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DIAMOND-BACK TERRAPIN CULTURE¹

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Five varieties of diamond-back terrapins are recognized on the Atlantic and Gulf coasts of the United States, namely, the Chesapeake terrapin (Malaclemys centrata concentrica), ranging from Cape Cod to and somewhat beyond Cape Hatteras; the Carolina terrapin (M. centrata centrata), ranging about from Cape Hatteras to Florida; the Florida terrapin (M. pileata macrospilota), inhabiting the Gulf coast of Florida; the Louisiana terrapin (M. pileata pileata), ranging from Florida westward to the mouth of the Mississippi River; and the Texas terrapin (M. pileata littoralis), which inhabits the coast of Texas and outlying islands. It is evident from the distribution given that diamond-back terrapins live only along the coast where they occupy shallow salt and brackish water bays, estuaries, and swamps. Although terrapins can endure fresh water for long periods of time, they rarely if ever, enter it voluntarily. The propagation of diamond-backs in fresh water, therefore, quite probably, is not feasible.

Diamond-back terrapins do not occur on the Pacific Coast but were introduced there for the first time in May, 1943, as young and adult specimens, in San Francisco Bay. The Atlantic appears to be more suitable because of the extensive areas of shallow, brackish water bays, estuaries, and swamps, in which the water is very warm during the summer, abundantly stocked with food organisms and is not subject to excessively strong tides. However, it seems probable that terrapin farming could be carried on successfully on the Pacific coast in inshore areas where the natural conditions are similar to those found on the coasts of the South Atlantic and Gulf States.

All varieties of diamond-back terrapins are valued as food, although the Chesapeake, Carolina, and Texas terrapins are preferred in the order named. Over half a century ago, diamond-back terrapins were common to abundant from Chesapeake Bay southward. However, because of their excellent flavor they were sought extensively and by the beginning of the twentieth century, these slow-growing, long-lived creatures had become so greatly diminished, especially in the South Atlantic States, that they were in great danger of commercial extinction.

¹/ Revision of Memorandum I-17.

As early as 1902 the Bureau of Fisheries began to study the life history of diamond-backs and to devise means and methods for their artificial cultivation. By 1909 the methods had been advanced sufficiently to make artificial propagation feasible. Since that time several hundred to as many as 16, 425 young have been hatched annually at the U. S. Fishery Biological Laboratory at Beaufort, N. C. Up until the winter of 1946 there has been produced at this laboratory a total of 241,013 young terrapin, most of which were distributed in the coastal waters from Chesapeake Bay to Florida after they had been reared and protected for a period of eight to twelve months. In addition several small lots were grown to maturity in captivity and have demonstrated that terrapins can be grown in confinement nearly as readily as chickens.

Pens or pounds for holding terrapins must be well constructed, as the animals are sure to escape if any avenue be left open. In the construction of a pen it is imperative to sink the walls well below the surface of the ground. If the walls are made of lumber, it is necessary to place a board over the top which projects both inward and outward like a shelf in order to keep the terrapins in and the rats out. For the construction of the pens, although the original cost is greater, concrete is preferable to lumber, especially in the South where the borers (shipworms) and Limnoria are prevalent and cause considerable damage in the inter-tidal zone.

The pens may be built anywhere along the shore, preferably on a hard clay and sand bottom (mud should be avoided) and where a clean supply of salt or brackish water is available, but it is more economical to inclose a small arm of an estuary or a small bay. If a bay with a comparatively narrow mouth can be found in a suitable place, a concrete wall, constructed across the mouth, and a wooden fence on land to complete the inclosure, would make a fairly permanent pound at a much smaller cost than to inclose an area of the same size along a straight shore, as the last mentioned situation would require three of the four walls to be built at least partly in water.

The cost of constructing a terrapin pound, as already indicated, would vary according to the contour of the shore line. It would vary, furthermore, according to the rise and fall of the tide. For example, in a locality where the mean difference between high and low tides is 5 feet the walls of the pound would have to be built two feet higher, and correspondingly stronger, than in another locality having a mean difference between tides of only 3 feet. Furthermore, the costs of materials and labor vary in

different localities. In 1925 a pound 55 by 64 feet, with all walls of concrete, was constructed along a nearly straight shore line at Beaufort, N. C., at a cost of approximately \$600.

The pens should be so situated that they always contain at least some water, and preferably so that they are flushed on each tide, as clean water is highly essential. To insure free circulation of water it is advisable to have one or more "gates" or large concrete pipes in the outer or seaward wall. They may be closed to the terrapins with iron rods, or for the young with a wire screen. If a clean supply of water is available, 1-1/2 square feet of space within the pen for each adult is sufficient. Young animals require less space according to size.

Terrapins in nature lay their eggs in sand somewhat above the usual high tide mark. In artificial propagation it generally is necessary to construct a large sand bed (egg bed) of proper height within the pen to provide a suitable place for depositing the eggs. The egg bed should be built about 8 to 12 inches above mean high tide. At such a level the sand will absorb some water on each high tide and will remain moist, a condition necessary for a maximum hatch. An occasional flooding of the egg bed, as during a storm tide, will do no harm. However, if flooding takes place frequently the sand becomes too wet and the eggs rot. The female digs a hole 5 or 6 inches deep in the sand in which she lays the eggs (usually about 8 to a "nest"), and covers them carefully with the sand removed in making the hole. The eggs are hatched by the heat of the sun in about 65 days. The laying season begins in the spring usually about the middle of May at Beaufort, and it ends there near the first of August. A female may lay only once during a season, or as often as 3 or 4 and rarely 5 times, and, of course, some animals are "boarders" and do not lay every year.

The newly hatched terrapin generally is a little over an inch in length on the median line of the lower shell (plastron). It usually does not begin to eat for a month or more after hatching. During this time it subsists on the yolk from the egg which in part becomes inclosed within the shell. When the young are ready to eat they may be given finely chopped fish, or crab meat, or minced oysters and clams, or preferably a mixture of two or more of these foods. They will also eat liver and beef in the absence of sea foods, but these foods do not tend to produce rapid growth or healthy animals.

It has been found advantageous in order to reduce the death rate and to promote growth, to place the young in a rearing house during most of their first year. The animals are kept in square wooden tanks, containing some water, so arranged that they can

crawl out of the water at will. This may be accomplished by tilting the tanks sufficiently to make one side a few inches lower than the other. Sufficient water is used to cover about half the bottom of the tanks. When cold weather arrives the young go in hibernation and are provided with a "blanket" of chopped straw or marsh grass which is dampened occasionally to prevent drying of the young. During the fall and spring feeding periods great care must be exercised to keep the containers in which the terrapins are held in an especially clean and sanitary condition. This requires three washings and about six changes of fresh water and sea water weekly. The best routine procedure has been to keep the young in fresh water for two days a week and in sea water for the balance of the time with careful washing of the tanks after each tri-weekly feeding period.

The rearing tanks are constructed of cypress in groups of four, each of which has a length of 24 inches, width of 18 inches and depth of 5 inches with a 2 inch overlapping strip on top to keep the animals from climbing out. From 75 to 100 young terrapin are confined in each tank where a piece of copper screen 2 inches square, is kept at all times as a control measure for "sore tail" and "soft shell" diseases which once destroyed a high percentage of the young. The weaker specimens generally die during the first year or two of life, that is, before the animals have reached a length of 2 to 2-1/2 inches. Thereafter the deaths from natural causes are negligible. There is a high rate of survival of terrapin grown in captivity which compares quite favorably with that of chickens.

The only enemy of importance encountered in the experimental culture of terrapins at Beaufort, N. C., is the common (Norwegian) house rat, which does not hesitate to enter water or jump over the walls of the pens. This animal not only destroys and carries away the eggs, but kills the young if accessible. A single rat is known to have killed 3 dozen young terrapin in a single night. The terrapins seldom are eaten by the rodents. Generally a hole is gnawed through the upper shell (carapace) in the region of the heart, as only the blood apparently is desired. In choosing a location for a terrapin farm, therefore, it is advisable to bear in mind the proximity of the site to places furnishing harborage for rats.

The chief difficulty in terrapin farming is the slow growth of the animals, and the long time before returns may be expected. Although a few animals may reach a marketable size in 5 or 6 years, the majority require from 8 to 10 years to reach such a size. However, the care of the immature and adult terrapins is not difficult, nor very expensive, if the "farm" is properly located. Cheap or scrap fish, with which some crabs are mixed,

make an ideal food. The fish and crabs should be cut into comparatively small pieces, even for adult terrapins. This may be accomplished most economically by the use of a food chopper such as is commonly employed on farms for cutting stock foods. For small terrapins the food should be finely ground in a food chopper, of the type commonly used in the kitchen. During the cooler months of the year, when fish are scarce and high in price, terrapin normally hibernate and need no food and virtually no attention. However, the establishment of a "farm" for growing terrapins is not recommended, unless sufficient capital is available to finance the project for a period of about 8 years without an appreciable income.

The males do not grow large and are of little value for food. Fortunately, from an economic point of view, a ratio of only about 1 male to 6 females has occurred among animals grown in captivity. Such a sex ratio, also, seems proper for breeding purposes, as it insures a high degree of fertility of the eggs. When several hundred wild terrapin were captured on natural breeding grounds in 1937 there was an average of one male to nearly 6 females.

Among the young the sexes are not distinguishable externally. However, at a length of about 3 to 3-1/2 inches the males become recognizable through the development of a longer and much stockier tail, a smaller head, and a proportionately narrower upper shell (carapace) than that possessed by the female. Until the sexes become differentiated externally, the rate of growth of males and females appears to be about equal. Thereafter, the males grow much more slowly, and the maximum length attained among Chesapeake and Carolina terrapins is only about 4-3/4 inches (measuring along the median line of the lower shell, a measurement always used in commerce), whereas the females reach a length of 7 and rarely 7-1/2 inches. The Texas terrapin is a larger species and attains a somewhat greater length.

The production of young terrapin at the Beaufort hatchery has been greatly increased since 1931 by enlargement of the concrete breeding pens in which a broodstock, consisting of approximately 600 males and 2,000 females, has been in captivity for many years. During the 15 year period prior to 1946 a total of 193,775 young diamond-backs were hatched, reared and protected until they were about 10 months old and then distributed at several of the Service's Wildlife Refuges and other favorable coastal areas from Maryland to Florida. A considerable number of the eggs, embryos and young were also utilized for medical studies, and biological research.

The fish and Wildlife Service does not supply young or adult terrapin for stocking private estates. There is now available in the South Atlantic and Gulf States an abundance of large terrapin of fine quality for use as a food or broodstock which can be obtained through various commercial fishing agencies.

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