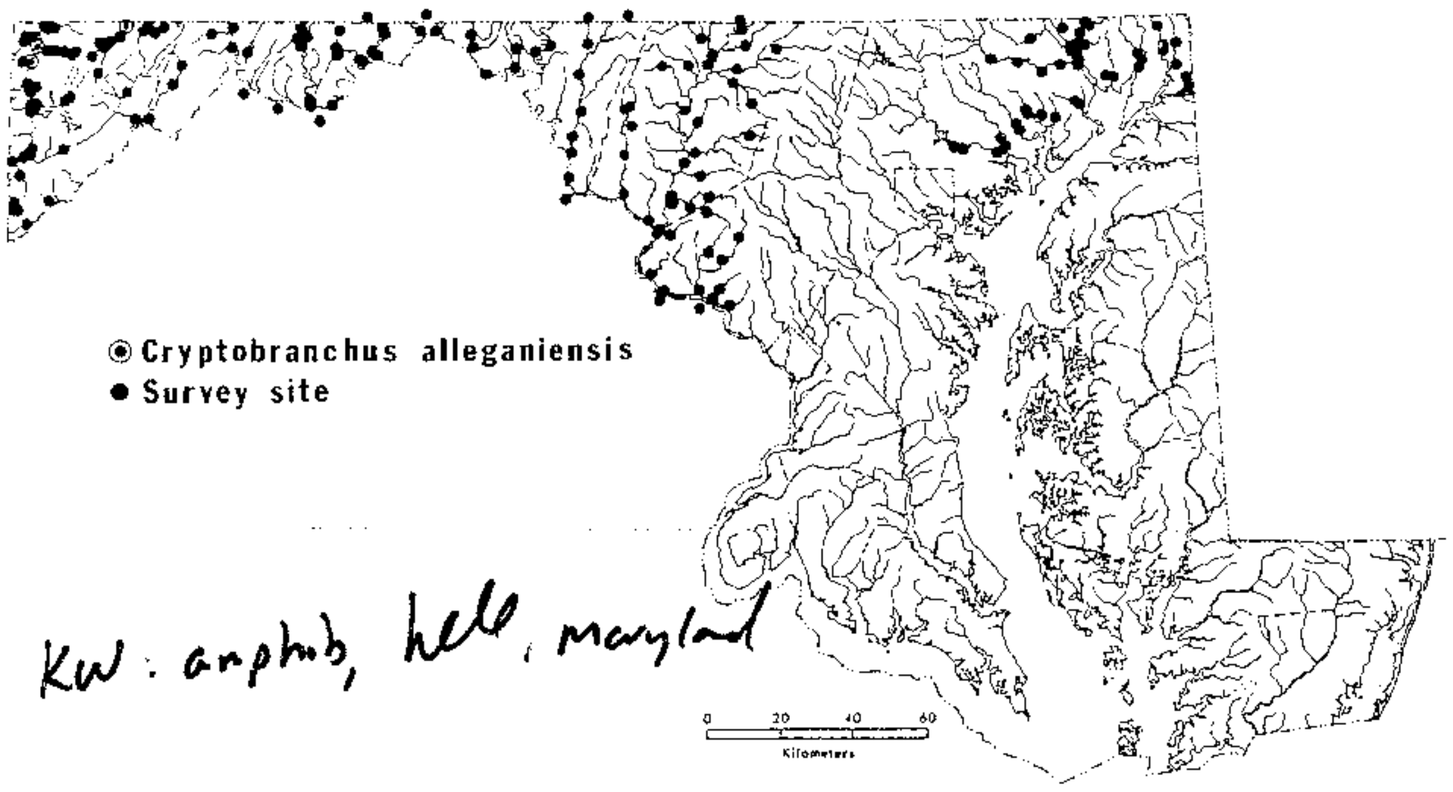
McMurtray, J. D. 1983. Hatching success of eggs remaining in loggerhead sea turtle nests partially depredated by raccoons. Assoc. S.E. Biol. Bull. 30:71.

JENNIFER D. McMURTRAY
School of Forest Resources
Athens, Georgia 30602, U.S.A.
and
JAMES I. RICHARDSON
Institute of Ecology
Athens, Georgia 30602, U.S.A.

THE DISTRIBUTION AND STATUS OF *Cryptobranchus Alleganiensis* IN MARYLAND

Cryptobranchus alleganiensis is listed as endangered in Maryland and is declining throughout its range (Williams et al. 1981a; Gates et al. in press). In Maryland, it is known from: 1) the lower Youghiogheny River, 2) the Casselman River, and 3) the Susquehanna River and its tributaries (Fowler 1915; McCauley and East 1940; Meszoely 1966; Harris 1975). There are unsubstantiated accounts from fishermen of *C. alleganiensis* in the Potomac River and tributaries, where it may have dispersed from the Youghiogheny via stream capture (Hendricks et al. 1983). An extinct Pleistocene form of *Cryptobranchus* is known from the Potomac River watershed (Holman 1977). This study's objective was to determine the present distribution and status of *C. alleganiensis* in Maryland.

From 30 September 1979 through 21 November 1981, approximately six days per month (range = 1-18) were spent surveying the Youghiogheny, Susquehanna, and Potomac rivers and tributaries, depending on weather and stream conditions. Several rivers emptying into the northern Chesapeake Bay were also included, as well as the mouths of tributaries of the Potomac River in nearby West Virginia and Virginia (Fig. 1). No surveys were done from December through March. Most survey days (92.6%) occurred from May through October. Although several different techniques were employed in stream surveys (see Williams et al. 1981b), electrofishing with dip nets was the one method used most often by the survey crew. A two-to-four man crew spent 308.5 in-stream hours (905.5 man-hours) sampling for *C. alleganiensis*. Two hundred and fifty-nine individual sites were sampled: 91 in the Youghiogheny River system, 44 in the Susquehanna River system and other streams emptying into the northern Chesapeake Bay, and 124 in the Potomac River system (Fig. 1). Multiple samples were often made where habitat appeared good. Twenty-four percent of the sites were sampled both day and night. Night sampling usually began about 0.5 hour after sunset. We spent an average of 54 (± 2.3 SE, range = 15-300) minutes per sample. All captured individuals were returned alive to the stream.



KW: amphib, hell, maryland

Figure 1. Location of sites surveyed for *C. alleganiensis* in Maryland.

Additionally, 200 "hellbender wanted" posters were posted along the Youghiogheny and Susquehanna river drainages, Gunpowder Falls, and Little Gunpowder Falls between 31 March and 7 May 1982. On 1-2 May 1983, 42 additional posters were placed along the Susquehanna River and its tributaries. No posters were placed along the Potomac River drainage.

Between 29 May 1980 and 30 September 1982, seven *C. alleganiensis* were captured within a one kilometer section of the Casselman River from 1.6 km north of Crab Run Road to 0.8 km south of the Pennsylvania state line (Fig. 1). Individuals ranged from 298-438 mm total length (212-270mm snout-vent length) and weighed from 245-530 g. Our stream surveys were unsuccessful in locating *C. alleganiensis* elsewhere in the Youghiogheny River system, or in the Susquehanna and Potomac River drainages.

We received ten responses to our "hellbender wanted" posters. Three resulted in documentation of *C. alleganiensis* in Maryland streams. One fisherman hooked and caught a *C. alleganiensis* in the Casselman River on 13 April 1982 near the sites already identified by our stream surveys. Another fisherman caught and photographed a *C. alleganiensis* in the Youghiogheny River at Friendsville, Maryland, on 15 April 1982 approximately 274-366 m upstream of the confluence with Bear Creek (Fig. 1). This was the first record we had of *C. alleganiensis* in the Youghiogheny River system, other than the Casselman River, since we began our study. On 22 August 1982, another *C. alleganiensis* was captured, photographed, and released by Drew Ferrier, a biologist with Garrett Community College, McHenry, Maryland, while electrofishing 2.4 km south of Friendsville (Fig. 1). These two records from the Youghiogheny River document the continued presence of *C. alleganiensis* in a 4.0 km section. No response was received from fishermen along the Susquehanna River or any of its tributaries.

Compared with our previous work in Pennsylvania (Williams et al. 1981b), *C. alleganiensis* populations in the Youghiogheny River system in Maryland are sparse. The Casselman River probably has a more dense population than the Youghiogheny River. *Cryptobranchus alleganiensis* is highly susceptible to pollution and the submergence of swift water riffles by artificial impoundments (Gentry 1955; Nickerson and Mays 1973). The Youghiogheny River Reservoir just north of Friendsville eliminated much *C. alleganiensis* habitat and is a definite barrier to dispersal. Acid mine drainage, municipal sewage, industrial effluents, agricultural runoff, and siltation resulting from forestry practices, mining, and construction are the major pollutants in the Youghiogheny River system. The most limiting pollutants to aquatic organisms in this system are acid mine drainage and siltation (Hendricks et al. 1983). The river was considered almost lifeless in 1950 (Reppert 1964). The decrease in coal production and the increase in water quality law enforcement and mine drainage abatement projects since then have improved water quality considerably.

The lack of recent information from the Maryland portion of the Susquehanna River system leaves the continued existence of *C.*

alleganiensis there in doubt. The Conowingo Reservoir eliminated much habitat and is a definite barrier to dispersal. The same pollutants found in the Youghiogheny River system, excluding possibly acid mine drainage, are factors that may have affected populations here. Low dissolved oxygen concentrations and nutrient enrichment are two of the concerns in the Susquehanna below Conowingo Dam (Rudisill 1979). However, several tributaries of the Susquehanna, especially Deer and Octoraro creeks, appear to be suitable habitat. Even in these two streams, elevated nutrient concentrations and siltation are problems (Rudisill 1979).

There is no evidence of the occurrence of *C. alleganiensis* in the Potomac River system. Water quality in the Potomac River basin ranges from poor in the North Branch, where acid mine drainage restricts most aquatic life, to good from the confluence of the North and South branches downstream to Little Falls Dam, Maryland. Nutrients, bacteria, and sediment from inadequately treated municipal sewage discharges and street and farmland runoff are the major forms of pollution in most of the Potomac River basin (Mason et al. 1976).

Cryptobranchus alleganiensis in Maryland is rightfully categorized as endangered. Where it is found, populations appear to be low. We found no evidence of successful reproduction though we sampled during the late summer-fall breeding season. Besides different forms of pollution, fishing could have an impact on populations. Many fishermen believe that *C. alleganiensis* is poisonous and attempt to kill captured individuals before removing them from the hook. Or, they may merely cut their line and release them with the hook imbedded inside their digestive tract (Nickerson and Mays 1973). Mortality from this impact is difficult to document, but could be considerable in certain areas. Better education of the fishing public would be an important means of reducing this source of mortality.

ACKNOWLEDGMENTS

We thank Clark Shiffer, Pennsylvania Fish Commission, for his help in the early stages of the study, and Bob Davis, Maryland Water Resources Administration, for information on water quality in Maryland streams. Several people contributed time and muscle as members of the survey crew. Thanks go to Dave Williams, Carl Christianson, Ed Esmond, Paul McKeown, Dave Oswald, Ron Stouffer, Tim Welch, Jim Lebo, Terry Barila, Rich Raesly, and Brian Lang. Typing was done by Evelyn Kirk. Funds for this research were provided by the Maryland Department of Natural Resources, Forest, Park, and Wildlife Service, and the U.S. Fish and Wildlife Service, through the Maryland Endangered Species Program. This is Contribution No. 1550-AEL, Center for Environmental and Estuarine Studies, University of Maryland.

LITERATURE CITED

Fowler, H. W. 1915. Some amphibians and reptiles of Cecil County, Maryland. Copeia 1915:37-40.

Gates, J. E., C. H. Hocutt and J. R. Stauffer, Jr. (in press). The status of the hellbender *(Cryptobranchus alleganiensis)* in Maryland. Proceedings of a symposium on threatened and endangered plants and animals of Maryland, September 3-4, 1981. Towson State University, Towson, Maryland.

Gentry, G. 1955. An annotated check list of the amphibians and reptiles of Tennessee. J. Tenn. Acad. Sci. 30:168-176.

Harris, H. S., Jr. 1975. Distributional survey (Amphibia/Reptilia): Maryland and the District of Columbia. Bull. Md. Herpetol. Soc. 11:73-170.

Hendricks, M. L., J. R. Stauffer, Jr. and C. H. Hocutt. 1983. The zoogeography of the fishes of the Youghiogheny River system, Pennsylvania, Maryland and West Virginia. Am. Midl. Nat. 110:145-164.

Holman, J. A. 1977. The Pleistocene (Kansas) herpetofauna of Cumberland Cave, Maryland. Annals Carnegie Mus. 46:157-172.

Mason, W. T., Jr., V. J. Rasin, Jr., W. J. McCaw, III and K. C. Flynn. 1976. Potomac River basin water quality 1974. Interstate Commission on the Potomac River Basin Tech. Publ. 76-3. 69 pp.

McCauley, R. H., Jr. and C. S. East. 1940. Amphibians and reptiles from Garrett County, Maryland. Copeia 1940:120-123.

Meszoely, C. 1966. North American fossil Cryptobranchid salamanders. Am. Midl. Nat. 75:495-515.

Nickerson, M. A. and C. E. Mays. 1973. The hellbenders: North American "giant salamanders." Publ. Biol. and Geol. I. Milwaukee Public Mus. Press, Milwaukee, Wisconsin. 106 pp.

Reppert, R. T. 1964. Aquatic life and the acid reaction, *In* Fifth annual symposium on industrial waste control. Pp. 27-45. Frostburg State College and Md. Water Poll. Contr. Comm., Annapolis.

Rudisill, S. E. 1979. Second assessment of the water quality of streams in the Susquehanna River basin. Susquehanna River Basin Commission Publication No. 62. 129 pp.

Williams, R. D., J. E. Gates, C. H. Hocutt and G. J. Taylor. 1981a. The hellbender: A nongame species in need of management. Wildl. Soc. Bull. 9:94-100.

Williams, R. D., J. E. Gates and C. H. Hocutt. 1981b. An evaluation of known and potential sampling techniques for hellbender, *Cryptobranchus alleganiensis*. J. Herpetol. 15:23-27.

J. EDWARD GATES
Appalachian Environmental Laboratory
Center for Environmental and
Estuarine Studies
University of Maryland
Frostburg, Maryland 21532, U.S.A.
CHARLES H. HOCUTT
Horn Point Environmental Laboratories
Center for Environmental and
Estuarine Studies
University of Maryland
Cambridge, Maryland 21613, U.S.A.
JAY R. STAUFFER, JR.*
Appalachian Environmental Laboratory
Center for Environmental and
Estuarine Studies
University of Maryland
Frostburg, Maryland 21532, U.S.A.
and
GARY J. TAYLOR
Department of Natural Resources
Wildlife Administration
Tawes State Office Building
Annapolis, Maryland 21401, U.S.A.

*Present address
School of Forest Resources
Ferguson Hall
Pennsylvania State University
University Park, Pennsylvania 16802, U.S.A.

Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoo, Box 6040, Knoxville, Tennessee 37914, U.S.A.

EGGS AND HATCHLINGS OF THE YELLOW GIANT CHUCKWALLA AND THE BLACK GIANT CHUCKWALLA IN CAPTIVITY

Iguanid lizards of the genus *Sauromalus* (chuckwallas) are found only in the Southwestern United States, and in Northern Mexico. They are thought to have originated from *Ctenosaura* (spiny-tailed iguana) stock (Etheridge 1964; Hotton 1955; Smith 1946; Mittleman 1942). There are eleven subspecies, six belonging to the fine scaled "*obesus* group," and five belonging to the rough scaled, "*atar* group" (Robinson 1972). Three subspecies are in the United States, one on Baja California, one on the Mexican mainland, and six on the islands in the Gulf of California, Mexico (Shaw 1945).