Herpetologica, 37(2), 1981, 92–95

THE KARYOTYPE AND CHROMOSOMAL BANDING PATTERNS OF THE CENTRAL AMERICAN RIVER TURTLE *DERMATEMYS MAWII*

JOHN L. CARR, JOHN W. BICKHAM, AND ROBERT H. DEAN

ABSTRACT: *Dermatemys mawii* has a diploid number of 56 and a karyotype identical to that of a sea turtle (*Chelonia mydas*). We hypothesize that *D. mawii* and *C. mydas* share the primitive karyotype for all non-trionychoid cryptodiran turtles.

Key words: Cryptodira; Dermatemydidae; *Dermatemys;* Karyology; Reptilia; Testudines

THE family Dermatemydidae is one of the oldest extant families of the suborder Cryptodira, with a fossil record extending back into the Cretaceous (Gaffney, 1975). The only living dermatemydid is *Dermatemys mawii*, a large river turtle from southern Mexico and adjacent Central America (Iverson and Mittermeier, 1980).

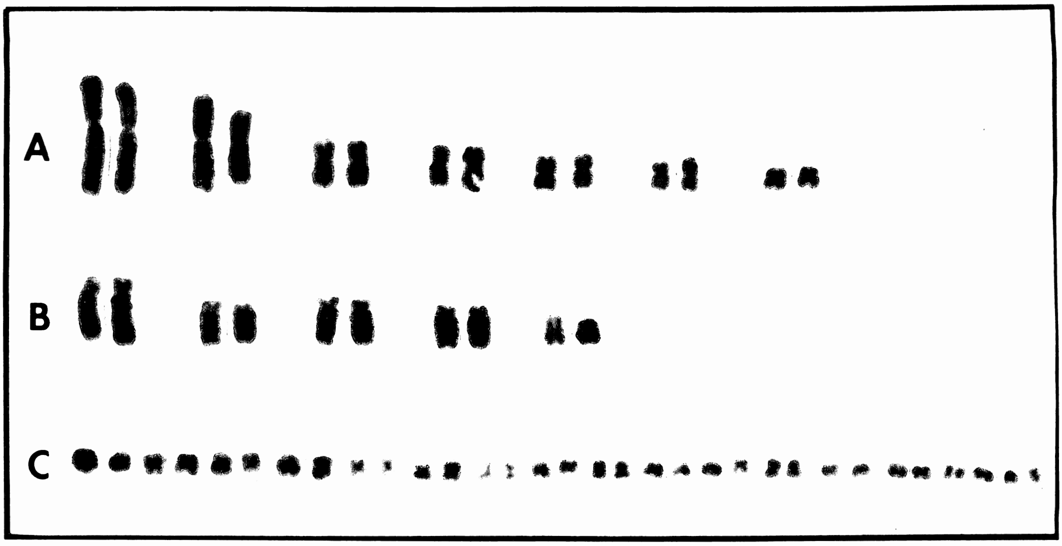

FIG. 1.—Standard karyotype of *Dermatemys mawii* with chromosomes arranged into groups: (A) metacentric to submetacentric macrochromosomes, (B) telocentric to subtelocentric macrochromosomes, and (C) microchromosomes.

Dermatemys has been closely allied to the mud and musk turtles of the family Kinosternidae on the basis of serum protein electrophoresis (Frair, 1964, 1972), cranial morphology (Gaffney, 1975), and penial morphology (Zug, 1966). Based upon pelvic girdle and hindlimb morphology, Zug (1971) further proposed that *Dermatemys* represents the basal stock of the kinosternids. Knowledge of the karyotype of *D. mawii* could provide an important test of the hypothesized relationship between kinosternids and dermatemydids. Standard karyotype and banded chromsome data for *D. mawii* are presented here for the first time.

MATERIALS AND METHODS

Fibroblast cultures were initiated from the heart tissue of a single male *D. mawii* and grown in medium 199 enriched by twenty percent of original volume with fetal bovine serum. Standard karyotype, G-banded, and silver-stained preparations were made from cultured cells as described in Sites et al. (1979*b*).

The specimen (TCWC 57695) was a captive individual in the Parque Zoológico of the Instituto de Historia Natural in Tuxtla Gutiérrez, Chiapas, Mexico. Exact locality data were unavailable, but the specimen was presumably from the state of Chiapas.

RESULTS

The standard karyotype of *D. mawii* (2n = 56) is presented in Figure 1. Chromosomes are arranged according to Bickham (1975) into group A metacentric or submetacentric macrochromosomes, group B telocentric or subtelocentric macrochromosomes, and group C microchromosomes. There are 7, 5, and 16 pairs of chromosomes in groups A, B, and C, respectively. A heteromorphic pair of sex chromosomes is not present in the male specimen examined.

Figure 2 is a comparison of the G-banded macrochromosomes of *D. mawii* and a cheloniid (*Chelonia mydas*). *Chelonia mydas* has a diploid number of 56, with 7, 5, and 16 pairs of chromosomes in groups A, B, and C, respectively (Bickham et al., 1980), as does *D. mawii*. We can detect no difference between the G-banded macrochromosomes of *Chelonia* and *Dermatemys*. The location of

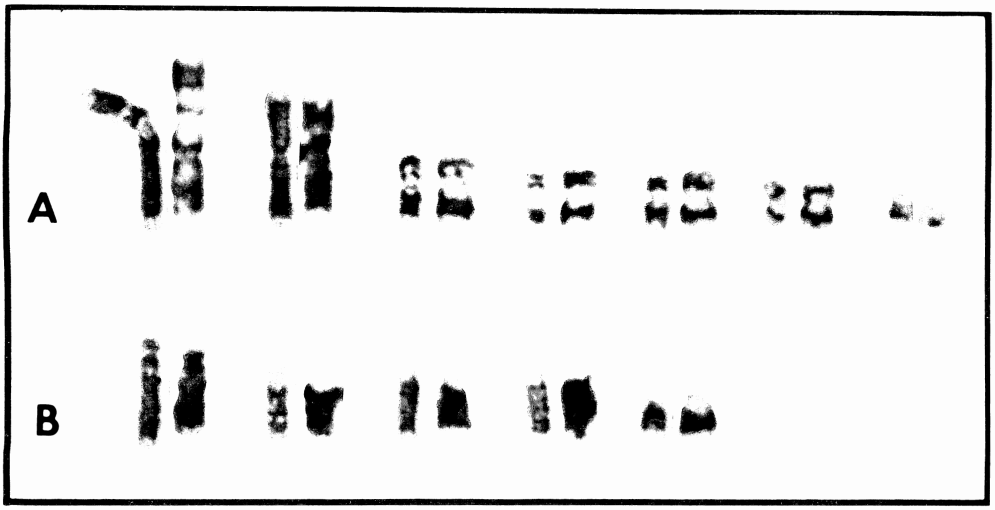

FIG. 2.—G-banded macrochromosomes of groups A and B. The left element of each pair is that of *Dermatemys mawii*, the right element that of *Chelonia mydas*.

the nucleolar organizing region in *D. mawii* is on a group C microchromosome.

DISCUSSION

The only extant species of the family Dermatemydidae, *D. mawii*, is characterized by a diploid number of 56. This same diploid number is also characteristic of two other cryptodiran groups, the Kinosterninae (Killebrew, 1975; Sites et al., 1979*b*) and the Cheloniidae (Bickham et al., 1980). The cheloniids and the dermatemydid share the 7:5:16 arrangement of chromosome pairs into groups A:B:C, respectively, while the kinosternines differ in having a 6:6:16 chromosomal arrangement. The difference can be explained as a pericentic inversion in a pair of group A chromosomes in the cheloniids and dermatemydid to create another subtelocentric pair of group B chromosomes in the kinosternines (Sites et al., 1979*b*).

The absence of heteromorphic sex chromosomes is interesting because the only reported sex chromosome system in turtles is found in the genus *Staurotypus*, with males being the heteromorphic sex (Bull et al., 1974; Sites et al., 1979*a*). *Staurotypus* and *Dermatemys* have been hypothesized to be close relatives (see Pritchard, 1979).

The location of the nucleolar organizing region (NOR) is proximal to the centromere on a large, acrocentric microchromosome. This is also true for cheloniid and emydine turtles, but it differs from kinosternines, staurotypines, chelydrids, testudinids, trionychids and batagurine emydids (Sites et al., 1979*a*; Haiduk and Bickham, 1982).

This study corroborates earlier findings indicating that slow rates of chromosomal evolution characterize cryptodiran turtles (Bickham and Baker, 1976, 1979; Bickham et al., 1980; Sites et al., 1979*b*). The fact that the two morphologically primitive families compared herein possess identical karyotypes (at least at the levels examined) and that this karyotype is directly comparable (see Bickham et al., 1980) to that of emydids (probably the most derived family of turtles) leads us to conclude that this may represent the primitive karyotype for all of the Cryptodira, excluding the Trionychidae and Carettochelyidae. Assuming this hypothesis to be correct, nothing can be said about the relationship between the Dermatemydidae and the Cheloniidae because their karyotypes are completely plesiomorphic. The Kinosternidae possess karyotypic apomorphies, but none of these is shared with either of the other two familes, making a cladistic assessment of the relationships impossible. However, considering *Dermatemys* to possess the primitive karyotype for the majority of the suborder does make it an available ancestor from which the kinosternine and staurotypine karyotypes (as well as the karyotypes of other families) can be derived.

Acknowledgments.—We are grateful to Miguel Alvarez del Toro of the Instituto de Historia Natural in Tuxtla Gutiérrez, Chiapas, for making the specimen of *D. mawii* available to us. We also thank Alvaro Rodriguez, Manuel Lemus Kourchenko, and Susana López de Lara de la Fuente for encouragement and assistance in obtaining the specimen. This research was supported, in part, by National Science Foundation grant DEB 77-13467.

Literature Cited

Bickham, J. W. 1975. A cytosystematic study of turtles in the genera *Clemmys, Mauremys* and *Sacalia.* Herpetologica 31:198–204.

Bickham, J. W., and R. J. Baker. 1976. Chromosome homology and evolution of emydid turtles. Chromosoma 54:201–219.

———. 1979. Canalization model of chromosomal evolution. Bull. Carnegie Mus. Nat. Hist. 13:70–84.

Bickham, J. W., K. A. Bjorndal, M. W. Haiduk, and W. E. Rainey. 1980. The karyotype and chromosomal banding patterns of the green turtle (*Chelonia mydas*). Copeia 1980:540–543.

Bull, J. J., R. G. Moon, and J. M. Legler. 1974. Male heterogamety in kinosternid turtles (genus *Staurotypus*). Cytogenet. Cell Genet. 13:419–425.

Frair, W. 1964. Turtle family relationships as determined by serological tests. Pp. 535–544. *In* C. A. Leone (Ed.), Taxonomic Biochemistry and Serology. The Ronald Press Company, New York.

———. 1972. Taxonomic relations among chelydrid and kinosternid turtles elucidated by serological tests. Copeia 1972:97–108.

Gaffney, E. S. 1975. A phylogeny and classification of the higher categories of turtles. Bull. Am. Mus. Nat. Hist. 155:389–436.

Haiduk, M. W., and J. W. Bickham. 1982. Chromosomal homologies and evolution of testudinoid turtles with emphasis on the systematic placement of *Platysternon.* Copeia 1982: in press.

Iverson, J. B., and R. A. Mittermeier. 1980. Dermatemydidae, *Dermatemys.* Cat. Am. Amphib. Rept.:237.1–237.4.

Killebrew, F. C. 1975. Mitotic chromosomes of turtles. III. The Kinosternidae. Herpetologica 31:398–403.

Pritchard, P. C. H. 1979. Taxonomy, evolution, and zoogeography. Pp. 1–42. *In* M. Harless and H. Morlock (Eds.), Turtles: Perspectives and Research. John Wiley and Sons, New York.

Sites, J. W., Jr., J. W. Bickham, and M. W. Haiduk. 1979*a*. Derived X chromosome in the turtle genus *Staurotypus.* Science 206:1410–1412.

Sites, J. W., Jr., J. W. Bickham, M. W. Haiduk, and J. B. Iverson. 1979*b*. Banded karyotypes of six taxa of kinosternid turtles. Copeia 1979:692–698.

Zug, G. R. 1966. The penial morphology and the relationships of cryptodiran turtles. Occas. Pap. Mus. Zool. Univ. Mich. no. 647.

———. 1971. Buoyancy, locomotion, morphology of the pelvic girdle and hindlimb, and systematics of cryptodiran turtles. Misc. Publ. Mus. Zool. Univ. Mich. no. 142.

Accepted: 20 January 1981

Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843, USA