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# BRITISH JOURNAL OF HERPETOLOGY

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Contributions should be addressed to the Editor, Dr. A. d'A. Bellairs, University Department of Anatomy, Cambridge. Articles should be typed in double spacing, on one side of the paper only. Figures should be drawn in Indian ink on plain white paper or Bristol Board.

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## FROG AND TOAD BREEDING RECORDS FOR 1952

*Compiled from the phenological reports sent in  
to the British Herpetological Society*

By

J. F. D. FRAZER

The weather summary for the months concerned with spawning have been taken from the Monthly Weather Reports of the Meteorological Office published by H.M. Stationery Office.

December 1951.—Mean temperature exceeded the average by 1.9°F. in England, 0.8°F. in Scotland. A cold spell occurred from about 10th to 13th, severe frosts being fairly widespread. It was very mild on the 4th and 5th and 15th to 20th. Extreme temperatures for the month included (England and Wales) 59°F. at Hawarden on the 16th, 13°F. at Thetford on 13th. Rain: Less than 75% of average over most of E. Scotland and England as well as parts of S.W. England. A large excess over much of N. Wales, N.W. England and W. Scotland. Summary: Mainly rather mild, dry in E. and S., wet in W.

January 1952.—Mean temperature was below average by 2.3°F. in England and Wales, 4.8°F. in Scotland. In Scotland it was the coldest January since the very cold January of 1945. Very cold from 17th to 31st. Extremes: (England and Wales) 56°F. at Poole and Teignmouth on 10th, 2°F. at Shawbury on 27th; (Scotland) 55°F. at Perth on 6th, 1°F. at Logie Coldstone on 30th. Rain: (England and Wales) more than average in W., less than in E.; (Scotland) more than average in W. coastal areas, less than in S.E. Summary: Sunny and cold with frequent snow.

February 1952.—Mean temperatures below average by 1.5°F. in England and Wales, 0.7°F. in Scotland. The first 16 days were mainly cold, particularly the week ending on 16th. Remainder of month milder on the whole. The week ending on 23rd was very mild in the northern half of the country. Extremes: (England and Wales) 56°F. at Dishforth on 23rd and Poole on 29th, 10°F. at Bellingham on 13th; (Scotland) 57°F. at Stonehaven on 18th, 12°F. at Dalwhinnie on 12th. Rain: Less than average over most of Scotland, less than 25 per cent. of average over many parts of England. Summary: Dry and sunny on the whole; cold 1st to 16th.

March 1952.—Mean temperatures exceeded average by 1.9°F. in England and Wales, 1.5°F. in Scotland. Generally very mild from 2nd to 12th and 16th to 22nd. From 13th to 15th rather cold, maximum 39°F. at Elmdow; exceptionally cold from 27th onwards. Extremes: (England and Wales) 63°F. at Boxworth on 3rd, 16°F. at Kiedler Castle on 15th; (Scotland) 60°F. at Kelso on 18th, 15°F. at Dalwhinnie on 30th. Rain: Parts of N. and C. Wales and much of N. England less than 75 per cent. of average, but elsewhere a considerable excess. Summary: Mainly mild until 25th, then cold and wintry. Rather dull.

It might have been expected from this weather report that the early breeders would not start until about mid-February. In this country, the first localities for frogspawn are usually in Devon and Cornwall, and it is seen from table 1 that breeding was delayed until the first week of February. A word of explanation about this table is necessary here. In the first place, the date of spawning is represented by a number or numbers

showing the actual day in the year. Thus January 10th is represented by 10, February 1st by 32 and March 1st (in this leap year) by 61. Further, where two numbers are given, the first represents the date of first spawning and the second the day when spawn was abundant. Thus, while the earliest Devon frogs had spawned on February 3rd, spawn was not abundant until the 14th (S. Molton) and in other Devon and Cornish localities not until the first week of March.

From the data in table 1, it is only possible to say that the spawning (unless slowed up by cold weather, as in Devon and Cornwall and as in the late mid-Herts. river spawning) was normally spread over a few days only in any one locality. In some places (*e.g.* Alton) the dates of first spawning and abundance coincided completely. The type of site used varied from cartrut to river, and the depth of water from two inches to three feet. The soil and type of bottom could be anything, and the presence or absence of weed apparently did not influence the spawning.

The records of temperature are not yet sufficient for argument, but figure 1 gives a plot of temperatures at Benderloch, Argyll, over the last six years. In this, each line represents the daily fluctuation in temperature, the top of the line corresponding to the maximum and the bottom to the minimum temperature recorded. The arrow corresponds to the date when frogspawn was first noted. This figure has been drawn from data kindly supplied by Miss Davidson. Examination of it shows that, although spawning occurred on variable dates, it was always after a general upward trend in the air temperature. The minimum air temperature was usually around 40°F. or more at the time, the lowest minimum recorded being 36°F. It may be argued that the air temperature would not be reflected in the water, and that the water temperature is more likely to be the one influencing spawning. Records, however, from three observers show that although the water temperature may be as much as 7°F. below the air temperature, changes in either are followed very closely by the other. Any sudden change in the air temperature tends to be smoothed out in the water, and an occasional sudden drop in temperature may leave the water a degree or so above the air. This is shown very well by fig. 2, which gives the Hendon record from figures supplied by C. A. Rose. Speaking generally, records from 7 English localities showed spawning as occurring after a rise in temperature. One may perhaps surmise that one reason for the lateness of the one river spawning might be that the water temperature in this is presumably not so high as that in shallower still waters. As the frogs also hibernate in this river, emergence from hibernation as well as breeding could also be affected by such a factor.

Examination of the toad records (table 2) showed that the Devon ones started spawning the earliest (February 28th), but spawn was not abundant at Bideford until April 1st, several days after the toads in other southern localities had completed their spawning. No explanation for this prolonged

spawning season is apparent. The Yorkshire toads were later than those in the South of England, where the start of spawning was remarkably uniform. In some localities, there was overlap with the frog breeding season, and at Hastings the toads were actually recorded as spawning before the frogs. Apart from the Windermere records (which are treated separately elsewhere), breeding sites were at depths ranging from 6 inches to 10 feet, over various types of bottom; weed might or might not be present. In the absence of weed, spawn was attached to rushes or tree-roots. Records were only returned from 15 sites, so that it is impossible to generalize on any findings.

The arrival of both frogs and toads at the breeding sites was noted by many observers. The interval before spawning varied in different parts of the country. At Alton, frogspawn was abundant the first day that frogs were seen in the water; while in Westmoreland (3 localities), the interval was a fortnight to three weeks. At Haslemere, Wallington and Hastings the delay was 3-4 days, yet just North of London (Hoddesdon and Hendon) 13-14 days, and at Ilford 3½ weeks. Once spawn was abundant, the frogs remained for further varying lengths of time (as distinct from a few localities where they spend the whole summer in the water). At Hastings, they left the same night, and in other Southern localities were noted for up to 11 days. Above the 53rd parallel they remained for longer periods, records having been received of 6 (Yorkshire), 9, 10, 11, 27 and 34 days. From the West Country, intervals of 14 (Devon) and 18 (Clevedon) days were recorded.

Toads were recorded as reaching the breeding pond anything from 0 to 11 days before breeding commenced, and remained between 3 and 11 days after spawn was abundant (6 localities). In Yorkshire, most left the water 13 days after abundance of spawn, but stragglers remained for a further fortnight.

One record was received of the passage of young metamorphosed froglets away from the breeding pond. This was on Hampstead Heath on June 22nd. There had been heavy rain about 3 p.m., and by 7.30 p.m. the migration was in full swing (when it was watched for a quarter of an hour). The froglets were moving uphill across a road on a 50 foot front in a north-easterly direction: they were described as "quite thick on the road" and were suffering heavy losses from small boys.

One other fact has emerged from the 1952 records. From three separate localities a scarcity of toads over the last few years has been reported. This was reported from Southampton, while near Guildford a former breeding pond remained free of both toads and tadpoles in 1952. It has also been noted from Chilham, Kent (D. Stainer), that there has been "an alarming drop in the number of toads resorting to lake since 1949". In 1949 he had noted "Lake nearly dry. Great expanse of mud seething with toads". Perhaps such drying up of the breeding haunts for one season may be responsible for local scarcity of toads.

Finally, I should like to express my thanks to all those who sent in records or supplied other information on which portions of this paper have been based.

TABLE 1  
MAIN DATA FROM FROG RECORDS

Locality and observer	Site and depth	Date of spawning	Bottom, etc.
<b>DEVON</b>			
S. Molton (M. L. Elliott)	Old sheep dip (3 in.)	34-45	Deep mud, no weeds
Wrangston (700 ft.) (H. G. Hurrell)	Pond (Few in.-2 ft.)	39-72	Concrete, no weeds
<b>CORNWALL</b>			
Truro (A. M. Leadley Brown)	Stream (6 in.)	50-66	Mossy, no weeds
<b>SOMERSET</b>			
Bristol (C. E. Dyte)	Pond (6 in.)	65-66	Cement, with weeds
<b>LANCASHIRE</b>			
Graythwaite (K. Shepherd)	Cartrut (6 in.)	61	Peat mud
Preston (J. Brindle)	Ponds (3 in.)	63-71	Grass on clay
Lotterbarrow (J. D. Allonby)	Pool on path (5 in.)	66	Clay and grass
	Pond (2 ft.)	70	Mud, with weed
Mossley (256 ft.) (R. D. Fielding)	Pond (6 in.)	68-70	Grassy clay, with weeds
<b>WESTMORELAND</b>			
Loughrigg (A. Dixon)	Pond (12 in.)	66	Boggy, with weeds
Patterdale (A. J. Berry)	Pond (2 ft.)	66-69	Rocky, with weeds
Grasmere (J. D. Allonby)	Pond A (3-6 in.)	66	Muddy, with weeds
	Pond B (12 in.)	69 (Abundant)	" "
Windermere (J. D. Allonby)	Stream (3 in.)	72	Stones, no weed
	Pond (18 in.)	72	Rock and mud, little weed
<b>HAMPSHIRE</b>			
Brockenhurst (O. Hook)	Pools (6 in.)	Before 76	Marshy, with weed
Alton (450 ft.) (R. H. Ahrenfeldt)	Ditch (12-18 in.)	73	Muddy with weed
<b>SURREY</b>			
Haslemere (J. Clegg)	Pond	61-?	Clay, with weed
" (P. Farrer)	Pond (1 ft.)	64-68	Mud, with weed
Wallington (B. Hyde)	Stream (8-9 in.)	63-68	Chalk, no weeds
Woking (M. Smith)	Pond (6 in.)	64-67	Mud, with weed
Dorking (J. F. D. Frazer)	Pond (12 in.)	Before 74	Clay
Lingfield (E. M. Atkins)	?	80	—
<b>SUSSEX</b>			
Hastings (B. Hutchinson)	Pond (2-16 in.)	81-83	Muddy
<b>MIDDLESEX</b>			
Hendon (C. A. Rose)	Pond (3 in.)	81-82	Gravel, with weeds

<b>ESSEX</b>			
Ilford (C. E. C. Cole)	Pond	79-88	No weed
Eastwood (B. James)	Pond (32 in.)	70	Mud, with grass
<b>HERTFORDSHIRE</b>			
Hoddesdon (J. R. L. Carter)	Gravel pit (4-12 in.)	77-79	Mossy
Mid-Herts. (J. I. Menzies)	River (6-36 in.)	84-96	Muddy, with plants
<b>STAFFORDSHIRE</b>			
Tipton (J. V. Tranter)	Pond (4-5 in.)	81	Grass on Clay
<b>YORKSHIRE</b>			
Glusburn (A. Butterfield)	Pond A (6 in.)	67-69	Loam, with <i>elodea</i>
	Pond B (2 ft.)	72-75	Loam, with <i>myriophyllum</i>
Bradford (J. S. Binns)	Pond (9½ in.)	74-77	Sandy, with weed
Robin Hood's Bay (A. Rowlands)	Pond	Before 83	Muddy, with weed
<b>ARGYLLSHIRE</b>			
Benderloch (E. M. Davidson)	Pond (12-18 in.)	63	Peaty mud
<b>ABERDEENSHIRE</b>			
Braemar (1100 ft.) (J. H. Cumming)	Pond (6 in.)	67-69	Mossy, no weeds
<b>BANFFSHIRE</b>			
Cabrach (1000 ft.) (A. Rattray)	Pond (9 in.)	74-?	Reedy, with weeds
<b>SHETLAND ISLES</b>			
Lerwick (L. S. V. Venables)	Pond (18 in.?)	56-61	—

TABLE 2  
MAIN DATA FROM TOAD RECORDS

Locality and observer	Site and depth	Date of spawning	Bottom, etc.
<b>DEVON</b>			
Bideford (M. L. Elliott)	Reservoir (Up to 2 ft.)	59-92	Stony, no weed
<b>SOMERSET</b>			
Bristol (C. E. Dyte)	Pond (6-14 in.)	70	Mud, with weed
Clevedon (C. E. Dyte)	Ditch (8-12 in.)	75	Mud, slight weed
<b>SURREY</b>			
Cheam (R. C. Hinton)	Pond (14 in.)	79-?	Muddy, with weed
Ranmore (B. Hyde)	Pond (10-18 in.)	76-83	Clay, with weed
Dorking (J. F. D. Frazer)	Pond (Over 2 ft.)	74	" "
Camberley (M. Smith)	A. Lake (3-4 ft.)	79-81	Sand, no weed
	B. Pond (8-10 ft.)	79-81	Sand, with weed
<b>SUSSEX</b>			
St. Leonards (R. I. Shepherd)	Reservoir (1 ft.)	73-75	Clay, with weed
Hastings (B. Hutchinson)	Pond (2-18 in.)	79-81	Humus, with weed
Hurstpierpoint (J. E. Heriot)	Lake (18 in.)	75-?	Mud, no weed
Hastings (Mrs. Inskipp)	Pond (10-12 in.)	75-82	Leafmould, with weed

HANTS.			
Brockenhurst (O. Hook)	Pools (1 ft.)	76	Loam, with weed
ESSEX			
Thorpe Bay (B. James)	Pond (12-18 in.)	76-82	Clay, with rushes
YORKSHIRE			
Robin Hood's Bay			
(A. Rowlands)	Pond (1-2 ft.)	83-85	Muddy, with weed
Kirkburton (325 ft.) (E. Lees)	Small reservoir (2-3 ft.)	81-88	Sandy clay, with weed

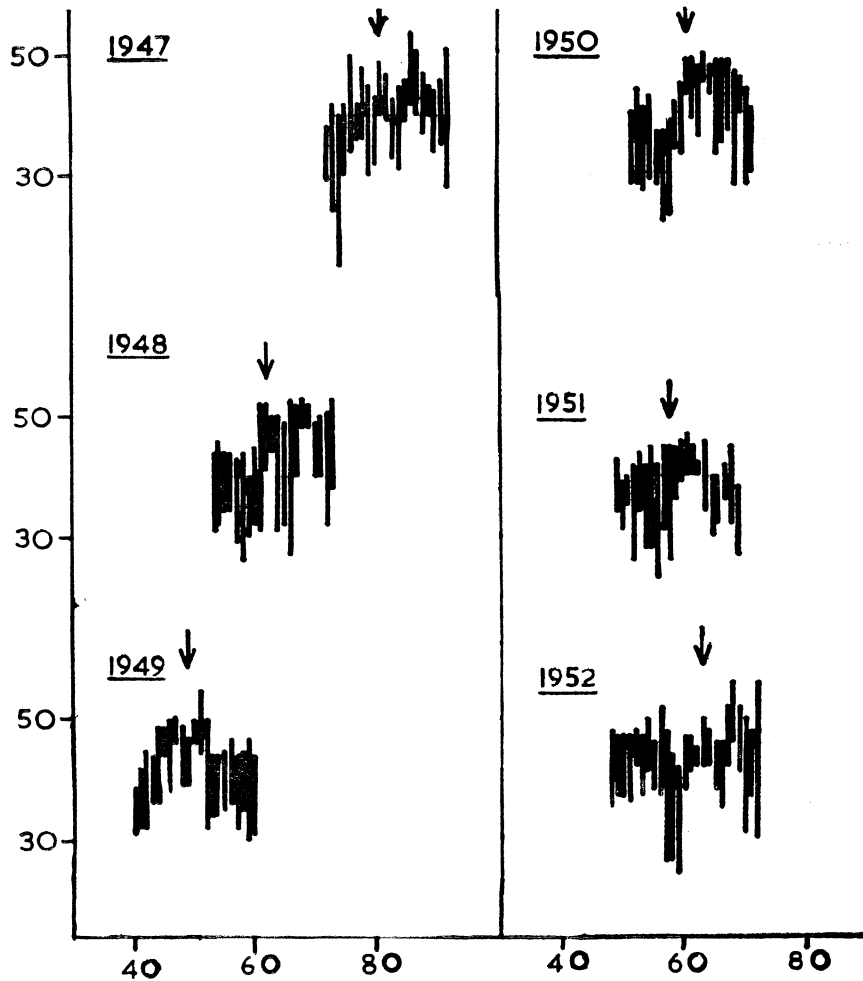


Fig. 1. Daily maximum and minimum temperatures at Benderloch, Argyllshire, during the frog breeding seasons 1947-1952. Temperatures are plotted in degrees Fahrenheit on the vertical axis, days of the year on the horizontal axis.

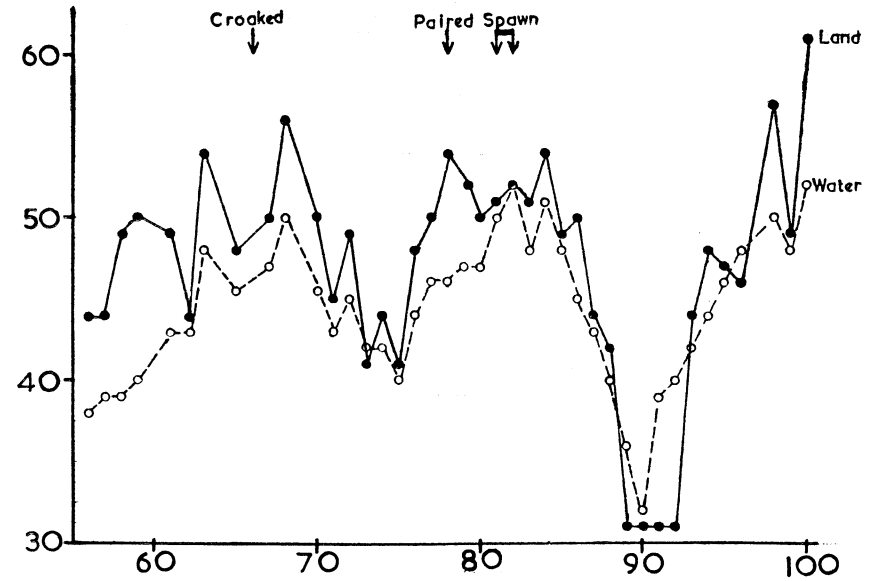


Fig. 2. Land and water temperatures at Hendon during Spring, 1952. Plotted as in Fig. 1.

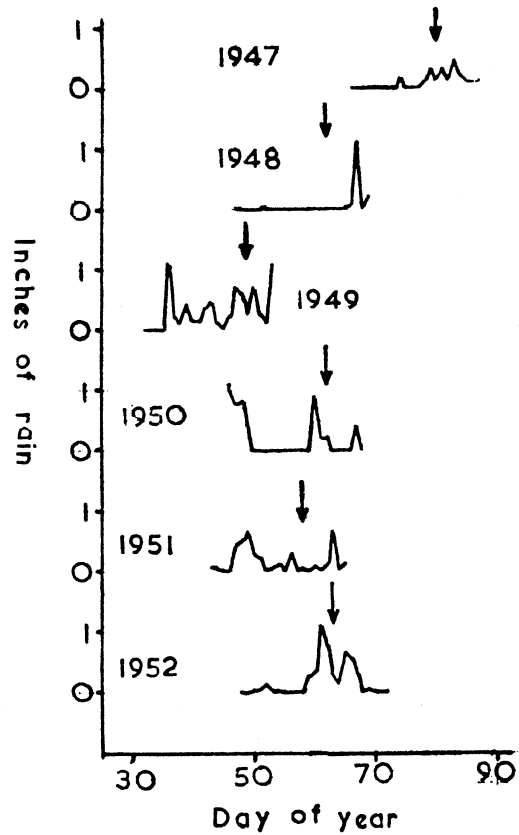


Fig. 3. Rainfall.

NOTES

THE BREEDING OF FLIES AS FOOD FOR AMPHIBIA  
DURING SUMMER AND WINTER MONTHS

*Rana temporaria* required for experimental purposes in a laboratory are prevented from hibernation. Both *Rana* and *Bufo* have been maintained healthy through the winter by twice weekly feeding with blow flies (*Lucilia* sp.). The purpose of this communication is to describe the method by which an abundant supply of flies can be assured.

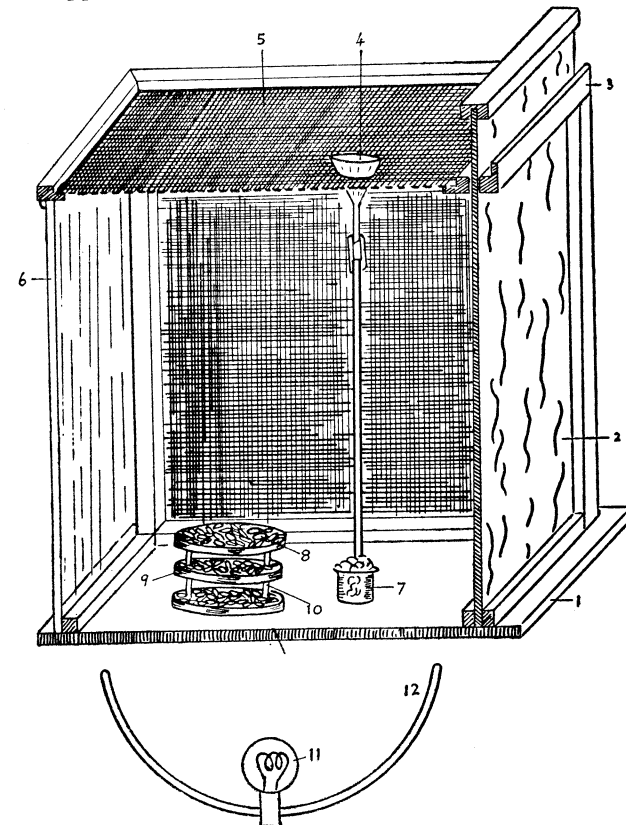


DIAGRAM OF FLY BREEDING CAGE (1 cm. : 1 in.)

1. Asbestos-concrete base. 2. Sliding panel (wood). 3. Rim for attachment of sleeve. 4. Funnel and glass tube. 5. Perforated zinc. 6. Glass panel. 7. Beaker holding cotton wool soaked in 20% glucose solution. 8. Fly pupae. 9. Petri dish. 10. Support for petri dish. 11. Carbon filament lamp. 12. Reflector.

A 12" square wooden frame supports a box of the following structure. Two opposite sides and the top are made of perforated zinc (2 mm. perforations) to allow ventilation. The third side is of glass, allowing observation, and the fourth is a sliding panel of plywood. The floor of the cage is constructed of asbestos-concrete sheeting. Heat is radiated from a carbon filament lamp in a reflector suspended underneath the cage (11 and 12 in fig.).

The pupae, which can be obtained from the Buckingham Bait Co., Preston Basset, Bucks., are accommodated in petri dishes stacked on metal supports. The flies are fed with a 20% glucose solution from a container filled with cotton wool. The container can be refilled without opening the cage through a funnel and tube (4 and 7).

For the purpose of removing flies, a one yard calico sleeve, open at both ends, is attached to the cage. A rubber band is sewn into the edge of the sleeve. The band is stretched from under the bottom of the cage to extend over the ridge at the top (3). The panel is then lifted, the operator passes his hand through the sleeve into the box and scoops flies into a 1" x 6" glass test tube. The optimal temperature for the metamorphosis of flies is 20°C., but the number of flies obtained depends as much on the quality of the pupae obtained as on the temperature of the cage.

EDWARD ELKAN, Group 9 Laboratory, Shrodells Hospital, Watford.

#### BREEDING OF THE GREEN LIZARD (*LACERTA VIRIDIS*) IN ENGLAND

In April 1952 a pair of Green Lizards were purchased from a dealer. They were said to have come from Italy and had not been long in captivity. At the end of April courtship was observed on several occasions. This was of the standard lacertid type, the male biting the tail of the female, each time nearer to the body, until finally the abdomen was reached. Actual mating was not witnessed. Three to four weeks later, by the increase in the size of the body of the female, it was evident that she was gravid. About seven weeks after mating the position of the eggs in the body could be seen externally and could be felt on palpation. The lizard also became more sluggish in its movements than before, and tamer.

During the mating period the lizards were kept indoors in a vivarium and only put out of doors on hot days. As soon as the weather was warmer they were transferred to a reptiliary out of doors. This is 9 ft. by 5 ft., and 3 ft. deep, enclosing a small moat 9 inches wide by 3 inches deep, and an island with rocks, moss, plants and heather. The inner walls are glazed to prevent climbing and the whole is covered with a wire frame to prevent cats and birds from entering.

On June 17th the female was seen to crawl under a flat rock, and several hours later emerged, having laid her eggs. These, 14 in number, were removed and placed in a wide-necked jar with sand. They were then partially covered and water to moisten the sand was run down the inside so that it did not come into contact with the eggs. The jar was then floated in a tropical fish tank which maintained a temperature of 75°-80°F. A piece of glass was placed on the aquarium; this collected the moisture evaporating from the sand which condensed on the glass and dripped back into the jar. In this way the sand was kept damp.

The eggs when first laid were about 15 mm. long and oval in shape. Three weeks later they were distinctly larger and darker in colour. About five weeks after laying they had attained their full size and in some of them the embryo could be seen, its situation being indicated by a dark blob. The embryo became more noticeable a week or so before hatching, and was seen to move about, exceedingly slowly.

On August 15th, exactly eight weeks after being laid, the first eggs hatched. A watch was kept and as soon as the lizard began to break through the egg was removed; the first sign of emergence was the appearance of a tiny slit about one-eighth of an inch long, in the parchment-like shell\*. Some of the eggs were accidentally turned so that the dark blob, marking the site of the embryo, was underneath. This proved fatal, since after rupturing the shell, the head of the emerging lizard became buried in the sand, moistened with escaping albumen, so that it was unable to breathe and died. In the case of those young that hatched successfully, about half an hour or more elapsed before the lizard finally freed itself and left the shell. Most of the young emerged with the yolk and umbilical cord still attached to the body. Nine of the fourteen eggs had hatched successfully by the next day. The young were about two inches long, brownish above, pale green beneath. They were housed in a small vivarium and fed on *Drosophila*, green fly, black aphid, chopped earthworm, shredded raw meat, small caterpillars and maggots. Six of the lizards still survive (April, 1953) and are about 11 inches long, the body being about one-third of the total length.

\* Presumably made by the egg-tooth with which the young lizard is furnished.—*Ed.*

PETER SAYER, 7 Bramley Way, West Wickham, Kent.

#### NOTE ON THE SPAWNING SITE OF THE COMMON FROG

In a pond bordering Epping Forest, near Loughton, Essex, a colony of *Rana temporaria* has bred regularly since my first observations started in 1934. The colony has been observed every year since (except in 1944 and 1946), and on each yearly occasion has chosen the same corner of the pond. The spawn clumps always appear in a dense mass covering an area of about

12 square feet, lying just beyond a reed-bed in about one foot of water. Spawning occurs between end-February and mid-March, varying with the season's weather.

The significance of the depth of water did not strike me until this year (1952), when I visited the usual site in early March, to find no trace of either frogs or spawn. On the point of leaving the pond I was attracted by the frog chorus which I traced to the far side of the pond, about eighty yards away, and where the frogs were now assembled and laying their spawn. Heavy rains this season had raised the pond's surface causing an overflow at this far end. The spawn was massed as usual in about one foot of water, resting on waterlogged grass where the pond had overflowed onto the verge.

The normal site used in all previous years was found to be nearly two feet in depth, and was presumably unsuitable for the colony, for this year at least. Does the depth of water have any bearing on the selection of the spawning site of this species?

ALFRED LEUTSCHER, British Museum (Natural History).

#### SOUNDS EMITTED BY COMMON LIZARD

Specimens of *Lacerta vivipara* kept in an outdoor reptiliary were heard on several occasions to make sounds, apparently after being alarmed. The sounds were similar to the high-pitched note emitted by shrews. While they were being made the mouth was apparently closed and the throat distended. No previous observations on the Common Lizard making sounds have come to my notice. It is possible that such sounds are only audible to some persons.

J. W. FALCK, 14 Allison Drive, Fartown, Huddersfield.

#### TURTLE RECORDS

Two turtles, one probably *Dermochelys coriacea*, seen off Scilly Isles 5/7/52.

J. F. D. FRAZER, 52a Carlisle Mansions, London, S.W.1.

#### NOTICE

*HERPETOLOGICA*. Members' attention is called to this publication which is the journal of the American Herpetologists' League. This journal contains papers on very many aspects of American herpetology and will be of interest to those members who are not already acquainted with it. The annual subscription is three dollars and enquiries should be sent to Chapman Grant, Rt. 1—Box 80, Escondido, California, U.S.A.

## LIST OF MEMBERS OF THE BRITISH HERPETOLOGICAL SOCIETY

### ADDITIONS AND CORRECTIONS

#### CORRIGENDA

- ALEXANDER, James, *now at* 37 Elizabeth Street, Glasgow, S.W.1.  
 BROWN, F. C., *now at* 6 Osmond Gardens, Wallington, Surrey.  
 CORKILL, Dr. N. L., *now at* Protectorate Health Service Headquarters, Mukalla, Aden Protectorate.  
 CUMMINS, R. J., *now at* 203 Anderson Avenue, Bellmawr, New Jersey, U.S.A.  
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 FUSSELL, R. H., *now at* 18 Oak Tree Road, Marlow, Bucks.  
 GREIG, Alistair, *now at* Beach View, Cliff Road, Sennen Cove, Land's End, Cornwall.  
 GWYNNE, J. N. W., *now at* Nether Lypiatt nr. Stroud, Glos.  
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