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10. REPORT ON MASS MORTALITY OF FROGS AT SON CHIRIYA WILDLIFE SANCTUARY, GWALIOR, INDIA

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Complete disappearance of amphibian populations in different parts of the world has been reported since 1950 and the frequency of such reports increased sharply during the 1990s (Kiesecker *et al.* 2001; Harp and Petranka 2006). Currently, the rate at which amphibians are going extinct far exceeds the rate for any other vertebrate taxa in the world (Stuart *et al.* 2004). Loss of habitat, introduction of exotic species and exploitation for food, and pet trade are the key threats (Stuart *et al.* 2004). Recent amphibian declines have been reported from species rich tropical forest sites in Central and South America, and Australia, with minimal or no anthropogenic pressure (Alexander and Eischeid 2001; Pounds 2001; Blaustein *et al.* 2003). Infectious diseases partly explain this phenomenon, because it has now been established that pathogens with multiple hosts, biotic or abiotic reservoirs could infect species that are rare and cause disease, and even drive them to extinction (Lips 1999; Lips *et al.* 2006). The chytrid fungus – *Batrachochytrium dendrobatidis*, Iridoviridae group of viruses and pathogenic bacterial strains are known to cause catastrophic mortality of amphibians, decimating wild populations in many parts of the world (Richard *et al.* 2004; Densmore and Green 2007). It has been established that amphibians play an important role in ecosystem function (Whiles et al. 2006), and are sensitive to the quality of their environment (Relyea 2009). For this reason, they are referred to as fortuitous canaries, signalling problems in our environment. It is therefore important that studies on the ecology of amphibians report any adverse impacts on their population.

We present a report on the mass mortality of frogs from a site in Son Chiriya Wildlife Sanctuary. The site is located at Nalkeshwar, Forest Compartment number 373, at Ghatigaon, Son Chiriya Sanctuary, Gwalior, Madhya Pradesh, India (26.2° N; 77.8° E) at an elevation of 240 m above msl. The Sanctuary encompasses an area of 511 sq. km. The site where the mass mortality occurred has a perennial freshwater source from a spring on a hillock. The water trickled into small artificially made puddles that hold water temporarily for use by wildlife in the reserve. The entire area, including the spring and the temporary puddles, was spread over one hectare. It had no human activity and no apparent contamination of freshwater.

The first observation of mass mortality of frogs was made by the staff of the Sanctuary on March 21, 2009, where 30 individuals of the Indian Bull Frog *Hoplobatrachus*

Fig. 1: Bull Frog *Hoplobatrachus tigerinus* with bleeding lesions found in Nalkeshwar, Madhya Pradesh

tigerinus were found dead at the site. On March 28, 60 more frogs of the same species were found dead at the site. On April 05, 2009, 60 more bull frogs were recorded dead and the population of the species had been reduced to 40 individuals. Carcasses of frogs were found along the edge of waterbody and inside the water. An inventory of frogs was carried out on April 25, 2009, using visual encounter survey of the site and was scanned using a powerful torch by one of the observers from 1700 to 1830 hours. All individuals, live and dead, sighted were recorded. Frogs that were dead, diseased and healthy were collected and sealed in plastic bags. The specimens were preserved in -40 °C freezer at the Animal Disease Investigation Laboratory, Department of Animal Husbandry, Gwalior. Eight specimens of diseased *H. tigerinus* collected earlier by the forest department staff were also preserved in a similar fashion for further pathological investigation. Only frogs that showed symptoms of disease were caught and examined for skin lesions, discoloration of skin and ectoparasites. Carcasses observed were examined for any sign of predation.

In all, four frog species were encountered, they were Indian Skipper Frog *Euphlyctis cyanophlyctis*, Paddy Field Frog *Fejervarya* cf. *limnocharis*, Indian Bull Frog *Hoplobatrachus tigerinus*, and Common Burrowing Frog *Sphaerotheca* cf. *breviceps*. The number of frogs of each species encountered during the survey revealed further reduction in the population of bull frogs on the site (Table 1). No tadpoles were observed during the present survey. Diseased frogs had oedema of limbs and phalanges. Small focal ulcers on the skin were observed on the limbs, ventral and dorsal surface of the skin (Fig. 1). The ulcers were wet, open and blood oozed from it when the portion of the body was pressurized. The animal showed poor reflexes and limb movements were impaired, making them almost immobile. Bleeding lesions were also observed on the foot of these frogs. Live frogs representing those that showed these symptoms and those that did not were collected and preserved in the deep freezer (Table 1). It is important to note that all frog species, except *F. limnocharis* showed symptoms of the disease, and no carcasses of this species were recorded from the site. No ectoparasites were observed on the frogs examined during the survey. Dead frogs showed no sign of predation on them.

Based on discussions with amphibian disease experts on this incident the following scenario emerged. There are several diseases that cause heavy mortality in frog populations. Among them, only few infectious diseases are reported to cause mass mortality in wild frogs, they are Ranaviruses (e.g. FV3, tadpole oedema virus) and chytridiomycosis (Densmore and Green 2007). Toxins could also cause mass mortality in amphibians but could be extremely tedious to diagnose. Chytridiomycosis causes ulcers but typically skin changes are mild, with excess shedding being the most consistent sign (Berger *et al.* 1998). Bacterial infections such as red leg have not been found causing mass mortality in the wild (Green *et al.* 2002). Ranavirus cause skin ulcers and haemorrhage (Densmore and Green 2007), although they do not cause lesions identical to those seen in the frogs in Nalkeshwar. It should not be ignored that there are different strains of pathogens causing diseases in different regions of the world, and only a thorough investigation could reveal the pathogen. However, frogs having legs swollen with fluid is often considered a typical symptom of infection caused by Ranavirus (Densmore and Green 2007). They are best diagnosed by isolating on cell culture using standardized protocols (Greer and Collins 2007). During monsoons when frogs breed, they tend to disperse and there is a possibility of

Table 1: Frogs encountered during the survey of April 25, 2009, at Son Chiriya Wildlife Sanctuary

Species	Frogs encountered	Live frogs examined for symptoms and preserved	Live frogs showing symptoms of disease	Dead frogs examined
Euphlyctis cyanophlyctis	141	5	5	8
Fejervarya cf. *limnocharis*	63	4	0	0
Hoplobatrachus tigerinus	14	2	2	2
Sphaerotheca cf. *breviceps*	1	1	1	1

spread of the disease, which is probably localized at present. It is important to investigate thoroughly such stray incidents of mass mortality, because they might be the precursor to an impending disease outbreak in frogs in the region.

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11. ON A RECORD OF *BADIS BADIS* (HAMILTON) (TELEOSTEI: PERCIFORMES: BADIDAE) FROM TAMIL NADU, INDIA

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India is endowed with a vast fish biological resource representing more than 10% of the world's fish diversity (Das and Pandey 1998). The diversity of indigenous aquarium fish has been documented; however, many species are being indiscriminately caught from their natural habitats leading to their depletion and probable extinction. *Badis* is one such fish which belongs to Family Nandidae and Subfamily Badinae. The first badid species were described by Hamilton (1822) as *Labrus badis* with a lateral line and 17 dorsal spines, and without lateral line and 14 dorsal spines in *L. dario*. Bleeker (1854) established *Badis* as a genus to include these species (Kullander and Britz 2002), which was also recognized by Day (1878). *Badis badis* with highly variable colour was found to be distributed from Pakistan to Myanmar. The genus was revised recently by Kullander and Britz (2002) with the description of 10 new species from the various geographical zones while limiting the distribution of the species *Badis badis* to the lowlands of the Ganges, Brahmaputra and Mahanadi basins, in Nepal, India and Bangladesh. They recognized 2 genera, *Badis* with 12 species and *Dario* with 3 species.

Badis badis is recognised from its congeners (Kullander and Britz 2002) in the combination of the following characters, namely a conspicuous dark blotch covering superficial part of cleithrum above pectoral fin base; absence of dark caudal peduncle blotch; in the presence of a series of