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CONTRIBUTIONS IN SCIENCE

ЗЕР 61 DECEMBER 7, 19

SEA TURTLES IN BAJA CALIFORNIAN WATERS (WITH SPECIAL REFERENCE TO THOSE OF THE GULF OF CALIFORNIA), AND THE DESCRIPTION OF A NEW SUBSPECIES OF NORTH-EASTERN PACIFIC GREEN TURTLE

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Los Angeles County Museum • Exposition Park • Los Angeles 7, Calif.

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David K. Caldwell

Editor

SEA TURTLES IN BAJA CALIFORNIAN WATERS (WITH SPECIAL REFERENCE TO THOSE OF THE GULF OF CALIFORNIA), AND THE DESCRIPTION OF A NEW SUBSPECIES OF NORTHEASTERN PACIFIC GREEN TURTLE

By David K. Caldwell[1]

Abstract: All five genera of sea turtles *(Chelonia, Eretmochelys, Lepidochelys, Caretta* and *Dermochelys)* are shown to occur in the outside waters of Baja California and within the Gulf of California. Systematic and distributional comments are made relative to northeastern Pacific sea turtles, and a new subspecies of green turtle, *Chelonia mydas carrinegra,* is described from this region. Sea turtle nesting within the Gulf of California is discussed.

Recently there has been an increase in interest in the biogeography of Baja California, Mexico, and its adjacent seas. A symposium on this topic, involving a large number of participants from many disciplines, was held in San Diego, California, in 1959, and the results recently published in *Systematic Zoology* (1960, vol. 9, nos. 2-4).

Caldwell (1960) and Hubbs (1960: 142) indicated that all five known genera of sea turtles probably occur at least occasionally along the west or outer coast of Baja California. It now seems appropriate to summarize evidence which shows the extent to which all five genera of sea turtles occur along the outer coast of Baja California, and, as that body of water is considered by many to be zoogeographically distinct, how far within the Gulf of California as well.

Most of my studies on Baja California sea turtles have been carried on at Bahia de Los Angeles, a small village whose chief industry and only export is sea turtles in large numbers. Bahia de Los Angeles lies on the shores of a large bay bearing the same name at about latitude 29° N on the west central shore of the Gulf of California. Most of the turtles landed there come from about 25 miles away at Isla Angel de la Guarda, and it is from here that a new subspecies of green turtle is herein described.

Annotated Species List

Chelonia mydas (Linnaeus)

By far the most abundant sea turtle in the Gulf of California, this species supports a large and widely scattered commercial fishery. Introductory remarks concerning the biology of the Gulf of California green turtle have recently been published by Carr (1961b), Carr and Hirth (1962: 21) and D. K. Caldwell and M. C. Caldwell (1962). Results of more complete and detailed studies of the fishery and of certain aspects of the biology of the green

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turtles of Baja California recently have appeared (Caldwell, 1962), as well as a study of their ability to find the water when on land (M. C. Caldwell and D. K. Caldwell, 1962).

My observations (see Caldwell, *in press*) clearly show that the green turtle is abundant at least in the central Gulf of California at all times of the year (contrary to Carr, 1961b: 67). The presence of this permanent population, which includes both very small individuals and large turtles of both sexes of sufficient size for breeding (coupled with apparently valid reports of nesting by the population), suggests genetic isolation (see Carr and Hirth, 1962: 1) and leads one to surmise that there is a stable population of green turtles in Baja California waters. As the green turtles of the Gulf of California and the outer coast of Baja California (and those from northward) can be distinguished from the green turtles of Pacific Central America, the members of this northern population appear to merit description and may hereafter be known as:

Chelonia mydas carrinegra, NEW SUBSPECIES

Figures 1-5 herein, and figures given by Carr (1961b: 66, and 68-69, lower).

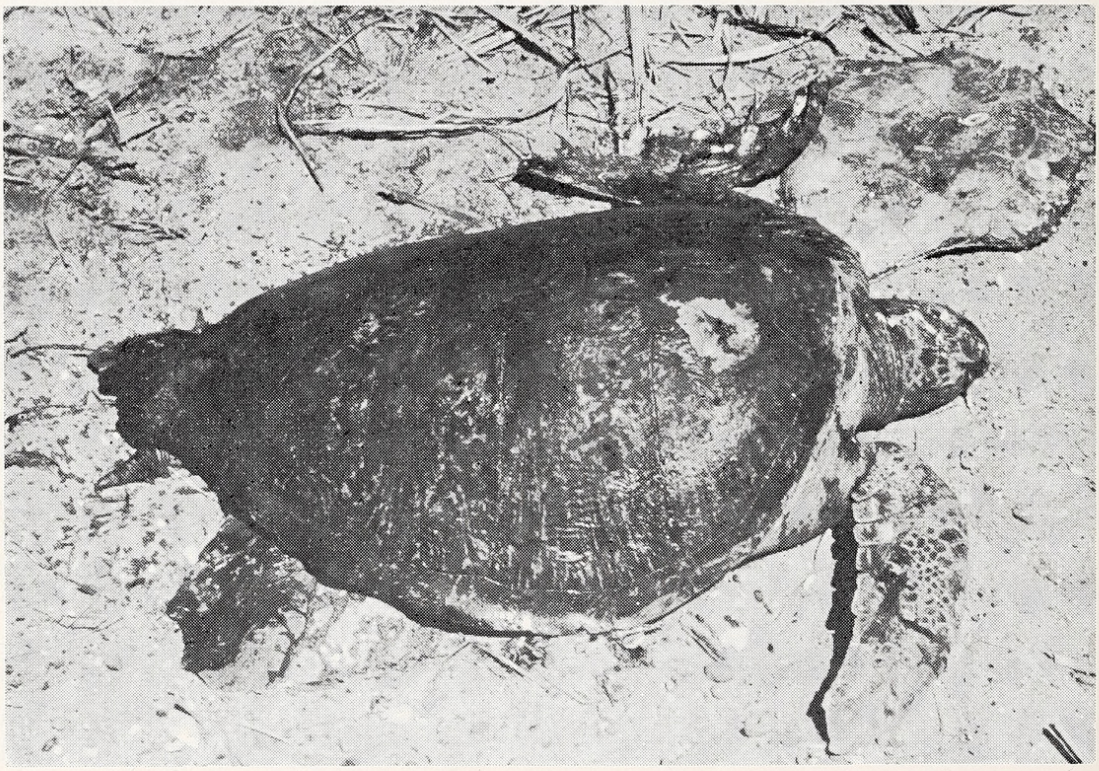

Fig. 1. The black subspecies of the green sea turtle of the Gulf of California, *Chelonia mydas carrinegra,* new subspecies. This individual, with a carapace length of about 25 inches, is from Isla Angel de la Guarda, Mexico, the type locality. Note very dark carapace and dark upper surfaces of the head and flippers.

Diagnosis: A subspecies of the green sea turtle, *Chelonia mydas* (as defined by Carr, 1952, and Deraniyagala, 1939), characterized by its dark coloration. Carapace and upper surfaces of the head and flippers slate gray to black, or if with a mottled or radiating pattern of brown, olive or yellow (pattern seen particularly in the smaller individuals), the upper surfaces of the head and flippers remain dark, so that the overall appearance of the color of the turtle is dark. Plastron varying from bluish to dark gray, the amount of deep-lying pigment varying greatly and usually not covering the two central plastral ridges (Fig. 5).

Description: The results of this discusison are based on the examination, in four trips encompassing some six weeks of observation of all turtles landed, of some 3000 specimens of *carrinegra* from the type locality.

Carapace often strongly elevated or arched, especially in large females (Fig. 3). Carapace very low in large males (Fig. 4). A tendency for the marginals to be constricted over the hind flippers (Figs. 3 and 4), giving the carapace an emarginated appearance in this region when viewed from the dorsal aspect. These two characters have been noted in earlier literature for eastern Pacific green turtles in general (Agassiz, 1857: 379; Carr, 1952: 359) and it should be noted that they vary considerably, and the latter, in particular, does not always hold to any degree.

Meristics are included in Tables 1 to 5, and certain proportional data in Tables 6 and 7. Some of the variation requires special comment, however. In general, the counts for *carrinegra* (and actually for all green turtles as a group) are remarkably consistent, and with the exception of the postocular scales, those counts other than ones which are typical by virtue of their overwhelming occurrence can almost surely be considered abnormal. Deraniyagala (1939, 1953: 21) commented on the rather frequent occurrence of such abnormalities in sea turtles, and gave many illustrated examples in several genera. Only those variations that occur fairly frequently are discussed herein. All of the counts in Tables 1-5, and the bases for the comments regarding them, were made on living turtles from the type locality. Actual counts were made at most on a few hundred individuals—some characters being investigated more fully than others. In addition, I superficially examined over 600 additional living *carrinegra* from the type locality and some 2000 dead examples from the same area. The size range for all of the material examined was 17½ to 38½ inches in carapace length, the largest specimen being a female. Unusual-looking individuals were sought, but no important variations other than those discussed below were found.

The number of *epidermal central laminae* is usually five (Table 1). A not uncommon number is six, but when this occurs, the extra central is almost always much smaller than the others and appears to have been formed by a splitting off of the posterior portion of regular central number four and the anterior portion of regular central number five. The resulting small central lies in position five in the six count. Such a situation is suggested by the illustration of a young *Lepidochelys* given by Deraniyagala (1939: 143, fig. 57).

The regularity of this extra central when it occurs, and its relatively frequent occurrence, suggest that such occurrence may be genetic in origin although it appears to the eye to have been formed by a "borrowing" from two other laminae. Partial splitting was sometimes observed. Central counts of a higher number than six (see Table 1) are quite obviously abnormal, as they are always crowded and twisted. Such a situation is illustrated, again with *Lepidochelys*, by Deraniyagala (1939: 135, fig. 48). In several instances, in individuals both with a five or a six central lamina count, a central, usually the last, was split longitudinally essentially to form a bilateral pair.

TABLE 1

Epidermal central laminae counts for 224 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

Number of Laminae	Frequency of Occurrence	Percent of Total
5	170	75.9
6	48	21.4
7	3	1.3
8	2	0.9
9	1	0.4

The *epidermal lateral laminae* usually number four on each side (Table 2). In the few cases to the contrary, the unusual number is always the apparent result of the lateral splitting of one or more normal-sized lateral laminae into two. The area covered by the two resulting smaller lateral laminae is the same as that normally covered by one.

TABLE 2

Combinations of epidermal lateral laminae counts for 224 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

Number of Laminae		Frequency of Occurrence		Percent of Total	
Left Side	Right Side				
4	4	201		89.7	
5	4	9	16	4.0	7.1
4	5	7		2.7	
5	5	4		1.8	
4	6	1		0.4	
5	6	1	2	0.4	0.9
6	5	1		0.4	

There are usually 11 *epidermal marginal laminae* on each side (Table 3). The few counts other than 11 appear to be the result of combination or splitting of normal-sized marginals and the resulting laminae cover the same area normally occupied by a regular-sized lamina.

There is a single *epidermal precentral lamina,* not normally in contact with the laterals.

The paired *epidermal postcentral laminae* vary considerably in proportion. Some are broader than long, and others are longer than broad; in combination there is sometimes a notch of varying degree between the two at their posterior end and sometimes no notch at all. Although I looked for a sexual or ontogenetic difference in the proportional relationships of each of these laminae (as suggested by Carr, 1952: 359), I was able to find none.

TABLE 3

Combinations of epidermal marginal laminae counts for 222 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

Number of Laminae		Frequency of Occurrence		Percent of Total	
Left Side	Right Side				
11	11	194		87.4	
11	12	9	15	4.1	6.8
12	11	6		2.7	
12	12	6		2.7	
11	10	5	6	2.3	2.7
10	11	1		0.5	
13	11	1		0.5	

There are usually four *inframarginal* (plastral bridge) *laminae* (Table 4). Counts other than four do not appear to be the result of splitting or lumping as in the case of high or low carapace laminae counts, but rather seem only to be the result of larger or smaller laminae occupying the bridge area. Sometimes one of the end laminae is smaller than the others on that side, but when this occurs the others still cover less area than they would without the small one—that is to say it is apparently not split off from its adjacent neighbor, as in the case of the extra central, but rather all of the others are somewhat smaller as well.

TABLE 4

Combinations of epidermal inframarginal (plastral bridge) counts for 187 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

Number of Laminae		Frequency of Occurrence		Percent of Total	
Left Side[1]	Right Side				
4	4	174		93.0	
3	3	6		3.2	
4	3	4	5	2.1	2.7
3	4	1		0.5	
4	5	2		1.1	

[1]Refers to the left side as viewed from the ventral aspect (the right side if viewed dorsally).

On the head, 188 out of 191 specimens so examined had one pair of *prefrontal scales.* One specimen had one normal scale on the left, and on the right, one which was partially split horizontally. Two other specimens had the two scales combined to form a single large scale which covered the area normally occupied by the two. Several specimens, not included in the count of 191, had a third small scale which apparently was formed by the splitting off of about a half disc from each inner side of the normal scale. The resulting scale was oval and lay between the two larger scales, with the latter still in contact in a normal fashion at the anterior and posterior ends of their inner margins.

As indicated above, none of the meristic counts have been considered as being of value in separating populations of the green turtle with the exception of the *postocular scale* count. Based on the work of others, Carr and Caldwell (1956: 17) noted that to tally postocular counts might be of some value in separating regional populations in a worldwide zoogeographic study, although the character is not useful at a taxonomic level. However, considering the variation in this character in *carrinegra* (Table 5), noting that the expected

TABLE 5

Combinations of postocular scale counts for 419 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

Number of Scales		Frequency of Ocurrence		Percent of Total	
Left Side	Right Side				
4	4	267		63.7	
4	3	33	59	7.9	14.1
3	4	26		6.2	
3	3	27		6.2	
4	5	23	39	5.7	9.3
5	4	16		3.8	
5	5	15		3.6	
3	5	2		0.5	
2	3	2	4	0.5	0.9
3	2	2		0.5	
4½ [1]	5	1		0.3	
3½	4	1		0.3	
2½	3	1		0.3	
2½	4	1		0.3	
2	2	1		0.3	
1½	2½	1		0.3	

[1] ½ refers to the fact that the scale was partially split horizontally, and if completely split would have been counted as two.

value (four on each side) and the range for a large series (two to five) are the same as those shown for Atlantic populations (Carr and Caldwell, 1956: 18; Carr and Giovannoli, 1957: 14), even this effort now seems futile.

The relationship of head width to carapace length (Table 6) and carapace

width to carapace length (Table 7) will be discussed in the section on Relationships, but should be noted here as forming part of the description of the new form.

Holotype: Los Angeles County Museum Herpetological Collection (LACM) No. 1696, 21¼ inches in carapace length; complete specimen in formalin, young female, obtained at Bahia de Los Angeles, Baja California Norte, Mexico, by David K. Caldwell and Melba C. Caldwell in early June, 1961. Original place of capture about 25 miles east of Bahia de Los Angeles in the vicinity of Isla Angel de la Guarda in the central Gulf of California, Mexico. The waters adjacent to this large island should be considered the type locality.

Meristic counts as follows: five central laminae, four lateral laminae on each side, eleven marginal laminae on each side, one precentral lamina, a pair of postcentral laminae, four inframarginal (plastral bridge) laminea on each side, one pair of prefrontal scales on the head, and four postocular scales behind the right eye, five behind the left (the middle scale very small).

Paratypes: LACM 1697, 36 inches in carapace length; complete (except for internal organs) dry-mounted specimen, female, obtained with the holotype and with the same locality of original capture. Meristic counts the same as for the holotype except that there are four postocular scales on each side.

LACM 1690, formerly University of Southern California (Allan Hancock Foundation) Herpetological Collection (AHF) No. 1241 (Accn. 128), 14¼ inches in carapace length; complete (except for internal organs) specimen in alcohol (specimen somewhat bleached), sex undetermined although on the original label listed as a male. Collected at Santa Maria Bay, Baja California (24° 47′ N, 112° W) by Dr. John S. Garth on April 4, 1949, aboard *Velero IV*. Meristic counts the same as the holotype except that there are 3½ postocular scales on each side.

LACM 1700, dried carapace only, 27 inches in length, from the type locality. Obtained in Ensenada, Baja California, in the fall of 1962, by David K. and Melba C. Caldwell. Meristic counts the same as for the holotype.

A second dry carapace, 26 inches in length, obtained with LACM 1700 and also from the type locality, is hereby designated a paratopotype and will be deposited in the University of Florida Collections at Gainesville. Meristic counts the same as for the holotype.

Referred Material: As no attempt has been made herein to discuss the skeletal elements of the new subspecies, a collection of 22 unprepared skulls of this new form are not designated as paratypes, but rather only as Referred Material. Of these skulls, 19 have been placed in the Los Angeles County Museum Vertebrate Paleontology Collection (Nos. R-83 through R-101). The remaining three skulls will be deposited in the University of Florida Collections.

An additional cranium (prepared), bony elements of the carapace and one leg element of a small *Chelonia* from Santa Maria Bay, and apparently collected with the paratype LACM 1690, are also tentatively referred to *car-*

rinegra solely on the basis of locality as the color of the living animal is not on record. This material (LACM, VP No. R-102) was originally cataloged as AHF No. 1242 (Acc. 128).

Relationships: The dark coloration of *carrinegra* has been noted in the diagnosis above. Although I have been unable to secure living specimens of *agassizi* for direct comparison, I have carefully examined the color description and color plate of *agassizi* as presented by Dumeril, Bocourt and Mocquard (1870: 27 and pl. 6)[2] and have considered the discussion given by Carr (1952: 360) after his examination of living specimens from Central America. In considering the color plate just noted, it is difficult to compare it with color standards and then describe the color as there is great variation due to the mottled effect resulting from the true color pattern and the artistic shading. However, following Ridgway (1912), the color of the carapace illustrated ranges generally from *buffy* to *buffy citrine* in the lightest areas to *brownish olive* in the shaded areas. The upper surfaces of the head and flippers also are *brownish olive*. The overall appearance of the color, which from the description of Dumeril, Bocourt and Mocquard, and of Carr, seems to be as faithfully reproduced as possible, is one of greenish-olive or olive drab with a brownish cast. A more recent color illustration of *agassizi*, based on "Bocourt" (probably actually on Dumeril, Bocourt and Mocquard), has been published by Angel (1949: pl. 10, fig. 62). *Agassizi* is certainly not the slate gray to black which characterizes the carapace and upper portions of the head and flippers of *carrinegra*. In over 1000 living specimens of *carrinegra* that I have examined, never have I seen the greenish-olive carapace which apparently is typical of *agassizi*. The darker portions of the carapace of even the lightest *carrinegra* are of the typical black or slate gray of the subspecies, although there is sometimes considerable yellowish or brownish mottling. Such light individuals of *carrinegra* that I saw all retained the very dark coloration on the upper portions of the head and flippers and some pigmentation on the plastron.

Black and white photographs of green turtles from the outer or west coast of Baja California indicate that these are typical *carrinegra*, and the living specimens that I have seen from the vicinity of Magdalena Bay also had the typical almost black carapace.

More recent works which include descriptions of eastern Pacific green turtles in northern Mexican and Californian waters (*e.g.*, Carr, 1952: 360; Stebbins, 1954: 184; Caldwell, 1960: 10; Ditmars, 1949: 382; and Van Denburgh, 1922: 997) usually note the color as greenish-olive or brownish, often mottled with yellow or brown. This color is typical of *agassizi*, as noted above, and the descriptions which use it are probably based on the older work of Dumeril, Bocourt and Mocquard (1870) or on examination (as in the case of

[2]Bocourt (1868) was the author of *agassizi* only two years before, and in addition the turtle is referred to in the larger work as "n. sp." so that obviously the plate can be considered as being based on the material examined by Bocourt in her original description, or at least on material that she considered to be the same form as that she described as *agassizi*.

Carr, 1952) of fresh material also from Central America—rather than on specimens from the northern form. In the future, therefore, care should be taken to recognize the region in question when color of eastern Pacific green turtles is described.

I have compared small (about 18 inches in carapace length) living green turtles from Florida (ssp. *mydas*) and Hawaii (ssp. ?) with comparably-sized living *carrinegra* and find that they can easily be distinguished on the basis of color. I believe such a distinction could be made 100 percent of the time, although I had at hand only one specimen each from Florida and Hawaii. Others that I have seen or have had described to me compare favorably with the specimens I had. The carapaces of the Florida and Hawaii specimens are brightly patterned (see Carr, 1961b: 68, upper) and their overall color, including the upper portions of the head and flippers, is light and one of shades of brown. As noted above, I have never seen this color in *carrinegra*. The plastron of the Florida specimen was light yellow, and that of the Hawaiian specimen greenish white with a yellow tinge. Carr (1961b: 69) noted that in the Atlantic green turtle this light coloration persists in large individuals, and in my own experience with hundreds of living Atlantic specimens I never recall seeing the dark plastron usually found in *carrinegra*. The light color of the plastron of large individuals of the Atlantic form was well illustrated in black and white by Carr and Hirth (1962: 22-23) and in color by Keating (1961: 37). An Atlantic green turtle illustrated in color by Sagra (1841-43: pl. 3) shows a similar coloration as described above for both the carapace (brownish overtones) and plastron (light). The typical brownish, highly patterned, carapace and light underparts of the Atlantic form are also accurately illustrated by Frommhold (1959: 97) from a color photograph that I provided him of a young Gulf of Mexico individual. Less valuable color illustrations, apparently of the Atlantic form, have recently been published by Bevans (1956: 51) and Zim and Smith (1953: 21). Both of the latter two color plates are rather too dark brown, but yet neither are the olive of *agassizi* or the black of *carrinegra*.

I have also compared small living *carrinegra* with the dried and shellacked carapace (LACM 1698, formerly AHF 1195) of a small *Chelonia* from the "Phoenix Islands group off Canton, China," and find that they are easily distinguishable on the basis of color, the Phoenix Island specimen being shades of reddish brown with a few very dark blotches toward the anterior end of each lamina. A number of small dried and mounted green turtles have recently appeared in a chain of gift shops in Los Angeles, and although I have been unable to determine their exact origin other than "somewhere in the orient," they are similar to the carapace noted here and are quite different from *carrinegra* in color, although quite variable among themselves. A color illustration (Kuroda, *et al.*, 1958: 285) of the upper surfaces of a green turtle, supposedly from Japan and of the subspecies *japonica*, is quite dark green, almost the black of *carrinegra*, although there is evidence from a partial view of the underparts of the head and neck that these areas are light (verified by the text description), and not the dark gray of *carrinegra*. The dark green color may be a poor

rendition of the true color of the Japanese green turtle. The illustrations of *Eretmochelys* and *Caretta* in the same work are not accurate, according to my experience. At any rate, the turtle illustrated is clearly not *carrinegra* on the basis of plastral color, but from the text description is more like the green shade described for the green turtle of Ceylon by Deraniyagala (1953, see below).

Also on the basis of color, *carrinegra* can easily be distinguished from the green turtle of the Great Barrier Reef of Australia, if the reddish-brown turtle illustrated by Roughly (1947: pl. 26) can be taken as having the typical color of the green turtles of that area.

Comparison of the color of *carrinegra* with that of the green turtle of Ceylon, as illustrated in color by Deraniyagala (1953: pl. 5), results in an easy distinction in that the green turtle from Ceylon has an overall decidedly greenish cast.

Although I find no mention of carapace color, the green turtle of Malaya and Sarawak, as depicted by Hendrickson (1958: pl. 5c and pl. 8c) in photographs of living specimens, at least appears to have the light plastron associated with the Atlantic populations and not the dark plastron of *carrinegra*.

Carr and Hirth (1962: 20)[3] presented data on the relationship of head

TABLE 6

Relationship of head width[1] to carapace length[2] in 115 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

	Males	Females	Unsexed[3]	Combined
Size Range (Carapace Length) in Inches	23-35½	23-38½	18¾-22¾	18¾-38½
Width of Head/Length of Carapace				
Range	.13-.17	.11-.17	.14-.17	.11-.17
Mean	.15	.15	.16	.15
Number of Individuals	30	74	11	115

[1]Measured to the nearest ¼ inch at the widest point.

[2]Measured to the nearest ¼ inch in accord with Carr and Caldwell (1956: 4).

[3]Individuals less than 23 inches in carapace length which were of uncertain sex.

width to carapace length in two populations of the Atlantic green turtle (from Costa Rica and Ascension Island) and suggested (p. 22) that this character was useful in distinguishing the two. Although the method of taking carapace length was slightly different, I include similar data for *carrinegra* for comparison (Table 6). In this character, *carrinegra* is somewhat more like the Ascension Island population. It should be noted that above the carapace length of

[3]These authors have an error in their table 6 in that the last ratio is obviously head width/carapace length, and not the reverse as they have it listed.

about 30 inches, there is a tendency for the head of *carrinegra* to become relatively slightly narrower. As the relative carapace width also tends to become less at about this same size (see below), it is likely that at this size the carapace begins to increase its length at a slightly faster rate than does its width and the width of the head.

Carr (1952:359) suggested that, on the basis of the works of others, the shell of the eastern Pacific green turtle is narrower than that of the Atlantic form. I had this same impression from a subjective examination of a number of turtles from both populations. In Table 7, I have included data on the carapace length-carapace width relationship of *carrinegra,* and in comparing these data with data on the Atlantic form taken in the same manner (Carr and Caldwell, 1956: 14), I find that while there is a mathematical *tendency* for *carrinegra* to be a slimmer turtle, the variation in both populations is so great as to

TABLE 7

Relationship of carapace width[1] to carapace length[1] in 184 living specimens of *Chelonia mydas carrinegra* from the vicinity of Isla Angel de la Guarda in the central Gulf of California.

	Males	Females	Unsexed[2]	Combined
Size Range (Carapace Length) in Inches	23-35½	23-38½	18¾-22¾	18¾-38½
Width of Carapace/ Length of Carapace				
Range	.72-.90	.71-.88	.78-.87	.71-.90
Mean	.78	.80	.82	.80
Number of Individuals	42	114	28	184

[1]Measured to the nearest ¼ inch according to Carr and Caldwell (1956: 4).
[2]Individuals less than 23 inches in carapace length which were of uncertain sex.

make this character useless in comparing individual turtles from the two areas from a systematic standpoint. The same conclusion is reached when the data for *carrinegra* are compared with those presented by Carr and Hirth (1962: 20) for two other Atlantic populations, even though their method of measuring carapace length differed slightly from mine. In *carrinegra* there was a tendency, on a mean basis, for males of all sizes to be slightly narrower. On graphical analysis of the data (not included here) it was found that the unsexed juveniles smaller than 23 inches in carapace length were, as a group (see Table 7), broader than the turtles of larger size, the narrowest having a carapace width-carapace length ratio of .78, and most being above .80, with a median of about .83. There is then a general tendency, within broad limits of individual variation, for the shell to become relatively narrower with increase in age. At a carapace length of about 30 inches, there is a marked tendency in both sexes for the shell to become relatively narrower; in 20 specimens of both sexes, none

above 30 inches in length had a ratio of carapace width to carapace length greater than .79, and the median was about .75.

In Table 8, I have compared the means of empirical body weights for comparable-sized green turtles from the western Atlantic and the central Gulf of California. The results are remarkably similar and suggest similar body proportions in the two groups in order to achieve them. The limited amount of variation between the two groups may be due more to inaccuracies in methods and equipment used in obtaining the data rather than to actual differences. Weights of the Atlantic individuals were taken only to the nearest pound, and those of the Pacific specimens only to the nearest kilogram (2.2 pounds); and lengths were made in all cases only to the nearest ¼ inch. Relative condition

TABLE 8

Comparison of mean empirical weights of selected western Atlantic and northeastern Pacific green sea turtles. Data used in the upper portion of the table are for combined sexes, those in the central portion of the table are for females only, and those in the lower portion of the table are for males only.

Carapace Length[1] (inches)	Weight (pounds) Atlantic[2]	Pacific[3]
18¼	22.3	19.8
18½	27.5	27.1
18¾	27.0	24.2
19¼	30.0	35.2
19½	29.8	31.9
19¾	28.0	31.9
20	34.5	33.4
20¼	37.8	41.1
20½	37.2	38.5
20¾	40.5	40.7
21	39.0	38.5
21¼	43.0	40.7
21½	43.3	42.9
21¾	41.3	40.7
22	46.1	49.1
22¼	44.4	45.1
22½	50.3	51.7
22¾	49.5	55.7
23	50.6	57.2
23¼	51.8	59.2
23½	53.8	61.6
23¾	55.9	62.5
24	58.1	61.2
24¼	57.2	62.5
24½	63.6	63.1
24¾	58.0	63.8
25	62.3	69.3
25¼	68.3	75.9
25½	64.7	72.8
25¾	72.5	73.0
26	76.0	78.5

of the captive turtles might also be expected to cause some variation. Data presented by Carr and Hirth (1962: table 7) suggest even greater variation within populations of the Atlantic subspecies, *mydas;* with those from Ascension Island being somewhat heavier for a given length than those from Tortuguero, Costa Rica.

General Remarks: Bocourt's (1868) type specimen of *agassizi* was about 24 inches in carapace length. Presuming this to have been measured over the curve of the carapace as was the old style, the specimen would have been approximately 23 inches in carapace length as I measure sea turtles (from the midline of the anterior end of the carapace to its greatest posterior projection,

TABLE 8 (Contd.)

Carapace Length[1] (inches)	Weight (pounds) Atlantic[2]	Pacific[3]
26¼	81.3	82.5
26½	75.0	75.9
26¾	82.2	84.7
27	83.7	86.5
27¼	87.0	89.3
27½	85.0	84.5
27¾	88.3	82.5
28	90.6	95.5
28¼	84.0	97.9
28½	91.5	107.1
28¾	96.0	102.1
29	99.0	100.1
29¼	115.0	101.9
29½	101.5	114.0
29¾	99.0	111.8
31½	135.0	124.3
31¾	138.0	127.6
33¾	167.0	161.7
34¼	176.0	143.0
35	....	162.7
35¼	157.0	....
35½	....	196.9
37	....	202.4
37¼	223.0	....
37½	....	246.4
32¼	....	158.4
33½	145.0	....
35½	....	167.2

[1]Measurements in all cases made to the nearest ¼ inch in accord with Carr and Caldwell (1956: 4).

[2]*Chelonia mydas mydas,* data from Carr and Caldwell (1956: Table 2).

[3]*Chelonia mydas carrinegra,* data from Caldwell (1962). Weights taken originally to the nearest kilogram and here converted to pounds by a factor of one kilogram equals 2.2 pounds.

in accord with Carr and Caldwell, 1956: 4), and thus of comparable size with hundreds of specimens of *carrinegra* that I examined. This is particularly noteworthy in that it indicates that our color descriptions can be reliably comparable, and important as sea turtles tend to become more uniformly colored as they grow older and similar-sized turtles should thus always be considered in making such comparisons.

The scales of the head and flippers are often boldly outlined in green turtles from both the Atlantic and Pacific (see Carr, 1952: 346, 358). While most individuals of *carrinegra* also demonstrated this patterning at least in part on each individual (Figs. 3 and 4), many did not do so to a bold degree, especially on the head, and thus the overall dark appearance which characterizes the subspecies was accentuated in these individuals.

Carr and Hirth (1962: 5) have pointed out that green turtles from Ascension Island in the south Atlantic have a much more pronounced and more angular emargination of the carapace over the neck than do green turtles from the western Atlantic (a large specimen from the Gulf of Mexico, showing the absence of this Ascension feature, was illustrated by Carr and Hirth, 1962: 32). None of the 1000 or more living specimens of *carrinegra* that I examined had this pronounced emargination, but rather all were more like Carr and Hirth's Gulf of Mexico specimen in this respect.

The edges of the carapace of *carrinegra,* like all typical specimens of green turtles, as usually smooth. However, I have seen one specimen from the Gulf of California, at this writing living at Marineland of the Pacific oceanarium near Los Angeles, that had a strongly scalloped posterior carapace margin (Fig. 2). A similar condition is shown in the green turtle illustrated by Kuroda, *et al.* (1958: 285). I have seen others with a slight tendency to this scalloping, and care should thus be taken in superficially examining sea turtles not to mis-

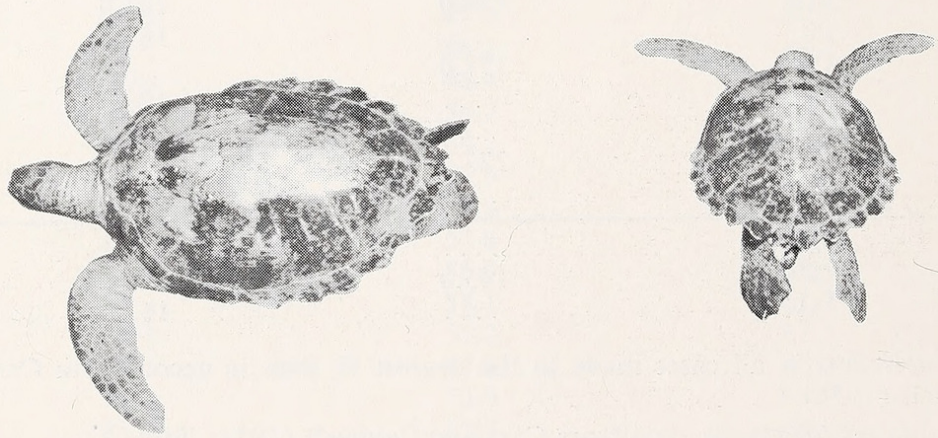

Fig. 2. Living specimen of *Chelonia mydas carrinegra,* new subspecies, from the Gulf of California. Note unusual amount of scalloping of the posterior portion of the carapace.

take such an individual for another species, some of which have a more scalloped carapace margin than does the normal green turtle.

Like other sea turtles, *carrinegra* shows strong sexual dimorphism in older individuals. In this subspecies in particular, the carapace of the female is much higher domed (Fig. 3) than that of the male, which is often quite depressed (Fig. 4) and more elongated and posteriorly pointed than that of the female. The male of *carrinegra* also has the much-elongated tail typical of sea turtles

Fig. 3. Large female *Chelonia mydas carrinegra,* new subspecies, about 34 inches in carapace length, from Isla Angel de la Guarda, Mexico. Note short tail and high-domed carapace.

(Figs. 4 and 5). It is possible that this Pacific form matures at a smaller size than the green turtle of the Atlantic. I have seen males of *carrinegra* as small as 25 inches in carapace length with a well-defined tail, many at 28 inches with a tail that seemed fully developed and all were so developed by 30 inches. Even in individuals as small as 23 inches in carapace length, males were obvious

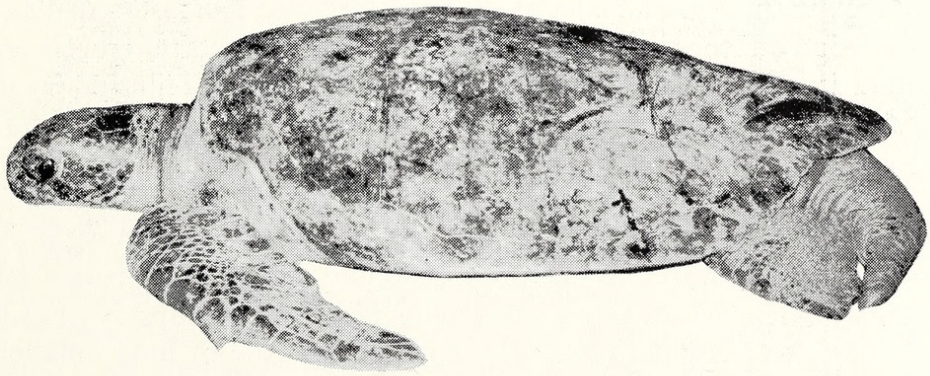

Fig. 4. Large male *Chelonia mydas carrinegra,* new subspecies, about 34 inches in carapace length, from Isla Angel de la Guarda, Mexico. Note long tail and low-domed carapace.

although the tail was just lengthening. I never saw such a male (or one even approaching this degree of tail development) among numerous immature green turtles as large as 29¾ inches in carapace length that I examined in Florida (Carr and Caldwell, 1956). In the relationship of greatest carapace width

Fig. 5. Ventral (plastral) view of two *Chelonia mydas carrinegra,* new subspecies, from Isla Angel de la Guarda, Mexico. Note dark color of plastron and undersurfaces of flippers. *Left:* Female, 27½ inches in carapace length. Note short tail. *Right:* Male, 29¾ inches in carapace length. Note long tail.

to carapace length, there was only a slight tendency in *carrinegra* for the males to be narrower than the females at all sizes (see also discussion of this character in section on Relationships). The feeling that one gets that males are narrower than females is probably more the result of an optical illusion created by the slimmer and more pointed posterior portion of the adult male carapace than to an actual lesser greatest width.

As noted by Carr and Caldwell (1956: 13), the measurement of body depth in sea turtles is difficult to make, and the variation is so great even in small local populations or in narrowly delimited ontogenetic groups that this character would have little or no value in distinguishing groups of green turtles on a worldwide systematic basis. The momentary state of lung inflation also causes variation in this character in a given individual. Therefore, although a few such measurements were attempted early in the study, the effort was soon discontinued and these few data are not included. I have already pointed out

above that on the basis of subjective examination, there is sexual dimorphism in this character, with the females being considerably deeper-bodied.

Synonomy: Synonomys of varying degrees of completeness have been given for the described forms of the green turtle (*e.g.*, Deraniyagala, 1939: 217-219 and 1953: 20; Smith and Taylor, 1950b: 17; Mertens and Wermuth, 1960: 70; Bourret, 1929: 126; and Van Denburgh, 1922: 996). It should suffice to note here that only one name is currently recognized as being available for an eastern Pacific green turtle—that being *agassizi* of Bocourt (1868), referred to by Carr (1952: 357) as *Chelonia mydas agassizi* Bocourt. This name is herein restricted to the eastern Pacific green turtle occurring to the south of the Gulf of California and Baja California, its exact limits at present being unknown.

Agassiz (1857: 379) recognized that there was a strong difference between his green turtles from California and ones from the Atlantic, but questioned the difference between his material and descriptions of named green turtles (*C. marmorata, C. virgata* and *C. maculosa*) which he noted as being from Malabar and the East Indian Ocean. Of *virgata* and *maculosa,* he applied the older name, *virgata,* to his California material. However, as synonyms of *Chelonia mydas mydas, virgata* has now been restricted to the Atlantic Ocean with Bermuda Island as the type locality; *maculosa* to the Atlantic with Ascension Island as the type locality (see, for both of these, Smith and Taylor, 1950b: 17; Mertens and Wermuth, 1960: 70); and *marmorata* to the Atlantic also with Ascension Island as the type locality (Mertens and Wermuth, 1960: 70). In honoring Agassiz by naming an eastern Pacific green turtle for him, Bocourt (1868) also recognized that there was a difference between her material from Guatemala and the green turtle of the Atlantic, but failed to realize the presence of two forms of green turtles in the eastern Pacific. The northern form, which includes the green turtles of California that Agassiz studied, were thus left unnamed. In view of the new name provided herein for these Pacific North American green turtles, the name *agassizi* used by Schmidt (1953: 106) will have to be revised and replaced by *carrinegra.*

Derivation of New Name: First, I take pleasure in naming this new turtle for Archie Carr, my former major professor and co-worker who introduced me to the study of sea turtles, and, in the opinion of many, the world's most outstanding authority on the biology of sea turtles. It was he who first suggested in print that this northern population of the eastern Pacific green turtle might be a distinct subspecies (Carr, 1961b: 70). Second, in including the Spanish term *negra,* the name of the new turtle also emphasizes the primary distinguishing characteristic of the new form—that of the dark, often black, coloration of the carapace, flippers, head and much of the plastron.

Common Name: Carr (1961b: 66) noted that in the eastern Gulf of California and elsewhere that the common name *caguama* refers to "sea turtle" in general, and that the green turtle is referred to there as *caguama prieta* or *tortuga negra,* and sometimes, in the case of light colored individuals, as *mestiza.* Although other species of sea turtles occur there, at Bahia de Los

Angeles the name *caguama* clearly is used solely in reference to the green turtle. The other species of turtles are clearly distinguished by different common names which refer to them only. The name *caguama prieta* is unknown there, although Bahia de Los Angeles is directly across the Gulf of California from Kino, where Carr apparently found it in use. The name *tortuga* is known only in reference to land tortoises in mainland Mexico. The name *mestiza* is unknown and light colored individuals of the green turtle are not distinguished by a special name. At Coyote, near Mulege, the green turtle apparently is sometimes referred to as *caguama comun,* but usually only as *caguama.*

Mr. James Honey, a member of the Los Angeles County Museum staff and a careful observer of natural history subjects, tells me that before he came to the United States (he is a Mexican by birth and lived there much of his life) he knew the Pacific green turtle of Mexico simply as *caguama.* He remembers the common name for sea turtle in general was either *tortuga marina* or *tortuga de mar.* From his description, the sea turtle he knew on the mainland coast of Pacific Mexico as *tortuga negra* was *Lepidochelys.*

At Ensenada, on the outer northwestern coast of Baja California, the Gulf and outer Baja coast green turtles processed into soup there are known simply as *caguama.* On the other hand, at Bahia San Quintin, some 100 miles south of Ensenada, turtle fishermen interviewed referred to *caguama negra* and *caguama amarilla.* They had no turtles to show us, but one of these names (*negra*) clearly referred to the green turtle and we later found a bleached carapace which substantiated its occurrence there; the other name (*amarilla*-yellow) could not be positively identified with a turtle, but may have been in reference to a light colored green turtle (since the fishermen distinguished it by no other means than color) or it may have been in reference to *Caretta* or *Lepidochelys.*

Distribution: Chelonia mydas carrinegra occurs throughout the Gulf of California in large numbers and is known regularly on the outer coast of Baja California as far north as Bahia San Quintin (northwestern outer coast of Baja California). Townsend (1916: 445) noted the abundance of this species on both sides of the peninsula, and Nelson (1921: pl. 12) presented a photograph showing large numbers of captive green turtles at Scammon's Lagoon, about midway along the outer coast of Baja California. Walker (1949: 255) included a photograph of green turtles from the outer coast of Baja and showed (p. 249) an aerial view of a message spelled out on the shores of Scammon's Lagoon with green turtle carapaces, indicating their abundance there. All of the living specimens that I have seen from the outer coast of Baja California clearly appear to belong to the same population as that found within the Gulf of California. Radovich (1961: 49) recorded the green turtle as relatively common in California waters in warm years, and even extended its range at such times possibly as far north as Nootka Sound, British Columbia. Logier and Toner (1961: 55) also recorded the green turtle from the southwestern coast of Vancouver Island, British Columbia. Agassiz (1857: 379) had earlier noted the occurrence of green turtles along the entire southern California coast.

Although the records are often not complete enough to distinguish *carrinegra* and *agassizi,* from available evidence it now appears that all references to the green turtle in the waters of the Gulf of California, outer Baja California, California and northward should be considered as indicating *carrinegra.* Some of the more widely cited of these records are those of Carr, 1952: 357; Pope, 1939: 259; Van Denburgh, 1922: 996; Stebbins, 1954: 184; Ditmars, 1949: 383; Loveridge, 1945: 21; Smith and Taylor, 1950a, 1950b: 18; Schmidt, 1953: 106; Agassiz, 1857: 379; and Van Denburgh and Slevin, 1921: 53. Further study may show that all of Pacific Mexico should be included in this range.

It should be borne in mind that there is the possibility that green turtles could, on occasion, ride all the way across the Pacific on the eastward-flowing North Pacific Current (Sverdrup, Johnson and Fleming, 1942: chart 7) and arrive in Pacific North American waters from the Orient. Sea turtles from America are known to do this in the Atlantic (Carr, 1952), but the numbers that arrive on the other side, in Europe, are so small that they are always worthy of published note and they have founded no population as large as that of *carrinegra.* The increased journey required for such a trip in the broader Pacific makes such a source for *carrinegra* even more remote, although it does not eliminate the possibility of an occasional record of a non-*carrinegra* green turtle in northeastern Pacific waters. The record, however, would likely be of a *mydas*-like turtle rather than an *agassizi*-like individual.

Nesting: I have noted below that there is strong evidence to support the assumption that green turtles nest within the Gulf of California. There are also numerous reports that there is nesting by this turtle along the southern shores of the outer coast of Baja California, especially in the region of Magdalena Bay. The smallest specimen of *carrinegra* that I have seen, 14¼ inches in carapace length (one of the paratypes), is from near Magdalena Bay. Van Denburgh (1922: 997) mentioned nesting by this species in April and May at San Bartolome Bay (now known as Bahia Tortolo), on the outer coast of Baja California at about 27° 40′ N., just west of Scammon's Lagoon. Averett (1920: 24) suggested nesting in this same area.

Carr (1961b: 68) suggested that the *Chelonia mydas* which nest in the summer at Maruata Bay, Michoacan, Mexico (Peters, 1954: 9, 1957, 1960: 331; Duellman, 1961: 56) may be the parents of the population of green turtles in the Gulf of California. Green turtles reportedly nesting at Socorro Island (Van Denburgh, 1922: 997; Slevin, 1931: 17) possibly should be considered in this respect as well. However, as Carr noted, the features which serve to distinguish the Gulf population were not mentioned by those writers discussing the Maruata Bay nesting assemblage, and it remains for further study to determine if Carr's hypothesis is correct. That it is not, is suggested by the fact that this rookery lies over 300 miles south of the mouth of the Gulf of California, and the current patterns of the eastern Pacific (Sverdrup, Johnson and Fleming, 1942, chart 7) do not favor such a means of dispersal northward for young turtles at the mercy of the currents, as is the case in the western

Atlantic where turtles hatched in Costa Rica may ride the northward-flowing currents into the Gulf of Mexico or beyond on the outer Atlantic coast (Carr and Caldwell, 1956: 7). On the other hand, the turtles nesting in the Bahia de Los Angeles and Punta Pescadore areas and near Mulege are all said to be the green turtle, as are the less definite records for turtles nesting to the south within the Gulf. The reports of green turtles nesting in the Gulf are sufficiently frequent and widespread (especially along the coast of Baja California) to warrant further search for an expected concentration of nesting typical of green turtles (Carr and Hirth, 1962: 1). Young turtles resulting from nesting activities on the outer coast could drift southward to Cape San Lucas and then make their way into the Gulf on the strong tides that sweep in there and thus swell that population. That such concentrations of nesting have not been discovered is not surprising when one considers the difficulties encountered with the rough terrain and lack of facilities for concentrated biological research along the shores of Baja California and much of the coast of Sonora and Sinaloa.

Eretmochelys imbricata squamata Agassiz
PACIFIC HAWKSBILL SEA TURTLE

This species is extremely common in the waters of the southern Gulf of California. Dried and mounted specimens, most of them caught locally, abound in the curio shops of La Paz, near the southern tip of the Peninsula of Baja California. Townsend (1916: 445) previously has noted its abundance in the southern Gulf. Carr (1961b) noted its occurrence in the southeastern Gulf, and I have seen specimens at Bahia de Los Angeles that were taken in local waters. The specimens from the latter locality were usually small (about 18 inches in carapace length), but one large female was seen which measured 33 inches. I know of no records from north of about latitude 29° N in the Gulf and none north of the southern tip of the peninsula on the outer coast of Baja California.

Schmidt (1953: 106) included the hawksbill, as a waif, as ranging to Californian waters. This record should be questioned and until a modern record is established the hawksbill should be removed from that list.

Lepidochelys olivacea (Eschscholtz)
PACIFIC RIDLEY SEA TURTLE

Carr (1961a, 1961b) has given definite records for this species from the middle and southern waters of the eastern Gulf of California. My own field observations in Baja California have failed to produce definite records for this species there, although the name *jabalin* (see section on *Caretta* below) may refer to it at least in part.

That this species does occur in the northwestern Gulf, and therefore may thus be expected throughout that body of water is evidenced by a specimen (complete skeletal elements, carapace 24 inches in length) in the Vertebrate

Paleontology Collections of the Los Angeles County Museum (No. R-77) from San Felipe. The specimen was obtained through the generosity of Marineland of the Pacific oceanarium, through the Curator of Fishes, Mr. John H. Prescott.

Houck and Joseph (1958: 219) recently reported *Lepidochelys* from northern California waters. The ridley should therefore be expected to occur along the outer coast of Baja California as well.

Carr (1952) used the name I have cited above for this species in the eastern Pacific. As he was unable to find differences separating the east and west Pacific populations, I continue to follow his example. However, in light of the present findings dealing with the separation of *Chelonia* populations, it is likely that when enough specimens are examined, differences will eventually be found to separate those two populations of Pacific *Lepidochelys*. A name is available for the Mexican population in the Gulf of Tehauntepec, far south of the Gulf of California. This name, noted by Carr (1952: 404) and used by Schmidt (1953: 107) would be *Lepidochelys olivacea remivaga* (Hay, 1908). If the eastern Pacific ridley does prove to differ from that of the western Pacific, it will then have to be determined further if this name should also apply to the nesting populations of the Gulf of California. The same principles of recruitment from the south to swell the numbers of individuals in the population of the Gulf would apply to this population as have been discussed earlier in this paper for the Gulf green turtle, *Chelonia mydas carrinegra*.

Common Names: The common names *mestiza* and *golfina*, which Carr (1961b: 66) found used for the ridley in the eastern Gulf, are not used for this species of turtle at Bahia de Los Angeles. *Golfina* is used there as a secondary common name for *Dermochelys*, and the name *mestiza* is unknown. A turtle called *jabalin* is known rarely from Bahia de Los Angeles, and this name may in part refer to the ridley. It probably refers to the loggerhead (*Caretta*) as well.

Caretta caretta gigas Deraniyagala
PACIFIC LOGGERHEAD SEA TURTLE

The presence of this species within the Gulf of California was questioned by Carr (1961b: 66). While my own field observations have also failed to produce certain records of its occurrence there, there is an apparently valid record (Shaw, 1947: 55), based on a specimen that author examined, which demonstrates the presence of this species in the northern Gulf at San Felipe. Having been recorded from the upper Gulf, the loggerhead may thus be expected anywhere within that body of water. As I have seen small specimens of *Caretta* that had been taken in California waters near Los Angeles (similar examples reported also by Shaw, 1947), this species must occur along all of the outer coast of Baja California as well.

Shaw (1946: 123) reported a small sea turtle taken from the vicinity of North Coronado Island, lying off the northwestern or outer coast of Baja California, which he recorded as an abberant *Lepidochelys*, although he noted

that it had many characters in common with *Caretta*. One of his reasons for considering his specimen to be *Lepidochelys* was its possession of four inframarginal laminae on each plastral bridge. At the time of Shaw's report, it generally was believed that this number of inframarginal laminae did not occur in *Caretta* (usually reported to have only three) and that it was a valid character to distinguish the two genera. However, Brongersma (1961: 3) has summarized recent reports which show that *Caretta* may have four such laminae. Another of Shaw's reasons for applying the name *Lepidochelys* to his specimen was the presence of a pore on one of the inframarginals, typical of this genus. In discussing Shaw's specimen, Carr (1952: 395) noted that *Caretta* also sometimes has an apparent pore. These facts, coupled with Shaw's color description and recognizable black and white photograph of his specimen, convince me that his specimen was a *Caretta* rather than a *Lepidochelys* and therefore may stand as a definite record for this species of sea turtle in the waters of the outer coast of Baja California. Schmidt's (1953: 108) questioned inclusion of this turtle in California waters can now be revised to include it as a positive visitor.

Carr (1952: 394) has pointed out that there is possibly an available name for the eastern Pacific loggerhead if this population should prove to differ significantly from the loggerheads of the Indian Ocean described by Deraniyagala (1933) as *gigas*. The available name in proper combination would be *Caretta caretta tarapacana* (Philippi, 1899: 731).

Common Name: The common name *mestiza,* cited by Carr (1961b: 66) as possibly referring to the loggerhead if it occurs in the Gulf, was unknown at Bahia de Los Angeles.

However, it is interesting to note that Shaw (1947: 55) mentioned that the local name for the loggerhead at San Felipe is *"cahuama javelina."* At Bahia de Los Angeles, Antero Diaz often spoke of a sea turtle rarely taken near there which he called *jabalin*. From his description, and after he had been shown photographs of all the kinds of sea turtles, it was apparent that he was speaking either of the loggerhead or of the ridley, *Lepidochelys*. In addition, the other three genera of sea turtles can positively be eliminated as they were either shown to me in the form of actual specimens or adequately described (as in the case of *Dermochelys*). Although Senor Diaz is attempting to obtain one for me at this writing, I have not yet seen a specimen of the *jabalin* for positive identification. As they are often confused, even by biologists, it is quite likely that *jabalin* refers to both *Caretta* and *Lepidochelys*.

Dermochelys coriacea schlegelli (Garman)

PACIFIC LEATHERBACK OR PACIFIC TRUNKBACK SEA TURTLE

On 12 June 1961, my wife Melba and I observed a dead leatherback, evidencing considerable decomposition but no obvious injury, floating near the entrance to Bahia de Los Angeles. The carapace length of this individual was about five feet, nearing the maximum size recorded for this genus.

At Bahia de Los Angeles, Antero Diaz told me that live specimens, up to about 1000 pounds in weight, of this species are taken or are seen in the area on rare occasions.

In the summer of 1961, while at Bahia de Los Angeles, an American sport fisherman told me of a large leatherback that he had seen which had been captured and killed shortly before at San Felipe, near the northwestern head of the Gulf. In addition, in July of 1962 the proprietor of a motel at San Felipe told of a hatchling-sized leatherback that had once been taken near San Felipe, indicating possible nesting activity by that species in the northwestern Gulf.

Carr (1961b: 66) reported that this species is also known as a straggler in the eastern Gulf. Its range, then, can be considered to include the entire Gulf of California, and as it is not infrequently seen or taken in the waters off Los Angeles, California, it might be expected to occur anywhere along the outer coast of Baja California. Its range in the northeastern Pacific extends to British Columbia (Carr, 1952: 452; MacAskie and Forrester, 1962).

Carr (1952: 453) noted that the subspecific name for the Pacific leatherback is of questioned validity.

Common Name: At Bahia de Los Angeles, this turtle is known as *siéte filos,* meaning *seven sharps,* in reference to the seven longitudinal ridges on the carapace. It is also known secondarily as *golfina.* The name *galápago,* cited by Carr (1961b: 66) as referring to this species in the eastern Gulf, was unknown at Bahia de Los Angeles except in reference to the famous Galapagos Islands giant land tortoise.

BIOGEOGRAPHICAL SUMMARY

In view of the present findings, it appears that *Chelonia, Lepidochelys, Caretta* and *Dermochelys* occur throughout the Gulf of California, and along the entire western or outer coast of Baja California. Of these, the green turtle, *Chelonia,* is by far the most abundant.

Eretmochelys, on the other hand, is a more tropical turtle, and present records indicate that within the Gulf of California it occurs only as far north as about latitude 29°, and on the outer coast of Baja California only in the region of Cabo San Lucas, where it is frequently encountered.

SEA TURTLE NESTING IN THE GULF OF CALIFORNIA

Sea turtles reportedly nest throughout the Gulf of California. Such reports come from turtlemen, fishermen and laymen, and it is likely that they are valid. Carr (1961a) noted that the ridley (*Lepidochelys*) nests in the southeastern Gulf. There is reason to suspect that *Dermochelys* may nest in the northwestern Gulf near San Felipe (see appropriate section, Species List, this paper). Townsend (1916: 445) noted that green turtles (*Chelonia*) reportedly nested near the mouth of the Rio Colorado, in the northern Gulf.

Mr. Ralph Davis, an expert underwater diver and careful observer, tells me that several years ago in February or March he dug up a sea turtle nest at

Bahia San Luis Gonzaga and ate some of the eggs. The species involved is unknown, but from his description the eggs were not large enough to have been *Dermochelys* and must have been of one of the four remaining genera of sea turtles. Bahia San Luis Gonzaga lies in the northwestern Gulf, and is north of the known range of *Eretmochelys*. The implication, therefore, is that the eggs Mr. Davis dug up were of either *Chelonia, Caretta* or *Lepidochelys*.

There are persistent reports of nesting by green turtles in the general vicinity of Bahia de Los Angeles, and of the occasional presence of hatchling-sized turtles in the water—both at the south end of the large bay itself, and nearby to the south at Punta Pescadore. Dr. Gordon Carman tells me that from the air he has seen turtle tracks on the beach at Punta Pescadore in September and November, and I understand that on occasion sea turtle eggs (believed to be of the green turtle) have been collected at that place by local residents. Dr. Ira Wiggins, from Stanford University, tells me that he saw a sea turtle track on the shores of Bahia de la Conception (near Mulege) at Coyote Cove in late March or early April in 1931. Dr. Wiggins spoke to several local turtle fishermen who were in the area at the time and had a green turtle with them, and was told that they expected to get eggs laid by "this kind of turtle" soon. In addition to these definite sites of reported nesting by Gulf sea turtles, I have been told by a number of presumably reliable observers that sea turtles (they believed them to be the green turtle) have been known to nest on the shores of many of the islands of the south central Gulf. Both McGee (1898: 186) and Dawson (1944: 133) suggested that green turtles nested on the shores of El Infiernillo, bordering the eastern shore of Tiburon island.

Large green turtles with unlaid but shelled eggs are reportedly taken on occasion in the central Gulf. I have visited Punta Pescadore in mid June and found no tracks. I have also examined several large female green turtles as they were being butchered and found only very small (up to 10 mm. in diameter) yellow ovarian eggs. However, these observations were made in mid summer (on June 20, on a turtle with a carapace of 36½ inches, and on July 12 on a turtle with a carapace length of 38½ inches), and as it appears that nesting may occur in the period from fall to spring, the absence of shelled eggs in these large turtles or the lack of tracks at that time does not necessarily mean that nesting does not occur nearby at another time of year. The turtles with shelled eggs were said to have been even larger than the largest (38½ inches) that I examined.

ACKNOWLEDGMENTS

In particular I would like to emphasize the great amount of help given this study by the cooperation of Señor Antero Diaz, the leading turtle dealer at Bahia de Los Angeles, and his associates. Señor Diaz was most generous in allowing me to examine his turtles, and most patient in answering my questions which to him must have seemed endless. Señor Eribert Arce of Ensenada also generously allowed me to examine his turtles at his soup factory. These

turtles had come from the outer coast of Baja California as well as from the Gulf.

Others who have given of their knowledge of sea turtles in Baja California have either been mentioned in the appropriate place in the text or, I regret to say, I did not get their names. To all of these people I am most grateful.

Dr. Carl L. Hubbs kindly conferred with me about his experiences with Baja California green turtles, but as his notes to my knowledge duplicated my own previous findings, which I feel are sufficient, I have not attempted to include them here, although Dr. Hubbs offered them early in the study.

Dr. M. Dale Arvey generously translated from the Japanese the portions of the work by Kuroda, *et al.* that dealt with *Chelonia.*

To my wife, Melba C. Caldwell, I offer my sincere thanks for her critical reading of the manuscript and especially for many hours spent with me in the field helping to obtain and record data. Clyde A. Wilson, Jr. II and Frank F. Wilson also aided in this latter endeavor.

Support for the field work on this project was received in part from the Los Angeles County Museum and the Museum Associates and from funds made available to the Museum from the American Foundation for Oceanography.

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