prompted us to share the story with DAPTF members and introduce the Korean Working Group of the DAPTF to interested parties. Jiyul, a 48 year-old Buddhist nun from Naewon Temple on Mount Cheonseong, northwest of Pusan, recently fasted for 100 days demanding an immediate halt to the construction of a highway tunnel. She believed that the tunnel would change underground water systems, resulting in drying of swamps and marshes and destroying plants and animals living in the area. In particular, she was concerned about the long-tailed clawed salamander, *Onychodactylus fischeri*. This national crisis soon became more than a story about the plight of the hynobiid clawed salamander. Jiyul's fast focused an entire nation's attention to the issue and provided an important insight into a culture whose values are not well appreciated on an international scale, but whose people have a long and rich tradition of protecting and preserving wildlife in the face of commonly understood setbacks. The problem is both complex (related to economics, religion, politics, and the environment) and compelling.

The story begins in 1992 with the construction of a Korean train express (KTX) system intended to save 3 hours of travel time between Seoul and Pusan, the second largest city in the country. The project had already cost more than 18 billion dollars. The 13th portion of the project required the construction of a 13.2 km long tunnel under Mt. Cheonseong, where a buddhist temple and 22 unusual mountain swamps can be found. Due to the highly developed swamp systems and well-conserved forests, many endangered species live in the Mt. Cheonseong area, including 11 species listed as endangered in the Korean Red Data Book, including two mammals, six birds, one snake, one salamander, two insects, and four plants.

In Korea, the Ministry of the Environment must submit an environmental evaluation to the Court before beginning any major construction project. Researchers are drawn from universities, government agencies and private research institutes. In this case an environmental evaluation conducted in 1994 "indicated" that the tunnel project would not affect any environmentally sensitive locations or animals living in them. Unfortunately, the environmental evaluation is not available for public review. The Ministry of Environment approved the project allowing the Ministry of Construction and Transportation to start the work. The whole rail-line was approved at that time and a 293.7 km segment from Seoul to Taegu began operating in 2004.

It has become standard procedure in Korea for large scale development projects to be planned with little attention to long-term environmental planning. This is particularly true during election periods. Once a project is approved and started, proponents routinely state that not finishing the project would have serious economic consequences and argue that stopping the project would result in the loss of jobs.

In 2001 when the construction project reached the mountain area, many environmental organizations and a local buddhist group argued that the tunnel would disrupt the watershed and probably result in significant environmental perturbation. In particular, the long-tailed, clawed salamander, *Onychodactylus fischeri*, lives there. As a lungless hynobiid that requires relatively mature forest systems to survive (Kuzmin, 1995) it has been recognized as an environmental indicator species in Korea. The members of the organizations and temple made the salamander the plaintiff against the Ministry of Environment, suing to stop the project until another environmental assessment could be undertaken. This was the first time a non-human animal was a plaintiff in a law suit in Korea and it became known as the "salamander trial." Several thousand people appeared before the court testifying on the salamanders' behalf, some even trying to represent a salamander's "feelings" to the judge. The courts ultimately decided in 2004 that *Onychodactylus* had no legal standing.

The current President Rho, as a candidate in 2002, promised that another fair environmental evaluation would be carried out and the project carefully re-considered if he were elected. The promise was not kept, however, prompting the nun, Jiyul, to get involved. She urged the government to conduct another evaluation to be undertaken by researchers selected by both the government and private environmental organizations.

Several months ago, Jiyul started her third hunger strike in front of the President's house taking only water and salt for 87 days. But when no progress was made she suddenly left the location without a word, leading people to imagine that she went off to an unknown place to die for her beloved salamanders. Huge national debates rapidly ensued arguing both for and against the nun and her salamander. After several days, a Buddhist organization found her and started to take care of her. She still refused to eat and as her condition deteriorated the national debate turned to one of questioning the impact of her death on Korean society as a whole. At the eleventh hour on the 100th day, the government relinquished and agreed to conduct another environmental evaluation within three months.

The plight of the hynobiid clawed salamander has focused an entire nation's attention and is looming large in the minds of many Koreans. An important challenge facing the country is how to continue the long and rich tradition of protecting and preserving wildlife in the face of unbridled development.

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Fish introduction is a major cause of paedomorphosis extinction in European newts (*Triturus* spp.)

By Georg Džukić, Ruža Ćirović, Mathieu Denoël and Miloš L. Kalezić

Contrary to the numerous studies on worldwide declines of amphibian diversity at the species level, the loss of intraspecific biodiversity, particularly in species with polyphenism, is much less studied. The adaptive switching (depending on environmental conditions) between two alternative ontogenetic pathways and corresponding highly dissimilar morphs, are of special interest. In some newts and salamanders, mainly from Europe and North America, facultative paedomorphosis occurs when larvae either metamorphose into a terrestrial morph (i.e. the common life history pathway), or attain sexual maturity in retaining an aquatic larval structure (e.g. external gills) to become paedomorphic (Denoël *et al*., 2001).

Here we report that fish introduction has a negative impact on the European newt (*Triturus* spp.) populations with facultative paedomorphosis. The majority of European paedomorphic populations occur in the Mediterranean area: the palmate newt (*T. helveticus*) in southern France, the alpine newt (*T. alpestris*) in southeastern France, Italy, and in the Balkans, and the smooth newt (*T. vulgaris*) mainly in the Dinaric Alps (e.g. Džukić *et al*., 1990; Denoël *et al*., 2001). In particular, we studied 22 populations of alpine newts (France, Italy, Slovenia, Bosnia, Montenegro and Greece) and 17 populations of palmate newts (France) in which fish were originally absent and in which paedomorphs were abundant at the time of their first description (Denoël *et al*., 2005).

In the paedomorphic alpine newt populations, some introductions were of “native” species (*Salmo trutta, Phoxinellus alepidotus*), but most of them contained non-European species

of fish, such as *Oncorhynchus mykiss*, *Salvelinus alpinus*, *S. fontinalis*, and *Carassius auratus*). Fish stocking in palmate newt ponds mainly involved small and ornamental fish species: *Carassius auratus*, *Gambusia affinis, Lepomis gibbosus,* and *Phoxinus phoxinus.* The introduction of fish dates back to the second half of the nineteenth century, but reached its peak in the last three decades and continues nowadays (Denoël *et al*., 2005). All fish species had detrimental effects on the studied paedomorphic newt populations. Salmonids are active predators on adult newts, while smaller fish species consume egg and larval stages of newts.

Our research on alpine and palmate newts confirmed that fish introductions were always followed by the extirpation of paedomorphic individuals. The abundance of metamorphs decreased after fish introduction, but this morph remained present in some of the fished ponds and lakes (Denoël *et al*., 2005). Thus, our research showed that fish introductions have altered both paedomorphic and metamorphic newt populations. However, because paedomorphs are present in a considerably smaller number of places than their metamorphic counterparts, they are more vulnerable to extinction. Moreover, paedomorphs cannot escape fish predation by hibernating in terrestrial habitats as metamorphs can do.

Beside the loss of variability in developmental pathways, fish introduction can be attributed to the reduction of taxonomic diversity. For example, in the Balkans, all the local "subspecies" of the alpine newt (*lacustris, reiseri, montenegrinus*, *piperianus* and *serdarus*), disappeared or are critically endangered due to the detrimental effect of fish (Denoël *et al*., 2005).

Regarding conservation matters, paedomorphosis is recognized as a vulnerable source of variation in life history and morphological traits, as well as a bioindicator of population and ecosystem health (Whiteman & Howard, 1997). If we take into consideration Europe only, conservation concerns should also be devoted to newt species which exhibit facultative paedomorphosis. This is not only the case of *T. helveticus* and *T. alpestris*, but also for other dimorphic species such as *T. vulgaris* and *T. carnifex* which are found in the Montenegrin holokarst region. Indeed, recent research shows that paedomorphic *T. vulgaris* risks disappearance because of fish introductions, notably *Leuciscus cephalus* and *Ictalurus nebulosus* (R. Ćirović, *unpubl. data*). Paedomorphic *T. carnifex* populations are also highly threatened because they are extremely rare (Kalezic *et al*., 1994). If urgent measures are not taken soon, an important kind of intraspecific biodiversity will disappear. Some sites in Europe still contain large paedomorphic populations and should be closely protected and surveyed to assure their persistence. Legislation should take into account paedomorphic populations as conservation units (see Fraser & Bernatchez, 2001) and consider stopping fish introductions, especially non-native ones. Management measures should also be taken to restore disturbed habitats by removing introduced fish.

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Reports on DAPTF Seed Grants

Recipients of DAPTF Seed Grants are generally expected to publish the results of their projects in refereed journals, or as articles in *Froglog*. They are also required to send us reports, so that their results can be made available to DAPTF members. Below is a list of reports that we have received recently. Anyone wanting a copy of a report should contact the author in the first instance; we can supply copies if you cannot reach the author.

Rapid Response Fund:

Ron Gagliardo (2003) Further exploration in search of *Atelopus varius* in Costa Rica. (Mason Ryan, Erick Berlin & Ron Gagliardo) **rgagliardo@atlantabotanicalgarden.org**

Books received

• Craig Guyer & Maureen A. Donnelly. (2005) *Amphibians and Reptiles of La Selva, Costa Rica, and the Caribbean Slope.* University of California Press, Berkeley. (299 pp.)

This is truly intended as a field guide, being pocket-sized and with a font size to challenge senior herpetologists. Lavishly illustrated, it contains numerous identification keys and is fully referenced. Based on the authors' first-hand experience of Costa Rica over more than 25 years, this is an essential book for any herpetologist visiting the tropical forest of Central America.
Tim Halliday

Froglog Shorts

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For many years, Jim has been our most reliable and active supporter. Thanks to him, we have received a generous donation that will keep us going for another year.

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