

In June of 2001 a project was initiated to assess the prevalence of URTD in the Wekiva Basin GEOPark in Orange, Seminole, Volusia, and Lake Counties. Included in the GEOPark are Wekiwa Springs State Park, Lower Wekiva River State Preserve, and Rock Springs Run State Reserve (RSRSR). Rock Springs (where the die-off occurred) is a 13, 710 acre Type I Wildlife Management Area. It is composed of a mixture of habitat types including sandhill, scrub, flatwood, hydric, mesic and xeric hammock, swamp and small, marshy ponds. However, the die-off occurred in well-maintained sandhill. Prescribed burning is used to maintain the quality of the habitat, although drought conditions have limited this activity since 1998.

Upon visual survey of approximately 150 acres of sandhill at RSRSR, approximately 125 dead tortoises were found between August and December 2001. Three marked tortoises were among the dead. Dead tortoises were concentrated in a central area of approximately 100 acres. Most tortoises were found plastron side up and within 5 meters of their possible burrow. A large majority were intact and bleach white, suggesting that they had been there for some time (Dodd, 1995). This population was surveyed in May of 2000 and showed no signs of mortality at that time.

Visual surveys continued from August to November 2001 in an attempt to collect tortoises to be tested for URTD. Because few tortoises were found, it was necessary to switch to bucket trapping to obtain a sufficient sample size. After collection, standard morphometric data was recorded as well as any visually obvious symptoms of URTD. Samples were sent to the University of Florida to be tested using ELISA for exposure to *M. agassizii*. Of the 22 tortoises tested, 14 (64%) tested positive for exposure to URTD and two tortoises (9%) were suspected of having been exposed to URTD.

Although the exact cause of the die-off has not been determined, many factors are being considered. Local Florida Fish and Wildlife Conservation Commission staff has reported

tortoises being dropped-off at RSRSR. This could introduce individuals with URTD and infect the existing population. Strain virulence, burn history and burrow humidity may also be factors.

The occurrence of large-scale die-offs and their association with URTD has become more common in Florida in recent years (Cindy Gates, pers. comm.). Loss of suitable habitat, illegal development practices, drought conditions and a well-intending but under-informed public may be contributing factors to its prevalence. Determining the factors affecting the distribution of URTD within and among populations, its virulence and possible solutions warrant future investigation.

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## Generic Revisions of Emydine Turtles

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Emydine turtles (sister to Deirochelyinae within Emydidae) are represented by ten extant species, nine of which are restricted to North America. This charismatic and ecologically diverse group of turtles is relatively well studied (as turtles go) and is familiar to both amateur and professional chelonologists. Recent phylogenetic studies (Bickham *et al.*, 1996; Burke *et al.*, 1996; Lenk *et al.*, 1999; Feldman and Parham, 2001, 2002), combined with the discovery of important new fossils (e.g., Hutchison, 1981; Holman, 1987; Holman and Fritz, 2001), have contributed to an emerging consensus on the major aspects of emydine evolutionary

history. Based on this combined evidence, two independent studies (Holman and Fritz, 2001; Feldman and Parham, 2002) proposed contrasting generic revisions of emydine turtles. The purpose of this note is to briefly review these taxonomic changes and point out areas of agreement and disagreement.

Presently, the emydine species can be divided into four well-supported, monophyletic groups (Figure 1); listed in order of their date of authorship these are:

***Emys Dumeril 1806***- The type species of *Emys* is the European pond turtle, *Emys orbicularis* (Linnaeus 1758). Using mtDNA data, Bickham *et al.* (1996) were the first to

suggest that the western pond turtle, *Emys marmorata* Baird and Girard 1852, Blanding's pond turtle, *Emys blandingii* (Holbrook 1838), and *E. orbicularis* form a monophyletic group. Given this arrangement, Bickham *et al.* (1996) suggested that all three species could be placed in the genus *Emys*, pending further support. Since that time, a monophyletic *Emys* has been strongly supported by two additional molecular-based studies (Lenk *et al.*, 1999; Feldman and Parham, 2002) and an expanded *Emys* was adopted by Feldman and Parham (2002). However, Holman and Fritz (2001), based on the results of Lenk *et al.* (1999), suggested the *Emys* clade be divided into three separate genera: *Emys*, *Actinemys* Agassiz, 1857 (for *E. marmorata*) and *Emydoidea* Gray 1870 (for *E. blandingii*). They specifically avoided placing a species without shell kinesis (*E. marmorata*) into the same genus as taxa with shell kinesis (*E. orbicularis* and *E. blandingii*). We disagree with this typological approach, and provide the following arguments in support of a more inclusive *Emys*.

First, there are multiple examples of turtle genera that display varying degrees of shell kinesis. Two notable examples are mud turtles (*Kinosternon*) and Palearctic tortoises (*Testudo*). In fact, shell kinesis can be polymorphic within a single species. For example, the spider tortoise, *Pyxis arachnoides*, can have a plastron with a well developed hinge or an akinetic plastron (Siebenrock, 1906; Bour, 1981). Additionally, Harding (pers. comm. to JFP) has recorded *E. blandingii* with akinetic plastra in Michigan. Because shell kinesis is a character that can vary at several taxonomic levels, even within emydine species, we feel it should not be used to split *Emys* into separate genera.

Second, Feldman and Parham (2002) found that the amount of uncorrected sequence divergence among the three *Emys* species (5.66-6.33%) overlaps with the genetic

distances seen between other congeneric emydines (4.22-6.09%), but is less than that observed between emydine genera (7.01-9.26%). Although useful as a comparative example, we emphasize that genetic distance alone (i.e., without a phylogenetic justification) should not be an arbiter of taxonomy.

Third, the taxonomy suggested by Holman and Fritz (2001) results in three closely related genera, each with a single living species. This would obscure the undeniably close relationships of *E. marmorata*, *E. blandingii* and *E. orbicularis*. Separate generic names are redundant because *Emys* species are already distinguished by their specific epithets. Extinct relatives of *Emys* species exist, but the bulk of *Emys* research and interest is focused on living taxa. To make the scientific names informative to the majority of workers, we suggest *Actinemys* and *Emydoidea* be reserved as subgeneric names for groups that include a living species and its close fossil relatives.

***Terrapene* Merrem 1820-** No taxonomic revision is required for the well-known genus *Terrapene*. All analyses support the hypothesis that the species of *Terrapene* represent a natural group with a shared history that is independent of the other emydines.

***Clemmys* Ritgen 1828-** The only species in the genus *Clemmys* is the type species, *Clemmys guttata* (Schneider 1792). Although monotypic genera are generally undesirable, it is necessary here because the phylogenetic affinities of *C. guttata* to other emydine genera are uncertain (Bickham *et al.*, 1996; Burke *et al.*, 1996; Feldman and Parham, 2002). None of the analyses suggest a close affinity to *Emys marmorata* or *Glyptemys*.

***Glyptemys* Agassiz 1857-** All analyses agree that the wood turtle, *Glyptemys insculpta* (LeConte 1829), and bog turtle, *Glyptemys muhlenbergii* (Schoepff 1801), are each other's closest relative and are not closely related to *Clemmys*. Two groups working in parallel (Holman and Fritz, 2001; Feldman and Parham 2002) revised the taxonomy of these species. Unbeknownst to one another, they chose different names for this clade. Feldman and Parham (2002) chose *Calemys* Agassiz 1857 while Holman and Fritz (2001) chose *Glyptemys*. The generic revision of Holman and Fritz (2001) was published three months before Feldman and Parham (2002) so *Glyptemys* is the appropriate, valid name.

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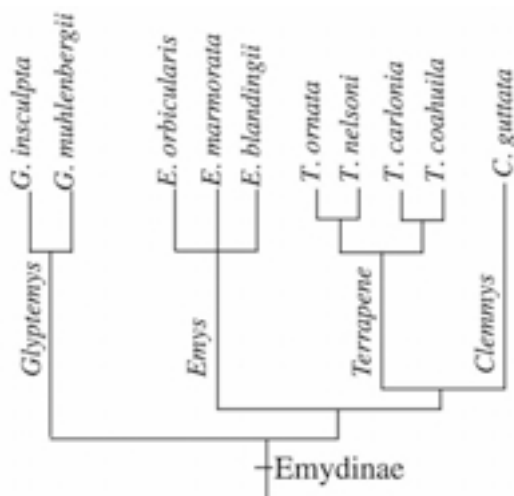


Figure 1. A phylogenetic tree of emydine species based on Feldman and Parham (2002), similar to Bickham *et al.* (1996) and Lenk *et al.* (1999). The four species groups are well supported, but the basal relationships (e.g., the relationships of *Clemmys* sensu stricto) are more ambiguous."

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## Adapting the Namaqualand Speckled Padloper, *Homopus signatus signatus*, to Captive Conditions

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*Homopus s. signatus* is the world's smallest terrestrial tortoise (max. male, 87.5 mm carapace length, 96 g; female, 106 mm and 163 g) (Boycott, R.C. and Bourquin, O., 1988) and is endemic to Namaqualand, South Africa. The species is listed in Appendix II of CITES, but is not listed in the South African Red Data Book. In South Africa the species is also called "klipskilpadjie" which means little rock tortoise. This tortoise is found in a region with relatively low rainfall and can be found on rocky outcrops.

In October 2001 two male and two female wild-caught *Homopus signatus signatus* (specimen studbook numbers 0035-0038) were imported from South Africa into the Netherlands (export permit EB2001/432, import permit 33145) to consolidate the studbook for this species within the Homopus Research Foundation. These specimens were from the same area (Springbok, Namaqualand) as previously imported specimens. After capture, during flight and customer transfer a data logger (HOBO temp, Onset computer corporation, Pocasset, USA) was placed in the transport box. While temperatures dropped briefly to less

than 5°C during transport, these temperatures are also encountered in the wild at this time of year.



Figure 1. Male *Homopus* exploring his new cage.