

Occurrence of the alien Bedriaga's frog (*Rana bedriagae*) Camerano, 1882 in the Maltese Islands, and implications for conservation

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ABSTRACT — We document the occurrence of Bedriaga's frog *Rana bedriagae* Camerano, 1882 in the freshwater pool of L-Ghadira ta' Sarraflu on the island of Gozo, one of the very few naturally occurring permanent bodies of water in the Maltese Islands, and a protected site. The frog is an alien species that appears to have been deliberately introduced in the late 1990s and to have established a breeding population at Ta' Sarraflu and possibly at two other sites on Gozo and at one site on Malta. Spread of the alien seems to be through human agency, not natural dispersal. Occurrence of the alien frog may have an impact on the only native amphibian, the Painted frog *Discoglossus pictus pictus* Otth, 1837, a protected species, as well as on the biota of the freshwater systems where the alien occurs, which are within or in close proximity to, protected sites and candidate Natura 2000 Special Areas of Conservation.

WHILE fossil remains of toads (*Bufo* spp.) have been recovered from Quaternary deposits in the Maltese Islands (reviewed by Hunt & Schembri, 1999), the only living amphibian that has ever been reported from the islands is the Painted frog, *Discoglossus pictus* Otth, 1837 (Lanza, 1973; Baldacchino & Schembri, 2002). This species is highly adapted to live in the semi-arid Maltese environment, where it thrives in spite of a dearth of freshwater (Sammut & Schembri, 1991). The Painted frog has a very limited distribution, with one subspecies (*Discoglossus pictus pictus*) occurring in Sicily and the Maltese Islands, and another (*Discoglossus pictus auritus*) in Algeria, although it has been introduced to parts of southern France and NE Spain (Lanza *et al.*, 1986).

Against this background, the discovery of a thriving population of a species of water frog in the permanent freshwater pool at Ta' Sarraflu on the island of Gozo was surprising. This population was discovered when one of us (AS) investigated the origin of strange calls that were being heard from the pool area. These peculiar calls were first noticed in mid-April 2000 but were initially

dismissed as those of a water bird; however, after they could not be assigned to any water bird that occurs in the Maltese Islands, more careful study showed them to be similar to those made by water frogs. Investigation of the water in the pool revealed the presence of the Painted frog, but also of a larger and different species that proved very difficult to observe since at the slightest movement individuals disappeared very rapidly under water and into the dense reed beds in the pool. It was only on 27th May 2004 that we managed to take photographs of this animal; the first specimens were captured on 5th September 2004 (Fig. 1).

Size, colour and morphology of the 'new' species from Ta' Sarraflu indicated it to belong to the southeastern European/northeastern African group of water frogs, possibly *Rana ridibunda*/*R. bedriagae* or a related species (Fred Kraus, pers. comm.; Ulrich Sinsch, pers. comm.). Because of the great morphological similarity in frogs within this group and the small sample size available for study, specific determination was made by Prof Ulrich Sinsch (Institut für Zoologie, Universität Bonn, Bonn, Germany) on the basis of analysis of eight male advertisement calls recorded in the

field on 29th March 2005. All calls analysed had 12–20 pulse groups per call and each pulse group had 6–8 pulses, which are coincident with reference calls from *Rana bedriagae* recorded from Egypt to Turkey (Ulrich Sinsch, personal communication; Schneider & Sinsch, 1992; 1999). We are therefore confident that the 'new' frog from Ta' Sarraflu is Bedriaga's frog, *Rana bedriagae* Camerano, 1882. The native distributional range of *Rana bedriagae* is Cyprus, Egypt, Greek islands close to the Turkish coast, Israel, Jordan, Lebanon, Syria and Turkey; it is also present in Iraq and possibly further east (Arnold & Ovenden, 2002; IUCN, 2004). This frog is not native to the Maltese Islands but has been introduced, probably sometime in the late 1990s. Given their larger size, different coloration and the very loud noises these frogs make, especially in spring and summer when the males establish territories and court females, it is unlikely that these animals would have been overlooked, especially given that many naturalists, including ourselves, visit Gozo regularly and that there are no other species present in the Maltese Islands that make comparable calls; in fact, it was the unusual calls from Ta' Sarraflu that alerted us to the presence of this species in the first place.

When first detected in 2000, some six individual males were heard calling at Ta' Sarraflu. At present (spring and summer of 2005) about 50 males can be heard calling at any one time. Eggs, tadpoles and froglets of the alien are also present in the pool. This suggests that *Rana bedriagae* has established an actively breeding population at Ta' Sarraflu and that this population has increased at least tenfold over a period of five years. Whether the carrying capacity of the pools has been reached or not is unknown.

How this species was introduced to Gozo is not clear, but in all probability it was introduced deliberately perhaps in a misguided attempt to 'embellish' the environment. Some farmers in the area whom we questioned are of the opinion that the frogs were obtained from overseas and released by a resident of Gozo in the early 1990s; however, we cannot confirm this since the person indicated is now deceased. Up until Malta's

accession to the European Union in 2004, the local Environment Protection Department (EPD) operated a system whereby any importation of biota from overseas required a permit from the EPD. These regulations were put in force specifically to control the entry of potentially problematic alien species into Malta. According to the records of the EPD, prior to 1st May 2004, requests for the importation of a number of species of *Rana* were received and processed by the Department, however, *Rana bedriagae* was not amongst these and no species of *Rana* was actually imported. After Malta's accession to the European Union on 1st May 2004, the requirement for an import permit for species originating from EU member states was abolished in accordance with the principle of free trade. However, as the alien species was already established by 2000, we exclude the possibility that the Ta' Sarraflu population originates from legally imported material.

The presence of *Rana bedriagae* in the pool at Ta' Sarraflu is of concern. L-Ghadira ta' Sarraflu (as the pool is known) is a very important habitat in the local context since it is one of very few pools where natural freshwater accumulates and persists throughout the year, even during the hot summer months when most other freshwater dries up (mean annual rainfall in Malta is ca 530 mm of which some 85% falls during the period October–March; Chetcuti *et al.*, 1992). A significant number of plant and animal species that require a perennial supply of freshwater occur there but are overall very rare in the Maltese Islands, as their habitat is rare. For this reason the pool at Ta' Sarraflu has been scheduled as a Level 1 Area of Ecological Importance and Site of Scientific Importance under the Development Planning Act of 1992 (Government Notice 288 of 1995), while the entire western coastal area of Gozo, including L-Ghadira ta' Sarraflu, has been declared a Candidate Special Area of Conservation of International Importance in the Flora, Fauna and Natural Habitats Protection Regulations, 2003 (Legal Notice 257 of 2003); these regulations transpose the requirements of the European Union's 'Habitats Directive' to local legislation.

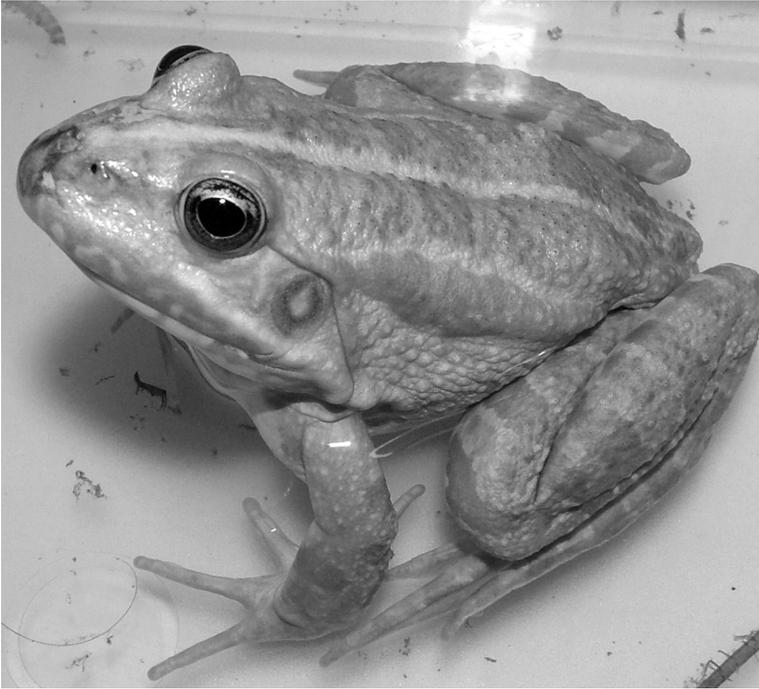


Figure 1. *Rana bedriagae* collected from the pool at Ta' Sarraflu in Gozo. Photograph © Arnold Sciberras.

What the impact of the alien water frog on the biota and ecology of the pool has been, or will be, is not known, but *Rana* are known to be voracious predators and to eat the tadpoles and froglets of smaller species as well as a large variety of invertebrates. In captivity, we observed *Rana bedriagae* from Ta' Sarraflu to be unselective feeders on beetles, dragonflies and cockroaches, as well as on bees and wasps (which *Discoglossus pictus* rejects). We have also observed predation by *Rana bedriagae* on larval and juvenile *Discoglossus* on numerous occasions and on two instances we observed a large individual of *Rana bedriagae* (>15 cm length) prey on the shrew *Crocidura sicula calypso* (a protected, endemic subspecies), and at another time an equally large *Rana bedriagae* preying on a juvenile House mouse (*Mus musculus*), close to the water's edge. On the other hand, on four occasions we observed large *Discoglossus* (one individual ca 8.5 cm, and three individuals ca 7 cm in length) feeding on *Rana* froglets (<3 cm length).

Rana bedriagae and *Discoglossus pictus* currently co-exist at Ta' Sarraflu. For the present, *Rana bedriagae* seems to be confined to the pool because of its requirements for water, however, the population of *Discoglossus* is probably replenished from the surrounding environment since the native frog is able to transverse large expanses of arid ground. Unlike *Discoglossus pictus*, which is active during the wet season (October to March), we observed *Rana bedriagae* to spend cold periods when the temperature falls below 15 Celsius in a state of quiescence under water and to become active during spring and summer, that is, at the tail end of

the wet season and during the dry season. Nonetheless, the impact of *Rana* on *Discoglossus* and on the pool and bank biota needs to be studied, especially given the status of L-Ghadira ta' Sarraflu as a protected area and of *Discoglossus pictus* as a locally protected species.

It is worrying that we have recently heard calls of what is probably *Rana bedriagae* from two other localities on Gozo: Il-Wied tax-Xlendi, where the calls came from dense reed beds in a wet and thickly vegetated part of the valley, and from a deep artificial pool at Nadur. We have yet to confirm the species here by actual specimens or acoustic characterisation. We have also seen what appears to be the same species in a reservoir within the grounds of a tourist complex at Mellieha Bay on the island of Malta. Additionally, we have information that what may be this species is also available from street markets on Malta. It is likely that the apparent spread of the alien frog on Gozo is more due to transport and release by humans than to natural dispersal; we have seen children at Ta' Sarraflu capturing the frogs with nets to be kept as 'pets'. The presence of an alien *Rana* at Il-Wied tax-Xlendi and at Mellieha Bay is

of particular concern since the areas where the frogs occur are in close proximity to ecologically important scheduled sites and within candidate NATURA 2000 sites. In this regards we recommend that measures be taken with urgency to prevent the further spread of the alien by humans and to control the populations where it has already established itself, especially at this early stage when the alien species is still present in a few, contained areas.

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