Herpetofaunal observations in agricultural drainage dykes, Naoussa, northwestern Greece

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GREECE is well known for its rich and diverse herpetofauna (see Werner, 1938; Ondrias, 1968; Chondropoulous, 1986, 1989; and Corbett, 1989). A wealth of information is available, with distribution records for many of the islands; however, in mainland areas there may be missing pockets in our overall knowledge of species distribution (Pérez Mellado et al., 1999). Naoussa is located east of Thessaloniki just north of Veroia in the Imathia division. The slopes of the Mount Vermion region surrounding Naoussa are known for their healthy agriculture and successful production of red wine. The hydroelectric town of Naoussa trades mainly in rug/skin processing and fruit production. The surrounding area remains tranquil throughout the year, the main tourist calendar event being a historical parade and carnival in February.

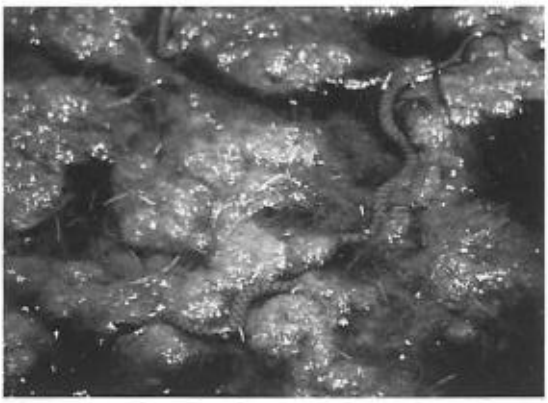
This short report comments on the few herpetofaunal species found in agricultural drainage dykes in the Naoussa region, northwestern mainland Greece, during four visits between April-June 1999. The area investigated was situated a few miles outside of the town. Lowland farmland areas in this region are characterised by a patchwork of peach, apricot, and silk farms at elevations of <500 m.

Observations of herpetofauna frequenting field margin drainage dykes at an agricultural research site (operated in conjunction with The Aristotelio University of Thessaloniki) were conducted on three occasions. The time allocated was short due to the primary study time focusing on retrieval and monitoring of botanical samples. Each survey lasted for 60 minutes and covered four 150 m-long dykes. There was a network of dykes, but the four chosen were the only ones containing water. All animals were identified and released at the site of capture.

HERPETOFAUNA

Bombina variegata, Yellow-bellied Toad (L). Comments: Largely diurnal, frequents most forms of temporary pool. Sociable, calls both diurnally and nocturnally. Small (<5 cm), flat, warty body. Bright yellow underside with blue grey/blackish markings, yellow markings on finger tips, grey brown to olive back, no vocal sac (for additional identification features see Arnold et. al., 1980 and Lang, 1988). Over 20 specimens were found in a running stream close to an actively used path. Most of the individuals congregated under a 2 m piece of corrugated iron in the stream (presumably for protection). Seven of the same individuals were found on all three occasions under the tin (identified by their distinctive belly pattern). When disturbed, individuals would exhibit the familiar *Unkenreflex* (see Hinsche, 1928; Duellman & Trueb, 1994). Interestingly, all *B. variegata* found had very few of the grey-blue blotches on their undersides and some younger individuals had just a few flecks. Specimens were also found buried under fist-sized rocks in the main babbling flow.

Rana ridibunda, Marsh Frog/Lake Frog (Pallas). Comments: Gregarious, diurnal, highly aquatic, warty, pointed snout, grey vocal sacs, olive green to brown back, <15 cm, closely set eyes, basks in sun (see Arnold et al., 1980). The specimens encountered were extremely agile and avoided capture. Those captured for identification were retrieved from deep grassy pockets beside the ditches and under a confluent pipe. Four to five individuals existed in each 100-250 m length of field margin dyke. The individuals captured from the pipe frequented thick soupy water that was rich in algae, other aquatic plants and detritus. Locating individuals was made easier by their persistent croaking chorus.



Natrix tessellata foraging in drainage dyke, Greece (Corfu). Photograph by P. Stafford.

Natrix tessellata, Dice Snake, Tessellated (Water) Snake (Laurenti).

Comments: Highly aquatic, adults 100 cm+ (usually <75 cm), narrow pointed head, round pupil, keeled dorsal scales, variable colour and markings, grey brown to yellow green, dark blotches on body, sometimes with yellowish spot, yellowish chequered underside (see Arnold et al., 1980). One live and one dead individual were found. The dead individual was an adult found at the edge of a peach plantation field. The cause of death was most probably a lawn mower (the animal was found shredded shortly after a cut). The live specimen was juvenile (<20 cm) and found under a slab of concrete near a confluence of three dykes. It may be assumed that *Natrix* sp. frequented the area due to the availability of suitable habitat and food resources (Hailey et. al., 1982). The juvenile specimen did not musk upon capture.

DISCUSSION

Corbett (1989) describes a range of threats to herpetofauna within Greece including collection, persecution and speculation for land development. Regarding Naoussa, collection may not be a large threat due to the isolation of the town and limited tourist interest (compared with Greece's many islands). However, vast open tracts of land may not necessarily be patrolled routinely by farmers. Persecution could also be a threat if animals were to venture onto paths/tracts through crops although the chances of this are arguably low. Encounters with amphibians and reptiles are few without actually searching for the animals.

Naoussa's main potential threat to herpetofauna is from agricultural intensification of its lowland habitats. Amphibians are known to inhabit agricultural areas (Beebee, 1981) but this can depend upon the physiological characteristics of the pond and tolerance of its inhabiting species (Beebee, 1983). Most intensive agricultural areas make poor habitats regardless of chemical pollution (Beebee & Griffiths, 2000). The reduction in diversity caused by monocultures and removal of corridors such as hedges and dykes inhibits the life cycle of migratory species and could lead to an isolated population. It is uncertain without further study whether the individual species encountered were resident, migratory or relic populations. Their isolation amongst such vast agricultural plantations may indicate a use of the dykes as corridors to other habitats.

The agricultural testing plots that were studied are mostly used for bio-control experimentation. Amphibians found in the dykes appeared healthy with no visible signs of physiological damage from agrochemical leaching, despite the dykes showing signs of eutrophication. Eutrophication is usually associated with excess phosphate and nitrate run-off and is common in crop margin dykes (Hill, 1991; NRA, 1992). However, it would be debatable in this instance whether nitrates (although known to be toxic to larval and adult amphibians — Secher, 2000; Oldham et. al., 1997; Watt & Oldham, 1995) are a potential factor limiting the distribution and presence of herpetofauna in this area. The higher summer temperatures (which coincide with applications) encourage maximum rates of growth and therefore optimum uptake by the fruit trees. Bare soils leach easier than those in Naoussa planted with fruit trees and the scorching summer sun can increase evapotranspiration of water-soluble nitrate from the soil (Hill, 1991). Other factors, such as type of soil, groundwater level and drainage, crop strains, type and frequency of nitrogen applied, can also influence levels of leaching (Hill, 1991; Soffe, 1995).

Numbers of amphibians found were greater in the two dykes surrounding a peach plantation. Peach plantations are generally sprayed very lightly to avoid damage to the plant (NAC, 1994). These testing plots in particular were also being used for Integrated Pest Management experimentation. Perhaps the increase in amphibian numbers is correlated with the implementation of biocontrol methods. In-situ studies into the effects of locally used agrochemicals and tolerance levels of these populations could reveal this. Further reports of species, their habitat preferences and distribution would also enable monitoring of the herpetofauna inhabiting this unusual, artificial habitat.

ACKNOWLEDGEMENT

I thank Makis Sidiropoulos for field advice/assistance and The Aristotelio University of Thessaloniki.

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