Zootoca vivipara (Jacquin, 1787)

Viviparous Lizard · (Italian name: lucertola vivipara)

Elongated and slender, short head and limbs, thick neck and squat tail. Caudal edge of the collar is serrate and the dorsal scales are keeled. Dorsal coloration of different brown to grey tonalities (a population in Scandinavia is know to be greenish). A dark vertebral stripe (generally continuous in females) and a lateral dark band are usually present, frequently also with dark scattered spots and ocelli mainly in males. Ventral part in females is white-yellowish and scarcely spotted, while in males it can be bluish with reddish tones or even white on the throat and belly, and marked black spots on the ventral part of the tail. Juveniles are generally darker. Total length up to 18–20 cm; SVL 6.5 cm.

Zootoca vivipara, is easily confused with *Podarcis muralis*, from which it is distinguishable by the less flattened body, small head, serrate collar edge and larger, keeled and overlapping dorsal scales.

Distribution, zoogeography and taxonomy: The western and eastern distribution limits are represented by Ireland and the Sakhalin Island (Russia) and Hokkaido Island (Japan) respectively; the southern by northern Spain, Po Valley (Italy) and the Rhodope Mounts in Bulgaria. The northern limits reach 70° (Varangerfjord, Norway). *Zootoca vivipara* together with *Vipera berus* is one of the widely distributed reptiles, and the northernmost lizard. Common in central Europe, while lacking in most of central-southern France and central Balkan areas. In the Po Valley, the presence of this species seems to be relict.

Normally linked to mesophyll or wet habitats. It is found in peat bogs, alpine meadows, covered areas characterized by *Agrostis* sp., *Calluna vulgaris*, *Sphagnum* sp., *Nardus* sp. and *Carex* sp., wet clayed grounds close to pond and water reserves. Heulin (1986) related the marked hygrophily shown by this species with its notable pulmo-cutaneous evaporation and the consequent water loss which is more pronounced than in other lacertids.

In the northern regions of its distribution range, this lizard is found in a greater variety of habitats, including sandy dunes, coastal cliffs, gardens, cultivated areas, open

Fig. 92: *Zootoca vivipara,* gravid ♀, Val Germanasca, Piedmont. R. SINDACO

shrub- and heathlands. In the southern part of its distribution range, *Z. vivipara* is mainly found in montane habitats. In the Alps the species is found between 900 and 2500 m, occasionally up to 3000 m.

In the Carpathians it reaches 2400 m, in the Albanian Alps and in southern Serbia up to 2500 m. In the Pyrenees even up to 2700 m.

This species presents both ovoviviparous and oviparous reproductive modes. SURGET-GROBA et al. (2001), in phylogenetic studies, indicates that the evolutionary transition from oviparity to ovoviviparity probably occurred once in *Z. vivipara*; and ovoviviparity probably originated from an eastern oviparous lineage. Besides the ovoviviparous populations, widespread on most of the distribution range, oviparous populations, previously know only for northern Spain and southwestern France (LANTZ, 1927; BRAÑA & BEA, 1987; HEULIN, 1988; BÖHME, 1997), were also recently found in Slovenia, Carinthia (Austria) (MAYER et al., 2000) and northern Italy (GHIELMI et al., 2001; surroundings of the Lago Maggiore, R. SINDACO pers. comm., summer 2001).

Phylogenetic studies based on mitochondrial DNA analysis show that the Italian oviparous population of the Palude Brebbia belong to the same group of the oviparous populations of Slovenia. This oviparous Italian-Slovenian group is distinct from the Pyreneean-Cantabric oviparous (Ghielmi et al. 2001). The latter is phylogenetically most closely related to the ovoviviparous populations (Mayer et al., 2000; Surget-Groba et al., 2001). The divergence between these two groups dates back to a separation occurring between 0.5 and 2 mybp (Guillaume et al., 1997; Heulin et al. 1999; Surget-Groba et al., 2000). The Italian ovoviviparous populations are included in the nominal form, while oviparous populations have been ascribed to the spp. *carniolica* Mayer et al. (2001) distributed in Slovenia, NE Italy, S Carinthia (Austria) and probably NW Croatia.

Two other taxa are known: ssp. *sachalinensis* Pereleshin & Terentiev, 1963 of the Asiatic eastern coastal populations, and ssp. *pannonica* (Lac & Kluch, 1968) of south-eastern Central Europe.

Biology and ecology: Avery (1962; 1966), the first researcher, who studied the feeding ecology of *Z. vivipara* in England, observed the consumption of a high variability of invertebrates. The most common prey, even if seasonally changing in percentage, were Heteroptera (36 %) and spiders (27,9 %), besides Collembola, Isopoda and larvae of Lepidoptera. Avery (1966) also observed a possible preference for some prey when comparing the obtained data with the arthropods abundance within the same

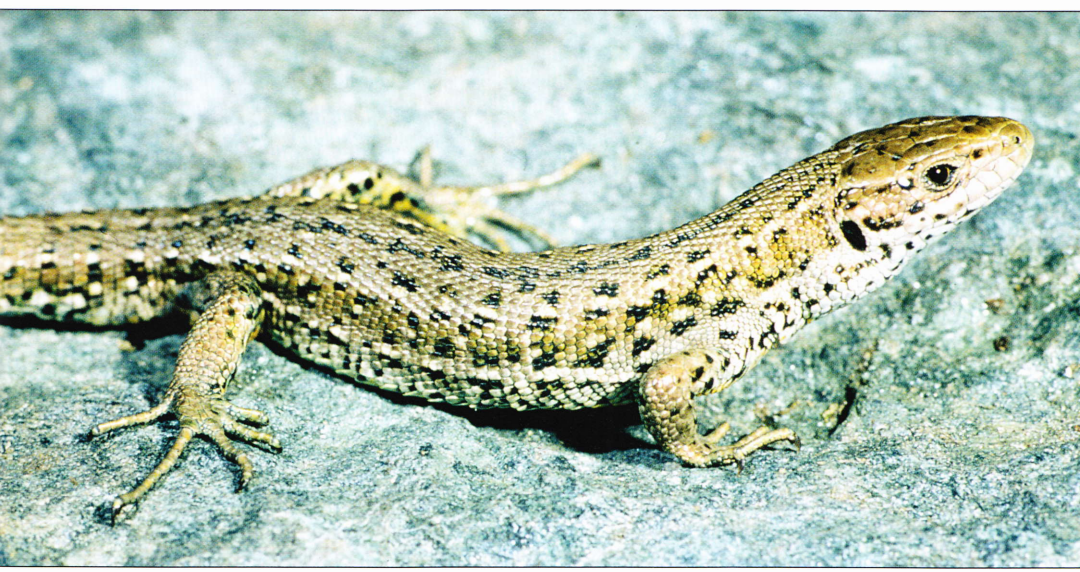

Fig. 93: *Zootoca vivipara,* Val Varaita, Piedmont. R. Sindaco

season in one of the studied areas: for instance ants never appear as prey even if extremely common. The author hypothesized that taste, prey size and speed could influence prey selection. STRIJBOSCH (1986) indicated as prevailing prey, in a dune habitat close to the riverbank of the River Maas (Netherlands), spiders (34.5 %), Homoptera (25 %), Diptera (9.4 %), Opiliones (5.5 %), Coleoptera (5.2 %) and mites (5 %); PILORGE (1982), in a population of Puy-de-Dôme (France), observed Homoptera (59 %) spiders (16.9 %), Gastropoda (7.3 %) and Coleoptera (6.1 %). BRAÑA (1984) for the Asturias (northern Spain), mention spiders (29.6 %), Homoptera (19.2 %) and Orthoptera (8.5 %). At higher latitudes (Finland) the diet of this lizard seems to be based mainly on Diptera (ITÄMIES & KOSKELA, 1971).

Zootoca vivipara is diurnal, even showing, during the reproductive season, a partial nocturnal activity. In the Friuli lowlands, this lizard is active during the day only in spring and autumn, while in summer (June–August) it is active only during night (L. LAPINI, pers. comm.). This behavior seems to be related to temperature. The winter dormancy is shorter than in other sympatric lacertids, but is never interrupted, even in favorable weather conditions. The winter survival is estimated to be 97 % and death during this phase can be mainly due to the loss of fat reserves and particularly rigid temperatures (BAUWENS, 1981). In northern Central Europe, the activity begins between February and April and stops with the end of the summer (VAN NULAND & STRIJBOSCH, 1981). It can obviously change in relation to latitude or elevation. Studies carried out on cooling endurance showed that *Z. vivipara* possess a high tolerance for both supercooling and freezing (GRENOT et al., 1999).

PILORGE (1981) observed in a population of the Massif Central (France), a density of 200–300 individuals/ha and in some parts of the Netherlands 700–800 ind/ha, very variable in relation to food availability of the different areas considered. No exact data is available for Italy, even if abundance is expected to be relatively low. It has been estimated that in females the territory can vary from 500 to 1000 m^2, while in males it can extend to 1700 m^2 (PILORGE, 1988).

The beginning of the reproductive period take place with the end of the first annual shedding of males (BAUWENS et al., 1989), and extends from April to the end of May. When ovoviviparous, *Z. vivipara* gives usually birth to 3–12 young, (15–22 mm, 100–250 mg) (GRENOT & HEULIN, 1990). BRAÑA (1986) observed that in the oviparous populations of the Cantabrian range, mating take place in June and deposition (only one per year) around the middle of July. In the Italian population of the Palude Brabbia (N Italy), 3 depositions per year occur in case of early pairing (GHIELMI et al., 2001). In this population, deposition takes place between the beginning of June and the middle of July, clutches of 5–6 completely calcified white eggs were found (GHIELMI et al. 2001).