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SYNOPSIS OF THE TURTLES, CROCODILES, AND AMPHISBAENIANS OF IRAN

By

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ABSTRACT: Three species of freshwater turtles, *Emys orbicularis, Mauremys caspica caspica, Trionyx euphraticus*; two land tortoises, *Agrionemys horsfieldii, Testudo graeca* (*T. g. ibera* and *T. g. zarudnyi*); and one marine turtle, *Eretmochelys imbricata bissa,* are known and documented from Iran. *Chelonia mydas japonica* and *Dermochelys coriacea* have been observed, and two other species of marine turtles, *Caretta caretta gigas* and *Lepidochelys olivacea,* may occur in Iranian waters. A single species of crocodile, *Crocodylus palustris,* and a single amphisbaenian, *Diplometopon zarudnyi,* occur in Iran. Synonymy, diagnoses, Iranian distribution, all literature records, and all known Iranian localities are given, and the natural history and ecology of each species in Iran is summarized. A key to the turtles of Iran is provided.

INTRODUCTION

This synopsis is an outgrowth of work begun in 1958 with field studies in southwestern Iran, continued during subsequent years through studies of museum collections, and culminated with field studies throughout Iran in 1975.

With the encouragement and sponsorship of the Iran Department of the Environment, a number of ecosystem studies have been initiated in various areas of Iran, and environmental impact statements are now being undertaken in connection with development projects. It is thus desirable that synopses of the various taxonomic groups of organisms be prepared whenever possible to facilitate these studies. The systematics of amphibians and reptiles has now reached the stage where such comprehensive summaries are possible. The present report is but a small part of continuing systematic work on the herpetology of Iran, but a single monographic treatment of all of the amphibians and reptiles has not proved practical nor economically feasible. Therefore, reports on smaller taxonomic groups are being published as this work reaches the appropriate stage for each group.

The turtles of Iran are representative of the impoverished chelonian fauna of the Palearctic. *Emys, Testudo,* and the western forms of *Mauremys* today are all restricted in their distribution to the milder climates of southern Europe, North Africa, and Southwest Asia, being essentially Mediterranean faunal elements. *Agrionemys* may be a relatively ancient genus of uncertain affinities; its distribution is strictly Irano-Turanian. The marsh crocodile, which occurs in the extreme southeastern corner of Iran, is one of a small number of Indian faunal elements extending beyond the Oriental Region

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into Iran. In the not-too-distant past, the currently interrupted distribution of crocodiles in the river systems of the Makran of Iran and Pakistan may have been more or less continuous, connecting the Iranian population with those of the Hab and Indus drainages. In southwestern Iran, in the low plains of Khūzestān, Arabian elements of the Saharo-Sindian subregion are encountered, and Iran's lone amphisbaenian, *Diplometopon zarudnyi*, is one of these. It is the northeasternmost representative of the Trogonophidae, amphisbaenians occurring in the arid regions of North Africa, East Africa, and the Arabian peninsula.

In the accounts which follow, standard herpetological procedures and terminology have been followed. The reader not familiar with herpetological terminology is referred to Peters (1964) for definitions.

The synonymies include all references known to me that cite specimens from Iran. Thus, my interpretations of the identifications of previous workers and the status of all published museum records should be clear.

I have attempted to summarize what little is known of the natural history of Iranian species, based on published accounts and my own observations. Where no information exists for a species within Iran, I have cited accounts for areas elsewhere in the range of the species.

I have listed here all of the Iranian localities known for each species. Wherever possible, I have associated the localities in the literature with a standardized spelling in the United States Board on Geographic Names Gazetteer no. 19, *Iran*, 1956, and only this spelling has been listed under each species in the interest of saving space. Each published locality is followed by the initials of the author and the date, and/or (in the case of specimens I have examined) the abbreviation for the museum in which the specimen(s) is located. Where I have been unable to associate a published place name with a standardized spelling, the original spelling has been used. Any localities from which I have examined specimens are preceded by an asterisk (*). In cases where the reader questions my interpretation of the identification by a previous author, it sometimes may be necessary to check the locality cited in the original paper. Distances and elevations appear as given in publications and on museum labels. In fear of introducing further imprecision, I have not converted such data from miles and feet to kilometers and meters. For convenience in locating place names, the localities have been listed under the *ostān* (administrative province) in which they occur. A map of these ostān boundaries is provided in a previous paper (Anderson 1974: 28, fig. 1), and in Fisher (1968: map 2). It should be noted, however, that the boundaries of administrative subunits in Iran have changed since publication of this map, and seem to be subject to periodic relocation. It seems practical to stabilize this organization of localities for expedient reference, however.

Acknowledgments

Anyone engaged in faunal studies owes his primary debt to the many collectors, without whom such studies would be impossible. Many of these collectors are anonymous, but the bulk of Iranian material has been collected by those cited in the publications of previous workers. I owe special thanks to William S. and Janice K. Street, who have contributed so much and have waited so long and patiently for the reports on their material. Similarly, Dr. Henry Field has been a tireless contributor to the natural history material of Southwest Asia, and has constantly encouraged those of us working with the fauna.

Curators who have loaned me material and/or made me welcome at their institutions during the course of my work include: Robert Inger and Hymen Marx, Field Museum of Natural History; the late Doris Cochran, the late James A. Peters, and George Zug, United States National Museum; Charles M. Bogert, Richard Zweifel, and Charles Myers, American Museum of Natural History; Charles Walker, Donald Tinkle, and Arnold Kluge, Museum of Zoology, University of Michigan; Ernest E. Williams, Museum of Comparative Zoology, Harvard University; Robert C. Stebbins, Museum of Vertebrate Zoology, University of California, Berkeley; Wilmer W. Tanner, Brigham Young University; Ilya Darevsky, Zoologicheski'i Institut, Leningrad; Josef Eiselt, Naturhistorisches Museum, Wien; Alice Grandison, J. C. Battersby, and E. N. Arnold, British Museum (Natural History); Jean Guibé, Muséum National d'Histoire Naturelle, Paris; F. W. Braestrup, Universitetets Zoologiske Museum, Copenhagen; P. Kuenzer, Zoologische Institut und Museum der Universität, Göttingen; Robert G.

Tuck, Jr., Iran National Museum of Natural History (Muse'-ye Melli-ye Tarikh-e Tabi'i), Tehran.

Much of the research for this and other studies in Southwest Asian herpetology was done while I was Associate Curator in the Department of Herpetology of the California Academy of Sciences. I thank Dr. George E. Lindsay, Director of that institution, and Dr. Alan E. Leviton, Chairman and Curator of the Department of Herpetology for the opportunity and necessary facilities to pursue the research. Dr. Leviton and I have worked together on many projects in Southwest Asian herpetology, and his comments and encouragement have been a constant stimulus.

During field work in 1958, I was extended many courtesies by employees of the Iranian Oil Exploration and Producing Company. The Iran Department of the Environment made possible my field work in 1975 as a visiting scientist, and provided me with air travel funds, vehicles, equipment, and field assistants. I am indebted to many personnel of that department, but especially to His Excellency, Mr. Eskandar Firouz, the former Director, and to Robert G. Tuck, Jr., Curator and Advisor to the Museum.

I have been accompanied in the field by many people at various times. I am particularly grateful to Howard T. Anderson, William O. Williams, and Rufus Cook, all formerly with the Iranian Oil Exploration and Producing Company; Ruben McCullers, American Peace Corps; Reza Khazai'e, Abbas Ahmadi, and Robert G. Tuck, Jr., Iran Department of the Environment.

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Most important to me has been the continuing support of my family. My father, Howard T. Anderson, has provided financial assistance as well as constant encouragement and intellectual stimulation throughout the 20 years of my herpetological work. My mother, Lois B. Anderson, shared her home in Masjed Soleyman with elements of the Iranian herpetofauna during 1958. My wife, Kay, and son, Malcolm, have made all of the sacrifices familar to families of researchers.

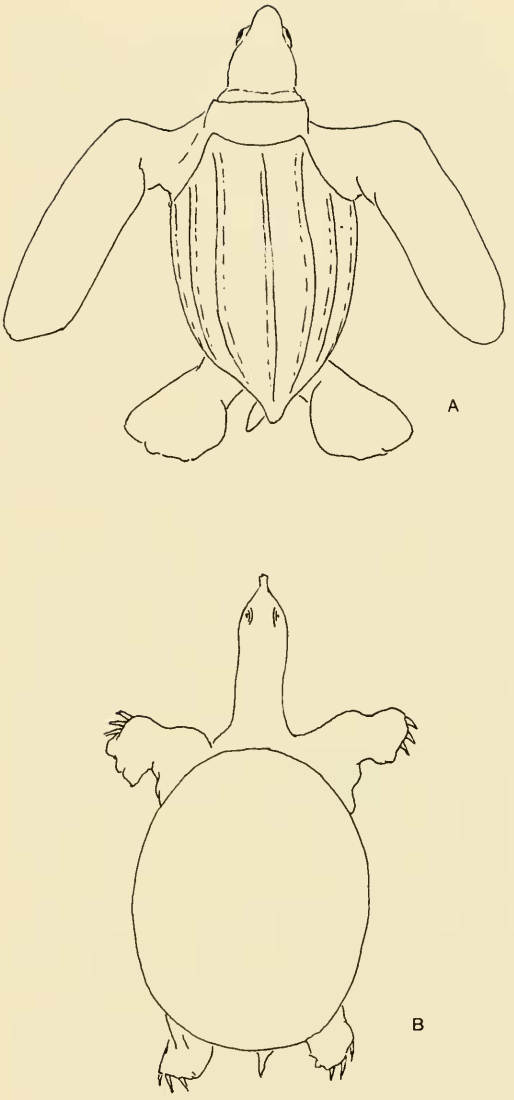

FIGURE 1. (*A*) *Dermochelys*. (*B*) *Trionyx*.

SYSTEMATIC SECTION

The following abbreviations are used for museums: AMNH—American Museum of Natural History, New York. CAS—California Academy of Sciences, San Francisco. FMNH—Field Museum of Natural History, Chicago. MMTT—Muze'-ye Melli-ye Tarikh-e Tabi'i, Tehran. USNM—United States National Museum, Washington, D.C.

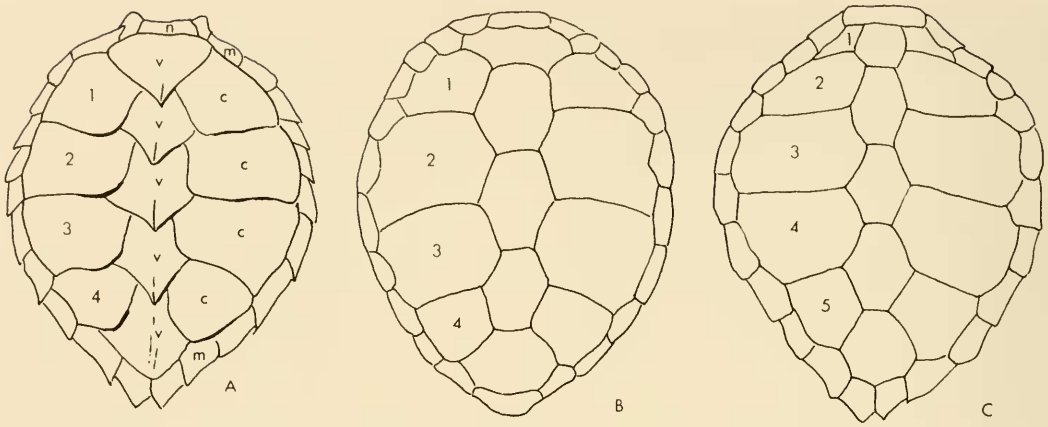

FIGURE 2. (*A*) Carapace of *Eretmochelys*. (*B*) Carapace of *Chelonia*. (*C*) Carapace of *Caretta*. Abbreviations: c = costal, m = marginal, n = nuchal, v = vertebral.

Key to the Turtles of Iran

Species marked with an asterisk (*) have not been collected in Iran, but may be expected to occur within the borders of the country. Department of the Environment personnel have recorded turtles identified as *Chelonia mydas* and *Eretmochelys imbricata* from many areas along the Iranian coast of the Persian Gulf and the islands of the gulf. Ten to 15 *Dermochelys coriacea* are reportedly taken annually at Larak Island in the Strait of Hormoz to support a local oil industry for sealing the hulls of dhows and other craft. But there are no records of marine turtles in the herpetological literature, and apart from two skulls of *Eretmochelys imbricata bissa*, no specimens of record.

1a. Carapace and plastron without horny plates (Fig. 1) 2
1b. Carapace and plastron with horny plates (Figs. 2–4) 3

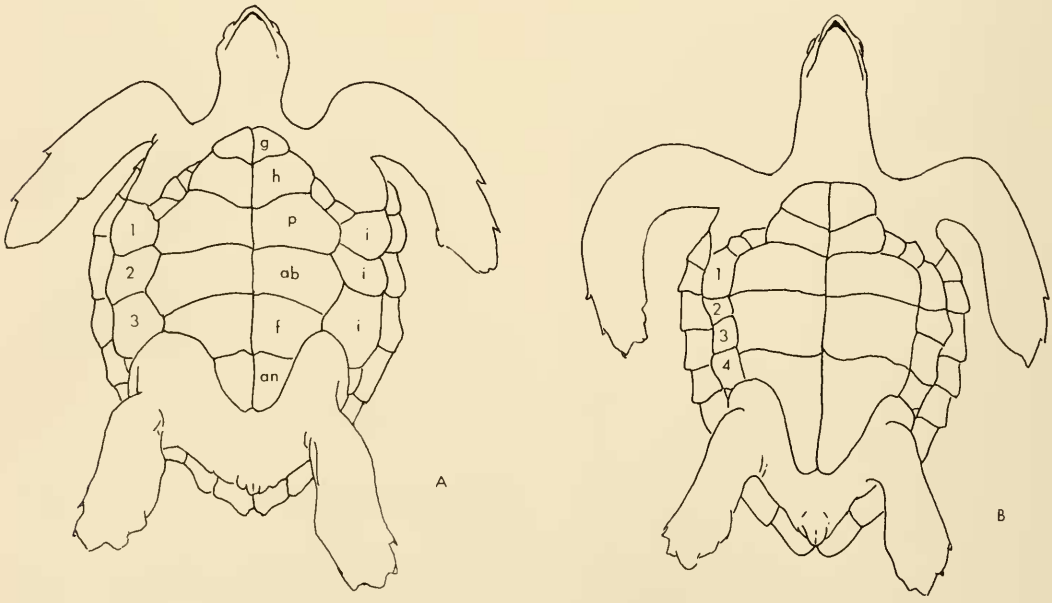

FIGURE 3. (*A*) Plastron of *Caretta*. (*B*) Plastron of *Lepidochelys*. Abbreviations: ab = abdominal, an = anal, f = femoral, g = gular, h = humeral, i = inframarginal, p = pectoral.

2a. Carapace with 7 distinct longitudinal ridges; limbs modified to form flippers, without claws; marine (Fig. 1*A*) ..... **Dermochelys coriacea* (Linnaeus, 1766)

2b. Carapace flat, without ridges; feet with 3 claws; freshwater (Fig. 1*B*) ..... *Trionyx euphraticus* (Daudin, 1802)

3a. Limbs modified to form flippers; digits not distinct; marine 4

3b. Limbs not modified to form flippers; digits distinct; freshwater or terrestrial 7

4a. Four pairs of costal plates on carapace; first vertebral plate in contact with marginals (Fig. 2*A–B*) 5

4b. Five or more pairs of costal plates on carapace; first vertebral plate not in contact with marginals (Fig. 2*C*) 6

5a. Plates of carapace imbricate (Fig. 2*A*) ..... *Eretmochelys imbricata bissa* (Rüppell, 1835)

5b. Plates of carapace juxtaposed (Fig. 2*B*) ..... **Chelonia mydas japonica* (Thunberg, 1787)

6a. Bridge with 3 inframarginal plates (Fig. 3*A*) ..... **Caretta caretta gigas* Deraniyagala, 1933

6b. Bridge with 4 inframarginal plates (Fig. 3*B*) ..... **Lepidochelys olivacea* (Eschscholtz, 1829)

7a. Head covered with undivided smooth skin; digits fully webbed 8

7b. Head covered by shields; digits not webbed 9

8a. Axillary and inguinal plates present on plastron; plastron united to carapace by bony suture; plastron not hinged, immovable; anal plates of plastron pointed, their median suture shorter than interabdominal suture (Fig. 4*A*) ..... *Mauremys caspica caspica* (Gmelin, 1774)

8b. Axillary and inguinal plates absent; plastron united to carapace by ligamentous attachment; plastron more or less distinctly hinged, movable (in adults); anals rounded, their median suture longer than interabdominal suture (Fig. 4*B*) ..... *Emys orbicularis* (Linnaeus, 1758)

9a. Forelimb with 4 claws ..... *Agrionemys horsfieldii* (Gray, 1844)

9b. Forelimb with 5 claws 10

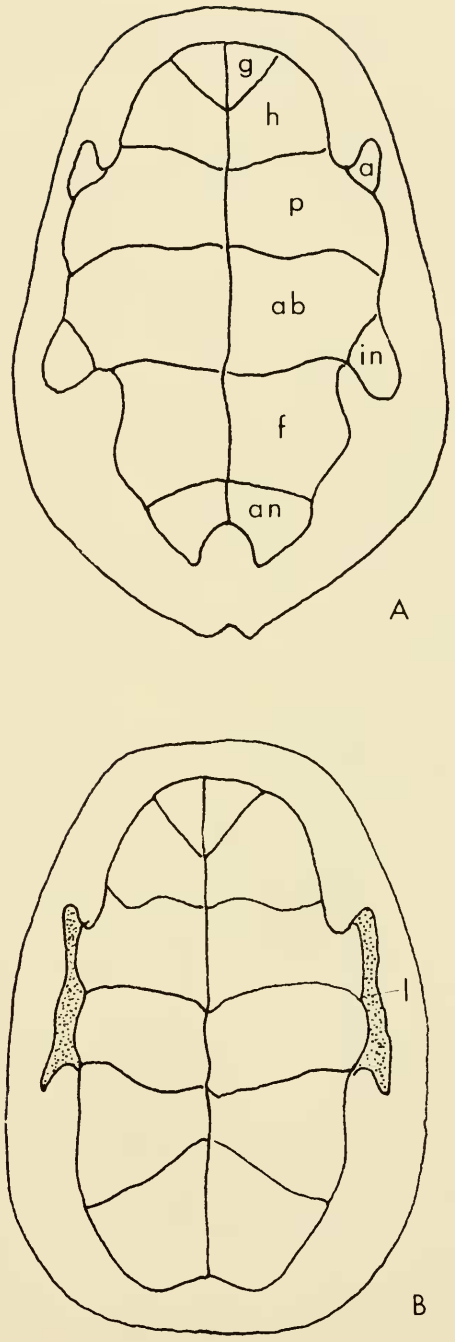

FIGURE 4. (*A*) Plastron of *Mauremys caspica*. (*B*) Plastron of *Emys orbicularis*. Abbreviations: a = axillary, ab = abdominal, an = anal, f = femoral, g = gular, h = humeral, in = inguinal, l = ligamentous attachment, p = pectoral.

10a. Shell oval in outline, with smooth, rounded posterior margin; ground color light olive, with large, distinct, individual dark markings ..... *Testudo graeca ibera* Pallas, 1814

10b. Shell elongate in outline, with upturned, emarginate posterior margin; ground color brownish olive, with very indistinct dark markings ..... *Testudo graeca zarudnyi* Nikolsky, 1896

Testudines

Family Cheloniidae

Genus **Caretta** Rafinesque

Caretta Rafinesque, 1814:66 (type-species: *Caretta nasuta* Rafinesque [= *Caretta caretta* (Linnaeus, 1758)]).

Definition.—Large marine turtles with five or more pairs of costal plates, first in contact with nuchal; three poreless inframarginal plates on bridge; elongated carapace with vertebral keel, becoming smoother with age, highest anterior of bridge, serrated posteriorly (Ernst and Barbour 1972:231).

Caretta caretta (Linnaeus)
*__Caretta caretta gigas__ Deraniyagala

Caretta gigas Deraniyagala, 1933:66, pl. 5, figs. 4–6 (type-locality: Gulf of Mannar, Ceylon).
Caretta caretta gigas: Deraniyagala 1939:164, figs. 66, 73.

Diagnosis.—Seven to 12 neural bones, last one to five usually interrupted by costal bones; 13 marginal plates on each side of carapace.

Color Pattern.—Carapace reddish brown, sometimes tinged with olive, plates may be bordered with yellow; plastron yellow to cream. Head reddish or yellow-chestnut to olive-brown, scales often margined with yellow, and yellow below. (Ernst and Barbour 1972:231).

Size.—Averaging about 300 lbs (136 kg), but weights to 1,000 lbs (455 kg) recorded, with lengths up to two meters.

Iranian Distribution.—I find no records for the Persian Gulf, although it may be expected to occur there.

Genus **Chelonia** Latreille

Chelonia Latreille, 1801:22 (type-species: *Chelonia mydas* [Linnaeus, 1758]).

Definition.—Each flipper with a single claw; one pair of prefrontal shields on head; horny beak of lower jaw coarsely toothed, that of upper jaw with strong ridges on inner surface; four pairs of costal plates, first not in contact with nuchal; four inframarginal plates.

Chelonia mydas (Linnaeus)
*__Chelonia mydas japonica__ (Thunberg)

Testudo japonica Thunberg, 1787:178, pl. 7, fig. 1 (type-locality: Japan).
Chelonia mydas japonica: Wermuth and Mertens 1961:237–238.

Diagnosis.—A broad, deep shell, often markedly indented above hind limbs. Greenish or olive-brown, some individuals melanistic, becoming slate-gray to black.

Size.—Average carapace length of adult males about one meter, slightly longer for females.

Sexual Dimorphism.—Tail of male extends well beyond carapace margin, prehensile in vertical plane; tail of female barely attains edge of carapace; the single claw of male long and curved.

Iranian Localities.—Minton (1966:59–61) reports the species from the vicinity of Karachi, and Shockly (1949) reported it nesting at Ras Jawani, Pakistan, close to the Iranian border. Although there are no specimens of record, and no published reports of green turtles in Iran in the herpetological literature, preliminary investigations of the status of marine turtles in Iran were carried out by Bosch, Bullock, Kinunen, and Walczak. The following sight records were given in their reports to the Iran Game and Fish Department in 1970 and 1971 (Walczak and Kinunen 1970, 1971; Bullock and Kinunen 1971; Kinunen and Walczak 1971; Walczak 1971).

Ostān 8 (*Fārs*): 2 km E Bandar-e Maqām [26°56′N, 53°29′E]. *Ostān 10* (*Baluchistān–Sīstān*): Chāh Bahār, 25°18′N, 60°37′E; 10 km E Chāh Bahār; Khalij-e Chāh Bahār, 25°20′N, 60°30′E; 10 km E Pasarvandan [25°05′N, 61°25′E], tracks only. *Persian Gulf*: Jazireh-ye Hormoz, 27°04′N, 56°28′E; Jazireh-ye Lārak, 26°52′N, 56°22′E; Jazireh-ye Sheykh Sho'eyb, 26°48′N, 53°15′E; Qeshm Island, 26°45′N, 55°45′E.

Remarks.—Minton (1966:59–61) found the green turtle nesting primarily from late June through early November. Walczak counted 22 nests attributed to this species 28–29 March 1971 on Hormoz Island (Walczak 1971). Eggs were found 28–30 cm below the sand surface. Although omnivorous, adults prefer plant material, and Bullock and Kinunen (1971) saw green turtles grazing on algae near shore off Lavan Island (Jazireh-ye Sheykh Sho'eyb), usually in groups of three to six. They remained submerged to feed for five to ten minutes, surfacing only briefly for air. These authors recorded 52 sightings in mid-February (Kinunen and Walczak 1971). They found dead females near Chāh Bahār and

near Bandar-e Maqām in early May, late October, and late November. Greatly valued for flesh and eggs, populations of green turtles have been greatly reduced in many areas of their range. To what extent human exploitation has affected populations in the Persian Gulf is not known, but Kinunen and Walczak (1971) recorded turtles killed for shells and found nests ravaged by people, dogs, and foxes. They found no evidence of human consumption of turtle flesh, proscribed by Muslim religious beliefs.

Genus **Eretmochelys** Fitzinger

Eretmochelys Fitzinger, 1843:30 (type-species: *Eretmochelys imbricata* [Linnaeus, 1766]).

Definition.—Plates of carapace imbricate except in very young individuals; four pairs of costal plates; four inframarginal plates; two pairs of prefrontal shields on head.

Eretmochelys imbricata (Linnaeus)
Eretmochelys imbricata bissa (Rüppell)

(Figure 5)

Caretta bissa Rüppell, 1835:4, pl. 2 (type-locality: Red Sea; holotype: Senckenberg Museum no. 7886, ♂).
Eretmochelys imbricata bissa: Smith and Taylor 1950:16.

Diagnosis.—Heart-shaped carapace, fully continuous vertebral keel, all vertebrals with ridges converging posteriorly; head and flippers almost solid black (Ernst and Barbour 1972:223).

Color Pattern.—Carapace dark greenish brown, plastron yellow.

Size.—To one meter long and about 200 lbs (91 kg).

Iranian Localities.—Two skulls from Jabrin are the only specimens of record. Kinunen and Walczak (1971) listed sight records from four other localities in the Persian Gulf.

Ostān 10 (*Baluchistān–Sīstān*): Berīs, 25°09′N, 61°11′E. *Persian Gulf*: *Jabrīn [= Nakhilu Island], 27°51′N, 51°26′E (MMTT); Jazireh-ye Hormoz, 27°04′N, 56°28′E; Jazireh-ye Sheykh Sho'eyb, 26°48′N, 53°15′E; Jazireh-ye Shotur, 26°47′N, 53°25′E.

Remarks.—These turtles are omnivorous, but apparently prefer invertebrates. They share nesting beaches with other species of marine turtles. Hawksbill turtles are the source of commercially valuable tortoise shell. There are two skulls of this species in the Iranian National Museum of Natural History, collected by Derek Scott, who said that he had also seen hatchling hawksbill turtles, had watched one turtle nesting, and counted numerous tracks on a small island just off the coast in the Persian Gulf.

Kinunen and Walczak, in unpublished reports of their investigations of marine turtles in the Persian Gulf, recorded nesting by hawksbills in late April and early May and early to mid-June 1971 on Hormoz Island, on Sheykh Sho'eyb Island, where they counted 218 nests, and on Shitvār Island (Jazireh-ye Shotūr), where they found 250–300 nests on clean white-sand beaches. In the vicinity of villages, many nests had been destroyed by people and dogs. They also found remains of these turtles which had been killed for the shell. They found three dead turtles on the beach at Berīs in late October, but all nests were found on islands; comparable beaches on the adjacent mainland showed no evidence of hawksbill nesting. On Chat-e Lambe Beach on Hormoz Island, they watched nesting behavior of one turtle on 30 April 1971. Their detailed account of nesting (Kinunen and Walczak 1971) is similar to that described by Carr as cited in Ernst and Barbour (1972:225–227).

Genus **Lepidochelys** Fitzinger

Lepidochelys Fitzinger, 1843:30 (type-species: *Lepidochelys olivacea* [Eschscholtz, 1829]).

Definition.—Four inframarginal plates, at least some with pores; first vertebral plate in contact with nuchal.

*Lepidochelys olivacea** (Eschscholtz)

Chelonia olivacea Eschscholtz, 1829:2, pl. 3 (type-locality: Manila Bay, Philippine Islands).
Lepidochelys olivacea: Fitzinger 1843:30.

Diagnosis.—Usually more than five pairs of costal plates; carapace olive.

Color Pattern.—Carapace olive, skin olive above, lighter below, plastron greenish white or greenish yellow.

Size.—Carapace usually under 75 cm in length; to about 180 lbs (82 kg).

Sexual Dimorphism.—Tail of male thick, extending well beyond edge of carapace; tail of female usually not reaching margin of carapace; plastron of male concave.

Distribution.—No records exist for Persian Gulf, but Minton (1966:61) found them breeding at Hawke's Bay, Pakistan.

Family Dermochelyidae
Genus **Dermochelys** Blainville

Dermochelys Blainville, 1816:119 (type-species: *Dermochelys coriacea* [Linnaeus, 1766]).

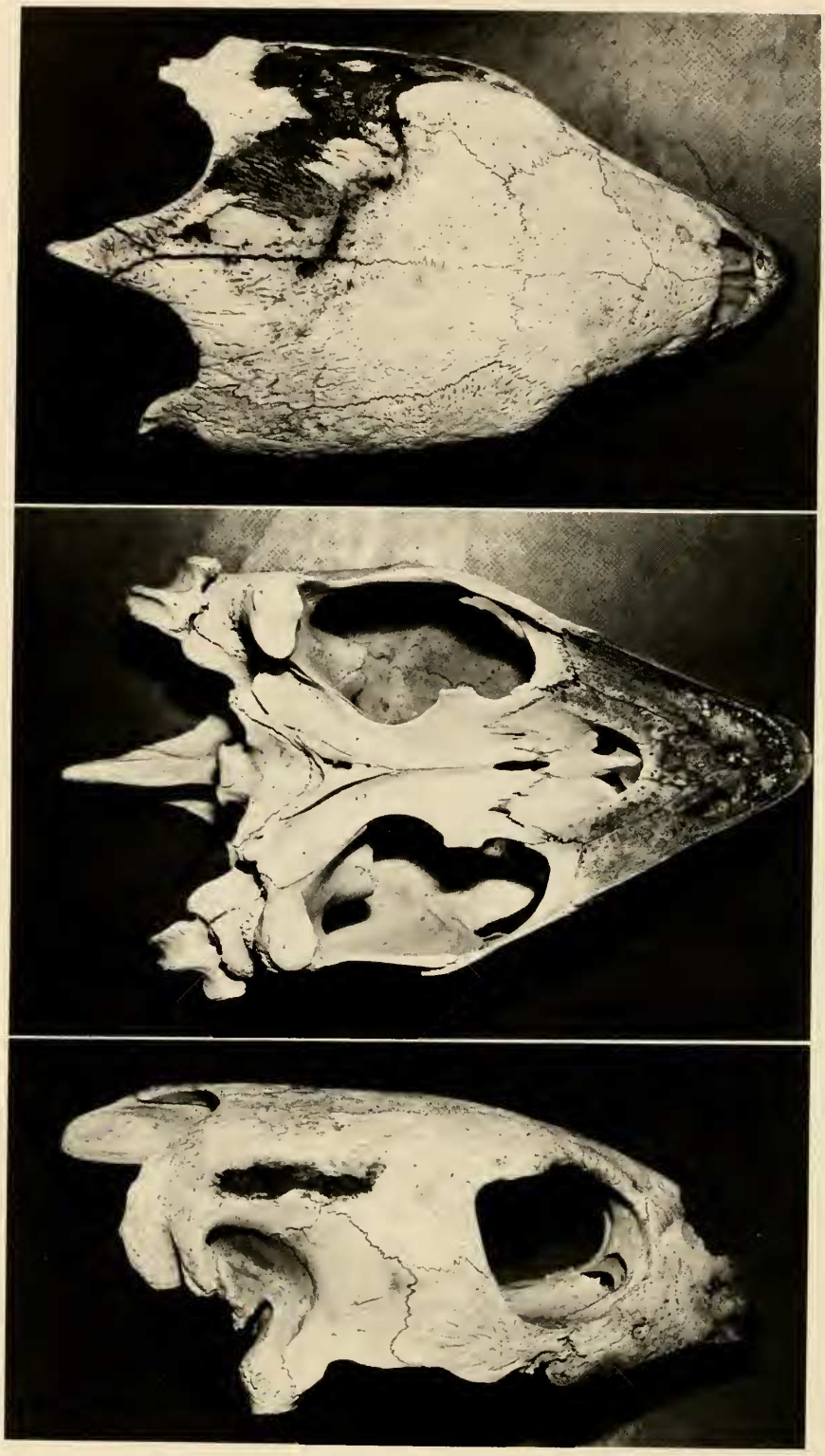

FIGURE 5. Skull of *Eretmochelys imbricata bissa*, Nakhilu Island, Persian Gulf. MMTT specimen. (*Top*) Dorsal, (*middle*) ventral, (*bottom*) lateral.

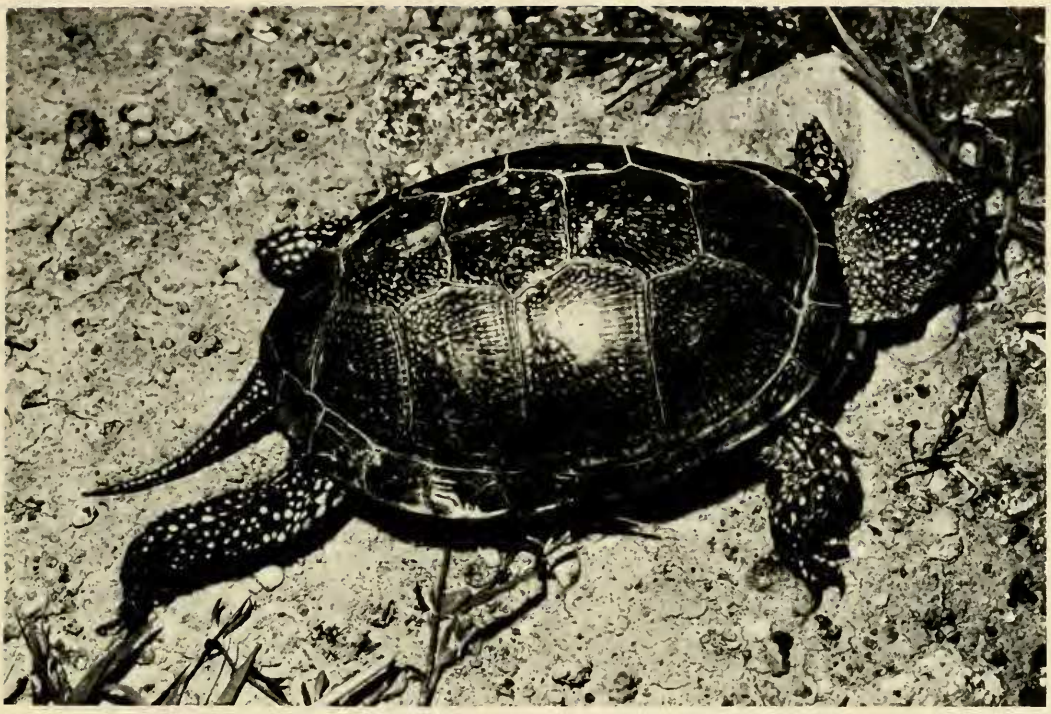

FIGURE 6. *Emys orbicularis*, Ardabil, East Āzarbāijān, Iran. MMTT 1278.

DEFINITION.—Carapace covered with smooth, leathery skin, and lacking horny plates; carapace and plastron composed of small platelets of bone imbedded in skin, plastral bones other than margin absent.

***Dermochelys coriacea** (Linnaeus)

Testudo coriacea LINNAEUS, 1766:350 (type-locality: Mediterranean Sea).
Dermochelys coriacea: BOULENGER 1889:10.

DIAGNOSIS.—As for the genus.

COLOR PATTERN.—Carapace, head, neck, and limbs black or dark brown with small white or yellow blotches; plastron whitish.

SIZE.—Adults to about 2.7 m in length and 1,600 lbs (727 kg).

SEXUAL DIMORPHISM.—Male with concave plastron, tail longer than hind limbs; tail of female about half as long as hind limbs.

DISTRIBUTION.—No specimens of record for the Persian Gulf, but Minton (1966:59) records it from Hawke's Bay, Pakistan.

REMARKS.—Kinunen and Walczak (1971) recorded an oil-rendering operation on Jazireh-ye Lārak, where leatherback turtles are processed to provide oil for sealing the hulls of small craft. They saw 12 dried skulls there. They did not determine the locality at which the turtles were obtained, but presumably they were caught in the vicinity of that island.

Family TESTUDINIDAE
Genus **Emys** Duméril

Emys DUMÉRIL, 1806:76 (type-species: *Emys europaea* Schweigger, 1814 [= *Emys orbicularis* (Linnaeus, 1758)], by subsequent designation of Fitzinger 1843:29).

DEFINITION.—Beak mesially notched, not hooked; skin on hinder part of head smooth, undivided; back of thighs without tubercles; digits fully webbed; posterior margin of carapace smooth; only anterior part of plastron somewhat movable, a more or less distinct hinge between hyo- and hypoplastra; entoplastron crossed by humeropectoral sulcus well in advance of its posterior border; plastron united to carapace by a ligament. Skull with orbits completely concealed when viewed dorsally (Loveridge and Williams 1957:202). No axillary or inguinal plates.

Emys orbicularis (Linnaeus)

(Figures 6, 12)

Testudo orbicularis Linnaeus, 1758:198 (type-locality: southern Europe).—Pallas 1814:17.
Emys lutaria: Strauch 1862:101–104.
Cistudo europaea: De Filippi 1865:352.
Emys orbicularis: Blanford 1876:308–309. —Boulenger 1889:112–114, text-fig. 31. —Werner 1903:340. —Nikolsky 1915:13–25, text-figs. 1, 3–4. —Werner 1936:200. —Terentjev and Chernov 1949:107, 323, fig. 33. —Forcart 1950:144. —Wettstein 1951:429. —Mertens 1957:119. —Mertens and Wermuth 1960:63. —Wermuth and Mertens 1961:79–81, fig. 53 a–d. —Pritchard 1966:273. —Anderson 1968:324–325. —Tuck 1971:52. —Anderson 1974:30, 42.

Diagnosis.—As for the genus (as defined by Loveridge and Williams 1957:202).

Color Pattern.—Carapace light or dark olive, dark brown, or black, uniform or with yellowish dots or radiating lines, or with irregular dark markings; plastron dark brown, black, yellow, or brown and yellow; head and limbs dark olive, with yellow spots and vermiculations.

Sexual Dimorphism.—Loveridge and Williams (1957:207) were unable to confirm Boulenger's (1889:113) findings of sexual differences in tail length and spotting. Pritchard (1966:273) reported that in two specimens near Āstārā, Iran, the male had red eyes, the female yellowish. He did not state how the sex of his specimens was determined.

Size.—Carapace length to 190 mm.

Natural History.—West of Pahlavi, they first appear in March, becoming numerous along the water courses by April, often climbing up to a meter high on logs and brush to bask (Mertens 1957:119). Aspects of the natural history of this species outside of Iran have been discussed by Nikolsky (1915:22–24) and by Loveridge and Williams (1957:208).

Habitat.—This turtle occurs along the coast of the Caspian Sea and has been stated by De Filippi to prefer brackish water, such as the Murdab, while *Mauremys caspica* is found in the running streams of fresh water (Blanford 1876:309). Sobolevsky (1929:135) states that in the Lenkoran District just north of the Iranian border, this species is found in the littoral zone of marshes, lakes, and pools of stagnant water along the Caspian coast, in the damp subtropical forests of the lowlands and lower mountain belt, and on the flat, uniform plain of the Moghan Steppe. There are two specimens (not examined by me) in the Iran National Museum of Natural History from Neur Lake, which is 35 airline km east-southeast of Ardabil at 2,400 m elevation. This is a spring-fed lake in a small valley near the crest of the Talish Mountains. The lake has marshy borders and the vegetation of the surrounding terrain consists of scattered shrubs with a "pincushion" growth form. There are large populations of gammarid amphipods and aquatic insects in the lake, and in late June there are dense aggregations of *Rana camerani* tadpoles in the shallow waters of the lake margins. Adults of *R. camerani* are also extremely numerous. The only reptiles which I collected in this environment were *Natrix tessellata* and *Ablepharus bivittatus*. A *Lacerta*, tentatively identified as *L. saxicola*, was seen in the surrounding hills. At Ardabil, I was given a specimen of *Emys orbicularis* by the owner of a public bath house, who said he had found it in his garden within the city. It may have been an escaped pet.

Zoogeographic Element.—Mediterranean (Anderson 1968:332).

Iranian Localities.—Chartschäng, on the Siyahrud (LF 50); Kura River (AN 15). *Ostān 2* (*Gīlān*): Āstārā, 38°26′N, 48°52′E (RT 71); 45 km S Āstārā (RT 71); Bandar-e Pahlavi, 37°28′N, 49°27′E (WB 76; GB 89; FW 03); Mordāb, 37°26′N, 49°25′E (FdF 65); 20 km E Rasht [37°16′N, 49°36′E] (RT 71); Rezvāndeh, 37°33′N, 49°09′E, and vic. (RM 57). *Ostān 3* (*East Āzarbāījān*): *Ardabil, 38°15′N, 48°18′E (MMTT); Neur Lake, 38°00′N, 48°34′E, 2,400 m (MMTT). *Ostān 12* (*Māzanderān*): *Bābol Sar, 36°43′N, 52°39′E (AMNH); *Dasht-e Naz National Park (MMTT); *8 miles N Gorgān [36°50′N, 54°29′E] (FMNH); Khorramābād, 36°46′N, 50°53′E (OW 51); Rūdkhānehye Tālār near Dasteng-Kela (LF 50).

Genus **Mauremys** Gray

Mauremys Gray, 1870:500 (type-species: *Emys fuliginosa* Gray, 1860, by original designation).

Definition.—Beak not hooked, skin on hinder part of head smooth, undivided; backs of thighs without tubercles; digits fully webbed; plastron immovable, united to carapace by a suture; no plastral hinge; entoplastron crossed by humeropectoral sulcus well in advance of its posterior border; skull with orbits largely concealed when viewed dorsally; basioccipital with strong lateral tuberosity extending lateral to the lagena, forming the floor of recessus scalae tympani; forearm with numerous transversely enlarged scales separated by granular scales (Loveridge and Williams 1957:191; McDowell 1964:245–247). Axillary and inguinal plates present on plastron. The separation of *Mauremys*

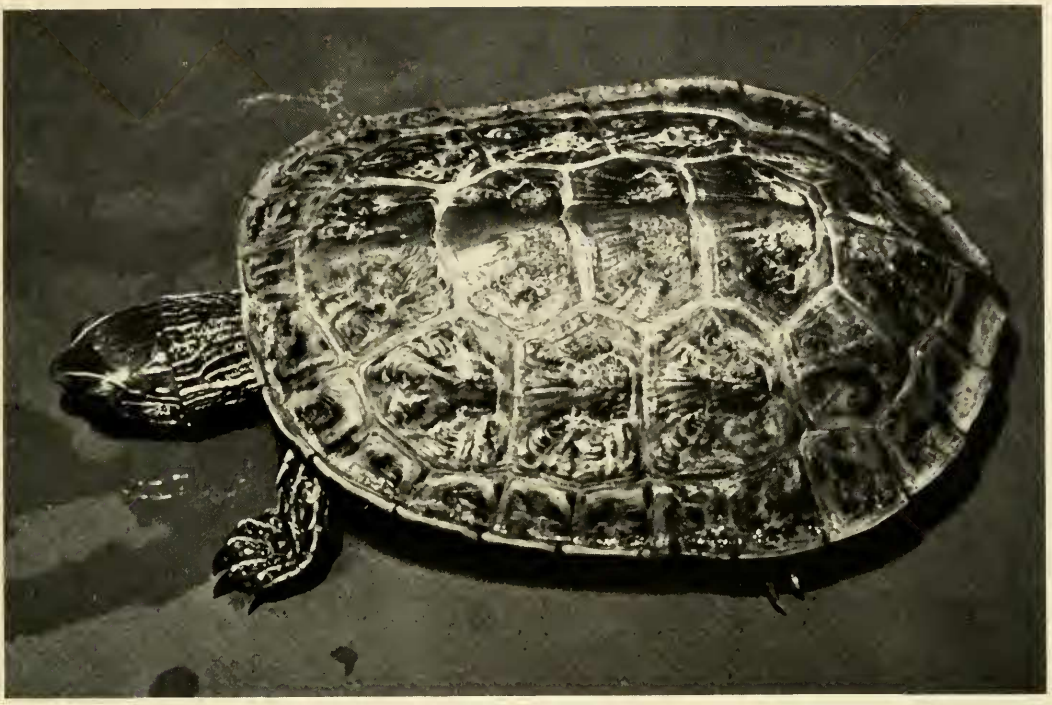

FIGURE 7. *Mauremys caspica caspica*, 3 km E Haft Tappeh, Dez River area, Khūzestān, Iran. CAS 141118.

from the New World *Clemmys* and the relationships of the aquatic Testudinidae are discussed by McDowell (1964:239–279).

Mauremys caspica caspica (Gmelin)

(Figures 7, 13)

Testudo caspica GMELIN, 1774:59, pls. 10–11 (type-locality: Bach Pusahat [= Pirsagat] near Schamachie, Transcaucasia, USSR).

Clemmys caspica: WAGLER 1830:pl. 24. —BLANFORD 1876:309–312. —BOULENGER 1889:103. —SIEBENROCK 1913:177–187, pl. 10, text-figs. 1–8. —NIKOLSKY 1915:7–12. —WERNER 1917:220; 1936:200.

Emys caspia: DE FILIPPI 1865:352.

Clemmys caspica caspica: MERTENS, MÜLLER, AND RUST 1934:61. —SCHMIDT 1939:89. —TERENTJEV AND CHERNOV 1949:106–107, text-figs. 34, 37. —FORCART 1950:143. —WETTSTEIN 1951:429. —SCHMIDT 1955:200. —MERTENS 1957:119, 125. —HELLMICH 1959:2–3. —MERTENS AND WERMUTH 1960:61. —WERMUTH AND MERTENS 1961:59. —ANDERSON 1963:434–435, 473. —GUIBÉ 1966:97. —ANDERSON 1968:325.

Mauremys caspica: MCDOWELL 1964:239–279, text-figs. 1–4.

Mauremys caspica caspica: PRITCHARD 1966:271–272. —TUCK 1971:52; 1973:13. —ANDERSON 1974:30, 42.

DIAGNOSIS.—Posterior margin of carapace not serrate; bridge predominantly light, only suture between marginals dark.

COLOR PATTERN.—Plastron dark brown to black, each shield with a yellow lateral border; bridge yellow with dark sutures; carapace olive and olive-brown, with yellowish stripes, forming figure-8's on costals, circles on marginals; lower part of marginals yellow with dark sutures, the first seven marginals on each side with two black spots; head olive, with a yellow stripe on margin of snout and under eye; neck with yellow stripes bordered by black.

SEXUAL DIMORPHISM.—Male with slight concavity on plastron in region of abdominal and femoral plates; plastron of female flat or slightly convex; anal opening of male more distal than in female, beyond posterior margin of carapace when tail is extended.

SIZE.—Carapace length to 230 mm (Nikolsky 1915:9).

NATURAL HISTORY.—In suitable bodies of water, these turtles occur in considerable numbers, and many can be seen basking together on river banks or on floating objects, immediately submerging at any hint of danger. According to Nikolsky (1915:11) they hibernate, at least in Russian territory, from October or November to early March.

Copulation has been observed in April in the Caspian region (Nikolsky 1915:11) and in late October in southwestern Iran (Anderson 1963:434). Egg-laying is recorded for both the above areas in June. The eggs measure about 40 × 30 mm, and the shells have a chinalike texture.

Known dietary items are fishes, worms, tadpoles, and small frogs. Individuals have also been reported as feeding on ripe melons (Nikolsky 1915:11–12). Undoubtedly they feed on carrion, as my captive specimens readily took strips of raw beef.

Storks are said to feed on the young turtles, while vultures (*Neophron percnopterus*) successfully prey on adults, pecking the flesh from beneath the shell (Nikolsky 1915:12). Man may take a heavy toll in some areas where turtles may be opened to obtain eggs, thought to be useful in the treatment of ubiquitous eye ailments (Anderson 1963:435).

HABITAT.—This turtle is common in running streams, in ponds, and in lakes throughout northern and western Iran, in the mountains, foothills, and on the western part of the plateau wherever water persists throughout the year, or at least is present seasonally from year to year without fail. I have found these turtles in a great variety of habitats throughout western Iran, often in cultivated areas where the only water was in marshy pastures or small irrigation ditches. Surrounding vegetation seems to have little correlation with their occurrence, although I have not found them in heavy forest. *Rana ridibunda* usually occurs in the same habitats. The greatest concentration of these turtles that I encountered was along the banks of a stream running through the village of Marīvān (35°31′N, 46°10′E) in Kordestan, near the Iraq border, about 1,200 m elevation. This is a highly eutrophic stream, and the large turtle population is probably supported in part by the availability of garbage. According to Nikolsky (1915:9), the species has been found in the Caspian Sea itself, near the mouths of rivers where the salinity is low. The same author states that the species has been reported from sulphur springs at 40 C. In the Lenkoran District, just north of the Persian border, Sobolevsky (1929:135) records this turtle from the littoral zone, stretching along the shore of the Caspian, and characterized by abundant marshes, lakes, and marshy rice fields. It also occurs there in the forests of the lowlands and mountain foreland, a zone of damp subtropical forest up to 600 or 700 m elevation. He notes its presence in the Moghan Steppe as well, a flat, uniform plain overgrown by scanty herbaceous vegetation.

ZOOGEOGRAPHIC ELEMENT.—Mediterranean (Anderson 1968:332). The subspecies *caspica*, considered alone, could be regarded as Iranian.

IRANIAN LOCALITIES.—From below sea level along the Caspian Sea to at least 2,000 m in the Zagros Mountains. It apparently does not occur east of the Zagros Mountains on the Central Plateau.

Siyahrud, near Reikände (LF 50). *Ostān 1 (Tehrān)*: Arāk (FS 13). *Ostān 2 (Gīlān)*: *Āstārā, 38°26′N, 48°52′E (USNM; RT 71); Bandar-e Pahlavī, 37°28′N, 49°27′E (JG 66); *6 km W Chālūs [36°38′N, 51°26′E] (FMNH); *10 km W Chālūs (FMNH); Galūgāh, 37°30′N, 49°20′E (RM 57); Mordāb, 37°26′N, 49°25′E (WB 76; RM 57); Rasht, 37°16′N, 49°36′E (FS 13); Safīd Rūd, S Rasht (WB 76). *Ostān 3 (East Āzarbāījān)*: *78 km N Khalkhāl on road to Ardabīl, 1,720 m (CAS). *Ostān 4 (West Āzarbāījān)*: *1 km E Gol Tappeh, ca. 37°50′N, 45°03′E, at margin of Lake Rezā'īyeh, dirt road 29 km N Rezā'īyeh, 1,425 m (MMTT); *Mahābād, 36°45′N, 45°43′E, Lake Shapur 1 (MMTT); *7 miles NNE Mākū [39°17′N, 44°31′E] (FMNH); *36°56′N, 46°17′E, 19 km ESE Miāndow Āb, on road to Shāhīndezh, 1,350 m (MMTT); *20 miles N Rezā'īyeh (CAS; FMNH). *Ostān 5 (Kordestān–Kermānshāh)*: Ab-i-Marik, near Nāmīvand [34°22′N, 46°45′E], 20 miles NW Kermānshāh (PP 66); Deh-e Jāmi, 34°23′N, 46°14′E, near Karand (PP 66); *Kermānshāh, 34°19′N, 47°04′E (FMNH); E Kermānshāh (OW 51); *34°13′N, 46°04′E, creek near turnoff to microwave station 42 km W Kermānshāh on road to Shāhābād, 1,640 m (MMTT); *8 km E Qaşr-e Shīrīn [34°31′N, 45°35′E] (USNM; RT 71); Sah Tang, near Karand [34°16′N, 46°15′E] (PP 66); *32 km WNW Sanandaj [35°19′N, 47°00′E] (USNM; RT 71); *66 km NW Sanandaj (USNM; RT 71); vic. Sheykhābād, 33°53′N, 48°02′E, ca. 30 miles E Kermānshāh (PP 66); *Tappeh Sarab, near Bijenah, 7 km E Kermānshāh (FMNH); Taut Shami, near Karand (PP 66). *Ostān 6 (Khūzestān–Lorestān)*: *lake 17 km E Haft Gel [31°28′N, 49°30′E] (CAS; SA 63); *32°05′N, 48°22′E, 3 km E Haft Tappeh, 380 m (CAS); Harmalah, 120 km NW Ahvāz (WH 59); Īstgāh-e Dezh, 31°43′N, 48°38′E (WH 59); Īstgāh-e Eznā, 33°27′N, 49°28′E, between Dow Rūd and Arāk (KS 55); *Khorramābād, 33°30′N, 48°20′E (USNM; RT 71, 73); *vic. Masjed Soleymān airfield, 31°59′N, 49°15′E (CAS; SA 63); Shādegān, 30°40′N, 48°38′E (RM 57); *Shalgahī, 32°15′N, 48°31′E, SE Dezfūl (FMNH). *Ostān 8 (Fārs)*: sulphurous springs 15 km NE Borāzjān 29°16′N, 51°12′E (KS 55); Dūdej, 29°33′N, 52°59′E, 40 km E Shīrāz (OW 51); Fārs Province (FW 17); *Parīshān Lake [= Daryācheh-ye Fāmūr], 29°30′N, 51°50′E (MMTT); *Persepolis, 29°57′N, 52°52′E (FMNH; KS 39); *5 km SE Pol-e Ābgīneh [29°33′N, 51°46′E] (CAS; FMNH); Rūd-e Kor, 29°36′N, 53°18′E, near Persepolis (WB 76); Tang-e Karam, 29°06′N, 53°39′E, 70 miles E Shīrāz (WB 76). *Ostān 12 (Māzanderān)*: *Bābol Sar, 36°43′N, 52°39′E, at mouth of Bahnamir River (MMTT); *near Bābol Sar (AMNH; *21 km NW Ghala Khash on Kuhsār River, N Gonbad-e Kāvūs [37°17′N, 55°17′E] (CAS; MMTT); Khorramābād, 36°46′N, 50°53′E (OW 51); Kura River (AN 15); Rūdkhāneh-ye Tālār, near Dasteng-Kela (LF 50); *Shilat Station, 18 km N by road of Dasht-e Naz National Park (MMTT).

Genus **Agrionemys** Khozatsky and Mlynarski

Agrionemys Khozatsky and Mlynarski, 1966:123–125 (type-species: *Testudo horsfieldii* Gray, 1844, by monotypy).

Definition.—Carapace smooth, without keels, slightly convex in comparison with most testudinines; posterior margin slightly, but distinctly serrated. Two suprapygals (metaneurals), the second crossed in its median part by the sulcus separating the last vertebral from the caudal. Plastral bridge broad, buttresses evenly developed; humeropectoral sulcus crosses entoplastron in its posterior part; no movable elements of shell. Concavity of plastron and other male sexual features vague or lacking. Forelimbs with four digits. (Khozatsky and Mlynarski 1966; Mlynarski 1966).

Khozatsky and Mlynarski have made a case for removing *Testudo horsfieldii* Gray from *Testudo* on the basis of the above characters, which, they claim, distinguish it from all other living and fossil testudinine genera.

Distribution.—Central Asia east of the Caspian, and the eastern Iranian Plateau. A single species.

Relationships.—The authors of this genus, in comparing it with other testudinine genera, both living and fossil, state that it shares taxonomic characters with African genera as well as with *Gopherus* and the fossil genus *Stylemys*. However, they believe these similarities to be convergent and postulate that the combination of "primitive" characters ("emydoidal" entoplastron and shape of suprapygals) and advanced specializations (digits of forelimbs reduced to four) indicate that it may be more ancient than *Testudo*, while its relationships to other testudinine genera are as yet unclear.

Agrionemys horsfieldii (Gray)

(Figures 8*A*, 12)

Testudo horsfieldii Gray, 1844:7 (type-locality: Afghanistan; holotype in British Museum). —Blanford 1876:308. —Nikolsky 1897:306. —Zarudny 1903:2. —Nikolsky 1915:31–37, text-figs. 6–7. —Werner 1936:194. —Terentjev and Chernov 1949:109. —Mertens and Wermuth 1960:66. —Wermuth and Mertens 1961:212–213, text-figs. 158a–c. —Anderson 1963:474; 1968:325; 1974:30, 42.

Testudinella horsfieldii: Gray 1873:13.

?*Testudo ibera*: Boulenger 1889:176–177 (in part; *nec* Pallas, 1814).

Testudo baluchiorum Annandale, 1906:75, 205, pl. 2, fig. 1 (type-locality: Baluchistān; holotype in Indian Museum, Calcutta).

Agrionemys horsfieldii: Khozatsky and Mlynarski 1966:123–125. —Mlynarski 1966:219–223, pls. 29–32. —Obst and Meusel 1974:3 ff., figs. 12, 13, 18, col. pl. 6.

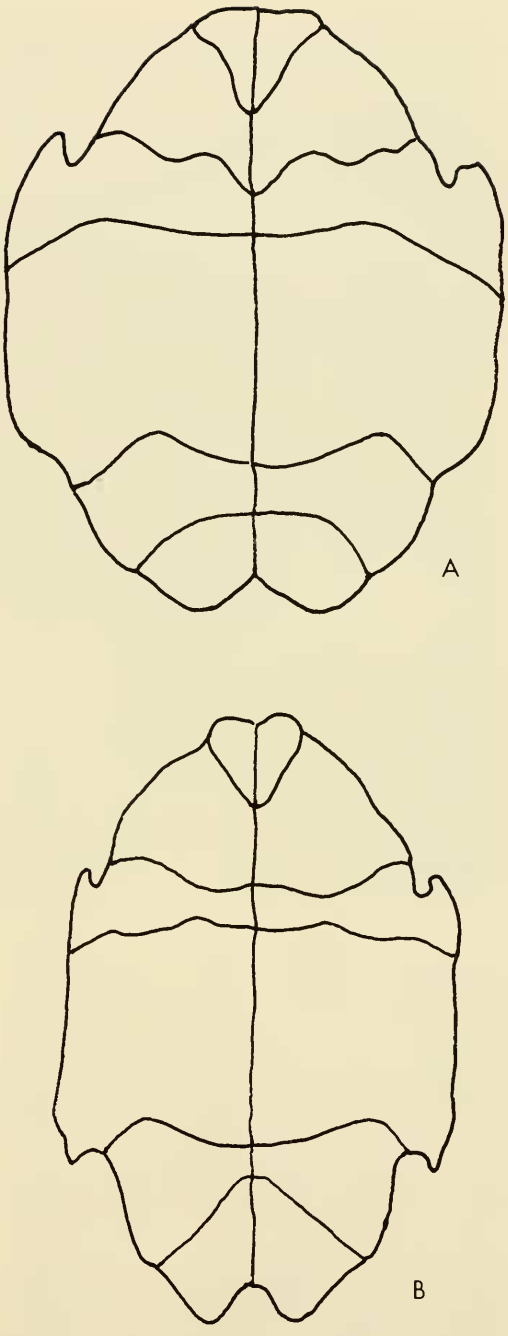

Figure 8. *(A) Agrionemys horsfieldii* plastron. *(B) Testudo graeca ibera* plastron.

DIAGNOSIS.—As for the genus. The only Southwest Asian tortoise with only four claws on the forelimb.

COLOR PATTERN.—Carapace yellow or yellowish brown, each shield with or without a black mark, variable in size; black markings on plastron may cover almost entire shield, rarely absent.

SIZE.—Carapace length to 286 mm (Terentjev and Chernov 1949:109).

NATURAL HISTORY.—No information is available for Iran. Natural history information for this species in the USSR is summarized by Nikolsky (1915:36) and Terentjev and Chernov (1949:109). In Pakistan, Minton (1966:66) records a few remarks about its habits.

HABITAT.—In the USSR this animal has been found on both sandy and loam steppes, mountains to about 1,300 m, and oases. Minton (1966:66) found them in rocky and hilly terrain in Pakistan, being most numerous in grassy places near springs. In Pakistan they seemed to avoid sandy and clay soils, although they occur in rocky desert. Minton found them at 1,600–2,300 m. They sought refuge in burrows beneath boulders or rock outcrops. Niche partitioning between this species and *Testudo graeca zarudnyi* in the area of apparent overlap (Khorāsān) remains an interesting problem for investigation.

ZOOGEOGRAPHIC ELEMENT.—Biregional, Iranian, and Aralo-Caspian (Irano-Turanian).

IRANIAN LOCALITIES.—Hisomi (FW 36). *Ostān 11* (*Khorāsān*): between Akhangerun, 33°25′N, 60°13′E, and Dorokh (NZ 03); Kara-ilitschi Mts. (AN 97); Kuhistan [region centering on 33°N, 57°E] (FW 36); Rud-i-Mil, between Chah-i-Sagak and Dūruḫ [32°17′N, 60°30′E] (JG 73; WB 76; GB 89); 13 km SW Sarakhs [36°32′N, 61°11′E] on the Turkmen Plateau beside Sarakhs–Mashhad road (MMTT); Tauran (FW 36). *Ostān 12* (*Māzanderān*): *Almeh, Chondeh 'Abbas, Mohammad Reza Shah National Park (MMTT).

REMARKS.—The specimens collected near Dūruḫ north of Sīstān by General Goldschmidt's party were referred by Gray (1873:13) to *Testudo horsfieldii*, and Blanford (1876:308) concurred in this. Boulenger (1889:177) listed these with *T. graeca ibera*. Blanford points out that only the shells have been preserved.

I have seen only one Persian example of this species. I did not encounter this tortoise in the field during my travels in Khorāsān and Māzanderān.

Zarudny (1903:2) reported that it was rare in Sistān, completely absent to the south, where it was replaced by *Testudo graeca zarudnyi*, and common in the vicinity of Bekhars in eastern Khorāsān.

Genus **Testudo** Linnaeus

Testudo LINNAEUS, 1758:197 (type-species: *Testudo graeca* Linnaeus, 1758, by subsequent designation of Fitzinger 1843:29).

DEFINITION.—I follow here the redefinition and restriction of the genus by Loveridge and Williams (1957:254–255, or perhaps more correctly cited as Williams *in* Loveridge and Williams; see footnote, p. 220, ibid.), but I accept the removal of *T. horsfieldii* Gray by Khozatsky and Mlynarski (1966, see above). The following characters appear sufficient to separate *Testudo* (sensu stricto) from other testudinine genera (Loveridge and Williams 1957:220–221): Carapace without hinge; outer side of fourth costal subequal to, or smaller than, outer side of third; gulars paired; carapace convex, rigid, solid; neural bones unreduced; anterior neurals octagonal and quadrilateral; supranasal scales present; nuchal scale present; plastron more or less clearly movable in one or both sexes; prootic typically concealed dorsally and anteriorly by parietal.

RELATIONSHIPS.—Loveridge and Williams (1957:258–260) have outlined their view of relationships within the genus as they have restricted and redefined it. In their view, *Testudo hermanni* (southern Europe) is the most primitive living member of the genus, *Testudo graeca* (Spain, North Africa, southeastern Europe, and Southwest Asia) and its close relative *T. marginata* (Greece) being more specialized. They suggest that the dwarf species *T. kleinmanni* (Tripoli, Egypt, and Sinai) may have been derived from *T. graeca*. The zoogeographic implications of species distributions within the genus have been considered briefly by Loveridge and Williams (1957:259–260). The availability of fossil material suggests that a detailed study of the relationships among this genus would be profitable from a zoogeographic standpoint.

Testudo graeca Linnaeus
Testudo graeca ibera Pallas

(Figures 8*B*, 9, 14)

Testudo ibera PALLAS, 1814:18–19, pl. 2, figs. 2–3 (type-locality: "Iberia," region of the central Kura Valley in the Caucasus [designated by Mertens 1946:112]). —DE FILIPPI 1865:352. —BLANFORD 1876:306–307 (in part). —NIKOLSKY

FIGURE 9. *Testudo graeca ibera*, 22 km E Ahar, East Āzarbāijān, Iran. MMTT specimen.

1907:260; 1915:25–31. —WERNER 1936:200. —ROSTOMBEKOV 1938:11.

Testudo graeca: PALLAS 1814:17–18, pl. 2, fig. 1. —TERENTJEV AND CHERNOV 1949:108–109, 298. —FORCART 1950:144. —SCHMIDT 1955:200. —PRITCHARD 1966:273–274.

Testudo ecaudata PALLAS, 1814:19, pl. 3, figs. 1–2 (type-locality: forest region of Persia on the Caspian Sea).

Testudo buxtoni BOULENGER, 1920:251 (type-locality: Manjil, between Rasht and Kasvin, on south coast of Caspian Sea; holotype in British Museum).

Testudo graeca ibera: MERTENS 1946:112. —WETTSTEIN 1951:429–430. —MERTENS 1957:120. —MERTENS AND WERMUTH 1960:65. —WERMUTH AND MERTENS 1961:208–209, text-figs. 156a–d. —ANDERSON 1963:474. —GUIBÉ 1966:97. —ANDERSON 1968:325. —TUCK 1971:53. —OBST AND MEUSEL 1974:3 ff., figs. 5, 9, col. pls. 3–4. —ANDERSON 1974:30, 42.

Testudo zarudnyi: SCHMIDT 1939:89 (*nec* Nikolsky, 1896). —WETTSTEIN 1951:430. —TUCK 1971:53, fig. 2.

Testudo graeca zarudnyi: PRITCHARD 1966:274 (in part; *nec* Nikolsky, 1896).

DIAGNOSIS.—Maxillary with a weak ridge; quadrate enclosing stapes; forelimb with five claws; a large subconical tubercle on posterior aspect of thigh; supracaudal shield undivided; fifth vertebral shield not broader than third; shell oval in outline, with smooth, rounded posterior margin (but see remarks below under *T. g. zarudnyi*).

COLOR PATTERN.—Carapace light olive or yellowish; scutes with individual black spots, larger and less regular in adults than in young, sutures sometimes black-margined; plastron with dark spots which often nearly cover scutes.

SIZE.—Nikolsky (1915:28) gives the maximum carapace length as 350 mm. Most specimens are under 300 mm, however.

NATURAL HISTORY.—Pritchard (1966:273–274) observed copulation in this species in the Zagros

in late August and early September, whereas Nikolsky (1915:30) records mating in April and May in the Transcaucasian area. Pritchard has described the copulatory behavior observed in Iran. Further notes on the natural history of this tortoise in areas outside of Iran are provided by Nikolsky (1915:31), Terentjev and Chernov (1949:108–109), and Reed and Marx (1959:115–116).

HABITAT.—These tortoises are reported from elevations near the shore of the Caspian Sea to high mountainous localities. They occur on dry open steppes, hillsides, and mountains as well as cultivated regions and forest situations (Nikolsky 1915:30; Sobolevsky 1929:137). Rostombekov (1938:11) records it from Mt. Sitaver at about 4,000 m, an elevation which I feel requires confirmation for this species. I collected this species in dry cultivated areas, in overgrazed steppe vegetation on rocky alluvium, on rocky hillsides in scrub-oak vegetation, and in grassy areas in the vicinity of streams and ponds, up to 2,050 m elevation. Reed and Marx (1959:115–116) discuss the habitat in Iraq.

DISTRIBUTION.—In northern and western Iran, it occurs in Āžarbāījān, the Caspian coast, and presumably, the Alborz Mountains. The subspecific status of the tortoises of the Zagros Mountains remains unclear (see below under *T. g. zarudnyi*), but those records are included here under *T. g. ibera*. From below sea level to above 2,000 m, possibly to 4,000 m in Iran.

ZOOGEOGRAPHIC ELEMENT.—The species as a whole is biregional, Mediterranean and Iranian. The subspecies *T. g. ibera* is interpreted here as Iranian. Wermuth and Mertens (1961:209) recognize four subspecies of *Testudo graeca: T. g. graeca* Linnaeus (southern Spain and North Africa from Morocco to Cyrenaica), *T. g. ibera*, *T. g. terrestris* Forskål (Syria and Israel to northeastern Africa from middle Egypt west to Libya; I know of no records for North Africa which can be referred to this subspecies, and Loveridge and Williams [1957] and Marx [1968] record only *T. kleinmanni* Lortet from Egypt and Sinai), and *T. g. zarudnyi* (see below). Except that its tolerance of aridity enables the subspecies *T. g. zarudnyi* to occupy the Central Plateau in Iran, the distribution of *Testudo graeca* closely parallels that of *Mauremys caspica*. It is noteworthy, however, that no *Testudo* seems to have been collected in the Arabian Peninsula proper, while *M. caspica* occurs at least along the Persian Gulf coast of Arabia.

IRANIAN LOCALITIES.—Forest region on Caspian Sea (PSP 14, type-locality for *T. ecaudata* Pallas); Mt. Sitaver, Kordestān 12,000 ft (VR 38). *Ostān 1* (*Tehrān*): W Arāk, [34°05′N, 49°41′E] (OW 51); *Ḥeşārak, 35°51′N, 50°56′E (CAS). *Ostān 2* (*Gilān*): Bandar-e Pahlavi, 37°28′N, 49°27′E (RT 71); *2 miles N Bījār [35°52′N, 47°36′E] (FMNH); coastal region of SW Caspian coast (RM 57); *1 mile S Dıvāndarreh [35°55′N, 47°02′E] (FMNH); Manjil, 36°44′N, 49°24′E, between Rasht and Qazvin, 7,000–7,500 ft (GB 21, type-locality for *T. buxtoni* Boulenger); *87 miles N Zanjān [36°40′N, 48°29′E] (FMNH). *Ostān 3* (*East Āžarbāījān*): *38°26′N, 47°15′E, 22 km E Ahar, on road from Meshkīn Shahr, 1,800 m (MMTT); *37°22′N, 46°30′E, SE Shalivan, paleo site 29 km E Maragheh, 1,800 m (MMTT); *9 km E Maragheh [37°23′N, 46°13′E] (MMTT). *Ostān 4 West Āžarbāījān*): *23 miles SSE Reẓā'īyeh [37°33′N, 45°04′E] (FMNH); *near Daryācheh-ye Reẓā'īyeh (MMTT). *Ostān 5* (*Kordestān–Kermānshāh*): Bisotūn, 34°23′N, 47°26′E, near Kermānshāh (OW 51); 17.5 km SW Borūjerd [33°54′N, 48°46′E] (RT 71); *21 km N Ḥoseynābād [35°33′N, 47°08′E] on road from Sanandaj to Saqqez, 2,050 m (MMTT); *34°29′N, 46°41′E, 31 km NW Kermānshāh on road to Nowsud, 1,440 m (MMTT); *34°13′N, 46°41′E, creek near turnoff to microwave station 42 km W Kermānshāh on road to Shāhābād, 1,640 m (MMTT); 24 km W Karand [34°16′N, 46°15′E] (RT 71); 42 km W Kermānshāh [34°19′N, 47°04′E] (RT 71); W Kermānshāh (OW 51); *3 miles W Lālābād and ca. 25 miles NW Kermānshāh (FMNH); 32 km WNW Sanandaj [35°19′N, 47°00′E] (RT 71). *Ostān 6* (*Khūzestān–Lorestān*): Bakhtiari region (AN 07; 15); Dow Rūd, 33°28′N, 49°04′E, 1,400 m (KS 55); 5 km NW Dow Rūd (RT 71); *Khorramābād, 33°30′N, 48°20′E (FMNH). *Ostān 7* (*Eşfahān*): W Eşfahān [32°40′N, 51°38′E] (OW 51); *Galatappeh, 33°13′N, 51°45′E (FMNH); 15 miles E Mūrcheh Khvort [33°06′N, 51°30′E], 33 miles N Eşfahān (PP 66). *Ostān 8* (*Fārs*): Khāneh Kowreh, 30°52′N, 53°09′E, SE Ābādeh, 2,180 m (OW 51); *Yazd-e Khvāst, 31°31′N, 52°07′E (FMNH; KS 39).

Testudo graeca zarudnyi Nikolsky

(Figures 10, 14)

Testudo ibera: BLANFORD 1876:306–307 (in part; *nec* Pallas, 1814). —WERNER 1895:1.

Testudo zarudnyi NIKOLSKY, 1896:369 (type-locality: mountains in Birjand Province, Iran [restricted by Mertens 1946:113]; holotype: Zoological Institute, Leningrad, no. 8738); 1897:307, pl. 17; 1899:375–376. —ZARUDNY 1903:2. —WERNER 1929:238–239; 1936:194–195; 1938:265–267, text-fig. 1. —FORCART 1950:144. —ANDERSON 1963:474.

Testudo graeca zarudnyi: MERTENS 1946:113; 1956:91. —WERMUTH AND MERTENS 1961:210. —PRITCHARD 1966:274. —ANDERSON 1968:325. —OBST AND MEUSEL 1974:5 ff. —ANDERSON 1974:30, 42.

DIAGNOSIS.—Maxillary with a weak ridge; quadrate enclosing stapes; forelimb with five claws; a large subconical tubercle on posterior aspect of thigh; supracaudal shield undivided; fifth vertebral shield not broader than third; shell

FIGURE 10. *Testudo graeca zarudnyi*, ♀, 32 km W Zāhedān, Balūchistān, Iran. MMTT specimen.

elongate in outline, with upturned, emarginate posterior border.

COLOR PATTERN.—Carapace brownish olive, with very indistinct dark markings.

SIZE.—To 275 mm carapace length.

REPRODUCTION.—An adult male in captivity almost daily attempted copulation with four females during May, June, and July. He would ram a female with the front of his plastron and then mount without further ado, inverting his tail beneath her carapace and opening his mouth during the process. The females seemed oblivious to these attentions, continuing to eat or to walk slowly. I could not tell how frequently he was successful in his attempts. He seemed tireless in his efforts, and it seems unlikely he would ever encounter such frequent opportunity in his natural habitat.

Mr. Reza Khazai'e of the Iran National Museum of Natural History and I found a nesting female at 1000 hrs on 18 April 1975 in rocky hills west of Zāhedān. She had excavated her nest on a west-facing slope, under and between two small *Artemisia* bushes. The nest was 11 cm deep, 15 cm long, and 12 cm wide. When located, the tortoise had already laid three eggs, and she laid a fourth as we watched. Her activities did not seem to be influenced by our presence. She began the laborious process of filling the nest by scraping in dirt with her hind limbs. During the hour required for this filling, she did not move her body off the excavation, but stretched out her hind limbs to the maximum, even at right angles to the body, in order to rake in dirt. She filled from back to front, resting briefly now and then. She scraped the silty alluvium into a fine

powder as she worked, and rejected stones, kicking them out. She moved forward across the nest as she finished, making no obvious tamping movements, and raked dead branches and twigs over the nest, again with her hind limbs only. She did not urinate on the nest, although she might have passed water into the excavation prior to laying. She moved off the nest and appeared weak at first as she walked away toward the top of the slope. We uncovered the eggs, which had 9 cm of earth covering them. When we showed the tortoise the exposed nest, she seemed interested, bobbing her head, and headed right for it, covering it with her body. She made no attempt to fill the nest again, and may simply have been trying to excape from us under the bush. The soil at the bottom of the nest was slightly damp. Mr. Khazai'e's subsequent attempt to incubate the eggs in the laboratory was unsuccessful.

HABITAT.—Blanford (1876:306–307) states that in the southern part of Iran, tortoises live on barren hillsides and plains far from cultivation. The two tortoises I collected in Balūchistān were in rocky terrain with steep slopes, barren except for widely scattered small shrubs. One individual had a maggot-infected wound on the tail. The shell was scarred and broken, apparently from falls, which must be frequent in this terrain. Perhaps worthy of note is that an adult *T. g. ibera* fell three stories from a balcony in Tehran onto concrete without sustaining apparent injury. Four months later it was still alive and seemed in good health.

DISTRIBUTION.—Iran, on the Central Plateau. 1,000–3,000 m elevation. While they have been taken close to the eastern border of Iran, these tortoises are as yet unknown from Pakistan, Afghanistan, and Sīstān, where the only recorded tortoise is *Agrionemys horsfieldii*.

ZOOGEOGRAPHIC ELEMENT.—Iranian; endemic to the Central Plateau.

IRANIAN LOCALITIES.—Askalabad, Balūchistān, 1,800 m (FW 38). *Ostān 7* (*Eṣfahān*): 'Arūsān, 33°29′N, 54°56′E, in the S of the Dasht-e Kavīr, 928 and 1,065 m (FW 29; 36). *Ostān 9* (*Kermān*): Kermān, 30°17′N, 57°05′E, 6,000 ft (WB 76; GB 89); vic. Kermān (FW 95); Kūh-e Jūpār, 29°55′N, 57°15′E, ca. 2,700 m (FW 95); steppe between Nabīd [29°40′N, 57°38′E] and Bam [29°06′N, 58°21′E] (LF 50). *Ostān 10* (*Balūchistān–Sīstān*): Bendun, 31°23′N, 60°44′E (AN 99; NZ 03); Gurmukh (NZ 03); *ca. 27°54′N, 60°48′E, 93 km N Īrānshahr on road to Khāsh, 1,350 m (MMTT); Sangūn, 28°35′N, 61°20′E, E Kūh-e Taftān, 1,700 m (RM 56); Tagab, 17 km SE Bazmān [27°49′N, 60°12′E] (NZ 03); *ca. 29°28′N, 60°41′E, 32 km W Zāhedān on road to Chashme Zīārat, 1,900 m (MMTT). *Ostān 11* (*Khorāsān*): Bīrjand, 32°53′N, 59°13′E (AN 96; 97; type-locality); Fandokht, 33°47′N, 59°54′E, Zirkuch (AN 99); Khārestān, 32°17′N, 59°56′E, Sarhaad, 2,500 m (FW 38); Kuh-i-Akhangerun, ca. 33°25′N, 60°13′E (NZ 03); Kuh-i-Atkul (NZ 03); Kuh-i-Khadzi (NZ 03); Kuh-i-Magomed-abad (NZ 03); Sarḥad-e Bālā (FW 36); Tscha-i-Gjuische (AN 99).

REMARKS.—The taxonomic status of the tortoises of the Central Plateau and the Zagros Mountains remains problematical. Blanford (1876:307) at first regarded his specimens from Kermān as distinct from *ibera* and stated that others examined from Shīrāz and on the road from Shīrāz to Eṣfahān did not differ from those collected at Kermān. After examining tortoises from various parts of southern Europe and northern Africa, he decided that there were no constant differences between these populations in the characters (mostly proportions of plastral shields) which he considered. Nikolsky (1896:369) believed them distinct in the shape of the carapace and in color pattern, and additional specimens collected by Zarudny in 1898 (Nikolsky 1899:375–376) strengthened his view. Bird (1936:259) examined a paratype in the British Museum and questioned the separation of *zarudnyi* even at the subspecific level, while Pritchard (1966:274) examined a paratype also (doubtless the same specimen seen by Bird) and voiced similar doubts. Schmidt (1939:89) and Wettstein (1951:430) identified specimens from the Zagros region as *zarudnyi*.

I have had the opportunity to examine only three specimens from the eastern part of the Central Plateau, and have seen only a few specimens of undoubted *ibera* from Iran, so I can offer only speculation about the status of these taxa. I have seen a number of specimens from the Zagros region, including Schmidt's series from Yazd-e Khvāst. I am impressed with the variation in these tortoises, even in the relatively small sample I have examined. In most of the Zagros specimens, including those from Iraq, the dark markings of the carapace are indistinct, the shells being almost a uniform dark brown; in several, the corners of the shell flare outward somewhat, and the posterior margin is emarginate. In all specimens I examined, the greatest height of the carapace is at the third vertebral plate; in the specimens from Yazd-e Khvāst, the profile is somewhat different from most other specimens in that the height of the shell at the

fourth vertebral is nearly as great as at the third, whereas in most specimens of *ibera* and *graeca* I examined, the fourth is distinctly lower. The profile of the smallest of four specimens from Khorramābād is similar to these Yazd-e Khvāst animals. In the flaring of the shell, FMNH 21028, from Yazd-e Khvāst, probably a female, is the extreme; all of the posterior marginals flared outward, forming a pronounced "skirt." This specimen bears a close resemblance in the shape of the shell to the specimen figured by Nikolsky (1897:pl. 17). Of the specimens I examined, the one closest to it in this regard is probably FMNH 74950 from Iraq. Specimens from Āžarbāijān collected by the Street Expedition to Iran in 1962 also have somewhat flaring, emarginate shells and indistinct markings, while young specimens collected by the 1968 Street Expedition in both Kordestān and Āžarbāijān have the shells much less flared, the dark spots more individual, many of the plates with one or more margins outlined with dark brown, contrasting sharply with the horn color of the background.

Both Robert Tuck of the Iran National Museum of Natural History, and Jeromie Anderson of Quetta (in litt.) have called my attention to specimens from the eastern central Zagros which exhibit characteristics attributed to *T. g. zarudnyi*. On the basis of the limited material I have examined, I find no consistent, geographically correlated distinctions which would justify separating the Zagros tortoises from *T. g. ibera*, and the Zagros localities are listed under that form. Since recording the above observations, I collected two specimens of *T. graeca* in eastern Iran and about a half-dozen in northwestern Iran. I did not find the opportunity to make careful comparisons and measurements of these specimens, which are still in Tehran, nor have they been compared as yet with any of the material mentioned above. The animals from Balūchistān were distinguishable from those from Āžarbāijān on the basis of their more flared carapace margins. A male *T. g. zarudnyi* seemed to make no distinction between the females from Balūchistān and those from Āžarbāijān in his amorous attentions.

I tentatively recognize the taxon *T. g. zarudnyi* as valid for tortoises from the eastern Central Plateau. It seems likely that clinal or ecotypic variation will be shown to exist, linking the nominal taxa of Persian tortoises. Should the eastern animals prove to be consistently distinct from *ibera*, the Zagros populations may represent a broad zone of intergradation between these subspecies.

In many Iranian specimens the first claw of the forelimb is quite small, and if overlooked, could prove misleading in use of the key.

Family TRIONYCHIDAE
Genus **Trionyx** Geoffroy

Trionyx GEOFFROY, 1809:4 (type-species: *Trionyx aegyptiacus* Geoffroy, 1809 [= *Trionyx triunguis* (Forskål, 1775)] by original designation; see Schmidt 1953:108; Loveridge and Williams 1957:422–423; Wermuth and Mertens 1961:xxii–xxiii, 260).

DEFINITION.—Plastron without cutaneous femoral flaps; skull without maxillary ridging; orbit nearer the temporal than the nasal fossa; intermaxillary foramen moderate to large; prefrontal always in contact with vomer; jugal not or but scarcely in contact with parietal; postorbital arch narrower than diameter of orbit; proboscis as long as eye opening (Smith 1931:154; Loveridge and Williams 1957:423).

RELATIONSHIPS.—Of the living genera of trionychids, *Trionyx* is the least specialized, the most widely (but disjunctly) distributed, has the longest fossil record, and the greatest number of species. Loveridge and Williams (1957:416) present a dendrogram summarizing their interpretation of the relationships within the genus. They regard the monotypic genera *Pelochelys* and *Chitra* as specialized offshoots of the Oriental subgroup of *Trionyx*.

Trionyx euphraticus (Daudin)

(Figure 12)

Testudo euphraticus DAUDIN, 1802:305 (type-locality: banks of the Euphrates River).

Trionyx euphraticus: GEOFFROY 1809:17. —BLANFORD 1876:312–313. —ANDERSON 1963:474; 1968:325; 1974:30, 42.

Amyda euphratica: MERTENS 1957:125–126.

DIAGNOSIS.—Eight pairs of pleural bones; 8th pleurals partially reduced; young with numerous longitudinal ridges of dermal tubercles; carapace without ocelli.

COLOR PATTERN.—Carapace uniform dark green in adults, venter white; young specimens have large light spots on top of head, numerous smaller light flecks on carapace.

SIZE.—The largest recorded Iranian specimen has a carapace length of 290 mm (Mertens 1957:125). Boulenger (1889:258) gives 370 mm as the size of a specimen from the Euphrates.

NATURAL HISTORY.—These turtles are very wary, disappearing into the water when approached. According to Richter, they can be taken readily with hooks. When captured, they bite viciously. (Mertens 1957:126)

I have found little published information on the natural history of this species. However, soft-shells generally are known to be rather thoroughly aquatic, but able to move rapidly on land as well as in the water. They inhabit large bodies of permanant water and shun temporary streams and ponds. They are known for their habit of burying themselves in the sand or mud of stream and lake bottoms. They bask on banks and shores, but never far from the water. These turtles are actively predacious, feeding on fish, frogs, crustaceans, mollusks, and insect larvae; vegetable matter is consumed by at least some species. Webb (1962:541–577) summarizes the literature on the American species of *Trionyx*, and the habits of Old World species are doubtless similar.

RELATIONSHIPS.—According to Loveridge and Williams (1957:416–417) the closest living relative of *Trionyx euphraticus* is *T. swinhoei*. These two species, which have reduced eighth pleurals, are more closely related to New World species than to other Old World species, according to these authors. However, Webb (1962:579–580) states that the American *T. ferox* is more closely related to Old World species than to the other three New World species. He does not say to which Old World species *T. ferox* is related, but mentions the large eighth pair of pleurals as one character separating it from other American soft-shells.

DISTRIBUTION.—The Tigris and Euphrates drainages; known from southern Turkey, northeastern Israel, Syria, Iraq, and Iran. In Iran, specimens have been collected at a single locality in Khūzetān, but species probably occurs in much of the Karun River drainage, as the Karun empties into the Shatt-al-Arab, the confluence of the Tigris and Euphrates.

ZOOGEOGRAPHIC ELEMENT.—Difficult to assign with certainty, as the disrupted distribution of the genus as a whole represents the fragmentation of a once more widespread range. I regard *T. euphraticus* as Saharo-Sindian (Anderson 1968:332), while Bodenheimer (1944:71) considered it Irano-Turanian.

IRANIAN LOCALITIES.—*Ostān 6* (*Khūzestān–Lorestān*): Shādegān, 30°40′N, 48°38′E, on the Rūdkhāneh-ye Jarrāḥi (RM 57).

REMARKS.—Recently, a specimen was captured, photographed, and released in the Karun River (Tuck, in litt.).

CROCODILIA

Family CROCODYLIDAE
Genus **Crocodylus** Laurenti

Crocodylus LAURENTI, 1768:53 (type-species: *Crocodylus niloticus* Laurenti, 1768).

DEFINITION.—"16–19 upper and 14–15 lower teeth on each side; fourth or fifth maxillary tooth largest; fourth mandibular tooth fitting into a notch in the upper jaw. Snout more or less elongate; nasal bones extending to the nasal opening; splenial bones not entering the mandibular symphysis, which does not extend beyond the eighth tooth. A dorsal shield formed of from four to eight longitudinal series of keeled bony scutes." (Smith 1931:40)

Crocodylus palustris Lesson
(Figure 12)

Crocodilus palustris LESSON, 1834:305 (type-locality: Ganges River).
Crocodylus palustris palustris: DERANIYAGALA 1936:282. — HONEGGER 1971:45–46.

DIAGNOSIS.—Nineteen teeth in upper jaw on each side, 5 in each premaxillary; premaxillomaxillary suture on palate nearly straight across; width of snout about 60 percent of length, usually without distinct ridges in front of eye; 4 or 5 large nuchal plates; 4 postoccipital plates in a transverse series; dorsal plates in 16–18 transverse, and 4 or 6 longitudinal series; 16 rectangular smooth plates across middle of belly. (Smith 1931:47; Minton 1966:71)

COLOR PATTERN.—Brown or olive above with dark mottling to almost uniform black, yellowish below; young lighter, olive with dark blotches.

SIZE.—Smith (1931:47) gives four meters as maximum size, but Minton (1966:71) stated that the largest individuals he saw in Pakistan were about three meters total length. The largest crocodiles observed by biologists in Iran have been estimated at no more than two meters total length.

Natural History.—Little seems to be known of the habits of the marsh crocodile, or at least there is little information that is reliable in the herpetological literature (Neill 1971:416). Smith (1931:48) and Minton (1966:71) have summarized what little is known of the behavior of this animal in India and Pakistan. Smith says that it only occasionally attacks man, and Minton says that he knows of no authenticated accounts of attacks on humans in Pakistan. Neill states that there is no basis for stories that these crocodiles eat living people or corpses. Insofar as I could determine, villagers do not fear them in Balūchistān (where many harmless animals are feared), and children swim in pools claimed to be inhabited by crocodiles. In Iran, these animals are shy and difficult to observe. Apparently, they are not considered a hazard to domestic stock in Balūchistān.

The only recorded observations of crocodiles in Iran are those of Kinunen and Bullock (1970) and Bosch, Bullock, and Kinunen (1970), in unpublished reports of the Iran Division of Research and Development. They reported crocodile tracks entering and leaving a "den" about two meters above water level excavated in a sloping bank. The entrance was 80 cm wide and 40 cm high. The excavation was at least two meters deep, enlarged into an inner chamber lower than the entrance. During the period of observation by these investigators (mid-November), crocodiles spent much of the day basking on the river banks or floating and swimming. The report states that at this time of year the crocodiles were able to remain submerged for at least four or five hours.

Nothing is known of the reproduction in Iran.

Minton (1966:71) says that fish and turtles seem to be their principal food in Pakistan. Neill (1971:416) says that their food includes fishes, frogs, and sizable aquatic mammals, with lesser numbers of smaller mammals and birds. No aquatic turtles are known from Balūchistān, nor are there any aquatic mammals. Possible crocodile food items in this region include cyprinid fishes, and in the lower reaches of the Sarbaz River, mud-skippers (*Periophthalmus* sp.). Frogs (*Rana cyanophlyctis*) occur in this area. Small mammals, including palm squirrels, groundsquirrels, foxes, mongooses, and gazelles may fall victim occasionally to crocodiles when they visit the pools in the river to drink. Water birds are available in this area, and Bosch, Bullock, and Kinunen observed a crocodile near a dead and mutilated mallard duck on a river bank.

Young crocodiles likely fall prey to the larger mammalian and avian predators, and possibly to adults of their own species. Desert monitors (*Varanus griseus*) are possible egg predators, as may be foxes, mongooses, and domestic dogs. Man is the only predator on adults, and hide poachers pose a continuing threat to the existence of the species in Balūchistān. Kinunen and Bullock (1970) state that Pakistani hide-hunters were reported to have taken 18 crocodiles from the Sarbāz River between Rask and Bāhū Kalāt in 1967.

Habitat.—Throughout its range, the marsh crocodile inhabits freshwater marshes, pools, and rivers. Probably the only suitable crocodile habitat in Iranian Balūchistān is along the Sarbāz River, although the Makran coast between Jāsk and Chāh Bahār should be carefully explored for other possible crocodile localities. The valuable report of Bosch, Bullock, and Kinunen describes the habitat of those areas in which they saw crocodiles. The headwaters of the Sarbāz River lie in the mountains of the Persian Makran. The river runs through a narrow canyon before forming a broad floodplain below Garm-e Bit. This floodplain is several kilometers wide and opens into Gavāter Bay of the Gulf of Oman west of Jiwani. The flow of the river is subject to great seasonal fluctuation and yearly variation, being intermittent during the dry season and subject to flooding during the rainy season. The climate of the region is hot and dry, annual rainfall being less than 10 cm. Dominant vegetation along the river is *Tamarix*, *Acacia*, and *Prosopis*, date palms being cultivated around villages. During the dry season, only pools up to two meters in depth and a kilometer in length persist in much of the lower reaches of the river, and a significant portion of the flow below Rask is used for agricultural purposes. During flood times, the entire river bed may be flooded to three or four meters above normal water level. Bosch, Bullock, and Kinunen (1970) observed crocodiles in pools at least 1.5 m deep, under 10–20 m high banks, usually at a bend of the river or oxbow pools. Crocodiles were never seen in pools in the middle of the valley. Usually there were shrubs on the banks, and often reeds were present. At Kolani the river is 10–20 m wide, running continuously for several kilome-

FIGURE 11. *Diplometopon zarudnyi*, Dhahran, Saudi Arabia. CAS specimen.

ters. It is bordered by a thick growth of reeds, shrubs, and trees. I observed only one crocodile, near the village of Hūdar. The river bed here is lined with *Tamarix* and oleanders (*Nerium*). Date orchards in the floodplain support the village, which sits on a slope above the river. The pool, through which the river was flowing in late April, was near the base of a bluff. Tamarisks and oleanders overhung the east bank of the pool. The water was fairly turbid. We had found the spot where crocodiles had basked on the river bank, and had seen tracks, but the only animal seen was floating in the water near the far bank. It was a relatively small individual, about 1.5 m total length. We could get no closer than about 25 or 30 m.

DISTRIBUTION.—Assam west through most of India and Sri Lanka, intermittently through Balūchistān to extreme southeastern Iran. In Pakistan it occurs throughout the Indus Valley north at least to Multar and Bahawalpur; the Hab River at least to Diwana. On the Makran coast in the Hingol and Dasht Rivers. In Iran, it is known only from the Sarbāz River, the drainage just to the west of the Dasht River of Pakistan. The crocodiles of Sri Lanka are considered a distinct subspecies, *C. p. brevirostris* (Werner). At present, all other populations, including those from Iran, are presumed to be *C. p. palustris*.

ZOOGEOGRAPHIC ELEMENT.—Indian.

IRANIAN LOCALITIES.—All of the following localities are sight records, the one from Hūdar my own, the others those of Bosch, Bullock, and Kinunen. There are no specimens of record at present. *Ostān 10 (Balūchistān–Sīstān)*: Bāhū Kalāt, 25°43′N, 61°25′E; 25°55′N, 61°34′E, 30 km N Bāhū Kalāt, 150 m; Djork-e Bit, road construction camp; 3 km below Firūzābād [26°15′N, 61°23′E]; Garm-e Bit; 4 km above Garm-e Bit; 3 km below Garm-e Bit; *Hūdar, 26°09′N, 61°27′E; Iran-Swiss; 2 km below Iran-Swiss; Kolani marsh, a few km NW of Gavāter Bay.

REMARKS.—Apparently the only previously published notice of crocodiles in Iran in the zoological literature is that of Honegger (1971), based on the unpublished work of Bosch, Bullock, and Kinunen (1970). The Iran Department of the Environment in 1971 established the Bāhū Kalāt Protected Region to protect this endangered species (Firouz 1974:35). This reserve covers 394,750 hectares of mountains, foothills, and plains, and embraces much of the Sarbāz River. The crocodile is a fully protected species under Iranian law. However, it faces the double threat of hide poaching and habitat destruction.

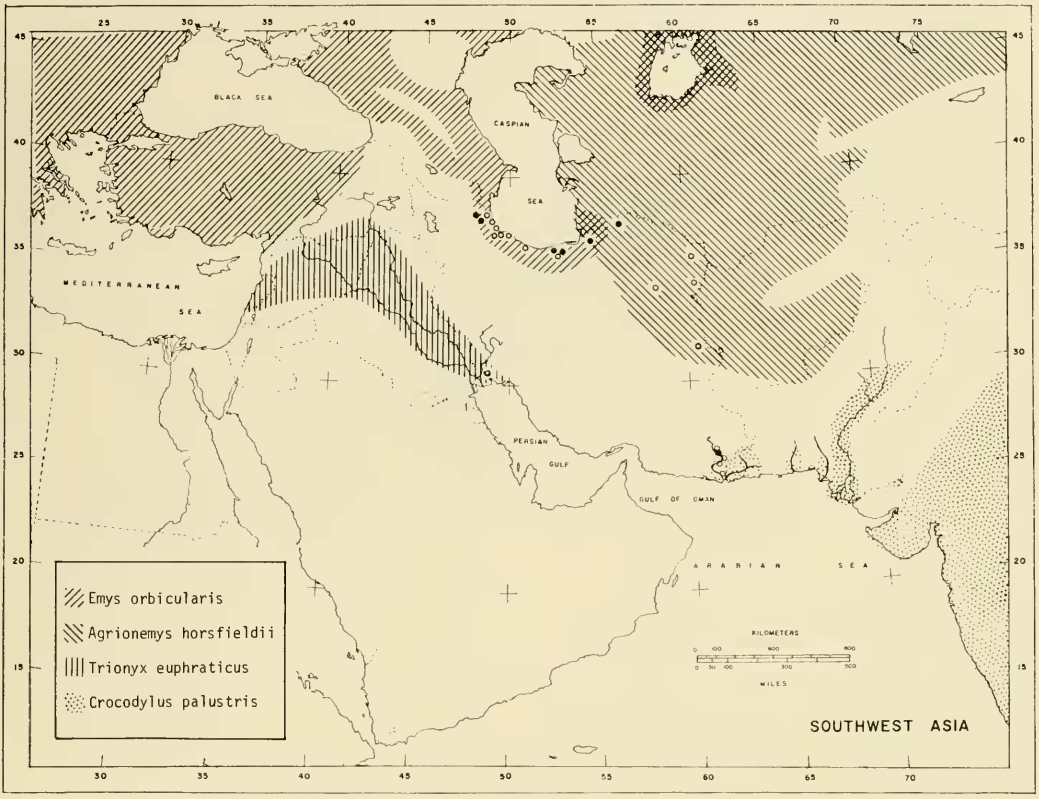

FIGURE 12. Distribution of *Emys orbicularis*, *Agrionemys horsfieldii*, *Trionyx euphraticus*, and *Crocodylus palustris*.

Enforcement of protective legislation along the Sarbāz River is difficult to impossible at present. In 1975 there was no station of the Department of the Environment within the Protected Region itself, and the office at Chāh Bahār had no four-wheel-drive vehicles. Without constant patrol of the river on horseback, it is doubtful that any hide poachers would ever be apprehended. Road and bridge construction in the area probably poses a threat to the animals, especially if further development results, putting a further demand on the flow of the river for irrigation and domestic use. No adequate study of the crocodiles has been carried out following the preliminary investigations of Bosch, Bullock, and Kinunen. These workers surveyed most of the Sarbāz River from the vicinity of Rask to Kolani over a two-week period. They actually observed a total of 18 individual crocodiles. They concluded that the total population at that time was over 50, but this may have been an optimistic figure. The fact that they estimated the maximum length of the largest animals seen at about two meters may be an indication that hunting pressure has eliminated the older mature crocodiles. Their survey indicated that the best crocodile habitat occurs from Fīrūzābād to Djork-e Bit and in the Kolani marsh.

SQUAMATA: AMPHISBAENIA

Family TROGONOPHIDAE
Genus **Diplometopon** Nikolsky

Diplometopon NIKOLSKY, 1907:277–280, text-figs. 1–3 (type-species: *Diplometopon zarudnyi* Nikolsky, 1907, by monotypy).

DEFINITION.—Without limbs; pectoral annuli not differentiated from other annuli; frontal divided or partially divided by a longitudinal sulcus, not in contact medially; eyes conspicuous; no lateral line, nor posterior fold; deep ventral median sulcus extending almost entire distance from head to anal region; tail acuminate; preanal pores present. A single species.

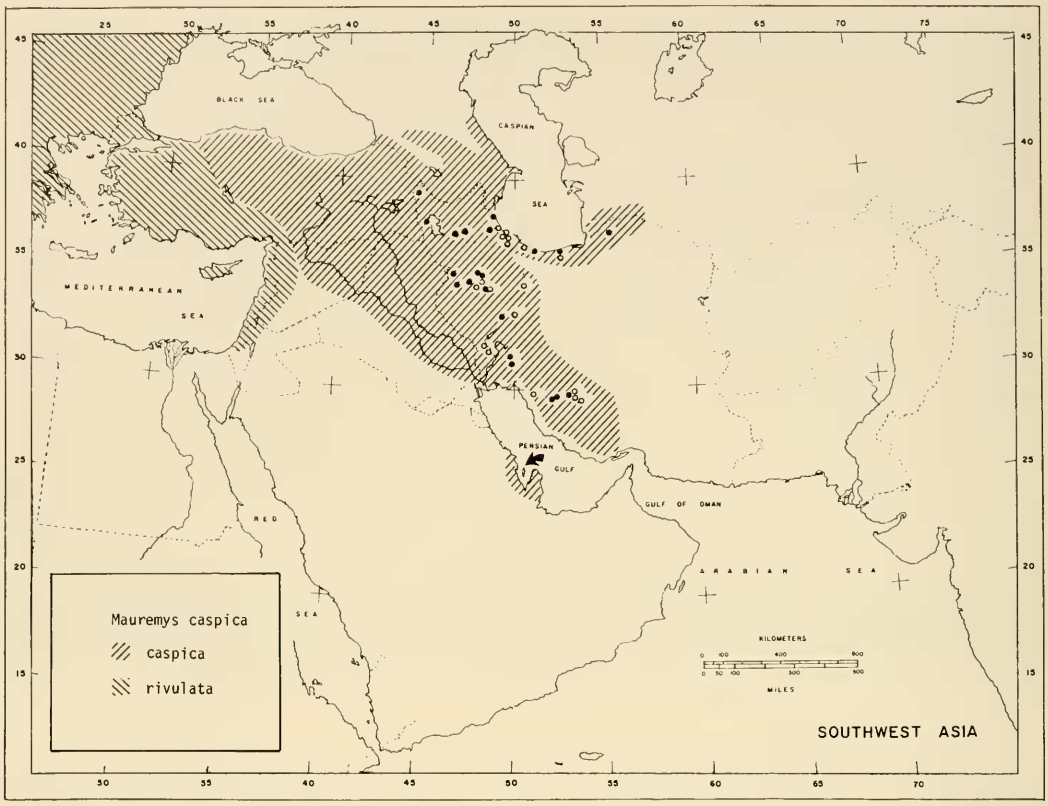

FIGURE 13. Distribution of *Mauremys caspica*.

REMARKS.—See Gans (1960) for a review of the trogonophid amphisbaenians.

Diplometopon zarudnyi Nikolsky
(Figures 11, 14)

Diplometopon zarudnyi NIKOLSKY, 1907:277–280, text-figs. 1–3 (type-locality: Nasrie, Arabistan, Iran; holotype: Zoological Institute, Leningrad no. 10341). —WERNER 1936:200. —GANS 1960:133–204, pl. 45, figs. 1, 3, 5–8, 12–14, 18, 20, 22–24, 29–30. —ANDERSON 1963:456. —GANS 1967:67; 1968:345–362. —ANDERSON 1968:333. —TUCK 1971:60. —ANDERSON 1974:30, 44.

DIAGNOSIS.—As for the genus.

COLOR PATTERN.—Dorsum light gray (pinkish gray in life), heavily flecked with black over entire length of back; head and venter dirty white (pink in life).

SIZE.—Snout-vent length 187 mm, tail 15 mm.

HABITAT.—I collected a single specimen on the Ahvāz plain in Khūzestān in an active dune area with sparse vegetation. It was a few centimeters below the surface. I could not determine whether it had been in a burrow or was moving through loose sand.

DISTRIBUTION.—The distribution of this species centers about the head of the Persian Gulf, in low, sandy deserts of southwestern Iran, southern Iraq, Kuwait, the northern half of Saudi Arabia, and the Trucial States.

ZOOGEOGRAPHIC ELEMENT.—Saharo-Sindian.

IRANIAN LOCALITIES.—*Ostān 6 (Khūzestān–Lorestān)*: *Ahvāz (USNM; CG 60; RT 71); *31°16′N, 49°11′E, dunes on road between Ahvāz and Haft Gel (CAS; SA 63); Nasrie [very close to Ahvāz, on Rūd-e Karūn] (AN 07; type-locality; CG 60).

REMARKS.—*Diplometopon zarudnyi* has its nearest living relatives in the species of *Agamodon* and *Pachycalamus* among the Trogonophidae. The morphology, adaptations, and relationships of this form are discussed in detail by Gans (1960). This species should be looked for in suitable dune habitats in Fārs Province

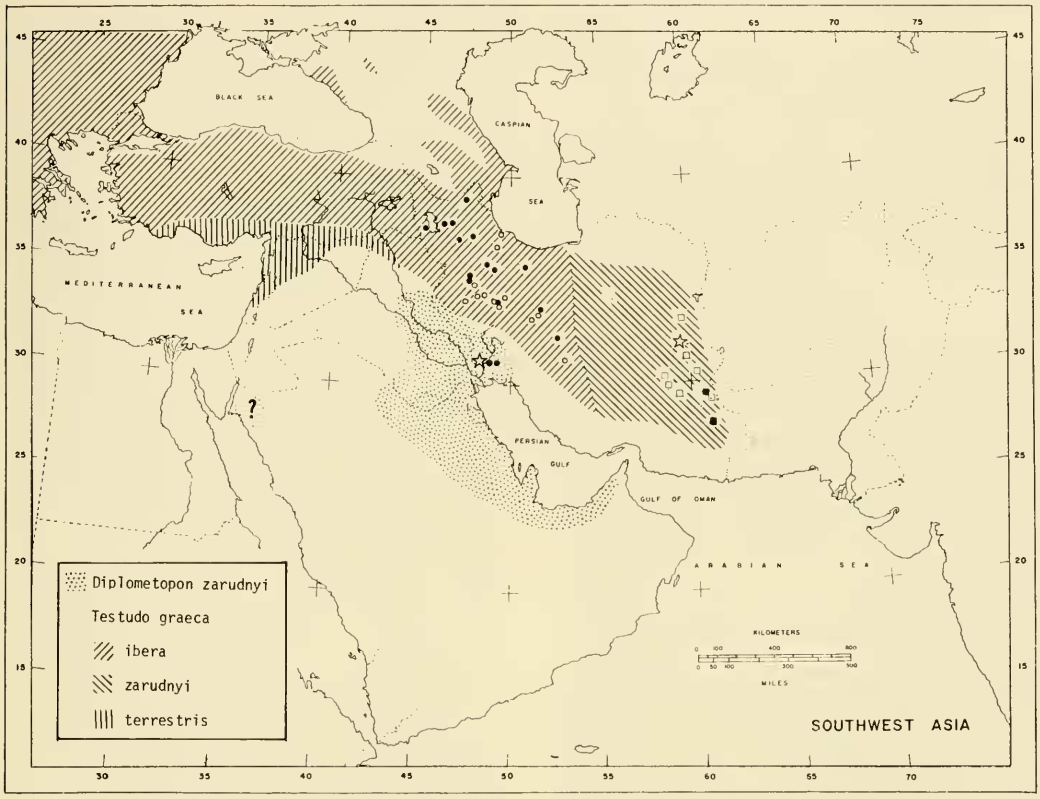

FIGURE 14. Distribution of *Testudo graeca* and *Diplometopon zarudnyi*.

along the coast of the Persian Gulf. It is part of the gulf coast fauna that extends south to Bushire, and perhaps as far south as 27°50'N. Continued survival of this fauna will depend upon action to preserve dune habitat in the face of pressure for dune stabilization.

MATERIAL EXAMINED

I list here only Iranian specimens. In addition, however, I have examined most of the reptiles from elsewhere in Southwest Asia in the American Museum of Natural History, California Academy of Sciences, Field Museum of Natural History, United States National Museum, University of Michigan Museum of Zoology, and University of California at Berkeley Museum of Vertebrate Zoology. I have listed specimens only by political provinces (ostāns); see text for specific localities from which I have seen material.

The collectors of the bulk of the material examined are as follows: Steven C. Anderson, 1968: CAS 86514–86639; William S. and Janice K. Street Expedition to Iran 1962–63: FMNH 141619–141631, CAS 102481–102483; Robert G. Tuck, Jr., John W. Neal, Jr., G. L. Ranck, and L. H. Hermann, 1962–65: USNM 153752–158945; Street Expedition to Iran 1968: FMNH 170989–170993; Steven C. Anderson, Robert G. Tuck, Jr., Ruben McCullers, Reza Khazai'e, 1975: MMTT 978–1530, CAS 141166–141236.

Eretmochelys imbricata bissa: PERSIAN GULF: MMTT 978–979.

Emys orbicularis: EAST ĀẔARBĀIJĀN: MMTT 1278; MĀZANDERĀN: AMNH 88424; MMTT 401–402; FMNH 141626.

Mauremys caspica caspica: GĪLĀN: FMNH 141619, 141627; USNM 154504–154505; EAST ĀẔARBĀIJĀN: MMTT 47, 2 live spec.; FMNH 141625, 141629; CAS 102483; KORDESTĀN–KERMĀNSHĀH: FMNH 170989; USNM 153752, 158529–158534; MMTT live spec.; KHŪZESTĀN–LORESTĀN: CAS 86629, 86634–86639, 141118; USNM 158945; FMNH 130819, 73492, 73495; FĀRS: FMNH 21035–21042, 141624; CAS 102481–102482; MMTT 208; MĀZANDERĀN: MMTT 421–422, 492, 1232; AMNH 88662; CAS 141166.

Agrionemys horsfieldii: MĀZANDERĀN: MMTT 53.

Testudo graeca ibera: TEHRĀN (CENTRAL): CAS 143300; GĪLĀN: FMNH 170990–170991; EAST ĀZARBĀIJĀN: MMTT 493, 1446, live spec.; WEST ĀZARBĀIJĀN: FMNH 141630–141631; MMTT 555; KORDESTĀN–KERMĀNSHĀH: FMNH 130820, 170992–170993; MMTT 1530, 3 live spec.; KHŪZESTĀN–LORESTĀN: FMNH 73483–73484, 73487–73490; EṢFAHĀN: FMNH 141620; FĀRS: FMNH 21027–21029.

Testudo graeca zarudnyi: BALUCHISTĀN–SĪSTĀN: MMTT, 3 live spec.

Diplometopon zarudnyi: KHŪZESTĀN–LORESTĀN: CAS 86514; USNM 121594.

MAPS

The distribution in Southwest Asia is given for each species; only the Iranian localities are shown. Each symbol represents one or more documented locality, as listed in the text. Stars represent type-localities. Solid symbols represent localities from which I have identified and examined specimens. Open symbols indicate localities based on literature or museum catalogues only.

LITERATURE CITED

ANDERSON, STEVEN CLEMENT. 1963. Amphibians and reptiles from Iran. Proc. Calif. Acad. Sci., Ser. 4, 31:417–498.

———. 1968. Zoogeographic analysis of the lizard fauna of Iran. Chap. 10, pp. 305–371 *in* W. B. Fisher (ed.), The Cambridge history of Iran, vol. 1. The land of Iran. Cambridge Univ. Press, Cambridge.

———. 1974. Preliminary key to the turtles, lizards, and amphisbaenians of Iran. Fieldiana Zoology 65:27–44.

ANNANDALE, NELSON. 1906. *Testudo baluchiorum*, a new species. J. Asiat. Soc. Bengal, n.s. 2:75–76.

BIRD, C. G. 1936. The distribution of reptiles and amphibians in Asiatic Turkey, with notes on a collection from the vilayets of Adana, Gaziantep, and Malatya. Ann. Mag. Nat. Hist., Ser. 10, 18:257–281.

BLAINVILLE, HENRI DUCROTAY DE. 1816. Prodrome d'une nouvelle distribution systématique du Règne Animal. Bull. Soc. Philomath. (Paris), 1816:105–124.

BLANFORD, WILLIAM T. 1876. Eastern Persia, an account of the journeys of the Persian Boundary Commission, 1870–1872. Vol. 2. The zoology and geology. London, viii + 516 pp., 28 pls.

BODENHEIMER, FRITZ S. 1944. Introduction to the knowledge of the Amphibia and Reptilia of Turkey. Rev. Fac. Sci. Univ. Istanbul, Ser. B. Sci. Nat., 9:1–93, pls. 1–10.

BOSCH, MARC, STEVE BULLOCK, AND WAYNE KINUNEN. 1970. Crocodiles; second survey. Job Completion Report, Division of Research and Development, submitted to Iran Game and Fish Department, F–6–49. 26 pp. (Unpublished).

BOULENGER, GEORGE ALBERT. 1889. Catalogue of the chelonians, rhynchocephalians, and crocodiles in the British Museum (Natural History). London. x + 311 pp., 6 pls.

———. 1920. Description of a new land tortoise from northern Persia. J. Bombay Nat. Hist. Soc. 27:251–252.

BULLOCK, STEVE, AND WAYNE KINUNEN. 1971. Lavan Island aquatic survey. Job Completion Report, Division of Research and Development, submitted to Iran Game and Fish Department, F–4–49, F–7–49. 9 pp. (Unpublished).

DAUDIN, FRANÇOIS M. 1802. Histoire naturelle, général et particulière des reptiles. Vol. 4. Paris. 397 pp.

DE FILIPPI, FILIPPO. 1865. Note di un viaggio in Persia nel 1862. Milano. viii + 396 pp.

DERANIYAGALA, P. E. P. 1933. The loggerhead turtles (Caretttidae) of Ceylon. Ceylon J. Sci. (B), 18:61–72.

———. 1936. A new crocodile from Ceylon. Ceylon J. Sci. (B), 19:279–286.

———. 1939. The tetrapod reptiles of Ceylon. Vol. 1. Testudinates and crocodilians. Ceylon J. Sci., Colombo Museum of Natural History Ser.; xxxii + 412 pp., 24 pls.

DUMÉRIL, ANDRÉ MARIE CONSTANT. 1806. Zoologie analytique, ou méthode naturelle de classification des animaux, rendue plus facile à l'aide de tableaux synoptiques. Augustine, Paris. xxxii + 344 pp.

ERNST, CARL H., AND ROGER W. BARBOUR. 1972. Turtles of the United States. Univ. Press of Kentucky, Lexington. x + 347 pp., 24 col. pls.

ESCHSCHOLTZ, FRIEDERICH. 1829. Zoologischer Atlas. Pt. 1. Berlin. 15 pp., pls. 1–5.

FIROUZ, ESKANDAR. 1974. Environment Iran. National Society for the Conservation of Natural Resources and Human Environment, Tehran. 51 pp.

FISHER, W. B. (ed.). 1968. The Cambridge History of Iran. Vol. 1. The land of Iran. Cambridge Univ. Press, Cambridge. xix + 784 pp., 16 pls.

FITZINGER, LEOPOLD J. F. J. 1843. Systema Reptilium . . . fasciculus primus: Amblyglossae (conspectus geographicus). Vindobonae. vi + 106 pp.

FORCART, LOTHAR. 1950. Amphibien und Reptilien von Iran. Verh. naturforsch. Ges. Basel 61:141–156.

FORSKÅL, PETRUS. 1775. Descriptiones animalium . . . in itinere orientali observavit. Copenhagen. (19) + xxxiv + 164 pp., pls. 1–43.

GANS, CARL. 1960. Studies on amphisbaenids (Amphisbaenia, Reptilia). 1. A taxonomic revision of the Trogonophinae, and a functional interpretation of the amphisbaenid adaptive pattern. Bull. Am. Mus. Nat. Hist., 119:129–204.

———. 1967. A check list of recent amphisbaenians (Amphisbaenia, Reptilia). Bull. Am. Mus. Nat. Hist. 135:61–106.

———. 1968. Relative success of divergent pathways in amphisbaenian specialization. Am. Nat. 102:345–362.

GEOFFROY ST. HILAIRE, ÉTIENNE. 1809. Mémoire sur les tortues molles, nouveau genre sous le nom de *Trionyx*, et sur la formation des carapaces. Ann. Mus. Hist. Nat. Paris 14:1–20, pls. 1–5.

GMELIN, SAMUEL GOTTLIEB. 1774. Reise durch Russland. Vol. 3.

GRAY, JOHN EDWARD. 1844. Catalogue of the tortoises, crocodiles and amphisbaenians in the collection of the British Museum. London. viii + 289 pp.

———. 1860. Description of a new species of *Emys (E. fuliginosus)*, lately living in the Gardens of the Zoological Society. Proc. Zool. Soc. Lond. 28:232–233.

———. 1870. Description of *Mauremys lanaria*, a new freshwater tortoise. Proc. Zool. Soc. Lond. 1870:499–500, pl. 37.

———. 1873. Hand-list of the specimens of shield reptiles in the British Museum. London. iv + 124 pp.

GUIBÉ, JEAN. 1966. Reptiles et amphibiens récoltés par la Mission Franco-Iranienne. Bull. Mus. Natl. Hist. Nat., Ser. 2, 38:97–98.

HELLMICH, WALTER. 1959. Bemerkungen zu einer kleinen Sammlung von Amphibien und Reptilien aus Süd-Persien. Opusc. Zool. (Munich), 1959:1–9.

HONEGGER, RENÉ E. 1971. The status of four threatened crocodilian species of Asia. Crocodiles: Proceedings of the First Working Meeting of Crocodile Specialists, sponsored by the New York Zoological Society and organized by the Survival Service Commission, IUCN, at the Bronx Zoo, New York, 15–17 March 1971. 1:44–50.

KHOZATSKY, L. I., AND M. MŁYNARSKI. 1966. *Agrionemys*—nouveau genre de tortues terrestres (Testudinidae). Bull. Acad. Pol. Sci., Ser. Sci. Biol., (2):123–125.

KINUNEN, WAYNE, AND STEVE BULLOCK. 1970. Baluchistan crocodile investigations. Job Report, Division of Research and Development. 20 pp. (Unpublished).

———, AND PETER WALCZAK. 1971. Persian Gulf sea turtle nesting surveys. Job Completion Report, Division of Research and Development, submitted to Iran Game and Fish Department, F–7–50. 16 pp. (Unpublished).

LATREILLE, P. ANDRÉ, AND C. N. S. SONNINI DE MANONCOURT. 1802. Histoire naturelle des reptiles . . . . Vol. 1 (part of the "Suites" to the Castel edition of the 'Histoire naturelle' of Buffon). 4 vols. Paris.

LAURENTI, JOSEPHI NICOLAI. 1768. Specimen medicum, exhibens synopsin reptilium emendatem cum experimentis circa venena et antidota reptilium austriacorum. Vienna. 214 pp., 5 pls.

LESSON, RENÉ P. 1834. Reptiles. Pp. 291–336, pls. 1–7 (Atlas on reptiles) *in* Charles M. Belanger. Voyage aux Indes-Orientales. Zoologie. Paris.

LINNAEUS, CAROLUS. 1758. Systema naturae. Ed. 10, vol. 1. Stockholm. 824 pp.

———. 1766. Systema naturae. Ed. 12, vol. 1, pt. 1. Stockholm. 532 pp.

LOVERIDGE, ARTHUR, AND ERNEST E. WILLIAMS. 1957. Revision of the African tortoises and turtles of the suborder Cryptodira. Bull. Mus. Comp. Zool. Harv. Coll. 115:163–557, pls. 1–18.

MARX, HYMEN. 1968. Checklist of the reptiles and amphibians of Egypt. Spec. Publ., U.S. Nav. Med. Res. Unit, No. 3. Cairo. 91 pp.

MCDOWELL, SAMUEL B. 1964. Partition of the genus *Clemmys* and related problems in the taxonomy of the aquatic Testudinidae. Proc. Zool. Soc. Lond. 143:239–279.

MERTENS, ROBERT. 1946. Über einige mediterrane Schildkrötenrassen. Senckenb. Biol. 27:111–118.

———. 1956. Amphibien und Reptilien aus s.o.-Iran, 1954. Jahresh. Ver. Vaterl. Naturkd. Württemb. 111:90–97.

———. 1957. Weitere Unterlagen zur Herpetofauna von Iran 1956. Jahresh. Ver. Vaterl. Naturkd. Württemb. 112:118–128.

MERTENS, ROBERT, LORENZ MÜLLER, AND RUST. 1934. [Not seen; cited in Wermuth and Mertens 1961:59.] Bl. Aquarien Terrarienkunde 45:61.

———, AND HEINZ WERMUTH. 1960. Die Amphibien und Reptilien Europas. Frankfurt am Main. xi + 264 pp.

MINTON, SHERMAN A., JR. 1966. A contribution to the herpetology of West Pakistan. Bull. Am. Mus. Nat. Hist. 134:29–184, pls. 9–36.

MŁYNARSKI, M. 1966. Morphology of the shell of *Agrionemys horsfieldii* (Gray, 1844) (Testudines, Reptilia). Acta Biol. Cracov., Ser. Zool., 9:219–223.

NEILL, WILFRED T. 1971. The last of the ruling reptiles: alligators, crocodiles, and their kin. Columbia Univ. Press, New York. xvii + 486 pp.

NIKOLSKY, ALEKSANDR MIKHAILOVICH. 1896. Diagnosis reptilium et amphibiorum novorum in Persia orientali a N. Zarudny collectorum. Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg 4:369–372.

———. 1897. Les reptiles, amphibiens, et poissons recueillis par M. N. Zarudny dans la Perse orientale. Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg 2:306–348, pls. [text in Russian]

———. 1899. Reptiles, amphibiens, et poissons, recueillis pendant le voyage de M. N. A. Zarudny en 1898 dans la Perse. Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg 4:375–417. [text in Russian]

———. 1907. Reptiles et amphibiens recueillis par M. N. A. Zarudny en Perse en 1903–1904. Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg 10(1905):260–301, pl. 1.

———. 1915. Faune de la Russie. Reptiles. Vol. 1. Petrograd. 532 pp., 9 pls. [Fauna of Russia and adjacent countries. Reptiles. Vol. 1. Chelonia and Sauria. Trans. 1963 by L. and E. Kochva. Israel Program for Scientific Translations. Smithsonian Institution.]

OBST, FRITZ JÜRGEN, AND WALTER MEUSEL. 1974. Die Landschildkröten Europas und der Mittelmeerländer. Die Neue Brehm-Bucherei; Wittenberg Lutherstadt. 5th ed. 72 pp., 1 col. pl.

PALLAS, PETER SIMON. 1814. Animalia monocardia seu frigidi sanguinis Imperii Rosso-Asiatici. Vol. 3, 428 pp.

PETERS, JAMES A. 1964. Dictionary of herpetology. Hafner, New York. vii + 392 pp.

PRITCHARD, PETER C. H. 1966. Notes on Persian turtles. Br. J. Herpetol. 3:271–275.

RAFINESQUE-SCHMALTZ, CONSTANTINE SAMUEL. 1814. Specchio delle scienze o giornale enciclopedico di Sicilia. Vol. 2. Palermo.

REED, CHARLES A., AND HYMEN MARX. 1959. A herpetological collection from northeastern Iraq. Trans. Kans. Acad. Sci. 62:91–122.

ROSTOMBEKOV, V. 1938. Chelonia, Sauria, and Amphibia of the Urmia Expedition in 1916. Bull. Mus. Géorgie (Tiflis) 9A:11–21.

RÜPPELL, EDUARD. 1835. Neue Wirbelthiere zu der Fauna von Abyssinien gehörig. 3. Amphibien. Frankfurt am Main. Pp. 1–18, pls. 1–4.

SCHMIDT, KARL PATTERSON. 1939. Reptiles and amphibians from southwest Asia. Field Mus. Nat. Hist. Publ. Zool. Ser., 24:49–92.

———. 1953. A check list of North American amphibians and reptiles. 6th ed. Chicago. viii + 280 pp.

———. 1955. Amphibians and reptiles from Iran. Vidensk. Medd. Dan. Naturhist. Foren. 117:193–207.

SCHWEIGGER, AUGUST FRIEDRICH. 1814. Prodromi monographiae cheloniorum. Sectio prima . . . Regiomontae. vi + 58 pp.

SHOCKLEY, CLARENCE H. 1949. Herpetological notes for Ras Jiunri, Baluchistan. Herpetologica 5:121.

SIEBENROCK, FRIEDRICH. 1913. Schildkröten aus Syrien und Mesopotamien. Ann. Nat. Mus. Wien 27:171–225, 3 pls.

SMITH, HOBART M., AND EDWARD HARRISON TAYLOR. 1950. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. U.S. Natl. Mus. Bull. 199:1–253.

SMITH, MALCOLM A. 1931. The fauna of British India. Reptilia and Amphibia. Vol. 1. Loricata, Testudines. Taylor and Francis, London. xxviii + 185 pp., 2 pls.

SOBOLEVSKY, N. I. 1929. The herpetofauna of the Talysh and of the Lenkoran lowland. Mem. Soc. Amis Sci. Nat. Anthropol. Ethnog. Sect. Zool. 5:1–141. [In Russian; English summary.]

Strauch, Alexander. 1862. Essai d'une erpétologie de l'Algerie. Mem. Acad. Sci. St. Pétersbourg 7:1–85.

Terentjev, Paul V., and S. A. Chernov. 1949. Opredelitel presmykaiushchikhsia i zemnovodnykh. 3rd. ed. Moscow. 340 pp. [Key to amphibians and reptiles. Trans. 1965 by L. Kochva. Israel Program for Scientific Translations. Smithsonian Institution.]

Thunberg, Carl Pehr. 1787. [Not seen; cited in Wermuth and Mertens 1961, p. 237.] K. Svens. Vet. Akad. Handl. 8:178, pl. 7.

Tuck, Robert G., Jr. 1971. Amphibians and reptiles from Iran in the United States National Museum Collection. Bull. Md. Herpetol. Soc. 7:48–86.

———. 1973. Additional notes on Iranian reptiles in the United States National Museum Collection. Bull. Md. Herpetol. Soc. 9:13–14.

Wagler, Johann Georg. 1830. Natürliches System der Amphibien, mit vorangehender Classification der Säugethiere und Vögel. München, Stuttgart, und Tübingen. vi + 354 pp., 2 pls.

Walczak, Peter S. 1971. Green sea turtle nests and turtle sightings at Hormoz. Iran Fishery Co. Fishery Research Institute Progress Report, submitted to Iran Game and Fish Department, F–7–49. 4 pp. (Unpublished).

———, and Wayne Kinunen. 1970. Green sea turtles at Chah Bahar, Baluchistan. Job Completion Report, Division of Research and Development, submitted to Iran Game and Fish Department, F–7–49. 2 pp. (Unpublished).

———, and ———. 1971. Gulf of Oman turtle nesting survey. Job Progress Report, Division of Research and Development, submitted to Iran Game and Fish Department, F–7–50. 6 pp. (Unpublished).

Webb, Robert G. 1962. North American Recent soft-shelled turtles (family Trionychidae). Univ. Kans. Publ. Mus. Nat. Hist. 13:429–611, pls. 31–54.

Wermuth, Heinz, and Robert Mertens. 1961. Schildkröten, Krokodile, Brückenechsen. Jena. xxvi + 422 pp.

Werner, Franz. 1895. Ueber eine Sammlung von Reptilien aus Persien, Mesopotamien und Arabien. Verh. Zool.-Bot. Ges. Wien, 45:14, pl. 3.

———. 1903. Über Reptilien und Batrachien aus Westasien (Anatolia und Persien). Zool. Jahrb. Syst. 19:329–346, pls. 23–24.

———. 1917. Reptilien aus Persien (Provinz Fars). Verh. Zool.-Bot. Ges. Wien 67:191–200.

———. 1929. Beiträge zur Kenntnis der Fauna von Syrien und Persien. Zool. Anz. 81:238–242.

———. 1936. Reptilien und Gliedertiere aus Persien. Festschrift zum 60 Geburtstage von Prof. Dr. Embrik Strand, 2:193–202.

———. 1938. Reptilien aus Iran und Belutschistan. Zool. Anz. 121:265–271.

Wettstein, Otto. 1951. Ergebnisse der Österreichischen Iran-Expedition 1949/1950, Amphibien und Reptilien. Versuch einer tiergeographischen Gliederung Irans auf Grund des Reptilien-verbreitung. Sitzungsber. Österr. Akad. Wiss. Math.-Naturwiss. Kl. 160:427–448.

Zarudny, Nikolai Aleksyevich. 1903. [Les reptiles, amphibiens et poissons de la Perse orientale. Materiaux herpetologiques et ichthyologiques du voyage fait en 1898.] Zap. Imp. Russ. Geog. Obs. Geog. 36(3):1–42. [In Russian.]