vakia. Five voucher specimens were deposited in the Paris Museum of Natural History (Accession No. 1993/109). Metaphases were prepared from kidney tissue, using a standard air-drying technique (Rab, 1981).

Results and discussion.—Fifteen of the specimens possessed a diploid complement of $2n = 50$ chromosomes (Fig. 1a) as described in Madeira et al. (1992). One male possessed 75 chromosomes (> 100 metaphases counted; Fig. 1b) and was presumed to be genetically triploid. The triploid individual (total length of 110 mm) was indistinguishable in external morphology from the diploids and had only slightly developed testes. To our knowledge, this is the first report of a (spontaneously occurring or induced) triploid from the speciose cobitoid family Balitoridae. The occurrence of triploidy in the closely related family Cobitidae is well documented and has been hypothesized to stem from independent polyploidization events in separate lineages (Vasil'ev et al., 1989). Triploids and higher-level polyploids have been documented frequently in the related family Cyprinidae, suggesting that polyploidy may be more common than previously believed, at least in cypriniform fishes (Rab and Collares-Pereira, 1995).

Triploidy in animals is thought to stem from failure of the egg to extrude the second polar body nucleus, possibly resulting from overripening of eggs (Ihssen et al., 1990). However, Flajshans et al. (1993) recently compared progenies of different strains of tench (*Tinca tinca*) and hypothesized that a genetic predisposition to produce unreduced ova may exist. This possibility also was suggested by Thorgaard and Gall (1979) for rainbow trout. Ancestral alleles promoting an elevated frequency of unreduced ova could explain why spontaneous triploids appear to arise frequently in cypriniform fishes.

Acknowledgments.—We thank two anonymous reviewers for their helpful comments on the manuscript.

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GROWTH IN JUVENILE LOGGERHEAD SEATURTLES (*CARETTA CARETTA*) IN THE NORTH PACIFIC PELAGIC HABITAT.—Seaturtles mature slowly and usually do not attain adult sizes in less than 20 years (NRC/

CSTC, 1990). Yet in captivity, young seaturtles grow rapidly, often more than doubling their hatchling carapace lengths in less than a year (Caldwell, 1962; Swingle et al., 1993; Witham and Futch, 1977). Rapid growth in the wild is expected of juvenile turtles, because selection should favor individuals that can transform rapidly from bite-size morsels for numerous predators to increasingly larger, armored prey capable of thwarting the attacks of many predators.

Natural (i.e., noncaptive) growth rates of hatchling and small juvenile seaturtles are little known (e.g., Bjorndal and Bolten, 1988a, 1988b). Small loggerheads, *Caretta caretta*, salvaged from high-seas driftnet fishing in the North Pacific provide an opportunity to use skeletochronology to estimate the ages and growth rates of some young turtles during their earliest years of life.

Materials and methods.—The skeletochronological age estimates derive from thin (approximately 0.5 mm) cross-sections of uncalcified bone removed from the middle of the left humeri of 12 turtles. These turtles are from collections made during March 1991 to Feb. 1992 at locations between 29° and 41° N and 171° E and 154° W (Table 1). Sea temperatures at the capture sites ranged from 17–20 C. The multinational program to monitor driftnet fishing only recently discovered the presence of pelagic-dwelling loggerheads and other seaturtle species in this region of the North Pacific. Presumably, the loggerheads originate from nesting beaches in Japan.

The humeral cross-sections are taken from the diaphysis just distal to the deltopectoral crest and are stored and examined in a 4:6 glycerin-ethanol solution. The initial data set consists of a series of diameter measurements (ab- to adaxial axis) of the resorption core, each periosteal growth layer, and the exterior of a bone section from each specimen. We use two methods to estimate the age from these measurements: a ranking protocol and a regression-growth model. Both methods assume that each growth layer represents one year's growth. The ranking protocol directs the assignment of periosteal diameters of each bone to age classes, and the age class containing the exterior diameter translates to the turtle's estimated age. Zug (1990) outlined the methodology and conceptual basis of the ranking protocol. The regression-growth protocol derives from skeletochronological techniques of fisheries biology (e.g., Ralston and Miyamoto, 1983). Because growth rate tends to decline with increasing size or age of an individual, this protocol assumes

TABLE 1. CAPTURE DATES (DAY/MONTH/YR), LOCALITIES (LATITUDE, LONGITUDE), AND SEA SURFACE TEMPERATURE (C) FOR THE NORTH PACIFIC DRIFTNET *Caretta* SAMPLE. Additional details of this sample are available in Wetherall et al., 1993.

Date	Locality	Temperature
5/3/91	31°07′N 168°35′W	16.9
26/3/91	29°30′N 171°12′E	18.8
23/5/91	34°40′N 176°49′E	17.9
23/5/91	34°40′N 176°49′E	17.9
24/5/91	34°50′N 177°22′E	17.8
10/6/91	36°19′N 176°02′E	18.1
13/6/91	39°06′N 157°57′W	17.9
22/6/91	39°55′N 154°16′W	17.7
29/6/91	38°19′N 171°03′W	18.2
16/7/91	39°42′N 174°08′W	20.2
18/7/91	41°29′N 174°56′W	18.5
10/2/92	29°28′N 158°06′W	19.7

that the width (thickness) of each growth layer is a function of its distance from the initial diaphysis (i.e., periosteal surface at hatching) and that age can be estimated by integrating this function over the entire radius of the humerus.

The relationship between layer width and the radius of humerus at the end of each sequential growth cycle is determined by regression analysis. The slope and Y-intercept permit the estimation of an asymptote and a growth coefficient for a linear growth equation (e.g., von Bertalanffy model; Everhart et al., 1975); substituting these estimates in the equation, the equation is solved, yielding the total number of layers in the humerus (J. F. Parham and G. R. Zug, pers. obs.) or the individual's age (i.e., one growth layer equals one year). Using the regression-growth model, we created the following: (1) a data subset of all growth layers except those adjacent to the resorption core, because the inner most layer usually does not represent a complete year's growth; and (2) a select data subset excluding both the innermost and outermost layers, because the outer layer also is unlikely to represent a full year's growth. These data were fitted to von Bertalanffy equations by a Quattro Pro® regression procedure (least-square).

Results and discussion.—The sample includes turtles with estimated ages ranging from 2–8 yr, 1.4–7.7 yr, and 1.4–8.9 yr, respectively (Table 2), for the three age-estimate subsets. The age estimates for the two models (ranking and regression) are similar. This similarity of the age estimates might be used as an argument for the robustness of the estimates. Even though

TABLE 2. SIZE AND AGE ESTIMATES IN THE NORTH PACIFIC DRIFTNET SAMPLE OF *Caretta caretta*. Column heads: SCL, straight-line carapace length (cm); CCL, over-the-curve carapace length (cm); Periosteal layers, number of periosteal layers observed in the cross-section of the humerus; Age estimates (yr), Rank—ranking protocol, All (1) and Select (2)—regression-growth protocol, see text for explanation of data composition in these two sets of age estimates.

SCL	CCL	Periosteal layers	Age estimates		
			Rank	All	Select
13.0	14.5	2	2	1.4	1.4
15.8	17.0	2	2	1.8	1.8
17.4	19.5	1	2	2.1	2.2
18.3	20.0	2	3	2.8	2.9
19.4	21.5	3	3	3.2	3.4
20.3	22.0	1	3	3.1	3.3
21.5	23.5	1	3	3.5	3.7
22.5	25.0	1	3	3.6	3.9
36.8	40.0	4	6	5.4	6.0
38.9	43.5	3	6	6.3	7.1
39.7	43.0	5	7	6.4	7.2
42.0	46.5	5	8	7.7	8.9

we believe the estimates to be reliable (e.g., ± 1 yr), the three sets of age estimates derive from the same sample and that tempers overconfidence in their robustness. The differences among age-estimate subsets probably become progressively greater in older turtles. The regression protocol is the more objective of the two techniques, because it avoids the necessity of correcting for resorption. Its decimal estimates do not, however, reflect a higher level of certainty, although the decimal estimates do reflect the reality of growth being continuous during a single time interval each year or cycle. The subsequent remarks on age and growth obtain from the age estimates derived from the select data subset (#2 above).

The ages of all individuals < 20 cm SCL (straight-line carapace length) are three or less years old, and ages of individuals > 36 cm are six or more years old. Age-specific growth rates can be extracted from the fitted growth curves used to estimate the turtles' ages. The age-specific growth rates (cm/yr) for the first 10 years are: 5.09, 4.87, 4.65, 4.45, 4.25, 4.07, 3.89, 3.72, 3.55, 3.40; $\bar{x} = 4.2$ cm/yr; producing a 46.6 cm SCL in 10 years (hatchling 4.2 cm SCL; Zug et al., 1986).

Comparative age-specific growth rates are available from a few other wild populations of juvenile *Caretta*: Bahamas (Bjorndal and Bolten, 1988b); Chesapeake Bay (Klinger and Musick, 1992); eastern Atlantic (Bjorndal et al., 1994);

Florida (Mendonca, 1981); Mediterranean Sea (Bolten et al., 1992). Because these data are summarized in Klinger and Musick (1995:table 3), only a few rates are mentioned here. The Bahamian *Caretta* grow much faster than the juveniles from our Pacific sample. The Bahamian turtles grew from approximately 25 cm to 70 cm SCL in 35 months, averaging 15.7 cm/yr; thereafter (approximately 1 yr recaptures), their growth had slowed to about 5.2 cm/yr. With such differences in growth rates, there can be no equivalency in size and age between the benthic Bahamian population and the pelagic Pacific one. Growth in the Chesapeake and Floridian populations is more similar to the Pacific population but still nearly double the rate within equivalent size classes. In contrast, an eastern Atlantic *Caretta* (3.5 cm/yr, 37–46 cm SCL in 32 months) and a Mediterranean one (3.7 cm/yr, 17–36 cm SCL in 61 months; approximately 48 months for same size difference in our Pacific sample) have slower rates. These two individuals (and the populations they represent) and the Pacific sample are pelagic compared to the more benthic or near-shore habitats of the western Atlantic populations. Although the habitat differences offer ideal grounds for speculation, all currently available growth data derive from limited samples for each age or size class. Furthermore, turtles show highly variable growth rates within the same cohort and populations (Balazs, 1982; Davenport and Scott, 1993; Dunham and Gibbons, 1990). Our limited sample shows that natural growth rates of young *Caretta caretta* are considerably less than the physiological growth potential shown by captive-raised loggerheads. Comparison with age- or size-specific growth rates of other populations highlights a high interpopulational variation.

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INVALIDATION OF THE WICHITA SPOTTED BASS, *MICROPTERUS PUNCTULATUS WICHITAE*, SUBSPECIES THEORY.

—The subspecies *Micropterus punctulatus wichitae* (Wichita spotted bass) was described in 1940, based on a reexamination of specimens collected in 1926, 1927, and 1928 from West Cache Creek in the Wichita Mountains of southwest Oklahoma (Hubbs and Bailey, 1940). As late as 1980, the subspecies was validated in taxonomic reference (Lee et al., 1980).

The population was originally described as a hybrid assemblage of *M. pseudaplites* (= *punctulatus*) and *M. dolomieu* (Hubbs and Ortenburger, 1929). Some of the 441 specimens closely resembled *M. punctulatus*, and others exhibited features of *M. dolomieu* and *M. punctulatus*. None was described as resembling only *M. dolomieu*.

Hubbs and Bailey prefaced their description of the new form with a lengthy justification of the original hypothesis of hybridization: "There is considerable evidence in favor of this view." In arguing for the subspecies designation, they wrote, "Evidence accumulates, however, to indicate that the bass of West Cache Creek in the Wichita Mountains do not represent a partially fused complex of *dolomieu* and *punctulatus*."

In their discussion, Hubbs and Bailey mentioned an unnamed fish culturist who suggested that *M. p. wichitae* could have been a result of crossing between stocked *M. dolomieu* and native *M. punctulatus*. The authors dismissed this theory, however, believing that ". . .the supposed stocking of smallmouths would have been too recent to explain the production of so homogeneous a stock." They also stated that *Microp-*
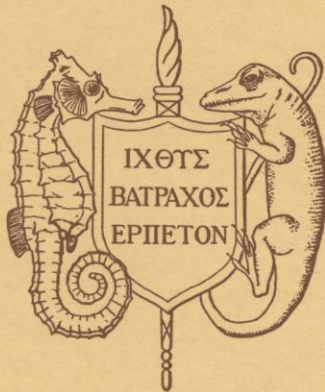
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Official Publication of the

AMERICAN SOCIETY OF
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1995, No. 2   May 3