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Problems for Conservation of Pond Turtles (*Emys orbicularis*) in Central Italy: is the Introduced Red-Eared Turtle (*Trachemys scripta*) a Serious Threat?

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The only native freshwater turtle in the Italian peninsula is the European pond turtle (*Emys orbicularis*). Although this species is still relatively widespread, natural populations are declining or vulnerable in several regions of Italy (Lanza, 1983). The main threats seem to be habitat loss, pollution, and intensive illegal capture of animals for the pet trade (Gariboldi and Zuffi, 1994). Moreover, in some sites where this species is still common but where it inhabits ponds and streams surrounded by roads, highway mortality represents a major threat to neonate turtles in late summer (U. Agrimi, pers. comm.).

During recent years the occurrence of introduced pond-turtle species in Italy has been documented. They include *Mauremys caspica*, *Mauremys leprosa*, and the North American red-eared turtle (*Trachemys scripta*, see Lanza and Corti, 1993). The first two species have been introduced in only a few scattered places but *T. scripta* has been released in many ponds and streams of central and southern Italy (Lanza and Corti, 1993), a result of the widespread release of both young and adult specimens by pet keepers and amateurs no longer able to house them in captivity.

The number of red-eared turtles is presently also increasing in artificial ponds in urban parks. For instance, large colonies occur in two artificial ponds of the historic Villa Doria Pamphilj and Villa Borghese parks in Rome. Our observations on the latter population indicate that the colony increased from about 25 adults in 1991 to at least 60 adults and an uncertain number of immatures in 1994-95 (M. Capula et al., unpubl. data). However, it is still unknown until now whether the increase resulted from the release of additional captive specimens or successful on-site reproduction.

It has been repeatedly suggested by conservationists that *T. scripta* is ecologically dominant over *E. orbicularis* and that it could be a serious competitor for the native species (e.g., Giugliano, 1988; Frisenda and Ballasina, 1990). This

view is not, however, based upon quantitative data, and thus we were curious to determine what ecological differences may be present between the species when they co-exist. In this note we report preliminary findings on reproduction and differential winter survivorship of adults vs. neonates of the two species in central Italy.

Study Area and Methods. — We studied two free-living colonies of red-eared turtles, one in a large artificial pond at Villa Borghese Park, Rome, and the other in an artificial drainage canal near Latina (ca. 70 km south of Rome). In Latina, some *T. scripta* individuals were observed between 1991 and 1995 along a canal transect 5.8 km long where they co-existed with a relatively large population of *E. orbicularis* (Fig. 1). This population of *E. orbicularis* was previously studied by Capula et al. (1994).

In several surveys conducted in recent years, we were struck by the relatively high number of juvenile *E. orbicularis* observed but, conversely, the total absence of neonate *T. scripta*. To explain the lack of neonates and the apparently constant number of adults, we assumed that the original release involved a small number of adult *T. scripta*, and hypothesized that (i) adults were unable to successfully reproduce and/or that (ii) neonates were unable to survive the winter cold.

To test hypothesis (i) we collected 11 adult females during the reproductive season in June and placed them in outdoor enclosures to monitor their behavior and to observe whether they produced eggs.

To test hypothesis (ii) we constructed an outdoor semi-natural water basin (about 5 x 2 m and 40 cm deep) in the study area, providing it with habitat features similar to those of the source habitat (including both mud and vegetation). The water basin was enclosed with a plexiglas wall (80 cm high). Thirty newborn turtles of each species were introduced to the enclosure in the fall of both 1993 and 1994. The *T. scripta* were obtained from a pet shop in Rome and the *E. orbicularis* were wild-caught locally. In early spring 1994 and 1995 at a time when visible activity of free-ranging turtles starts, the enclosure was surveyed and the number of juvenile turtles that had survived the winter evaluated.

Results and Discussion. — Evidence of *T. scripta* reproduction in the study area was limited to courtship behavior, which was frequently observed at both the Latina and Rome sites, mainly on sunny days. The earliest courtship observed was on 10 April and the latest on 12 June. Nevertheless, we did not obtain any eggs from 11 females captured

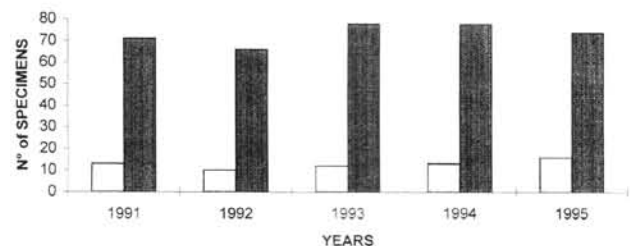


Figure 1. Numbers of native *Emys orbicularis* (shaded bars) and introduced *Trachemys scripta* (open bars) observed along a canal transect near Latina (central Italy), 1991 through 1995.

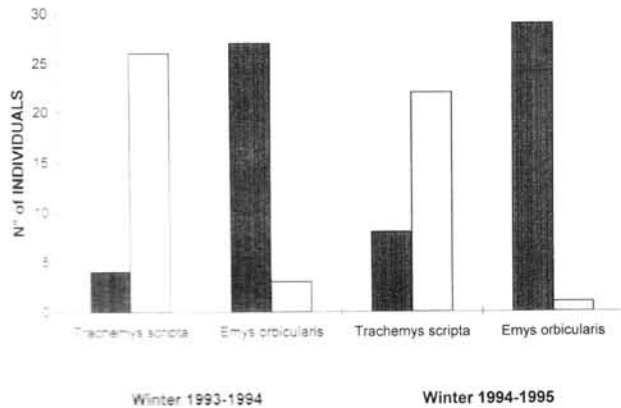


Figure 2. Numbers of surviving (shaded bars) and deceased (open bars) overwintered neonatal native *Emys orbicularis* and introduced *Trachemys scripta* near Latina (central Italy), 1993 through 1995.

in June from the Latina population and housed in small outdoor enclosures for 15 months. Many chelonian species are able to produce viable eggs in bioclimatic regimes very different from those to which they are native. For example, Grillitsch (1993) documented successful reproduction of Mediterranean *Testudo hermanni* in Austria. However, we believe that red-eared turtles introduced to central Italy may have very low, if any, reproductive potential. In this regard radiographs or examination of the ovaries would provide evidence of reproductive activity in these populations (Hutchison, 1993).

The survivorship of neonate *T. scripta* and *E. orbicularis* through winter is presented in Fig. 2. Most of the *E. orbicularis* survived in both years, whereas only a few *T. scripta* were able to do so. The difference in survivorship rates between the species was highly significant in both winters (χ^2 -test with $df = 1$, $p < 0.001$), and thus we conclude that the hypothesis that young *T. scripta* show high winter mortality in Italy is reliable. High mortality rates of red-eared turtles during wintertime have also been observed in Tuscany (M. Zuffi, *pers. comm.*), indicating that our results might be applicable to many other regions of peninsular Italy with similar or lower winter temperatures.

Conversely, based on the stable number of adult *T. scripta* observed along the canal transect from year to year (Fig. 1), we suggest that winter cold does not affect adult survivorship rates at this site.

Conclusions. — Data given here provide preliminary evidence that the reproductive success of introduced *T. scripta* in central Italy may currently be very low, with two main constraints: (1) low winter survivorships of neonates, and (2) apparently low adult female reproductive success.

If we combine these major constraints with the observation that introduced colonies of red-eared turtles are smaller than those of the indigenous *E. orbicularis*, we conclude that *T. scripta* is not a current threat for *E. orbicularis*, at least in central Italy. However, it is possible that the situation may be different in other regions. In central France, where *E. orbicularis* is at its northernmost distribution limit (Servan, 1989), it could possibly be more vulnerable to potential

competitors. *Trachemys scripta*, however, being the more cold-sensitive form, would also be more vulnerable there. With regard to the low success of introduced *T. scripta* in central Italy, one should note that this North American species also occurs naturally in some very cold areas (e.g., southern Illinois, see Behler and King, 1979), and that if specimens from these cold regions were introduced into Italy, their resulting success might have been better. In fact, *T. scripta* has been successfully introduced in several different countries, such as Spain (Da Silva and Blasco, 1995), Israel (Bouskila, 1986), South Africa (Newbery, 1984), Korea (Platt and Fontenot, 1992), and United Kingdom (Daniels, 1994), as well as in North American areas outside its natural range.

In conclusion, although the impact of introduced *T. scripta* on populations of *E. orbicularis* appears to be less obvious than might be expected, it remains true that the only native freshwater turtle in Italy is in dramatic decline, and much attention needs to be directed to conservation of this threatened taxon. Moreover, whatever the effect of introduced *T. scripta* on native *E. orbicularis* populations may be, we emphasize that the introduction of exotic species should always be strongly discouraged, and that severe preventive measures should be adopted by each responsible government for reducing such activities.

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