Introduction

The moorfrog, *Rana arvalis* NILSSON, is known to have a wide intraspecific variation in morphology (DELEY, 1964; STUGREN, 1966; TOMASIK, 1971). Longlegged *R. arvalis*, occasionally referred to as *Rana dalmatina* BONAPARTE, has been reported from various parts of the range of the species. The same is true for the morph with striped back and with spotted throat and belly. This kind of variation is, however, in most cases intrapopulational. Four subspecies are currently recognized: *Rana a.arvalis*, *R.a.altaica* KASCHTSCHENKO, *R.a.issaitschikovi* TERENTIEV and *R.a.woltersrofffi* FEJERVARY partly depending on geographical variation in leg size. The validity of some of these subspecies has meanwhile been questioned because of the use of morphological characters which are known to be variable also within the nominate form (KAURI, 1959; TERENTIEV and CERNOV, 1965; STUGREN, 1966).

Material

During five different periods in 1979 and 1980 16 *Rana arvalis* were collected on the island of Gotland in the Baltic Sea [DZG (Department of Zoology, University of Göteborg, private collection of the authors)]. *Rana arvalis* is the single *Rana* species occurring on Gotland and it has earlier been known to be aberrant in its colour pattern by having a spotted throat and belly (GISLEN and KAURI, 1959). A closer analysis of the material showed that these frogs differ in other characters as well. As comparison 49 *Rana a. arvalis* from mainland Sweden [9, DZG; 14, GNM (Göteborg Naturalhistory Museum) Ba. Re. Su. 742–752, 815, 816], Denmark (8, GNM Ba. ex. 73, 391, 393, 821), West Germany (4, GNM Ba. ex. 595, 837), Poland (7, GNM Ba. ex. 257, 258, 591–594) and USSR (7, GNM Ba. ex. 864, 910, 911, 1293) were studied.
Results and Discussion

Leg Length

The body length of *Rana arvalis* from Gotland varied between 25 and 54 mm. The hind legs are comparatively long on Gotland. The growth of the legs is allometric. The heel extends to or beyond snout in all the fullgrown individuals (Fig. 1). When the legs are bent at right angle to body the heels overlap clearly in 87.5% of the frogs and are in contact in 12.5%. Corresponding figures for mainland Sweden are 61% and 39%, for Denmark 62% and 38%, for West Germany 50% and 50%, for Poland 29% and 71% and for USSR 43% and 57% respectively. The tibia of *Rana arvalis* is comparatively very long in specimens from Gotland (Fig. 2).

Body Pattern

No specimens with a vertebral stripe have been found on Gotland. This kind of pattern is also extremely rare in the rest of Sweden. The dorsal pattern in frogs from Gotland is typical for spotted *R. arvalis*. It is different, however, in the lateral body pattern. The dark spots between axilla and groin are united into a normally broad dark band in all specimens (Fig. 3). This kind of lateral band is found only in 20% of Swedish mainland
Fig. 2. Linear regression of the tibia length to body length in *Rana a. arvalis* from Gotland as well as from surrounding areas in northern Europe.

*Fig. 3. A Rana arvalis from Gotland showing the broad lateral band and marbled throat and chest.*
frogs, 6% in Danish and 17% in German frogs. The examined specimens from Poland and USSR had all spotted lateral pattern.

**Belly and throat Pattern**

Throat and belly are dark spotted in all frogs from Gotland. When heavily spotted the throat has always a light central stripe. The posterior part of the belly is light without pattern. Only 13% of the frogs from the Swedish mainland had more or less spotted bellies. All frogs from the other areas had completely white bellies. Spotted throat was more common and was found in 35% of the Swedish mainland specimens, in 13% in Danish, 30% in West German and in 29% in Polish frogs.

**Larvae**

Altogether five tadpoles were collected on Gotland. In all the tadpoles the hindlimbs had just became visible. In size and larval mouth characters the tadpoles from Gotland agree with mainland tadpoles, but differ in that the position of the upper crest extends forwards almost to the level of the eyes. Of the five examined tadpoles one had a crest which extended to a level just anterior of the spiracle, in three tadpoles the crest extended to a position exactly between the spiracle and the eyes and in one tadpole the crest extended just to posterior level of the eyes. In nineteen tadpoles of *Rana arvalis* from the Swedish mainland (Göteborg) and the island of Öland which had reached the same developmental stage all had a upper crest which only extended to a position much posterior of the spiracle, which is typical for *R.arvalis*.

A single metamorphosed juvenile collected in August was malformed and had three hind legs.

This island of Gotland (situated in the middle of the Baltic Sea and isolated from the nearest mainland by more than 80 km and from the island of Öland by about 50 km) is known to have a high degree of endemism among various groups of animals and plants. The isolation of the fauna has been comparatively short. The 8–10,000 years that have passed since the last ice age is a comparatively short time for speciation to occur. However, many species of animals occuring on the surrounding mainlands, e.g. *Rana temporaria* L. are absent from Gotland and others are very rare. *Rana arvalis* has been considered rare on Gotland (Gislén and Kauri, 1959) and according to Lomander (in litt., Göteborg Nat. Hist. Mus.) only a single moorfrog was found during last century by collectors on Gotland. The present population of moorfrogs on Gotland have perhaps originated from a small founder population. In such case genetic drift might have been of importance in evolution of the present morphologically aberrant population of moorfrogs on Gotland.

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References


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