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ANIMAL LIFE IN PALESTINE

An introduction to the problems of
animal ecology and zoogeography.

BY

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III. REPTILES AND AMPHIBIA.

A. Zoogeography and Ecology.—The zoogeography of the reptiles and amphibians does not show anything exceptional. The high percentage of Saharo-Sindian forms among the reptiles simply indicates a rich development of the life of this family in deserts and predeserts. Since tropical animals are generally restricted to humid habitats, they are rather poorly represented amongst these lovers of arid habitats. Euro-Siberian elements are entirely lacking:

	Total No. of species	Med.	Sah. Sind.	lr. Tur.	Trop.	Eur. Sib.	Hol.
Snakes	33	12,5	13,0	6,0	1,5	—	—
Lizards	37	12,5	15,5	7	2	—	—
Tortoises	5	2,5	1	1,5	—	—	—
Amphibians	8	5,0	1,0	0,5	—	0,5	1
Total	83	32,5	30,5	15,0	3,5	0,5	1,0
%	100,2	39,2	36,9	18,1	4,2	0,6	1,2

The semi-arid character of the country has a decidedly adverse influence on the amphibians and the few species which do occur (*Salamandra*, *Triton*, *Pelobates*) are very rarely seen owing to their strictly nocturnal habits.

Many of the species are of Irano-Turanian origin and have spread into Palestine only in a relatively recent period. All species of genera, such as *Lacerta*, *Tropidonotus* are good illustrations. Many of the Scincids and Agamids have the same origin. They are typical dominants of steppe environments and must have flourished during the late diluvial and the present alluvial period, but many of these species have formed local sub-species in the Eastern Mediterranean.

The body temperature of the reptiles depends to a high degree upon that of the environment. The temperature of the lizard, in the shade, generally coincides with the temperature of its surroundings. A lizard's temperature in the sun on the other hand rises up to 40° C and higher, when the shade temperature, for example, is only 28° C. It utilizes the rays of the sun to raise its body temperature. Fig. 40

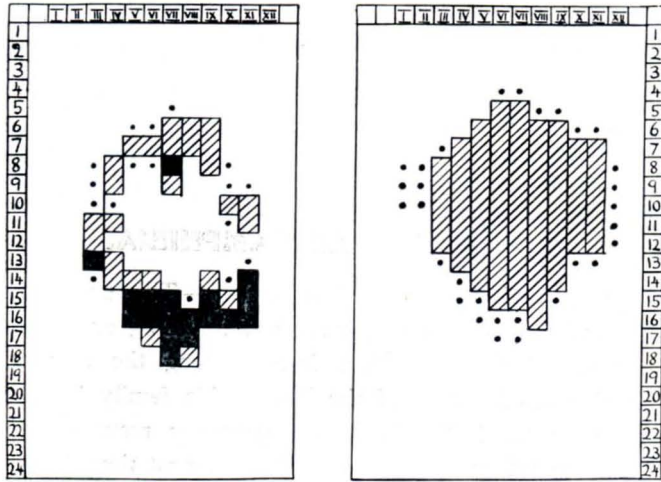


Fig. 39. Seasonal and diurnal activity of *Ophisops ehrenbergi* (at right) and *Testudo ibera* (at left). The data on *Testudo* from S. Ulitzki).

illustrates these conditions, fairly well. From 11—14 h the body temperature of a *Stellio*, in October, approaches even 40°C, excepting from 11:30—12:15 h when the lizard was in the shade, and registered exactly the temperature of its environment. The afternoon of that day was cloudy and windy, and as a consequence, the body temperature dropped.

During the cooler seasons the reptilian activity is highest at noon, but many species lessen their activity or even interrupt it, in the noon hours, during the summer. In a long series of experiments all *Hardouns* died when they were exposed to the direct rays of the sun for two hours at noon. The same species is, however, frequently seen in nature, during the noon hours. In our experiments, however, the maximal surface of the body was turned to the sun, whereas, in nature, the body-axis of the lizard runs parallel to the direction of the sun-rays, which means that it turns its minimal surface to the sun. In this way, it lowers its body temperature by several degrees as compared with the first posture. In the activity experiments, lizards behaved as follows:

Species	Cold torpor	High activity	Instantaneous death	Preference temperature
<i>Lacerta laevis</i>	8,5	33,5	44,8 °C	31,7 °C
<i>Agama stellio</i>	3,4	39,2	47,5 °C	33,4 °C
<i>Ophisops ehrenbergi</i>	3,5	36,5	44,0 °C	35,3 °C
<i>Gongylus ocellatus</i>	2,7	36,5	44,8 °C	
<i>Ptyodactylus syriacus</i>	5,5	35,5	43,7 °C	
<i>Gymnodactylus kotschy</i>	—	—	44,5 °C	
<i>Rana ridibunda</i>	—0,9	—	40,9 °C	
<i>Bufo viridis</i>	4,1	36,2	40,7 °C	

A rise of the body temperature to about 45°C means instantaneous death to these lizards. A slow normal activity begins at 17.5°C and a body temperature of 35°C is needed for full activity. These data fully explain the activity behaviour of reptiles. Near Jerusalem the

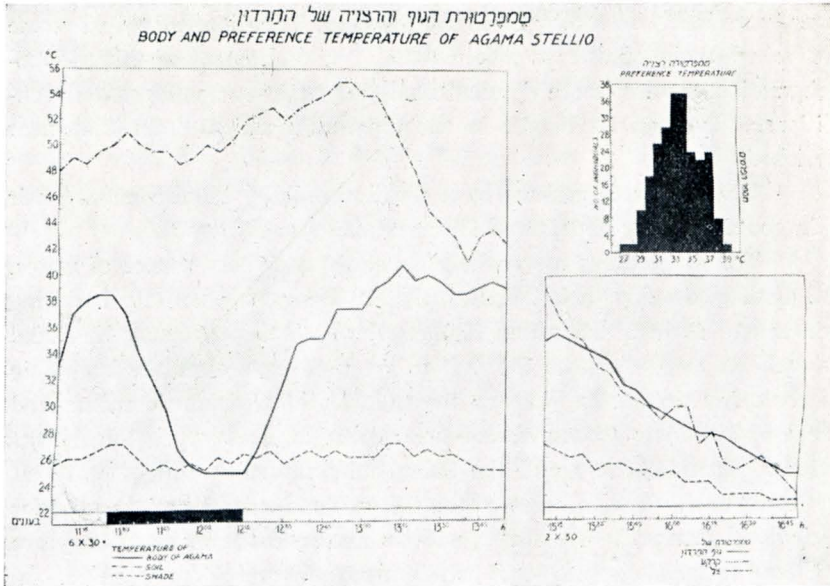


Fig. 40. Body temperature of *Agama stellio* under the influence of normal sun-radiation. At right above: The preference temperature of *A. stellio*.

great activity of the Hardoun stops at 16 h in August, and at 12 h in October. It begins at 5 h in June and at 7 h in October. The preference temperature is at about 34°C, i. e. at the lower limit of high activity. Fig. 40 shows the preference reactions of a *Stellio* when it has the choice of a long series of temperatures.

Reptiles are well adapted for living in arid conditions. Their skin has a thick corneous stratum. The glands of its skin are very restricted in number and consequently the evaporation is minimal.

Much of the life history of our reptiles remains to be studied. The nuptials of most lizards seem to take place in the summer months, but their courtship has not been adequately observed. The seasons and numbers of ovipositions are absolutely unknown. In the Common Hardoun they seem to be rather protracted. Oviposition begins not later than June/July, but mature eggs are found in the females even at the beginning of September. One can only guess at the length of the egg-stage

and the duration of the whole development. Most lizards probably mature in one year, while snakes and tortoises require several years. No true estivation or hibernation is known in the case of reptiles. Nevertheless, many species lie in their holes in a state of semi-torpor during the coolest weeks of the rainy season. Often groups of from 6 to 20 and even more individuals may be found together. They immediately become active, when the sun's rays waken them. The real extent of this pseudo-hibernation requires more detailed study. It depends upon external conditions, only, and its length in the mountains differs from that near Jericho.

The nocturnal geckoes have certain humidity requirements. Their skin contains many glands and its corneous layer is very thin.

The amphibians are entirely dependent on the presence of water. All of them develop their tadpoles, there. Their main activity is during winter and spring. *Bufo* and *Pelobates*, whose tadpoles may be found as early as December, are the first to lay their eggs after the beginning of the rainy season. In January the tadpoles of *Hyla* are common and those of the Frog (*Rana ridibunda*) appear in February. The Newts oviposit from February and the Salamander probably also oviposits at the same time. The tadpoles of the Green Toad require two months for their development, in the winter, and six weeks, in the spring. They are still seen through the summer if conditions are favorable for breeding. In March/April their long egg-chains are quite common and during the somewhat abnormal summer of 1932 eggs and tadpoles were observed as late as July, wherever fresh-water was still present.

The amphibians are not protected against evaporation by a corneous layer of the skin, but rather by the presence of many mucus glands. In our Tree-frog the number of these glands is 25—50% greater than in individuals from Central Europe¹¹). A higher degree of protection is necessary in our arid and hot climate and it is attained by an increased mucuous secretion. It tolerates the heat better when the air is humid. It dies within one day when exposed to a Rel. Humidity of only 20%, after four days when exposed to 80% R. H. and only after 63 days when exposed to 100% R. H. (without food)¹²). The protection by the mucus glands is sufficient to enable it to survive through the favorable conditions of the hot noon-hours, to which it is sometimes exposed, even in the summer.

B. S n a k e s.—The common representative of the Blind Snakes (Typhlopidae) is the European Blind Worm (*Typhlops vermicularis*).

At first sight this snake is similar to an earth-worm in colour and size. It lives underneath stones and in self-prepared soil-galleries, into which it retreats, during the day. As a consequence of its subterranean and nocturnal life habits, the eyelids cover almost the entire eye. The Blind Worms still possess remainders of a pelvis. They feed on worms and small insects. They are distributed over the whole country, except in the extreme south. The author found a pair in Jerusalem in the wall in the second story of an old house. Nothing much is known of their life history. They may reach 20—25 cm in length, but generally do not exceed 15 cm. *T. simoni*, which resembles it, lives on the fields of the coast-plain and of the Jordan Valley. *Leptotyphlops phillipsi* is found near Petra. These two species are known from Palestine, only.

Two other small snakes are similar in appearance and habits: *Micrelaps muelleri* (35 cm, whitish with many broad dark-brown or blackish half-rings) occurs in the hills and in the coast-plain. It is not uncommon near Jerusalem.

The elegant Black-head *Oligodon melanocephalus* (45 cm) is rather common all over the country underneath stones and in damp soil, but is especially common in the Jordan Valley and near Petra. It is pinkish grey changing to lemon yellow with a metallic blue head, which turns black in alcohol.

Surely, the most typical snakes of Palestine are the *Coluber* Snakes. The natives fear them greatly. However, they are not all poisonous and are decidedly beneficial in destroying field-mice. When attacked, they rise, hiss and bite. They prey on small mammals, birds, lizards, snakes, grasshoppers, etc. and climb trees with agility in order to look for birds' eggs. It is to be deplored that they are being killed in large numbers by the agriculturists, who are accustomed to kill every snake, at sight.

The most abundant species is the olive-brown Syrian Black Snake *Coluber jugularis* (up to 200 cm). A black melanistic variety, which does not merit a special name is fairly common, and occurs everywhere, mixed with the brown individuals. In the winter they are found in holes. A varying number of individuals remain together, in a half-torpor, for some weeks. In the spring they are a preferred food of the White Stork. This snake inhabits the arid habitats all over the country, becoming scarce in the southern desert. The graceful Whip Snake *C. najadum* (up to about 130 cm, yellowish grey to grey-green, has a black collar and a series of black "ocelli," with white margins on and below the neck), is found on more humid habitats, amidst herbs

and near springs, in the coast-plain and the Jordan Valley. "When alarmed it glides away among the grass and may be traced by the gentle motion of the blades over its sinuous track" 1). It preys preferably on lizards and insects.

The most common species in the hills is the Coin-marked Snake *C. nummifer* (up to 60 cm long). The light olive-grey colour has a continuous series of blackish rhomboid designs on the back, which together with the rather broad head give the observer the impression that he is dealing with the poisonous *Vipera xanthina*. However, the large shields on the head identify it quickly as the harmless Colubrid. It is likewise common on stony places in the coast-plain and in the Jordan Valley. In Jerusalem, it occasionally penetrates into the houses, on its search for mice.

In the desert areas only, we find five other species of the genus. *C. diadema* (150 cm, yellow brown with five rows of dark-brown stains), which is commonly used by the snake charmers of Egypt and India, feeds on small mammals, lizards and insects. *C. ventromaculatus* lives around the Dead Sea; *C. elegantissimus* further south near Aqaba; *C. rogersi* and *C. rhodorhachis* in the Negeb.

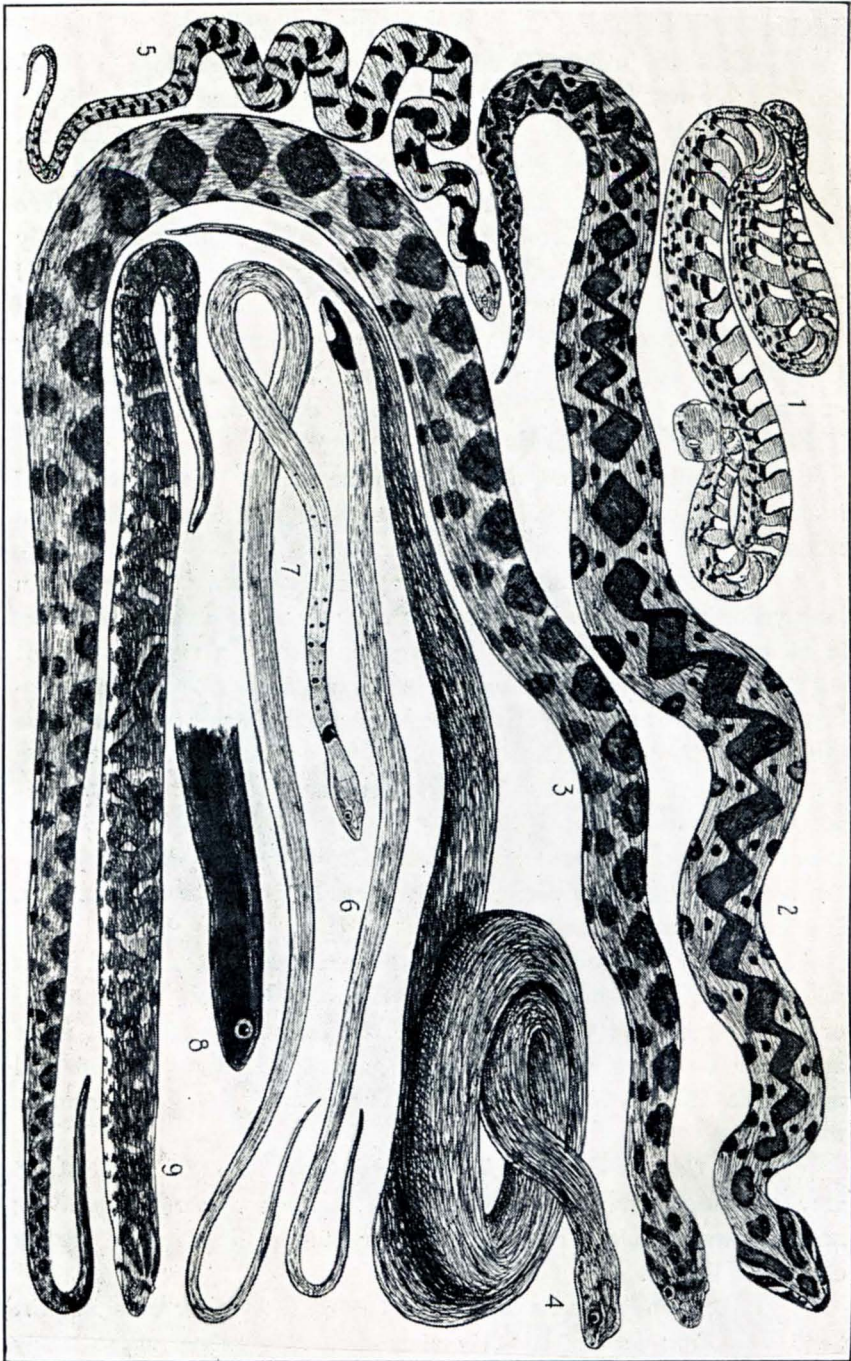
The Water Snake *Tropidonotus tessellatus* is very abundant in and near Lakes, rivulets, ponds and ditches all over the country. It is well adapted to swimming and to a life spent mainly in water. It uses lateral twisting movements in swimming. By spreading out its ribs, it flattens its body so that it forms an actual rowing-plate. Its lungs serve as a hydrostatic apparatus. When they are filled with air, the snake rises to the surface, after expiration it sinks to the bottom. Its main food in Palestine are frogs, toads, tadpoles and small fishes. Lortet reports that they feed mainly on small mammals, which is certainly not the rule.

The Ringed Snake (*T. natrix*), which has similar life habits, is easily recognized by the white or yellow crescents on both sides of the occiput. It is extremely rare and represents probably a new form of the *persa*-group.

In the southern dunes of the coast-plain and the desert-regions we meet the diademed Sand Snake *Lytorhynchus diadema* (up to 45 cm,

PLATE XVIII: REPTILIA I. SNAKES.

1. *Echis carinatus* (60 cm);
2. *Vipera xanthina* (130 cm);
3. *Coluber nummifer* (100 cm);
4. *Malpolon insignitus* (180 cm);
5. *Tarbophis syriaca* (60 cm);
6. *Oligodon melanocephalum* (35 cm);
7. *Coluber najadum* (80 cm);
8. *C. jugularis* (220 cm);
9. *Eryx jaculus* (60 cm).



sandy yellow with brown rhomboidal spots on the back). It preys on lizards.

The Peace Snakes (*Contia*) which are richly developed in Western Asia are not uncommon. They live on the ground amongst herbs and feed mainly on insects. *C. collaris* has been recorded from Es Salt, while *C. rothii* is fairly common everywhere under stones. The banded Peace Snake *C. fasciata* inhabits dry stony places in the hills. The Crowned Peace Snake *C. coronella*, of which *C. fasciata* is perhaps only a variety, is common all over the country under stones. It is most rapid in its movements. This short, plump snake, which does not exceed 25 cm in length, is yellow brownish with many small red-brown designs covering the back. The largest species of the genus *C. decemlineata* (up to 65 cm) occurs throughout Palestine, but is not very common. Near Jerusalem it feeds mainly on the lizard *Ophisops*.

C. modesta reaches almost the same length. Two varieties of it are often seen near Jerusalem. It occurs throughout the Mediterranean sections.

The Montpellier Snake *Malpolon monspessulanus* (up to 150 cm long, yellowish green with many small dark spots on its back) is abundant in all parts of the country. Tristram calls it a rock and desert snake. It preys on snakes, lizards, small mammals, birds and grasshoppers. When approached it hisses loudly and thus often attracts the attention of the passing naturalist. Davydow expressed the opinion that in the hot deserts its sting is rather dangerous, but the writer is not able to corroborate this statement. It is a well-known fact, however, that the sting proves fatal to small mammals, when it has been prolonged for some minutes. A large gland in back of the eyes is venomous. Further observations are needed.

Psammophis schokari (up to 100 cm, sand-coloured sometimes with brown longitudinal stripes) is a common Sand Snake. In cultivated or dense vegetation, however, it is a tree-inhabiting snake. It hides among the scrub and on olive-trees, darting out suddenly upon birds and mice. The Hooded Snake (*Macroprotodon cucullatus*) is common in the Negeb.

The Cat Snake *Tarbophis syriaca* (up to 100 cm long, bluish grey with large brown spots on the back) is common everywhere, living under stones. It is either crepuscular or nocturnal in its habits, feeding chiefly on lizards.

In the sandy deserts and dunes (near Tel-Aviv for example) the Sand Boa *Eryx jaculus* is fairly abundant. This plump snake rarely

grows larger than 60 cm, but is our only representative of the large Boids. Like the pythons, it strangles its prey (lizards or small rodents) before swallowing it. The small scales which cover its head instead of shields may cause it to be confused with a viper, but its smaller and narrower head makes its identification easily possible. It lives beneath stones or more often in the galleries of lizards and rodents and it "swims" fairly rapidly in loose sand, so that it is not easily caught. Lortet records myriapods and beetles as its food, but this is probably not correct. It is yellowish grey-brown, richly spotted with dark brown designs on the back. Its blunt snout and tail and the very flaccid body are characteristic features. It may be kept in captivity for many months. It generally remains in the sand, hidden from the eye of the observer.

We now turn to the poisonous snakes of Palestine, most of which belong to the Viperids. The only species which is common throughout the inhabited parts of our country is the oriental form of the Levant

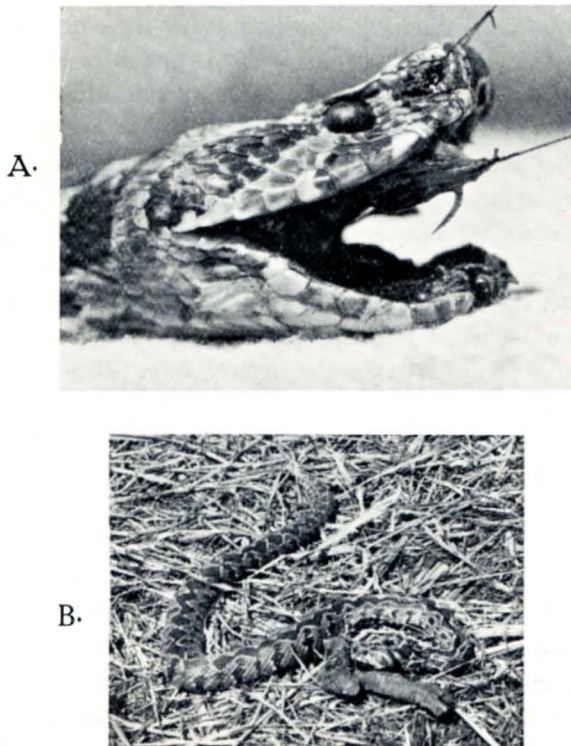


Fig. 41. *Vipera xanthina*, the only poisonous snake of the Mediterranean territories in Palestine. A. Head; B. The pattern of the body. (phot. Dr. Elkan).

Viper *Vipera xanthina* (up to 100 cm, light grey with a black-brown broad zigzag line along the back and lateral spots of the same colour). It can be recognized (like all other vipers) by its broad head and the continuation of the scales up to the mouth. It lives amid stones and shrubs, or on trees, where it rests during the day. As its activity is mainly nocturnal, it is usually seen only when it has been accidentally disturbed. Its preferred prey are birds and small mammals. Tristram observed one which had swallowed a full-grown hare whole and was unable to move after that. Another viper had just struck a quail which dropped down dead with no other mark of injury than a slight scratch close to the tips of its wing. Its bite is dangerous to man and one or two cases of death are known to the writer. The immediate use of Snake-Antitoxin lessens the danger of snake stings, considerably.

The plump Horned Cerastes (*Cerastes cornutus*) is rather common in the southern and Syrian deserts (up to 70 cm, brownish, tinted yellow with series of large brown spots on the back). It can be easily identified by the two horns behind the eyes. During the day these nocturnal snakes rest in the sand. In the southern desert Tristram's horse narrowly escaped being attacked by a *Cerastes*, which lay coiled in the depression of a camel's foot-print. Aharoni says that it does not attack people, but the warning movements of the black shining tail-tip succeed in giving one a most uncomfortable feeling. He saw one of these vipers bite two Beduins in the hot season. They recovered, after some weeks, without any special medical treatment. This, and the two following species are often reported as being attracted by the body-warmth of men sleeping in the desert. It seems, however, that as far as human beings are concerned, disasters are extremely rare. The *Cerastes* preys mainly on small rodents.

Pseudocerastes fieldi (75 cm, pale yellow-brown, tail-tip black) lives in the Syrian and Southern desert. It can be distinguished from the preceding species by a small groove behind each nasal shield, and by the presence of only one horn between the eyes.

The Efa (*Echis carinatus*; up to 60 cm, compact, light yellow-brown with irregular black-brown spots and drawings on its back) is the snake which is probably most prone to attack and bite human beings. It is common in the sandy deserts, where it rests in the sands during the day and preys on small rodents, myriapods, scorpions and other animals.

The Cobra (*Naja haje*), which was found by Tristram near Gaza, is restricted to the Southern deserts and is not very common.

It is used by the Egyptian snake charmers and it may well be that the deaf vipers of the psalmist (58,5) were cobras, which were unfit for training. It is generally straw-yellow colored and may grow to a length of 2 m. Its neck is much less inflated than that of the Indian cobra. It preys on small mammals and birds and in nature rarely attacks people. It is the only poisonous snake of Palestine, whose head is covered with shields instead of scales. When met in nature, it can be recognized by the inflated neck and the threatening attitude it assumes.

C. Lizards.—The genus *Lacerta* will always be considered the prototype of the lizards. The large Green lizard (*L. smaragdina*) lives on all the hills, but is by no means as common as Tristram states it to be (up to 50 cm long, green). The males appear, in the spring, in bright nuptial colours and fight violently among themselves. They feed mainly on insects.

L. laevis (up to 20 cm, green to grey green with a blackish lateral stripe and a series of beautiful blue spots on both sides) is the common lizard of the hills, and is met everywhere on rocks and town-walls. In the Irano-Turanian parts it is replaced by the sub-species *L. danfordii* (Petra, Hermon). This species is very variable and has been described under many names.

The Desert Lizards (*Acanthodactylus*) broaden the surface of their toes by a fringe of elongated scales. They live on sand and this is regarded as an adaptation to the environment. They attain a length of 20 cm and are generally of a yellow-brown colour. The common species, on the dunes, is *A. syriacus*, a quick running species which is active, even during the hot season. *A. boskianus* is the Desert Lizard of the Southern deserts. *A. pardalis* occurs with the two preceding ones, but is less abundant. The plump *A. robustus* lives in the Syrian desert. When in danger they escape into holes in the ground or under low shrubs. Only *A. pardalis* seems to prefer stony soil.

Eremias guttulata (up to 16 cm, with many colour patterns on its back, which is mainly yellow-brown) is common in the Southern deserts.

In the Ophisopids the eyelids have grown together, the lower one, which covers the eye, being very transparent. *Ophisops ehrenbergi* grows up to 15 cm and its brown coloring is interrupted by two pale yellow longitudinal stripes. It is common everywhere, even in the Jordan Valley. Its main habitat are bare fields and batha. In sunny weather its movements are rather quick. When followed, it always tries to escape

under low bushes, where it may be easily caught. This species is very variable. All its forms are tentatively united under the above mentioned subspecies.

The Egyptian Skink (*Scincus officinalis*) may occur in the sandy Southern deserts, but no reliable record of it is known up to date.

Mabuya septemtaeniata is abundant all over the country. *M. vittata* is much rarer.

Ablepharus pannonicus (10 cm, olive-brown with two longitudinal stripes) is a burrowing lizard with transparent eyelids which have grown together. It is known from Haifa and Jerusalem. The slenderer *A. festae*, described from Northern Transjordan, is certainly only a synonym.

The large *Eumeces syriacus* (up to 40 cm, yellow red-brown, richly dotted with red or yellow spots and a lateral yellow stripe along each side) is common everywhere. It lives on sandy and rocky soil and is very quick, on sunny days. When trying to escape, it very often enters holes which are too short for it and thus it can be easily caught. It preys mainly on large beetles and grasshoppers and it is said to require large amounts of water, to drink.

The genus *Chalcides* is an interesting one, because it displays so many variations of leg development. *C. ocellatus* (up to 20 cm, olive-yellow brown with many small transverse rows of black and white dots) appears everywhere in dry places among stones.

C. sepsoides is not uncommon in all the sandy deserts and dunes. It reaches 18 cm in length and is pale yellow with 11 pale brown longitudinal stripes. Its tail is nearly as long as its body and its legs are very rudimentary. It "swims" very quickly on loose sand. Hart found it, in Sinai, in an ant-nest of *Camponotus*.

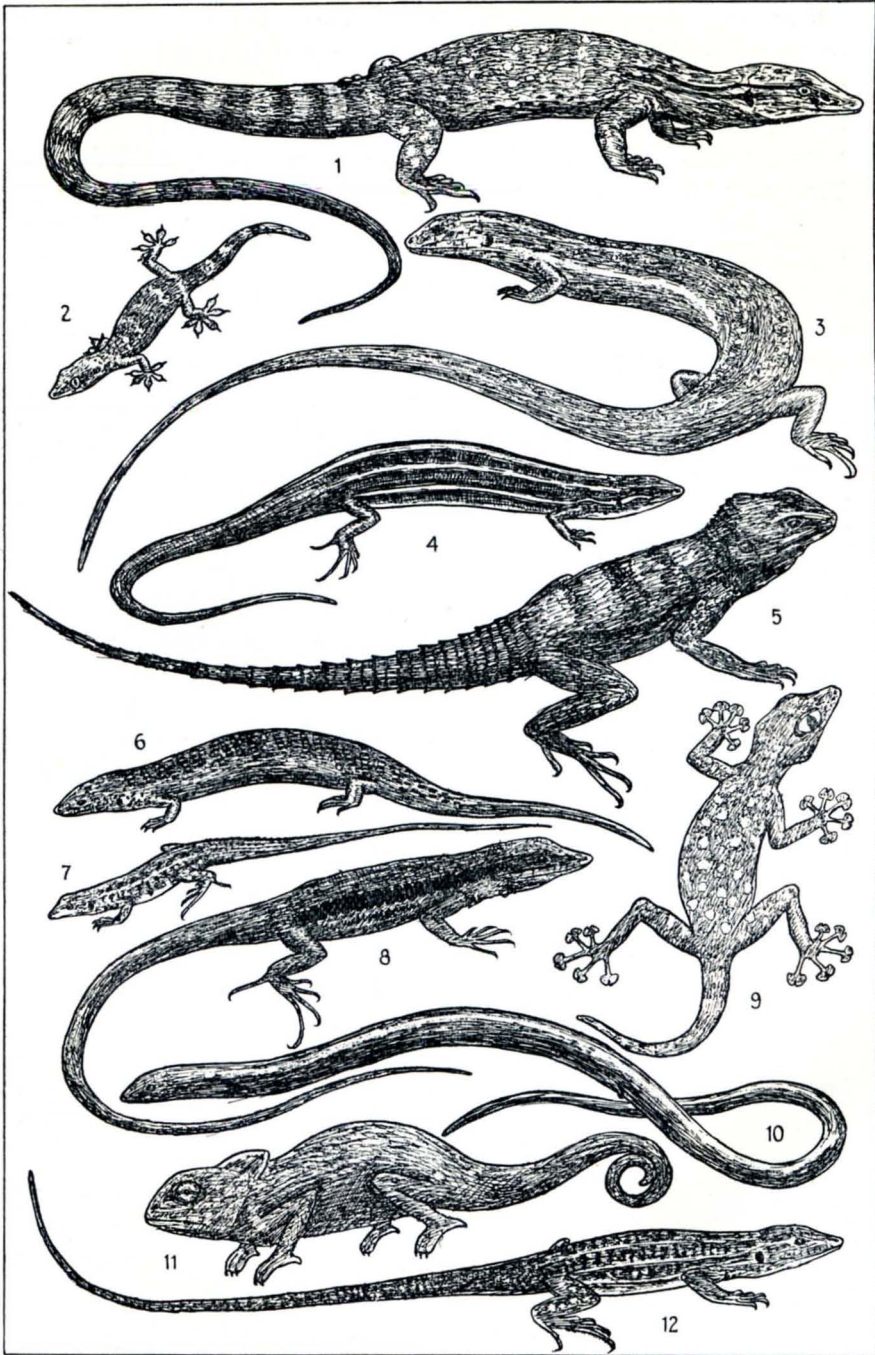
C. monodactylus (20 cm, olive-brown) greatly resembles a snake. It is peculiar to Palestine, where it is restricted to marshes. Its extremities are reduced to tiny stumps.

Another blind worm-like lizard is the yellow *Ophiomorus punctatissimus*. It lives under stones in Galilee, where it was reported by Tristram.

PLATE XIX: REPTILIA II. LIZARDS.

1. *Varanus griseus* (90 cm);
2. *Hemidactylus turcicus* (10 cm);
3. *Eumeces syriacus* (40 cm);
4. *Mabuya vittata* (20 cm);
5. *Agama stellio* (25 cm);
6. *Chalcides ocellatus* (20 cm);
7. *Ophisops ehrenbergi* (15 cm);
8. *Lacerta laevis* (18 cm);
9. *Ptyodactylus syriacus* (14 cm);
10. *Chalcides monodactylus* (30 cm);
11. *Chamaeleon chamaeleon* (28 cm);
12. *Acanthodactylus syriacus* (22 cm).

PLATE XIX: REPTILIA II. LIZARDS.



Blanus bedriagae is very much like an earth-worm. This small (20 cm long) grey-brown lizard lacks extremities and has a lateral fold on each side. Tristram and Lortet report it as not uncommon under stones near Tiberias and in the maritime plain. During the rainy season it burrows galleries in the soil into which it retreats, tail first, when the stone is upturned. It is by no means common in Palestine. The writer has never found one, in nature, here.

The giant among our lizards is the Desert Monitor or Waran, the Land Crocodile of Herodotus, *Varanus griseus*. It is common all over the sandy deserts and the dunes. It grows to a length of 130 cm and its grey body is covered with yellow spots. When caught, it is an enemy not to be trifled with. The biting power of its mouth is not to be ignored, but the powerful tail with which it deals really heavy strokes is still more dangerous. Its large eggs are laid in the sand in groups of 12—24. The Arabs use parts of this lizard in medicine. This giant is rather quick during the day (with the exception of the hottest noon-hours, in the summer). It preys on small vertebrates and larger insects.

The Nile Waran (*V. niloticus*), which can be easily distinguished by its laterally compressed tail — as compared with the round tail of *V. griseus*, — is reported by Tristram from the surroundings of the Dead Sea. This species is confined to the neighbourhood of water and must be verified anew before it can be definitely included in the list of Palestine lizards.

The Scheltopusik (*Ophiosaurus apus*) is not uncommon in the Mediterranean sections. It may grow over 1 m long, the tail constituting more than $\frac{3}{5}$ of its length. The body is snake- and cylinder-like, with a deep lateral fold on each side, which is as long as the rump. Anterior legs are lacking and the hind-legs are very rudimentary (1 mm long). It preys on small mammals, reptiles, insects, etc. When caught it does not defend itself by biting but by defecating.. The eggs are laid among herbs.

The Geckoes are a peculiar group. At the lower side of the enlarged toes they generally possess adhering disks, which enable them to run along smooth horizontal walls and even along ceilings. Their skin is richly furnished with granular scales. After casting their skin, they eat it. Their main prey are insects, for which they hunt during the night. They often appear about the light of verandas, where so many insects are attracted and assembled. All species are harmless and beneficial creatures which deserve protection.

The most common Gecko in houses is *Hemidactylus turcicus*.

It is a real pleasure to observe their activities on the verandas on warm summer-nights. In nature it lives in rocky habitats even in rather arid environments.

Ptyodactylus syriacus is likewise very common in town and is more commonly found about the light. The toes of this species are

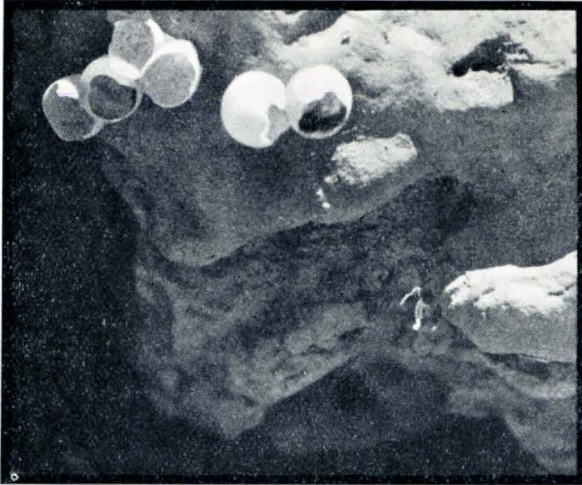


Fig. 42. Eggs of the gecko, *Ptyodactylus syriacus* pasted among rocks are fairly common in the hills of Palestine (phot. Dr. Stadelmann).

enlarged at their ends, but those of *H. turcicus* only at their base. Its singular sound "clic-clic" is characteristic. Its fairly large eggs are pasted on rocks, in shady places.

Gymnodactylus kotschy is often found in the mountains, under stones. It runs mornings and evenings, but retires at noon. The occurrence of a second species (*G. geccooides*) is extremely doubtful.

Round the Dead Sea and in the Southern deserts we meet the peculiar *Stenodactylus elegans*. It lacks any adhesive disks whatsoever and consequently cannot climb walls. It lives on the desert soil and retires beneath stones during the day. Its erect position and the slowly striding movements of its legs attract attention.

The Agamids are represented in Palestine by soil-inhabiting species only. They are broad and flat lizards with only short extremities, with which they are able to burrow. They run with an erected body, which is very characteristic. They feed mainly on insects.

The Hardoun *Agama stellio* is probably the most common and typical animal of our landscape. It grows up to 30 cm and is charac-

terized by its large body and the spiny scales, arranged circularly (not in a spiral) around the tail. Like all members of this family, they indulge in regular nodding movements of the head in warm weather. They are common in all regions, running about on rocks, walls and tree-trunks, throughout the warm season. During the few cold winter weeks they remain in holes in semi-torpor, in small groups of 6—20.

The blue-throated *A. sinaita* is similar to the Hardoun and is abundant on the rocks of the Dead Sea and the Negeb. The blue of the throat becomes very intense on hot days and is beautiful to see. *A. pallida* is found in the Southern deserts. *A. ruderata* is not uncommon over most of the country and may be distinguished from the Hardoun by a spiral arrangement of the tail-scales. *A. isolepis* and *A. persica* are inhabitants of the Irano-Turanian steppes (Syrian desert, parts of Negeb). It is not improbable that additional species of this interesting group will be discovered after further research.

The large phytophagous Mastiguer *Uromastix aegyptius* (up to 100 cm long) is not uncommon in the southern deserts. It burrows rather deep holes in the sand, which it leaves, during the day, to bask in the sun, but retires to them, during the hot noon-hours. *U. ornatus* is also reported from these districts. Further determinations of this genus are desirable.

The Chameleon (*Chamaeleo chamaeleo*) is distributed over the entire country. It is most abundant in the regions where both trees and water are present. However, it occurs even on sandy hills, where it lives on low shrubs and sometimes in holes. It is famous because of its ability to change its colour from green to yellow, grey or brown, the change being believed to be in accordance with the colour of the environment. That, however, is only partly true. It is protected mainly by its lack or slowness of movement, especially when in wait for prey (flies, etc.). It approaches the prey with extreme caution and captures it by jerking its long, viscous tongue suddenly from its mouth. Both eyes move independently of each other, which makes a rather comical impression on the observer. When irritated it inflates its body by filling its numerous lung-lappets with air. It originally came from the tropical woods but has adapted itself wonderfully to the semi-arid desert-life. It is not very active during the winter and when in captivity it does not feed during the winter months. On sunny days, on the other hand, it may be seen actively moving from place to place. In the summer, it prefers the shade of trees, during the hot hours.

D. Crocodiles and Turtles.—The recent occurrence of the Nile Crocodile (*Crocodylus vulgaris*) in Palestine has attracted a great amount of attention. The Nahr es Zerka, near Caesarea, is reported by Strabo and Plinius as the Crocodile river. Since about 1000 D.C. crusaders and geographers have continuously been reporting it as such. Schumacher in 1877 found a grey-green Crocodile, 3 m long, with 48 eggs in its abdomen, one of which is now in the Senkenberg Museum. Skins are preserved in the Museums of the Palestine Exploration Fund and of the Agricultural Department in Jerusalem. The Beduins, who inhabit the swamps, have repeatedly reported losses of human life and goats. Some individuals have been seen by reliable observers in the Kishon and possibly also in the Yarkon. They probably did not breed there, but may have arrived there by way of the shore. 5—6 specimens have actually been captured during the last century. Another specimen was found there at the end of the war. Since that time the whole swamp to the south of the Carmel has been properly drained and a flourishing settlement, Benjamina, now exists on their main breeding place. It is almost certain that the Nile Crocodile is definitely gone and that it should be added to the list of the extinct species.

Palestine is the only locality, besides Africa, where it has lived. From the zoogeographical point of view, however, its occurrence here is no more difficult to understand than its presence in Africa Minor, north of the Sahara, where it likewise seems to have been extinct for the past few years only.

Tortoises are extremely abundant in Palestine. The most common species is the Mauritanian Tortoise (*Testudo ibera*), which is most abundant in the plains (up to 25 m. long). It is vegetarian, but does not disdain worms and slugs. It may frequently be found on mammal excrement. Its food requirements are extremely modest. In an experiment an individual lived for over a year without any food. The experiment was then interrupted. Its weight was reduced during that period to about 25% of its former weight. In the spring the knocking sounds of the courting males are very characteristic in this country. The tiny variety found in the Negeb may be called *T. floweri*, in honor of the well-known zoologist.

It is replaced by the Desert Tortoise (*T. leithii*) at El-Arish. This small, pale yellow-green species (up to 12 cm.) is common in sandy places. Its status in Palestine still requires special study.

The Terrapin *Clemmys rivulata* (lower shield uniform) is abundant

in all the waters. They may be found by hundreds on the borders of ponds, rivulets and lakes. When approached, they "jump" into the water, dive and hide themselves in the mud at the bottom. Tristram reports that they seize and drag any killed or wounded bird under water with extraordinary promptness.

The European Terrapin (*Emys orbicularis*; lower shield articulated) is only met with in Lake Tiberias and Huleh, where it attains a considerable size. Both fresh-water Terrapins live by preying mainly on fishes. A *Clemmys* died in the winter after having lived for three months without food (27% loss of body weight).

E. Amphibians. Neither newt nor salamander were known from Palestine even as short a time as ten years ago. Nevertheless, they are now rather common on suitable habitats in all Mediterranean sections.

In the southern coast-plain and in the hills on the borders of Nahr Rubin or Wadi Musrara, in marshes, etc., the small newt *Triton chuldaensis* (up to 9 cm.) is not rare. Its tadpoles may be easily caught in the spring, but it is difficult to find adult individuals in nature. This is true for all Urodela. They must be decidedly nocturnal, throughout the dry season, and probably rest during the day. In Northern Palestine we meet the Syrian form of the same newt *T. vittatus*, which was rather common in Ain Bedda and in Upper Galilee.

It is most surprising that the large and conspicuous Fire Salamander (*Salamandra maculosa*) could so long escape attention. It occurs in Upper Galilee and on the Carmel rather commonly, but Mr. Margolin discovered large tadpoles of the species even in Wadi Musrara. It grows to a length of 26 cm. Its colour is a preponderant black with large sulfur-yellow spots. Whilst our newt is much smaller than the Syrian individuals, the Salamander does not display any signs of stunting. They do not enter the desert area. (No Urodel enters such areas). The presence of *S. maculosa* in Palestine in hard waters, which are rich in lime content, contradicts the opinion that it is hostile to lime.

The Green Toad (*Bufo viridis*; up to 10 cm long, grey-green with large olive to black-green spots and many warts) is the common toad of the country. It is found in multitudes in all moist places, but even in relatively dry places, like Jerusalem, it is rather abundant. On rainy days, in the evening and during the night, they withdraw to their soil-holes. They prey on insects. The species is extremely variable in colour and design. It also lives in the desert and tolerates arid conditions well.

The Desert Toad (*B. regularis*), which is only reported from Petra, is even more tolerant of the desert to which it is restricted.

Pelobates syriacus resembles the Green Toad in size, colour and pattern to such a degree that it is not easy to distinguish between them in nature. It looks more frog-like, however, has a smooth skin and possesses a large, sharp and horny burrowing-callosity on the metatarsus. It is common in the plains, where it lives mainly on light soils, burrowing its holes fairly quickly. It preys during the night.

The Edible Frog (*Rana ridibunda*) is very abundant. An amazing number of these frogs is encountered in every body of water "deafening the weary traveller through the long night. In no other country have I seen the frog population so dense" (Tristram). They are abundant in the perennial waters throughout the year.

The lemon-yellow Tree Frog (*Hyla savignyi*) is also abundant near water and swamps in the coast-plain and in the Jordan Valley, and is less common in the mountains. It sits motionless during the summer-noon on the top of the Papyrus bushes in swamps.

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