R E P O R T

SUCCESSFUL TRACKING OF AN AFRICAN CLAWLESS OTTER (*Aonyx capensis*) VIA AN EXTERNALLY ATTACHED TELEMETRY DEVICE

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Abstract: Studying the behaviour and ecology of otters using biologging approaches often involves the surgical implanting of telemetry devices and, on occasion, the use of custom-made harnesses due to the difficulty of securely attaching instruments externally to otters. However, biologging instruments are continuously advancing and getting smaller, presenting opportunities for attempting simpler external attachment approaches that minimise the inherent invasiveness of such studies. Here, we present data obtained from externally attaching a small Very High Frequency (VHF) device directly to the fur of an African clawless otter (*Aonyx capensis*) using a quick-setting epoxy. We successfully tracked the locations of the otter for period of 30 days and present these data as a proof of concept that such an external attachment approach carries promise for future studies to minimise the complexity and invasiveness of instrument attachment on otters.
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INTRODUCTION

Information on the movements and habitat use of animals is particularly useful, not only to better understand the ecology of species, but also for conservation planning. The application of biologging approaches to studying the behaviour and space use of otters typically takes the form of Very High Frequency (VHF) devices implanted in the abdominal cavities of otters and has been successfully used on multiple species, including North American river otters (*Lontra canadensis*) (Reid et al., 1994; Ben-David et al., 2005), sea otters (*Enhydra lutris*) (Laidre et al., 2009), Eurasian otters (*Lutra lutra*) (Ó Néill et al., 2008), Giant otters (*Pteronura brasiliensis*) (Leuchtenberger et al., 2014) and Neotropical otters (*Lontra longicaudis*) (Nakano-Oliveira et al., 2004). While this approach has been used with much success, implanting devices prevents the use of high-accuracy GPS-technology that typically requires external antennas for instruments to obtain locations and also present risks due to the invasive nature of the surgical implantation process.

These challenges can be overcome by attaching telemetry equipment externally. However, the body shape of otters (particularly their necks and heads having a similar diameter), combined with their dexterity, prevents the use of standard collars as used on other mammals. Attachment of devices on Eurasian otter has therefore also been undertaken previously using custom-made harnesses (Mitchell-Jones et al., 1984; Ó

Néill et al., 2008; Quaglietta et al., 2012). Such harnesses reportedly functioned well and only one fatality was recorded. In this case an otter got snagged with its harness by a stem of thick reeds (de Jongh, pers. comm), which was likely the result of the harness not fitting tight enough. Since then, harnesses that include a safety break-away system (de Jongh et al., 2010) have been successfully deployed on otters without any fatality in several European countries (de Jongh, pers. comm). However, the least invasive alternative to attaching biologging devices to otters is to glue instruments directly to the fur, as is commonly done in studies of other semi-aquatic mammals such as seals (McIntyre et al., 2016). This has not often been attempted on otters and as far as we are aware, there is only one published account and one unpublished account of instruments being glued directly to the fur of otters. Kruuk and de Jongh glued a transmitter to the fur of a single, large male European otter in 1983, which dislodged after one day (de Jongh, pers.comm.). Subsequently, Ó Néill et al. (2008) glued 15g devices directly to the fur of two European otters, successfully tracking these individuals for 16 and 17 days respectively. Such tracking periods were deemed too short and the authors concluded that implanting otters with tracking devices was preferable over any form of external attachment.

There are only a limited number of studies that have tracked African clawless otters (*Aonyx capensis*). Arden-Clarke (1986) tracked six individuals via internally implanted VHF devices and Somers and Nel (2004b) tracked seven otters using the same approach (see also Somers and Nel, 2004a). More recently, Majelantle et al. (2021) reported on the movement speeds of two more African clawless otters implanted with VHF-devices. Here we report on the external attachment and subsequent successful tracking of an African clawless otter and discuss this as a proof of concept for future studies into the behaviour and movement ecology African clawless otters, as well as other otter species.

ANIMALS

The instrumented otter was captured and instrumented under permit from the South African Department of Forestry, Fisheries and the Environment (Permit Number: O-52937) and the Mpumalanga Tourism and Parks Agency (Permit Number: MPB 9383).

MATERIAL AND METHODS

We opportunistically instrumented a female African clawless otter that was captured at a trout farm (hatchery) nearby Lydenburg in the Mpumalanga Province, South Africa. The otter was captured and transported using a standard carnivore cage trap to the offices of the Mpumalanga Parks and Tourism Agency (MPTA) in Lydenburg. Here, the otter was immobilised by an intramuscular injection of a pre-calculated dose of ketamine and medetomidine and basic body measures taken. The female weighed 10.6 kg with a total length of 1,250 mm and tail length of 450 mm. Based on these body size measurements, the female was considered to be an adult (Somers and Nel 2013). After degreasing the attachment site using acetone, we glued a small (length 40 mm; width 30 mm; height 22 mm; total length incl. trailing antenna 105 mm; mass 33.6 g) VHF-transmitter (Africa Wildlife Tracking) directly to the fur between the scapulae and the posterior of the head of the otter using Pratley® Quickset Epoxy (Fig. 1.).

Figure 1. Images of the immobilised African clawless otter, showing the attachment site of the VHF transmitter.

After recovery, the otter was released nearby the MPTA offices in the vicinity of suitable cover next to the Sterkspruit river. The otter was tracked on a near-daily basis post-release and locations determined using standard triangulation approaches. Locations were mapped in the R programming environment (R Core Team, 2022) and geodetic distance between sequential locations calculated using the *SoDA* package (Chambers, 2020).

RESULTS AND DISCUSSION

The otter was successfully located 22 times between 22 Nov 2022 and 22 Dec 2022 (Fig. 2). Distances between otter daily otter locations averaged 752 ± 479 m (± SD), with a maximum daily distance travelled of 1,752 m.

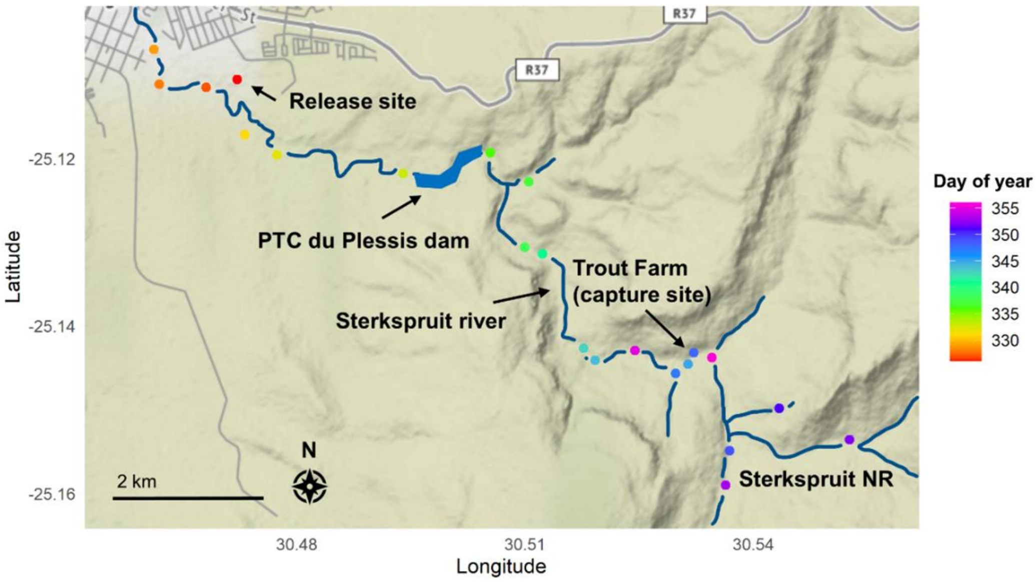

Figure 2. Track locations of the instrumented African clawless otter. Sterkspruit NR = Sterkspruit Nature Reserve. Background terrain was mapped using Terrain Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

After release, the otter initially moved downstream along the Sterkspruit river closer to the town of Lydenburg (Fig. 2). From here it returned upstream past the release site and was subsequently located around the PTC du Plessis dam and a tributary to the Sterkspruit river between 29 November and 3 December. From here the otter continued to move further upstream towards the trout farm (capture site) where it was located between 11 and 13 December. The otter then moved further upstream into the Sterkspruit Nature Reserve where it was located along various tributaries of the Sterkspruit river between 15 and 19 December. After this, the otter was located again in the vicinity of the trout farm on 21 and 22 December. No attempts were made to locate the otter between 23 December and 3 January 2023. However, attempts at locating the otter on 4 and 5 January 2023 failed, and the otter was not located since.

The results above are from an initial attempt at using an approach involving comparatively negligible risk to instrumented otters (by simply gluing the instrument externally to the fur) and provide some evidence for the feasibility of using such an approach for future studies of the movement ecology of otters. We do not know the fate of the instrumented otter that we report on and can therefore only speculate on possible reasons for the otter not being relocated after 30 days of tracking. However, we consider three potential outcomes to be likely. Firstly, while the otter was never resighted without the tracking device, it is possible that she managed to ultimately dislodge the device somewhere where signal detection is unlikely (e.g. under water). Secondly, we cannot discount device failure and it is possible that any of a number of components (e.g. battery) failed, preventing the device from emitting detectable signals. Thirdly, the otter may have been trapped again and/or killed. The last recorded location of the otter indicated that she had returned to the vicinity of her original capture location (within approximately 200 metres of the capture site) and was likely foraging in the trout hatchery. Given that trout farm managers are known to use lethal means of controlling otter activity (de Vos and McIntyre, 2023), we consider this a plausible explanation. A further potential explanation that we consider to be less likely is that the otter moved out of the general area during the pause in attempts at locating her (i.e. between 23 December and 3 January). This seems unlikely though, given the overall restricted distances that the otter moved in the preceding 30 days.

Given the opportunistic nature of this study, we used a readily available epoxy (Pratley® Quickset Epoxy) for the attachment. However, the properties of specific types of epoxy glue vary substantially between specific formulations, ultimately influencing the curing times, curing temperatures, as well as texture and pliability once cured. It is therefore advisable that future attempts at gluing biologging instruments to otters make use of widely-tested formulations that are known to cure at suitable temperature to not cause cell damage, while offering suitable adherence characteristics (Field et al. 2012). The tracking protocol used in our study did not offer the opportunity to obtain visual observations of the behaviour of the otter while instrumented and we were unable to assess potential interference with normal behaviours due to the instrumenting. However, both de Jongh et al. (2010) and Quaglietta et al. (2012) reported similar movement characteristics between European otters that carried externally-attached instruments and otters implanted with tracking devices, and further noted no behavioural signs of restrictions to movement. Nonetheless, we recommend that suitable trials be carried out in controlled environments such as captivity to assess the potential for behavioural impacts associated with the external attachments of biologging instruments to otters. Such information would be very valuable to inform future field studies seeking to study the behaviours and ecology of otters using externally attached biologging instruments.

CONCLUSION

The results reported above provide information on the first external attachment of a biologging instrument to an African clawless otter. The successful relocation of the otter for a period of 30 days suggests that this method of attachment can likely be used successfully in future for medium-term tracking of otters and provide the opportunity then also for the use of tracking approaches that required external attachment such as GPS-enabled devices. Such an approach to device attachment circumvents many of the risks associated with surgical operations, as well as external attachment via harnesses (e.g. irritation and entanglement). Advances in biologging technology and in particular the continued miniaturisation of components such as sensors and batteries, promise to make biologging instruments even more amenable to simple external attachment to otters as illustrated here. We therefore foresee future studies to benefit from such approaches through the decreased handling times of otters and minimising of risk of injury or even death to otters.

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RESUME

SUIVI RÉUSSI D'UNE LOUTRE A JOUES BLANCHES (*Aonyx capensis*) A L'AIDE D'UN APPAREIL DE TÉLÉMÉTRIE MUNI D'UNE FIXATION EXTERNE

L'étude du comportement et de l'écologie des loutres à l'aide d'approches de bio-connexion implique souvent l'implantation chirurgicale de dispositifs de télémétrie et, parfois, l'utilisation de harnais sur mesure en raison de la difficulté de fixer solidement les instruments à l'extérieur des loutres. Cependant, les instruments de bio-connexion progressent et deviennent de plus en plus petits, offrant des opportunités pour tenter des approches de fixation externe plus simples qui minimisent le caractère invasif inhérent à de telles études. Nous présentons ici les données obtenues en fixant extérieurement un petit appareil à très haute fréquence (VHF) directement dans la fourrure d'une loutre à joues blanches (*Aonyx capensis*) à l'aide d'un époxy à prise rapide. Nous avons suivi avec succès les déplacements de la loutre pendant une période de 30 jours et présentons ces données comme une preuve du concept selon lequel une telle approche de fixation externe est prometteuse pour de futures études visant à minimiser la complexité et le caractère invasif de la fixation d'instruments sur les loutres.

RESUMEN

SEGUIMIENTO EXITOSO DE UNA NUTRIA SIN GARRAS AFRICANA (*Aonyx capensis*) UTILIZANDO UN DISPOSITIVO DE TELEMETRÍA FIJADO EXTERNAMENTE

El estudio del comportamiento y la ecología de las nutrias utilizando enfoques de bio-logging, a menudo involucra la implantación quirúrgica de dispositivos de telemetría y, a veces, el uso de arneses hechos a medida, debido a la dificultad de fijar instrumentos externamente de forma segura en las nutrias. Sin embargo, los instrumentos para bio-logging están avanzando constantemente y achicándose en tamaño, lo que ofrece oportunidades para intentar enfoques de fijación externa más simples, que minimicen la invasividad inherente de tales estudios. Aquí, presentamos datos obtenidos de fijar

externamente un pequeño dispositivo VHF (Muy Alta Frecuencia) directamente a la piel de una nutria sin garras africana (*Aonys capensis*) utilizando un epoxy de fraguado rápido. Rastreamos exitosamente las localizaciones de la nutria por un período de 30 días, y presentamos éstos datos como prueba de concepto de que la fijación externa es prometedora para estudios futuros, para minimizar la complejidad e invasividad de la fijación de instrumental en nutrias.