

CONSERVATION OF THE GOLDEN TOAD: A BRIEF HISTORY

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The endemic Golden Toad (*Bufo periglenes*) disappeared from Costa Rica's Monteverde Cloud Forest Preserve after a sudden population crash in 1987 (Crump *et al.*, 1992; Pounds and Crump, 1994). Two years ago, we were tempted to respond to Harding (1993), who argued that this endangered species has been "neglected" and that its disappearance was the result of "too much science and not enough common sense". We chose to wait, however, in the hope of having good news to report regarding the toad's status. Unfortunately, little has changed. The Golden Toad, along with 19 of 49 other anuran species that previously inhabited our 30 km² study area, is still missing eight years after the crash (Pounds *et al.*, unpubl. Ms).

Harding (1993) categorised conservationists as "talkers" and "doers". To his way of thinking, the latter are absent from Monteverde, and the "laissez-faire" talkers have stood by, doing nothing to save the Golden Toad. In fact, and as we will show, it would be difficult to find a more effective group of "doers" than the conservationists that reside in Monteverde. The amphibian crash was a sudden, catastrophic event that lay far beyond their control. Harding proved himself to be the worst sort of "talker", one who is willing to talk about things of which he knows far too little.

It is no minor point that Monteverde's conservationists founded the cloud forest preserve to protect the Golden Toad, which was discovered in the early 1960's (Savage 1966). That is why a toad appears along with the panda logo of the World Wide Fund for Nature (WWF; previously the World Wildlife Fund) on the sign marking the preserve's entrance. In 1972, with the help of WWF and the Tropical Science Center (the Costa Rican organisation which manages the preserve), U.S. scientists George and Harriet Powell and Quaker settler Wilford Guindon set aside the 328 hectare Brillante tract. This elfin woodland includes the best-known breeding sites of the Golden Toad. Along with a tract the Quakers had set aside for watershed protection, it formed the nucleus around which the preserve would grow. Without the Powells and Guindon, the Golden Toad's habitat would have been logged and turned into farmland long ago. Ironically, Guindon was also a member of "Crump's team", accused by Harding of having failed the Golden Toad in 1987.

The same people who, according to Harding, were responsible for "25 years of comparative neglect" brought about the much-needed expansion of the preserve. In the mid-1980's, as a BBC crew filmed the Bare-Necked Umbrellabird in the Peñas Blancas valley (then outside the preserve), squatters began to chain-saw the forest around them. This emergency helped stimulate a grass-roots movement of local residents and visiting scientists who formed the Monteverde Conservation League (MCL). With the help of the WWF, the Nature Conservancy, and a host of smaller groups and individuals, the League and the Tropical Science Center tripled the size of the preserve to 10,500 ha. Likewise, with the help of children around the world, especially the Swedish organisation Barnens Regnskog, it set aside the adjacent 16,00 ha Children's International Rainforest.

This expansion was vital to amphibian conservation. It won protection of Golden Toad habitat not included in the original preserve and reduced the threat of local climate change due to deforestation. But perhaps most importantly, it provided the only ray of hope that amphibians might eventually recover from the 1987 population crash: 20% of the species which were missing from our study area in 1990 recolonised from outlying protected habitats during 1991-1994 (Pounds *et al.*, unpubl. Ms). Thanks to Monteverde's grass-roots conservationists, the preserve is more than a small island of forest in a sea of pastureland.

We cannot overemphasise that the Golden Toad's disappearance was sudden and unexpected. Populations seemed healthy shortly before their demise, and concern focused more on Baird's Tapirs, Mountain Lions, and Bare-Necked Umbrellabirds. It is clear in hindsight that captive breeding of the Golden Toad would have been, as Beebee (1993) put it, "a prudent measure", but the absence of toads in recent years has made this impossible. We also agree with Beebee that captive breeding is a limited option in conservation; there are too many endangered species to cope with.

Contrary to what Harding implied, there were no warning signals in 1987. Breeding pools dried up, killing the embryos, but this had happened in many previous years and was hardly a "catastrophe". As Beebee (1993) pointed out (and Harding should have known) mass mortality of eggs and tadpoles is common for toads that breed in temporary pools. There is absolutely no reason that Martha Crump should have thought it necessary to interfere with the natural processes that she was trying to study.

Harding seemed to believe that if he had been present he would have single-handedly saved the day: "I can say with my hand on my heart that I would not have let those Golden Toad eggs desiccate and die". Nevertheless, his common-sense plan of "topping-up pools" would not have helped. Of the 1500 adults observed at Brillante in 1987, only one appeared in 1988 (Crump *et al.* 1992). As discussed in Pounds and Crump (1994), this precipitous decline implies high adult mortality, not failed reproduction. Harding stated that "the case for water shortages in temporary pools as the principal cause of the demise of the Golden Toad is overwhelming and all but proven". This is simply not true. The whole anuran fauna declined regardless of breeding mode or habitat. Many of the affected species were not subject to the vagaries of ephemeral pools. They included, for example, stream-breeding Glass Frogs (*Centrolenella*), treefrogs (*Hyla*), and Harlequin Frogs (*Atelopus*) as well as terrestrial-breeding Rain Frogs (*Eleutherodactylus*).

Harding's other common-sense solution to the Golden Toad's predicament was that of "waterproofing" breeding pools with "plastic membranes". Beebee (1993) warned that this might cause the toads to abandon sites. There is another problem which is obvious to those with some knowledge of the Golden Toad's habitat: the breeding pools form around the stilt-like roots of elfin forest trees. It would be physically impossible to install "plastic membranes" without first removing the roots. The use of chain saws would be called for, and this would ensure that there is no habitat to which Golden Toads might one day return.

We remain hopeful that the toads will reappear. Although the species seems to be extinct in our study area, populations might still exist on inaccessible, outlying ridges. Recolonisation of empty habitats would literally be a dream come true. Were it not for Monteverde's conservationists, however, even this dream would be gone.

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