R E P O R T

INVESTIGATING THE DIETARY COMPOSITION OF SMOOTH-COATED OTTERS (*Lutrogale perspicillata*) AT VADUVOOR BIRD SANCTUARY IN THIRUVARUR DISTRICT, TAMIL NADU, INDIA

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Abstract: Smooth-coated otters play a vital role in freshwater ecosystems. The freshwater Otters such as *Lutrogale perspicillata* are common across Asia. In this communication, we conducted the first study of the smooth-coated otter's feeding patterns in response to variations in fish supply at the Vaduvoor Bird Sanctuary in Tamil Nadu, India. The bird sanctuary contained eleven fish species, while the otters ate eight different types of prey. The relative proportions of prey categories remained constant. The reserve is home to the *Oreochromis mossambicus* which formed a maximum 12±0.5% of the otter's diet. Other species included *Catla catla* (11±0.4%), *Anabas testudineus* (7±0.3%), *Cyprinus clupeoides* (6±0.2%), *Rastrelliger Kanaguria* (11±0.4), *Labeo rohita* (6±0.3), and *Clarias batrachus* (1%). Finally, this study discusses the fish species that otter species primarily eat, as well as their preferences, types, and proposed diet compositions.

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INTRODUCTION

India is home to three otter species: Smooth-coated otter (*Lutrogala perspicillata*), Eurasian otter (*Lutra lutra*), and Oriental small-clawed otter (*Aonyx cinerea*) (Foster-Turley and Santiapillai, 1990; Khoo et al, 2021). The present populations of the three otter species and their habitats in India have not been thoroughly examined, therefore little information on their status is known. All three otter species have been documented from the Southern Indian section of the Western Ghats, however there are no records from Tamil Nadu's coastal regions. Shrestha et al. (2021) reported the first evidence of a European otter in Nepal, and the Smooth-coated otter (*Lutrogala perspicillata*) is classified as vulnerable on the IUCN Red List (Khoo et al, 2021). Otters live in bodies of water such as streams, rivers, lakes, and dams (Kruuk and Conroy, 1987); degradation of pristine aquatic ecosystems is the most significant hazard to the survival of otter populations (Foster-Turley, 1992). Smooth-coated otters are believed to be extinct in nations such as Laos, and its population in India is steadily diminishing, according to IUCN status reports (Shenoy, 2006). Other significant risks to otters in India include illegal trade (Meena, 2002), reduced prey availability, persecution by fishermen, and water pollution (Mason and MacDonald, 1986). Otters are at a high trophic level, and suffer from pollutant accumulation in food chains (Foster-Turley, 1992). As a result, conservation efforts for this species must begin immediately.

Fish are a preferred component in their diet, but they also eat a wide variety of other foods, including insects, and smaller vertebrates like frogs and birds. (Anoop and Hussain, 2005). Foraging takes place among fallen tree trunks, rapids, fishing nets, and other obstacles (Shariff, 1984). Small fish are consumed whole (Helvoort et al., 1996), while larger fish are brought to shore (Ansell, 1947). The majority of foraging takes place in water; however, the animals do return toland to eat large fish, rest, and defecate. According to score bulk estimation, fish accounted for up 92% of *L. perspicillata's* entire diet along the Johor Straits in Singapore. These results support the observation that *L. perspicillata* is primarily a piscivore (Kruuk et al., 1994; Haque and Vijayan, 1995; Hussain and Choudhury, 1998; Anoop and Hussain, 2005; Sivasothi, 1995; Nawab and Hussain, 2012), which is unique among Asia's four otter species but similar to *Pteronura brasiliensis* in South America and *Hydrictis maculicollis* in Africa (Kruuk, 2006). A study in India reached a similar finding, with fish species consumed and preferred by otters varying per river based on availability during different seasons (Nawab and Hussain, 2012). This seeming opportunistic hunting behaviour is shared by otter species such as *Lutra lutra*, *Pteronura brasiliensis*, and *Lontra canadensis* (Duplaix, 1980; Kruuk etal., 1989; Bowyer et al., 1995; Carter et al., 1999). This study found that *L. perspicillata* prefers to consume small- and medium-sized fish (less than 18 cm) in SR, which is comparable to the conditions in a reservoir in Periyar, India (Anoop and Hussain, 2005). *L. perspicillata's* diet is primarily, but not entirely, piscivorous, and is determined by the prey community in its surroundings.

MATERIALS AND METHODS

Spraint Analysis and Sample Collection

Spraints were employed not only to indicate otter presence, but also to determine the food content at the research site. Spraints were only found in cluster deposits, making it difficult to identify individual spraints. Spraints on the ground were assessed visually and collected using gloved hands. Each spraint was collected in a separate zip lock bag and labeled with identification information. In the majority of instances, sprains were fresh or only a day old.

Spraint Sample Analysis

Each spraint was washed separately with biological washing powder (Suffolk Otter Group, 2017) and filtered through a screen to remove debris such as grass. Following filtration, the spraint was spread on newspaper and dried in the sun for a day. The spraint pieces were weighted individually. Throughout the process, the spraints were carefully numbered to maintain their individuality. The dried spraint was displayed on a white sheet in the light. Scales, bones, and other materials were classified and separated based on their size and structural characteristics. The anatomy of the spraint materials was employed to determine the taxonomy of feed composition. Using a magnifying lens, each particle was viewed and photographed at various angles on a clean, crisp background. The process is shown in Figure 1.

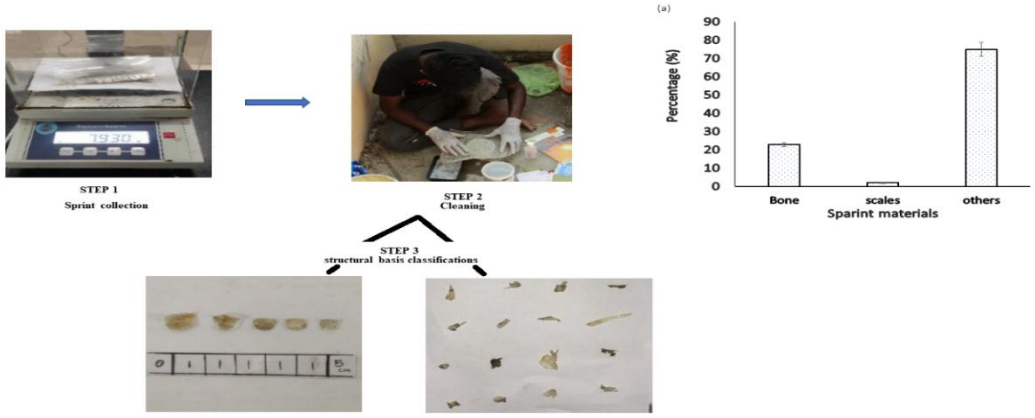

Figure 1. Spraint sample analysis steps for Smooth-coated Otter in Vaduvoor Bird Sanctuary (n= 22).

RESULTS

The composition of prey species was determined in spraints using bones and scales. Because it is impossible to identify all of the components included in the spraint, only recognized prey species were noted, and assessed based on their frequency of presence in the samples, as shown in Figure 1; Table 1 shows the fish present in the bird sanctuary and differs slightly from the previously published data (Gokula and Ananth Raj., 2021).

Table 1: Major Fishes available in Vaduvoor lake

S. No	Common Name	Scientific Name	Family
1	Bloch	*Cyprinus clupeoides*	*Cyprinidae*
2	Catfish	*Clarias batrachus*	*Clariidae*
3	Catla	*Catlacatla*	*Cyprinidae*
4	Climbing perch	*Anabas testudineus*	*Anabantidae*
5	Eel Fih	*Anguilla bengalensis*	*Anguillidae*
6	Indian mackerel	*Rastrelliger kanagurta*	*Scombridae*
7	Murrel	*Channa striata*	*Channidae*
8	Rohu	*Labeo rohita*	*Cyprinidae*
9	Spined Loach	*Cobitis taenia*	*Cobitidae*
10	Tank Cleaner Fish	*Pterygoplichthys pardalis*	*Loricariidae*
11	Tilapia	*Oreochromis mossambicus*	*Cichlidae*

Spraint components were examined individually using the identifications. According to the results (Table 2), 71 samples were found, with the majority of the samples showing *Oreochromis mossambicus* (14 samples equal to 20%), *Catla catla* (9

samples equal to 13%), *Anabas testudineus* (8 samples equal to 11%), *Cyprinus clupeoides* (6 samples equal to 8%), *Rastrelliger kanagurta* (5 samples equal to 7%), *Labeo rohita* (5 samples equal to 7%), and *Clarias batrachus* (2 samples equal to 3%). The remaining 22 samples (31%) revealed no definite identification and were referred to as the unidentified group. In addition to spraint analysis, the first reports of otters eating turtles, tank cleaning fish, and birds were made.

Table 2. Diet composition from spraint analysis

S. No	Species Name	Count	Percentage %
1	*Unidentified*	22	31
2	*Oreochromis mossambicus*	14	20
3	*Catla catla*	9	13
4	*Anabas testudineus*	8	11
5	*Cyprinus clupeoides*	6	8
6	*Rastrelliger kanagurta*	5	7
7	*Labeo rohita*	5	7
8	*Clarias batrachus*	2	3
Total		71	100

According to the analysis, fish bones are predominantly composed of vertebral regions, skulls, and spines, which are commonly observed. Weighing spraint components demonstrates that bones account for more than half of the proportion to scale, as well as other components discovered in the spraint samples. This could be because otter feeds primarily on large bony fish (Fig. 2). Remaining samples are classified as Unidentified group because no clear identification was found in bones to identify the fish type, and this category accounts for approximately 31%, however, in the identified category, *Oreochromis mossambicus* was dominant with 20 % of total number samples, followed by *Catla catla* (13%) and *Rastrelliger kanagurta* with 11% of total samples and *Anabas testudineusi* with 8%.

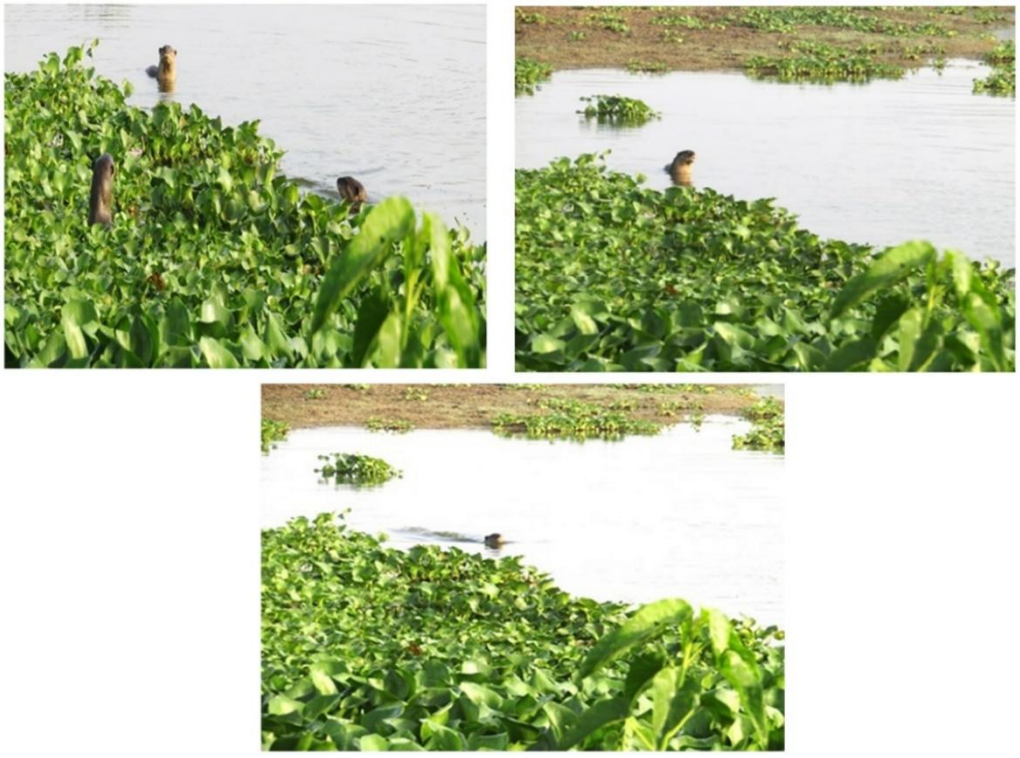

Figure 2. Otters fishing

Table 3. The Smooth-coated otter diet composition in Vaduvoor bird sanctuary, Thiruvarur District, Tamil Nadu (n=22).

Sl. No.	Species Name	Number Found	Occurrence (%)	Total weight (g)	Weight percentage (%)	Dry weight (g) (Mean ± SE)
1	*Anabas testudineus*	8	11	5.772	7	0.3 ± 0.1 2
2	*Catla catla*	9	13	9.282	11	0.4 ± 0.1 3
3	*Clarias batrachus*	2	3	1.018	1	0.0 ± 0.0
4	*Cyprinus clupeoides*	6	8	5.460	6	0.2 ± 0.1 5
5	*Labeo rohita*	5	7	5.522	6	0.3 ± 0.2
6	*Oreochromis mossambicus*	14	20	10.239	12	0.5 ± 0.1
7	*Rastrelliger kanagurta*	5	7	9.542	11	0.4 ± 0.3
8	Unidentified	22	31	40.122	46	1.8 ± 0.3
Total		71	100	87	100	

DISCUSSION

In this study, the highest otter cluster size is four individuals, including two juveniles. Previously, in March 2020, there were a maximum of six identical clusters at Vaduvoor Bird Sanctuary. However, in 2021, Arivoli and Narasimmarajan reported that no juveniles were found in the research area. The current investigation shows the presence of a juvenile (Fig. 2). As a result, it is clear that the population has begun to breed in this Bird Sanctuary. Otters have only been present here for a few years. By comparison, a pair of smooth-coated otters returned to the Sungei Buloh Wetland Reserve in 1998 and raised pups (Theng and Sivasothi, 2016), and there is now a healthy population of at least 170 individuals in Singapore (Shivram et al, 2023).

The current study found that otters mostly eat fish, with birds and amphibians accounting for only a small portion of their diet. Previous research has found a similar pattern (Gaethlich, 1998). Earlier research, however, suggested a link between fish availability and the makeup or preference for fish species in otters' diets (Erlinge 1968). Sallai (2002) discovered that some otters graze on non-native fish species. As with most spraints, the analysis was difficult because the bones were damaged. Furthermore, most of the spraint components werein the undetermined group because the remains were highly fragmented, necessitating further specific observations at a particular time. The reliability of spraint analysis as a measure of the relative frequency with which different prey are caught has been thoroughly explored. In general, the weight or volume of prey in spraints provides the most reliable assessment, though frequency of occurrence results in an accurate rank order of prey categories (Wise et al., 1981; Carss and Parkinson, 1996; Jacobsen and Hansen, 1996) Though a thorough diet calculation is impossible, *Oreochromis mossambicusis* is both more common in occurrence and has a higher mass in recognized spraint components. This suggests that this species is frequently consumed in the study area, which aids in the classification of prey species. The diversity of the prey community influences the otter's diversity of consumption of dietary resources. Understanding otter diet therefore contributes to biodiversity information on the otter prey community, which should then be addressed and protected. There is also evidence of otter feeding on other taxa, including as birds and turtles, although this was not found in thise spraint study.

Because otter species rely significantly on fish stocks, changes in stock quality and quantity may have a significant impact on their numbers.

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RÉSUMÉ: ENQUÊTE SUR LA COMPOSITION DU RÉGIME ALIMENTAIRE DES LOUTRES À PELAGE LISSE (*LUTROGALE PERSPICILLATA*) AU SANCTUAIRE DES OISEAUX DE VADUVOOR DANS LE DISTRICT DE THIRUVARUR, AU TAMIL NADU, EN INDE

Les loutres à pelage lisse jouent un rôle essentiel dans les écosystèmes d'eau douce. Les loutres d'eau douce telles que *Lutrogale perspicillata* sont communes en Asie. Dans cette communication, nous avons mené la première étude sur les habitudes alimentaires de la loutre à pelage lisse en réponse aux variations d'approvisionnement en poissons au sanctuaire des oiseaux de Vaduvoor au Tamil Nadu, en Inde. Le sanctuaire des oiseaux a révélé onze espèces de poissons, tandis que les loutres mangeaient huit espèces de proies différentes. La fraction des catégories de proies des sites est restée constante. La réserve abrite l'*Oreochromis mossambicus* et la loutre en a consommé au maximum 12±0,5%. Les autres espèces comprenaient *Catla catla* (11±0,4%), *Anabas testudineus* (7±0,3%), *Cyprinus clupeoides* (6±0,2%), *Rastrelliger kanaguria* (11±0,4), *Labeo rohita* (6±0,3) et *Clarias batrachus* (1%). Enfin, cette étude a abordé les espèces de poissons que les espèces de loutres consomment prioritairement, ainsi que leurs préférences, types et compositions des régimes alimentaires proposés.

RESUMEN: INVESTIGANDO LA COMPOSICIÓN DE LA DIETA DE LA NUTRIA LISA (*Lutrogale perspicillata*) EN EL SANTUARIO DE AVES VADUVOOR, DISTRITO DE THIRUVARUR, TAMIL NADU, INDIA

Las nutrias lisas desempeñan un rol vital en los ecosistemas de agua dulce. Las nutrias de agua dulce, como Lutrogale perspicillata, son comunes en Asia. En ésta comunicación, condujimos el primer estudio de los patrones alimentarios de la nutria lisa, en respuesta a variaciones en la disponibilidad de peces en el Santuario de Aves Vaduvoor en Tamil Nadu, India. El santuario de aves reveló tener once especies de peces, y las nutrias comieron ocho diferentes tipos de presa. The fraction of prey category sites remained constant. La reserva alberga Oreochromis mossambicus y la nutria consumió un máximo de 12±0.5%. Otras especies incluyeron Catla catla (11±0.4%), Anabas testudineus (7±0.3%), Cyprinus clupeoides (6±0.2%), Rastrelliger Kanaguria (11±0.4), Labeo rohita (6±0.3), y Clarias batrachus (1%). Finalmente, este estudio discute las especies de peces que comieron primariamente las nutrias, así como sus preferencias, tipos, y proposed diet compositions.