

the midlength of the first ray. (2) Tubercles on the dorsal surface of rays 2 through about 8 average slightly smaller and more crowded. In extreme cases a coarse shagreen is formed, with up to about 20 tubercles per fin ray segment arranged in 3 or 4 irregular rows or randomly scattered over each ray. Except occasionally for a few small tubercles on the second rudimentary ray of the dorsal fin, the dorsal, caudal, anal, and pelvic fins usually are devoid of tubercles.

Head tuberculation of *N. roseipinnis* is like that described for *N. b. bellus* except as follows: (1) Only the Bayou Pierre and Big Black populations approach *N. b. bellus* in the development of opercular and postorbital tubercles. (2) The interopercle and branchiostegal rays are less consistently tuberculate; and tubercles on these areas, when present, are fewer and more scattered.

Body tuberculation is similar to that described for *N. b. bellus* with the following exceptions: (1) Breast and prepelvic tubercles are usually present, but the belly between these two areas is usually nontuberculate. (2) Tubercles anteriorly on the sides average fewer, usually 3 to 6 along the posterior margin of each scale. They usually are erect but may occasionally vary from slightly antrorse to slightly retrorse in the same collection. (3) Body tubercles normally form only where a scale is present to act as a substrate. Thus extent of tuberculation on the anterior dorsolateral area of the body varies with degree of scale reduction. When scales are large and naked spaces small or absent, tuberculation is developed as in *N. b. bellus*. When scales are reduced in size, the number of tubercles per scale is reduced; the extreme condition is one centrally located tubercle per scale. No tubercles appear in naked spaces between scales and tubercles fail to develop on the anterior dorsolateral part of the body when that area is scaleless.

Qualitative observations suggest slight average differences between Gulf Coast and Mississippi Valley populations in the tubercle features noted below. Mississippi Valley populations have (1) tubercles on the lower opercle and postorbital area with greater frequency, (2) interopercular and branchiostegal tubercles slightly stronger and more consistently developed, (3) tubercles in the prepelvic area fewer and weaker, and (4) predorsal and nape tubercles more consistently antrorse. (5) Except as noted above, Mississippi Valley populations have slightly smaller and more numerous tubercles on most areas of the head and body.

**FEMALES.**—The tuberculation of female *N. roseipinnis* is like that previously described for female *N. b. bellus*.

**COMPARISONS.**—The important differentiating characters between *N. roseipinnis* and *N. b. bellus* are pointed out in Tables 16 and 17. The extensive geographic variation in *N. roseipinnis* masks the sharp distinctions between these two forms. Where they come into proximity in the Mobile Bay basin, the degree of separation is very high in body depth, caudal peduncle depth, dorsal fin length (Tables 14 and 15), fin pigmentation index (Tables 12 and 13), and anterior dorsolateral scale reduction (Table 11). In the western part of its range, however, *N. roseipinnis* becomes similar to, equal to, or even more extreme than *N. b. bellus* in all these characters.

The most trenchant differences between *N. roseipinnis* and *N. b. bellus* are details of fin pigmentation. In addition to the features pointed out above and shown in Figs. 3 and 4, there are cryptic developmental differences. In *N. roseipinnis* anal and pelvic fin patterns develop through an intensification of pigment along the posterior borders