

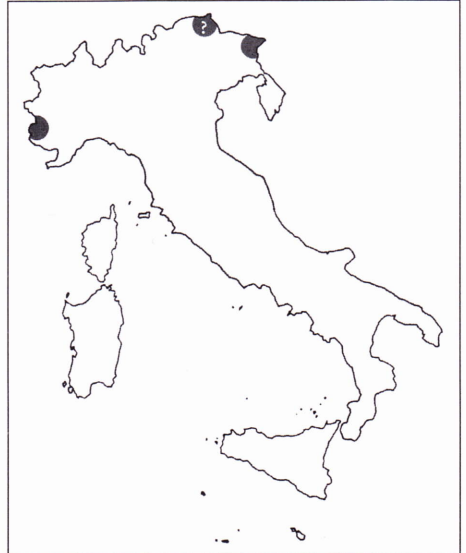
*Lacerta agilis* LINNAEUS, 1758

Sand Lizard · (Italian name: lucertola agile)

This is the smallest lizard belonging to the green lizard group. Its aspect is squat and the tail is relatively short, limbs are also short. Dorsal scales of the mid-dorsal part are narrow and more keeled when compared with those of the adjoining rows. Coloration is variable. Dorsally a light stripe can be present, sometimes interrupted, and light occipital stripes also can be seen on the tail. Between these stripes black spots can be found, shaping different ornamental patterns. Flanks with light ocelli and in some cases with small dark spots. The dorsal coloration between the light stripes can be from grey-brownish to brown or greenish. The brown-beige tones prevail generally in females, while in males the greenish ones, particularly evident on the flanks and ventral parts during the reproductive season. Individuals with reddish dorsal stripe can be seen, these are called "erythronotus-mutants" and has been recently observed also in northeastern Slovenia (VOGRIN, 1999). GVOZDÍK (1999) observed an hypomelanistic female on a sub-montane meadow of the Beskydy Mountains (Czech Republic).

Ventral part in females has white to yellow tones, while in male these are green presenting also sometimes abundant dark spots. Juveniles show the female's pattern but with a yellowish belly. Total length in adults up to 24 cm, rarely bigger, SVL about 10–11 cm. *L. agilis*, when compared with *Zootoca vivipara*, is more robust, the head is larger, dorsal pattern is different and ventral scales are very narrowly laid.

**Distribution, zoogeography and taxonomy:** Palaearctic species with a broad distribution pattern, reaching eastward Baikal Lake and northwest China, westward to southcentral England. In Europe, southern Scandinavia and northwest Russia represent the northern distribution limit (to the 62° N, in Karelia). The southern limit is represented by the Pyrenees and the mountain regions of southern France, by the Alps, by the inner mountain regions of Slovenia, Croatia, Serbia and Macedonia, by the Mt. Pindos (Greece), by southwest Bulgaria and some regions of European Turkey. Only recently this species has been found in Italy (LAPINI et al., 1989), where it seems limited to few localities along the Alps, in Piedmont, Friuli and perhaps Alto Adige.



In Europe the species occupies forest edges and steppes, roads and agricultural areas characterized by hedges, wooden and maquis zones southward exposed and sub-alpine meadows (PODLOUCKY, 1988). Similar habitat preferences have been also observed in the Italian populations (CAPULA & LUISELLI, 1992). In the Italian Maritime Alps, the species lives between 1650 and 2100 m on alpine meadows and it is more densely found in piled-up stones on calcaric well-drenated soil without arboreous and shrubby vegetation. Dense and stratified vegetation on sandy soil seem the preferred habitat of this species, even for reproduction (GLANDT, 1979). HOUSE & SPELLERBERG (1983) also give an exhaustive review of habitat preferences of the species; from these authors, the heatland formation represents an ideal habitat structure for the Sand Lizard in southern England.

The center of origin of this species is reputed to be the Caucasian and Trans-Caucasian region from where *L. agilis* spreaded during the Pliocene, colonising progressively the Euro-Asiatic areas of its actual distribution range (BISCHOFF, 1988). These populations fragmented during the glaciations periods and rejoined after the post-glacial phase. In some northern regions the more recent climatic changes did not allow the re-colonisation of the entire area previously occupied (as in the Scandinavian Peninsula, cf. GISLÉN & Kauri, 1959).

In a molecular systematic study carried out by KALYABINA et al. (2001) *L. agilis* appears to be clearly monophyletic, and three genetically distinct groups have been found.

**Biology and ecology:** The feeding ecology of the Italian populations of *L. agilis* has never been investigated. The diet of a population of northcentral Europe (Netherlands) is based on Araneae (23.5 %), Coleoptera (21.6 %), Homoptera (10.6 %), mites (8.9 %), Heteroptera (8.9 %), Formicidae (6.4 %), Hymenoptera (6.2 %), Opiliones (5.6 %) and many other groups represented in smaller percentage STRIJBOSCH (1986). BISCHOFF (1984) reports data by YABLOKOV regarding some Russian populations in which Lepidoptera (34.9 %), Coleoptera (34.1 %), Orthoptera (19.5 %), Hymenoptera (17.8 %) and Diptera (14.4 %) are the prevailing prey.

Different data is available on the population density. NAULLEAU (1990) estimated about 10 individuals/ha in France; TURNER (1977) reports 480 ind/ha in Moldavia; GVOZDÍK (2000) reports for Opava (Czech Republic) 73 ind/ha; YABLOKOV et al. (1980) observed up to 1500 ind/ha in Altaj (Russia); ELBING (1997) reports up to 120 ind/ha for Wangerooge Island (North Sea, Germany); STRIJBOSCH (1986) reports for a dunal habitat of Maas River (Netherlands) an average of 95 ind/ha. In the latter locality, this lizard occupies exclusively dry sandy areas, while the sympatric *Z. vivipara* shows a wider habitat preference. In the Italian Maritime Alps more than 30 individuals have been marked in a surface of 1 ha but only 4 have been recaptured (R. SINDACO, pers. obs, in 2001). In the Cuneo province (Piedmont) *L. agilis* is syntopic with *P. muralis* (less abundant), *Anguis fragilis*, *Vipera aspis*, *Coronella austriaca* and *Hierophis viridiflavus* (R. SINDACO, pers. obs).

Only few interspecific competition mechanisms have been generally observed between *L. agilis* and other lacertids (*Z. vivipara*, *L. viridis*) (SAINT GIRONS, 1976; GLANDT, 1995). Following NICHOLSON & SPELLERBERG (1989), females can occupy a territory of 100–400 m<sup>2</sup> and males 500–600 m<sup>2</sup>; while OLSSON (1986), in the Scandinavian Peninsula, noted a relatively big difference between females (156 m<sup>2</sup>) and males (up to 1110 m<sup>2</sup>) suggesting the existence of polygamy.

Daily activity can be uni- or bimodal and is more intense in June–August. It is also possible that the male activity is prolonged (SAINT GIRONS, 1976; KORSOS, 1986; NICHOLSON & SPELLERBERG, 1989). In a population of Czech Republic the lizard is active from 4 to 6 months. Males emerged earlier from hibernation than females (GVOZDÍK, 2000).

Mating season takes place in April–June (May/June in the Italian Maritime Alps, R. SINDACO, pers. obs). The clutch size changes in relation to altitude and latitude, average clutch size 5–6 white eggs of 12–15 x 7–10 mm (RYKENA, 1988; SALVADOR, 1985). Up to three depositions can take place during the reproductive season in populations living in warmer climate. Near the northern edge of the species' range, female Sand



Fig. 47: Habitat of *Lacerta agilis*, Valle Stura di Demonte, Piedmont.

R. SINDACO



Fig. 48: *Lacerta agilis*, Valle Stura di Demonte, Piedmont.

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Fig. 49: *Lacerta agilis*, Valle Stura di Demonte, Piedmont.

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Lizards usually laid only single clutches each year and the relative timing of oviposition seem to be consistent within a given female from year-to-year (OLSSON & SHINE, 1997). In a study dealing with breeding dispersal of this species, OLSSON et al. (1997) observed that females with a low reproductive output dispersed further than females that reproduced more successfully; the relationships between age differences and band-sharing similarity also suggested that some males could mate with their mothers. In NW Italy newborns were observed in August.