Journal of Herpetology, Vol. 17, No. 3, pp. 283–285, 1983

Movement in a River Population of *Chrysemys picta bellii* in Southern Saskatchewan

ROSS D. MACCULLOCH[1] AND D. M. SECOY, *Department of Biology, University of Regina, Regina, Saskatchewan S4S 0A2, Canada.*

Study of movement, whether in migratory or relatively stationary populations of turtles, can provide insight into habitat utilization by a species. Undisturbed movement in pond or lake populations of *Chrysemys picta* has been discussed in a number of studies (Gibbons, 1968; Mallet, 1975; McAuliffe, 1978; Pearse, 1923; Sexton, 1959). Movement after displacement in this species has been examined by Ernst (1970), Ream (1967) and Williams (1952). Movement of river populations has not been studied in *C. picta*, but has been in *Pseudemys scripta* (Moll and Legler, 1971), *Trionyx muticus* (Plummer and Shirer, 1975) and *Graptemys pseudogeographica* and *G. ouachitensis* (Vogt, 1980).

Most studies of the movement of individuals or populations of turtles have examined sea turtles (Bustard, 1979). In freshwater turtles, movement has been considered to be due to the nesting activities of females or changes in the quality of the habitat (Meseth and Sexton, 1963; Sexton, 1959; Timken, 1968), particularly with reference to vegetation cover and species composition. This study examined movement in a river population of the western painted turtle, *Chrysemys picta bellii*, at the northern edge of the range of the species.

The study area is a 15.5 km stretch of the Qu'Appelle River between the towns of Lumsden (50°39′N, 104°52′W) and Craven (50°42′N, 104°29′W), in southcentral Saskatchewan. The Qu'Appelle River, part of the Hudson Bay watershed, is the northern limit of the range of painted turtles in Saskatchewan. The river in the study area is narrow, meandering and sluggish; width ranges from 7 to 20 m (mean 10 m) and depth is approximately 2 m. Mean current speed during the summer is 0.2 m/sec. The water is turbid; submerged aquatic vegetation is absent and emergents are scarce. Numerous fallen trees and gently sloping banks provide plentiful basking sites.

The study area was visited from 4 to 6 times per week during the months of May through August and weekly during September and October of both 1978 and 1979. Each visit entailed covering the entire length of the study area twice using a motorboat. Most turtles were captured by hand or in basking traps (MacCulloch and Gordon, 1978). At the time of first capture each individual was sexed. Males were distinguished by external secondary sexual characteristics. All turtles smaller than the smallest male were classed as juveniles while all turtles larger than the smallest male and having no male secondary sexual characteristics were classed as females. The straight-line plastron length of each turtle was measured using calipers. The shells were marked according to the system devised by Cagle (1939). Turtles were released at the point of capture immediately after handling.

The 15.5 km stretch of river was divided into 31 sections of 500 m each. The minimum movement was defined as 500 m, by passage from one section to another. All movements were calculated in increments of 500 m.

The number of individuals in each sex-age group which moved the minimum distance of 500 m was compared to the number which did not move and with the total number for each year. The numbers of individuals in each sex-age group which moved were compared among sex-age groups in the same year and between years for the same group. All the above comparisons were made using chi-square tests. The distances travelled by each member of the 3 sex-age groups during each year were compared among sex-age groups in the same year and between years for the same group using Mann-Whitney *U* tests. Correlation coefficients of plastron length with distance travelled were calculated for the members of each sex-age group. To determine the effect of current on movement, the distances travelled upstream and downstream during each month were totalled and compared using chi-square tests.

With the exception of the juveniles in 1979, the majority of the turtles in each sex-age group moved 500 m or more during one season (Table 1). For males and females the differences were significant ($P < 0.01$), while for juveniles the numbers were not significantly different. Comparison among the sex-age groups showed no significant differences among groups in the same year or in the same group between years, except for the 1979 juveniles, which differed from both other groups in 1979 and from the 1978 juveniles ($P < 0.01$).

Distances travelled by individual turtles between their first and last captures in one season are shown in Fig. 1. Distances travelled were variable but males travelled the farthest (1978 mean 5.6 km, 1979 mean 6 km), then females (1978 mean 2.2 km, 1979 mean 3.2 km), then juveniles (1978 mean 0.7 km, 1979 mean 0.4 km). Rapid long-distance travel occasionally occurred; in 1979 a male travelled 6.5 km in one day and in 1978 a female covered 6.5 km in four days.

The distances travelled by individual turtles in each sex-age group were not significantly different between the two years. In 1978 there were no significant differences between males and females

[1] Present address: Department of Ichthyology and Herpetology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6, Canada.

TABLE 1. The number and percentage of turtles in each sex-age group which moved at least 500 m in 1978 and 1979.

		1978		1979	
		Number	%	Number	%
Males	movement	19	90	16	89
	no movement	2	10	2	11
Females	movement	11	85	16	94
	no movement	2	15	1	6
Juveniles	movement	5	63	2	33
	no movement	3	37	4	67
Total	movement	35	83	34	81
	no movement	7	17	7	19

or between females and juveniles, but the difference between males and juveniles was significant ($P < 0.05$). In 1979 the difference between males and females was not significant, but the differences between males and juveniles and between females and juveniles were both significant ($P < 0.01$).

Correlations between sizes of individuals and total distance travelled during one season for males were 0.23 (N = 21) in 1978 and 0.34 (N = 18) in 1979, for females 0.10 (N = 12) in 1978 and 0.07 (N = 17) in 1979 and for juveniles 0.71 (N = 8) in 1978 and −0.45 (N = 6) in 1979.

Some turtles may be carried downstream by the strong spring current. Even the slow summer current may contribute to the movement of turtles, as evidenced by the sight of one drifting downstream on a floating log in the summer of 1979. Comparison of the distances travelled upstream and downstream showed no significant difference relative to the direction of flow (chi-square test, $P > 0.10$).

Gibbons (1968) found that fewer than 15% of a Michigan population of *Chrysemys picta marginata* moved distances of 100 m or more during one summer. Pearse (1923) stated that 30% of a Wisconsin population of *C. picta* moved, although no distances were reported. Sexton (1959) found that

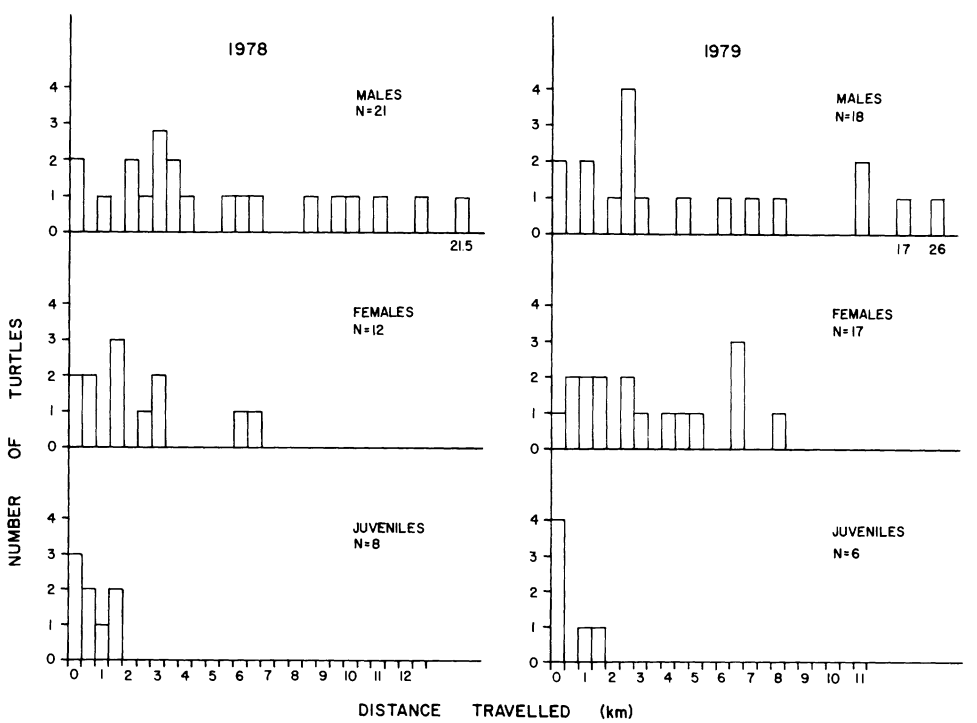

FIG. 1. Distances moved by individual *Chrysemys picta* in the Qu'Appelle River study area.

during one summer only 20% of a population of *C. p. marginata* was sedentary while the remainder moved. McAuliffe (1978) reported that 58% of *C. p. bellii* recaptured in Nebraska had travelled distances of at least 100 m. Mallet (1975) stated that 50% of a Quebec population of *C. p. marginata* travelled 500 m or more during the course of an active season. The percentage of turtles which travelled in this study (81–83%) was greater than any other reported, even though the minimum distance (500 m) equalled or exceeded that of any other study. The other studies concerned pond or lake populations while our study was of a river population.

Gibbons (1968) found no significant differences in the portion of each sex-age group which moved, although more females than males or juveniles moved. Sexton (1959) found that more females than males and more adults than juveniles moved. In this study only one group, juveniles in 1979, differed in that fewer moved than did not (Table 1) and a small sample size may have been the cause of this disparity.

Turtles in this study moved greater distances during one season than has been previously reported. The longest previous distances, reported by Ernst (1970), Ream (1967) and Williams (1952) were of displaced turtles, which travelled greater distances than did turtles which were not displaced.

Gibbons (1968) found that females moved greater distances than did males, whereas in this study the opposite was true. Gibbons also stated that males moved more extensively during the spring than during the summer. In this study no change in distances was observed during the active season. Individual turtles in this study varied greatly in distance travelled, similar to the findings of Williams (1952), but no relationship was found between body size and distance travelled, concurring with the reports of Gibbons (1968) and Mallet (1975). In this study there were no significant differences in the distances travelled relative to direction of flow, indicating that the current did not affect movement over the active season. Elsewhere (Ortleb and Sexton, 1964), *C. picta* has also been shown to not orient to current.

Vogt (1980) found that female *Graptemys pseudogeographica* and *G. ouachitensis* travelled extensively within large pools of the Mississippi River. Plummer and Shirer (1975) found that *Trionyx muticus* in the Kansas River travelled long distances, appeared to be familiar with large segments of river and exhibited no fidelity to a restricted home range. This appears to be the case with *Chrysemys picta* in the Qu'Appelle River.

Acknowledgments.—Don McKinnon and Allan Ireland provided able and enthusiastic field assistance. Dan Klippenstein of Environment Canada supplied data on current speed. Equipment and financial support were supplied by the Saskatchewan Museum of Natural History and the Department of Biology and Faculty of Graduate Studies and Research, University of Regina.

LITERATURE CITED

BUSTARD, H. R. 1979. Population dynamics of sea turtles. *In* M. Harless and H. Morlock (eds.), Turtles: Perspectives and Research. Pp. 523–540. Wiley and Sons, New York.

CAGLE, F. R. 1939. A system of marking turtles for future identification. Copeia 1939:170–172.

ERNST, C. H. 1970. Homing ability in the painted turtle, *Chrysemys picta* (Schneider). Herpetologica 26:399–403.

GIBBONS, J. W. 1968. Reproductive potential, activity and cycles in the painted turtle, *Chrysemys picta*. Ecology 49:399–409.

MACCULLOCH, R. D., AND D. M. GORDON. 1978. A simple trap for basking turtles. Herp. Review 9:133.

MALLET, H. 1975. Activité, croissance et tables de survie d'une population de tortues peintes, *Chrysemys picta* (Schneider), du sud du Québec. M.Sc. thesis, McGill University, Montreal. 60 pp.

MCAULIFFE, J. R. 1978. Seasonal migrational movements of a population of the western painted turtle, *Chrysemys picta bellii* (Reptilia, Testudines, Testudinidae). J. Herpetol. 12:143–149.

MESETH, E. H., AND O. J. SEXTON. 1963. Response of painted turtles, *Chrysemys picta*, to removal of surface vegetation. Herpetologica 19:52–56.

MOLL, E. O., AND J. M. LEGLER. 1971. The life history of a neotropical slider, *Pseudemys scripta* (Schoepff), in Panama. Bull. L.A. Co. Mus. Nat. Hist. Sci. 11:1–102.

ORTLEB, E. P., AND O. J. SEXTON. 1964. Orientation of the painted turtle, *Chrysemys picta*. Amer. Midl. Natural. 71:320–334.

PEARSE, A. S. 1923. The abundance and migration of turtles. Ecology 4:24–28.

PLUMMER, M. V., AND H. W. SHIRER. 1975. Movement patterns in a river population of the softshell turtle, *Trionyx muticus*. Occas. Pap. Mus. Nat. Hist. Univ. Kansas (43):1–26.

REAM, C. H. 1967. Some aspects of the ecology of painted turtles, Lake Mendota, Wisconsin. Ph.D. thesis, University of Wisconsin, Madison. 84 pp.

SEXTON, O. J. 1959. Spatial and temporal movements of a population of the painted turtle, *Chrysemys picta marginata* (Agassiz). Ecol. Monogr. 29:113–140.

TIMKEN, R. L. 1968. The distribution and ecology of turtles in South Dakota. Ph.D. thesis, University of South Dakota, Vermillion. 110 pp.

VOGT, R. C. 1980. Natural history of the map turtles *Graptemys pseudogeographica* and *G. ouachitensis* in Wisconsin. Tulane Stud. Zool. Bot. 22:17–48.

WILLIAMS, J. E. 1952. Homing behaviour of the painted turtle and muskturtle in a lake. Copeia 1952:76–82.

Accepted: 21 October 1982.