

OBSERVATIONS ON THE POOL FROG, *RANA LESSONAE* CAMERANO IN NORWAY

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INTRODUCTION

The occurrence of *R. lessonae* in Southern Norway near Arendal (Aust Agder country) has recently been documented (Dolman, 1996). Its presence was first noted in 1986 by Professor Torstein Solhøy (Bergen University) who had caught a single specimen and had identification confirmed by Professor Hans Kauri. Dolman remarks that the Norwegian frogs closely resemble those from Estonia, Sweden and Britain, which are brown rather than green in ground colour. The bodies of water known to be inhabited by *R. lessonae* are few in number and the locality itself of limited extent. Early in November 1996 I located one of the ponds and although the weather was mild it was clearly too late for observations, the animals having retreated into hibernation. In April 1997 investigations were negative but early in May spawn was found in shallow water. It was not until early July that I was able to revisit the area. This article is the result of fieldwork carried out in 1997 as well as observations on specimens maintained in captivity. *R. lessonae* is portrayed in plates 2-5.

SITE DESCRIPTION

The exact locality is being kept confidential for obvious reasons. Dolman states that *R. lessonae* is found in four ponds and small lakes but only breeds in one, which is free from fish. Fish are known to devour the larvae and even adult frogs, which restricts breeding possibilities. This more or less agrees with my observations: frogs were found in two ponds and one small lake, which lie on the same side of a minor country road. It was also seen in a stream feeding a lake on the other side of the road. These sites are hereafter referred to as **A**, **B**, **C**, **D**. The road itself is flanked by ditches which vary between being totally dry to water-filled depending on the season and rainfall.

A is a pond approximately 75m x 50m. This site is discussed in greater detail below since it was here that the most consistent observations were made. (Plate 1).

B is a small lake about 250m x 150m. It contains fish and is also used for swimming. Human activity (fishing and swimming) is confined to the rocky shoreline adjoining deep water. The frog population seems confined to the reedy shallows at the southern end which is connected to **A** by a narrow ditch. Only adult frogs were found and the maximum number counted was five. The thick reed beds are difficult to approach from the land and the population may be higher. None were found at the northern end that is also shallow but with a muddy foreshore.

C is a small pond about 25m x 20m. The maximum number of frogs counted was three. **C** is connected to **B** by a 60-m long channel; one individual was found on July 31st. The surroundings are marshy and approach is awkward even in dry weather. This pond appears fish free.

D is a stream feeding a lake. No frogs were found in the lake itself, which contains fish. However two *R. lessonae* were found in the stream.

OBSERVATIONS

Site A was visited on 19 times between July 10th and October 2nd. The months July and August were exceptionally warm. The July mean was 19.8°C (normal 16.5°C) and August 20.54°C (normal 16.1°C). Daytime maxima were 24.7°C for both months and temperatures were consistent without large variations around this figure. Sunshine totals were high. September was also warmer than usual. Such a summer was clearly favourable both to the frogs and for making regular observations. The Pool Frog is sun loving and was mostly seen basking in shallow water near the edge of the pond, on the banks or in shallow pools on the margins. It was also seen on lily pads and floating in the water. After heavy rain the pond overflows its banks which are at water level. The frogs could then often be located in small pools and puddles some distance from the pond itself. When disturbed they would dive into deeper water but in most instances reappeared in a minute or two. Spotting them was not easy and often a telltale plop revealed an individual that had been overlooked. Tadpoles were seen in mid-July occasionally swimming near the surface but by the end of the month none could be found.

R. lessonae was most active from late morning until about 17.00 in July and 16.00 in August. The greatest number of frogs counted – excluding metamorphosed froglets – was 23 on July 25th in the early afternoon. This pond is surrounded by woodland and by 20.00 in mid-July parts lay in shadow and by 19.00 in mid-August nearly the entire pond was in the shade. On July evenings (19.00-20.30) the total seen was less than 10 with activity mostly confined to sunny parts. Calling was heard on the evenings on July 10th and 16th but not after these dates. By late September activity was restricted to a few hours round the middle of the day. On 22nd between 12.30 and 13.30, air temperature 15°C, 14 examples were counted. But on October 2nd (last visit) only three small adults were seen despite warm autumn sunshine: air temperature 14°C. Solheim (1997) reports on territorial rivalry among male frogs in early June and that they were in full chorus. He states that the females kept to themselves and were passive.

Metamorphosis occurred in the middle of August. On the 9th one froglet was found, on the 16th between 25 and 30 and on 25th between 50 and 60. The young frogs were mostly on the water's edge and in small pools nearby. Thereafter there was a reduction: eight on September 8th and 14th, 12 on the 22nd and three on October 2nd. Five froglets were also found in **C** on September 22nd, all but one at the point where the channel from **B** enters. If breeding does not occur in **C** then the froglets must have migrated from **A**. Since there is no direct connection between **A** and **C** the route would presumably have been to pond **B** and then further to **C** via the stream connections. Overland migration is also possible but the terrain is rough and in places densely wooded. Dolman (1996) reports that metamorphosis took place in September and that tadpoles were still to be found. This discrepancy could be attributed to more moderate temperatures in that year: July mean 15.81°C, August mean 18.15°C. In captivity metamorphosis of tadpoles collected on July 10th was completed on August 8th, the remaining two on August 9th. The total absorption of the tail occupied about a week during which period the animals were not feeding prior to emergence on land.



Plate 1: Observation site A



Plate 2: Adult *R. lessonae* site A



Plate 3: *R. lessonae* in terrarium



Plate 4: Newly metamorphosed *R. lessonae* site A



Plate 5: Newly metamorphosed *R. lessonae* in terrarium

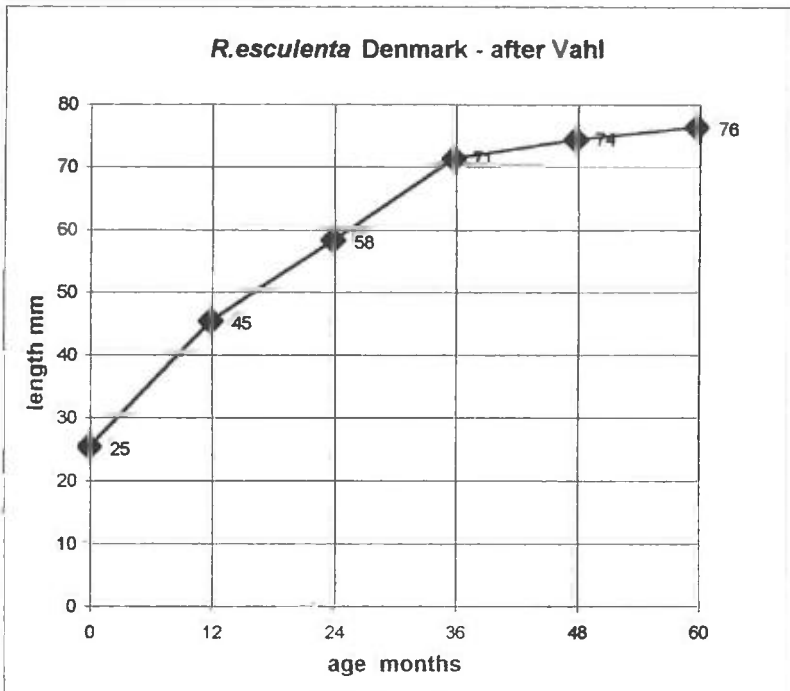


Fig. 1

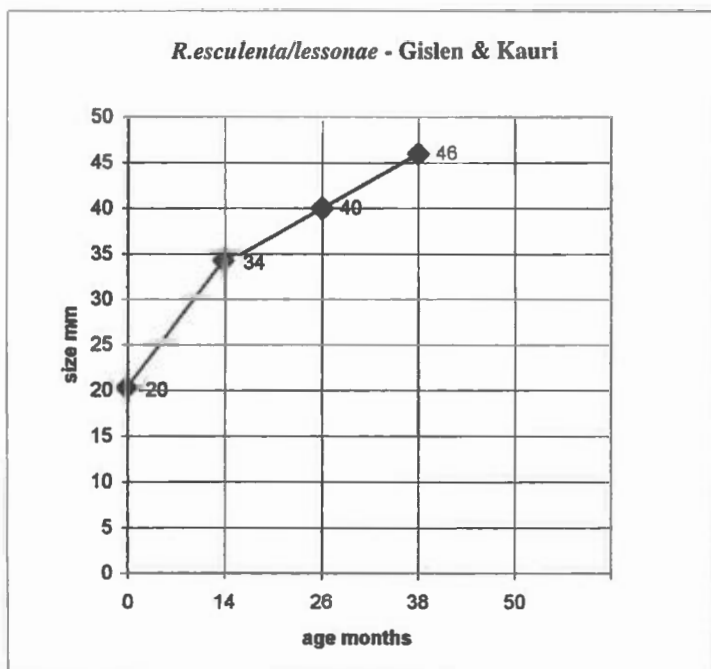


Fig. 2

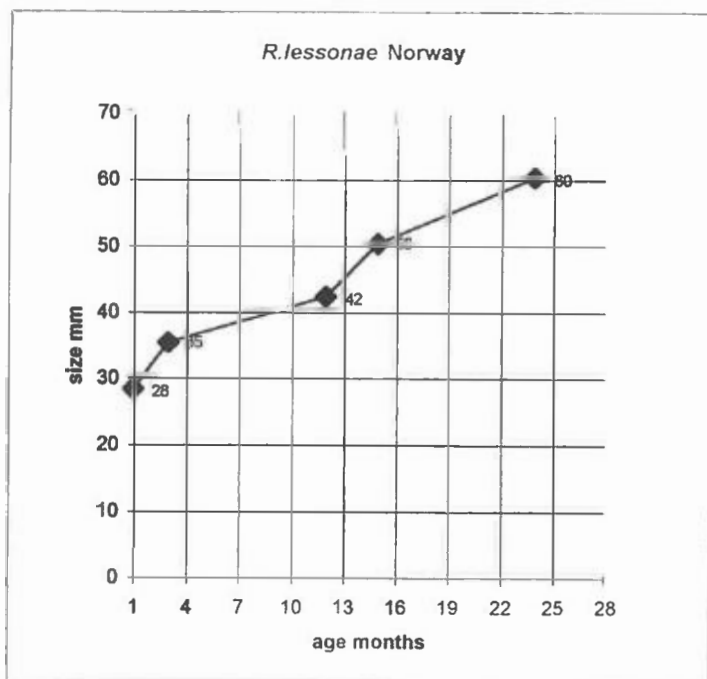


Fig. 3

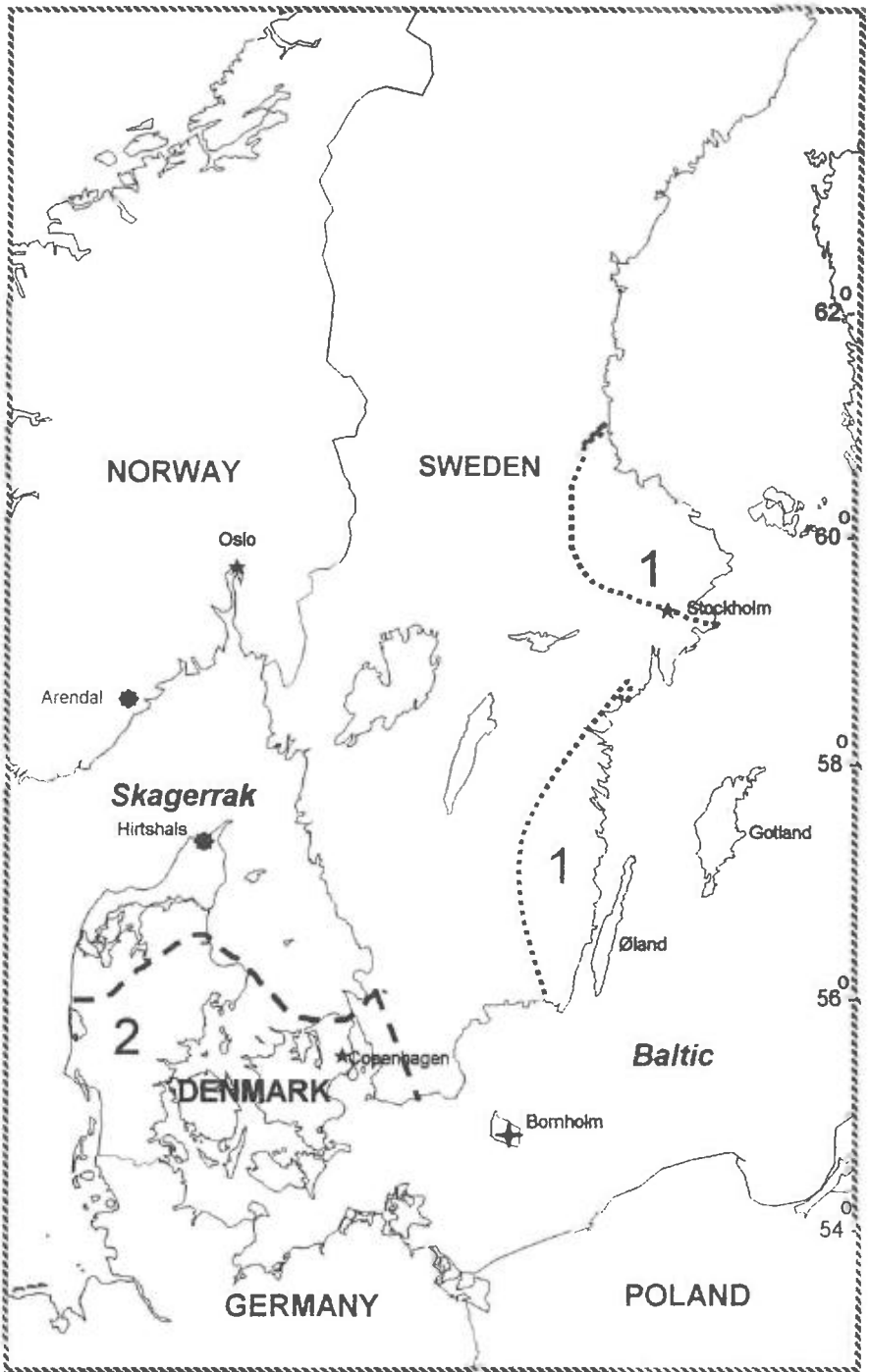


Fig. 4: Map of Scandinavia

- 1 *R. lessonae*
- 2 - - - - *R. esculenta*
- * Individual localities for *R. lessonae*
- + *R. ridibunda*
- 54° degrees latitude

SIZE AND GROWTH

The frogs fell into well-differentiated size groups. Samples of each were taken and measured and others estimated accordingly.

Dolman quotes a maximum length of 70mm. The largest individual I caught totalled 65mm and was caught on September 22nd but just a few were larger. According to Terentev & Chernov (1949) "*esculenta*" attains a maximum size of about 80mm, "*lessonae*" 70mm. The greatest size for this population is therefore in accordance with these figures. "Large" frogs were fewer than those that were noticeably smaller. On July 18th out of a total of 16 roughly 50% were under 45mm and on July 25th about 70%. As the summer progressed so did the smaller frogs grow. By late September there was a decline in the number of large frogs and most were around 50mm. On the completion of metamorphosis baby frogs were 28mm and had increased to 35mm by the end of September. Of the four reared in captivity three measured 20mm but the fourth was as big as those in the wild. By the end of September the smaller animals were 28mm, the larger one 38mm. A baby frog caught in mid-August grew at the same rate as the largest captive specimen. In addition two frogs were caught and reared at home. One of these measured 42mm on July 12th. By August 6th it had increased to 48mm, August 18th 55mm and when put away for hibernation, 58mm. This was a female and by the end of September was robust and plump. Another caught on August 2nd was 40mm on August 6th and 48mm at the onset of hibernation. This was more slender in habitus and probably a male.

On the basis of these observations it is deduced that the young reach about 35mm at the end of the first year, 40mm by early/midsummer of the 2nd year and 50mm by the autumn. The frogs would then be ready to breed by the spring of the 3rd season. 60mm is probably reached by late summer of the 3rd year at any rate during the course of the 4th. These figures are in close accordance with those given for *R. esculenta* by Smith (1954) and Vahl (1995). They differ from those quoted by Gislen & Kauri (1959) who indicate a size of only 20mm on metamorphosis. Much must depend on when mating and metamorphosis takes place and it is possible that in years with colder winters and rather cooler summers the frogs might not reach breeding size until the spring of the 4th year. It has also been demonstrated that the tadpoles in populations where the frogs are triploid are larger than those that have only two chromosomes, the newly changed frogs being correspondingly larger. Growth rates are presented diagrammatically in figures 1-3.

CAPTIVITY

Smith (1954) states that *R. esculenta* is nervous as a captive, sometimes refusing food. This was not my experience with *R. lessonae*. The two individuals caught in July and August were housed in a plastic terrarium with a 15cm layer of moss and plants gathered from the collecting site and a separate container of water. Water was always collected from the pond and changed every few days. After about a week the frogs lost their initial shyness and food could be introduced without them being alarmed. Indeed it was possible to handle the frogs gently, as when cleaning out their container. They were fed on a variety of invertebrates: flies, spiders, grasshoppers, small grey slugs. Wood lice, plant lice and ladybirds were refused as obviously being distasteful. As the frogs grew they tackled quite large worms, which were seized in both hands and crammed into the mouth. During September the frogs began to spend more time in retreat buried in the moss. Although they were still feeding in the first half of the month they accepted mostly earthworms and rejected more active prey. From the middle of September activity was even more reduced, the frogs spending most of the time in hiding only occasionally

emerging to feed.. At the end of the month activity had ceased and the animals were put away for hibernation in a frost-free cellar.

Captive tadpoles were fed on chopped up earthworms and small pieces of meat once the carnivorous stage was reached. The young readily took a wide variety of small insects and spiders caught with a sweep net and by August 25th were also devouring small grasshoppers. The young continued to feed vigorously until the middle of September, and earthworms were also included in their diet. Thereafter they spent more time in hiding but continued to feed until the end of the month whenever the tank was placed in a sunny position. The pattern of activity in captivity mirrors that in the wild and suggests that hibernation commences towards the end of September or early in October and that day length as well as temperature help to provide the essential trigger.

TAXONOMY

Green Frog taxonomy is complex and still not completely understood. The species *R. lessonae* (Pool Frog) and *R. ridibunda* (Marsh Frog) either breed true or hybridize to give *R. esculenta*, normally given as *R. kl.esculenta*. This hybrid, a so-called kleptospecies that has “stolen” its genetic material from the parent species, is not sterile. Although it normally needs to pair with either *R. ridibunda* or *R. lessonae* to produce more *R. esculenta* it can in certain areas reproduce itself as a “true” species (Arnold, Burton & Ovenden, 1995). This happens mainly in the northern parts of its range (Vahl, 1995). In older literature (c.pre-1960) *lessonae* is listed as a variety or subspecies of *R. esculenta* and not considered to be more than a short-legged variant. *R. ridibunda* on the other hand has been classified by some taxonomists as a separate species e.g. Mertens & Wermuth (1960), and by others as a subspecies of *R. esculenta*, Gislen & Kauri (1959). Smith (1954, p.143) discusses this in some detail and himself considers the taxon *ridibunda* as a species distinct from *esculenta*. In areas where all three species occur field diagnosis can be difficult and it is *esculenta* and *lessonae* that are mostly easily confused (Arnold, 1995). Colouration is not always reliable since although *R. esculenta* tends to be green and *R. lessonae* brown this can vary according to the season and weather. Many *R. lessonae* I found had a distinctly green tinge in sunny conditions but were darkish brown in the absence of sunshine.

DISTRIBUTION

The occurrence of *R. lessonae* in Norway is naturally of high interest and needs to be considered against the background of its distribution in neighbouring countries (Fig. 4). *R. ridibunda* is an inhabitant of eastern and central Europe and ranges across the middle-east to central Asia as far as northeast Afghanistan. The species enters Scandinavian territory only on the Baltic island of Bornholm which, although politically Danish, is zoo-geographically allied to Europe. It is absent in Sweden and its presence in Finland is given as questionable by Arnold, Burton and Overton (1978) although Gislen & Kauri (1959) state that it is found in the Helsinki area. *R. esculenta* and *R. lessonae* occur in Denmark and Sweden. Vahl (1995) refers only to *R. esculenta* in Denmark and gives the range as a southeasterly one. It is sympatric with *R. ridibunda* on Bornholm, occurs further west on some of the islands and then ranges northwestwards sporadically up to about Vibourg. There are apparently large areas within this range where it has not been found. However, Green Frogs, resembling *R. lessonae* rather than *R. esculenta*, have recently been reported from extreme northern Denmark near Hirtshals, latitude 57°C30' (Dolman 1997). In Sweden Green Frogs are found in the south-west (Scania) and then further east and north along and close to the Swedish Baltic coast up to nearly latitude

61° (Gislen and Kauri, 1959). The records in Scania, described as *R.esculenta*, are concentrated; the others more scattered. The latter are referred to as “a pronounced form of *lessonae*” and considered to be “relics from the post-glacial warmth period”. This raises the question whether similar relic colonies could have survived in southern Norway at latitude c58°. On the evidence available it could be suggested that *R.lessonae* is a hardier species than *R.esculenta* that has survived in favoured localities outside its main range in otherwise unfavourable climatic conditions. Isolated populations of the Æsculapian snake, *Elaphe longissima*, north of its main range, are attributable to the same cause and one should note that this snake could be found in Denmark until the mid-19th century. It is also now considered that the present-day occurrence of the European Pond Tortoise *Emys orbicularis* in Denmark is not due to introductions but to survival from an earlier warm period (Dolman, 1997a).

If *R.lessonae* is not native to Norway then it must have been introduced. In Britain the situation is complicated by the fact that there have been numerous and deliberate introductions of Green Frogs of all three species from different continental countries over a long period of time. These are well documented: (Bell 1849, Smith 1954, Arnold, Burton & Ovendon 1978, Arnold 1995). This has made it impossible to determine whether or not *R.lessonae* was ever native to Britain. Although there is nothing to suggest that this has happened in Norway it has to be admitted that little information is available. There is also the possibility that *R.lessonae* has been introduced accidentally. Gislen and Kauri (1959) state that this happened in some parts of Sweden due to the unwitting inclusion of larvae in fish fry (carp) imported for the purpose of stocking lakes. Quite possibly the problem will never be solved but the discovery of other populations would certainly strengthen the case for the frog being native. I have examined other bodies of water in the area without result. The challenge will be to widen the search area. The criteria would seem to be small ponds and lakes that are fish-free. Larger lakes always contain fish.

CONCLUSIONS

The Pool Frog, *R.lessonae*, is known from a single locality in southern Norway. It appears to breed in only one pond and to have migrated to other bodies of water in the immediate vicinity. *R.lessonae* is evidently well adapted to the climate, completing its breeding cycle within the active period, which extends from April to early October. There is the possibility that this frog has been introduced but the likelihood of it being a native species cannot be overlooked in view of its irregular and sporadic distribution in other parts of Scandinavia.

SYMPATRIC HERPETOFAUNA

The following amphibian species were found: *Bufo bufo*, *Rana temporaria* and *Triturus vulgaris*. *B. bufo* was observed at A and D, *T. vulgaris* at A. *Rana temporaria* larvae were found in the roadside ditches and an adult example at another pond about 1 km away. In addition *R. arvalis* has recently been confirmed from the area (Dolman, 1997). Reptile species found in the immediate area, all as road kills, were *Anguis fragilis*, *Coronella austriaca* and *Vipera berus*. *Natrix natrix* was found on 22nd September at site A. This was a 1997 juvenile example and was basking on the edge of the pond. Baby frogs would be a natural prey for this snake.

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#Norwegian text, English summary.

##Danish text, English summary.