noticeable blanching of the dorsal-fin spot, although, if this is also a distended fish, it may show the same change in the abdominal profile.

In some observations on group behavior in large aquaria a blanched, S-curving fish has aroused a response from as many as five other banded individuals. Although usually only one or two banded fish are able to hold a position close to the S-curving fish, in several instances all six of these fish rushed to the surface in a tight group and made a splash, the body of the blanched fish being strongly arched. Occasionally a rotund but banded fish, especially in a group showing this behavior, will suddenly reverse its role, blanch, and start S-curving and behaving like a typically blanched fish. This may last for only a few seconds or continue into typical spawning behavior with a banded fish. On some occasions both fish of a spawning pair may reverse roles for short periods, with intervals when both fish are blanched and S-curving. Usually the more distended fish will S-curve more strongly and more continuously, in an aggressive manner, blocking off and cornering the other blanched fish until it returns to the banded condition.

Spawning activity among pairs or groups may keep up for more than an hour, and water-surface samples taken afterwards show hundreds of fertilized eggs in various stages of early cleavage. However, the exact moment when eggs and sperm are released has yet to be determined with certainty, as there appear to be no special times when the genital areas of the fish are very close together. Also, it is not known which fish releases eggs and which sperm, or if eggs and sperm are released together from one or both fish. It was at first suspected that the blanched fish was releasing eggs and the banded fish, sperm, but subsequent observations have shown that an obviously gravid fish will blanch and go through S-curving and quivering movements and, without any response from another fish, release eggs and sperm that produce embryos and larvae even when such a fish is kept in isolation. In two instances the eggs could be seen coming out of the fish shortly after some quivering movements and a lowering of the post-abdominal region; the fish then seemed to rest on the bottom. There is also evidence that the mere sight of another fish in an adjacent aquarium could stimulate this release. Greatly distended fish caught in the morning and kept isolated will often release nonfertile or self-fertilized eggs the same or the following day. This may well be an artificial response brought about by laboratory conditions and the separation of natural pairs just before they are ready to spawn. A comparison of the sizes of these fish with the state of their gonads has given no evidence, so far, of a protandric condition with an intermediate stage to explain individuals capable of self-fertilization.

In nature these fish are strongly territorial. Before June, skin-diving observations indicated that only one mature-sized fish of this species occupied a territory (usually a ledge or pathway among the rocks). But in June and more frequently in July, pairs and sometimes trios of large fish with distended abdomens shared the same pathways, indicating a tolerance to sharing the same territory. This is especially noticeable because of the manner in which we catch these fish. By chasing them a few times around the rocky ledges, a diver can soon estimate the extent of their territory and can determine what other fish share this territory (such as *Opsanus, Equetes, Pomacentrus* and various species of gobies and blennies, and *Hypleurocheilus geminatus,* the last of which forms a substantial part of the diet of *Serranellus*).

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2. Details of the gross anatomy and histology of the reproductive system, as well as details on the embryonic development and spawning observations, are in preparation. This study has been greatly helped by the valuable suggestions and criticisms of Dr. C. M. Breder, Jr.
3. I am grateful to P. Bylaska, O. Farver, J. Hamlin, J. Randall, and T. Romans for their aid in collecting specimens.

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Hemoglobin Patterns in American Indians

Abstract. Two populations of North Carolina have been analyzed for hemoglobin patterns by paper electrophoresis. Of 534 Cherokee Indians, both mixed and full bloods, all showed normal hemoglobin. Lumbee Indians of less certain ethnic status had 1.7 percent of hemoglobin S, an equal amount of hemoglobin C, and one possible hemoglobin D trait among 1332 bloods studied.

Bloods of Cherokee and Lumbee Indians of North Carolina have been analyzed for hemoglobin patterns by the rapid paper electrophoresis method (*1*). All abnormal patterns were verified by standard electrophoretic techniques and sickle-cell tests.

The Cherokee Indian sample consisted of school children on the reservation at Cherokee, N.C. Among this Eastern band of the tribe, descended from those who escaped the forced westward migration of 1838, there is, as is known from the tribal records, a wide range of degree of Indian ancestry. No abnormal hemoglobins were found among 534 bloods studied, including 136 "full bloods."

The Lumbee Indians are a population in the south-central part of the state, whose origins are uncertain. Considering themselves primarily a mixture of Indian and white, they have also been known as Croatans and Indians of Robeson County. The sample studied consisted of students in Pembroke College, High School, and Elementary School. Of 1332 bloods analyzed, 23 (1.7 percent) showed sickle-cell trait (A plus S), and an equal number exhibited hemoglobin C trait (A plus C). One possible case of hemoglobin D trait (A plus D) requires further study for verification. No other abnormal hemoglobins were encountered.

Previous studies of American Indians have revealed no abnormal hemoglobins (*2*), but the claim of Indian ancestry among many individuals with hemoglobin D suggested the likelihood of a reservoir of such abnormal hemoglobin among Indian populations (*3*). Furthermore, two non-Indian families in the same general geographic area as the Lumbee Indians had shown hemoglobin D (*4*). The present survey suggests the absence, or extremely low incidence, of abnormal hemoglobins among unmixed American Indians (*5*).

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4. Unpublished observation.
5. A report on the results of blood typing conducted on the same blood samples, along with an anthropological analysis, is in preparation.
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