

their uses as experimental animals. The information so far obtained by the methods described suggests, however, that further investigation of such material would not only be possible, but profitable.

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NOTES ON FERTILISATION, THE INCUBATION PERIOD AND HYBRIDISATION IN *LACERTA*

By

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The following observations have been made upon lizards of the genus *Lacerta*, kept in outdoor vivaria which provide near-natural surroundings.

In *L. muralis* and *L. viridis* mating and egg-laying occur regularly during the summer, the eggs being buried in the soil or under large stones. In the outdoor reptilium of the Bristol Zoo, where some dozens of these lizards are kept, literally hundreds of eggs are laid every year, yet none have ever been known to hatch even in the best seasons. The embryos do, however, reach an advanced stage of development before perishing. It is interesting to note that the eggs of *L. agilis*, in the same outdoor vivarium conditions, hatched after a normal incubation period of 60 days.

Introduced colonies of *L. muralis* and its subspecies now exist in South Devon, the Isle of Wight and Surrey (Taylor 1963, Frazer 1964). The latter colony was started over twenty years ago and breeding is said to occur regularly (Smith, 1954). Such colonies are of special interest since vivarium experiments indicate that hatching of the eggs under natural conditions in this country is unlikely.

THE INCUBATION PERIOD.

Eggs of *L. muralis*, maintained at different temperatures, and in conditions otherwise similar (Cooper, 1958) have indicated that the rate of development is affected directly by temperature and can vary widely:—

<i>Incubation temperature</i>	<i>Incubation period</i>
65–70°F by day, 55 at night	122 – 160 days.
70°F by day, 60 at night	78 – 92 days.
75°F by day, 60 at night	51 – 53 days.
80°F day and night	46 days.

It seems improbable that sufficiently high natural soil temperatures to hatch the eggs would be found, and incubation periods of over five months would certainly be too long for our seasons.

FERTILISATION.

There is strong evidence that in *L. muralis* (and others of the genus) the eggs are carried for almost exactly one month after fertilisation. The figure of one month is affected only slightly by weather conditions, which is surprising, since the incubation period of the eggs is so markedly affected by temperature. During a fine season in this country, a mature female

L. muralis produces up to three clutches of eggs at monthly intervals. Always sexual activity ceases abruptly after fertilisation has occurred and is resumed immediately after the eggs have been laid. For instance, a female *L. muralis* laid eggs on May 16th, June 18th and July 18th, and mating was observed within two days after each laying. Separate fertilisation for each clutch also seems necessary. Females without a mate often lay eggs at the normal intervals, and such eggs are invariably infertile. Furthermore, if a female lays a normal first clutch, and is then deprived of a mate, later clutches are infertile. It appears that delayed fertilisation does not occur in *L. muralis*, though it is known to occur in many reptiles.

The male *L. muralis* can fertilise numerous females and a ratio of one male to seven females has been known to produce thirteen clutches of fertile eggs in a season.

HYBRIDISATION.

Numerous instances of cross-breeding among reptiles are on record, but few references to the genus *Lacerta* can be found. Rollinat (1934) described unsuccessful attempts at breeding between *L. agilis* and *L. viridis*, in which mating was observed, but all the eggs proved to be infertile.

The following two hybrids have been produced between subspecies of *Lacerta*.

L. muralis nigriventris and *L. muralis brueggemanni*.

These subspecies are so closely related that cross-breeding is not surprising. A female *L. muralis brueggemanni*, which had already bred with a male of the same subspecies, produced two clutches of eggs by a male *L. muralis nigriventris* and one of the resultant young is still alive, aged two years. Its colouration and markings could identify it with either parent since the subspecies in question intergrade in this respect.

L. lilfordi lilfordi and *L. lilfordi brauni*.

These subspecies interbred during the seasons of 1958 and '59, despite the great differences in their appearance. Two eggs were produced on each occasion, and the resultant hybrids were male and female in each case. Their colouration and markings showed features which are interesting.

Male parent, *L. lilfordi brauni*. Greenish grey dorsal surface with a pronounced pattern of dark markings including longitudinal lines and discrete spots. Pale greenish grey ventral surface, including the throat, without markings.

Female parent, *L. lilfordi lilfordi*. Jet black dorsal surface and brilliant deep blue ventral surface.

HYBRID YOUNG.

	<i>Dorsal surface</i>	<i>Ventral surface</i>	<i>Throat</i>	<i>Tail</i>
Male	Rich brown with markings as male parent, spots predominating.	Pale blue	Intense blue	Bright green
Female	Paler brown with markings as male parent. Longitudinal stripes predominating.	Pale blue	Pale blue	Bright green

Bright colouring of the tail is common in the young of many species in the family Lacertidae (Boulenger, 1920) and the colour usually fades with increasing age.

In many lizards, longitudinal stripes are more pronounced and common in the female, and vivid colouration of the throat is more common in the male. In the hybrids described, these sexual differences became marked, although they did not occur in either parent.

One of the hybrids, a female, lived for three years, but no opportunity arose to assess its fertility.

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HERPETOLOGICAL NOTES ON RHODES

By

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Rhodes is an island in the eastern Mediterranean, approximately 100 miles to the north-east of Crete, and a mere 15-20 miles from the western part of the south coast of Turkey. Politically, its history has been varied: originally the site of three Greek cities (Lindos, Rhodes and Kamiros) which were merged two thousand years ago in the major one of Rhodes itself, it was at that time famous for one of the Wonders of the World, the Colossus, a gigantic bronze figure said to have stood by the entrance to the old harbour of Mandraki.

In A.D. 1306, the island was sold by the governor to the Knights of St. John, who built the present fortifications around the city of Rhodes, so that it became renowned at that time as the best fortified city in the world. Here the knights held out as a bastion against the forces of Islam, until after a long campaign the island finally fell (as the result of treachery) to Suleiman the Magnificent in the year 1522. After this, it remained in the hands of the Turks until 1912, when it was taken by Italy, and only in 1948 was it handed over again to Greece.

To a chequered political history may be added ecological changes which have left their mark on the island. Volcanic in origin, it has been severely weathered in recent millenia. Pine forests have been denuded, and woodland is now very rare in the northern part of the island. Great rivers have obviously run in former times from the now bare mountain tops (rising to 3,000 ft.), and apart from the season of the autumn rains their valleys exist as dry wadis with an occasional trickling stream or shallow pool of permanent water. The deepest of these pools are only a foot or so in depth. The land is arid, and by the month of May the level of the permanent water may be as much as 20 ft. below the surface of the riverbed. Wells are dug in this and the water pumped up (often by the use of windmills), both for direct irrigation along permanent channels and by means of small tanks which contain standing water to a depth of 6 ft. or so.

Not only is the climate a dry one, with the main rains in the autumn, but it is warm and sunny. Mean temperatures vary from 55°C in January to 83°C in August. Grain crops, oranges and tomatoes are already being harvested by May, and later crops include grapes, melons, figs and olives. While some areas in the north of the island are relatively bare, with an aspect reminiscent of Aden or Ingleborough, in this part other areas are well-wooded, with natural regeneration of pine occurring. Elsewhere, the slopes are covered with a maquis type of prickly scrub, very floriferous, but remarkably free of insects, save for aphids and whiteflies, with a varied hymenopterous fauna and a large number of robber-flies. In places, grasshoppers of various types are abundant.

Cultivation occurs not only on the slopes and in the flatter enclosed fields, but in the outlying parts of the dry river wadis, where the presence of orchards or young plantations suggests that the peripheral floodplain is no longer subject to any major water flow. On the flatter lands, cultivation is fairly continuous in small fields, frequently protected from the wind by brushwood or even fences of bamboo. On the slopes, crops are grown briefly, and the land then reverts to the maquis. Orchards of olives or figs make a type of parkland, where the grazing asses, ponies, sheep or goats are tethered, or the orchards may carry grain or other crops, even close against the trees. Hedges as such are non-existent, but scrub and bushes are plentiful, such species as oleander (*Nereus oleander*) being especially abundant in the dry river wadis and along their edges.

Walls are a particular habitat to be found among both modern and ancient sites. Either type of place may have close-set stones with little mortar between them, or rough drystone walling with plenty of crevices which can give shelter to lizards. Vegetation may cluster round the foot of these, or the wall may more rarely be clear of it. Many of the former Italian houses and farmsteads are now tumbling into ruin, and form a similar habitat.

Little appears to have been published about the herpetology of Rhodes, though in ancient times it was particularly known as the Island of Serpents, and was also notorious as a haunt of lizards. Both these are said to have diminished in recent times, presumably with the increasing dryness of the climate and the increase in land reclamation by man. An opportunity was taken to make a somewhat cursory examination of the reptile and amphibian fauna during the course of an entomological expedition to Rhodes in 1964.

Wetland habitats.

In the drier parts of river wadis the Green Lizard (*Lacerta viridis meridionalis*) was found commonly, especially around the vegetation massed along the banks, though occasionally well out into the wadi. Adults could be found as little as 10 yards apart, and occasionally in pairs together. Another lizard (*Mabuya vittata?*) could also be found in similar terrain. Both species are very shy, and retreat rapidly through the dead leaves and bushes as soon as they are aware of human presence. On the bushes may sometimes be seen treefrogs (*Hyla savignyi*). On one occasion, a snake (*Natrix natrix persa*) was found proceeding in the full heat of the afternoon along a completely dry wadi.

The wetter parts of the wadis are inhabited by terrapins (*Clemmys caspica rivulata*) and by edible frogs (*Rana esculenta*). The former may be