**ACOUSTIC TECHNIQUES FOR BIOLOGICAL MONITORING AND LAW ENFORCEMENT**

**Botswana**

**Cameroon**

**Central African Republic**

**Congo Republic**

**Democratic Republic of Congo**

**Gabon**

**Ivory Coast**

**Kenya**

**Madagascar**

**Namibia**

**Nigeria**

**Rwanda**

**Tanzania**

**Uganda**

**Zambia**

**WCS capacity in country**

WCS has trained field teams able to install and manage acoustic devices (Fig. 2). These teams can help researchers in the deployment and maintenance of ARUs, over the duration of a monitoring cycle.

Initial data preparation and analysis is currently carried out in Gabon, with detailed analysis completed by ELP at Cornell University.

**Technical development needs**

Currently acoustic sound files are visually scanned for wildlife vocalisations and human signs.

Automatic detection software of wildlife and human signs will dramatically increase the speed at which acoustic data files can be analysed. The immediate transmission of automatically detected human signs from remote devices has the potential to facilitate rapid deployment of law enforcement personnel.

WCS is seeking funding to address these technological developments.

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**Acoustic monitoring - a novel tool for forest conservation**

Acoustic recording units (ARUs) are a promising tool for biological monitoring and law enforcement. ARUs work automatically on battery power, recording sounds, including at frequencies too low for humans to hear, onto hard disks. They are light enough to be deployed in remote locations and once installed can run unattended (see Fig. 2). They have been used to monitor elephant activity and different measures of human presence in national parks in Gabon since 2007, in and around Batéké, Ivindo and Loango National Parks (see map).

This work has been piloted by the Elephant Listening Project (ELP) at Cornell University, which has provided and deployed the acoustic units and carried out the data analysis, and reporting (e.g. Wrege et al 2010 ). WCS has supported this work with logistics and field assistants.

**Applications of acoustic monitoring in Gabon**

**Monitoring in forest bais**

Bais are important feeding sites for forest elephants (Fig. 1). The acoustic method has been used to assess elephant vocalisation patterns in bais, providing data on nocturnal activity of elephants which complements diurnal direct observations by field teams. As multiple bais across Ivindo and Batéké National Parks and their buffer zones have been monitored with ARUs, there is now data on seasonal use and their relative importance to elephants (Fig. 2). This seasonal data has value for: 1) planning active protection efforts and guiding tourism activity in parks, and 2) the planning of timber extraction around important sites for elephants in forestry concessions.

**Surveillance**

In forestry concessions in Ivindo National Park buffer zones, ARUs have been deployed near company road barriers. These barriers are intended to prevent unauthorised vehicle traffic, in particular towards the park boundaries. The acoustic units have been used to monitor the effectiveness of the barrier personnel, whereby the acoustic recordings of passing vehicles is checked against the notes taken at barriers, frequently demonstrating errors or negligence by the barrier guards.

**Monitoring the impacts of oil exploration on elephant activity**

At Loango National Park, the ELP studied how oil exploration affected forest elephant activity and whether illegal hunting increased. Elephants did not leave the area but shifted activity to the night time in response to exploration activity. Hunting activity was effectively controlled during exploration. On completion of the exploration, when conservation and oil-company personnel vacated the area, surprisingly high levels of hunting were detected. Continued surveillance and anti-poaching is therefore necessary to control hunting.

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1 Wrege, P. et al., 2010. Use of acoustic tools to reveal otherwise cryptic responses of forest elephants to oil exploration. Conservation Biology DOI: 10.1111/j.1523-1739
ARUs record animal vocalisations in the forest

Software that can automatically detect acoustic signatures for different species in sound files is being developed.

Analytical techniques are being developed that will enable the use of ARUs for long term biological monitoring.

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WCS – Wildlife Conservation Society
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Mission
Save wildlife and wild places worldwide. We do so through science, global conservation, education and the management of the world’s largest system of urban wildlife parks, led by the flagship Bronx Zoo. Together these activities change attitudes towards nature and help people imagine wildlife and humans living in harmony. WCS is committed to this mission because it is essential to the integrity of life on Earth.

Wildlife Conservation Society
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The Cornell Lab of Ornithology

Elephant Listening Project

http://www.birds.cornell.edu/brp/elephant/index.html