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COMPARISON OF *LACERTA AGILIS* HABITATS IN BRITAIN AND EUROPE

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SUMMARY

A questionnaire was circulated to several European herpetologists and a large amount of original and unpublished information was obtained on details of the habitat of the Sand Lizard (*L. agilis*).

Throughout Europe, *L. agilis* inhabits a variety of environments including open woodland, scrub, dwarf shrub associations, grasslands and dune habitats. Two common features were open but diverse vegetation structure and open areas of soil for egg incubation.

In the North West of its range (England, Sweden and The Netherlands), *L. agilis* seems to be restricted to areas with a sandy substratum but any loose, well-drained soil is suitable in central Europe.

A comparison between Continental and Southern England habitat *L. agilis* features suggests that this species is more specialized (in terms of habitat ecology) in England.

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INTRODUCTION

The known geographical range of the Sand Lizard, *Lacerta agilis* L., extends from northwest and southern England (two disjunct populations), across southern Sweden, Denmark, the Baltic Soviet Republic, The

Netherlands, Belgium and France. It is found throughout the whole of middle Europe, north of the Alps, where it is known up to 1800 m, and in eastern Europe, the Balkans and west and middle Siberia (Arnold & Burton, 1978).

The English populations are considered to be relict distributions, although more recent declines are due to habitat changes rather than climatic deterioration (British Herpetological Society, 1973).

Characteristics of the Sand Lizard habitat in southern England have been described by Corbett & Tamarind (1979) and Spellerberg & House (1980), and in northwest England by Jackson (1979). These studies demonstrate that, in England, viable *L. agilis* populations are associated with two important habitat features; a shrubby mosaic of vegetation cover broken by frequent plant/ground interfaces, and areas of bare sandy substrate in which the eggs are incubated (House & Spellerberg, 1980). The investigation reported here was designed to gather new information and compare data collected from *L. agilis* habitats in continental Europe with that known from English habitats. In view of the changing status of *L. agilis* in Europe, it is important to be able to assess habitat quality for the conservation of this species throughout its range.

References to *L. agilis* habitat in the published literature are few. Rollinat (1934) describes typical habitat in France as sandy locations along hedgerows and forest margins, but the species is now extinct from many of the localities he names (Rosselot & Saint Girons, pers. comm.). Glandt (1976) describes West German lizard habitats in greater detail, with reference to the suitability of the sites for locally sympatric species *L. agilis* and *L. vivipara* Jacq. Bund (1964) discusses habitat types for *L. agilis* in The Netherlands, naming a variety of natural and manmade features. More recently, a report was made on a coastal *L. agilis* population in The Netherlands (van Leeuwen & van der Holf, 1976). A monograph on *L. agilis* published in Moscow includes a chapter on the distribution and habitat of the species in the U.S.S.R. (Jablokov, 1976).

METHODS

A questionnaire was circulated to herpetologists in Europe, inviting them to participate in a *L. agilis* habitat survey. The circulation established contact with persons having an active interest in the species and they were able to give detailed information. The questionnaire consisted of an introductory letter explaining the purpose of the survey; a survey sheet in English; a translation sheet with relevant words and phrases translated into either Dutch, French, German or Russian; and a sheet of explanatory notes with examples. Much of the information provided here comes from translation of original reports and publications. This being the case, difficulties were encountered in the translation of ecological terms. To avoid misinterpretation, technical terms have been translated so as to give the most reliable interpretation of the original material.

RESULTS

The response to the questionnaire survey was mixed and included the following categories: no answer, answer but no information, answer with suggestions for alternative contacts, answers with general information, answers with detailed information. A description of *L. agilis* habitats for several European countries is summarized below, using the most informative questionnaire results in conjunction with information available in the literature. Full details may be found in Spellerberg & House (1980).

Southern England

A description of English *L. agilis* habitat types is given in House & Spellerberg (1983). Results from an intensive three-year research programme suggests that *L. agilis* is associated with heathland communities and their derivatives or vegetation similar in structure and morphology, such as mixed grass species interdispersed with shrubs and open ground. Plant species richness bore no relationship to the selected habitat whereas structural diversity was found to be an important component of the lizard's habitat.

U.S.S.R.

A monograph describing *L. agilis* habitats in the U.S.S.R. has been mentioned (Jablokov, 1976). A translation of the list of habitat types has been undertaken and the *L. agilis* habitat distribution can be summarized as follows.

In natural landscapes of woodland forest and forest steppe, lizards were found in a number of habitats including forest margins, wet meadows, borders of bogs and around swamps, and in areas of natural rock falls. In semi-desert and mountainous areas, lizards were found in fewer habitats such as forest "islands", secondary scrub thickets, meadows and rocky outcrops. Anthropomorphic or cultural landscapes seem to provide a larger number of suitable habitats. These included cereal fields, small gardens, vineyards, parks, roadsides, plantations, churchyards, railway embankments and industrial wasteland.

Federal Republic of Germany

Information obtained suggests that *L. agilis* was formerly classified as common and widespread in Germany but is now found sporadically and occasionally throughout large areas of its range (Honnegar, 1977). Glandt (1976) describes seven population habitats distributed between inland dune areas on the lower Rhine terrace and large forest areas on the main Rhine terrace. Glandt (1979) explores the habitat requirements of *L. agilis* and *L. vivipara* in more detail by scoring the number of populations of each species specifically associated with different substratum and vegetation characteristics over a range of landscape types. He concludes that *L. agilis* requires a loose, well drained substratum combined with a plant cover described as sparse to moderately thick. The Common Lizard (*L. vivipara*) on the other hand, is associated

with habitats with dense vegetation covering a broad spectrum of ecotypes, generally at the moist end of the scale. Details of habitat characteristics supplied by Glandt may be found in Spellerberg & House (1980).

The Netherlands

L. agilis is found only on sandy soils in The Netherlands (Bund, 1964). Suitable habitat types fall into three categories: (i) inland heathlands subject to a variety of management practices; (ii) coastal dune systems; (iii) man-made habitats. Inland heaths cover a variety of geobotanical formations including drifting dunes subject to erosion and stabilization processes. Permanent open tracts of heath are formed on glacial sand ridges and are subject to management practices such as burning, grazing and afforestation. Grasses are a more important component of the vegetation structure than in the heathland formations of southern England. Topographic relief is generally slight. Coastal dune habitats lie on a calcareous substrate and consist of a series of steep-sided dune ridges and slacks carrying a variable representation of shrubs (*Crataegus monogyna*, *Salix repens*) and grasses (*Calamagrostis*). Man-made habitats include railway embankments and road cuttings in rural areas.

Denmark

L. agilis is relatively common along the west coast of Jutland and the north coast of Zeeland, and locally common on the islands except Bornholm. There are several populations in the east of the country. Many of the island populations are threatened by intensive afforestation with conifers. Typical habitats are generally open coastal areas with low or sparse vegetation on dunes, heathlands or abandoned gravel workings.

France

The distribution of *L. agilis* in France is very fragmented, the species being more common in the north, east and centre of the country. Outside these areas the precise distribution of *L. agilis* is not known. The greater concentrations of populations tend to be in central and eastern parts of the country (Rosselot, pers. comm.). It is generally assumed that *L. agilis* is a continental species compared with *L. vivipara* and *Podarcis muralis* which are more widespread and locally abundant in coastal areas. Confusion between *L. agilis* and *L. viridis* makes accurate recording difficult, particularly in the southwest of the country. Some large populations of *L. agilis* are known in Alsace and the French Pyrenees (Rosselot & Cheylan, pers. comm.). It is considered by Saint-Girons (pers. comm.) to be a species found on high ground, occurring in large populations up to 1800 m and most abundant between 1400 m and 1800 m. The following vertical zonation has been noted: *L. vivipara*—plains/low ground to low hills; *L. agilis*—low hills to mountain foothills; *L. viridis*—low to high mountains (Saint-Girons, pers. comm.). A Sand Lizard habitat in the French Pyrenees is described as being dwarf shrub cover with localized patches of bare ground, generally on relatively undisturbed slopes. It is also known from low, flat marshland in the Brennes district of central France, particularly in hedges, along roadsides and in meadows. In these latter habitats the species tend to be widespread but not abundant.

Sweden

In Sweden *L. agilis* is found as far north as lat. 61°N (West Varmland, Mora and West Sweden). It is more common in southern and eastern areas such as Scania and Smaland. It is abundant on the island of Ven off the south coast and is sparsely distributed around Gothenburg and eastern areas. The species inhabits sandy areas throughout much of its range in Sweden. Different habitat types have been described by Andren & Nilson (1979). The most common habitats are moving sand dunes and old sand pits partly overgrown with tussock grasses and herbs. The species is also found amongst grassland communities and on exposed slopes on rocky ground.

Yugoslavia

The details of one *L. agilis* site in western Yugoslavia and described by Soti (pers. comm.) were obtained. In this case, the habitat was a mixed grass community on very basic soils.

Romania

The distribution of *L. agilis* is central and widespread in mountainous ground, often in forested areas.

Czechoslovakia

L. agilis is still common in non-cultivated regions of Czechoslovakia, from low lying areas to approximately 500 m above sea level. In Slovakia it reaches 1500 m. It was reported that *L. agilis* is one of the most common reptiles in the country.

DISCUSSION

Both on the continent and in England the habitat of *L. agilis* is formed structurally by low shrubby vegetation with frequently occurring patches of bare ground, litter or bryophyte cover. The implications of this structural diversity of invertebrate abundance, thermoregulatory behaviour, incubation requirements and cover are discussed in Spellerberg & House (1980) and House & Spellerberg (1980). Comparative studies on the habitat of *L. vivipara*, a smaller viviparous species (Glandt, 1979; Spellerberg & House, 1980) suggest that the latter species is more often associated with less structurally diverse and less well drained habitats.

The vegetation cover in *L. agilis* habitat in continental Europe varies from sparse to fairly dense with open areas. The degree of tolerance to invasion by tall scrub may be expected to decrease towards the

climatically less favourable edge of the species ranges, for instance in southern England. However, House and Spellerberg (1983) show that a certain amount of scrub invasion can enhance certain microclimatic conditions in favour of basking and egg incubation requirements, providing the habitat structure is both topographically and vegetationally diverse. Invasion by tall, dense shrubs and trees would not be tolerated as well on sites of little topographical relief, either in England or on the continent. The low relief areas described by Glandt as becoming overgrown support very small numbers of adult lizards.

In Europe it appears that *L. agilis* requires a dry, loose substratum for egg incubation but not necessarily a sandy soil. In the more maritime climate of England and the west coasts of Sweden and The Netherlands, the species' requirements may be more specialized, the optimal heating and drainage conditions being provided by very sandy soils (House & Spellerberg, 1980).

In southern England, the heathland formation represents an ideal habitat structure for *L. agilis* and in a condition managed along traditional lines this provides natural open areas suitable for basking and egg incubation. On the continent, manmade landscapes other than heathland provide the same structural features but have often been produced under different management regimes so that grasses and mixed shrub species sometimes replace the Callunetum structure (Noirfalise & Vanesse, 1977). The "natural" habitats relatively unmodified by anthropogenic trends tend, both in England and on the continent, to be open coastal or mountainous locations where substratum instability and/or exposure to harsh environmental factors preclude the extensive growth of tall shrub and tree species. The common occurrence of *L. agilis* in abandoned gravel workings and railway cuttings is due to a historical migration into these areas from surrounding populations soon after human disuse of the sites. Subsequent land use changes of the hinterland often isolate a population in what is only temporarily an optimum habitat until management intervenes. The same is true of pockets of *L. agilis* populations in afforested areas of England and on the continent.

In conclusion, it is suggested that *L. agilis* requires a structurally diverse habitat both in England and on the continent. In cooler, more moist areas, however, those topographic and biotic features that improve the opportunities for egg incubation and thermoregulation, become major influences in the lizards' habitat.

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