Android apps to aid wildlife research

Recent figures suggest that there are over six billion mobile phone users in the world and over a billion who use smart phones. These smart phones come with attractive technological features and are well-connected to the internet. With good internet connectivity these smart phones have now become an inevitable tool for wildlife researchers to store, share and analyse voluminous data. Earlier, wildlife researchers and enthusiasts relied heavily on their field notes to document observations made on field trips. But with mobile apps slowly gaining ground, they are enabling wildlife researchers and enthusiasts to not only identify species of frogs and birds, but also collect data on many different species. Recently, three mobile apps named *Pakshi*, *Samrakshane* and *Frog Find*, were launched in India; all three have been developed using crowd-sensing technology.

Pakshi and *Samrakshane* have been developed by the Department of Electronics System Engineering (DESE) at the Indian Institute of Science (IISc), Bangalore. These two apps are designed for any smart phone enabled with internet connectivity. Both the apps record the date and GPS coordinates automatically. Once the data is entered, it is transferred to a database through the user's network provider. *Pakshi*, as the name suggests, is designed to identify bird species and record their locations. It lists over 200 species of birds. The list is categorized into two sub-sets, one subset classifies 27 species of birds that are commonly found in one's backyard. Photographs and calls of the birds are made available for easy identification. The other subset catalogues 190 species of birds along with photographs. The latter catalogue, according to the app developers, will be useful for serious bird watchers (Figure 1). Once the data about a species and its location is entered by the user, it can be viewed on *Google* maps along with observations or bird sightings reported by other members. Apart from photographs and call-identification features, the app has a special feature called the 'timer'. On hitting the 'timer' button, it records instantly the GPS location of the person at that point of time. Given this feature, it is useful as data can be recorded even while moving in a vehicle.

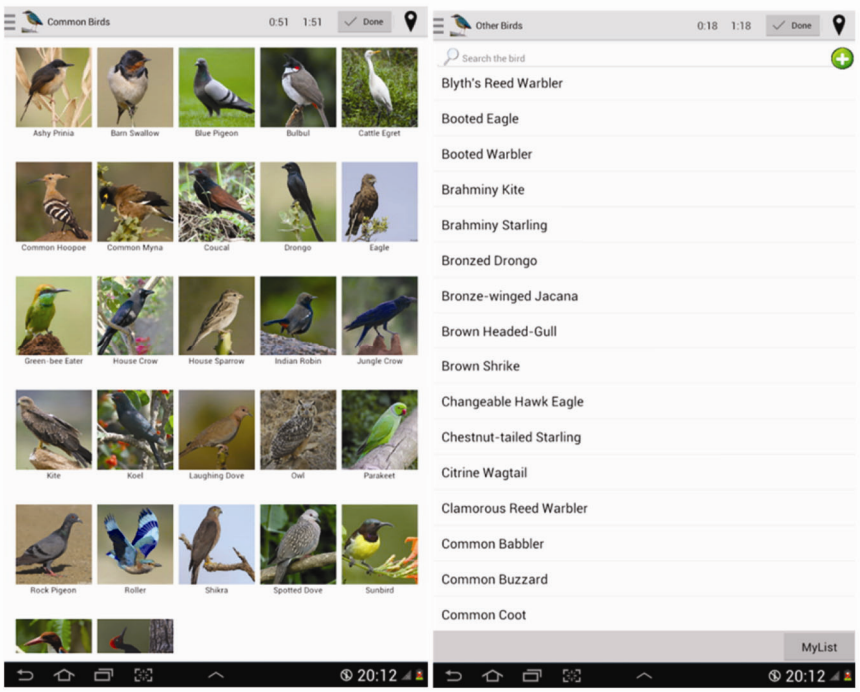


Figure 1. The *Pakshi* app showing two-subcategories – a list of commonly sighted birds (left) and a list of the birds which includes rare species (right), aimed at those who pursue bird watching as a serious hobby. (Photo: DESE, IISc.)

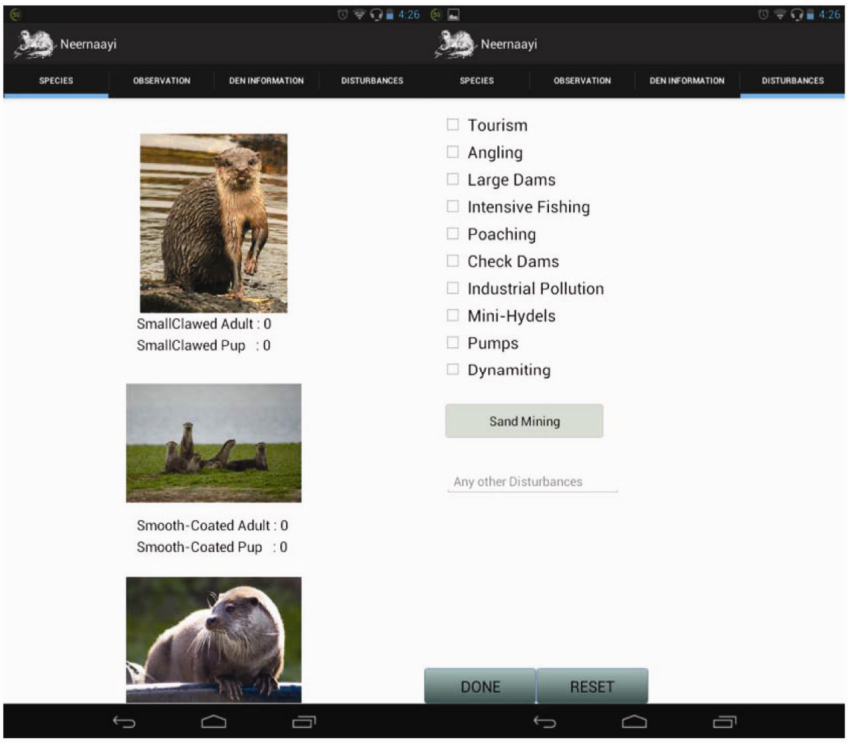
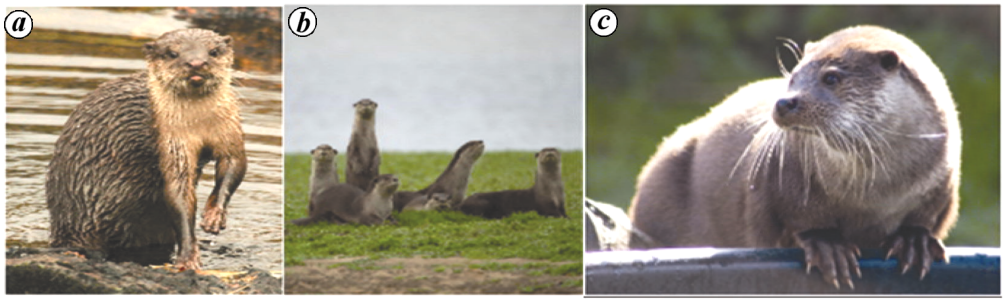


Figure 2. The *Samrakshane* app provides check boxes and dialogue boxes to enter data on the selected species (left) and its habitat conditions (right). (Photo: DESE, IISc.)

Box 1. The app *Samrakshane* allows the user to collect data on threats found along riverine habitats in addition to marking location where presence of otters, crocodiles and fishing cat is found.

Otters

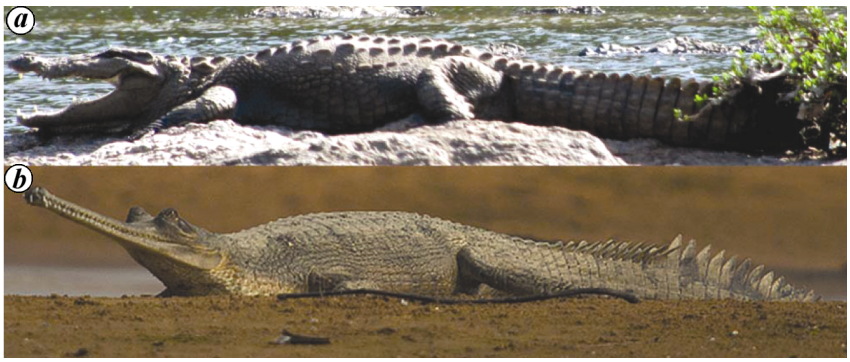
India has three species of otters, the Eurasian *(Lutra lutra*), the smooth-coated (*Lutrogale perspicillata)* and the small-clawed (*Aonyx cinerea*). The smooth-coated and small-clawed otters have been categorized as 'Vulnerable' and the Eurasian otter is categorized as 'Near Threatened' by IUCN. Loss of habitat and illegal hunting for its fur are the main reasons for the decline in the number of otters.



The three species of otters found in India: ***a***, Small-clawed otter, Photo: Dilan Mandanna; ***b***, Smooth-coated otter; Photo: Kalyan Varma; ***c***, Eurasian otter, Photo: unknown.

Crocodiles

The marsh crocodile or the mugger (*Crocodylus palustris*) and the gharial (*Gavialis gangeticus*) are the two crocodile species found in India. Mugger is commonly found in lakes, rivers and canals all across the country but the gharial is endemic to the Indian sub-continent and has been categorized as 'Critically Endangered' by the IUCN. With its population in most of its distributional range showing a steep decline due to loss of habitat and sand mining, the Chambal river and its tributaries are the last stronghold for this crocodilian species.



The two crocodilian species found in India: ***a***, Marsh crocodile, Photo: Ipsita Herlekar; ***b***, Gharial, Photo: Atul Dhamankar.

Fishing cat

The fishing cat (*Prionailurus viverrinus)* is found in swampy areas like wetlands and mangroves in South and Southast Asia. As its name suggests, it frequently preys on fish. A elusive animal, it is categorized as 'Endangered' by the IUCN. Habitat loss due to conversion of land for agriculture and development is the main threat to the species.

Fishing cat (Photo: Chottu Khan)

Box 2. The app *Frog Find* is based on the book *Pictorial Guide to Frogs and Toads of Western Ghats* by K. V. Gururaja and helps the user in identifying frog species on field.

The Western Ghats has high amphibian endemicity with 142 species being endemic to the region. New species are still being discovered in this landscape. Frogs are very sensitive and can sense even subtle changes in the moisture and temperature levels and hence are considered as good environmental indicators. Habitat loss, climate change and fungal infections threaten amphibians not just in the Western Ghats, but all over the world.

The Malabar Gliding frog (*Rhacophorus malabaricus*), is a species endemic to the Western Ghats. (Photo: K. S. Sheshadri.)

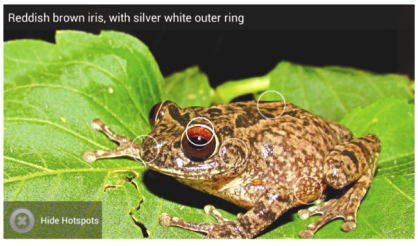


Figure 3. The 'hotspots' feature of the *Frog Find* app points out the key identifying features of a species. (Photo: Gubbi Labs.)

Pakshi app also updates the user to enter data on any specific activity or event. 'We hope that the data collected from this app will help us identify bird hotspots. In future, we plan to develop an index system for the listed bird species based on the number of sightings and their rarity' says Sesha Raghav (DESE, IISc).

Samrakshane is another app that has been designed to map sightings and collect information on otters, fishing cat and crocodiles (Figure 2). The check boxes and dialogue boxes available in the app enable the user to enter data on the species sighted. For example, in the case of otters, data on the species sighted/signs of presence, number of individuals, location of den, type of den, etc. can be entered in addition to those on ecological variables like anthropogenic activities in the area and distance to the nearest village from the recorded location. The outlay is similar for crocodiles and fishing cat. If the user does not have immediate access to a mobile network, the data is stored and transferred opportunistically when the network is available. With the data updated immediately, researchers can start analysing them in a short time. The users can access their data using a login id or download the same as a consolidated version in a predesigned Microsoft Excel format, which can be easily modified if needed to suit any statistical software. The app also enables the user to project the GPS locations of sightings and other variables on *Google* maps. This provides good visual representation, making it easy to spot patterns in the data collected. The app also acts as a repository for the data and acts as a back-up, preventing data fabrication and duplication. H. S. Jamadagni (DESE, IISc) explains that the one-button data entry minimizes error and increases the accuracy of the data. Apart for being easy to use, the app is useful when data collection is a team effort as it minimizes observer bias.

The third app, *Frog Find* is based on the book *Pictorial Guide to Frogs and Toads of the Western Ghats* by K. V. Gururaja (Centre for Infrastructure, Sustainable Transportation and Urban Planning, IISc). It was developed and launched by Gubbi Labs in 2013. Along with high-resolution photographs, it provides information on 55 out of the 160 species of frogs that are found in the Western Ghats, a biodiversity hotspot. The app also provides information on the type of habitat and distributional range of the species, the common name and scientific name, its IUCN status, whether it is endemic or not, and behaviour of the species like its grouping details, activity and size. Once the species page is opened, it also gives information on the other geographical locations from where that particular species has been reported. The user-friendly design of the app allows one to navigate information through a landscape book style format. It has a feature called the 'hotspots', which indicates the unique identifying features of the species (Figure 3). In addition, the app filters out the possible species that could be encountered in the area, based on the user's GPS location. Space has also been provided to enter in any additional observations made by the app user. The uploaded data is stored in a data base that can be accessed by the app developers, who authenticate the data received. '*Frog Find* is a citizen science based approach where wildlife enthusiasts can record and report locations and observations on the different frog species they encounter during their field trips' says Gururaja. A new version of the app is being developed, which will allow the users to identify frog species based on their calls too. *Frog Find* was conferred the India Geospatial Forum Award in the biodiversity and conservation category in Hyderabad on 5 February 2014.

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