International Otter Survival Fund
1993 - 2023
Celebrating
30 Years

# OTTER

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**The International Otter Survival Fund (IOSF)** was inspired by observing otters in their true natural environment in the Hebrides. Because the otter lives on land and in the water and is at the peak of the food chain it is an ambassador species to a first class environment. IOSF was set up in 1993 to protect and help the 13 species of otter worldwide, through a combination of compassion and science. It supports projects to protect otters, which will also ensure that we have a healthy environment for all species, including our own.

**OTTER** is the annual scientific publication of the IOSF.
The publication aims to cover a broad spectrum of papers, reports and short contributions concerning all aspects of otter biology, behaviour, ecology and conservation. It also contain information on the work of IOSF and reports on our activities.

**Submission of manuscripts**

**OTTER** is a peer-reviewed journal and a summary of the guidelines for authors may be found at the back of each Journal but please contact us for full instructions. Papers should be submitted through enquiries@otter.org.

## Publication

The Journal, including back issues, is available to download free on the Media and Resources page of the IOSF website (www.otter.org). A limited number of copies are also printed and these are available for sale on the Ottershop (www.ottershop.co.uk).

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## FOREWORD

Thirty years is a long time and it is time to reflect on what has been achieved in those years.

When IOSF first started back in 1993 little did we know how it would grow: now we have 160,000 supporters in 39 countries; we have held training workshops in eight countries; we have had conservation, research and education programmes in 69 countries; we have provided help and support for otter rescue and care in 50 countries; and what started out as Otterly Mad Week has evolved into World Otter Day, that we now know is such a force in bringing otters and their conservation to the public's attention. At our own sanctuary on Skye we have cared for 245 otters and released many back to the wild where they belong.

This latest Otter Journal is our ninth, and it has articles from all over the world:

- We have the usual reports: Asian Otter Conservation Network, African Otter Report, Team Otter Report, IOSF World Otter Day 2023 and the Otter Oscars 2022.
- In the UK we have papers on our long-term project monitoring otters on the Isle of Skye, a student otter survey on the Isle of Barra, a review of 30 years of rescue and rehabilitation of Eurasian otters in Scotland, otter mortalities and the effects of road kill mitigation measures in the Isle of Mull, and the first photographic evidence of otters on the Isle of Wight in 2022.
- Worldwide we have papers on smooth-coated otters in Pakistan, Nepal, India and Iran (Maxwell's otter), and unusual sightings of Eurasian otters in Kathmandu (Nepal) and Bangladesh, where it is the first evidence of this species in post-independence Bangladesh.
- There are also papers on the effects of warming oceans on sea otters and people's perceptions of Eurasian otter conservation in Nepal.

So I am sure you will agree that there is something of interest for everyone.

We would like to take this opportunity to say a huge thank you to everyone who has been involved with IOSF since we started:

***The people who have worked with us:*** Helen, Janet, Jackie, Aodhan, Astrid, Ben and Callum; the various vets we have had the privilege to work with, particularly all those past and present at the Old School Veterinary Practice in Broadford and those who have helped with post mortems over the years – a big thank you.

***To our Patron***, Julian Pettifer, and ***Joint Presidents***, Laurence Broderick and Dennis Furnell and the ***Patron*** of our campaign against the fur trade – HRH Princess Michael of Kent.

***To our Board:*** Jackie West, Sarah Neill, Andrew Cameron, Andy Rothwell and Padma de Silva – a very big thank you for all the help and advice you give.

***To our worldwide co-ordinators***: William Mgomo (African Community Education), Aad Adrean (southeast Asia), Jyoti Bhandari (south Asia), Ling-Ling Lee, (east Asia) and Omar Al-Sheikhly (the Middle East).

***To our volunteers*** who help with our Skye Team Otter clubs, and the fishermen who help us to keep our otters fed.

***And finally to all of our supporters all over the world who have helped us to bring otter conservation to the attention of the public. Without you we would not have been able to achieve all of this in otter conservation.***

***As we look forward we can see a strong foundation to carry otters and their conservation forward and we look forward to working with you all to do even more for otters***

Dr Paul Yoxon
Head of Operations

# ASIAN OTTER CONSERVATION NETWORK REPORT

PADMA K. DE SILVA
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We were fortunate enough to continue otter conservation work throughout the past year in Asia without much hassle. Several countries, *viz*. Nepal, India, Singapore, Indonesia, Malaysia, and Iraq, were particularly active in continuing otter conservation research, holding several otter workshops, and publishing their work. Accordingly, concise accounts of the above activities appear in the present report, but you will also find more information in the section on World Otter Day.

The trade in otters continues to be a concern particularly in southeast Asia. Rescue centres particularly in Thailand, Cambodia, Vietnam, and Indonesia still regularly receive unwanted pets or animals confiscated from the trade. An Asian small-clawed otter and a hairy-nosed were taken in by Wildlife Friends Foundation Thailand after being kept as pets for about six years. The hairy-nosed otter is only the second of this species now in captivity – the other is in Phnom Tamao Wildlife Rescue Centre in Cambodia.

More work still needs to be done in education and also legal enforcement to reduce the threat to otters from the trade for pets and fur.

## SOUTH ASIA

### *Nepal*

The Fourth Himalayan Otter Network Workshop was held at Kathmandu, Nepal on 28–29 September 2022. The main objectives of the workshop were (1) to give network partners an opportunity to share information on otter status and distribution, survey successes, failures, and future plans to sharpen otter research and conservation approaches; (2) to strengthen a Himalayan-wide network of otter researchers and conservationists; (3) to present findings of the recent Nepal Otter Action Plan (NOAP) surveys and public awareness projects by members of the Himalayan Otter Network (HON) over the past two years, and to prepare those findings for publication; and (4) to collate the documentation of otter status and distribution collected by NOAP surveys and move toward the creation of a national

strategy for otter conservation. The workshop was supported by a generous grant from Wildlife Reserves Singapore.

Purna Man Shrestha completed a survey of otters in Myagdi River and Thuli Bheri River. They observed more signs, approximately three-fold, than the previous survey in the same rivers. They also explored two tributaries, one major (the Mudi), which showed evidence of the presence of otter. and one minor river (the Darr), which had no evidence.

### *India*

Omkar Patil and his team produced a video in the local language of Maharashtra for use in the community. Omkar also gave a presentation for the IOSF World Otter Day Webinar on "Otters of Western Maharashtra, India – Otter species and habitats awareness programme".

## Publications on South Asia

### *Bangladesh*

Muntasir Akash and his team published "What does a discovery tell us? Camera-trapping insight into the Asian small-clawed otter in northeastern Bangladesh" in the *IUCN Otter Specialists Group Bulletin* in September 2022. Muntasir and Sourav Chakma have also published "First evidence of Eurasian otters in post-independence Bangladesh" in this current issue of the *OTTER Journal*.

### *India*

Stephen Jonah Dias et al., "Habitat selection of smooth-coated otters (*Lutrogale perspicillata*) in the peri-coastal, urbanised landscape of Goa, India" in the *Mammal Research* journal in May 2022.

Swanand Patil et al., "Distribution of smooth-coated otters *Lutrogale perspicillata* (Mammalia: Carnivora: Mustelidae): in Ratnagiri, Maharashtra, India" in the *Journal of Threatened Taxa* in 2022.

Dinesh Singh et al., "On the occurrence of Eurasian otter *Lutra lutra* (Carnivora: Mustelidae) in Neeru stream of Chenab catchment, Jammu and Kashmir, India" in the *Journal of Threatened Taxa* in 2023.

Shaik Shaheen and Dr Rahul Mungikar, "Assessment of status and distribution of smooth coated otter in Hyderabad and Medak of Telangana, India" published in this current issue of the *OTTER Journal*.

Omkar Patil and Hrishikesh Wagh, "Unveiling the tragic tale of Mumbai's otter, a victim of the pet trade: a case study" published in this current issue of the *OTTER Journal*.

### *Nepal*

Mohan Bikram Shrestha recorded the Eurasian otter in Jajarkot district and published "First evidence of Eurasian otter in Nepal in three decades" in the *IUCN Otter Specialists Group Bulletin*. In addition, together with other authors, Mohan has published "Unusual sighting record of Eurasian otter (*Lutra lutra*) in Kathmandu Valley, Nepal" in this current issue of the *OTTER Journal*.

Purna Man Shrestha and other authors: "People perceptions on Eurasian otter (*Lutra lutra*) conservation in Mugu District, Nepal" in this current issue of the *OTTER Journal*.

Jyoti Bhandari and other authors: "Conservation status survey of smooth-coated otters in Babai River of Bardia National Park, Nepal" in this current issue of the *OTTER Journal*.

### *Pakistan*

Zafeer Ahmed Shaikh. "On some recent sightings of smooth-coated otters (*Lutrogale perspicillata sindica*) from Pakistan" in this current issue of the *OTTER Journal*.

## MIDDLE EAST and CENTRAL ASIA

### *Iraq and Iran*

Currently, the Mesopotamian Marshes are facing a severe drought and water scarcity due to the synergic effect of climate change and hydrological schemes in the upstream countries. Large extents of the Iraqi marshes were reduced in size: Hawizeh Marsh, the stronghold of the Iraqi smooth-coated otter *Lutrogale perspicillata maxwelli*, was totally dry as evident from recent satellite surveillance imagery. As a consequence, it is expected that most of the *L. p. maxwelli* population in the Iraqi Hawizeh moved into the Iranian Hoor ol-Azim Wetland in southwestern Iran, where major water bodies are still intact and they are protected from illegal hunting. In contrast, if a few individuals of *L. p. maxwelli* survive the current drought in Iraq, there is a high possibility that they will be persecuted by locals on the Iraqi side and the cubs taken to be raised as pets.

In Iraq, several sightings of the Eurasian otter, *L. lutra*, were made by local people, from Derbendikhan Lake in southeastern Sulaymania Province in northern Iraqi Kurdistan, in the Diyala River near Baquba, Diyal Province in central Iraq. In addition, two nocturnal individuals were seen on the eastern bank of the Tigris River in Al-Jadriayh area in Baghdad city, a remarkable observation as the city is full of crowds and river users.

Links: https://www.theguardian.com/world/2023/jan/29/death-in-the-marshes-environmental-calamity-hits-iraqs-unique-wetlands

https://nypost.com/2021/05/28/in-iraqs-iconic-marshlands-a-quest-for-endangered-otters/

In March 2023, IOSF's Grace Yoxon was invited to give a brief presentation in celebration of the tenth anniversary of the Iraqi Green Climate Organisation.

***Kyrgyzstan***

Very little is known about otters in Kyrgyzstan. Eurasian otters are believed to have isolated populations but actual documented research has never been conducted. It is believed that their range has contracted considerably and there is almost no reliable information on numbers and ecology.

Learning more about these otters and exerting efforts toward their conservation is more important than ever, as pressures on this population are increasing, and extinction of otters in Kyrgyzstan is definitely possible.

A project will soon begin to conduct standard surveys in the Chong-Alay area to provide base-line data on distribution, diet, threats, etc. and identify reasons as to why otters have declined and are confined to certain areas.

***Turkey***

On 26 September 2022, an adult Eurasian otter, *Lutra lutra*, was spotted in Batman's Gercüş countryside and recorded by local people with a mobile phone camera. It was stated that the otter was seen for the first time in that region. The otter was wandering in the countryside and escaped into the Gercüş pond after seeing the people filming it.

Link: https://expatguideturkey.com/endangered-otter-spotted-in-batman/

**Publications on the Middle East**

***Iraq***

Omar Al-Sheikhly et al., "First breeding record of the smooth-coated otter (*Lutrogale perspicillata Maxwelli*) (Hayman 1956) in Hoor ol-Azim wetland in southwestern Iran, with notes on its intra/interspecific behaviour" published in this current issue of the *OTTER Journal*.

***Palestine***

A review of the status of Eurasian otters, *L. lutra*, in Palestine was comprehensively discussed in an article published in Arabic in March 2022: The Persian Otter (*Lutra lutra seistanica* Birula, 1912) in Palestine. *Gazelle: The Palestinian Biological Bulletin*, 40(207), 1-22. Published by Prof. Dr. Norman Ali Khalaf Department for Environmental Research and Media, National Research Center, University of

Palestine, Gaza, State of Palestine. (With English and Arabic abstracts).
ISSN 0178 – 6288.

Link: https://issuu.com/dr-norman-ali-khalaf/docs/persian_otter_in_palestine

## SOUTHEAST ASIA

### *Indonesia*

A training event was carried out on 31 May as part of World Otter Day and you can read more about this in that section.

The Indonesian otter website (https://berang-berang.com/) has a lot of interesting material about otters including an article on the use of otters in circuses (https://berang-berang.com/2023/04/layakkah-berang-berang-sebagai-hewan-peraga). This is a controversial subject in Indonesia but it is still legal and there are two oceanariums featuring otter attractions, namely Ocean Dream Samudra and Jakarta Aquarium Safari.

Aadrean and Ferdi Andeska are writing a book about otters in the Indonesian language for use in education work in the country.

### *Malaysia*

The positive work started in Malaysia at the workshop in April 2022 has continued with new information on hairy nosed otters in Selangor and in the north of the country.

They were also very active for IOSF World Otter Day. As you will read in that section they held workshops about human–otter conflicts and had an exhibition in collaboration with Tapii Coffee.

## EAST ASIA

### *South Korea*

Since 1974 there has been a lot of development in Seoul and otters were not seen for many years. In 2017 a mother and three cubs were caught on camera and now it has been confirmed that at least 15 otters are living along the Han River in the middle of the city.

# AFRICA REPORT


## ALGERIA

**Seddiki et al. (2023)** conducted a study into the Eurasian otter (*Lutra lutra)* around Lake Jorf Torba in southwest Algeria. Their study found the presence of Eurasian otters in the region but populations are extremely limited and a serious conservation effort may be necessary for their long-term survival.

The wildlife in the region, particularly semi-aquatic species, are facing a number of pressures such as water pollution, invasive species, anthropogenic issues and, of course, climate change. The lake is in the Saharan region which means that this is a major lifeline for biodiversity in the country. The study found that there have been climatic changes, including increased average temperature and lower rainfall, leading to increased problems for this wetland habitat. It concludes that although there are otter populations present, further studies must be conducted to examine how they adapt to these pressures and more work needs to be done to maintain the habitat as a whole.

## NIGERIA

Michael Salami Olalaken, along with the Team Otter club, are working on community awareness and reducing anthropogenic pressures on otters (and other wetland species). You will read about Team Otter, and the education work, which he is conducting through the Netlink Environmental Conservation Organization, in the Team Otter report.

## RWANDA

In Rwanda, Placide Nkusi has started working on otter conservation recently and he is currently researching the spotted-necked otter on Lake Kivu.

His World Otter Day event is a catalyst for more work to take place in the country and you can read about it in the full World Otter Day report. Placide, along with the Center of Excellence in Biodiversity and Resources Management, University of

Rwanda, also arranged a webinar on World Otter Day to highlight the species and bring more knowledge. Dr. Paul Yoxon, of IOSF, spoke on otters, the challenges they face and their conservation to just under 30 attendees from the university.

**TANZANIA**

As always, Tanzania has been incredibly active and you can read about the work in relation to children in the Team Otter report.

Outwith the children's work, there is a lot of community awareness and interaction taking place. This is reducing potential threats and helping communities, including fishing communities, to gain a better understanding of the importance of maintaining otter populations and wetlands. By working alongside communities, we can understand the pressures on them, and provide favourable conditions for both the people and the otters to thrive.

Mrisho Mohamedi visited two communities to gain an understanding of how people in different watershed areas may have differing conflict levels. In Bagamoyo, a coastal area, there was little to no conflict with otters. The fishermen mentioned that they are unsure of the presence of otter presence and suggested that high noise levels/disturbance could be a reason for that. On the other hand, in the Makurunge area, a freshwater area, conflict with fishermen was substantially higher. The areas of higher conflict were those with higher fish populations and otters were known to damage fishing equipment. One of the farmers showed such damage and a footprint of who they believed to be the potential culprit. They also believe that otters are far stronger and more powerful than any other animals of their size, and that they are still hunted for traditional medicines – to increase sexual ability.

Mrisho discussed conflict management solutions for the fishermen in the area, working to find steps that help both the otters and people. He explained the benefits of having local otter populations to which the fishermen were receptive. The fishermen are looking at ways in which they can reduce any conflicts, and perhaps by adapting these methods they can peacefully co-exist with the otters.

Jimmy Chami visited the local community at Mindu Village in the Morogoro region of Tanzania. Together they looked at otter signs, and shared knowledge on otters, including how they are an indicator of healthy environments, important in maintaining ecological balance, and can also help with economic stability as they can attract tourists. Fishermen and farmers are both aware of the presence of otters and stated that they are mostly nocturnal as to avoid human presence. The farmers have no conflict but, naturally, the fishermen have had issues due to otters sometimes destroying the nets.

Finally, William Mgomo, IOSF's African Coordinator, has been continuing his outreach work, with schools and local communities and through World Otter Day. William regularly visits different areas and works alongside local communities, including fishermen. Through his extensive outreach programme, William has managed to find mitigation to reduce threats/conflicts with otters, increase local awareness, and ensure a peaceful co-existence between people and otters.

Furthermore, William has been working on local and national media to help spread the word of otters further afield. He regularly has a radio show where he talks all things otters and wetlands. William has recently set up an African Otters YouTube channel which he hopes will continue to spread the word of otters across the continent.

Recently an African clawless otter was found in the Morogora region and plans are in hand to restore their habitat further and create a better place for their survival.

Tanzania is a hive of activity. William's passion is evident and is clearly inspiring other individuals to take part in otter conservation and really make a difference.

## TUNISIA

The Eurasian otter (*Lutra lutra*) is the most widely distributed of the otter species and is listed as Near Threatened in the IUCN Red List. However, in Tunisia, information about its distribution remains poorly known.

In 2019, the Association Tunisienne de la Vie Sauvage (ATVS) started investigating and studying its presence in northern Tunisia, where they first discovered an otter which had been a victim of a traffic accident. Since then, the Association created a documentary in 2019 and submitted a paper to the *IOSF OTTER Journal* Volume 6 (2020).

From 2020 to 2022, Association Tunisienne de la Vie Sauvage worked on this species in northern Tunisia, specifically in Nefza in a project called "COBIOM", funded by the Critical Ecosystem Partnership Fund (CEPF) to increase the knowledge of the distribution of the otter in the area.

The Association believes that raising awareness about otters in Tunisia, is a key tool in its conservation.

In 2023, Faouz Kilani, member of the Association Tunisienne de la Vie Sauvage attended the IOSF World Otter Day webinar to speak about otters in Tunisia.

## ZIMBABWE

Save Our Environment Trust are working on a number of otter projects across the country, disseminating knowledge about otters to communities through online presentations and physical events. During World Otter Day, they held an online presentation focusing on a number of different aspects in relation to otters, including habitats, reproduction, diet, threats and what can be done to help. The presentation also included pictures of different species of otter to help communities understand more about them. They also held outreach programmes in local schools.

SOET are currently working on designing a questionnaire to understand a variety of different aspects on co-existence between otters and local communities. The survey will help to identify some of the reasons why the otter is endangered in Zimbabwe.

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**Seddiki, LS, Seddiki, F, Torki, K, Seddiki, A, and Seddiki, S, 2023.** The otter in an arid zone - Lake Jorf Torba, Southwest Algeria: ecology, diet and behaviour. *IUCN/SSC Otter Specialists Group Bulletin* 40(2), 72–79.

# TEAM OTTER PROGRAMME: RECONNECTING CHILDREN WITH NATURE

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IOSF's Team Otter programme is designed to reconnect children with nature, wildlife, and the environment, igniting a passion that will last their whole life. It is well known that we have become disengaged from the natural world and as a result we are having a massive detrimental impact on it. IOSF's Team Otter programme is helping to change that and ensure future generations understand the role they play and the steps they can take to ensure a healthier tomorrow for all. Furthermore, we aim to build children's confidence and understanding of how they can become a good citizen for the whole community and making a change. Although we use otters as a mascot, we focus on all things in the natural world.

## CANADA

Team Otter Seaside Park is based in St. John, News Brunswick, and is the newest part of the Team Otter network. The club has already met many times and is focussing on helping children connect with nature, but also about being positive individuals around their community.

The club has raised support to help Eden, one of IOSF's otters, and held a fundraiser for IOSF World Otter Day. They are planning a day trip to try and find otters in the area. We are very excited to see how this club continues to grow.

## COSTA RICA

The Toucan Rescue Ranch is working with children in their area on an "Otter Ambassador Project" to help highlight the issues of wetland degradation and

projecting otters in the long-term. The group of children have done various project to help otters and even gave a presentation on what they are doing at IOSF's World Otter Day webinar 2023.

**GUYANA**

Yupukari Wildlife Club is a very active club and meet regularly to allow the children of the village and surrounding areas to learn all about wildlife and conservation from the experienced and highly skilled local wildlife researcher, Oswin Ambrose, and his team. The group is also run by IOSF partners, Save the Giants, and is helping children become more careful of the wildlife they co-exist with.

**NIGERIA**

Last year, Michael Salami Olalaken, at Netlink Environmental Conservation Organisation, set up a Team Otter club in Ondo State, as part of their IOSF World Otter Day grant event. The club works on monitoring otters in the area and the threats that they face. Michael is regularly updated on the pressures placed on otters, and other coastal species in Ondo State.

This year, Michael is looking to grow that programme, by visiting Abuja, the nation's capital, and spreading the word about otters further.

**TANZANIA**

William Mgomo, IOSF's African Education Co-ordinator, has inspired the next generation of otter conservation workers across Tanzania.

Throughout the last year, there has been a concerted, well-run effort to grow the number of children that are taught about otters and about why it is so important to look after their populations. Between William himself, Ashura Talgimbudzah and Mrisho Mohamedi, over 20,000 children have been visited across three regions and various schools. A truly astonishing number that will help keep otters in the mind, and at the forefront of efforts, for many years.

You can read more about William's work, and the work of others in Tanzania in the Africa report.

**UGANDA**

In Uganda, the Mutanda Community Conservation Organisation (MUCCO) is still running their Team Otter club around Lake Mutanda, in the Kisoro district. The club focusses on raising awareness on otters, wetlands, and wildlife, and making crafts. They are also helping teach the children how to swim – a vital lifeline in the area they live in.

## UNITED KINGDOM

Team Otter Broadford is run by IOSF's education officer and is based in Broadford, Isle of Skye, Scotland.

The club is in two parts – a primary school group, containing 16 children, and a high school group with seven children.

The Primary group spends much of their time learning about wildlife through fun and interactive materials and games, cleaning up our local village, building wildlife habitats, such as bug hotels, and many other wildlife and community-based projects. This allows the children to learn about local and global wildlife issues, find a focus for them to help, and offer simple and effective steps to help reduce our impact. During the programmes, the group also works with other organisations such as Whale and Dolphin Conservation, Broadford and Strath Community Company and many other like-minded organisations.

The High School part of the group is much more campaign led. Their current campaign is a 30 for 30 beach clean. In order to celebrate IOSF's thirtieth birthday they have decided to do 30 beach cleans in 2023. During this project, they will raise money to support clubs around the world, as one of the children said he wanted to "help other kids have what we have". It is so encouraging to see this attitude in the kids.

Along with their beach cleans, the older children have made signs to go around our local area to discourage people from littering, helped set up a beach cleaning station and investigated other related factors around our area. The club is really active, and passionate, about making a difference moving forward!

## OTHER CLUBS

These clubs are also joined by clubs in various other countries including South Africa, Nepal, and Lao PDR.

***We will continue to increase the impact of Team Otter and would love to have more clubs around the world. Should you have any interest in joining our Team Otter programme then please contact our education officer at Ben@otter.org***

# IOSF WORLD OTTER DAY 2023: REPORT


IOSF World Otter Day 2023 was a huge success and we want to start by saying a massive thank you to all who took part and spreading the word of otters globally. This year, we had events in 40 different countries, across all continents, bar Antarctica – so really a **"WORLD"** Otter Day again!

## GRANTS

### *India*

ECO – Earth Crusaders Organisation organised a seminar at the Auditorium of Nandankanan Zoological Park. The programme started with a quiz, to determine the students' initial understanding of otters before the start of the seminar. There were various presentations on the otters of Odisha, threats to them, and their value to the ecosystem. At the end each participant made pledges on how they can help with the long-term survival of otters in the region: not dumping litter, reporting water contamination, protecting wetlands, telling others about importance of otters, encouraging otter-friendly fishing practices, and reporting otters at risk to nearest forestry office.

### *Ireland*

Cork Nature Network used their grant to develop a number of promotions and actions online, which included posts, posters, and adverts to increase the local knowledge of otters across their area. Part of their event also highlighted this amazing otter sand art: https://www.youtube.com/watch?v=W7sOkHa4Hc4. This event ensured there was a much higher engagement with people from around Cork, and further afield, on otters, their importance, highlighting their presence, and the conservation issues they face.

### *Nepal*

Subarna Ghimire held an event in Kathmandu with 35 otter enthusiasts, including 25 students. The main objective was to educate university students about otters, their importance, habitats and challenges they face and encourage more work to be done across Nepal. They focused on:

*Sharing awareness material*: A poster entitled "Conservation of otter species to conserve aquatic ecosystems" was designed and unveiled during World Otter Day. This will be used when team members are in the field and distributed to local communities and schools.

*Education workshop*: A workshop was held to encourage attendees to be part of otter research and conservation across Nepal. It covered "Otters: the global distribution and diversity", "Study of Eurasian otter in Nepal and lessons to share", and "Conservation awareness for otters in Nepal".

### *Rwanda*

Placide Nkusi ran a multi-disciplinary education and outreach programme for over 100 people, involving a number of different stakeholders, to raise awareness of otters and the threats they face across the country. There were three elements: An awareness meeting with a variety of different stakeholders and an online seminar, with IOSF's Dr Paul Yoxon; Placide also created banners, leaflets, and t-shirts to be given to people to keep otters in their minds; IOSF's video was translated into their local language, Kinyarwanda: https://youtu.be/MfzWu46Hmks.

Placide and his team are highly motivated to continue awareness, research, and education to help to reduce the otter's decline in the long-term.

## OTHER EVENTS

IOSF was delighted to see the number of events taking place in 40 countries across the world, both online and in person. Of course, we cannot mention everyone and everything but we want to thank each and every person and organisation that has helped make World Otter Day the biggest one yet!

Below is more information on some of the events that took place:

### *Canada*

*Vancouver Aquarium*: A joint event was held by Vancouver Aquarium, together with the Squamish Nation, who have a deep-rooted connection with nature and the diverse wildlife that inhabit the land. On 31 May, Bob Baker and Lisa Lewis, esteemed experts in indigenous culture and environmental studies, hosted thought-provoking activities and provided invaluable insights into the relationship between the Squamish people and the animal kingdom.

*Team Otter – Seaside Park Elementary*: This group held a special event of their own, selling "popsicles" to raise support for otters and their conservation. They delivered them around their area and managed to raise a massive $244.79CAD for IOSF – so a huge thank you to them.

The club also teamed up with Linda Wilinski, who kindly offered gifts for the group. Linda ran her own World Otter Day event, which you can read about in the USA section.

Finally, although not directly World Otter Day related, there was a soap box derby and some kids were involved in this with their otter-themed entry.

***France***

Legendia Parc's event had facepainting, special sessions with their keepers on the situation of otters around the world, a presentation about otter conservation and IOSF and how they can help.

***Germany***

Heidy Davis, of the German Otter Protection Network, held three World Otter Day events. On 25 May, Heidy Davis, and otter spotter Markus Heines, walked along the River Schwalm with a handcart full of exhibits, spending three hours explaining and presenting interesting facts about otters to a very curious group. On 27 May, and in partnership with Duisburg Zoo, Heidy set up a huge information stand with her two otter mounts, paw moulds, paw prints, quizzes, a drawing competition, and on-site painting for children to raise awareness of all 13 otter species around the world. On IOSF World Otter Day itself, Heidy gave a two-hour talk on the importance of otters to the Friends of the Zoo Association at Duisburg Zoo, using her Eurasian otter mount, otter spraints, paw prints and otter sounds. She also drew attention to the pet trade, particularly in relation to social media, and attendees said they would be more conscious of highlighting the pet trade online. During her talk, Heidy raised funds for Caroline Leuchtenberger's giant otter project "Projecto Ariranhas" in Brazil.

A massive thanks to Heidy for her hours of preparation and "groundwork" to make this event, or series of events, so successful!

***Guyana***

Oswin Ambrose, and Save the Giants, worked alongside Yupukari Wildlife Club and the children of the region. The kids spent the day learning all about otters with a short video, making their own unique giant otter throat markings and more art related activities focusing on otters. The group will be taken on the Rupununi river soon in search of giant otters!

***India***

Praphul Gopal and Mr Ankit Moun were invited by Cauvery Wildlife Sanctuary and Karnataka Forest Department to deliver a workshop on otters as part of World Otter Day celebrations. Both guest speakers shared a number of different aspects on otters and their relationships with communities and habitats and also innovative conservation approaches, the illicit otter trade, and the challenges of fragmented landscapes.

Praphul encouraged a call to action saying: "Together, we have the power to make a difference by supporting local conservation initiatives, raising awareness, and advocating for stronger protection measures. Each individual has a vital role to play in preserving the beauty and diversity of our natural world."

***Indonesia***

A training event was carried out on 31 May at Andalas University Biology Plaza. This is a first step to raise a sense of concern for otter conservation and to open opportunities for students to conduct otter research at the conservation area in Dharmasraya Sumatran Tiger Rehabilitation Center.

***Ireland***

Samira Blaauw, a PhD student at South East Technological University, Co. Waterford, Ireland, gave a talk to two different primary schools in the catchment of Lough Carra, Co. Mayo, explaining the difference between native otters and non-native American mink. They looked at how to monitor otters, including examining spraints (faeces), and she stressed the importance of not disturbing the otters.

***Italy***

The Centre Acqua e Biodiversità of the Gran Paradiso National Park organised an event as part of a festival of naturalistic drawing, devoting 3 June to otters. Twenty-five participants of all ages joined in with the teacher, Javier Lazaro, using pictures, books, and images of otters. There was also an opportunity to talk about the otter situation in Italy and across the world, raising awareness of the need to continue conservation efforts for all of the different otter species of the world. More otter-related activities are planned in the future, to further enhance the conservation of otters in the area.

***Malaysia***

Our friends and colleagues at the Malaysian Nature Society/Malaysia Otter Network (MNS/MON), once again joined in World Otter Day with a series of events.

*Human–otter conflict workshops*: MNS/MON conducted three human–otter conflict workshops across three districts (Klang, Kuala Selangor, and Sabak Bernam) in the Selangor state. These were held in collaboration with the Department of Wildlife and National Parks Peninsular Malaysia and Department of Fisheries Malaysia, to raise awareness about the importance of otters, mitigation measures and coexistence among aquaculture farmers. They will engage with the farmers continuously in the long term.

*Otter exhibition*: MNS/MON also collaborated with Tapii Coffee, whose logo is an otter! A three-day event was held from 26–28 May 2023 in the Tapii Coffee BMC branch, with otter talks, screening of a short documentary, merchandising booth, and an otter-themed

exhibition in a cafe, the very first in Malaysia! What is even more important is that Tapii Coffee's owner agreed to maintain the exhibition permanently in order to educate and raise awareness of the public about otters, with increasing cases of human–otter conflict around Kuala Lumpur and Selangor urban areas.

***Nepal***

Rabin KC and Rabin Kadariya held an event involving 1,227 people near Bardia National Park with awareness sessions aimed at communities and also schoolchildren. During the community awareness event, 12 awareness sessions were conducted in the communities of Bardia National Park, which has a high population of otters in the waterways. During the sessions for children, they reached out to five schools (Shree Jagdamba Basic School, Amar Shahid Dharmabhakta Basic School, Shree Saraswati Basic School, Janajyoti Secondary School, and Janaki Secondary School).

***Pakistan***

The Mountain Society for Research and Development (MSRD Chitral) organised an event in Chitral, which raised awareness and sensitised local people and students about the importance of conserving otters and their freshwater habitats. There were three different events:

*Awareness Workshop*: This took place at Pamir Riverside Inn Chitral and was attended by a diverse group of participants, including local community members, students, and representatives from environmental organisations. Experts and researchers delivered presentations on the importance of otters, highlighting the ecological significance of otters and their role in maintaining healthy, freshwater ecosystems. They also shed light on the various challenges faced by otters, such as habitat loss, pollution, and illegal hunting. Practical conservation strategies and initiatives were discussed to inspire participants to be active in engaging in otter conservation efforts.

*Radio*: A talk on otter conservation was broadcast on Radio Pakistan Chitral. This aimed at reaching a wider audience and raise awareness among the public about the importance of protecting otters and their habitats. The talk emphasised the role of community participation in preserving otters and encouraged listeners to contribute to their conservation efforts.

*School Awareness*: To instil a sense of environmental responsibility in young minds, MSRD Chitral conducted a school awareness programme, which took place at Hillcrest. Through interactive sessions, educational presentations, and engaging activities, the students gained insights into the vital role otters play in maintaining the ecological balance of freshwater ecosystems. It also focused on empowering students to become ambassadors for otter conservation within their communities, by spreading awareness, participating in clean-ups, and engaging in habitat restoration projects. This is a valuable platform for inspiring the next generation of conservationists.

***Paraguay***

Para La Tierra celebrated World Otter Day with their eco-club. During the event, the children learned about the importance of otters and their role in the ecosystem, painted an otter poster and made some otter masks. They finished by going out to the nearby river to see if they could spot any otters!

***Tanzania***

IOSF's African Community Education Coordinator, William Mgomo, joined forces with Mrisho Mohamedi to run a World Otter Day event. They started by working on a radio session at Dizzim FM to further increase the outreach programme across the entire country. During the programme, William talked about otters, their conservation and why we must do more. There was a question-and-answer session where people could highlight their issues and discuss with William what can be done and he emphasised how important they are.

William also visited Chief Albert Primary School and 364 students participated in an otter artwork competition with prizes for the eventual winner, Jackline.

***Uganda***

For the third year running, the Mutanda Community Conservation Organization (MUCCO), alongside their newly formed Uganda Otter Club (UOC), worked on a World Otter Day event at the Mutanda Cultural Center, Igali Village, Kisoro district. This was run by Glads Nyesigomwe, who worked to encourage pupils to conserve habitats, and therefore conserve clean waters, vital to communities and otters. The project also encouraged people to understand the charm and importance of otters, and on ways to reduce conflict between otters and fishing communities. The final request was for community members to come together to conserve otters and their habitats, including increased waste plastic management.

***United Kingdom***

*Lochgoilhead Primary School, Scotland*: Following the visit of Ben, our Education Officer, in early May, the school pledged to join in World Otter Day, and they didn't disappoint! The school created outdoor artwork, using natural resources, with the main theme being otters.

*Mull Magic, Isle of Mull*: Ruth Fleming, of Mull Magic, celebrated by hosting her "Mull Magic Otter Detective Walk" for the day with all proceeds donated to otter conservation and IOSF! Ruth had the perfect day of weather, watching otters, and supported IOSF by raising £280!

*Lush, Glasgow*: Lush Cosmetics Glasgow City held a charity pot event for World Otter Day, to raise support and awareness of otter conservation through IOSF. In addition, the Lush staff talked to their customers on the importance of maintaining and helping otter populations and the ecological benefits of doing so.

*Longleat Safari Park*: The Park held a special World Otter Day event with a series of different features. They put up a stand outside their giant otter enclosure with a banner, some posters, and some other decorations. Using a silent auction, they sold various artwork and photos donated by the team to raise money, alongside a raffle with prizes. Over £900 was raised and donated to otter conservation through IOSF.

***United States of America***

In USA, there were events all over the country, so we cannot write about them all, but here is a sneak peek at some of them!

*Linda Wilinski*: Linda Wilinski, who we mentioned in the Canada section, held a fundraiser for IOSF, which raised $260 and donors were offered otter stickers and other gifts. Linda also created some short videos to highlight otters, and how important they are, and you can see them on her YouTube channel: https://youtube.com/@lindawphotography.

*Ochsner Park Zoo:* The zoo teamed up with their local library to hold a multi-activity event with scavenger hunts, crafts, an otter-y book walk, a table all about otters, and live talks near the enclosure for otters.

*Riverbank Elementary School*: The school, who join in with World Otter Day every year, read and completed the activity book available on the Resources for Children page on the IOSF website, "Fun with Sophie the Sea Otter and Ricky the River Otter", to learn about the differences between sea otters and river otters. The students were captivated by the story, "If You Take Away the Otter", by Susannah Buhrman-Deever, and learned about the importance of sea otters. They made otter masks and wore them to attract attention during their clean-up efforts on campus to teach other students how our trash can negatively impact the river habitat bordering the school and the animals that live there, including their beloved mascot, the river otter. The students were proud to join in this global effort and are more dedicated than ever to protecting the otters.

***As we said, there were so many events all around the world and unfortunately, we cannot report on them all! But we thank everyone for being involved.***

**SOCIAL MEDIA**

We have discussed in the past how there are certain negatives to social media, particularly in relation to otters and the pet trade. However, when it comes to IOSF's World Otter Day, it is a really effective, powerful tool, to get many thousands, if not millions, of people spreading the word about otters and their conservation needs and benefits.

IOSF was inundated in otter posts, and for that we thank you. We were delighted to see how many people were interacting with otters and #WorldOtterDay. So much so that it was trending number 1 in the UK, and trending worldwide! It was great to see people such as Charlie Hamilton James and Gordon Buchanan joining in the event and making a big difference – so thanks to them as well.

**WEBINAR**

IOSF held its third IOSF World Otter Day Webinar, following the previous two highly successful, informative, and enjoyable events. We were delighted to have just under 300 people sign up to the webinar from over 40 different nations. We always hold two webinars, one in the morning and one in the evening, so that time zones do not mean that people will miss out.

This year we were joined by the following otter experts, and we would like to take this opportunity to thank them all for supporting our event and sharing their expertise:

*MORNING:*

*Sivasothi N.* – Natural history revelations of the urban smooth-coated otters of Singapore.

*Omkar Patil* – Otters of Western Maharashtra, India – बुजऱ्या पाणमांजरांचे अद्भुत जग |Otter species and habitats awareness programme.

*Chaminda Jayasekara* – The story of Sri Lankan otters and wetland habitats.

*Ross Lawford and Charlotte Neary* – Urban otters in Edinburgh. Their behaviour and the issues they face.

*Addy de Jongh* – Otter recovery in the Netherlands.

*EVENING:*

*Lali Fasola/Claudio Chehebar* – Challenges for Southern river otters in Northern Patagonia, Argentina.

*Faouz Kilani* – Otters in Tunisia.

*Manuel Santiago* – Advances in the knowledge of Neotropical otter ecology in Costa Rica.

*Angela Doroff* – Warming oceans, sea otters and clams.

*Toucan Rescue Ranch* – The Otter Ambassador Project – Wetland conservation through education and action.

The webinars have been recorded and put on the IOSF YouTube channel, so if you wish to catch up, or rewatch the webinars, you can do so here:

Morning session: https://youtu.be/SVF7i6AV8dQ

Evening session: https://youtu.be/24Bs-_Xc57Y

We want to make sure that nobody is restricted in joining the webinar, and therefore this event was free of charge to maximise the outreach and the number of people celebrating with us. We were delighted to have attendees from so many countries which made this a

truly global event. Should you wish to donate to support the running of the webinar, then you can do so at the following link:
https://ottershop.co.uk/products/donate-to-iosf-world-otter-day-webinar.

## CONCLUSION

World Otter Day 2023 was a huge success and the biggest event we have had to date, with 40 countries taking part! What we aim to achieve with World Otter Day is helping "to put otters on the map", and with so much interaction, both online and in person, we achieved that!

We are delighted with everyone's involvement and are already making plans for World Otter Day 2024.

# IOSF OTTER OSCARS

Our seventh IOSF Otter Oscars were awarded in 2022. We received a variety of submissions from four continents, covering some fascinating projects which were considered with interest by the Panel. The range of the work carried out by participants demonstrates their dedication to conservation and so to the future for otters, which we appreciate and thank everyone for.

**The winners for 2022 are:**

***Special Award: Dr. Wolfgang Gettmann, Germany***

Wolfgang has been creating awareness of the problems facing otters, particularly in Germany, for many years and continues to be a passionate advocate for their conservation.

***Image ©Dr Wolfgang Gettmann***

***Research: Frederick Kistner, Larissa Slaney (and co-contributors Asaf Ben David, Zoe Jewell and Sky Alibhair), Wildtrack***

For the development of non-invasive technology to survey the distribution of wild otter populations using otter footprints. This system could contribute to the gathering of vital information about elusive and declining populations of otter species around the world.

***Image: ©Dr Larissa Slaney***

***Group or Organisation: Chesapeake Bay Otter Alliance: Smithsonian Environmental Research Centre, USA***

This group has set up the East Coast's first organisation for monitoring the North American River Otter's on Chesapeake Bay, USA.

***Image: ©Chesapeake Bay Otter Alliance***

***Photography/Artwork**: **Talia Rose, USA***

Having spent a decade photographing and documenting otters on a stretch of the South Fork Eel River, California (for her own interest), Talia became involved in HSU River Otter Citizen Science Project. She has shared hundreds of her photographs and data with the Project, as well as using them to raise awareness about otters.

***Image: ©Talia Rose***


***Community Achievement:***
***Krunal Trivedi, Nature Club Surat, India***

Due to human/otter conflict between otters and the fishing community in Surat City, Krunal brought together stakeholders to develop ways to reduce conflict through outreach and mitigation methods.

***Image ©Krunal Trivedi***

***Young Person Award:** **Lim Wei Hang and Haizan Anak Kamarul Zaman, Malaysia Nature Society (MNS), Malaysia***

For their incredible knowledge, passion and help during the IOSF/MNS Workshop in April.

***Image: ©Woo Chee Yoong***

# REPORT OF THE FIRST IOSF STUDENT RESEARCH GRANT PROJECT: OTTER SURVEY OF THE ISLE OF BARRA, 5–17 JUNE 2022

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**Abstract**

*This was the first Student Research Grant project to be carried out in order to encourage students into field research for otters. For this programme the otter survey was conducted on the Isle of Barra, an island which was surveyed by the IOSF 22 years prior. The results from both surveys were compared to see if there were any differences in otter activity on the island between the two time periods. Whilst there were some minor differences, overall the results were very similar. The majority of the spraint sites found were located on the east side of the Island, on the exposed rocky coastlines. Rockling, a small benthic fish, was the most dominant prey item found in the fresh spraint samples analysed from both surveys. Non-fish prey played a small part in the diet, with small mammals being the principal prey from the original baseline survey, whereas crustaceans were the most prevalent of non-fish prey items found in the fresh spraints analysed from the students' survey.*

***Keywords:*** *Barra; otter; Outer Hebrides;* Lutra lutra*; prey items; rockling; spraints*

## INTRODUCTION

In 2022 the IOSF launched the first Student Research Grant project to provide sponsorship to undergraduates, and designed to help and encourage students into field research on otters and their ecology. Two student placements (Ron Pasieczna from Sheffield University, and Rachel Wick from Brighton University) were chosen via an application and interview process, to carry out an otter survey under the guidance of a professional ecological surveyor (Andrew Rothwell, the author).

This Student Research Grant otter survey was conducted on the Isle of Barra, which is at the southern end of the Outer Hebrides, is roughly 18km x 10km and is formed from Lewisian gneiss (the oldest rocks in Britain). The coastline is a mix of sandy beaches and rocky headlands, with inland dominated by moorland and grassed machair. The machair is a unique habitat consisting of a low-lying grassy plain with calcium-rich sand formed largely from crushed shell and it only occurs on the exposed west-facing shores of Scotland and Ireland. In addition to otters, the island has 1,000 species of wild flower, rare birds including the elusive corncrake, seals, and also dolphins and whales offshore.

The IOSF conducted an otter survey on the Isle of Barra over twenty years ago, with a group of dedicated volunteers (**Yoxon and Yoxon, 2000**). One of the original volunteers from this survey (Sarah Jupp) also volunteered during the new Barra

survey. Working independently, Sarah was able to provide extra survey data for the students to work on.

The results from both surveys were assessed to see if there have been any changes to otter activity on the island over the years.

## METHODS

The survey primarily involved walking the coastline (roughly 5–8km per day, depending on the ease of terrain and weather conditions), and recording all field signs found indicating otter activity. In addition, any otter sightings were recorded by scanning the field of view with binoculars, in-between looking for secondary signs (Figure 1).

***Figure 1. Ron Pasieczna and Rachel Wick watching otters on the west coast of Barra***

The field signs recorded included:

**Spraints**: otter faeces;

**Spraint sites**: spraints are principally deposited at regularly visited areas within an otter's territory, and are usually located on prominent features such as grassy tufts, rocks, and areas where there is cover, for example under bridges (**Chanin, 1985; Mason and Macdonald, 1986**);

**Footprints**: otters have five toes and webbed feet; however, the smallest toe sometimes does not make a mark so that the print may appear to be four-toed. Such prints tend to be lopsided and can be distinguished from the more symmetrical dog or fox prints;

**Rest-sites**: areas utilised by otters for sleeping or resting. The structure of a rest-site can vary depending on the geographical resources present, (as does the terminology used to describe such areas), whether it is an underground den or a temporary resting place above ground. They can range from substantial piles of branches/logs; dug

burrows; dense scrub or amongst rocks and boulders. The lair of an otter is commonly referred to as a holt and it is considered to be the main resting site within an otter's territory.

Otters may also use temporary and much smaller resting places, often referred to as a "lie-up", "hover", or "couch". Such rest-sites can also be found in a variety of places, for example under dense scrub, small rocky outcrops, and simply amongst grass or sedge tussocks.

For the purpose of this survey, a holt was defined as a substantial burrow system, or any natural crevices and boulder matrix, with lots of signs indicative of regular use by otters. All other small shelters above ground deemed to be utilised by otters were categorised as rest-sites.

Several geozones exist on Barra, and the island was divided into four main categories, namely *Exposed Coast*, *Sheltered Coast*, *Freshwater*, and *Inland*. Each of these geozones were further divided into sub-categories based around geographical orientation. Subsequently 22 habitat types were recognised. The majority of the survey was conducted on the exposed coasts in the east and west. A mixture of habitat types was chosen across the island thus giving a variety of environments for the students to work in.

For the purpose of this report, only fresh spraints collected were analysed. This was in order to make a direct comparison to the original baseline survey as only fresh spraints were collected and analysed during that survey. All other spraints the students logged and collected were analysed separately as part of their own personal study parameters.

The fresh samples collected were examined in a more controlled environment, back in the laboratory. Each spraint was put separately into a jam jar with hot water and a denture-cleansing tablet. The samples were soaked in solution for 24 hours and then rinsed through a 0.5mm sieve. The spraint contents were allowed to dry at room temperature on filter paper. The dry spraint contents were then examined under a binocular microscope and identified using a personal reference collection and published keys from **Webb (1977), Watson (1978)**, and **Conroy et al. (1993)**.

## RESULTS

The group arrived on Barra in beautiful weather with that "surreal tropical island feel". An excellent ferry crossing brought "a multitude of common dolphin pods, eight minke whales and five basking sharks".

Nine sightings of otters were made by the students in total. One family group of an adult female and two cubs were watched for well over an hour on the exposed rocky coast on the west side of the island at Suiachan. Here the mother was fishing for long periods, making deep dives, and bringing fish in to the two boisterous cubs on land. She continued fishing whilst the cubs ventured to the sea edge, but then she returned

with a large fish for them! Both cubs ran up the shore behind rocks to feed on the fish while she went out to hunt once more. One of the cubs soon joined their mother in the sea but did not venture far, leaving the other cub inland feeding. The mother caught a very large flatfish and came onto land with an excited and vocal cub in tow. Whilst this cub feasted on the fish provided by the devoted parent, the mother went a short distance away and had a rolling and grooming session. The cubs fought over the flatfish, but soon separated as one of them joined its mother grooming and rolling. Shortly after, the mother went back out to sea hunting, with the cub following on, leaving the remaining cub inland still tackling the flatfish.

All the other sightings were of individual adult otters. One was observed for about 45 minutes on a small offshore island in North Bay, an exposed sea loch on the east coast. This otter was predominantly fishing, often eating small fish at sea. Periodically it came on land to spraint and groom whilst rolling on the lower seaweed covered rock outcrops, before heading out to hunt again. Later it headed towards the mainland at Rubha Chàrnain, and sprainted on several of the spraint sites recorded by the students earlier in the day, before disappearing around the corner out of view. As the survey continued an otter was seen very briefly off Eileanan Dubha, also an island in North Bay. It was presumed that this was the same otter seen earlier fishing in the Bay. Towards the end of the day an otter was seen on the edge of Lamalum, an island on the exposed east coast (north face). It is conceivable that this was potentially the same otter seen earlier a kilometre away, fishing in North Bay.

A large otter (likely male) was seen briefly fishing at Bàgh nan Clach on the exposed west coast. Whilst further round the coast southwards at Tràigh Eais, Eòlaigearraidh, a smaller adult (likely female), was seen fishing along the kelp line. It landed on a rock to eat a fish before heading back to sea, continuing to fish amongst the intertidal seaweed. This otter may have been the mother of the two cubs observed about 2.8km southwards later on towards the end of the day.

In addition to these observations, a trail camera was set along a well-used otter trail, found on the first survey day, on the costal headland of Loch Ob, a sheltered sea loch on the east coast. Images of otters were captured six times during the 10-day period of deployment – with two otters in one frame, only two days after the camera was set up.

After a few good days of survey conditions, the weather unfortunately changed, reducing opportunities to look for otters directly. However, one more observation of an adult otter was made towards the end of the survey period, albeit very briefly in the rough surf, on the exposed west coast (north face), at Àird Mhurain, Cleit.

Despite the weather conditions, the field survey work continued with the students finding and mapping signs of otter activity (Figure 2). Overall approximately 53% of the Barra coastline was covered in total, with an additional 7% of the survey conducted inland on a couple of freshwater lochs.

***Figure 2. Ron Pasieczna inspecting a spraint site under an outcrop overhang on the west coast of Barra***

A total of 630 spraint sites were found during this survey, with the majority on the east side of Barra (*n* = 417; ~23km surveyed). The students surveyed approximately 13km on the west side of the island and found 143 spraint sites. Only 70 spraint sites were found on the south coast, although only a short distance (~2km) was surveyed on this part of the island (Figure 3 and Table 1). From this data, the number of spraint sites for each kilometre surveyed on the three different regions can be proportionally estimated at, 18 for the east, 35 for the south, and 11 for the west.

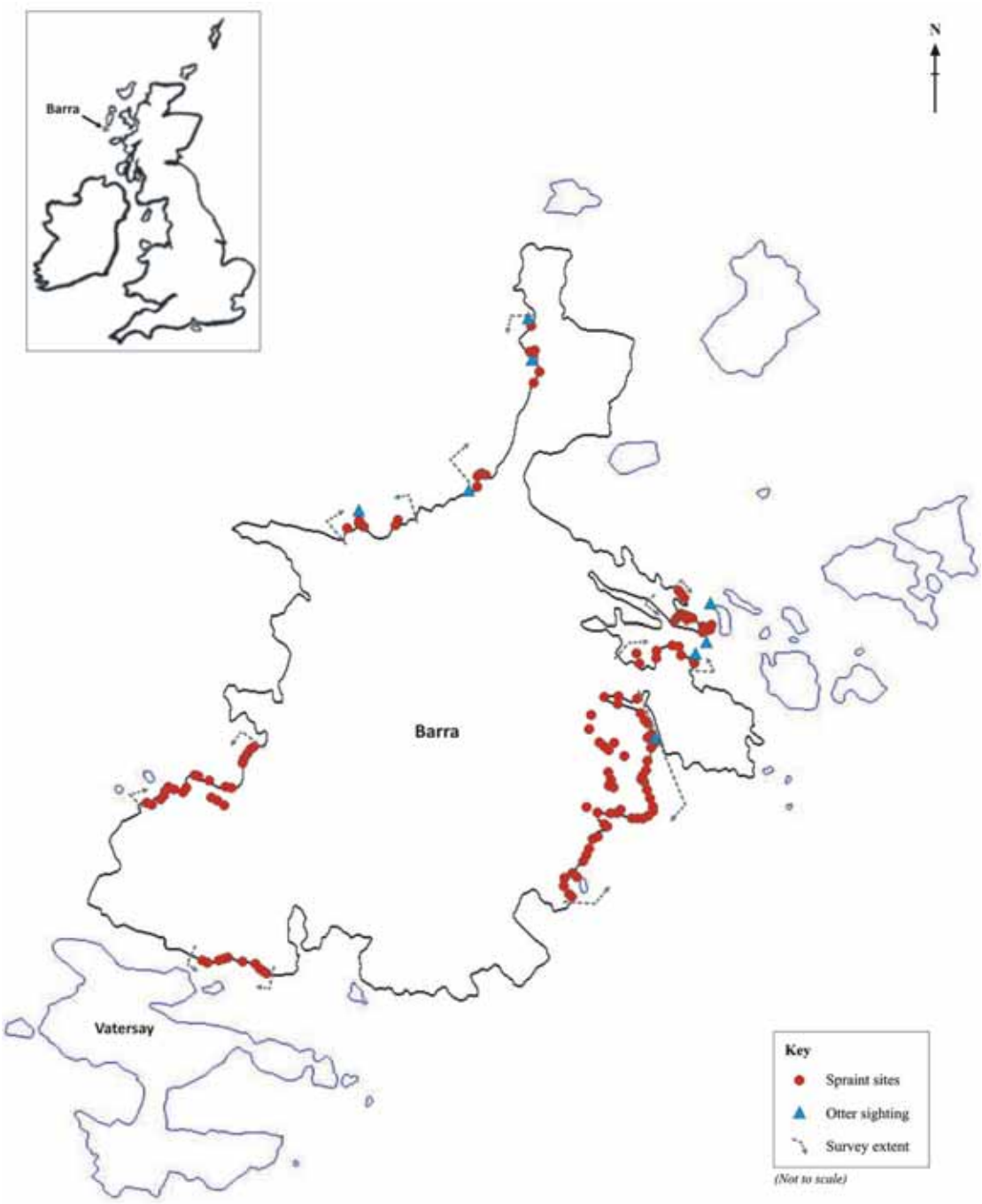


***Figure 3. Location of study area, showing field signs of otter activity on the Isle of Barra, June 2022***

***Table 1. Number of spraint sites and total spraints found within each of different survey zones investigated on the Isle of Barra, June 2022***

| ***Region (Distance surveyed)*** | **Spraint Sites** | **Spraints** | **Fresh** | **Recent** | **Old** | **Gel** |
|---|---|---|---|---|---|---|
| East (*23km*) | 417 | 1562 | 53 | 328 | 1170 | 11 |
| South (*2km*) | 70 | 301 | 42 | 85 | 170 | 4 |
| West (*13km*) | 143 | 468 | 26 | 110 | 326 | 6 |

| ***Habitat – Geo Zone*** | **Spraint Sites** | **Spraints** | **Fresh** | **Recent** | **Old** | **Gel** |
|---|---|---|---|---|---|---|
| *Exposed east coast* | 185 | 774 | 13 | 111 | 647 | 3 |
| *Exposed east coast (north face)* | 83 | 272 | 5 | 88 | 176 | 3 |
| *Exposed sea loch (east coast)* | 35 | 106 | 7 | 30 | 69 | 0 |
| *Exposed south coast* | 68 | 295 | 42 | 85 | 165 | 3 |
| *Exposed west coast* | 69 | 236 | 11 | 53 | 166 | 6 |
| *Exposed west coast (north face)* | 57 | 201 | 14 | 51 | 136 | 0 |
| *Freshwater burn (east coast)* | 12 | 29 | 1 | 6 | 22 | 0 |
| *Freshwater burn / exposed east coast* | 4 | 14 | 0 | 6 | 8 | 0 |
| *Freshwater burn / exposed south coast* | 2 | 6 | 0 | 0 | 5 | 1 |
| *Freshwater burn / sheltered east coast* | 1 | 1 | 0 | 0 | 1 | 0 |
| *Freshwater burn / west coast (north face)* | 2 | 2 | 0 | 1 | 1 | 0 |
| *Freshwater loch (east coast)* | 33 | 100 | 15 | 17 | 63 | 5 |
| *Freshwater loch / machair (west coast)* | 4 | 4 | 1 | 2 | 1 | 0 |
| *Inland cave (west coast)* | 6 | 17 | 0 | 3 | 14 | 0 |
| *Inland cliff (west coast)* | 1 | 1 | 0 | 0 | 1 | 0 |
| *Inland peatlands (east coast - north face)* | 5 | 11 | 0 | 3 | 8 | 0 |
| *Inland peatlands (east coast)* | 1 | 3 | 0 | 0 | 3 | 0 |
| *Inland peatlands (west coast - north face)* | 3 | 6 | 0 | 0 | 6 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Inland peatlands / machair (west coast)* | 1 | 1 | 0 | 0 | 1 | 0 |
| *Sheltered east coast* | 6 | 14 | 0 | 5 | 9 | 0 |
| *Sheltered east coast (north face)* | 5 | 10 | 1 | 3 | 6 | 0 |
| *Sheltered sea loch (east coast)* | 47 | 228 | 11 | 59 | 158 | 0 |
| ***Totals*** | **630** | **2331** | **121** | **523** | **1666** | **21** |

When comparing the quantity of field signs found in the different habitat types (see Table 1 for categories), the greater number of spraint sites were found on exposed coastlines (Figure 4). The number of spraint sites found within the sheltered coasts and freshwater bodies was the same, and a small proportion of spraint sites were also found inland, along a run connecting to either the coastal region or freshwater body.

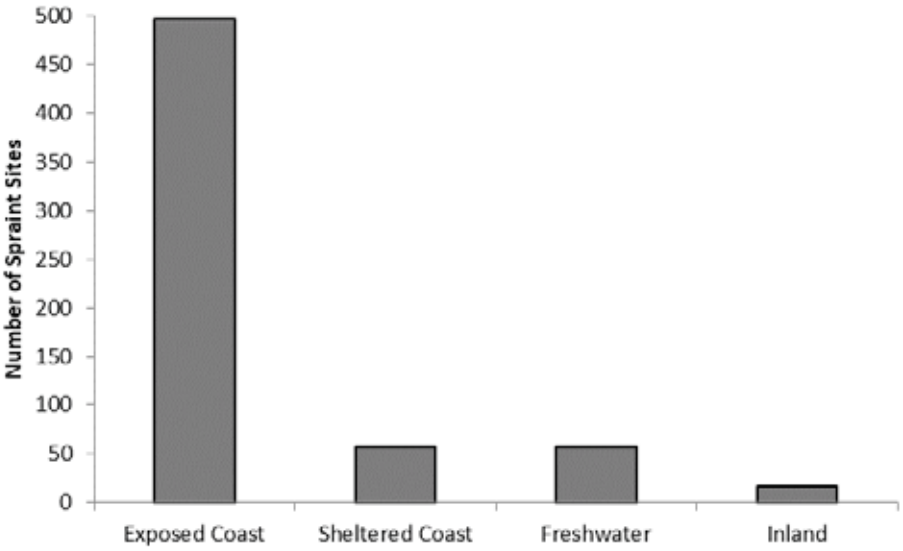


***Figure 4. Number of spraints sites found within the four main habitat types on the Isle of Barra, June 2022***

Interestingly the only place where there were no spraints found was on the dune systems on the west coast. However, there were otter prints in the sand in four separate locations in this region of the island. Among the other fields signs observed in this area was a sign heap, a structure formed by otters by scraping the substrate or vegetation into a small mound, often to place a spraint on top. This sign heap was constructed on the sand with a fresh spraint on top, and there was also a trail with prints heading inland towards the dunes.

The conditions of the spraints found during this survey were predominantly categorised as old, with most being detected on the east side of the island and on the

exposed coasts. A similar distribution was also observed for the recent and fresh spraint deposits (Table 1). However, a high proportion of fresh spraints were found on the south coast, associated with a large expanse of boulders used as reinforced banking/sea-defence structure.

Ten holt sites were found in total (four on the east side, five on the west side, and one in the south side). Three of the holts consisted of burrows in the sandy banks along the cliff tops on the exposed west coast and fresh spraints were found at these three holts. A carpet of old spraint remains outside a peatland burrow indicated an old holt site, on the exposed east coast. A couple of holt sites were found on two separate old rabbit warren burrows on a freshwater loch on the east coast. A fresh spraint was found outside a burrow on one holt site, whereas old spraints were found outside several burrows at the other holt site.

Two holt sites were found amongst outcrop crevices associated with sheltered sea lochs on the east coast, one of which had a recent soil heap outside, whilst the other had a recent anal gel spraint outside.

An inland cliff cave on the west coast was being utilised as a holt site. Five distinct sprainting areas were found inside, consisting of many old spraints together with a couple of recent spraints.

One location associated with the boulder matrix of the aforementioned reinforced banking/sea-defence structure on the south coast was the only holt recorded in this region. Many other spraint sites were found along this entire bank, indicating a well utilised area. Furthermore, several of the boulders were also used as lie-ups (rest-sites). Despite this area being relatively high in otter activity, no otter was actually observed along the south coast. Six of the otter sightings elsewhere on the island were geographically near holt sites.

Whilst many suitable geological and habitat features could be utilised as rest-sites on the island, only 22 rest-sites were recorded during this survey. The majority were found on the east coast, amongst the dense heather, dense bracken, under outcrop crevices, under a peat bank overhang, and one site was found in the dense scrub filling the ruin of an old dwelling. The rest-sites observed on the west coast were found in outcrop crevices or under large boulders.

Other features of interest were a couple of scrapes in the peat on the east coast. It would seem the scrapes were made deeper by otters in order to create a small pool, which would collect and hold the freshwater leaching from the peat banks.

### *Spraint analysis*

Out of the 121 fresh spraints found during this survey, 58 of them were collected and subsequently analysed (27 from the east coast; 13 from the south coast, and 18 from the west coast, respectively). When surveying it is important not to remove all

spraints as they contain various scent chemicals which are used by the otters to communicate.

The majority of the spraint contents were unidentifiable fish bones. From the species that were identified, members of the Gadidae (rockling species) were the most commonly occurring prey item. Butterfish was the next most common fish found in the spraints (Figure 5).

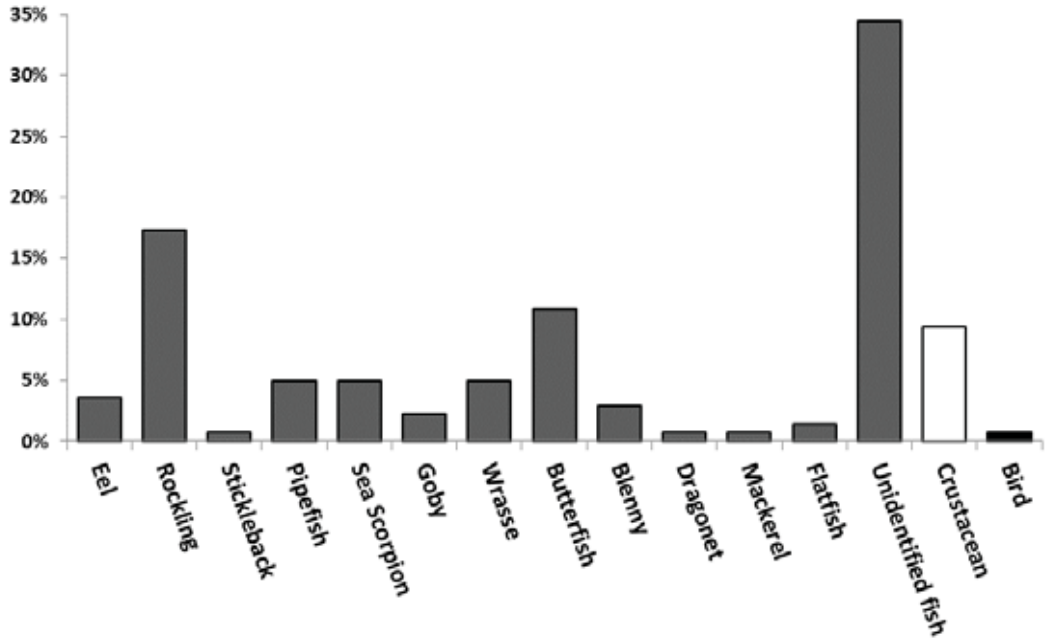


***Figure 5. Percentage occurrence of prey items found in fresh spraints collected during the survey on the Isle of Barra, June 2022 (total of 58 spraints analysed)***

Identified fish species found in the fresh spraints collected from the east coast were jointly dominated by rockling and butterfish. In contrast, the most numerous prey items found in the fresh spraints from the south coast were from butterfish, followed closely by sea scorpion (Figure 6). By far the highest amount of rockling occurred in fresh spraints from the west coast, with wrasse the next most frequent prey item found in this region.

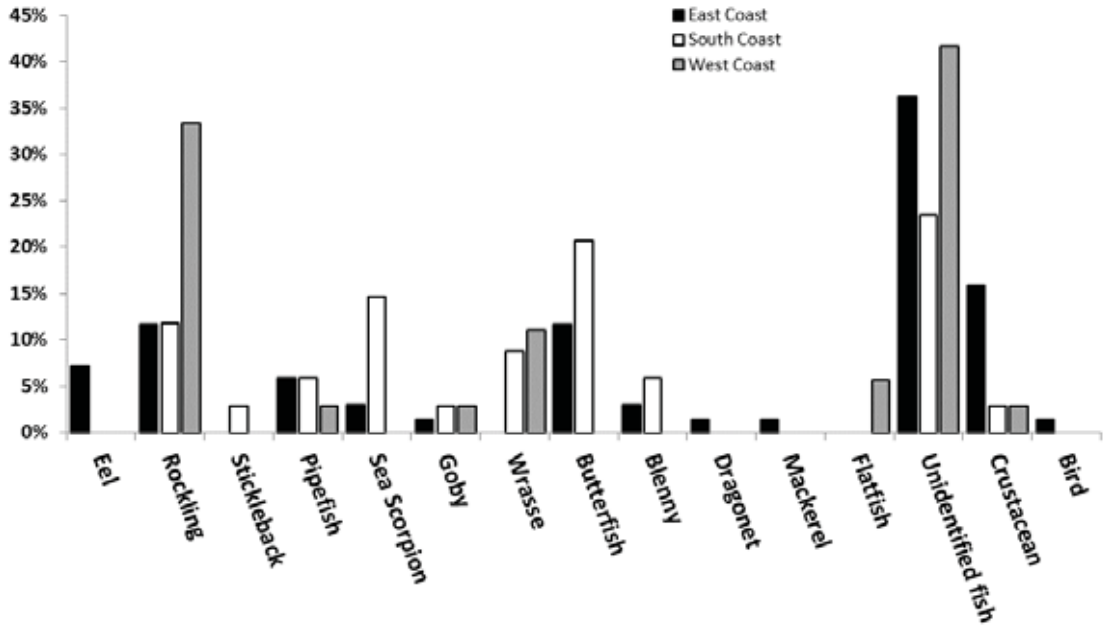


***Figure 6. Percentage occurrence of prey items found in fresh spraints from each coastal zone during the survey on the Isle of Barra, June 2022 (total of 58 spraints analysed)***

Eel occurred in the fresh spraint samples only from the east side of the island (from both sea and freshwater locations) and mackerel and dragonet were also only found on the east coast. Stickleback occurred in fresh spraints only from the south coast, and flatfish from the fresh spraints from the west coast (Figure 6).

Of the non-fish prey items found, crustaceans occurred the most (Figure 5), predominantly in spraints found on the east coast (11 spraints), with one spraint from the south, and one from the west (Figure 6). The crustaceans identified were principally shore crab but lobster was also found, in two spraints from the east coast.

Bird remains occurred in only one fresh spraint on a freshwater loch, Lochan nam Faoileann (on the east side of the island).

## DISCUSSION

Otter activity, based on the number and distribution of spraint sites found across the surveyed regions of the Isle of Barra, was more prominent on the east side of the island. However, proportionally speaking, a high number of fresh spraints were found over a relatively short distance on the south coast ($n$ = 42; 2km of coast), indicating a higher level of "*current*" otter activity on this side of the island. Nevertheless, no otters were observed in this area. Conversely, the west coast had the least number of fresh spraints, but it was on this side of the island where the lengthy observation of a mother and two cubs took place. With only a short distance covered on the south coast compared to the east and west side of the island, any resulting analytical calculations are likely to be a disproportionate representation, unless equal distances

are examined within a survey. Moreover, the amount of fresh spraints found does not relate to the chances of observing an otter.

All of the observations were made by scanning the coastline in-between cataloguing field signs, rather than dedicated set watching hours. It is possible that the individual otters seen were different animals, and in that case there are at least 11 otters on Barra (from eight separate observations; nine direct sightings and two from trail camera footage). However, equally one otter may have been observed in different locations so it is impossible to give an exact number. It was an interesting comparison, however, that during the baseline survey, the number of otters seen on the island was low, with only two otters seen briefly during the survey and a mother and two cubs seen by one of the volunteers a day after the survey ended (**Yoxon and Yoxon, 2000**).

However, similarities did present themselves with both surveys. They were roughly conducted around the same time of year, thus eliminating any major seasonality differences that may occur in otter activity and spraint distribution. The same distance of survey length was examined on the east and west side of the island (23km and 11km respectively). However, the author did not know which geographical locations were covered in the original survey. Nevertheless, this means a good comparison can be made between the two surveys.

Both surveys found that the number of spraint sites was greater on the east side of the island than the west. Ten holt sites were also counted on both surveys, however the original survey concentrated solely on the coastlines, whereas the students' survey also looked at a small proportion of inland features, particularly freshwater bodies, where two of the holt sites were found.

Rockling was the most dominant prey item identified from fresh spraints in both surveys. Similarly, other small benthic fish species occurred in samples from both surveys, namely butterfish, blenny, and sea scorpion. Flatfish occurred much less in samples analysed from the students' survey, compared to those from the baseline survey, in which it was quite a significant component of the prey items found. There was a similar result with blenny in the samples. Conversely, crab was more of a significant prey item found in the student's survey, compared to the baseline survey, in which the dominant non-fish prey item was small mammals. This may suggest that otters may have changed their hunting strategies over time, or the availability of prey has changed? However, this cannot be taken as a definitive statement, as not all spraints found were analysed, and the otters would clearly not have been the same animals in both studies. The non-fish element of the spraint from both surveys only made up a very small proportion of the diet of otters on Barra.

The same five key fish species recognised as important constituents of the diet of otters, not only on Barra but other northwestern islands in Scotland (**Yoxon, 2008**), included two members of the Gadidae family (rockling and saithe), butterfish, and sea scorpion. Saithe is a free-swimming fish and may have also been in spraints analysed from the students' survey, as they could be among the very high percentage of

unidentified fish species in the samples. This assumes that fish availability and dynamics has not changed significantly between the two surveys. Interestingly, the only free-swimming species of fish found in the students' survey was mackerel, which was not observed in the baseline survey.

Both of the sample sets analysed were relatively low in number (20 from the baseline survey and 58 from the students' survey). If both surveys had a much higher quantity in spraint samples collected, then a more accurate depiction of the otters' diet may have been produced? The students continue to analyse all of their spraint samples collected ($n$ = 360), which may produce a different ratio of fish species found in the spraint.?

Overall there was no significant difference in otter activity on Barra during the two survey periods, conducted 22 years apart. Otter observations were however more frequent during the students' survey. Can this be a reflection of an increase in otter population on the island? It could also be down to better observation skills between the volunteers in the first survey and the students. There would be no way of telling, unless a more quantifiable survey is conducted on the same coastline examined in the original baseline survey, or indeed across the whole island.

From the baseline survey it was calculated that there were between 16 and 23 otters on Barra, based on 52% of the coastline surveyed **(Yoxon and Yoxon 2000)**. This calculation was based on the relationship between the number of resident female otters and the number of holts, as demonstrated in studies conducted on Shetland and the Isle of Skye **(Kruuk et al., 1989; Yoxon, 1999)**. Since the otter observations from the students' survey were not from an analytical study, the number of otters on Barra at this time could not be calculated. So it is impossible say if there has been any increase or decrease in otter numbers or if it has stayed the same on the Isle of Barra.

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**Disclosure Statement**

No potential conflict of interest was reported by the author.

**Author Biography**

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# OTTERS, WARM WATER, BIVALVES, AND HARMFUL ALGAL BLOOMS

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**Abstract**

*During the mid-1970s, dynamic range expansion occurred for sea otters which was concurrent with an ecosystem regime shift from a shellfish dominated to a groundfish dominated system due to warmer ocean waters in the Gulf of Alaska. Bivalves are an important food resource in the ecosystem and are impacted by predation, warming sea surface temperatures, and other abiotic factors. By 1998/1999, the Gulf of Alaska was expected to return to a more shellfish dominated ecosystem, but it did not. The region experienced a warm water anomaly (2014–16) and an unprecedented heat wave (2022) that further impacted shallow-burrowing bivalves. Warm water also meant more frequent and sustained harmful algal blooms. Saxitoxin, a potent neurotoxin, has been found throughout the food web in Alaska. Our species conservation framework need to include monitoring of and incorporating trends of our rapidly changing ecosystems.*

***Keywords:*** *Bivalves, climate change, harmful algal blooms, sea otters*

## INTRODUCTION

Before global warming became better known as climate change, there was a common sentiment that warming ocean impacts to sea otters (*Enhydra lutris*) were going to be negligible or perhaps even beneficial to the otters because populations are limited in the north by shore-fast sea ice (**Schneider and Faro, 1975**) and the population is concentrated in marine waters 40m or less (**Kenyon, 1969; Bodkin et al., 2004**). Depleted polar ice may provide for additional population range expansion.

This species-specific view omits the role of the quality of habitat for sea otters and many other species (**Ballachey and Bodkin, 2015**). This is understandable because sea otters are generalists and are known to eat a wide range of benthic invertebrates and sometimes fish (**Riedman and Estes, 1990**). In soft-sediment habitats, sea otters consume primarily bivalves (**Kvitek et al., 1993; Doroff and DeGange, 1994**). Here there were two points of interest, one was the pronounced, long-term, decline of the bivalve *Leucoma stamina* throughout the species range (**Dunham et al., 2007; Shigenaka et al., 2008; Novoa et al., 2016; Strickland et al., 2016**) and the second was increased prevalence of toxins from harmful algal blooms in the food chain, and *Saxidomus gigantea* in particular, in the North Pacific (**Kvitek and Bretz, 2004;**

**Lefebvre et al., 2016; Wilking et al., 2023**). It is very difficult to generalise about the unique and complex drivers of bivalve population dynamics and even more difficult to pair environmental conditions with sea otter population dynamics. In this opinion piece I describe, illustrating with the evidence at hand, ecological change in the North Pacific for northern sea otters through the lens of warming ocean temperatures, bivalve populations, and harmful algal blooms.

## A BRIEF POPULATION HISTORY OF SEA OTTERS

The commercial fur harvest and depletion of sea otters is well documented (**Lensink, 1960; Kenyon, 1969; Riedman and Estes, 1990; Loshbaugh, 2021**). The worldwide population was depleted by the 1800s. By 1911, there were only 2–3,000 sea otters worldwide in small (<100) remnant populations. The Aleutian archipelago recovered earliest and became a source population for translocations in Alaska (Pribilof Islands, Southeast), British Columbia (Canada), Washington, and Oregon. The species recolonised naturally and with the help of the translocated populations. Some parts of the sea otter range were without this top predator for a few hundred years (**Lensink, 1960; Kenyon, 1969**).

During the mid-1970s, dynamic range expansion occurred for sea otters. As the species recolonised former habitat, there were two major difficulties. First, sea otter habitat overlapped with an increasing human population that had developed profitable commercial shell fisheries in the absence of sea otters. The second was the timing of the recolonisation, as the sea otter population was building in numbers and expanding in range, the Pacific Decadal Oscillation (PDO, defined as a long-lived pattern of climate variability) had switched from a cool period to a warm period in approximately 1977. For shellfish, this was the perfect storm. Sea otters have a high metabolic rate (**Costa and Kooyman, 1984**) and eat an abundance of shellfish (**Kenyon, 1969; Johnson, 1982; Riedman and Estes, 1990**). The return of sea otters had a highly visible impact on shellfish populations and shell fisheries. Warming sea surface temperatures also had an impact, though less well defined than direct predation.

Warming sea surface temperatures associated with the PDO triggered an ecosystem regime shift in the Gulf of Alaska (**Anderson and Piatt, 1999; Mueter and Norcross, 2000**). Warmer ocean temperatures were detrimental to shellfish (shrimp, crab) and forage fish (caplin), and favoured an increase in abundance of groundfish species (halibut, cod). Bivalve and crab populations adjusted to another, less visible predator: groundfish. Human and sea otter conflicts for shellfisheries were intensified as highly profitable shellfisheries were impacted by the return of sea otters to their historic habitat (**Johnson, 1982; Pitcher, 1989**).

In 2016, the Alaska Native tribes in Port Graham and Nanwalk were deeply concerned with the lack of bivalves (*L. staminea* and *S. gigantea* both are common foods). Sea otter predation on these clam species was an issue, but the greater issue

was that there were so few adult clams, spawning densities and juvenile recruitment were low. Out of this concern, the Alutiiq Pride Shellfish Hatchery began studies to examine what was happening to clam populations. Studies included hatchery spawning of *S. gigantea* and ocean acidification laboratory experiments on larvae and community-based ocean acidification monitoring.

Bivalves are an important food resource in the ecosystem and populations are responsive to large-scale environmental changes such as warming sea surface temperature and decreased salinity, factors that lead to a decline in species richness (**Dethier and Schoch ,2005**). By 1998/99, the Gulf of Alaska was expected to return to a crustacean and small pelagic fish system typical of cooler water temperatures, but this did not occur likely due to warming in the Gulf of Alaska that facilitated a trend in more temperate, warm water species (**Litzow, 2006**). In 2014–16 a warm water anomaly and in 2022 an unprecedented heat wave in the North Pacific had some devastating impacts on shallow-burrowing bivalves (**Raymond et al., 2022**).

Ocean chemistry, such as aragonite saturation and pH, can impact bivalves in multiple ways such as altering bivalve neurological functioning, elevate metabolic rates, and reduce shell growth and survivorship (**Kroeker et al., 2013; Waldbusser et al., 2015**). Smaller, landscape-scale factors such as bioturbation, disease, hypoxia, and predator populations also impact the health and viability of bivalve populations (**Barber et al., 2019**).

In the Kodiak archipelago and southeast Alaska, bivalves, such as *L. staminea* and *S. gigantea,* dominate sea otter diet (**Kvitek et al., 1992; Kvitek et al., 1993; Doroff and DeGange ,1994**). *L. staminea* experienced range-wide declines independent of sea otter predation for reasons that are yet poorly understood. *S. gigantea* had also experienced a population decline. Unlike *L. staminea, S. gigantea* are deeper burrowing and may experience less intertidal heat stress. Unlike other bivalve species, *S. gigantea* sequesters saxitoxins (STXs) for multiple years after a harmful algal bloom event as a predator avoidance strategy (**Kvitek and Bretz, 2004**); to a degree, sea otters can detect and avoid toxic *S. gigantea.*

As sea surface temperatures increased, the dinoflagellate, *Alexandrium cantanella* that produces STXs, a potent neurotoxin (PST) that cause paralytic shellfish poisoning (PSP), expanded north and by 2016 STXs were found in all marine mammals sampled in Alaska (**Lefebvre et al., 2016**) and throughout the food web (**Wilking, 2023**). **Roggatz et al. (2019)** modelled the bioavailability of STXs in future ocean conditions of warmer sea surface temperatures and progressive ocean acidification and found as oceans become more acidic, STXs increase in toxicity. The recent and larger harmful algal blooms being documented in the Arctic and Subarctic regions indicate an increase of STXs available in the food web.

## FUTURE CONSERVATION

Our conservation framework for sea otters, and all other impacted species, will need to take into account the rapidly changing environment. We cannot predict the all the pathways that warmer, more acidic oceans will influence ecosystems, but we can continue to monitor and adapt conservation strategies to include abiotic factors that are environmental drivers of ecosystem change.

**Disclosure statement**

No potential conflict of interest was reported by the author.

**Author Biography**

Angela Doroff is a wildlife biologist, who has worked in marine and terrestrial systems and has specialised in sea otters and their habitats. She served at an Affiliate Faculty at the University of Alaska, Fairbanks School of Fisheries and Ocean Sciences mentoring students and as a Sea Otter Species Coordinator for the IUCN Otter Specialist Group providing Red List Criteria for sea otters and regular updates on species conservation concerns.

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# FIRST BREEDING RECORD OF THE SMOOTH-COATED OTTER *Lutrogale perspicillata maxwelli* (HAYMAN 1956) IN HOOR OL-AZIM WETLAND IN SOUTHWESTERN IRAN, WITH NOTES ON ITS INTRA/INTERSPECIFIC BEHAVIOUR

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## INTRODUCTION

The Maxwell Otter is a subspecies of smooth-coated otter (*Lutrogale perspicillata maxwelli*, Mustelidae) endemic to the extensive reed beds of Hawizeh Marsh (Hoor "*Hawr*" Al-Hawizeh) in southern Iraq and Hoor ol-Azim Wetland in southwestern Iran (**Al-Sheikhly and Nader, 2013; Al-Sheikhly et al., 2020; Al-Sheikhly et al., 2021**). This rare otter was first described in Daub tumulus island village, c. 19 km northwest of Al-Azair (west of Hawizeh Marsh) in southern Iraq by **Hayman** (**1956**) (see also **Maxwell, 1957, 1960; Young, 1977**). In the 1990s, this species population underwent a severe decline due to desiccation of the Lower Mesopotamia wetlands in southern Iraq (**Richardson and Hussain, 2006**) which would almost certainly result in the global extinction of *L. p. maxwelli* (**Scott and Carp, 1982; Scott and Evans, 1993**). However, the persistence occurrence of *L. p. maxwelli* in Hawizeh Marsh was confirmed by **Al-Sheikhly and Nader** (**2013**) and **Al-Sheikhly et al.** (**2017**) and its occurrence has been recently approved for the first time in Hoor ol-Azim Wetland in southwestern Iran by **Al-Sheikhly et al.** (**2020; 2021**). Both transboundary wetlands straddling the international borders of southwestern Iran and southeastern Iraq are considered the major stronghold for *L. p. maxwelli* global population.

Due to excessive hunting, trapping and habitat destruction/fragmentation, the smooth-coated otter is listed as Vulnerable by the International Union for Conservation of Nature (IUCN) Red List (**Khoo et al. 2021**). **Al-Sheikhly et al**. (**2020**) estimated the population size of *L. p. maxwelli* in the Hawizeh Marsh at ca. 930 individuals (species density 0.6753 individuals/km$^2$). They also indicated that Extent of Occurrence (EOO) and Area of Occupancy (AOO) is ≤500 km$^2$ with severely fragmented locations (≤5), recommending a comprehensive revision of the taxon's global conservation status. To our knowledge, there was no estimation of the *L. p. maxwelli* population size in the Iranian Hoor ol-Azim Wetland and its breeding had never been confirmed. In addition, despite large groups of 8–12 *maxwelli* otters were occasionally reported by locals in Hoor ol-Azim Wetland where may breed, **Al-Sheikhly et al.** (**2021**) indicated that details on the their intra/interspecific behaviour were improperly documented. In this study, we report the first confirmed breeding record of *L. p. maxwelli* in Hoor ol-Azim Wetland in southwestern Iran with observations on the species' intra/interspecific foraging and territorial behaviour.

## STUDY AREA

Hoor ol-Azim Wetland (31°45' N 47°52' E), is a vast complex of a transboundary monotonic marshland habitat of a single freshwater hydrological system comprising the northeastern extremity of the Hawizeh Marsh (31°35' N 47°42' E) in southeastern Iraq. It occupies the Tigris-Euphrates Alluvial Salt Marsh (PA0906) Ecoregion with altitudes of ≤6m a.s.l. Hoor ol-Azim Wetland fed with water primarily from Karkheh "Karkhe'h" River and bisected by the Iran-Iraq international boundaries. It is situated in the north of the Azadegan Plain, ca. 80km to the southwest of Ahvaz city in Khuzestan Province in southwestern Iran. The general habitat ranges from submerged and emerged marshland vegetation of extensive common reed beds *Phragmites australis* and *Typha* sp. The adjacent eastern part is a mixed landscape of semi-desert and arid plains of sparse steppe vegetation of *Salix* spp. and *Tamarix* sp. and cultivated fields. This mixed habitat is interspersed by an artificial scheme of irrigation canals and embankments (Figure 1).

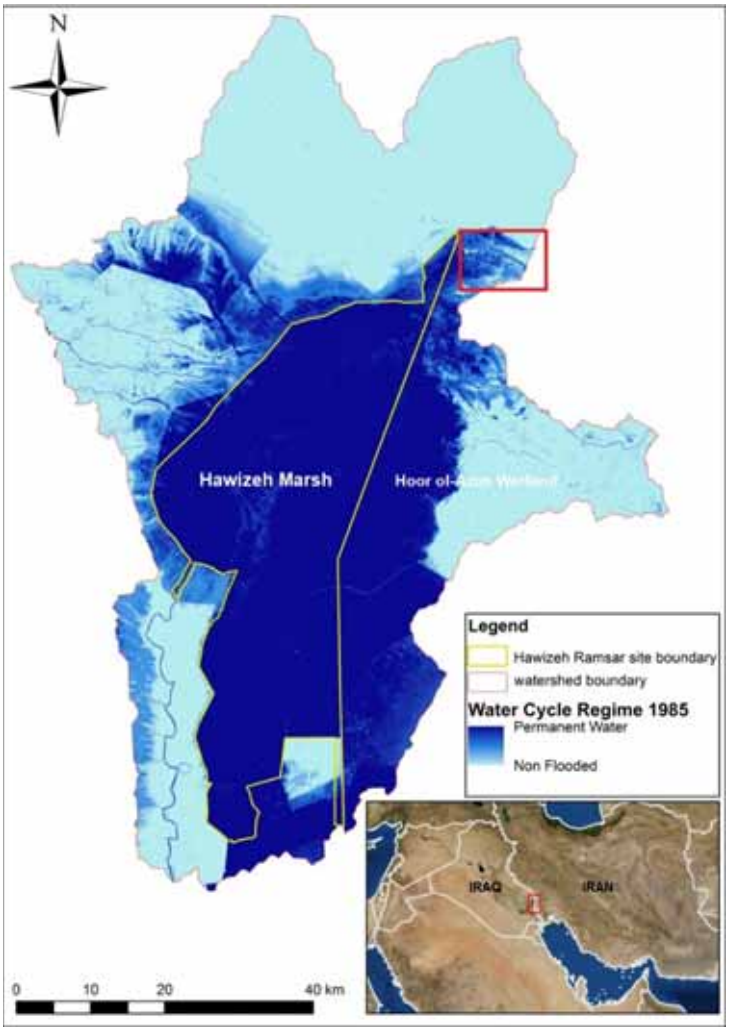


***Figure 1. The study area in Hoor ol-Azim Wetland in southwestern Iran***

## BREEDING RECORDS

**Al-Sheikhly et al.** (**2014; 2015**) indicated that *L. p. maxwelli* is breeding in Hawizeh Marsh in southern Iraq where many otter cubs are killed by electrofishing, bycatch, or trapped by local fishermen to be raised as pets. Although Hoor ol-Azim Wetland is geographically connected to the Iraqi Hawizeh Marsh, the breeding of *L. p. maxwelli* was expected but has never been confirmed. This is the first breeding record of *L. p. maxwelli* in the Iranian territory ever made.

During January–May 2023, we conducted a drone aerial survey (3 flying hours), flying twice a week to monitor two transect routes (length = 5 km each) and covering an area of ca. 20 km$^2$ in Hoor ol-Azim Wetland. A total of three active holts (dens) (1.6–2.8 km distance) were marked and observed from the drone (elv. ≤500 m). A ground survey was conducted by boat and/or on foot to locate the holts and adults with newly born cubs were observed.

All of the holts were located in the Al-Chathaba area in the northern extremity of Hoor ol-Azim Wetland and dug in the artificial irrigation canal system. The first holt was occupied by a family of six otters (four adults and two sub-adults). The holt was a big hole dug under a concrete bridge connecting irrigation canals with (1.7 m) escaping trail facing the marshland edge. A camera trap was set to monitor otter social activities (e.g., foraging, swimming, basking, and entering the holt site). In January 2023, the otter family was observed caring for two cubs (≤ 35–40 days old) and continued to visit the holt site frequently until May (Figure 2a).

The second holt was located ca. 2.3 km from the Iraqi border. The holt was dug in the bank of an irrigation canal, hidden among dense reed and tamarisk vegetation. It has a wide entrance with escaping trail (1.5–2 m) from the water, and occupied by a family of three adult *L. p. maxwelli* otters. Otter social activities were regularly monitored by the drone (Figure 2b). In February 2023, the otter family was observed taking care of four cubs (ca. ≤ 80–90 days old) (Figure 2c).

The third holt was occupied by two adult otters. Otters were observed digging in the muddy bank of an irrigation embankment; however, further aerial survey didn't observe the otters within the holt territory and their breeding status was not determined (Figure 2d).

It is worth mentioning that due to the cryptic behaviour of otters, courtship rituals and spatial/temporal mating activities were not observed. Despite our recent new observations, further in situ research on the *L. p. maxwelli* intraspecific breeding behaviour in both Hoor ol-Azim Wetland and Hawizeh Marsh is required.


***Figure 2. The smooth-coated otter,* Lutrogale perspicillata maxwelli*, breeding sites in Hoor ol-Azim Wetland-Iran.*** Photo credits: SB Mousavi

## FORAGING BEHAVIOUR

We identified a total of 22 foraging sites for *L. p. maxwelli* otters in the northern part of Hoor ol-Azim Wetland (Table 1). As a precaution against species persecution, seconds in the decimal coordinates have been obscured to mask the exact locations of otter foraging hotspots (exact coordinates will be available for further research). Based on the researcher's judgement, sites of "best-choice" were randomly selected and a total of ten camera traps were set to monitor the intra/interspecific foraging behaviour of the otters. Based on visual observations and 80% of the footage collected, otters perform diurnal and nocturnal [probably to avoid fishermen see **Al-Sheikhly et al.** (**2014; 2020**)] foraging behaviour, fishing together at one site, family members seem to maintain tight social bonds and expressing fawning attitude especially among adults and siblings.

***Table 1. Camera trap locations set to record foraging behaviour of the smooth-coated otter* Lutrogale perspicillata maxwelli *in Hoor ol-Azim Wetland-Iran.***

| No. | Location | No. | Location |
|---|---|---|---|
| 1 | 31°46'xx"N 47°56'xx"E | 12 | 31°44'xx"N 47°53'xx"E |
| 2 | 31°47'xx"N 47°55'xx"E | 13 | 31°44'xx"N 47°52'xx"E |
| 3 | 31°47'xx"N 47°55'xx"E | 14 | 31°44'xx"N 47°53'xx"E |
| 4 | 31°47'xx"N 47°53'xx"E | 15 | 31°44'xx"N 47°52'xx"E |
| 5 | 31°47'xx"N 47°52'xx"E | 16 | 31°44'xx"N 47°52'xx"E |
| 6 | 31°46'xx"N 47°52'39.45"E | 17 | 31°44'xx"N 47°52'xx"E |
| 7 | 31°46'xx"N 47°52'37.11"E | 18 | 31°44'xx"N 47°52'xx"E |
| 8 | 31°46'xx"N 47°52'37.87"E | 19 | 31°47'xx"N 47°55'xx"E |
| 9 | 31°46'xx"N 47°52'44.25"E | 20 | 31°44'xx"N 47°51'xx"E |
| 10 | 31°46'xx"N 47°52'29.89"E | 21 | 31°44'xx"N 47°51'xx"E |
| 11 | 31°45'xx"N 47°53'0.37"E | 22 | 31°46'xx"N 47°52'xx"E |

**Basak et al.** (**2021)** indicated that the diet of the Indian sub-population of smooth-coated otter is predominantly fish (95%), followed by crabs (4.17%) and birds (0.83%). **Al-Sheikhly et al.** (**2021**) mentioned that *L. p. maxwelli* were observed preying on different fish species in Hoor ol-Azim Wetland; however, no photographic documentation was presented. The ichthyofauna of the Hoor ol-Azim Wetland in Iran and Hawizeh Marsh in Iraq is transboundary and diverse, where a total of 15 fish species were recorded (**Mohamed et al., 2008**). In November 2021, we observed a family of *L. p. maxwelli* consisting of three to eight adult and juvenile otters fishing together in an open lake (≤3 m depth) in the Shatt Ali area. The adult otters were observed swimming together followed by juveniles, actively searching the vegetated banks of the marshy lake and performing long fishing dives (30"–2'), and frequently producing a "whistle-like" anxious and ditched calls of "*psi-psi-psi*" followed by loud "*psi-ee-psi-ee*" in prolonged repeated rhythm (Figure 3a). Otters were observed catching four fish species: the Vulnerable binni *Mesopotamichthys sharpeyi* was the main fish prey recorded in multiple occasions (n=5 visual observations) (Figure 3c), redbelly tilapia *Coptodon zillii* (n=3) (Figure 3b) and blue tilapia *Oreochromis niloticus* (n=2), which are both abundant invasive fish species (**Al-Faisal et al., 2014**). Otters were observed dragging fish prey by their heads out of the water onto a muddy platform shore on the marshland edge, where they started eating the cephalocaudal parts of the fish; posterior and tail parts with dorsal, anal and caudal fins are often left. This behaviour is possibly attributed to the high fish abundance in the site where otters be selective and eager to catch more prey; however, this claim required further observations.

Another observation of a group of *L. p. maxwelli* otters foraging in the Al-Chathaba area, ca. 0.5 km from the Iraqi border was made in May 2023. A family of three otters were observed slowly and quietly swimming between densely vegetated watercourses and probing their heads searching the submerged bases of reed beds with short alternative dives (≤1' each). Otters were observed catching bigger fish prey with loud splashes occurring on the water surface as an indication of active cooperative fishing teamwork. Otters with their broad paws and sharp teeth were able to catch large (ca. 70–80 cm) Tigris catfish *Silurus triostegus* (Figure 3d) and Tigris asp *Leuciscus vorax* and prey on them in the water. Both fish species are common in Hoor ol-Azim Wetland (see **Esmaeili 2021**). It is worth mentioning that this foraging behaviour of *L. p. maxwelli* preying on different fish species is documented for the first time ever.

**Nawab and Hussain** (**2012**) mentioned that Indian smooth-coated otters also prey on crabs and birds. **Al-Sheikhly et al.** (**2021**) indicated that *L. p. maxwelli* also preys on striped-necked terrapin *Mauremys caspica*, and little grebe *Tachybaptus ruficollis* but on rare occasions. Despite what has been mentioned, we were not able to document any other vertebrates as prey items in *L. p. maxwelli* diet during our study, the subject requires further monitoring.

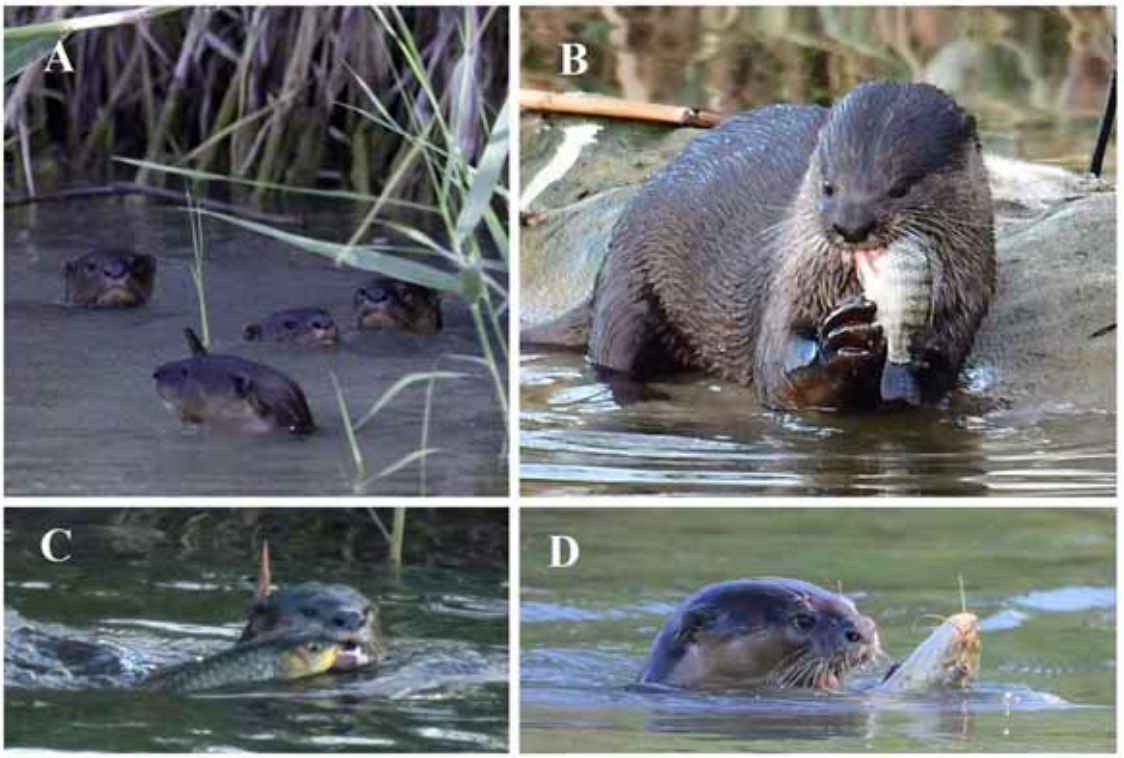


***Figure 3. The smooth-coated otter,* Lutrogale perspicillata maxwelli*, preying on freshwater fish species in Hoor ol-Azim Wetland. A: fishing group; B: redbelly tilapia* (Coptodon zillii)*; C: binni* (Mesopotamichthys sharpeyi)*; D: Tigris catfish* (Silurus triostegus).** Photo credits: SB Mousavi

## INTERSPECIFIC INTERACTION

Our camera trap footage showed that *L. p. maxwelli* otters are interacting with other wildlife species. **Al-Sheikhly et al.** (**2017; 2020**) indicated that Hoor ol-Azim Wetland is also occupied by the sympatric Eurasian otter, *Lutra lutra*; therefore, interspecific interaction is expected. Based on multiple footage (n=5) obtained from different locations, foraging groups of *L. p. maxwelli* clearly showed a defensive territorial behaviour of fierce short scrimmages with anxious "whistle-like" calls against *L. lutra* in the fishing areas (Figure 4a). In addition, otters also expressed aggressive behaviour of loud snarls with alarm calls to other family members against Indian wolf, *Canis lupus pallipes* (Figure 4b), jungle cat, *Felis chaus* (Figure 4c), honey badger, *Mellivora capensis* (Figure 4d), Asiatic golden jackal, *Canis aureus*, and striped hyena, *Hyaena hyaena* (Figure 4e) that visited the same otters' foraging sites on the marshland edges.

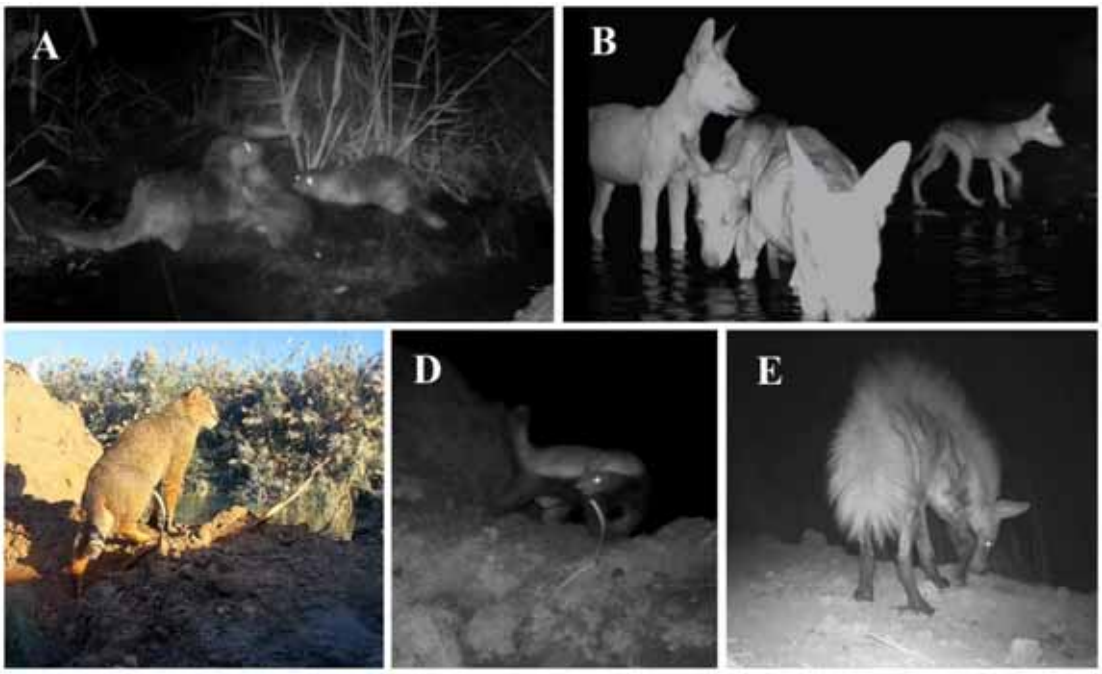


***Figure 4. Camera trap images of wildlife species with interspecific interaction with smooth-coated otter,* Lutrogale perspicillata maxwelli*, recorded in the foraging sites in Hoor ol-Azim Wetland-Iran.***

**Acknowledgements**

We are grateful to the Dornaye Omid Organisation (Iran) and Iraqi Green Climate Organisation-IGCO (Iraq) for their continuous support for the in situ research for the conservation of the smooth-coated otter, *Lutrogale perspicillata maxwelli*, in Hoor ol-Azim Wetland and Hawizeh Marsh. We would like to thank Anis Guelmami (Coordinator of the Mediterranean Wetlands Observatory at the Tour du Valat Research Institute, France) for providing the Surface Water Dynamics map of the Hoor ol-Azim Wetland/Hawizeh Marsh hydrological complex.

**Disclosure Statement**

No potential conflict of interest was reported by the authors.

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# ON SOME RECENT SIGHTINGS OF SMOOTH-COATED OTTERS (*Lutrogale perspicillata sindica*) FROM PAKISTAN

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## INTRODUCTION

Smooth-coated otters have declined throughout their range in Pakistan (**Roberts, 1997**). Since the last well targeted research work (**Khan et al., 2009; Khan et al., 2010**), the species is virtually unknown in the country with many localised extinctions feared. The race *sindica* highlighted by **Pocock (1939) and Roberts (1997)** was found as evolutionary distinct enough to be formulated into its own subspecies (**Moretti et al., 2017**), *Lutrogale perspicillata sindica*, which is endemic to the Indus riverine zone. This publication is an attempt to collate some recent records to give a perspective of the current (i.e. after 2010) status of the species in the region.

## RECORDS OF RECENT SIGHTINGS

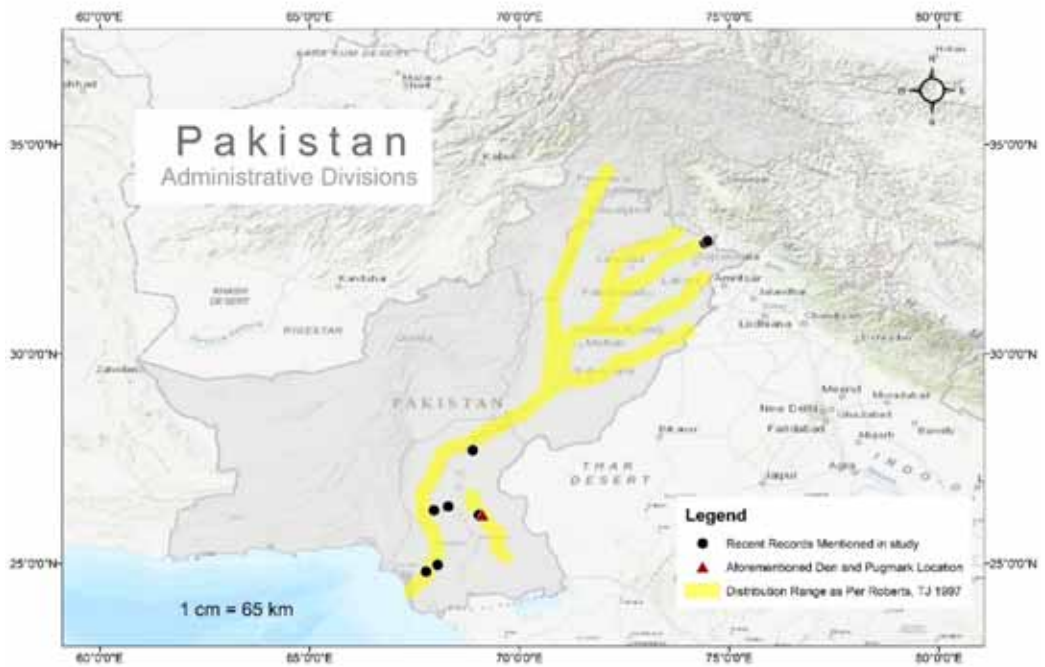


***Figure 1. Map showing locations of otter sightings***

Records were extracted from various online communities of nature watching and wildlife photography, field surveys and questionnaire based community surveys on an irregular basis. The locations are shown in Figure 1 and details are given in Table 1.

***Table 1. Sightings records from August 2012–December 2022***

| Serial number (s.no) | Date | Location | Individuals/ note | Observers/ Informants |
|---|---|---|---|---|
| 1 | August 2012 | Chotiari reservoir, Sanghar district | Family group of 5 camera trapped | Islam et al., 2015 |
| 2 | December 2016 | Headworks of Maralla | 1 pugmark noted | Mudasir Rao |
| 3 | February 2020 | Indus river bridge, Sukkur district | Family group of 5 | Tariq Hameed Sulaimani |
| 4 | June 2020 | Headworks of Marala, Sialkot district | Family group of 4 individuals observed in dense wetlands | Sajid Saeed |
| 5 | 2019 | Haleji lake, Thatta district | Localised extinction mentioned | Rasheed Khan, Ashraf Qazi |
| 6 | 25 July 2019 | Exact location not disclosed, Sindh Province | 1 killed by locals | Pakistan Wildlife Foundation |
| 7 | 2019 | Keenjhar lake, Thatta district | Local extinction mentioned by locals | Kamal Palari, Haroon Ahmed Palari |
| 8 | July 2021 | Shaheed Benazirabad district, Sindh Province | 1 individual rescued | Sindh Wildlife Department |
| 9 | 2022 | Headworks of Marala, Sialkot district | 1 individual seen | Jamal Leghari |
| 10 | December 2022 | Chotiari reservoir, Sanghar district | Locals mention species to be well extant. Active burrows, ugmarks and spraints observed. | Wali Muhammad Kumbhar, Gulzar Malla, and Zafeer Ahmed Shaikh. |
| 11 | December 2022 | Pechuha dhand, Nawabshah district | Presence mentioned | Kamal Palari |

## OBSERVATIONS

A short visit was made to explore the current status of smooth-coated otters in the Chotiari wetlands complex in late December 2022. Although no direct sighting was recorded, our team was successful in finding an active burrow (Figure 2) dug into a sand embankment with a very open setting i.e. lack of vegetation and cover. The sandbar around the burrow revealed two secondary burrows as well. Fresh spraint and pugmarks (Figure 3) were also noted: the latter were easy to identify based on their large, elongated size and oval toes (**Kistner et al., 2022**). Local fisherman mentioned the species to be much extant and widespread in the Chotiari wetland complex which is a positive sign. However, community-based surveys in the households around a portion of the complex revealed the major threat to be hunting for alleged medicinal properties and fur.

The species has been noted to be most likely regionally extinct from Thatta province as surveys have failed to find any evidence of the species (**Shaikh, 2021**). The last confirmed record of a roadkill near Keenjhar lake was more than a decade ago (***Dawn News*, 2008**).

***Figure 2. Entrance of the burrow clearly visible dug out on the open embankment***

***Figure 3. Pugmark noted on the entrance of the burrow: length 4.8", breadth 3.4"***

## CONCLUSIONS

Smooth-coated otters have declined massively along the Indus eco-regions and there is an immediate need for updated research and revised status confirmation since the last works (**Khan et al., 2009; Khan et al., 2010; Ali et al., 2010**). While working on this small note, there was discussion with the authorities at two locations, Haleji and Keenjhar lake, and they seemed very optimistic on possible otter re-introductions. This provides motivation and depicts a possible future for this species in Southern Sindh as both of these locations have very sizable wetland habitats. This once widespread species was even used in fishing practices (**Blandford, 1881; Murray, 1884**) but it has faced widespread decline along the Indus riverine habitat. However, with much targeted conservation efforts, this endemic subspecies can still rebound.

**Acknowledgements**

I would like to thank Wali Muhammad Kubhar and Gulzar Malla very sincerely for their field assistance and active support that led to the success of my short visit to Chotiari.

**Disclosure statement**

No potential conflict of interest was reported by the author.

**Author Biography**

ZAFEER AHMED SHAIKH started out as an avid nature lover and took on citizen science projects involving birds, mammals and reptiles of Pakistan. His work is mainly focused on solving lack of research and availability of data from Pakistan, and creating bridges between stakeholders to ease biodiversity conservation. He has been involved in numerous conservation projects in Southern Sindh. He is currently affiliated with Fishing Cat Conservation Alliance and is heading the Indus Fishing Cat Project that works to mitigate threats facing small wild cats in the country.

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# UNVEILING THE TRAGIC TALE OF MUMBAI'S OTTER, A VICTIM OF THE PET TRADE - A CASE STUDY

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**Abstract**

*This case study documents the occurrence of a smooth-coated otter (*Lutrogale perspicillata*) within an abandoned mill compound located in the heart of Mumbai, India. Preliminary monitoring revealed that the otter utilised not only the mill premises but also the adjoining compounds in search of resources. Observations indicated that the otter relied on various food sources like scavenging trash, consuming remnants of fast food, and fishing from a small pond located within the mill premises. Despite several rescue attempts aimed at returning the otter to a more suitable habitat, there was an unfortunate outcome resulting in the otter's demise during a failed rescue operation. This case highlights the complexities associated with illegal wildlife trade and the need of introducing formal training for creating safety norms and parameters for rescuing wildlife within urban eco-systems.*

***Keywords:*** *Smooth-coated otter; Mumbai; illegal wildlife trade; rescue*

The authors investigated the occurrence of a smooth-coated otter (*Lutrogale perspicillata*) based on video evidence received on November 2022. Further to subsequent investigations with local residents, it was confirmed that the otter was spotted in an abandoned compound named Kohinoor Mills (19° 0'55.22"N, 72°50'52.33"E) in the bustling city of Mumbai, Maharashtra, India. The Kohinoor mills encompass a significant expanse of abandoned structures and an extensive network of underground tunnels, surrounded by walls and fences that feature conspicuous openings enabling the otter to evade human presence and forage for sustenance. To confirm further the presence of the otter and monitor its movements, multiple camera traps were deployed within the premises of the Kohinoor Mills.

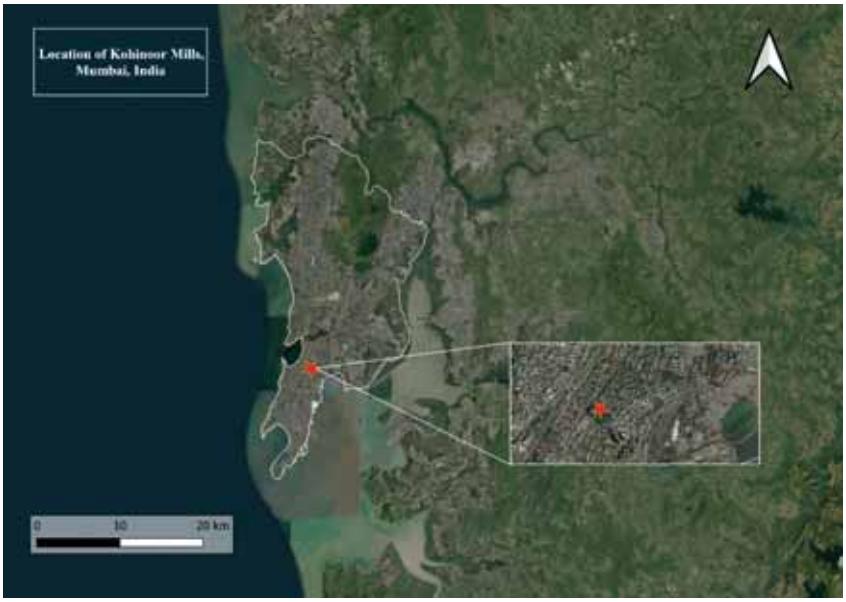


***Figure 1. Location of the Kohinoor Mills, Mumbai, India***

Upon further monitoring using camera traps, it was confirmed that a male smooth-coated otter had been occupying the abandoned premises.

A collaborative rescue mission was initiated by the Maharashtra Forest Department and a local Non-Governmental Organisation (NGO), comprising of trained and untrained volunteers who had previous experience of rescuing feral animals and wildlife including birds, monkeys, leopards, crocodiles, snakes, and other species.

Despite the strategic placement of multiple baited cages within the compound, the otter displayed an aversion to the fish baits and avoided entering the cages.

***Figure 2. Camera trap image of smooth-coated otter in the Kohinoor Mills***

In December 2022, the otter was observed venturing beyond the confines of Kohinoor Mills and moving near the adjacent road. The NGO volunteers attempted to capture it using nets, during which the otter fled into a vacant house. Unfortunately, the house lacked proper ventilation and was locked from the outside by the volunteers. After a certain period of time, a few volunteers entered the locked house with nets in an effort to capture the otter. During the process, the otter, already stressed, exhausted and frightened, severely injured a few volunteers by biting their hands. Despite the best intentions, the otter's capture was executed in a forceful manner, resulting in its unfortunate demise. Post mortem reports suggested that the male smooth-coated otter, aged 4/5 years died of cardiopulmonary failure, which is attributed to stress during its capture (**Breed et al.,2019**).

The above-mentioned incident brings to attention an intriguing aspect regarding the otter's presence within the Kohinoor mills. Given its location and the distance of 2km through dense urban sprawl to the Sewri Creek, the otter's closest probable natural habitat, it is unlikely that the otter reached the area independently. This suggests a plausible scenario wherein the otter may have been subjected to the illegal pet trade, only to be abandoned by its owner. Such instances underscore the alarming consequences of the illicit wildlife trade, leading to the displacement and abandonment of animals that are ill-suited for captivity within the urban environment.

Biodiversity across the world is threatened due to the global legal and illegal trade of wildlife, creating huge dents in biodiversity and species conservation (**Challender et al., 2015**). Demand for pets is one of the key drivers for trade after luxury goods (for example pelts) and traditional medicine (**Baker et al., 2013; Tingley et al., 2017**). Multiple serious consequences have resulted from the illegal pet trade in the form of loss of populations of native species, introductions of non-native species and zoonotic risks (**Bush et al., 2014; Fong and Chen, 2010; Palvin et al., 2009**). Amplification of illegal wildlife trade has occurred due to the growth in the use of internet. The internet has become a key platform for the trade of legal and illegal wildlife products wherein products from megafaunal species such as elephants, tigers and rhinoceroses were promoted along with live specimen of reptiles, amphibians and birds (**Lavorgna, 2015; IFAW 2008**). Social media is being used as a tool for advertising, sourcing and online trade of animals and plants alike, both directly and indirectly. The social media platforms create a stage for illegal pet trade by spreading viral exotic pet videos, thereby creating a demand in the market (**Hinsley et al., 2016; Nekaris et al., 2013**).

Otter species across the world are threatened due to habitat loss, as well as the legal and illegal trade (fur and pet trade, traditional medicine, and trophies) (**Duckworth, 2013; Shepherd and Nijman, 2014**). Asian species of otters are considered globally threatened as suggested by the International Union for Conservation of Nature (IUCN) Red List. Their international trade is regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (**IUCN Otter Specialist Group, 2016**). The Asian small-clawed otter (*Aonyx cinereus*) is

protected under Schedule I of the Indian Wildlife Protection Act, 1972; while the smooth-coated otter and the Eurasian otter (*Lutra lutra*) are protected under Schedule II. Despite that, India been a global hotspot for trade in otters along with China and Nepal (**Gomez et al., 2016**). There is an immediate requirement to include provisions for regulating online wildlife crime in national legislations of all countries. This would be parallel to the CITES Decisions 17.921 which aims at combating wildlife cybercrime (**Gomez and Bouhuys, 2018**).

Globally and in India, there is an urgent need to bolster legislation aimed at preventing the illegal trade of wildlife species. Efforts must be made to enhance the efficiency and effectiveness of wildlife trafficking crackdowns, ensuring their swift execution. Such decisive actions serve as crucial deterrents, dissuading potential illegal traders from engaging in similar activities. Strengthening these laws and implementing stringent measures is of paramount importance in safeguarding the well-being of wildlife populations and curbing the detrimental impacts of illegal wildlife trade.

In addition, it is important to note that due to the inefficiencies and lack of pragmatism in the rescue approach mechanism of local volunteers, this otter rescue was unsuccessful. Thus, it is crucial to provide training to local authorities in handling specific wildlife species to facilitate successful rescues and effective rehabilitation efforts. Equipping these authorities with the necessary knowledge and skills is paramount to ensure the safety of both animals and the rescuers involved.

The International Otter Survival Fund has developed comprehensive protocols for the safe rescue and care of otters, which can serve as a valuable reference article for authorities seeking guidance in this field (**Yoxon, 2003**). Implementing such protocols can greatly enhance the outcomes of otter rescue operations and contribute to the overall welfare and conservation of these remarkable creatures.

**Disclosure Statement**

No potential conflict of interest was reported by the authors.

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# AN UNUSUAL SIGHTING RECORD OF EURASIAN OTTER (*Lutra lutra*) IN KATHMANDU VALLEY, NEPAL

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**Abstract**

*The Eurasian otter (*Lutra lutra*) is a shy and solitary semi-aquatic species which is mainly nocturnal and prefers marshy places, rivers, lakes, seashores and estuaries. Contrary to the habit and habitat of the species, this report presents a Eurasian otter sighting in a built-up area at Chandragiri-6, Mahadevsthan, Chandragiri, in Kathmandu valley. One fresh carcass of a Eurasian otter was discovered in a human settlement area. The sighting of a Eurasian otter amidst this settlement area has resulted in queries requiring their exploration in rivers. primarily the Bagmati River. which could resolve the mysterious sighting.*

***Keywords:*** *Otter carcass, Chandragiri, exploration, Bagmati River*

## INTRODUCTION

Nepal is home to three species of otters namely, smooth-coated otter (*Lutrogale perspicillata*), Asian small-clawed otter (*Aonyx cinereus*) and Eurasian otter (*Lutra lutra*). There are ample studies on smooth-coated otters proving its presence inside the protected areas in lowland Nepal. However, the decline in its population is resulting in it being regarded as a rare species. There is a marked deficiency in information on the Asian small-clawed otter which made its occurrence in Nepal puzzling (**Jnawali et al., 2011**). For decades evidence of the presence of Eurasian otters in Nepal was ambiguous until it was recorded in the Barekot River, Roshi River, and Tubang River (**Shrestha et al., 2021**) and most recently from Pelma River (**Shrestha et al., 2022**). In addition to the records, the unusual sighting of the carcass of a Eurasian otter in the urban area of Kathmandu valley is reported in this study.

## STUDY AREA

Kathmandu valley is bowl-shaped being surrounded by the Mahabharat hills ranging from the lowest elevation of 1230m mean above sea level at Chobhar Gorge to the highest elevation of 2831m at Phulchowki peak (**ICIMOD, MoEST and UNEP, 2007**). The climate is sub-tropical to temperate influencing the occurrence of mixed

vegetation including *Alnus nepalensis*, *Schima wallichii*, *Castonopsis indica*, *Pinus roxburghii*, *Quercus* spp., *Rhododendron* spp., etc. (**Katuwal et al., 2020**). The Kathmandu valley floor is endowed with fertile soil that is irrigated by three major rivers systems: Bagmati River, Manohara River, and Bishnumati River. The valley is the fastest growing urban area and the most populous metropolitan region in Nepal. In recent decades, urbanisation sprawled in suburban and rural villages and a dramatic population growth resulted in the conversion of farmland, forest patches and river corridors into settlements (**Thapa and Murayama, 2012**). Chandragiri is a suburb located at the southwest of the Kathmandu valley, 16km from the core city. The Chandragiri hills are a biodiversity hotspot (**Katuwal et al., 2020)** which is located adjacent to the Chandragiri area. Multiple brooks originating from the Chandragiri hills flow across Chandragiri and join the main channel, named Balkhu Khola downstream. Further downstream this joins the Bagmati River that drains to the southern flatland of Nepal (Figure 1).

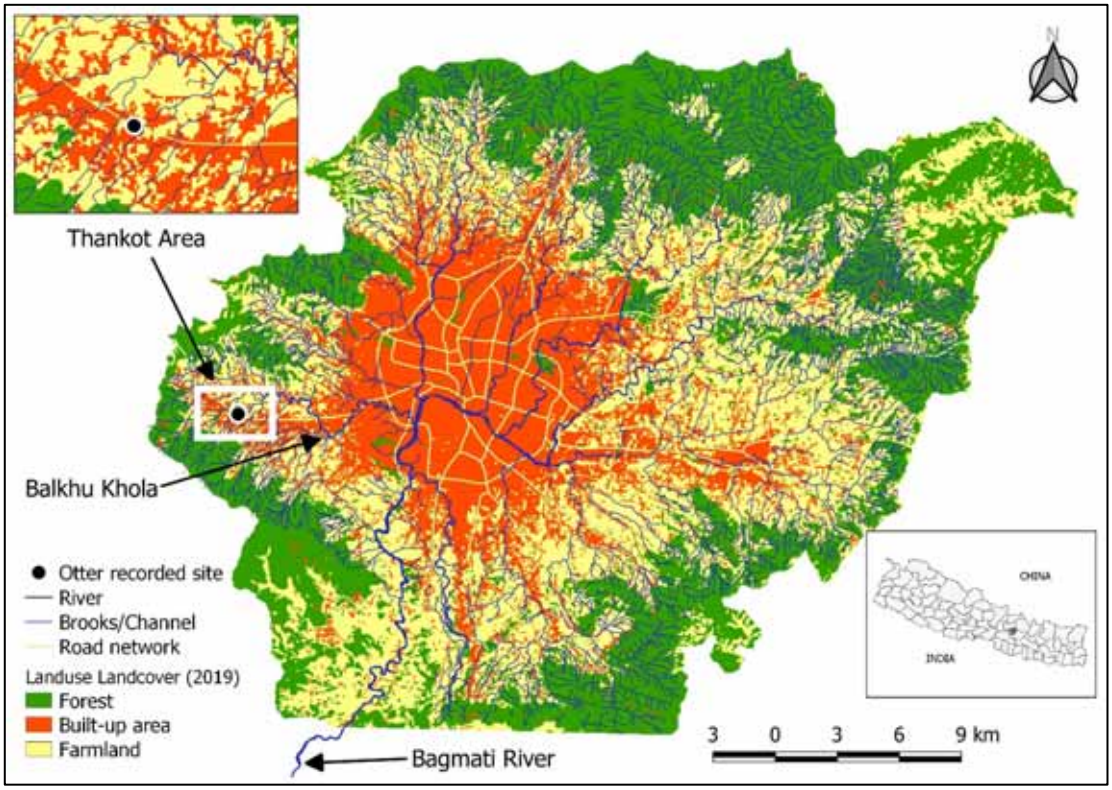


***Figure 1. Otter site overlaid on a Landuse/landcover map of Kathmandu valley.***

Landuse/landcover data source: International Center for Integrated Mountain Development (ICIMOD)

## METHODS

A site visit was carried out following information shared by locals on 10 July 2021. The carcass was examined and photographs were taken for otter species identification. The exact location was recorded in order to try to understand this mysterious sighting of an otter amidst the built-up area. Photographs were shared with research specialists at the International Otter Survival Fund and IUCN Otter Specialist Group for species confirmation and validation.

## RESULTS AND DISCUSSION

The fresh otter carcass was found at a courtyard (27° 41’ 16.28’’ N 85° 13’ 38.41’’E) which is used as a badminton court. The carcass had a fresh wound below the left fore limb which had punctured deep into the body causing its death. The nature of the wound inferred that the otter was attacked by a predator, most probably the street dogs patrolling the area. The carcass had clear visible webbed toes, a long and tapering cone-shaped tail, dense dark-brown pelage over most of the body with lighter-colour fur near the throat (**Sivasothi and Nor, 1994, Melissen, 2000**, **Kruuk, 2006**) (Figure 2). This indicated it was a Eurasian otter, which was confirmed by research specialists on otters.

This record of a dead otter is unfortunate as the species is largely depleted with a declining population. However, such carcasses, road kills or otter pelts confirm their presence in an area:

- A freshly road killed Eurasian otter provided proof of the species occurrence in the Anamalia hills of Southern Western Ghats in India where the species had been previously undiscovered (**Mudappa et al., 2018**).
- A fresh skin of an adult male otter accidently killed by electrocution by a fisherman became the first indication of permanent presence of the Maxwell sub-species of smooth-coated otter (*Lutrogale perspicillata maxwelli*) in Southern Iraq.
- Two freshly killed otters with one preserved skin gave evidence of smooth-coated otter presence in Lake Al Baghdadiya, Chebaeish in Iraq.
- Two fresh skins of an adult male Eurasian otter and an adult male Iraqi smooth-coated otter were seized from a local trader in the old city of Amara in Iraq. The Eurasian otter pelt came from the Al-Musharah River, a tributary of the Tigris River in Mayssan, and the smooth-coated otter pelt came from Umm Al- Na’aj the core lake of Hor Al-Hawizeh (**Al-Sheikhly and Nadar, 2013**). The otters had been electrocuted.
- A pelt recorded in the Pelma River of Rukum East, Nepal (**Shrestha et al., 2022**) and a skull recorded in the Roshi River of Kavrepalanchowk, Nepal

(**Shrestha et al., 2021**) confirmed the presence of the Eurasian otter in those rivers.

It is not unexpected to hear of otters in the wetlands and rivers but the record of a Eurasian otter carcass in the middle of a settlement area in Kathmandu valley is puzzling.


***Figure 2. Otter carcass lateral view (A); front view (B); courtyard used as a badminton court where otter carcass was found (C); nearby brook (D)***

Photo credits: Mahendra Maharjan (A and B); Mohan Bikram Shrestha (C and D)

Thirty mammal species were reported in the Chandragiri hills (**Katuwal et al., 2020**) located in the vicinity of the site where the otter carcass was found. All the mammal species are terrestrial and inhabit the forest. In contrast, the record of the semi-aquatic Eurasian otter in this area is mysterious. Communication with senior local citizens in the locality revealed that several decades earlier the species had been present in rice paddies and but it had disappeared with urbanisation. Urbanisation is one of the most

important factors which contributes to the subsequent loss of the natural environment in the Kathmandu valley (**Thapa and Murayama, 2012**). Conversion of agricultural land into built-up areas is the prime visible change (Figure 3): built-up areas have increased by 412% while agricultural land showed a 31% loss between 1989 and 2016. Much is unknown about how this affects fragile ecosystems within this mountainous valley (**Ishtiaque et al., 2017**). Is it possible that this Eurasian otter has survived in the changing natural environment in the Kathmandu valley? Or, did it arrive from nearby rivers?

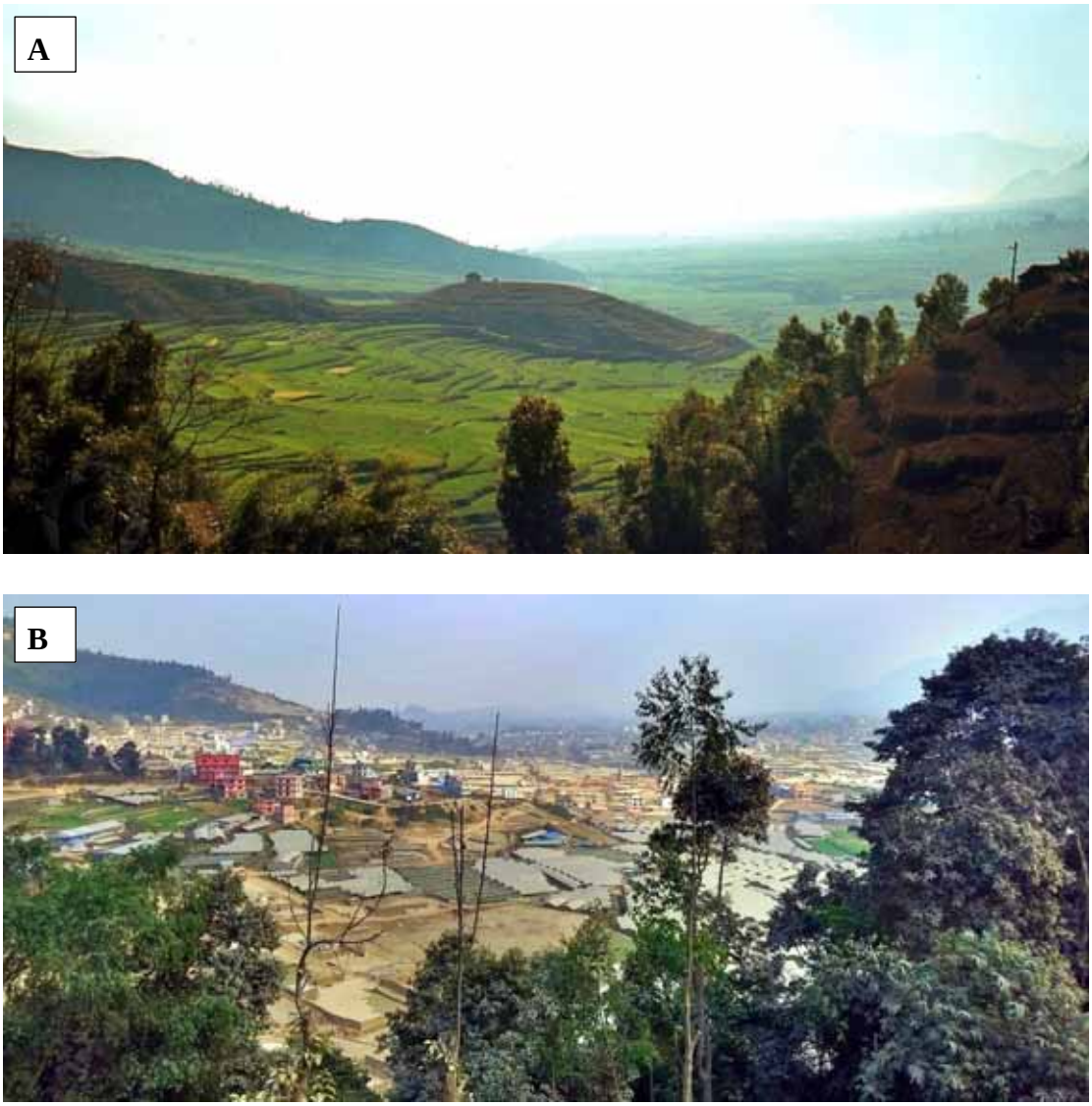


***Figure 3. Change in natural environment in the Chandragiri area where the otter carcass was found between 1977 (A) and 2021 (B)***

Photo credits: Museum Nepal (A) and Jeevan Ale Mager (B)

The Bagmati River is the main river of the Kathmandu valley. It is fed by all of the tributaries in the valley and flows to the Southern lowlands of Nepal (**ICIMOD, MoEST and UNEP, 2007**). The Eurasian otter is reported to be present in the Shivapuri Nagarjun National Park, the headwater or origin of the Bagmati River (**SNNP, 2017**), although there are no direct sighting records of the otter within the Park. It is not clear whether the otter was actually chased and killed while travelling outside the Park area or within the Park itself. It is even possible that the Eurasian otter is still thriving in the Bagmati River further downstream beyond the Kathmandu valley, and that it moved upstream and was chased to Chandragiri and killed (Figure 4). This query is still to be addressed through a detailed study along the Bagmati River watercourse.

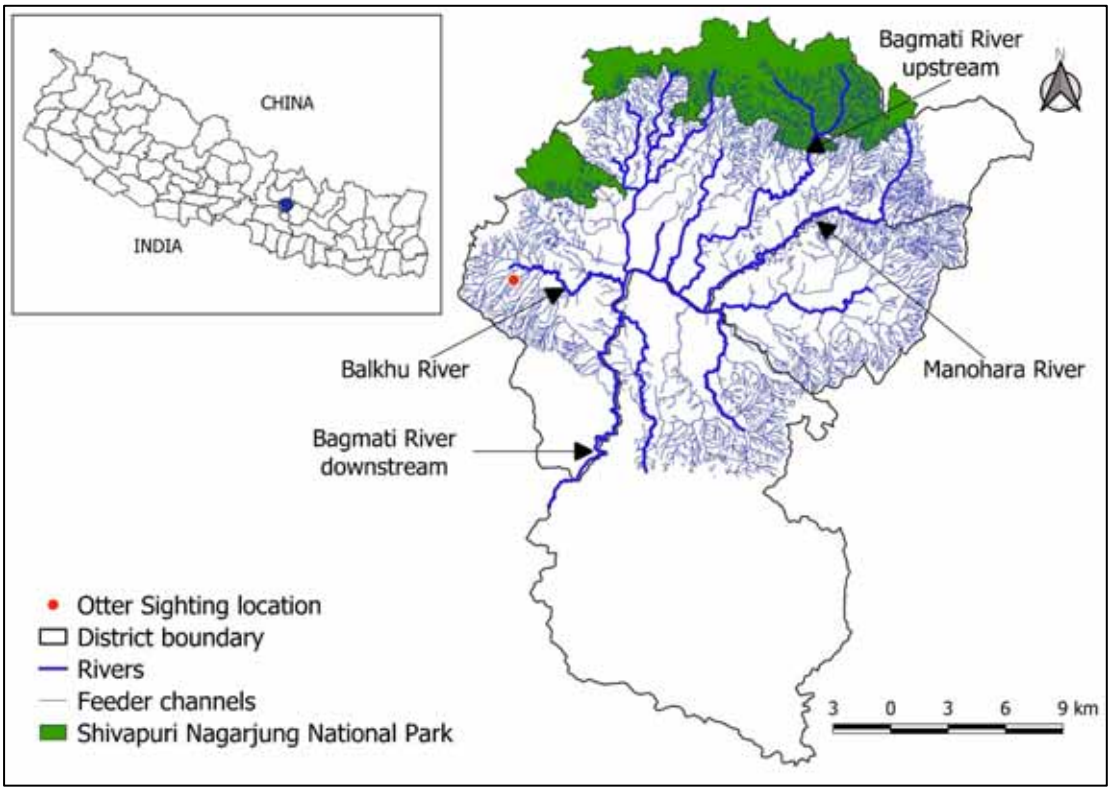


***Figure 4. Otter site location and the river network and nearby National Park***

## CONCLUSION

Destruction of the natural ecology and native habitat have threatened the survival of wild species (**Corvalan et al., 2005**). Kathmandu valley is a classic example with a city which has evolved from a green city to a grey city. The conversion of land use into a built-up area has put great pressure on agricultural land, forest patches and river corridors in the valley (**Thapa and Murayama, 2012, Ishtiaque et al., 2017**). Wild species are wiped out or become displaced to refuges in the forest which still

surrounds the valley. A multitude of queries arose following the mysterious occurrence of the Eurasian otter in the middle of a built-up area in the Kathmandu valley. An investigation into the presence of the Eurasian otter in the Bagmati River could resolve the question and enable conservation and environmental management for the survival of the species (**De Snoo et al., 2013, Bennett et al., 2017)**.

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**Disclosure Statement**

No potential conflict of interest was reported by the authors.

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# FIRST EVIDENCE OF EURASIAN OTTERS IN POST-INDEPENDENCE BANGLADESH

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## Abstract

*The Eurasian otter (*Lutra lutra*) is critically endangered in Bangladesh. The species has long been perceived to be present but there is no empirical data on its presence in the country as of 2023. Herein, we document a hunting incident that took place in early 2021 near the Kassalong Reserve Forest, Chattogram Hill Tracts, southeastern Bangladesh. The photographs of the dead specimens were taken by the parabiologist network of a local conservation NGO named Creative Conservation Alliance. The characteristics visible in the photographs were indicative of the species and in sharp contrast to those of the other two otter species of the country, Asian small-clawed otter (*Aonyx cinereus*) and smooth-coated otter (*Lutrogale perspiscillata*). Although the riparian, rugged ecosystems of eastern Bangladesh can be a potential habitat for the species, the region is only partially included in the existing national-level assessment and left out in the global assessment. This is another example of how the absence of adequate studies can impede our understanding of otters. This incident provides the first confirmed evidence of the presence of the Eurasian otter in Bangladesh as well as in the western cusp of the Indo-Burma Biodiversity Hotspot.*

***Keywords:*** *Chittagong Hill Tracts; Indo-Burma Biodiversity Hotspot; Kassalong Reserve Forest; northeast India;* Lutra lutra

The Eurasian otter (*Lutra lutra*) holds the most widespread range of all 13 extant otter species (**Duplaix and Savage, 2018**) with its distribution in the range states spreading across Europe, Asia, and North Africa. However, it is discontinuous in places and is assessed as Near Threatened by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (**Loy et al., 2022**). There are seven to 28 subspecies purported to be present (**Hung and Law, 2016**). In the Indian subcontinent, there are four subspecies i.e. *L. l. aurobrunnea, L. l. kutab, L. l. monticola, and L. l. nair* (**Duplaix and Savage, 2018**), of which the subspecies *monticola* is accounted for in Bangladesh.

The Eurasian otter is assessed as Critically Endangered in the latest country-level Red List Assessment (**Khan 2015a**). Although, in all existing literature, Bangladesh is regarded as a range country for the species, there has been no concrete evidence of its

presence since 1971, the year the country came into being. For decades, studies have highlighted the rarity of the Eurasian otter in Bangladesh (**Foster-Turley and Santiapillai, 1990; de Silva, 1995, 2011; Conroy et al., 1998**) and this matches the remarks on the highly elusive status of the species in Asia (**Foster-Turley and Santiapillai, 1990**). **Savage (2022)**, the latest collection of available information on the otters of northeast India, echoes the same. There is no record of this species in the Indian states of Tripura, Mizoram, Meghalaya, and West Bengal (**Savage, 2022, Loy et al., 2022)**. Similarly, the latest lexicons on the wildlife diversity of Bangladesh (**Khan 2015a, 2015b, 2018**) acknowledge its existence but dwindling status in Bangladesh and definitive records are wanting. The only forest that is reported to have the species and trans-border with Bangladesh is the Patharia Hill Reserve in southern Assam, India. However, no confirmed record of its presence was provided in the study. Thus, since the independence of Bangladesh, though the species is believed to be present, there is no verifiable account available in any peer-reviewed work or grey literature.

As a result, the general secretive nature of largely nocturnal otters, and the lack of updated information eventually contribute to great inconsistencies between sources concerning the perceived Eurasian otter distribution in Bangladesh. **Foster-Turley and Santiapillai** (**1990**) remarks that the species is "very rare and found in small numbers in forested areas in Chittagong and the Chittagong Hill Tracts and the wetlands of Mymensingh and Sylhet districts". **Khan** (**2015a**) states that the wetland habitats of Greater Sylhet (i.e. northeastern Bangladesh) and Greater Mymensingh (i.e. north-central Bangladesh) could hold some Eurasian otter populations. Wetlands in Bangladesh, however, have never been surveyed for otters (**Akash and Zakir, 2020**). On the other hand, for the last five years, several camera-trapping surveys have been carried out by the author in the riparian forests of northeastern and southeastern Bangladesh. The surveys confirmed the presence of the Asian small-clawed otter (*Aonyx cinereus*) but so far no evidence of Eurasian otter (**Creative Conservation Alliance, 2015; Akash et al., 2022**). Though not specifically designed to monitor otters, camera-trapping works in Mizoram, India, also have not produced images of the species (**Savage, 2022**). In the latest global assessment (**Loy et al., 2022**), the whole country has been left out of the potential range map of the Eurasian otter. The largely uncharted hill forests of northeast India and Myanmar receive the same consideration.

Under these circumstances, two photographs of dead otters reached the authors. In early 2021, the otters were trapped and killed in an incident that took place near the Kassalong Reserve Forest, Chattogram Hill Tracts, southeastern Bangladesh. The photos were posted on social media by an indigenous Chakma person, Shubartha Chakma, associated with the CCA Parabiologist Network. This caught the attention of the co-author S. Chakma. Upon further inquiry into this incident which was more than a year old, we were informed that a pair of Eurasian otters was captured and

beaten to death after being spotted for a week fishing in a hill stream named the Gangaram Canal (23°16' N – 23°18' N, 92°09' E – 92°11' E) (Figure 1).

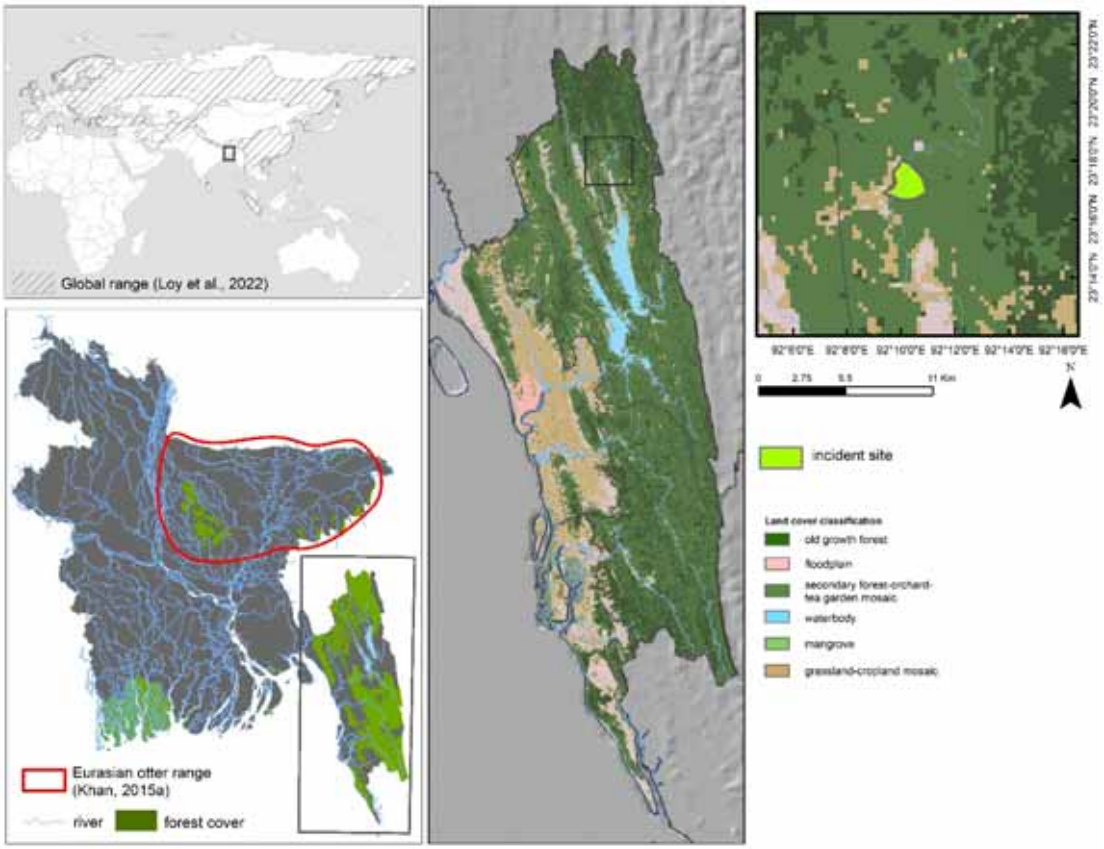


***Figure 1. (a) Proposed global range (cross-hatched area) of the Eurasian otter (Lutra lutra) (after Loy et al., 2022); (b) Range of the species in Bangladesh (after Khan, 2015a); (c) Chittagong Hill Tracts (landcover classification after Hansen et al., 2013); and (d) Incident site.***

The characteristics visible in the photographs i.e., the presence of distinctive claws, scraggly coat, small pinna, relatively flat and long muzzle, w-shaped rhinarium, large body size and conical tail were indicative of the species and in sharp contrast with those of the other two otter species in Bangladesh, Asian small-clawed otter and smooth-coated otter (Figure 2).


***Figure 2. Photographs of the Eurasian otter (Lutra lutra) killed at the Gangaram Canal, near Kassalong Reserve Forest, southeastern Bangladesh. Red circles denote the major pointers. Photo: Shubartha Chakma***

The Eurasian otter follows a different lifestyle to the other two sympatric otter species in Bangladesh. Unlike other Asian otters, the species is solitary and regarded as a habitat generalist (**Duplaix and Savage, 2018; Jamwal et al., 2022**). The species is primarily a piscivore (**Ruiz-Olmo and Jiménez, 2009**) but is also known to take shellfish with occasional records of taking small reptiles, mammals, and birds (**Duplaix and Savage, 2018**). Although, in Europe, research and conservation of the species have gained momentum, pertinent ecological information in the Indian subcontinent is sparse (**Duplaix and Savage, 2018; Savage, 2022**). **Raha and**

**Hussain** (**2016**) studied the stressors impacting habitat selections of three sympatric otters in the Western Ghats, India. The study shows that the Eurasian otter tends to prefer relatively low-lying areas (between 450–950m above sea level (asl) elevation), and slow-flowing, small rivers. Whereas, smooth-coated otters were shown to have a preference for large waterbodies such as lakes and reservoirs while Asian small-clawed otters stick to rugged, riparian hill-streams. The catchment of the Kassalong Reserve Forest has similar characteristics when compared to the study sites of **Raha and Hussain (2016**). The area has a moderate to low elevation (400–600m asl) and is fed by the Kassalong River and its tributaries which are not rapid except during the monsoon flash floods (**Chakma, 2015**). It is very likely that the region has an otter population. When cross-checked with local people, we were told that otters were also spotted in the same canal in 2016–17.

The steady, steep decline of the Eurasian otter in Bangladesh has been attributed to habitat destruction and wetland conversion (**Khan 2015a**). **Foster-Turley and Santiapillai** (**1990**) noted that the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) reported about 3,985 skins of smooth-coated otters extracted in Bangladesh had ended up in the international market between 1980 and 1982. In the Hill Tracts, otter hunting practices were common until 2015. Afterwards, the otters had become rarer and the hunting rate declined — this observation, however, needs to be verified by systematic surveys (**SC Rahman pers. comm. 2023**).

Lack of scientific research and conservation investment is another potential factor that makes otters in Bangladesh silent victims of anthropogenic activities (**Akash and Zakir, 2020**). As pointed out by **Basnet et al. (2020)**, the absence of studies poses a serious challenge to the conservation mainstreaming of Asian otters. The overall number of studies that exclusively featured otters of Bangladesh, as of 2023, is yet to reach double digits (**Akash and Zakir, 2020**).

New observations of otters have increased of late. Short-clawed otters are documented in the forests of northeastern Bangladesh, a site that was not previously endorsed in science (**Akash et al., 2022**). In a similar pattern, smooth-coated otters are found to be living in the riverine grassland mosaics of the Ganges-Brahmaputra River (**Shashoto and Yoxon, 2020; Akash, Iqbal and Mondal, 2022**). There is no study on the Eurasian otter in Bangladesh.

This landmark discovery comes after more than 50 years and opens up a new avenue for otter research and conservation in Bangladesh. The evidence suggests two key points: (1) the species is present in the Hill Tracts, southeastern Bangladesh. The region was missed out in the recent literature; (2) the main rivers in the Hill Tracts that share common topographic features need to be surveyed and the threats the otters are facing there require a systematic evaluation.

**Acknowledgements**

The authors express gratitude to the indigenous parabiologists of CCA who made this amazing discovery. Thanks also to the Facebook group “Otters of Himalayas”, Grace Yoxon, and Margherita Bandini for extending support in the identification process.

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**Disclosure Statement**

No potential conflict of interest was reported by the authors.

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# THE FIRST PHOTOGRAPHIC EVIDENCE OF OTTER (*Lutra lutra*) ON THE ISLE OF WIGHT 2022

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Following on from the report of the first official account of an otter utilising the inland river systems of the Isle of Wight during 2020 (**Rothwell, 2021b**), the author returned to the island between April 2022 and May 2023 in order to conduct a couple of spot-checks on some of the spraint sites previously recorded on the two main rivers (the Eastern Yar and River Medina). This was to ascertain whether an otter was still active and remained on the island since the initial observations.

In conjunction, an attempt was also made to capture an image of the otter using trail cameras at two locations. One camera was set-up under a bridge on the Eastern Yar River, and the other under a bridge on a tributary of the River Medina.

During April 2022, three out of five sites re-examined on the River Medina catchment were positive for otter spraint deposits (Figure 1). On the Eastern Yar catchment seven out of eleven sites were positive. In addition, three new spraint sites were found on the Eastern Yar River (two of them found during April 2022 and one during October 2022).

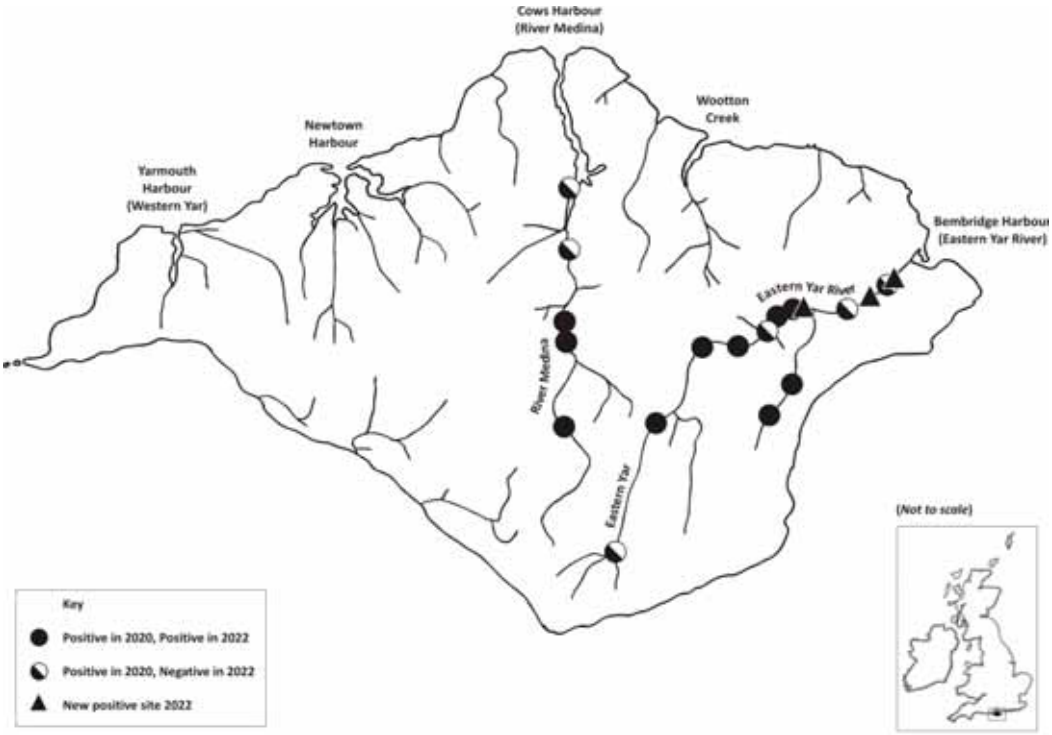


***Figure 1. Map of the study area showing the spraint site locations examined during two survey periods, from two main river catchments of the Isle of Wight***

The camera placed on a tributary of the River Medina ran from 4 May to 20 October 2022. Within this period, an image of an otter was captured four times (dated 2 June, 8 August, 15 August, and 24 August). Although the scale is not apparent in the poor-quality pictures produced, it was believed to be the size of a juvenile/young adult (Figure 2).

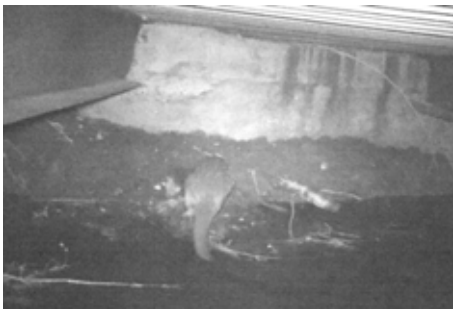

***Figure 2. Otter captured on a trail camera (8 August 2022), set under a bridge on a tributary of the River Medina, Isle of Wight***

***Figure 3. Otter captured on a trail camera (30 October 2022), set under a bridge on the Eastern Yar River, Isle of Wight.***

The camera on the Eastern Yar River was deployed on 4 May 2022 and collected on 19 May 2023. Only one image of an otter was captured (dated 30 October 2022). This animal appears to be a small adult in size (Figure 3), and tentatively suspected to be a different otter to the one captured on camera from the River Medina catchment? Even though this camera remained on site with refreshed battery power to last at least three more months, no more images were recorded beyond 3 November 2022. Unfortunately during the winter spate conditions the water level rose up to the level of the bridge (approximately 2m) and totally submerged the camera, which rendered it completely inoperative. Upon retrieval of the camera, an old spraint was found on the re-shaped and heightened silt bank under the bridge.

It has been confirmed with photographic evidence that an otter has been on two of the major inland river systems on the island during 2022. The spraint found on 19 May 2023 under a bridge on the Eastern Yar, further confirms its continued presence on the island this year. It cannot be determined when this spraint was deposited; however, it had to have been after the winter spate conditions had subsided. From an historical study conducted on the River Dee in Scotland, **Jenkins and Burrows (1980)** showed that 83–94% of spraints disappeared after seven weeks. With this reference in mind, the earliest the spraint under the bridge on the Eastern Yar River may have been deposited is sometime in mid–late March 2023.

Conclusively, an otter has been active on the Isle of Wight for three years since the initial findings of its presence back in 2020 **(Rothwell, 2021a)**. Where the otter came from and when, is unknown. Otters are no longer perceived as a resident of the Isle of Wight, and have only infrequently been recorded as a visitor from the mainland **(Grogan, 1998)**. The average distance of the north coast of the Isle of Wight from the mainland is about 5km, with the shortest distance roughly 1.5km.

Geographically the southern end of both the Eastern Yar River and the River Medina are on average only 2km apart. The shortest distance between these two main rivers (via minor tributaries) is only about 280 metres. Linearly, the nearest spraint site from the Eastern Yar River to the River Medina was approximately 2.5km. These are short distances for an otter to travel, as otters utilising freshwater systems do tend to have vast territories, which can range from 12-84km (**Green et al., 1984; Kruuk et al., 1993; Durbin, 1998**).

Potentially it is also conceivable that there might be two otters on the island. However, this is hypothetical speculation, as it is more than likely to be the same otter travelling between two river catchment areas. Assuming that it is a singular animal, the camera footage suggests that it spent more time on the River Medina catchment than the Eastern Yar catchment (during the times the cameras were recording, between early summer and early winter 2022).

The author hopes to conduct further investigations, with a dedicated survey on the activity of the otter on the two main catchment regions on the Isle of Wight in due course. A particular aim would be to find out if there is more than one otter active on the island.

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# OTTER MORTALITIES AND THE EFFECTS OF ROAD KILL MITIGATION MEASURES ON THE ISLE OF MULL, SCOTLAND

## (1 JANUARY 2013 TO 28 FEBRUARY 2023)

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**Abstract**

*The Eurasian otter (*Lutra lutra*) is the only species native to the UK. Otter deaths have been recorded on the Isle of Mull since 1981 but at first details were sketchy and difficult to obtain. From 1989 to 1994 a more detailed study was carried out and a report (unpublished) was produced. Records continued to be collated until 2013 with the formation of the Mull Otter Group, when a more detailed and intensive study commenced. The following note details the results from 1 January 2013 to 28 February 2023 and outlines Road Traffic Accident mitigation measures carried out by the group and also other otter welfare issues.*

***Keywords****: Eurasian otter; Mull Otter Group; road casualties; wildlife warning reflectors; road signage; disturbance*

## INTRODUCTION

***Figure 1. Map to show location of the Isle of Mull in the UK***

The island of Mull is the second largest island in the Inner Hebrides, off the West coast of Scotland (Figure 1). The island covers nearly 900km$^2$ and has a coastline of

480km. The population is about 3,000 but this increases considerably in the summer with many visitors, clearly adding to the traffic on the single track or twin track roads.

Otter road casualties are the most common non-natural cause of death in UK and since 1981 details of these deaths have been recorded on Mull. At first details were sketchy and difficult to obtain but a more detailed study was carried out from 1989 to 1994 and a report was produced (**Burch, unpublished 1996**). Records continued to be collated and in 2013 the Mull Otter Group was formed and a more detailed and intensive study commenced.

The Mull Otter Group has investigated different methods to reduce these fatalities including wildlife warning reflectors, signage and leaflets.

## METHODS

Local awareness of the study was created by an article in the local press and bi-monthly articles in island publications, together with talks to various groups and school visits. In addition, social media in the form of a web page, Facebook page and Twitter helped to raise awareness, and this all resulted in an increase in reporting of otter issues and in the number of carcasses received for examination.

When a dead otter was reported the site was visited and surveyed. As much information as possible was gathered on the events surrounding the incident, e.g. time of incident and where the otter crossed the road.

Details about the site were gathered by inspection and included aspects such as location of the nearest water course, water levels, nearest bridge, culvert or pipe under the road, particularly where the incident was a road traffic accident.

The otter was examined for basic data, tagged with an ID and frozen. When a number of otters were collected they were transported to The Cardiff University Otter Project (CUOP), or the Scotland's Rural College (SRUC) for subsequent post mortem/pathological examination. This protocol was agreed with CUOP, IOSF, SRUC and Scottish Natural Heritage – now NatureScot – with appropriate licences being issued.

A data base was formed, recording various available data including:

- Otter details (sex, age, etc.)
- Post mortem details
- Incident details
- Geographical details
- Meteorological details
- Tidal details
- Other relevant information

## MORTALITY DATA

The following figures illustrate the results of basic statistical analysis of data obtained from 1 January 2013 to 28 February 2023 with data given as the number, percentage e.g. 108, 75%. Data is shown as:

- Yearly total number of deaths from 1 January 2013–28 February 2023 (Figure 2)
- Monthly total numbers of deaths (Figure 3)
- Causes of death (Figure 4)
- Ages and gender of dead otters (Figures 5 and 6)
- Yearly number of road deaths (Figure 8)
- Monthly number of road deaths (Figure 8) with location (Figure 9).

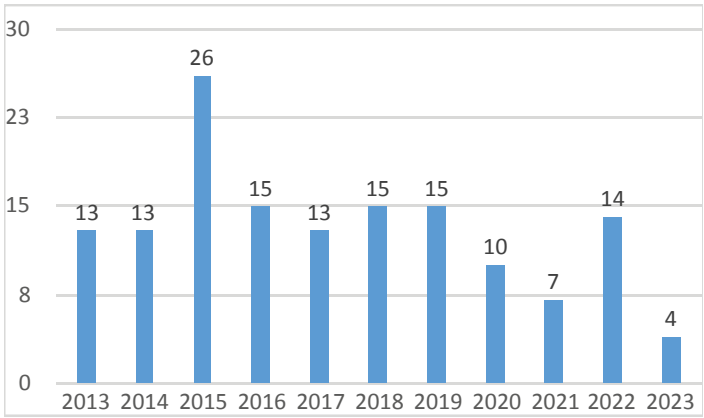


***Figure 2. Yearly total number of deaths from 1 January 2013–28 February 2023***

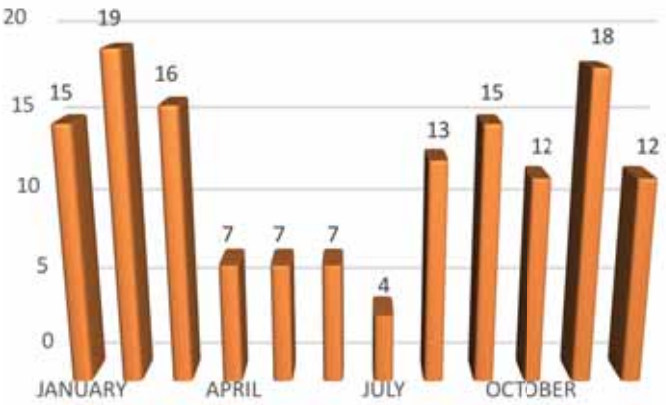


***Figure 3. Monthly totals of deaths***

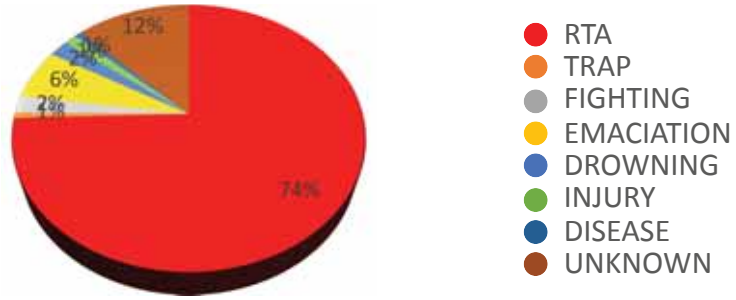


***Figure 4. Causes of death***

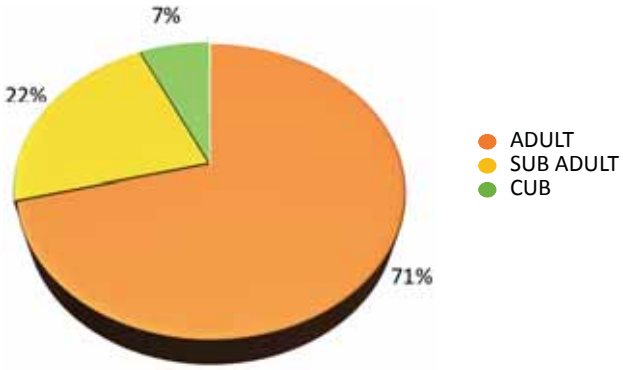


***Figure 5. Ages of dead otters***

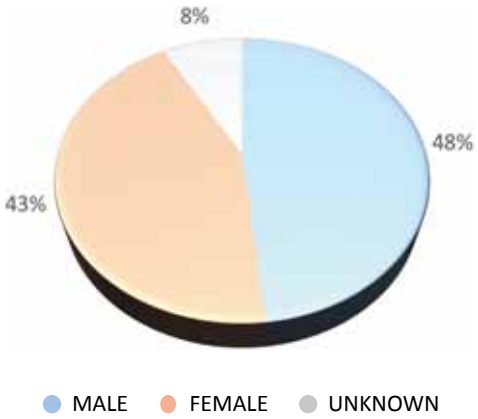


***Figure 6. Gender of dead otters***

The graphs in the Figures 7 and 8 detail data regarding road deaths alone.

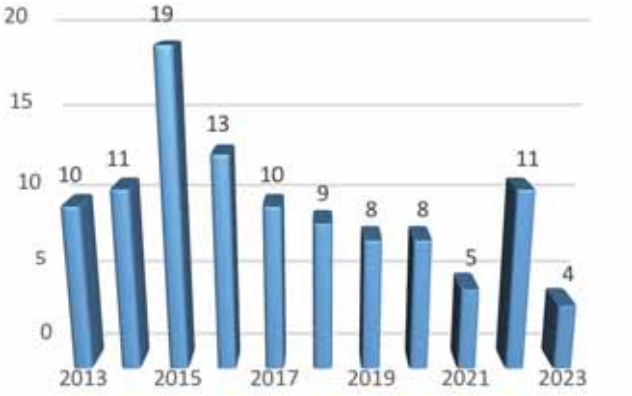


***Figure 7. Yearly total of otter road deaths***

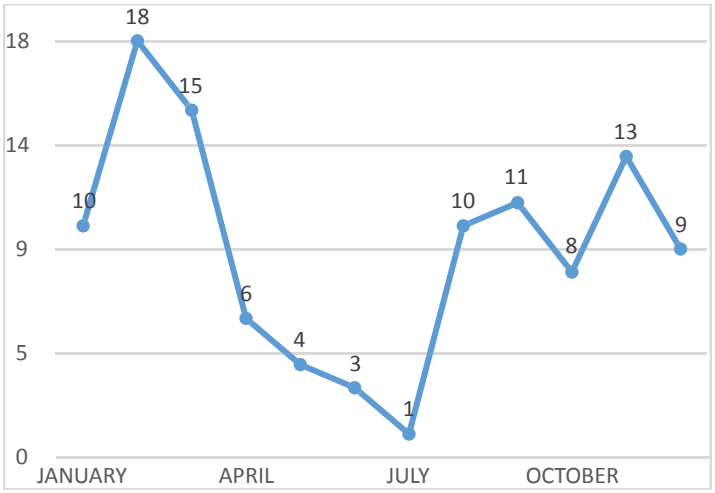


***Figure 8. Monthly number of otter road deaths***

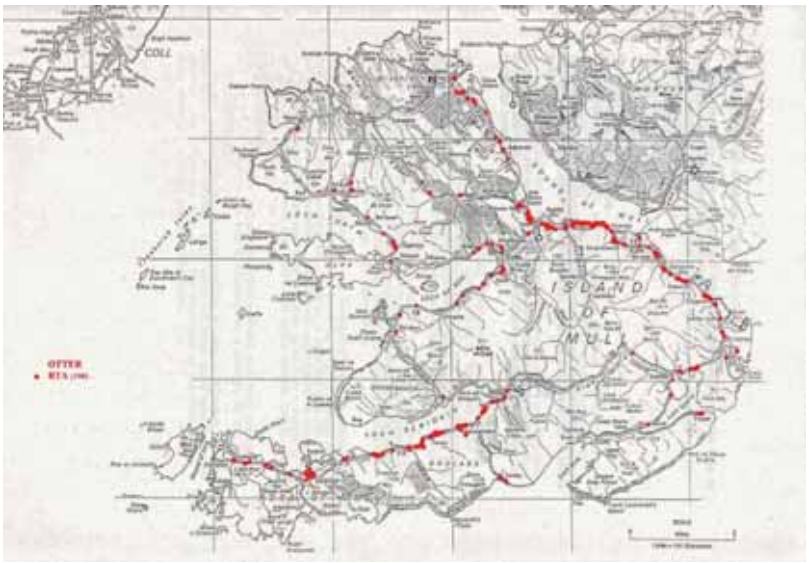


***Figure 9. Map of Mull showing locations of otter road deaths 1 January 1981–28 February 2023***

## OTTER WILDLIFE WARNING REFLECTOR PROJECT

Since 1981 reports of otter deaths on the Isle of Mull have been recorded and it has become evident that the major cause of reported mortality is road traffic collisions. A number of specific sites have been identified as “hot spots”, where a number of otters have been killed, or are frequently seen crossing the road. Wildlife warning reflectors can be used to distract animals in the hours of darkness or low light conditions. They work by reflecting the light from the headlights of a vehicle approaching from either direction. The light is reflected at right angles to the road and this startles an animal approaching the road from the verges, thus encouraging it to pause before continuing to cross the road.

In 2009 the Mull Bird Group raised funds and installed a number of reflectors at Salen, and Pam Brown compiled the resulting report (see Appendix A).

On road A848, South of Tobermory a number of wildlife warning reflectors have been installed to help prevent vehicle collisions with deer.

In 2013 the Mull Otter Group was formed and one of the group’s aims is to reduce otter deaths on the roads. Very little information or guidance could be found on the use of wildlife warning reflectors or how they should be installed to protect otters, therefore sites for a trial were identified, surveyed and reflectors installed at various heights and distances. These sites were:

- Fishnish NM 62978 43121
- Pennygown NM 61010 43313
- Garmony NM 68231 39327
- Ardlussa
  a) NM 69680 30747
  b) NM 69771 30801
  c) NM 69818 30841

Other potential sites include Pennycross, Killunaig, Beach, Loch Don and Salen; however, difficult geographical conditions could preclude installation.

Permission was obtained from Argyll and Bute Council to install the reflectors, and liaison with Council roads teams was carried out to prevent damage from Council activities such as roadside verge cutting.

Mull Otter Group raised funds from different sources including membership fees, personal donations, sale of goods, plant sales and attendance at shows. Wildlife warning reflectors were purchased, together with mounting posts and Mull Otter Group volunteers installed them. They are also maintaining them, cleaning reflectors and keeping grass and undergrowth cut short.

### *Reflector installations*

The wildlife warning reflectors used were Swarflex Wildlife Warning Reflector Model No 7172, (white level, Industrial Rubber Co). These were mounted facing away from the carriageway on round pressure-treated timber fencing posts at a height of either 75mm or 50mm. The costs were £25.00 each including posts (2016).

All reflector installations require periodic maintenance, cleaning lenses, cutting grass and undergrowth and checking the condition of both reflectors and wooden posts.

The data given below for dead otters is from 1983 when records began.

*Site 1: Fishnish*

Five otters were killed on the road A849 (a twin carriageway road) in the vicinity of a drainage culvert at grid reference NM 62978 43121 and a further two otters were killed very close to this point. As in many other locations on Mull, otters sometimes appear to use the culvert to get to the other side of the road, but also frequently cross the actual road at, or near to the culvert. Due to these occurrences, it was decided to install a number of reflectors centred on the culvert.

*Site 2: Pennygown*

Eleven otters were killed on the road A849 (a twin carriageway road) in the vicinity of grid reference NM 61010 43313. Although there is no one specific spot where several otters have been killed, this installation encompasses most of the recorded deaths in the vicinity (Figure 10 a and b). Earlier records did not have the more accurate 10-digit GPS grid reference, which has been available since 2013, and may therefore only be accurate to 100m.

***Figure 10. Reflectors at Pennygown: (a) showing reflector on post and 10(b) showing roadside positioning***

*Site 3: Garmony*

Three otters were killed on the road A849 (a twin carriageway road) in the Garmony area. On 16 February 2017 an adult female otter was killed on the road at NM 68231 39327, and she appeared to have two cubs around 10 months old. These cubs were observed to be active in the bay near to the site of their mother's death and were hopefully mature enough to survive.

An otter was also observed crossing the road at the same spot (believed to be one of the cubs). From this crossing point several paths lead up to the road and into a wet area and woodland.

On 4 May 2017 an adult female otter was killed at NM 68190 39373 which is 70m North of the previous otter road death. There are several crossing paths in the area but the main ones converge at the Southern end of the West side crash barrier. It was therefore decided to install reflectors at this spot in an attempt to prevent further deaths here.

Garmony was a difficult installation due to the presence of the Armco crash barrier, which is continuous on the East side of the road and has a tapering end on the West side. It was decided to install reflectors at ground level in eight positions and four above the height of the crash barrier, where there is no visual gap between the barrier and the ground (Figure 11).

***Figure 11. Reflectors beside road barrier at Garmony***

*Site 4: Ardlussa*

One otter was killed on the road A849 (a single carriageway road) at NM 69680 30747, a female with cubs (which are believed to have survived). A second otter was killed previously nearby. Otters have since been seen crossing the road at this location and at two further locations close to this point. As this area is frequently used by otters to cross the road, it was decided to install reflectors at all three points.

The details for each installation are shown in Table 1.

***Table 1. Details of reflector installations***

| Location | Date | Number | Post diameter | Spacing | Base above ground | Notes |
|---|---|---|---|---|---|---|
| **Fishnish** | 14/02/2016 | 20 each side of carriageway, 10 each side of culvert.<br>Total 40 | 75mm | 1.5m from carriageway. 2m apart | 15cm | |
| **Pennygown near quarry** | 27/11/2016 | 20 each side of carriageway.<br>Total 40 | 75mm | 1.5m from carriageway. 2.5m apart | 25cm | Location covered sites of two recent RTAs and several crossing places. |
| **Garmony West** | 18/03/2018 | 3 higher level | 75mm | 1.5m from carriageway<br>1.5m apart | 58cm | Behind crash barrier |
| | | 2 lower level | 50mm | 1.5m from carriageway | 15cm | On each side of visible otter pat at end of crash barrier |
| **Garmony East** | | 1 higher level | 75mm | 1.5m from carriageway | 60cm | |
| | | 6 lower level | 50cm | 1.5m from carriageway<br>1.5m apart | Ground level to maximise useable reflector area | Behind crash barrier<br>Grass and foliage must be kept low |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Ardlussa** | 18/03/2018 | Total 29 over 3 sites | 50mm | 1m from carriageway | 15cm | |
| **a) West site** | | 4 on S side and 4 on N side of road | | 1.5 m apart | | All centred on well-used crossing paths |
| **b) Middle site** | | 5 on S side, centred on culvert, 4 on N side of road – 1 each side of two offlets* | | | | |
| **c) East site** | | 5 on each side of road | | | | Centred on well-used crossing path |

*Offlets are drainage channels which cut across road verges to channel rain water off the roadway and into ditches.

***Follow up studies***

There are various potential problems which have to be considered:

- Damage from vehicles, council mowing activities, livestock and wildlife
- Human Interference – e.g. removing reflectors, vandalism
- Otters changing their crossing point: If otters are disturbed by the action of the reflector, it is possible that they may move the point at which they cross the road, hence rendering the reflectors redundant

Regular site inspections are made for maintenance and to ascertain if otter crossing paths and spraint sites are still being used both within and outside the actual sites. It has been found that pathways are still being used in line with normal otter activity.

People visiting the Mull Otter Group Facebook site have been asked to report if they spot any otters crossing near the reflectors. This provides information on visual sightings of otters crossing the road both at the reflector installations and nearby, both in daylight hours and when it is dark.

To date (28 February 2023) no further deaths have been reported in the four installation areas and otter pathways at reflector sites are still being used. Table 2 shows the number of incidents before and after installation of reflectors at each site.

*Table 2. Details of incidents at reflector sites up to 28 February 2023*

| Location | Dates | Number before installation | Number after installation |
|---|---|---|---|
| Fishnish | 1/01/1981–14/02/2016 | 2 | 0 |
| Pennygown | 1/01/1981–27/11/2016 | 11 | 0 |
| Garmony | 1/01/1981–18/03/2018 | 3 | 0 |
| Ardlussa | 1/01/1981–18/03/2018 | 2 | 0 |

## ROADSIDE SIGNAGE

In addition to reflectors, traditional roadside warning signs have been installed at various locations: Fishnish (Figure 12), Kinloch, Craignure, Salen North and Salen South (Figure 13 a and b). The distance between Salen North and Salen South signs is 1.2 miles.

***Figure 12. Roadside sign at Fishnish which includes the number of otters killed at that location since 2013***

***Figure 13. Roadside signs at (a) Salen North and (b) Salen South***

### *Results*

It is difficult to quantify how successful roadside warning signs have been in reducing otter road deaths. However, they do raise awareness of the issue and the likelihood of an otter possibly crossing the road in those areas.

Table 3 shows the number of deaths before and after installation of roadside signs at each site up to 28 February 2023.

***Table 3. Known deaths near roadside signs up to 28 February 2023***

| Location | Dates | Number before installation | Number after installation |
|---|---|---|---|
| Fishnish | 1/01/1981–24/08/2014 | 22 | 18 |
| Kinloch | 1/01/1981–24/08/2014 | 18 | 4 |
| Craignure | 1/01/1981–2/10/2016 | 7 | 1 |
| Salen | 1/01/1981–24/08/2019 | 15 | 0 |

There have been trials of different wording and distances covered by the warning signs. The sign that would appear to have most impact on people is the one at Fishnish detailing the numbers of otters killed on Mull's roads. This sign covers a large area of the A849 which appears to be the most dangerous area for otters on the island. However, unfortunately so far road deaths have not been reduced here as much as we would have hoped. The casualty in Figure 14 occurred before the additional "numbers killed" sign was added.

***Figure 14. Road casualty at the Fishnish sign 18 March 2016***

The two signs at Salen covering the area in which roadside reflectors were removed has so far seen no further deaths which is encouraging.

Unfortunately, at Kinloch one of the signs has been stolen and one damaged. One further sign has also been stolen and one vandalised.

Two further problems with the roadside signage are:

(1) People stop their cars near to the signs in order to take photos of the signs, sometimes causing disruption.

(2) People can be attracted to the area at the sign in order to attempt to see an otter, again sometimes causing disruption.

## OTHER WELFARE ISSUES

There is concern at the number of Mull otters where post mortem examination has identified emaciation as the probable cause of death (8.4%, CUOP). It has been noted that 12% (n = 18) of dead otters recorded on Mull have a condition index of 75% or lower. The body condition of dead otters was calculated as an index of body condition (*K*) for individual otters following the formulae described in **Kruuk, Conroy and Moorhouse, 1987.** These formulae were determined from those used by **Le Cren (1951)**.

There may be several causes for this, including prey availability, injuries including road and fight injuries leading to immobility, illness, and also disturbance leading to a reduction of productive foraging activities.

Human disturbance has been shown to have an effect on otter welfare. For example, two male adult otters were pushed along the coast towards each other by people's actions until they met and a fight ensued (personal observation). The number of incidents involving young otters being separated from the female by people's actions are increasing (personal observation).

Mull Otter Group with other partners are attempting to educate people on sustainable otter watching activities by personal interaction, information boards, leaflets (Figure 15), watching code of conduct and passing place warning signs (Figure 16).


***Figure 15. Information leaflet***


***Figure 16. Passing place warning sign***

## DISCUSSION

Recorded otter deaths continue to be around 15 per year. The Covid pandemic will have had an effect on the statistics of recent years with a reduction following lockdown restrictions followed by an increase in island visits due to removal of international restrictions. Road deaths have fallen but statistics in future years should provide a more accurate picture on how effective mitigation measures have been.

There has been much interest as to why monthly road death totals show a peak in Spring and Autumn. High water levels in culverts may be a cause but Mull has high river levels at other times of the year. Otters on Mull also tend to cross roads at many different places, often some distance from a stream. Culverts and river bridges are used at times but otters also come out and travel over the top of the same culvert or bridge to cross the road, regardless of water level. It is also probable that otter movements at twilight coinciding with routine journeys to and from places of work may be a factor.

Further research is being undertaken as to the use of offlets used by otters, which appear to play a part in otter road deaths. Otters appear to be travelling along ditches, up along offlet channels and emerge suddenly onto the road, resulting in head injuries when struck by vehicles.

It is hoped that analysis for the presence of pollutants in Mull's otters will take place in the future.

The issue of disturbance and its effects will continue to be addressed as it is likely to increase in years to come. Development with associated habitat loss, should also be monitored.

With the assistance of the International Otter Survival Fund (IOSF) and the Scottish Society for the Prevention of Cruelty to Animals (SSPCA) abandoned otter cubs and injured otters will continue to be assisted to recover where possible.

Mull Otter Group hope to continue promoting all the above otter welfare projects. Also by monitoring the otter population, education, giving talks to local groups, school activity days with practical site visits, open days, etc. this will raise awareness of and help address problems before they escalate.

**Acknowledgements**

My thanks go to Grace Yoxon and IOSF for their help in preparing this paper

**Disclosure Statement**

No potential conflict of interest was reported by the author.

**Author's biography**

NIGEL BURCH has been studying and recording many aspects of otter ecology on the Isle of Mull since 1981. He is a founding member of The Mull Otter Group as well as being a member of many other ecological groups. He is a Fellow of the Zoological Society of London. His time in retirement continues to be occupied by these studies and assisting in the rescue and recovery of otters in need of help.

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## Appendix A: Otter reflectors: a report by Pam Brown, 26 November 2010

In June 2009 the Isle of Mull Bird club accessed money from the MICT Eagle Fund. A sum of £363 was used to purchase forty otter reflectors to be put up on the road verges between Salen village and Aros Castle after up to eight otters had been killed around this stretch of road during the previous year. It was done in the hope of preventing the same happening again. The otter reflectors were put in place with the help of Argyll & Bute Council during the autumn of 2009. In July 2010 it was brought to the committee's notice that "at least 10 of the roadside otter warning reflectors/posts along Salen bay were smashed up by the road side grass cutter". An email was sent to Kaz Bailey of Argyll & Bute Council who replied that "the grass/bracken had grown around and was taller than the reflectors which made them difficult to see. Although the flail might have hit and damaged the first reflector accidentally, the operator would not then have continued and demolished the lot! A high number of vehicle drivers will often drive onto the verge rather than use the passing places; it is highly likely that they smashed up the reflectors." Kaz offered, as a gesture of goodwill, to pay for the replacement of the damaged reflectors and installation of same. The matter could not be discussed until we had a full committee meeting during September where it was agreed that we would need to walk the road to check how many reflectors have been damaged. In November 2010 Bird Club members Eileen Slorach and Tangye Johns walked the stretch of road where the otter reflectors had been placed and reported back that by this time there were only seven reflectors left standing and four mangled reflectors. They concluded that during a 12-month period almost all the otter reflectors had gone. The matter was again discussed at the November committee meeting and it was unanimously agreed that as almost all the reflectors had been damaged, if we tried to replace them, the same thing would almost certainly happen again. During the 12 months that the reflectors were in place no otters were reported killed on this stretch of road. This could be due to the fact that there were no otters there (as they had been killed the previous year) and wildlife tour operators agreed that otters were rarely seen in Salen Bay this summer. As the reflectors are so small and the growing grass and bracken covers them, it was decided that the efficiency of the reflectors was inconclusive.

# A REVIEW OF 30 YEARS OF RESCUE AND REHABILITATION OF EURASIAN OTTERS IN SCOTLAND

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## Abstract

*Data from two otter rescue and rehabilitation centres in Scotland were examined over a period of thirty years (1990–2020). The centres, namely International Otter Survival Fund (IOSF) and Scottish Society for the Protection of Animals (SSPCA), receive Eurasian otters (*Lutra lutra*) from both freshwater and coastal habitats with the majority of the IOSF ones being coastal and those taken to SSPCA from freshwater areas. The animals were admitted for a number of reasons including "abandoned" cub, road traffic casualty, bite wounds and snares. The data were examined for a number of factors – month of admission, reason for admission, habitat found, age when admitted, gender and outcome. Post mortems were carried out on many of the otters which died or were euthanised and causes of death were recorded.*

***Keywords:*** *Otter; rescue and rehabilitation; cub; post mortem*

## INTRODUCTION

The International Otter Survival Fund has been caring for orphaned and injured otters since it started in 1993, but as Skye Environmental Centre the author has received otters since 1988. The Scottish SPCA (SSPCA) has treated otters since 1991. Data from 1990-2020 was compared for the two centres and also the combined data set. Further information was supplied by **Rosemary Green** (**pers comm, 2023**) but this is not included in the detailed data analysis.

The IOSF centre is based on the Isle of Skye off the West Coast of Scotland, but receives otters from all over the UK and even had some from Ireland. The SSPCA centre was formerly based at Inverkeithing, northwest of Edinburgh in Fife, but in 2012 they moved to new premises at Fishcross in Clackmannanshire, Central Scotland. Rosemary Green worked for the Vincent Wildlife Trust in otter rehabilitation from 1985 to 1999 at Barrhill, near Girvan. The locations of these centres are shown in Figure 1.

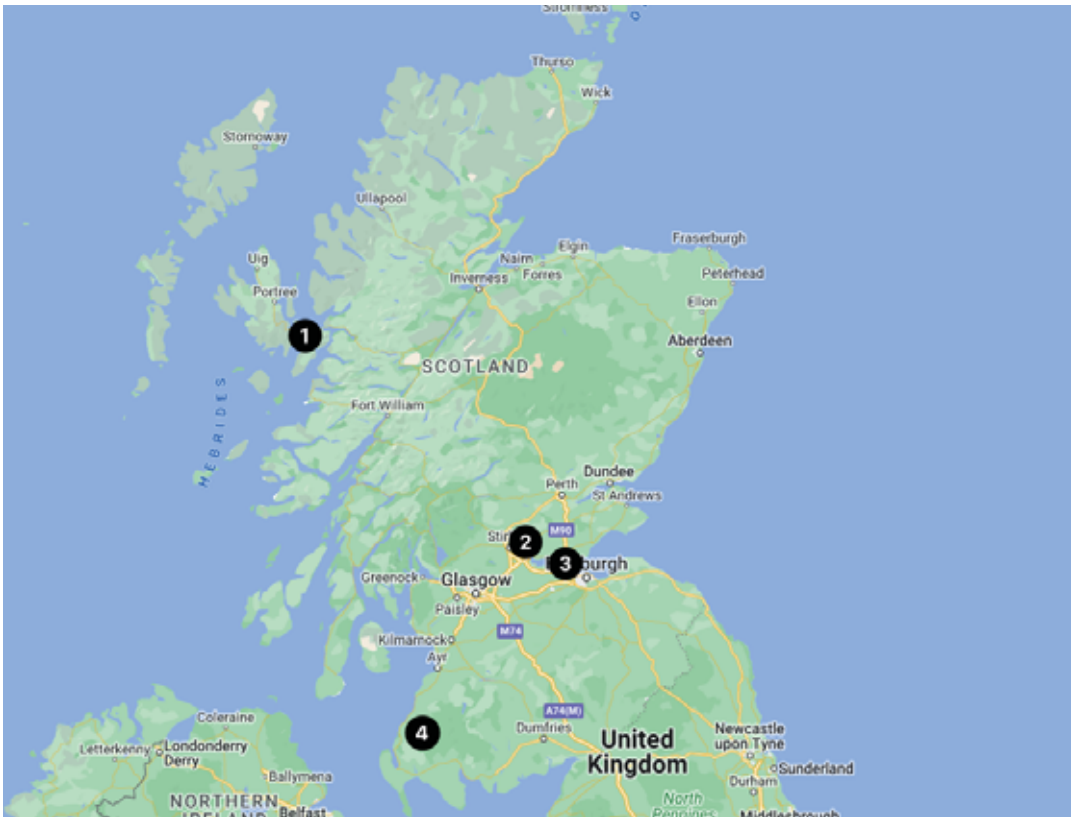


***Figure 1. Location of otter rescue centres supplying data for this study***

**KEY**
1. IOSF centre on the Isle of Skye 2. New SSPCA centre at Fishcross
3. Old SSPCA centre at Inverkeithing 4. Rosemary Green, Vincent Wildlife Trust at Barrhill.

Smaller numbers have also been treated in other centres such as Hessilhead Wildlife Rescue Centre, The North East Wildlife and Animal Rescue Centre (New Arc), Orkney Seal Rescue, Hillswick Wildlife Sanctuary, and South of Scotland Wildlife Hospital. The positive work of these centres must also be acknowledged.

In the UK the only native otter is the Eurasian otter (*Lutra lutra*) and the information in this paper relates only to this species. Other otter species have different requirements and their breeding pattern in the wild may also be different.

As with many other young mammals and birds which appear to be abandoned, it is very tempting for the finder to want to help and pick them up, even though the mother may be nearby. It is therefore important to advise them to leave the animal and monitor at a distance to make sure the mother can return. If the animal is clearly ill or in danger, as by the side of a road, or if it is clear that the mother is not able to return then the correct advice has to be given on how to pick it up and secure it for transfer to a specialist centre without putting the finder at risk of being injured.

Rescue and rehabilitation for otters is very different to that for most other wild animals, particularly in the care of “abandoned” cubs:

1. The young can be born in any month of the year so there is no “baby” season as for most wildlife casualties. This is clearly shown from the data on the intake of cubs (Figure 5).
2. The young remain with their mother for 12 to 15 months, even though they can usually hunt and feed themselves in the wild by the age of about six months. One theory for this is that the mother continues to offer them protection. However, it also means that the rescue centre must keep the animals until the normal age of dispersal to give them the best possible chance of survival. During this time human contact must be kept to a minimum to ensure the animal does not become tame in any way, which would prevent release.

This means that most otters are cared for in specialist centres like IOSF and SSPCA. Rosemary Green also cared for 142 otters between 1985 and 1999 whilst working with the Vincent Wildlife Trust. Of these 118 were small cubs or juveniles and the remaining 24 were adults. Ninety-one of the cubs were able to be released back to the wild.

It is important to point out that most people working in wildlife rehab are not vets but are capable of hand-rearing and nursing under the guidance of a qualified vet. The vet alone can diagnose and prescribe medication which may be administered by a rehabber under their direction. It is therefore vital that any rehab centre works in close partnership with a vet.

The principles of rearing abandoned otter cubs and caring for injured older animals have been documented in **Green, 1991** and **Yoxon, 2003** and so will not be covered here. Similarly, veterinary aspects of their care are covered in **Mullineaux et al., 2003**.

## METHODS

The data used here is from the SSPCA and IOSF with additional input from Rosemary Green. During this period, the number of otters taken into care at IOSF was 220 and at SSPCA it was 204, making a total of 424 animals. It is interesting to note that from 1990 to 2011 SSPCA received very few otters and in several years received none at all, giving an average of 3.26 otters per year over that 21-year period. From 2012 to 2020 the lowest number of otters received was nine (2014) and the highest was 25 (2015), giving an average of 17.22 over that nine-year period. Indeed, in 2011 only four otters were received and this rocketed to 19 in 2012! Over the same period, numbers received at IOSF were more variable with a low of one in 1994 and a high of 14 in 2009 and 2011 (Figure 2).

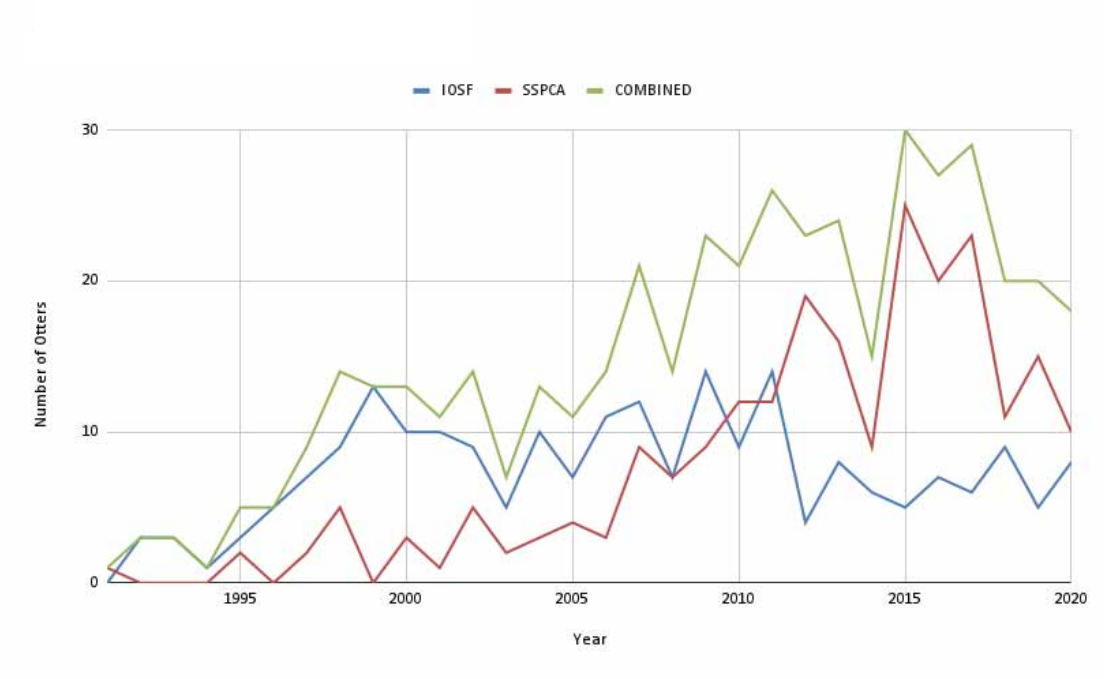


***Figure 2. Numbers of otters taken in by IOSF and SSPCA from 1990 to 2020***

In the early years SSPCA did not have facilities to finish the process of rehabilitation to release, so from May 2003 to January 2012, 31 otters were transferred to IOSF for the final process. In 2013 SSPCA opened their new facilities which enabled them to complete the rehabilitation and release which meant that these transfers were no longer necessary. To avoid repetition of data the otters transferred to IOSF from 2003 to 2012 have just been included in the IOSF data.

The data has been analysed under the following headings:

- **Month of admission**
- **Reason for admission** – "abandoned cub", road traffic casualty, bite wounds, infection, etc.
- **Habitat** – freshwater or coastal
- **Age** when admitted – cub, juvenile, adult
- **Gender**
- **Outcome**
- **Post mortem examinations**

## RESULTS

### *Month of admission*

In this study we have not differentiated between juveniles and adults for month of admission. By identifying cubs, it gives an indication of the breeding period.

Figure 3 shows that otters have been received at the rescue centres in every month of the year with the lowest intake during June/July. This is obviously the summer period when there is longer daylight and there are subsequently fewer road casualties. Day length in winter is considerably shorter so that animals are more at risk when crossing in the dark. Otters on the coast hunt throughout the 24 hours but otters in freshwater systems are generally more nocturnal and so they are potentially more at risk on the roads.

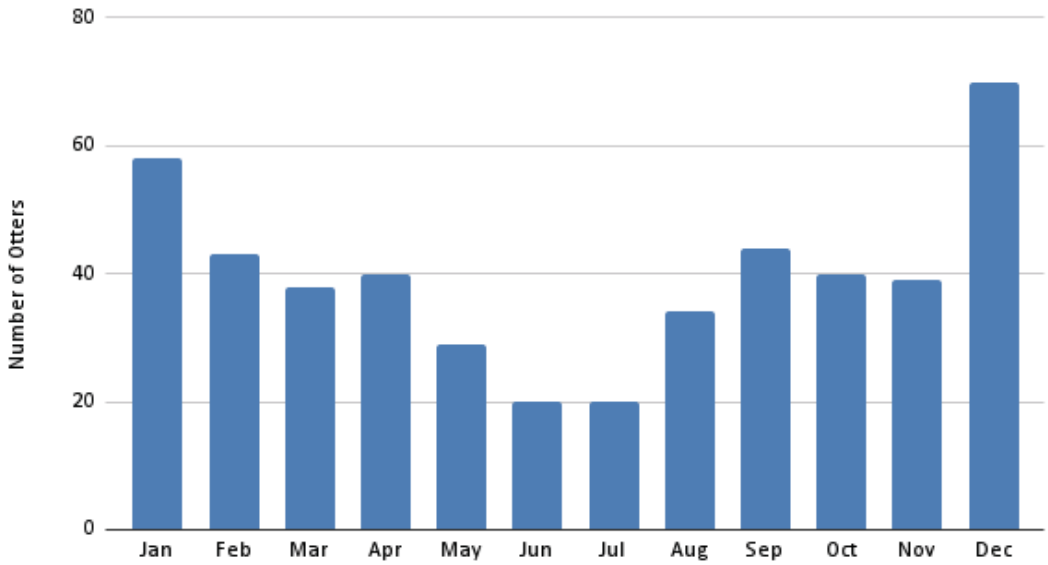


***Figure 3. Total monthly intake of otters***

If we separate the data into “juveniles/adults” and “cubs” there is a very different pattern (Figure 4). Again older otters have been received throughout the year but the main difference is in December and January, which is to be expected as mentioned earlier. The higher number taken in during September is curious and at this stage we cannot give a reason for it.

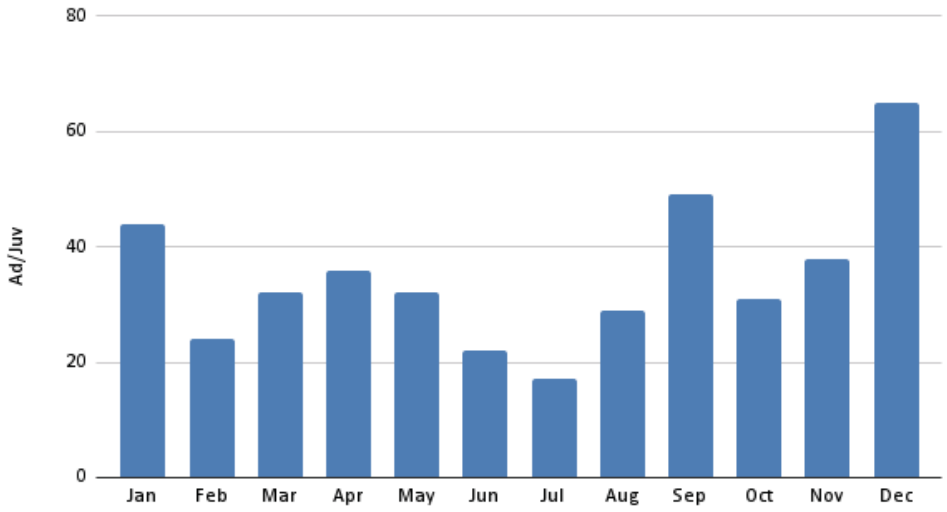


***Figure 4. Monthly intake of juvenile and adult otters***

When we look at cubs only (Figure 5), we can see again that they have arrived in every month of the year, confirming the lack of a breeding season for the Eurasian otter in Scotland.

The months of May to July see the fewest number of cubs and this is almost certainly because the weather is better for females to hunt and as day length is longer there are fewer road casualties. The highest intake of cubs is during January and February when weather conditions are considerably worse which can result in the female and cubs becoming separated.

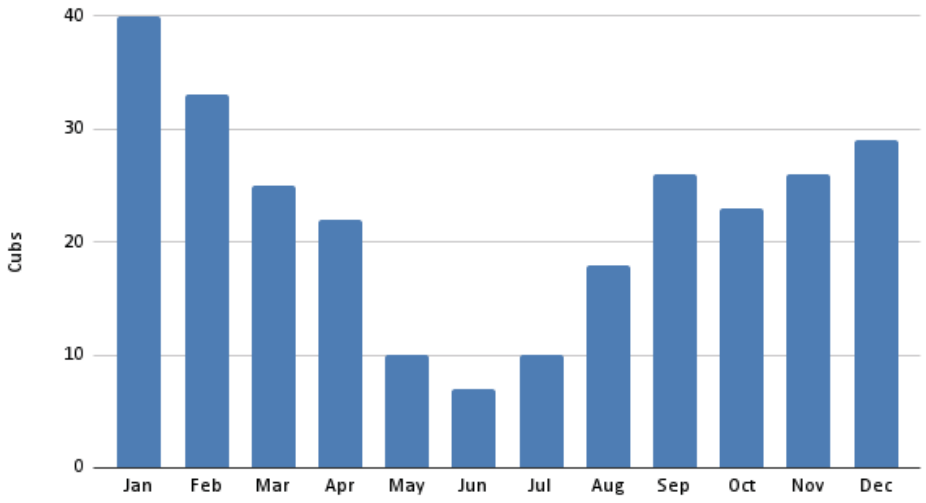


***Figure 5. Monthly intake of otter cubs***

### *Reason for admission*

There are several reasons for admission and these are shown in Figure 6.

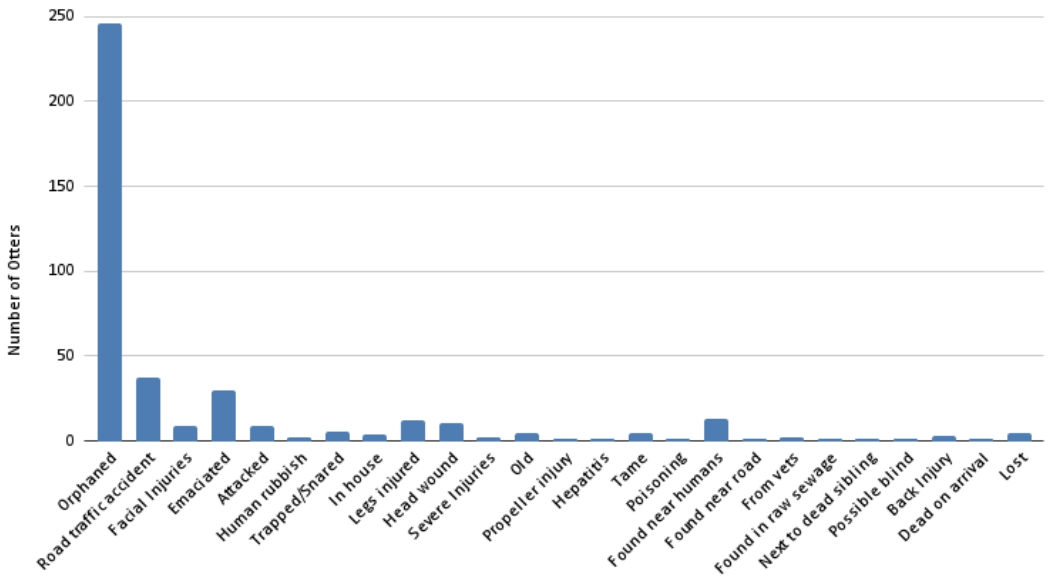


***Figure 6. Reasons for admission to the rescue centres***

In some cases there may be more than one cause, for example an otter that has been in a fight with another otter might find it hard to hunt and so will be emaciated as well as suffering from bite wounds.

Clearly the most common cause of admission is “orphaned”. Often it is not possible to know if a cub has actually been “abandoned” or “orphaned” but if there was no sign of the mother this has to be assumed.

Road casualties make up the second most common cause of admission, but this is considerably less as in most instances the otter is killed by the car.

Emaciation is the third most common cause for admission for the years studied. In a cub this could be because it has been separated from its mother for some time and is too young to fend for itself. In an older otter it may have been incapacitated in some way, for example as a result of a fight which has led to its inability to feed.

Although not actually a cause for admission, some otters may be found to carry a high parasite load with tapeworms and those in a poor condition will also have ticks.

Snares and traps are a serious threat to otters causing severe injury and death. In some instances, an otter may recover fully and be released to the wild, as in the case of an otter found in Kyle of Lochalsh and taken to the IOSF centre. In this instance it was not a snare but a plastic cable tie which had been around the animal’s neck for some time. It had cut deep into the neck, the head was swollen to twice its size and the otter

had difficulty breathing (Figure 7). However, once this was removed the otter quickly recovered and was released.

***Figure 7. Otter from Kyle of Lochalsh showing extreme swelling of the head***

On the other hand, an otter was found in north Skye with a snare around the middle of its body (Figure 8). This too had cut in deeply all around the body but with treatment the otter did show good signs or recovery. However, after two weeks it crashed and died. The post mortem revealed that the heart had become severely enlarged with the effort of pumping around the blood and this had been the cause of death.

***Figure 8. Otter from north Skye with snare injury***

According to the law all snares must be checked at least every 24 hours. In this case, it is clear that this had not been done. In these situations the incident should be reported to the Police Wildlife Liaison Officer for the area where it was found. This is also the case if poisoning is suspected.

***Habitat – freshwater or coastal***

Largely due to geography the majority of otters taken in by IOSF are from coastal habitats, whilst those treated by the SSPCA are mostly from freshwater habitats.

***Age when admitted – cub, juvenile, adult.***

**Sherrard-Smith and Chadwick** (**2010**) define cubs "as males weighing <3kg and females <2.1kg, and those with juvenile dentition."

They further state that "Sub-adults are males with a baculum (penis bone) length <60mm, and females with immature uteruses." However, this is based on dead otters presented for post mortem and therefore obviously cannot be used in rehab.

In this study it is largely the weight which is used to identify age class: cubs are under 2.5kg, juveniles from 2.5–4.0kg, and adults above 4.0kg. However, if an animal is clearly thin and underweight it may actually be an older animal and this is confirmed by the length from the nose to the end of the tail. Thus if an otter is approximately 1m long it is clearly an adult regardless of the weight.

Figure 9 shows that again the majority of otters taken to a rescue centre are cubs. Juveniles are generally 6–10 months and often arrive as they have somehow become separated from their mothers when they are still not able to look after themselves. This may be as a result of the mother being killed on the road or they may have become separated by flood. In these situations, the otters may well turn up in unusual places for example in a school, shed, garage, etc. IOSF even had an incident where an otter went through a cat flap and up onto the house-owner's bed! These animals are not usually tame or used to humans but they have just gone to these places for safety. They will often be emaciated but otherwise healthy and all that is necessary is to feed them and keep them until the appropriate age of dispersal.

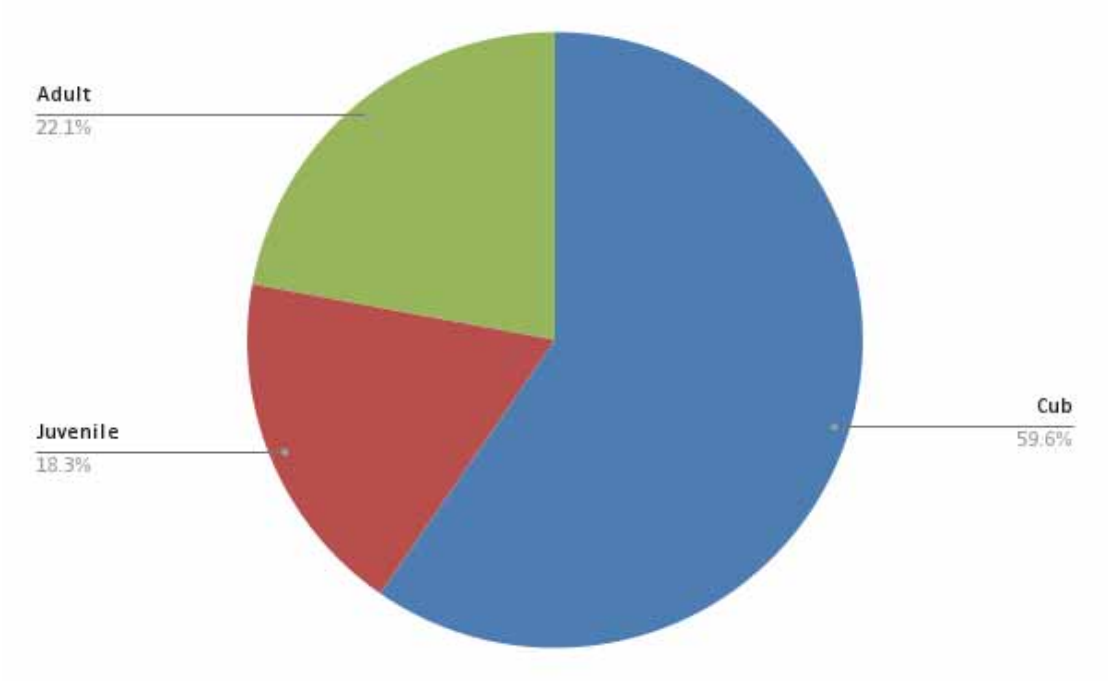


***Figure 9. Age of arrival of otters at the rescue centres***

### *Gender*

As would be expected, there is very little difference in the gender of otters coming into care (Figure 10).

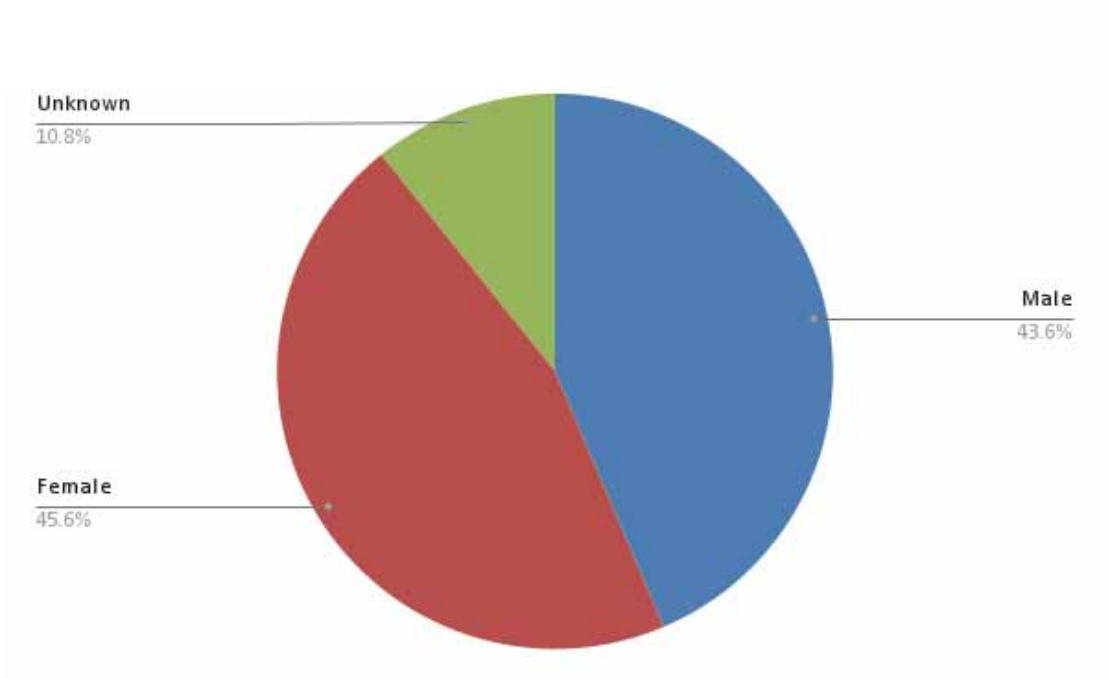


***Figure 10. Gender of otters received at the rescue centres***

***Outcome***

Figure 11 shows that the majority of otters taken into care are able to be released back to the wild. There are various well established protocols for hand-rearing otters (e.g. **Yoxon, 2003**) but if a cub comes in seriously compromised through having been alone for too long, it may not be able to recover. Road casualties and animals with serious bite wounds and other injuries may also not survive.

Unfortunately, euthanasia is necessary in cases where there is no chance of recovery or where the animal will be severely handicapped meaning that it cannot be released or there will be no quality of life. It is often difficult to assess whether an animal will survive or not: some may appear to be in reasonable condition on arrival but then "crash" due to some previously undetected cause. The outcome for others may not be optimistic but given a chance they may recover. For example, an adult female otter arrived at the IOSF centre after being hit by a car. The vet diagnosed radial paralysis but could not say whether the otter would recover or not. With careful nursing the otter quickly regained mobility and was fully fit and ready for release in three weeks! Any animal should be given a chance if there is a possibility of recovery and provided there are no welfare issues, such as extreme suffering. It is essential that any decisions regarding euthanasia are always made by the vet handling the case in consultation with the rescue centre.

If an animal is to be considered for release it must clearly be physically fit but other aspects are also import which must be assessed by the rescue centre:

- It is showing natural wild behaviour and the centre must therefore be fully aware of how the species acts in the wild.
- It shows no familiarity with humans such as going close for food.
- A suitable release site must have been identified with available prey, potential holt sites, minimal human activity such as roads, etc.
- Otters from freshwater areas should return to similar habitat and the same for coastal otters. Otters from islands, such as Mull, should return there.

In a few cases it is not possible to release the animal back to the wild. This may be because of physical disability or it may have become tamed in some way. An animal which has become used to people cannot be released as it can be a danger to the public if it goes up to someone seeking food. It can also be at risk from people who may attack it thinking it is dangerous. There are two main options for an animal which cannot be released: euthanasia or permanent captivity. If it is clear that the animal cannot have a proper quality of life then euthanasia is the only real option. However, if it can lead as normal a life as possible within a suitable enclosure then this may be a good outcome.

IOSF has not had many otters which could not be released. At present there is a female otter which was found aged about six months on the Isle of Mull and showed

no fear of people. It is believed that it may have been hand reared and then just dumped when as it grew out of being a suitable "pet". She has now been at the centre for three years and has certainly re-developed her dislike of people. However, she still cannot be released as she will not go in the water and so she stays in her large wild enclosure.

Another old male otter stayed at the centre for two years at the end of his life as he had very few teeth and so was unable to hunt.

SSPCA does not keep otters which cannot be released.

**Rosemary Green** (**pers comm, 2023**) had four which were not fit for release – three had physical disabilities and one seemed to want to be a "lap dog" with no encouragement by her whatsoever. These four otters went to a wildlife park.

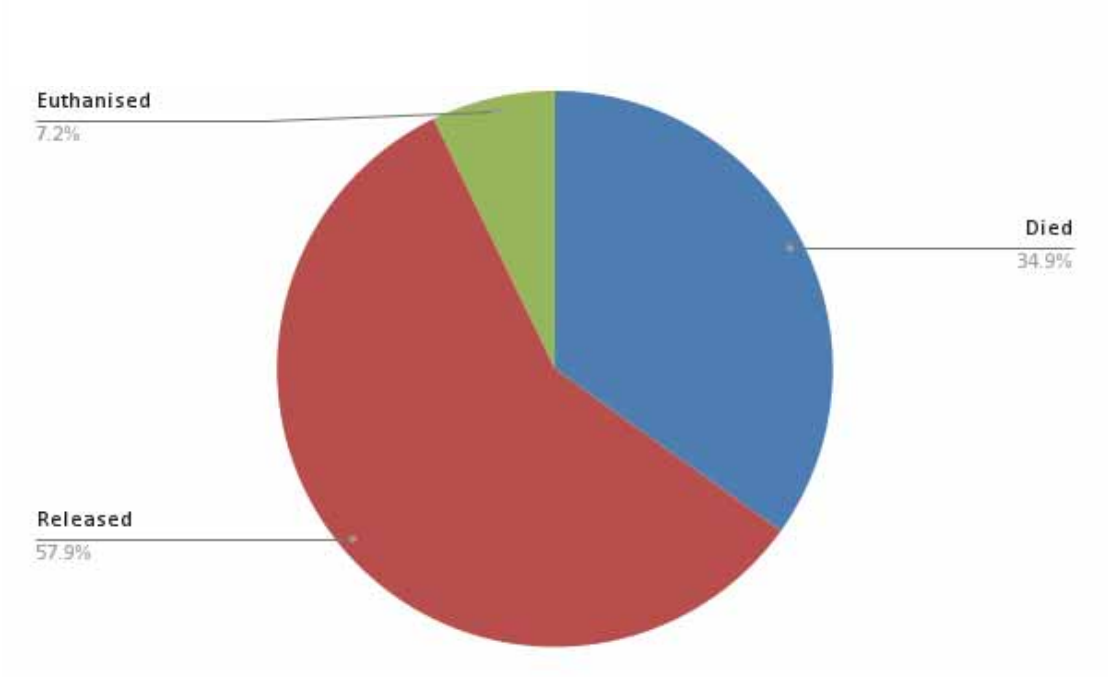


***Figure 11. Outcome of otters taken into the rescue centres***

Survival rates are generally lower in adults as they are already severely incapacitated upon arrival through injury, infection and/or disease. With cubs if they arrive quickly then their chances of survival are considerably higher.

### *Post mortem examinations*

Otters which die whilst in care are sent for post mortem to try and establish cause of death. This is important to detect any potential disease which may pose a threat to wild species and they may also reveal that the death was caused by human error at the rescue centre and this must be corrected for the future.

Over the years post mortem examinations have been carried out for IOSF by Vic Simpson (Wildlife Veterinary Investigation Centre), Scottish Agricultural College Inverness, Cardiff University Otter Project, Glasgow Vet School, and Scottish Rural College. Post mortems for SSPCA have been carried out by Romain Pizzi.

In many cases the exact cause of death cannot be identified. Looking at the cases where the cause of death has been identified, there are insufficient numbers to provide meaningful statistical analysis. So here we will look at the causes identified.

As with the reason for admission, there may be more than one factor which has caused death. An otter may become debilitated as a result of a fight or road incident and this will lead to a deterioration in condition. The actual cause of death may be emaciation but the previous incident has clearly led to this condition.

Cubs are very susceptible to infections such as pneumonia, digestive problems, etc. and their condition will deteriorate very rapidly.

### *Emaciation*

Post mortem studies do suggest that death as a result of emaciation is becoming more common. **Burch, 2023** found this to be the case on the Isle of Mull with 8.4% of otters submitted to the Cardiff University Otter Project showing emaciation to be the cause of death. Over the 30 years of the study 7.3% of otters admitted to the SSCPA and IOSF were because of emaciation. However, this is not really comparable with the Mull data which is purely from post mortem examination and some of the rescued otters did survive.

### *Road traffic mortalities*

Injuries caused by road traffic incidents include damage to the legs, back and head often with severe damage to the internal organs.

**Green, 2004**, estimated the number of otters killed on Scottish roads by recording numbers over a stretch of the A75 and extrapolating the number over the road network. Clearly different roads will have a higher level of wildlife mortality due to the speed of traffic and number of vehicles using the road. As has been mentioned the vast majority of otters which are hit by road vehicles die as a result and these are not included in the evaluation of causes of death here.

The deaths of these otters can have extensive repercussions as if it is a female with young, then the cubs will die unless found quickly and taken to a rescue centre. In one unfortunate incident recently on Skye, a mother and her cub were both found dead on the road in north Skye (Figure 12 a and b). If otter numbers in the area are low it may be some time until these animals are replaced and this therefore has an impact on the local population.

***Figure 12. (a) Female and cub found on the road in north Skye (b) showing relative size of cub to mother (b).***

Photo (C) Gill Williams

There are various methods of mitigation for such road deaths and the subject is covered by **Grogan et al.** (**2013**), so will not be covered here.

### *Wounds*

These may have been the result of a dog attack or from a fight with another otter. Otter fights can cause severe injury to the face and also to the genitalia. **Simpson** (**2005**) described the threat from wounds and the detailed examination needed to find bite wounds.

### *Snares*

Some otters have arrived at rescue centres with horrific injuries caused by snares. Some may recover as mentioned above but in more cases the injuries are so severe that the animal has to be euthanised.

***Septicaemia/toxaemia***

This was diagnosed in one male cub taken to the SSPCA centre. **Hypoglycaemia** is not particularly uncommon in dogs but it has not been identified in many wild animals. Again there are various causes but it can be associated with sepsis.

***Hepatitis***

This was found in one female cub from the Isle of Harris.

***Central neurological problems***

There are various central neurological problems which have been identified in otters **(Jacques, 2003)**.

**Hydrocephalus** in otters is not easy to diagnose except through post mortem as the characteristic "dome-shaped" skull is often not evident. **Green (pers comm, 2023)** received three cases, all of which had been alive on arrival but had to be euthanised. One from Tiree also had microscopic eyes and a distorted jaw in addition to the hydrocephalus. In nature, a mother animal will often know that something is wrong with a cub and that it will not survive and so she will deliberately abandon it. This was the case with one cub received by **Rosemary Green** (**pers comm, 2023**).

Cubs with hydrocephalus may be blind and/or deaf and do not present "normal" behaviour including difficulty in sucking and swallowing, chewing on a bowl, poor co-ordination, walking round in circles. IOSF found that even though a cub was apparently feeding well it did not put on any weight and following post mortem hydrocephalus was found. Green recommended that if a cub is exhibiting such traits it should be x-rayed and assessed for hydrocephalus by comparison with a "normal" skull.

In total there have been seven cases recorded – three from Rosemary Green (all female) and two each from SSPCA (one male and one female) and IOSF (one male and one female). Thus out of these seven cases five were female and two were male, but the sample number is too small to be certain if this is statistically significant or not. This is out of a total of 344 cubs (Rosemary Green – 118, SSPCA – 89, and IOSF 137). Thus the percentage is 2.03%. **Jacques** (**2003**) points out that this seems high compared to humans where hydrocephalus occurs is one per 1,000 births i.e. 0.1% but it is found more frequently in some other animals, such as dogs. The possible causes of hydrocephalus are various – it can be congenital or caused by injury. As the cases mentioned here were all in cubs we can assume that it was congenital.

**Meningitis and encephalitis** often occur together in the form of meningocephalitis but the frequency of occurrence appears to be fairly low. Again there can be various causes including bacterial infection and of the 26 cubs treated for infected bites by Rosemary Green, one died from meningitis resulting from a superficial bite on the

face infected with a group G *Streptococcus*. In 2002, IOSF received two cubs which died – one of meningitis and one of encephalitis.

### *Unusual cases*

**Tyzzers disease** was confirmed in a cub at IOSF which came from the Isle of Harris (**Simpson et al., 2008**). The female cub was weak upon arrival but showed no sign of disease. Following rehydration with electrolytic fluids it started to eat fish on its own on day two and it continued to improve. IOSF has a policy of quarantining all new admissions for two weeks and after that time it was put in with another cub of a similar age. After 16 days it developed bilateral corneal oedema which was treated. The cub continued to eat well but died unexpectedly on day 26. This was the first record of Tyzzer's disease in an otter and indeed the first in a wild animal in Britain.

**Intussusception** was found in a cub taken in by **Rosemary Green (pers comm, 2023**). This is a condition which is most commonly associated with some problem that causes inflammation of the intestine (enteritis).

**Pemfigous foliaceus** is an autoimmune condition that causes painful and itchy blisters and sores on the skin and a family of three all died of this (**Rosemary Green, pers comm, 2023**)

## DISCUSSION

It is clear from the results that otters are taken into rehabilitation centres for a number of reasons, the most common being "orphaned" or apparently so. The public nearly always wants to "act" when they find a baby animal or bird on its own even when this is not necessarily the right thing to do. In the case of otters, the mother may be away feeding so it is important to advise any person finding a cub to leave it and monitor it at a distance.

Injured animals of any age can pose a risk to any person attempting to help and so people should be advised not to touch unless they have experience with otters and/or are suitably equipped to do so safely. Specialist equipment such as a grasper may be needed and it is important that the handler knows how to use this properly.

Transport to a centre is another consideration. A young cub can be safely carried in a cat carrier but older otters need a stronger carrier, such as a varikennel. The animal must be kept warm but well ventilated and the transport time should be kept to a minimum with frequent stops to check on its well-being.

The importance of post mortem examinations cannot be overstressed. Firstly they are necessary to improve our knowledge about neurological otter diseases, such as hydrocephalus. Secondly, they provide a means of monitoring the health of the population in the wild.

To date Bovine Tuberculosis (TB) has not been identified at any of the rescue centres in this study. However, it was recorded by **Lee et al. (2009)** in Northern Ireland.

**Simpson (2009)** reported on his post mortem examination of 690 otters during which any suspect TB lesions were examined histologically and tissue samples collected for further analysis, but these all proved negative. Both authors concluded that the occurrence of the Bovine TB in the otter from Northern Ireland was the result of contact between otters and badgers carrying TB but it is always essential to be vigilant.

Although none of the centres in this study have yet found rabies it has been confirmed very rarely in wild otters (**Muller et al., 1998a, 1998b**). Similarly, canine distemper virus (CDV) and phocine distemper virus (PDV) could possibly appear in otters brought into care. During the PDV outbreak in Denmark six otters were found showing no signs of the illness but it was found at post mortem (**Madsen et al., 2002**).

At the time of writing, Avian Flu is still a concern in wild bird populations, but it has also been found in a few otter cases (**DEFRA, 2023**). Laboratories undertaking post mortems on otters are now observing strict protocols including testing for Avian Flu before carrying out the full examination.

## LIMITATIONS

In any study of this kind there are certain limitations, particularly when data comes from different sources, in this case from SSPCA, IOSF and Rosemary Green. Nowadays data is largely recorded digitally which allows for easier comparison through statistical analysis, but over the period covered much of the information will have been recorded on paper. Some of this may have been converted to a digital format but not all and some paper copies have been lost or destroyed.

There are also differences in recording data. For example, IOSF divides the otters into three age classes (cub, juvenile, and adult). The SSPCA data also records cubs, juveniles, and adults but in some instances cubs seem to be classed as juveniles while still only weighing just over 1kg. However, as the weight is given in most cases this can be checked.

The identification of the habitat from which the otter came can be difficult to ascertain. For example, it may only be recorded as “Caithness” which could be freshwater or coastal. Similarly, a cub from Aberdeen or St Andrews could come from either habitat.

## CONCLUSIONS

From this study there are a number of conclusions which can be made:

1. Otters have been received in every month of the year. This includes cubs, which confirms that there is no breeding season for Eurasian otters in Scotland. This may not be the case in other areas of their distribution.

2. The most common reason for admission is “orphaned” or abandoned cub, followed by road traffic casualty and emaciation.
3. The habitat from where the otters originate at the two main centres is largely governed by geography.
4. It is mostly cubs which are admitted as injured adults will often hide away and die.
5. There is no bias regarding gender of otters taken into care.
6. The majority of otters which are admitted are released but it is vital that post mortems are carried out on those which do not survive.
7. Otters can be effected by a number of diseases and rehabilitation centres must take care that there can be no onward transmission to either wild or domestic species.

**Acknowledgements**

We would like to thank the various people who have been working in otter rescue and rehabilitation who have shared their information with us. We are also grateful to the various vets and veterinary pathologists who have enabled us to carry out this work.

We would finally like to thank Kirsty Yoxon, for her help with analysing the data.

**Disclosure Statement**

No potential conflict of interest was reported by the authors.

**Author Biographies**

GRACE M YOXON is the Director and co-founder of the International Otter Survival Fund, which was established in 1993. She has carried out many otter surveys and co-organised training workshops in Asia, Africa, and South America. She has also been responsible for the day-to-day running of the specialist otter hospital since 1998, initially through Skye Environmental Centre.

Dr ROMAIN PIZZI is a Royal College of Veterinary Surgeons Recognised Specialist in Zoo and Wildlife Medicine, and the world’s leading expert in wildlife surgery. He has been an honorary professor in zoo and wildlife medicine at the University of Nottingham for 15 years, and has taught and mentored wildlife veterinarians from around the globe. He was a specialist surgeon at the Royal Zoological Society of Scotland for a decade, provided the veterinary service at the SSPCA National Wildlife Rescue for 18 years and was previously the pathologist at the Zoological Society of London’s London Zoo. He has worked with conservation charities, wildlife rescue and rehabilitation centres, and zoos across the world in over 30 countries.

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# LONG TERM MONITORING OF EURASIAN OTTERS ON THE ISLE OF SKYE, SCOTLAND

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**Abstract**

*Research on the Isle of Skye, Scotland, was carried out from 1991 to 1999 and this resulted in a model for estimating otter numbers using different factors of the coastline such as geology, width of the intertidal zone, intertidal makeup, slope of coastline, inland vegetation, and number of freshwater pools. One of the most important factors is the geology which influences many of the other parameters. A 10-year study has been carried out since 2014 in order to monitor the Skye otter population and sites are visited on the different geological zones to ascertain if holts are active or inactive.*

***Keywords:*** *Eurasian otter; geology; holt; spraint; coastal*

## INTRODUCTION

The Isle of Skye is located on the northwest coast of Scotland (Figure 1).

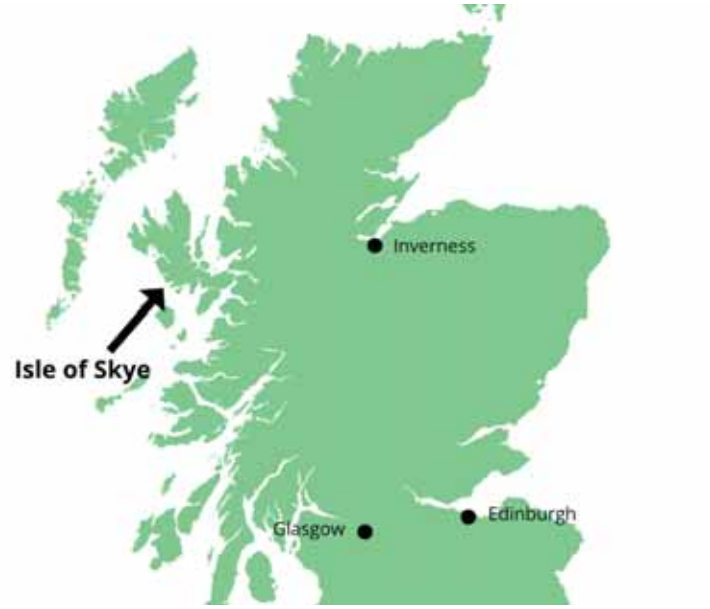



***Figure 1. Location of the Isle of Skye on the northwest coast of Scotland***

There is a healthy population of Eurasian otters (*Lutra lutra*) which use the coastline. However, there is increasing pressure on the island and its environment through more fish farming, house construction and a rapid rise in tourist numbers bringing more road traffic. It is therefore vital to monitor the state of the otter population in order to identify any steps which may become necessary for their conservation.

Skye is unique among the Hebridean islands for its variety of geology and landscape which has resulted in a diverse range of coastal types. For the purposes of this study the coastline was divided into seven geological zones as used in earlier research (**Yoxon, 1999**) and areas were monitored in relation to these geological coastal zones (Figure 2).

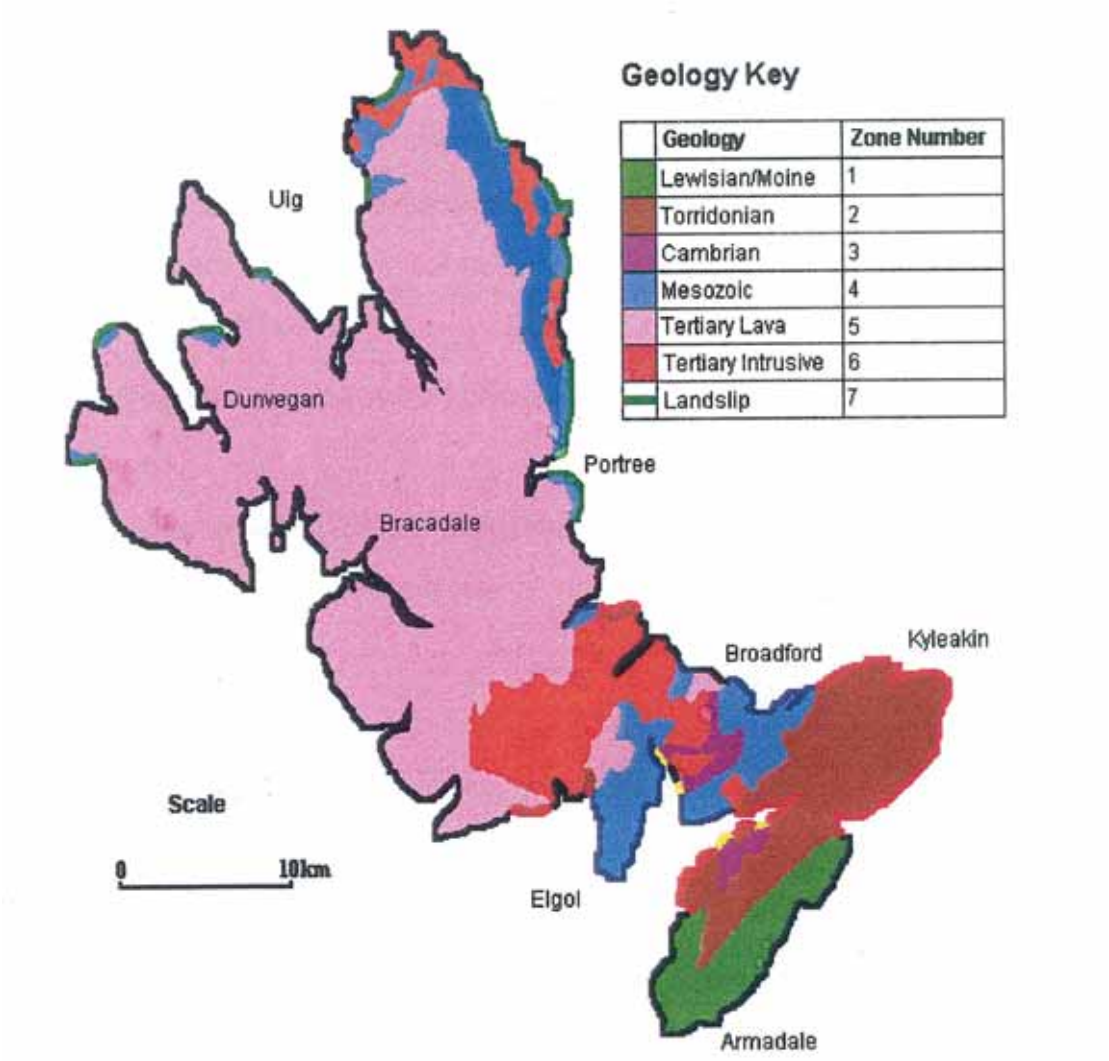



***Figure 2. Geological map of the Isle of Skye, showing the seven geological coastal zones***

In 1999 the author obtained a PhD on the "Effect of geology on the distribution of the Eurasian otter around the Isle of Skye coastline". An initial survey had been carried out and reported in **Yoxon and Yoxon (1990)** and the detailed research was started in 1991, which revealed a variation in distribution on different coastal types. Factors like geology, width of the intertidal zone, intertidal makeup, slope of coastline, inland vegetation, and number of freshwater pools can all influence otter distribution.

A quantitative method based on a logistic regression model was applied to take into account three scalable and four categorical environmental variables which may or

may not affect otter distribution (**Norusis, 1994**). Otter presence or absence in 500m coastal sections was compared with binary dependent variables and a set of independent variables on 622 coastal sites.

Analysis showed that this method can be used to characterise combinations of factors to predict if otters are likely to occur on a particular coastline (**Yoxon, 2013**). Geology, height 25m above High Water Mark (indicating slope of coastline), and the number of freshwater pools all affect otter utilisation of the coastal zone. Coastlines with Torridonian sandstones and Mesozoic sedimentary rocks and the landslip area show a positive effect on otters, while all other coastlines have a negative effect (**Yoxon, 1999**). Although primarily of theoretical importance, the model could be used as a tool to locate coastlines in other areas which are of potential conservation importance for otters.

It is possible to obtain a figure for the otter population based on a correlation between active otter holts, resident females and males. (**Kruuk et al., 1989**). Sites used by otters as holts are very variable and for the purpose of this study are defined as tunnel systems with signs of regular use by otters. The main evidence for an active holt is in the form of spraint, i.e. the droppings of the otter which include the undigested hard parts of the prey. The evidence of use consisted of tracks, flattened grass, fresh spraints, and the characteristic odour in the holt. On Skye, holts are found predominately in rock piles within 50m of the shore. If two holts are more than ten metres apart, they are considered separate. Holts are often very conspicuous, with well-marked spraining points and prominent green grassy areas as a result of the nutrients in the spraint. The earlier research produced a total population for Skye and its adjacent islands of 353 otters (**Yoxon, 1999**).

## METHODS

Following the earlier work there has been regular monitoring of holts at selected sites to see if any change in usage has taken place and thus has there been any change in the population? This monitoring included the use of camera traps at some sections. This was turned into a research project in 2014 and there has since been monitoring of holt activity on an annual basis.

Each section is visited once each year and as far as possible this takes place at about the same time of the year. This is to remove any possible change in usage which could take place according to the season.

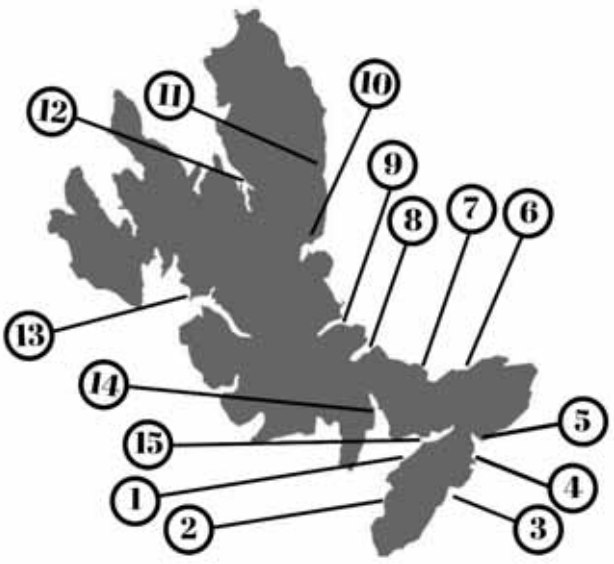
The sites are recorded using GPS and each is noted as being active or inactive. An active holt is recognised by the presence of recent spraint. There have been various discussions about the use of spraint to monitor populations and it is generally concluded that it cannot be used to give actual numbers (**Conroy and French, 1987; Kruuk and Conroy, 1987; Yoxon and Yoxon, 2014**). However, for this project the presence or absence of recent spraint is being used to identify activity at holts.

The geology of the coastline and the sections surveyed is shown in Table 1.

***Table 1. Geological Time Scale. The seven zones used in this study are shown in the column marked "coastal zones". Ages for the geological periods are shown in millions of years and represent when the corresponding geological period begins.*** Data based on Eager and Dunning (1992).

| YEARS (million) | PERIOD | EPOCH | COASTAL ZONES ON SKYE |
|---|---|---|---|
| 1.64 | Quaternary | Cainozoic | Landslip |
| 65 | Tertiary | | Tertiary intrusive rocks<br>Tertiary lavas |
| 146 | Cretaceous | Mesozoic | Mesozoic sediments |
| 205 | Jurassic | | |
| 251 | Triassic | | |
| 290 | Permian | Upper Palaeozoic | |
| 353 | Carboniferous | | |
| 395 | Devonian | | |
| 439 | Silurian | Lower Palaeozoic | |
| 510 | Ordovician | | |
| 550 | Cambrian | | Cambrian sediments |
| Older than 550 | Pre-Cambrian | | Torridonian sandstones |
| | | | Lewisian/Moine metamorphic rocks |

Figure 3 shows the locations of the sections surveyed and Table 2 relates this to the geology.




***Key***
1. *Ord*
2. *Tarskavaig*
3. *Knock*
4. *Loch Na Dal S*
5. *Loch Na Dal N*
6. *Ard Nish/Lusa*
7. *Sgianadin*
8. *Loch Ainort S*
9. *Loch Ainort N*
10. *Portree*
11. *Bearreraig*
12. *Kensaleyre*
13. *Eabost*
14. *Torrin*
15. *Drumfearn*

***Figure 3. Location of sections surveyed***

***Table 2. Geology of the sections surveyed and number of holts***

| LOCATION | GEOLOGY | NO OF HOLTS |
|---|---|---|
| Tarskavaig | Tertiary lava | 2 |
| Knock Bay | Lewisian gneiss | 2 |
| Drumfearn | Torridonian sandstone | 2 |
| Loch na Dal (North) | Torridonian sandstone | 5 |
| Loch na Dal (South) | Torridonian sandstone | 3 |
| Torrin | Cambrian sediments | 2 |
| Ord | Cambrian sediments | 1 |
| Ardnish-Lusa | Mesozoic sediments | 7 |
| Sgianadin | Mesozoic sediments | 1 |
| Loch Ainort (North) | Intrusive igneous rocks | 2 |
| Loch Ainort (South) | Intrusive igneous rocks | 2 |
| Kensaleyre | Tertiary lava | 1 |
| Eabost | Tertiary lava | 1 |
| Portree | Landslip | 1 |
| Bearreraig | Landslip | 3 |

## RESULTS

Table 3 shows the activity recorded at each of the holts surveyed over the 10-year period and Table 4 shows the total number of active and inactive holts over the years. This is shown graphically in Figures 4 and 5.

***Table 3. Sections and holts surveyed each year from 2014–2023 (A = Active, N = Not active)***

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|
| **SECTIONS** | | | | | | | | | | |
| **Tarskavaig** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| Holt 2 | A | A | A | A | A | A | A | A | A | A |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Knock** | | | | | | | | | | |
| Holt 1 | N | N | A | A | A | A | A | A | A | A |
| Holt 2 | A | A | A | A | A | A | A | A | A | A |
| **Drumfearn** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| Holt 2 | N | N | N | N | N | N | N | N | N | A |
| **Loch na Dal North** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| Holt 2 | A | A | A | A | A | A | A | A | A | A |
| Holt 3 | A | N | N | N | N | N | N | N | N | N |
| Holt 4 | A | A | A | A | A | A | A | A | A | A |
| Holt 5 | A | A | A | A | A | A | A | A | A | A |
| **Loch na Dal South** | | | | | | | | | | |
| Holt 1 | N | A | A | N | N | N | N | N | N | N |
| Holt 2 | N | N | N | N | N | N | N | N | N | N |
| Holt 3 | A | A | A | A | A | A | A | A | A | A |
| **Torrin** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| Holt 2 | A | A | A | A | A | A | A | A | A | A |
| **Ord** | | | | | | | | | | |
| Holt 1 | N | A | A | A | A | A | A | A | A | A |
| **Ardnish-Lusa** | | | | | | | | | | |
| Holt 1 | N | N | A | A | A | N | N | N | N | N |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Holt 2 | A | A | A | A | A | A | A | A | A | A |
| Holt 3 | N | A | A | A | A | A | A | A | A | A |
| Holt 4 | A | A | A | A | A | A | A | A | A | A |
| Holt 5 | N | A | A | A | A | A | A | A | A | A |
| Holt 6 | A | N | N | N | A | N | A | N | N | N |
| Holt 7 | A | A | A | A | A | A | A | A | N | A |
| **Sgianadin** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| **Loch Ainort North** | | | | | | | | | | |
| Holt 1 | A | A | A | N | A | A | A | A | A | A |
| Holt 2 | A | A | A | A | A | A | A | A | A | A |
| **Loch Ainort South** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| Holt 2 | | | | A | N | N | N | N | N | N |
| **Kensaleyre** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | N | A | A | A |
| **Eabost** | | | | | | | | | | |
| Holt 1 | N | A | A | A | N | A | A | A | A | A |
| Holt 2 | N | A | A | A | A | N | A | A | A | A |
| **Portree** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | A |
| **Bearreraig** | | | | | | | | | | |
| Holt 1 | A | A | A | A | A | A | A | A | A | N |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Holt 2 | A | A | A | N | A | A | N | A | A | A |
| Holt 3 | A | A | A | N | N | N | A | N | N | N |

***Table 4. Holt activity on the Isle of Skye***

| | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** |
|---|---|---|---|---|---|---|---|---|---|---|
| Active | 25 | 29 | 31 | 28 | 29 | 27 | 28 | 28 | 27 | 28 |
| Not Active | 7 | 6 | 4 | 8 | 7 | 9 | 8 | 8 | 9 | 8 |

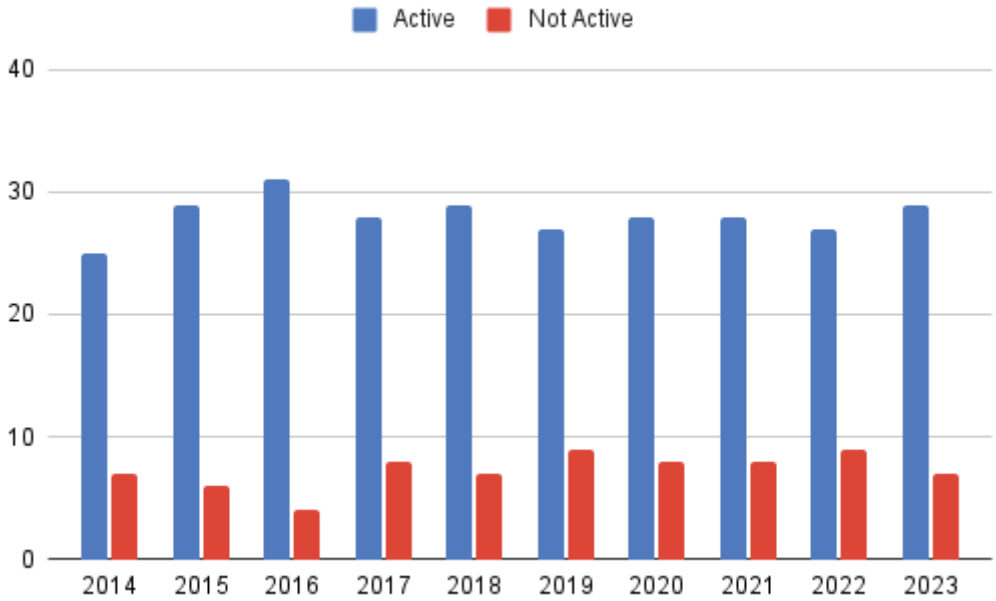



***Figure 4. Otter holt activity during the study period***

A Pearson's Chi-squared test was applied to the data in order to evaluate how likely it is that any observed difference arose by chance:

X-squared = 2.4571, df = 9, p-value = 0.982

This indicates that the test statistic is 2.4571 and the degrees of freedom are 9. The p-value is 0.982, which means that there is no significant difference between the observed and expected frequencies at the alpha = 0.05 level. Since we get a p-value of more than the significant level of 0.05, we accept the null hypothesis of no difference between the distribution of "Active" and "Not Active" over the years.

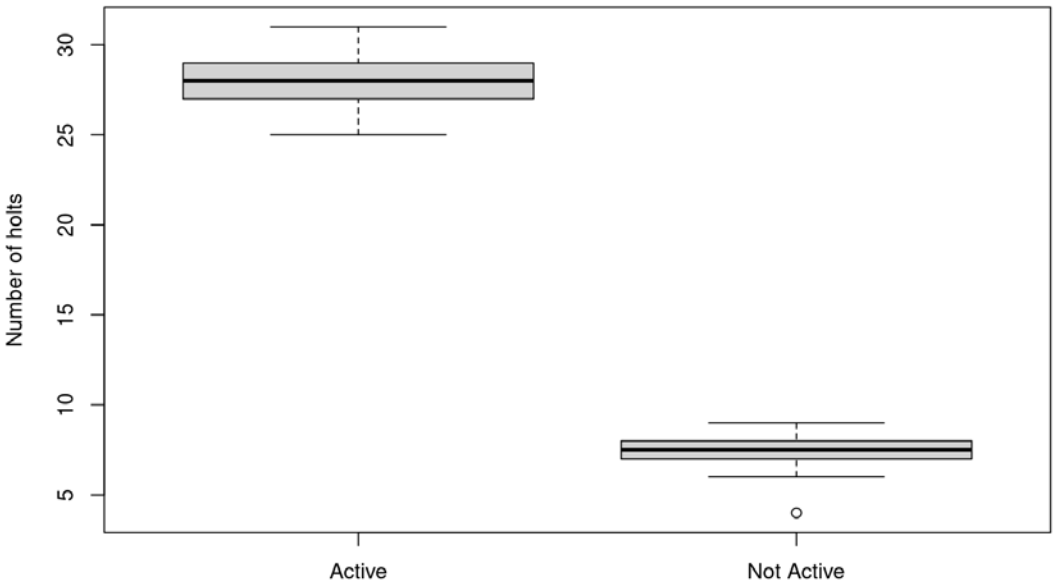



***Figure 5. Box plot of otter holt activity showing the distribution of the numbers with the thick middle line being the median***

## CONCLUSIONS

The activity at holts can sometimes vary depending on the number of suitable holt sites. So it is normal to find a holt inactive from time to time. However, some holts show very little use: Drumfearn holt 2, and Loch na Dal North holt 3, Loch na Dal South holts 1 and 2, and Ardnish holts 1 and 6. A second holt was found at Loch Ainort South in 2017 but this has not been in use since. Holt 3 at Bearreraig has had mixed usage with four years active and six years inactive. Holt 1 at Bearreraig has always been active but when checked in 2023 there had been a small landslip on to the site which will have prevented the otters from using it. It will be interesting to see if they return in 2024.

This detailed monitoring research began in 2014 and the data shows that since then there has been no significant change in the Eurasian otter (*Lutra lutra*) population on the Isle of Skye which has remained stable.

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**Disclosure Statement**

No potential conflict of interest was reported by the author.

**Author Biography**

PAUL YOXON is the Head of Operations of the International Otter Survival Fund (IOSF) which he co-founded in 1993 on the Isle of Skye, Scotland. In 1999 he completed his PhD on the otters of the Isle of Skye and their use of the coastal zone and he continues regular monitoring work there. He has collaborated on several international projects including an "International conference on Eurasian otter conservation and re-introduction" in Taiwan, and a potential reintroduction project in Hokkaido, Japan. He has organised many otter training workshops particularly in Asia and also in Africa and South America. His main role now lies in research, lecturing, and fundraising for IOSF.

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# PEOPLE'S PERCEPTIONS OF THE EURASIAN OTTER (*Lutra lutra*) CONSERVATION IN MUGU DISTRICT, NEPAL

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## Abstract

*This study aims to evaluate the perceptions and attitudes of people towards Eurasian otter conservation in Mugu District, Nepal. The social survey was carried out by interviewing local people in the river corridors of Mugu Karnali, Karnali and Khatyad rivers. Interviews were carried out through semi-structured questionnaires consisting of five categories: socio-demography of the respondent, fishing information, knowledge on otters, threats to otters, and perception towards the conservation of otters. A total of 90 people were interviewed – 92.22% male and 7.88% female with occupations of farmer, labourer, businessperson, student, and fisherman. The data obtained were analysed using Microsoft Excel. A total of 72.2% respondents go to the river frequently while 13.3% of respondents visit the river occasionally and 14.4% do not go to the river. The majority of fishermen have carried out fishing for 5–8 generations (47.54%) followed by 4–5 generations (31.14%), and 2–4 generations (21.31%). Different methods (gillnet, set net, hook, current net, etc.) of fishing were used during the day and night by 56.67% of respondents. 53.34% of respondents knew the morphological characteristics of an otter. 64.44% of respondents reported a drastic change in river dynamics. 34.44% of respondents had seen or heard about the killing of otters thereby threatening the survival of otters. 35.56% of respondents believed that otters still exist in these rivers. There have only been rare programmes regarding wildlife conservation carried out in the past years, and so they were unaware about the importance of otters and laws for their conservation.*

***Keywords:*** *Otters; perception; social survey; fishing; conservation*

## INTRODUCTION

Nepal holds three of the 13 otter species found in the world: Eurasian otter (*Lutra lutra*), smooth-coated otter (*Lutrogale perspicillata*) and Asian small-clawed otter (*Aonyx cinereus* Hodgson 1839). The Eurasian otter is an apex predator that occurs in various aquatic habitats (**Mason and Macdonald, 1986; Kruuk et al., 1994**). It primarily feeds on fish and secondarily on amphibians, crustaceans, and rodents, with

seasonal variation (**Kruuk et al., 1994; Lekagul and McNeely, 1977**). Otters are sensitive to pollution (**Mason, 1996; Yamaguchi et al., 2003**) and act as a key species of the wetland ecosystem (**Mason and Macdonald, 1986**). They usually exploit a linear home range of 5–20km of riverbanks and the surrounding wetlands in Europe (**Green et al., 1984; Chanin, 1985**).

In Nepal, there has been confirmed evidence of Eurasian otter (**Shrestha et al., 2021**) and smooth-coated otter (**Acharya and Rajbhandari, 2011; Mishra et al., 2022; Thapa et al., 2021**), whereas there is only anecdotal records of the Asian small-clawed otter's presence. Eurasian otters have disappeared from several areas of its historical range due to anthropogenic activities such as competition for fish, fur trade, deliberate killing, habitat loss and fragmentation. Otters were being killed using several trap nets or chasing the animal to exhaustion and shooting (**Acharya and Gurung, 1994; Fitchett, 2013**). Eurasian otters are a native species which is rarely observed in Nepal. It was recorded in 1993 (**Acharya and Gurung, 1994**) and recently recorded in Roshi, Tubang, and Barekot rivers (**Shrestha et al., 2021**). It has been listed as Near Threatened in the IUCN Red List and Largely Depleted in the IUCN Green List assessment (**Loy et al., 2022**).

For human survival, rivers have been the hub for settlement of civilisations from ancient times by providing basic and essential resources (**Clayton and Dent, 1973**). As a result, the versatile wildlife habitat along the rivers has been subjected to anthropogenic pressure since the very outset of human civilisation (**Khan and Abbasi, 2015**). The relationship between human and animal is more intense where both of them use resources from common sources and they play an important part of people's livelihood and their income (**Treves et al., 2006, Eniang et al., 2011**). For wildlife protection, and to evaluate the success of conservation projects, it is vital to know local people's attitude, knowledge, and perceptions of wildlife conservation (**Soto et al., 2001; Sundaresan et al., 2012**). Attitudes can be defined as an individual's disposition to respond with some degree of favour, or not, to an object, person, event, or any other discriminable aspect of the individual's world (**Ajzen and Fishbein, 1980**).

Information regarding perceptions and attitudes of local people living near and around protected areas is important to identify management programme and strategies that best fit to protect biodiversity alongside the development of local public livelihoods (**Allendorf, 2007; Heinen, 1993; Infield and Namara, 2001; Kideghesho et al., 2007; Manfredo, 2008; Rands et al., 2010**). Thus, understanding the attitude and perception of locals towards wildlife conservation, is a fundamental need in order to balance conservation goals with the needs of local human populations (**Terborgh and Peres, 2002; Shahabuddin and Rangarajan, 2007; Brett et al., 2009; Karanth and De Fries, 2010**). The relationship between local residents and wildlife may be additionally strained when there is conflict between them (**Lee and Priston, 2005**). We need to understand human–wildlife relations and

incorporate local stakeholders in the decision-making process through evidence-based management for conservation initiatives to succeed (**Nepal Gazette, 2002**).

The attitude of individuals leads to a complex psychological determinant system with diverse variables involved such as intangible and tangible cost and benefit perceptions, knowledge of wildlife, exposure and experience with wildlife, species characteristics and socio-demographic variables (**Kansky and Knight, 2014**). The perceived costs and benefits of wildlife have generally been considered the primary determinants of attitudes towards wildlife (**Chan et al., 2007; Linnell et al., 2010; Treves and Bruskotter, 2014**). However, tangible benefits may be very important, especially if the species contributes positively towards people's livelihoods (**Sekhar, 2003**). Infrastructure development programmes to support sustainable wildlife use in critical habitats may contribute tangible benefits for local people. If these efforts are linked with conservation initiatives, they can create positive conservation attitudes (**Agrawal and Gupta, 2005; Xiang et al., 2011; Ellwanger et al., 2015 Lamichhane et al., 2019; Shahi et al., 2022**). Different factors like age, gender, education, and family size demographics (**Yosef, 2015; Mekonen, 2020; Merkebu and Yazezew, 2021; Penjor et al., 2021**), influence people's perceptions and attitudes toward wildlife and conservation (**Biru et al., 2017; Mitchell et al., 2019**).

The aim of this study was to evaluate the perceptions and attitudes of people towards Eurasian otter conservation. In addition, it will help in obtaining reliable information that can attract the attention of researchers in carrying out scientific surveys of otters, conservation awareness campaigns, coexistence between people and otters, and effective management of otter habitat for its best survival. Through the face-to-face interviews, we provide an insight into the attitudes of Karnali people on otters and related factors.

## STUDY AREA

This study was carried out along the river corridors of Mugu district that includes major rivers - Mugu Karnali, Karnali and Khatyad (Figure 1). The biggest lake, Rara Lake is located in this district. According to the National Population and Housing Census (**CBS, 2012**), the total population is 64,549 comprising 32,168 female (49.8%) and 32,381 male (50.2%) with a household of 12,430. Mugu District has an average population density of around 18.26 people per square km. The average family size is 6.1. The average literacy rate of females is 49.9% and of males 50.1%. It has a multi ethnic composition with Chhetri, Thakuri, Brahman, Tamang Sherpa Bhote Lama, Damai, Kami, Kumal, Sunar, Bitalu and Yogi. The common language is Nepali followed by Bhot (**CBS, 2012**).

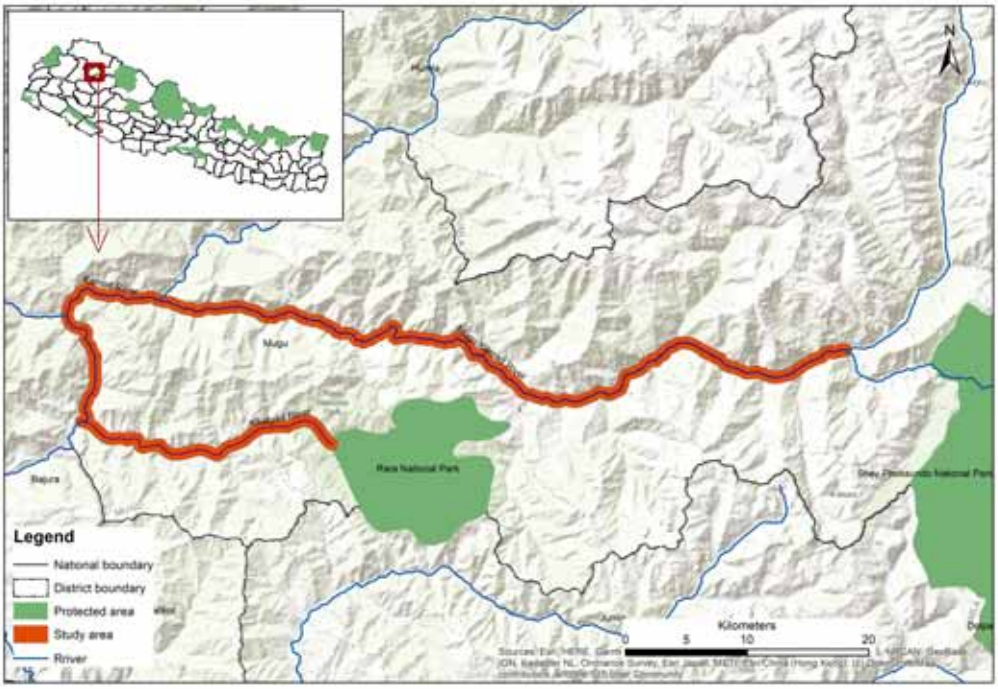


***Figure 1. Map of study area showing rivers surveyed in Mugu District.***

## METHODS

A questionnaire survey was carried out from 3 April to 2 May 2022, in Karnali, Mugu Karnali, and Khatyad River corridors. Local people from different communities (fishermen, herders, farmers, businessmen) were interviewed through a semi-structured questionnaire that asked both open and close-ended questions. The questionnaire consisted of five categories: socio-demography of the respondent, fishing information, knowledge of otters, threats to otters, and perceptions about the conservation of otters. The questionnaire was conducted with 90 respondents from the study site by involving participatory techniques.

The survey began with a structured questionnaire form but when the locals panicked and would have provided altered responses, we switched to informal, oral interviews based on the same format, and the questionnaire form was filled in immediately after each interview to reduce errors (**Khan and Abbasi, 2015**). Informal group discussions and poster presentations were conducted in the area. These discussion meetings included the use of photos to identify the otter species, a short talk about the biology of otters, and a discussion about the participants' familiarity with, and reaction to the otters they encounter.

The numerical or quantitative data was then put into a more comprehensive form using a graphical approach using Microsoft Excel. Analysis of the data was done through descriptive analysis using pivot tables and pivot charts.

## RESULTS

### *1. Socio-demography*

Altogether 90 respondents (92.22% male and 7.88% female) were interviewed during the field survey. The majority of the respondents were between 18 and 60 years of age (86.67%) followed by over 60 years (8.89%), and below 18 years (4.44%). For occupation/profession, farmers were highest (61.11%) followed by businessmen (13.33%), students (7.78%), social service (5.56%), labourers (4.44%), other job (4.44%), fishermen (2.22%), and household (1.11%)

### *2. Fishing activities*

A total of 72.2% respondents go to the river frequently while 13.3% of respondents go to the river occasionally and 14.4% do not go to the river. The purpose of going to the river was for grazing their cattle (45.56%), fishing (42.22%), firewood collection (40%), washing and bathing (11.11%), sand and boulder extraction (7.78%), irrigation (1.11%), and dumping waste (1.11%).

The purpose of fishing was mainly for personal household purposes (70%), selling (20%), both household and selling purposes (10%). 46.67% of respondents buy fish either for household or business purposes. The average fishing per day was 1.275 kg while 0.5 kg fish were bought in one day.

The majority of fishermen carried out fishing from generation to generation: 2–4 generations (21.31%), 4–5 generations (31.14%), and 5–8 generations (47.54%). Among the fishermen, the fishing experience of more than 25 years (44.44%) were higher followed by less than 5 years (26.67%), 5–10 years of experience (13.33%), 20–25 years of experience (11.11%), and 10–15 years of experience (4.44%) thus resembling the history of more than the 2nd to 8th generation (Table 1).

***Table 1. Fishing methods along with years of fishing experience by respondents***

| Years of experience with methods of fishing<br>with fishing time | Generation of fishing (%) | | | |
|---|---|---|---|---|
| | 2–4 Generation | 4–5 Generation | 5–8 Generation | TOTAL |
| **<2 Years** | **11.36** | | | **11.36** |
| **Hookline** | **4.55** | | | **4.55** |
| Whenever needed | 4.55 | | | 4.55 |
| **Hookline, Hand/Set net** | **6.82** | | | **6.82** |
| 9am–2pm | 2.27 | | | 2.27 |
| All time | 2.27 | | | 2.27 |
| Whenever needed | 2.27 | | | 2.27 |
| **2–5 Years** | **2.27** | **6.82** | **4.55** | **13.64** |
| **Hookline** | **2.27** | **2.27** | **2.27** | **6.82** |

| | | | | |
|---|---|---|---|---|
| 2pm–7pm | 2.27 | | | 2.27 |
| 9am–2pm | | | 2.27 | 2.27 |
| Whenever needed | | 2.27 | | 2.27 |
| **Hand/Set net** | | **2.27** | **2.27** | **4.55** |
| Whenever needed | | 2.27 | 2.27 | 4.55 |
| **Drag net** | | **2.27** | | **2.27** |
| Whenever needed | | 2.27 | | 2.27 |
| **5–10 Years** | **6.82** | **6.82** | | **13.64** |
| **Hookline** | | **4.55** | | **4.55** |
| 7pm onwards | | 2.27 | | 2.27 |
| 9am–2pm | | 2.27 | | 2.27 |
| **Hand/Set net** | **2.27** | | | **2.27** |
| 7pm onwards | 2.27 | | | 2.27 |
| **Hookline, Hand/Set net** | **2.27** | **2.27** | | **4.55** |
| 2pm–7pm | 2.27 | | | 2.27 |
| 7pm onwards | | 2.27 | | 2.27 |
| **Drag net** | **2.27** | | | **2.27** |
| Whenever needed | 2.27 | | | 2.27 |
| **10–15 Years** | **2.27** | **2.27** | | **4.55** |
| **Gill Net** | | **2.27** | | **2.27** |
| 2pm–7pm | | 2.27 | | 2.27 |
| **Hookline, Gill Net, Hand/Set net** | **2.27** | | | **2.27** |
| Whenever needed | 2.27 | | | 2.27 |
| **20–25 Years** | | **4.55** | **6.82** | **11.36** |
| **Hand/ Set net** | | **2.27** | | **2.27** |
| 7pm onwards | | 2.27 | | 2.27 |
| **Hookline, Hand/Set net** | | | **4.55** | **4.55** |
| 2pm–7pm | | | 2.27 | 2.27 |
| 9am–2pm, 4am–9am | | | 2.27 | 2.27 |
| **Drag net, Hookline** | | | **2.27** | **2.27** |
| 7pm onwards | | | 2.27 | 2.27 |
| **Hookline, Gill Net** | | **2.27** | | **2.27** |

| | | | | |
|---|---|---|---|---|
| 7pm onwards | | 2.27 | | 2.27 |
| **>25 Years** | **6.82** | **15.91** | **22.73** | **45.45** |
| **Hookline** | **4.55** | **6.82** | **4.55** | **15.91** |
| 2pm–7pm | | | 2.27 | 2.27 |
| 7pm onwards | 4.55 | 6.82 | | 11.36 |
| 9am–2pm, 4am–9am, 7pm onwards | | | 2.27 | 2.27 |
| **Hand/Set net** | | **2.27** | **2.27** | **4.55** |
| 7pm onwards | | 2.27 | 2.27 | 4.55 |
| **Hookline, Hand/Set net** | | **2.27** | **6.82** | **9.09** |
| 7pm onwards | | | 2.27 | 2.27 |
| 9am–2pm, 7pm onwards | | | 2.27 | 2.27 |
| All time | | | 2.27 | 2.27 |
| Whenever needed | | 2.27 | | 2.27 |
| **Drag net, Hookline, Hand/Set net** | | | **2.27** | **2.27** |
| 7pm onwards | | | 2.27 | 2.27 |
| **Drag net, Gill Net, Hookline** | | | **2.27** | **2.27** |
| 7pm onwards | | | 2.27 | 2.27 |
| **Hookline, Gill Net, Hand/Set net** | | | **2.27** | **2.27** |
| 7pm onwards | | | 2.27 | 2.27 |
| **Hookline, Hand/Set net, Supo Soli** | **2.27** | **2.27** | **2.27** | **6.82** |
| 2pm–7pm | 2.27 | | | 2.27 |
| 7pm onwards | | | 2.27 | 2.27 |
| Whenever needed | | 2.27 | | 2.27 |
| **Hookline, Supo Soli** | | **2.27** | | **2.27** |
| 7pm onwards | | 2.27 | | 2.27 |
| **TOTAL** | **29.55** | **36.36** | **34.09** | **10** |

Different methods of fishing were used during day and night by 56.67% of respondents: 96.08% used gill net during both day and night time. 70.59% used hooks or current net followed by hand/set net (5.88%) and hook and hand/set (1.96%) and divert the water flow (1.96%). Combined for day and night, 70.59% used a hook or current net and the gill net (Table 2).

***Table 2. Number of respondents using different methods of fishing during day and night***

| Day Fishing Method | Night Fishing Method (%) | | Day Total (%) |
|---|---|---|---|
| | Gill Net | others | |
| Divert the water flow | 0.00 | 1.96 | 1.96 |
| Hand/set net | 3.92 | 1.96 | 5.88 |
| Hook/current net | 70.59 | 0.00 | 70.59 |
| Hook and hand/set net | 1.96 | 0.00 | 1.96 |
| NA | 19.61 | 0.00 | 19.61 |
| Night Total | 96.08 | 3.92 | 100.00 |

A decline in fish was noticed by 38.89% respondents while 43.33% respondents were unaware of the trend of fish populations, 15.56% of respondents express no decline while 2.22% expressed stable fish population in rivers.

### *3. Knowledge of otters*

A total of 80% of respondents knew about fish-eating animals. Among them, 58.02% recognised otters as a fish-eating animal while 41.98% recognised mongoose and yellow-throated marten as fish-eating animals. Only 53.34% of respondents knew the morphological characteristics of an otter while 3.33% described it as a mongoose and 43.33% did not know the otter's morphological characteristics.

76.83% of respondents were aware of the food of otters while 23.17% did not know about their diet. 53.33% of respondents could identify the scat of otters consisting of scales and bones of fish and amphibians.

Most of the respondents (70%) did not know where the otters lived. Though 30% of respondents knew where otters live, there was a variety of answers in the location of a den/holt (29.63): river bank (25.93%), in the water (18.52%), under a big boulder (11.11%), followed by under logs, cave in the water, burrow and den, while 7.2% do not know where otters live.

Likewise, 71.11% of respondents did not know the time of the active period of otters while 28.89% had observed otter activities at 10.00–15.00 (26.92%) followed by 20.00–24.00 (26.92%), 1.00–5.00 (11.54%), 20.00–5.00 (11.54%), 15.00–20.00 (15.38%), and 15.00–5.00 (7.69%).

### *4. Threats to otters*

Only 28.99% of respondents responded regarding the threat to survival of otters. Among respondents, only 65% strongly stated that sand mining was being done during the past five years and 31% stated that sand mining was taking place 5 to 10 years ago. Therefore, 96% of sand mining was started within the last 10 years.

Altogether, 64.44% of respondents had responded about a drastic change in river dynamics. 14.4% of respondents noticed an increase in water level while 12.2% said it was because of seasonal change and a decrease in depth (10%). There were human causes such as infrastructure construction (4.4%), road construction (4.4%), sand mining (1.1%), and landslides due to deforestation (2.2%). While natural causes like drought (low and no rainfall (4.4%)), seasonal change, and change in water level (4.4%) were also noticed by respondents (Figure 2).

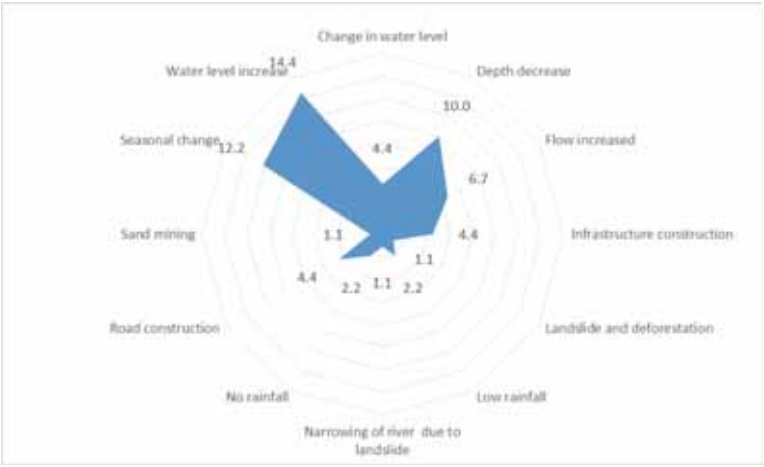


***Figure 2. Filled radar chart of the reasons for the change in river dynamics given by respondents in percentage (%)***

Similarly, 34.44% of respondents have seen or heard about the killing of otters but among them 76.67% had no idea about the location.

### *5. Attitudes of local people to the conservation of otters*

35.56% of respondents believed in the existence of otters in these rivers to date. Regarding the concern for conservation of otters, respondents prefer awareness programmes (78.89%) and habitat improvement (14.44%) rather than other activities. Among respondents, 37.78% noticed a decline in the otter population, out of which 13.33% gave the reason to be hunting followed by a decline in fish numbers (10%), infrastructure development (8.89%), hydropower (3.33%), and mining (2.22%).

## DISCUSSION

Available land for wildlife has decreased remarkably due to extensive needs for agriculture and urbanisation as a result of population increases (**Green et al., 2005**). Thus developed animal conservation strategies are necessary regarding how wild animals can coexist with people outside of protected areas (**Anand et al., 2010**). In

order to develop these strategies, conservation awareness, custom, activity, and socioeconomic cultures are important (**Athreya et al., 2013**).

In our study, the majority of respondents were males and farmers above 30 years of age because agriculture is the major occupation in these areas. Due to less available land, people take up other jobs like fishing and labouring during lean periods. There were eight highly valued respondents i.e., respondents above 60 years of age, who were not only information centres but also possessed a higher position in society. Similarly, four in the age group below 18 years represent the ideology of the new generation. Female respondents were not enthusiastic to answer the questions because of shyness and they worked mostly for household purposes. According to **Kaltenborn et al., 2006**, gender exerts a good significant influence on affinity levels towards animals. Women have higher levels of support for species protection than men (**Kellert, 1989; Williams et al., 2002; Zinn and Pierce, 2002**).

The majority of the local people were unaware of the decline in the fish population in the study area over the past five years. The fishing methods and density is also responsible for fish decline. We noticed more than 25–62 gill nets were installed in one km length for fishing each day. So, fishing is carried out densely as compared to the past.

The local people's attitude varies depending upon the time and situation. Most of the respondents were well aware of fish-eating animals, including the otter, except for a few respondents. The highly experienced respondents, above 60 years old, knew the morphological features of otters, behaviour, habitat, and scats of otters (**Green et al., 1984**) and that their behaviour allows them to avoid or hide from people. Beside these people, when they had gone to the river to collect fish from the set/gill net, some people had seen otters roaming late at night near the river for food and playing early in the morning This behaviour shows that otters and sympatric animals were mostly nocturnal although some might be diurnal.

Mining was found to have the most impact on embryonic stages of fish, with juvenile and adult fish more likely to avoid or survive passage through a suction dredge (**Harvey and Lisle, 1998**). **Rempel and Church** (**2009**) stated that this indirectly impacts on fish-eating predators like otters. This change in habitat for otters played a vital role in their disappearance as seen in the study area. Hunting and poaching was intense mainly by males and due to the fear of being caught, respondents hesitated to respond. Otters were mostly killed for fur and pelts used for cultural dress and medicine, respectively, in Tibet and China (**Savage and Shrestha, 2018**). Traditional hunters from Humla and Jumla districts, who sell wildlife pelts, also kill a number of otters (**Yonzon, 1998**). Karnali River corridor is one of the major routes for the trafficking of pelts and fur to China and Tibet where their price was known by the majority of the local people and some children as well. Illegal hunting of otters for the pelt trade was a serious problem in Nepal (**Savage and Shrestha, 2018**).

It is important to evaluate and understand public attitudes toward species, so that their loss can be prevented. It is necessary to know not only about the biology of wildlife species, but also about people's attitudes and behaviours that affect the wildlife species (**Manfredo, 2008; Saunders, 2003; Smith et al., 2010**). The otter feeds on fish entangled in fishing nets set by fishermen, thereby damaging the fishing equipment while foraging. The human–otter conflict results in economic loss of fishing nets. Despite this, local people showed a degree of positive attitudes toward otters although most of them had not encountered otters before. There might be only a few wildlife friendly programmes conducted in a number of rural areas and this is why the majority of the respondents do not participate in any form of event on otter conservation yet. However, some people from the buffer zone of the Rara National Park had participated in an awareness campaign. As the construction of infrastructure was rapidly proceeding in the corridors of Karnali River, it had somehow affected the water quality, fish population, and habitat of otters. These changes directly influence the population status of otters and provide a feasible route for trafficking.

## CONCLUSIONS

It is hard to confirm the presence of the Eurasian otter as the majority of the respondents had not encountered otters. They are not sure whether otters need to be conserved or not since they are not aware of any law protecting wildlife, including otters. It is difficult to conserve any species without the involvement of local community participation. A series of community approach wildlife friendly activities is needed to change people's attitudes towards animals. The awareness should include both (a) the animal's biology such as its behaviour, habitat, and its foraging activities, and (b) community participation through livelihood enhancement. Wildlife tourism is one of the major income generating activities for the enhancement of the livelihood of people living near the aquatic ecosystem in the study area. There is an urgent need for a number of programmes for the conservation of wildlife species, including otters, and these areas are prone to hunting and poaching.

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No potential conflict of interest was reported by the authors.

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# CONSERVATION STATUS SURVEY OF SMOOTH-COATED OTTERS (*Lutrogale perscipillata*) IN BABAI RIVER OF BARDIA NATIONAL PARK, NEPAL

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**Abstract**

*Research entitled "Conservation status survey and awareness of smooth-coated otters in Babai River of Bardia National Park, Nepal", was conducted along the Babai River and nearby villages within the project area. As part of the research, a questionnaire survey was conducted with 200 respondents in communities near the Babai River. During the survey, it was found that 72% of the respondents believed that the population of smooth-coated otters is low, and 61% of the respondents believed that the otter population will decline further in the next 5 to 10 years. Regarding the trend of otter population, 71% of the respondents mentioned that the otter population is decreasing. Illegal hunting of otters, illegal fishing, habitat destruction, and encroachment are the main causes of the decline in the otter population in the Babai River. Based on the findings of this research, it is recommended that conservation efforts be intensified to protect this smooth-coated otter population. This can include implementing strict laws and regulations to prevent illegal hunting and fishing, as well as increasing efforts to educate local communities about the importance of otter conservation and the negative impacts of habitat destruction and encroachment.*

***Keywords:*** *Conservation; smooth-coated otters; Babai River; Bardia National Park*

## INTRODUCTION

Smooth-coated otters (*Lutrogale perscipillata*) are apex predators of river ecosystems and they function as the key links in nutrient cycling between aquatic and terrestrial systems (**Ben-David et al., 2011**). Smooth-coated otters (*Lutrogale perscipillata*) are regarded as Vulnerable in the Red List of Threatened Species (**IUCN 2021**) and in Appendix II of **CITES** (**2021**). In the field of conservation intervention, the Nepalese government has promulgated the smooth-coated otters to be protected by Aquatic Life Protection Act, 2002 (**Government of Nepal, 2002**).

Wildlife conservation demands the assessment of people's attitude and perception towards conservation and this has become an important aspect in many studies **(Newmark et al., 1993**). A precise interpretation of people's perception towards wildlife aids in formulating better long-term conservation policies. Although these services refer to biological diversity (diversity of organisms, ecosystems and their

associated ecological and evolutionary processes), this concept is only revealed in the presence of the social components and recognising the central role played by culture in the links between people and nature (**Reyers et al., 2013, Martín-López et al., 2014**).

Various studies have shown links between the attitudes of local people and conservation of nature (e.g. **Heinen, 1993; Newmark et al., 1993; Mehta and Kellert, 1998; Walpole and Goodwin, 2001; Sah and Heinen, 2001**). It has been found that people have negative attitudes towards biodiversity conservation in their locality due to costs, such as damage to crops and livestock by wildlife (**Shyamsundar and Kramer, 1997; Gillingham and Lee, 1999**). However, the benefits from conservation - such as revenue from tourism, and licensed hunting of wildlife, and harvesting of game meat – have some positive effects (**Parry and Campbell 1992; Gillingham and Lee, 1999; Walpole and Goodwin, 2001**).

Freshwater ecosystems hold a notable proportion of biodiversity as about one third of the total vertebrate species is restricted to this ecosystem (**Dudgeon et al., 2006**) and yet they are one of the most endangered ecosystems in the world (**Vörösmarty et al., 2010**). Anthropogenic factors causing severe fragmentation of the natural landscape (**Rodgers, 1985**) and the population of animals living in those landscapes are being restricted to small fragmented patches throughout their distribution and confined mostly to protected areas (**Hussain and Choudhury, 1997; Nawab and Hussain, 2012**).

Nepal is regarded as a hotspot of biodiversity as it holds a good variety of flora and fauna species. Being a landlocked country, freshwater resources cover about 5% of the total area of the country (**Kafle and Savillo, 2009**) which constitute about 2.27% of the world's freshwater resources.

In Nepal, there has been very little research on small mammals such as the otter. Therefore, the objective of this study is to understand the perception of local people towards otter conservation in Bardia National Park.

## STUDY AREA

The Babai Valley was incorporated into the Bardia National Park (BNP) in 1983. BNP is the situated between latitude 28° 17’ to 18° 40’N and longitude 81° 12’ to 81° 43’E and is the largest National Park in the Terai lowland physiographic region of Nepal. It is one of the most attractive and biologically diverse areas and the most undisturbed National Park in Nepal’s Terai. The topography of BNP is quite varied, with the presence of Churia Ridge, the Bhabar foothills, the alluvial Terai flat land, riverine flood plains and the Babai Valley. The Babai River is a warm water system, with the source of the river in the Dang Valley. This is rare in a country where most rivers are snow-fed. The river runs through a valley of mixed Sal (*Shorea robusta*) forest containing a rich diversity of flora and fauna (Figure 1).

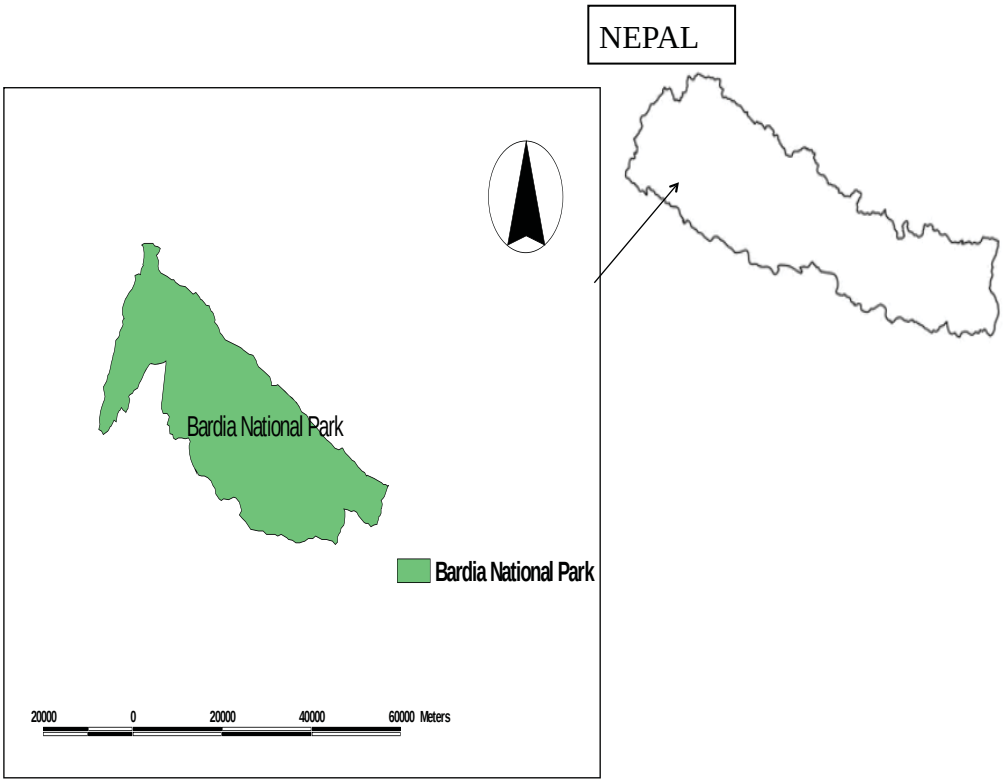


***Figure 1. Map of study area***

## METHODS

### *Questionnaire survey*

A questionnaire survey was conducted in the buffer zone area of Bardia National Park near Babai River. The questionnaires were designed for face-to-face surveys conducted in communities near the river. Altogether 250 respondents including local fishermen and other members of the communities residing in the study area were selected for these surveys.

### *Data analysis*

The data collected was entered in MS-excel-2010, and SPSS 19 was used for analysis. The results are shown below through simple figures and graphs. Descriptive statistics like mean, percentage, and frequency, and Likert scale were also used to interpret the obtained results.

## RESULTS

### *Socio-economic findings*

*Occupation*

Out of 200 respondents, 172 were found to be farmers and involved in agriculture and raising livestock. Similarly, other respondents were engaged in business, service, and labouring (Figure 2).

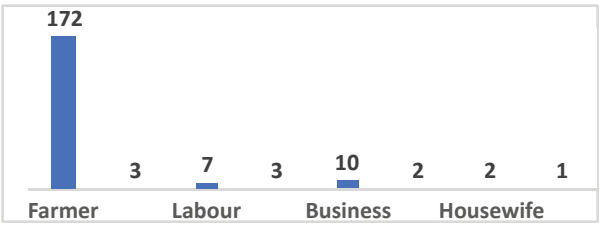


***Figure 2. Occupation of the respondent***

*Location of respondent*

Out of a total 200 respondents, the majority (n=40) were from Basgadi-1 Babai Chepang and followed by Barabardia-7 Seunia, Rammapur, Ghushra, Jyotipur, Harnauwa, Jamunia, Gerwani, Bargada, Magaragadi, Sainawar and Dhungari (Figure 3).

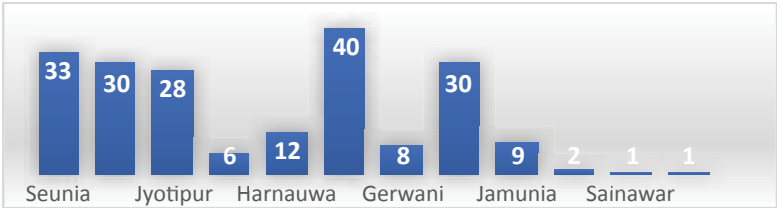


***Figure 3. Location of the respondent***

*Well-being ranking*

The majority of the respondents fall into the "lower middle income" category followed by "middle income", "poor" and "higher middle income" levels. None of the respondents were classed as "very poor" (Figure 4).

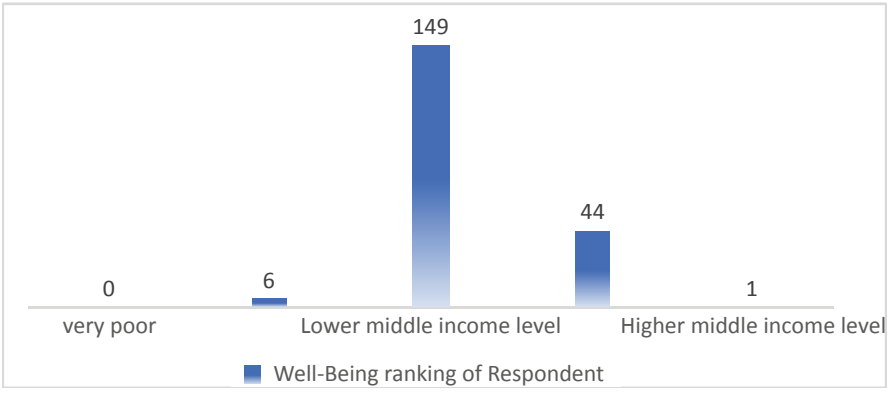


***Figure 4. Well-being ranking of the respondent***

### *Status of smooth-coated otters in Babai River*

*Present status of otter*

In total 200 respondents (72%) considered that the population of smooth-coated otters was low, whereas 12% of the respondents regarded the population status as medium. 16% of the respondents did not know the present status of smooth-coated otters. Overall, we can conclude that there is a serious decrease in numbers of smooth-coated otter (Figure 5).

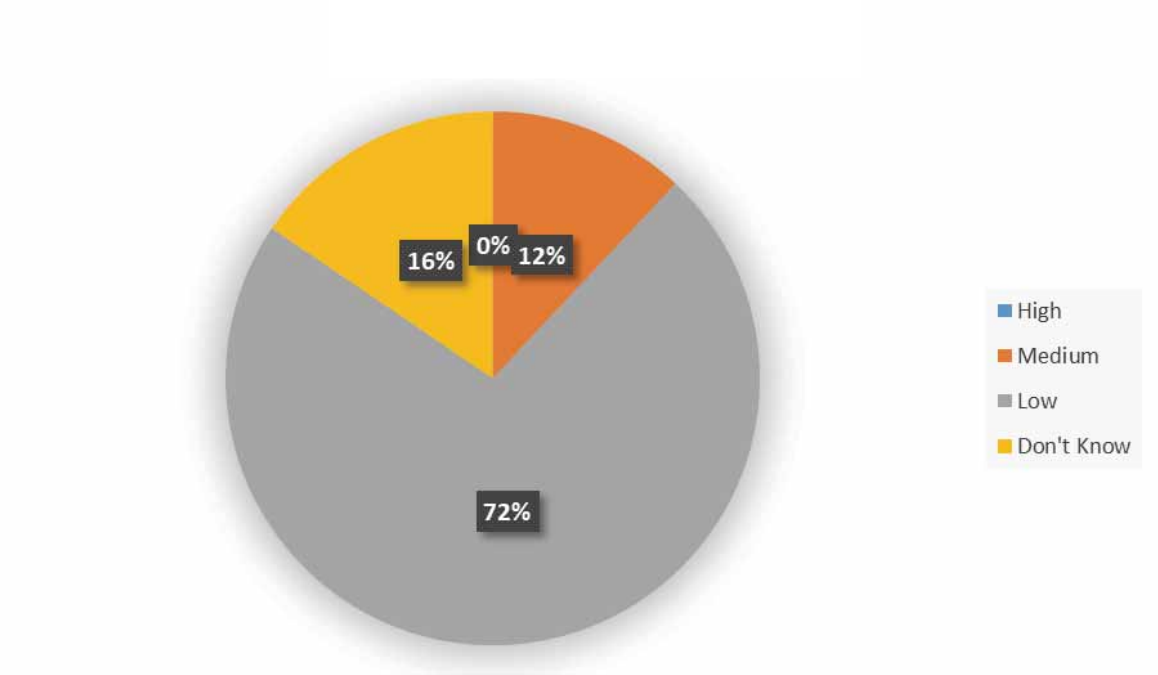


***Figure 5. Present status of otter***

*Status of otters in 5 to 10 years' time*

In total 200 respondents, only 15% believed that the population of smooth-coated otters will increase, whereas 61% believed that the population will decrease, and 24% of the respondent did not know whether it will increase or decrease (Figure 6). BNP had mainly focused on conservation and increasing the numbers of keystone and mega species and their habitat management; but in recent times, the Park is becoming concerned on the conservation of other key species. Restriction of fishing in Babai river and human disturbance have contributed to an increase in numbers of otters. It is hoped and expected that the population will increase later due to conservation practices adopted by BNP and awareness programmes conducted to communities near the river.

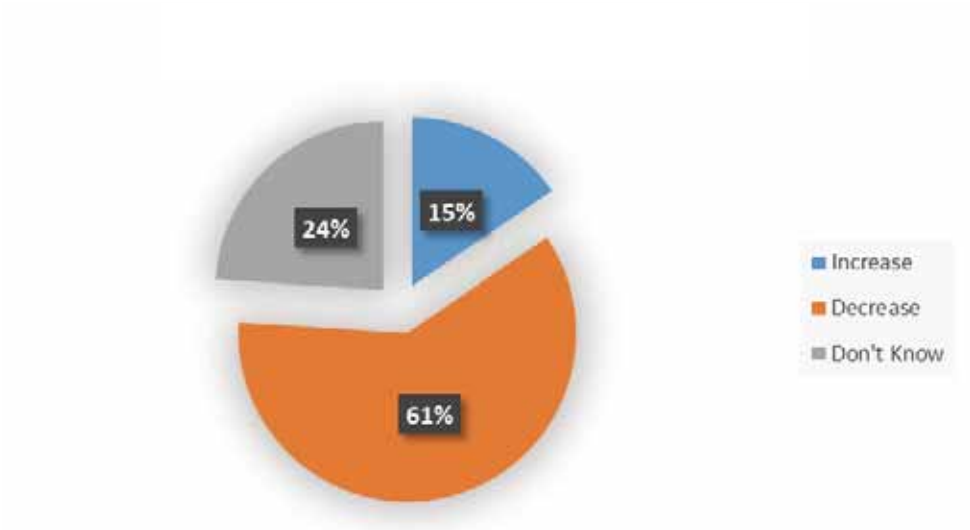


***Figure 6. Status of otter in 5 to 10 years' time***

*Trend of smooth-coated otters in Babai River*

The majority of the respondents (71%) considered that the number of otters is decreasing, 27% considered that it as increasing, and 2% did not noticed if it is increasing or decreasing. Thus it would appear that smooth-coated otters in the Park are showing a decreasing trend (Figure 7).

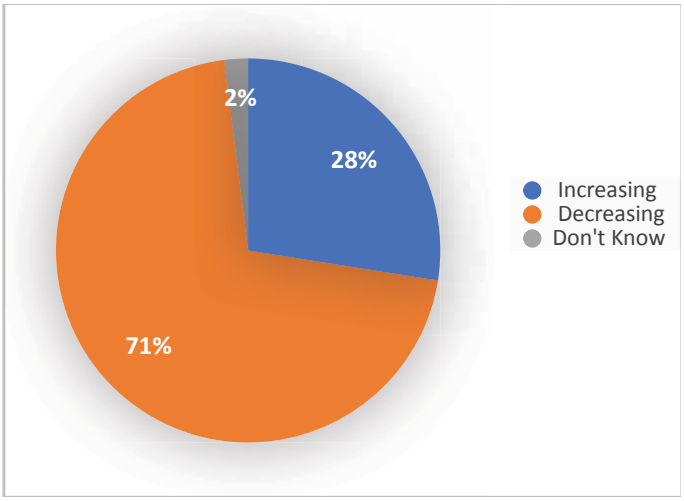


***Figure 7. Trend of otter in Babai River***

Awareness programmes and conservation practices carried out by the National Park and followed by the people have contributed to an increase in the otter population. However, habitat destruction and hunting of otters for skin and medicinal use caused a decrease in otter numbers. A massive flood in the river resulted in the deaths of

many young and adult otters and abundance of fish has also decreased in recent years and pollution is further challenging the otters' survival. So overall there has been a decrease in the population of otters.

## DISCUSSION

### *Issues/challenges*

Although restriction of fishing in Babai River has contributed to helping the otters, human disturbance also continues. In the buffer zone area, there are still conflicts between farmers and otters and this leads to shootings and entrapment in fishing traps and nets and these pose a major threat to otter populations. Although poaching of otters has decreased, the lack of suitable habitat and environment means that otters are displaced to a core area of Babai River. Disposal of garbage in the river is still prevalent in Basgadi-1 Babai Chepang and pollution in the river can jeopardise food sources of otters as well as causing direct harm.

## CONCLUSION AND RECOMMENDATIONS

The findings of this study reflect that human activities have contributed to a decrease in size of the otter population and their habitat. Besides natural causes, anthropogenic activities have played a significant role and communities of Tharu people near the river are also affected.

Based on the results and above discussion, the following recommendations are being made:

- Public awareness to the people about conservation of otters through media, school teaching, community teaching.
- Strategies to increase otter populations and management of otter habitat.
- Pollution and human disturbance in Babai River to be restricted.

**Acknowledgements**

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**Disclosure Statement**

No potential conflict of interest was reported by the authors.

**Author Biographies**

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JYOTI BHANDARI, PhD works as an Assistant Professor at Tribhuvan University, Institute of Forestry, Pokhara, Nepal. She is a doctorate graduate of China Agricultural University and has completed her Post Doctorate from the Chinese Academy of Sciences. She loves conducting research and teaching and is one of the first researchers in Nepal to study the habitat and ecology of otters. She was awarded the OWSD Early Career Fellowship–2020. Besides teaching, she also supervises undergraduates as well as postgraduate students. She has published several papers in different national as well as international peer-review journals.

BIKASH RIJAL is a dedicated and passionate student pursuing his MSc in Forestry. With a profound interest in wildlife conservation and sustainable resource management, he has chosen to specialise in the field of forestry. Throughout his academic journey, Bikash has demonstrated a strong commitment to understanding and addressing the challenges faced by our forest ecosystems. Bikash holds a Bachelor's degree in forestry, which laid the foundation for his enthusiasm in the field. During his undergraduate studies, he actively participated in various research projects and fieldwork, gaining practical experience in otter research including an otter status survey, habitat assessment, and ecosystem analysis. These experiences further fuelled his desire to contribute the preservation and restoration of our forests.

RAJU SHAU holds a Bachelor's degree in Forestry. Throughout his time as an undergraduate student, he enthusiastically engaged in numerous research initiatives and practical fieldwork, acquiring hands-on knowledge in otter research encompassing surveys on otter populations, evaluations of their habitats, and analysis of the surrounding ecosystems. These encounters deepened his aspiration to actively contribute towards conserving otters in Nepal.

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# ASSESSMENT OF STATUS AND DISTRIBUTION OF SMOOTH-COATED OTTER IN HYDERABAD AND MEDAK, TELANGANA, INDIA

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**Abstract**

*Smooth-coated otters (*Lutrogale perspicillata*) are the apex predators of the wetland ecosystem and are bio-indicators of a healthy ecosystem. They are classed as "Vulnerable" in the IUCN Red List. This study aims to assess the distribution of smooth-coated otters in Hyderabad and Medak, Telangana, India. To achieve these objectives different surveys were conducted to locate otter signs (spraints (scat), footprints, holts (dens), etc.) at two field sites during the period of August–November 2020. All signs observed during the survey were recorded, along with disturbances/ threats caused by anthropogenic activities in that region. A social survey was conducted where villagers and local people were interviewed with a structured questionnaire to understand the distribution from a local perspective. The data was analysed using different tests and software. Himayath Sagar lake site showed 31% otter presence while the Manjeera river showed 7.84% otter presence. Disturbances were correlated with signs of otter, and the data was imported to ARC map to produce distribution maps for smooth-coated otters. The study also focused on various anthropogenic causes that led to the disappearance of smooth-coated otters from the selected sites. A conservation action plan is provided with solutions such as allotting grazing lands, encouraging fish farming, eliminating illegal trade, and local support groups.*

***Keywords:*** *Smooth-coated otters; distribution; disturbances; survey*

## INTRODUCTION

Out of the five species of otter that are found throughout the Asian continent, three are present in the Indian subcontinent, namely smooth-coated otter *(Lutrogale perspicillata*), Eurasian otter (*Lutra lutra*) and Asian small-clawed otter (*Aonyx cinereus*). There are various reports of their distribution in India such as **Kruuk et al. (1984)**, **Theng and Sivasothi** (**2016)**, **Trivedi and Joshi (2018), Suthar et al. (2017), Kumara and Singh (2007), and Hussain and Choudhury (1997)** but all three species continue to decline. On the Indian subcontinent **Gray** (**1865**), reported the smooth-coated otter as being distributed from the foothills of the Himalayas, southwards to southern India and being present in the states of Karnataka, Kerala, Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Punjab, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, and Mizoram: Telangana and Andhra Pradesh had not yet been divided. **Nagulu et al.** (**1998**) with his team surveyed and documented

the distribution of smooth-coated otters in Andhra Pradesh and the population was considered to be large in East Godavari, West Godavari, Krishna, Guntur, Kurnool, Adilabad, Karimnagar, Khammam, Warangal and Medak. The highest population was in East Godavari and the most sparse population was seen in Karimnagar; it is also stated that the population has been decreasing continuously (**Nagulu et al., 1998**).

## STUDY AREA

The study was conducted in the areas of Medak and Hyderabad where smooth-coated otters were found previously and were recorded in 1998 during a survey in Andhra Pradesh (Figure 1). As most of the previous sites were different lakes in Telangana, some were surveyed again to find evidence for the presence or absence of the smooth-coated otter.

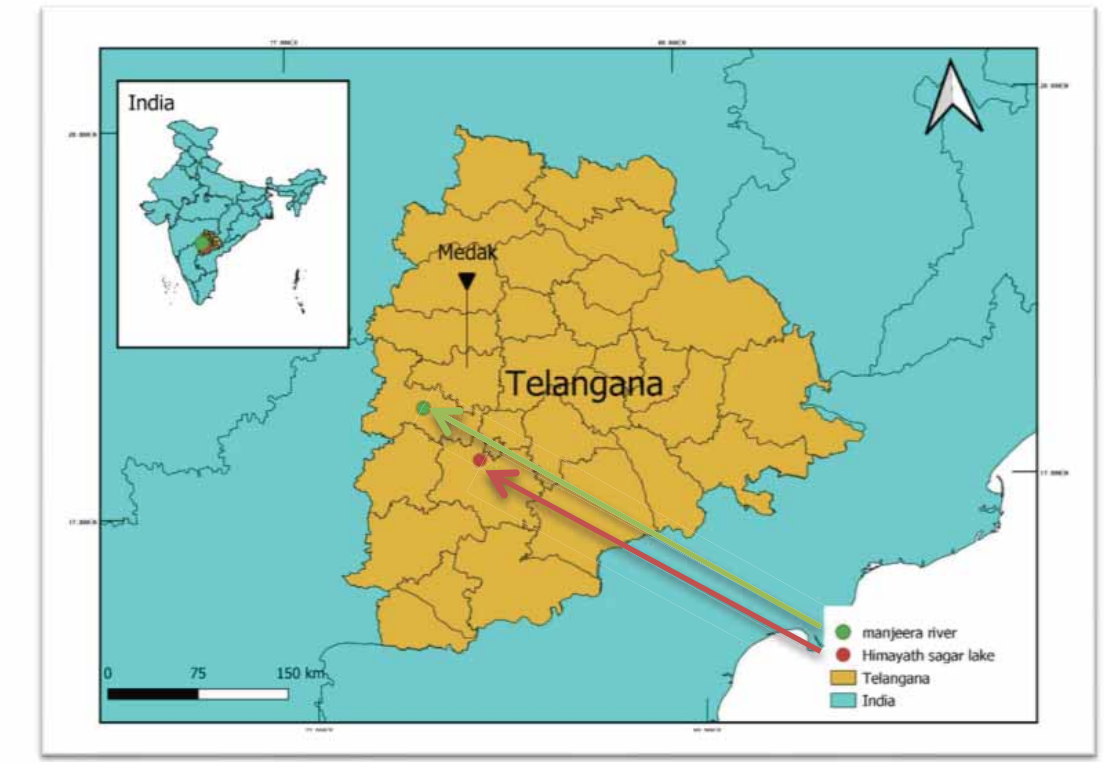


***Figure 1. Map showing the study areas 1) Manjeera river 2) Himayath Sagar lake in Telangana state of India***

### *Himayat Sagar Lake*

This is an artificial lake situated about 20km from Hyderabad (17˚18N 78˚21E), which was created to provide drinking water and also to protect the city from floods. Previously this lake had no record of smooth-coated otters but in May 2020 two birders spotted and photographed a smooth-coated otter in the area and there was evidence that there might be other otters living in the region. Therefore, this region

was selected as one of the sites for the survey (***Hyderabad Tourism*, 2014; *The Hindu*, 2020).**

### *Manjeera River*

This river, a tributary of the Godavari river, flows from Singuru village in Medak district, and passes through Telangana, Maharashtra, and Karnataka states. Singuru Dam is built on this river, providing the main source of drinking water for Hyderabad and a hydroelectric project in the Singuru village of Telangana (17.7496˚N 779278˚E). In the present study it has not been possible to survey the whole river but only the part flowing through Hyderabad. Previously Manjeera had more than seventy smooth-coated otters with groups ranging from 5 to 12 individuals (**Nagulu et al., 1998**).

## METHODS

The study to find the distribution of smooth-coated otters was based on a direct field survey and recording the habitat and severity of any anthropological disturbances, and any factors that may affect the population.

In order to identify threats and find other conservation perspectives a structured interview was conducted with local communities, fishermen and some officials in the study sites.

### *Sampling method*

To study the distribution of the smooth-coated otters, a sampling method was used to collect data, and conduct a systematic study according to the ecology and habitat of the species **(Khan et al., 2014)**. Line transects were used by dividing the study area into grids and the transects were laid down in these. A line transect method will not only give the abundance but will also indicate the presence and absence of the otters. In each transect a plot of 50m x 250m (left and right bank of the river) was used.

### *Data collection*

The data was collected during the period of August–November 2020 using an app called Epicollect, and it was then imported to Excel for analysis.

During transects surveys, otter signs (footprints, grooming sites, holts (dens), spraint (scat), direct sightings, food remains) were recorded. GPS was used to mark the latitude and longitude of any otter signs and the type of disturbance or any anthropogenic activities.

For the factors that might affect the population, different variables were recorded in each site such as pollution, human disturbance, tree logging, sand mining, fishermen

and otter conflicts, fishing intensity, etc. This enables a comparison of the availability of signs and effects of these factors.

A structured survey was conducted with the local people in order to understand the history of the distribution and also to understand the perception of the people towards smooth-coated otters. Each group was questioned separately and they were categorised into different age groups.

## RESULTS

***Table 1. Showing the sampling range in the study area***

| Study area | Number of Transects | Number of km |
|---|---|---|
| Himayath Sagar lake | 38 Transects | 6km |
| Manjeera River | 134 Transects | 17km |

The field sign survey was conducted along the banks of the Manjeera river and Himayath Sagar lake with transects surveyed (n =134) in Manjeera and (n =38) transects in Himayath Sagar lake.

The total days spent surveying both study sites were (n = 90 days)

It was observed that from a total of (n = 172), the transects that showed no sign of smooth-coated otters were (n = 150). There were seven different types of signs observed and footprints of the otters were the most prominent (n= 8).

***Table 2. Different types of otter signs observed***

| Type of sign | Number of signs |
|---|---|
| Footprint | 8 |
| Spraint | 6 |
| Den | 4 |
| Direct sighting | 2 |
| Leftover food | 1 |
| Trail | 1 |
| None | 150 |

To understand the factors that caused smooth-coated otters to disappear any signs of disturbance found during the survey area were noted. It was observed that out of (n = 172) sampled areas, (n = 41) transects did not show any kind of disturbance, and most of the transects (n = 79) showed plantations as a disturbance. The different kind of disturbances/threats that were observed are (n = 18) and are shown in Figure 2.

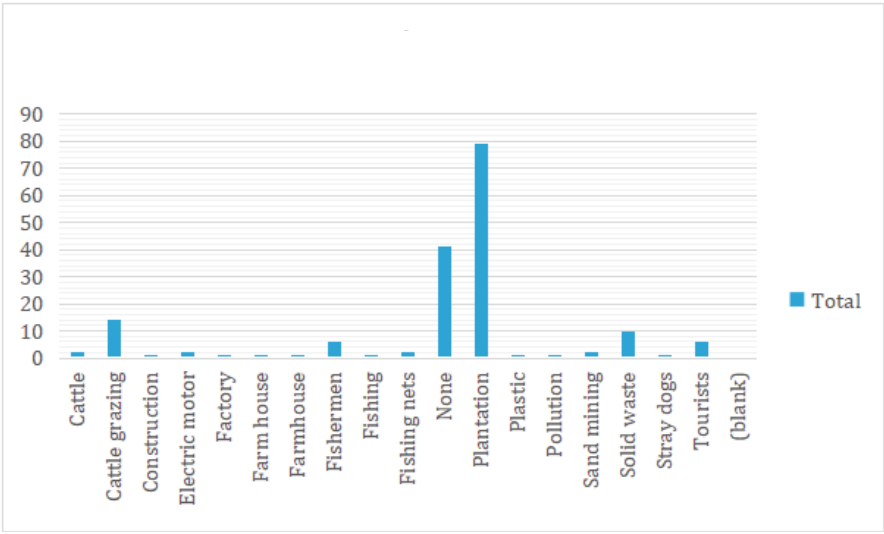


***Figure 2. Graph showing different types of threats that were observed in the study area***

## ANALYSIS

To demonstrate that the different factors of the survey were dependent on each other, these factors were correlated against each other. For the data analysis, a combination of Pearson's correlation and Spearman's correlation were used and the data were converted into binary codes for use in Excel and PAST software (Figures 3 and 4).

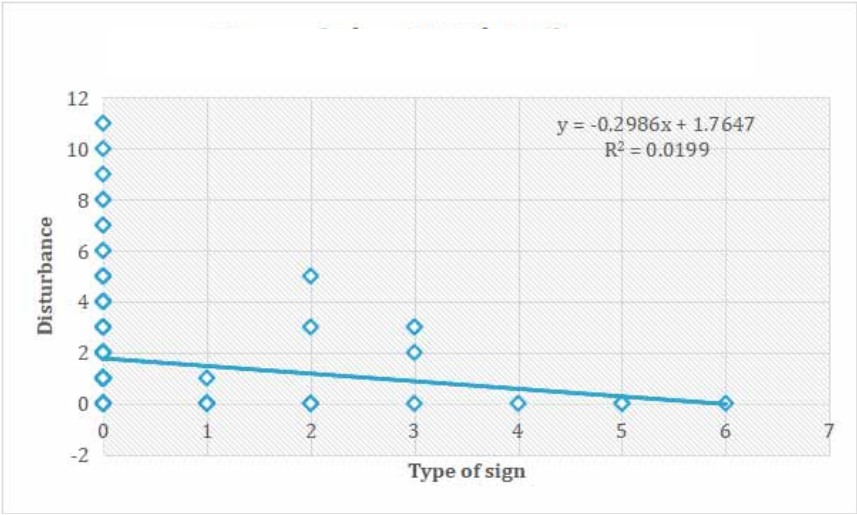


***Figure 3. Pearson's correlation between type of sign and disturbance/threats***

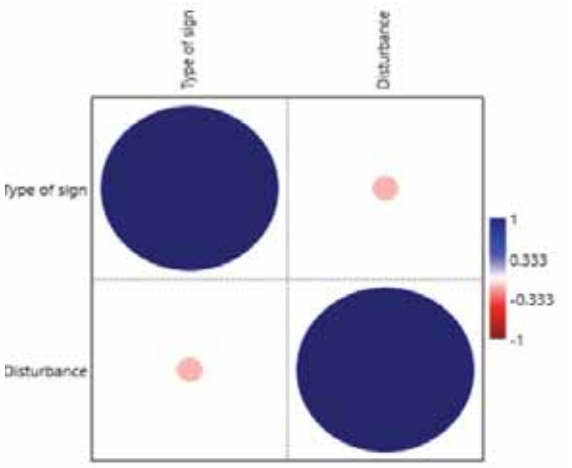


***Figure 4. Pearson's correlation between Type of sign and Disturbance/threats as shown in PAST software***

When the number of otter signs was correlated with the disturbances, the correlation coefficient was **–0.14102,** and the *p*-value for Pearson's correlation coefficient is ($p$ = 0.5).

In that case $p = 0.5 > -0.14102$.

Pearson's correlation states that if the correlation coefficient is less than the significant value that is ($p$ = 0.5) then it indicates that it is a negative correlation. In this case, as the number of disturbances/threats increases then the type of signs decreases (Figure 5).

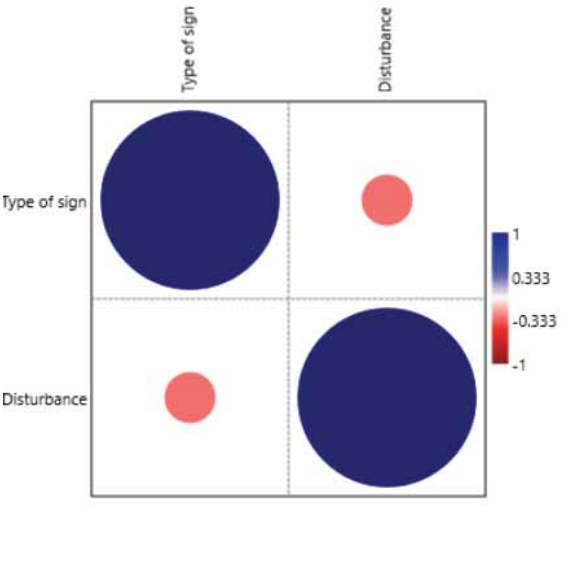


***Figure 5. Spearman's correlation plotted against the type of sign and disturbances/threats***

***Table 3. Showing that the Spearman's correlation is negative***

| | Type of sign | Disturbance |
|---|---|---|
| Type of sign | | –0.28005 |
| Disturbance | –0.28005 | |

When the type of otter signs was correlated against the disturbances the Spearman's correlation coefficient is –0.28005.

In that case $p = 0.5 > -0.28005$.

Spearman's correlation states that if the correlation coefficient is less than the significant value that is ($p = 0.5$) then it indicates a negative correlation, this suggests that the variables are indirectly proportional to each other

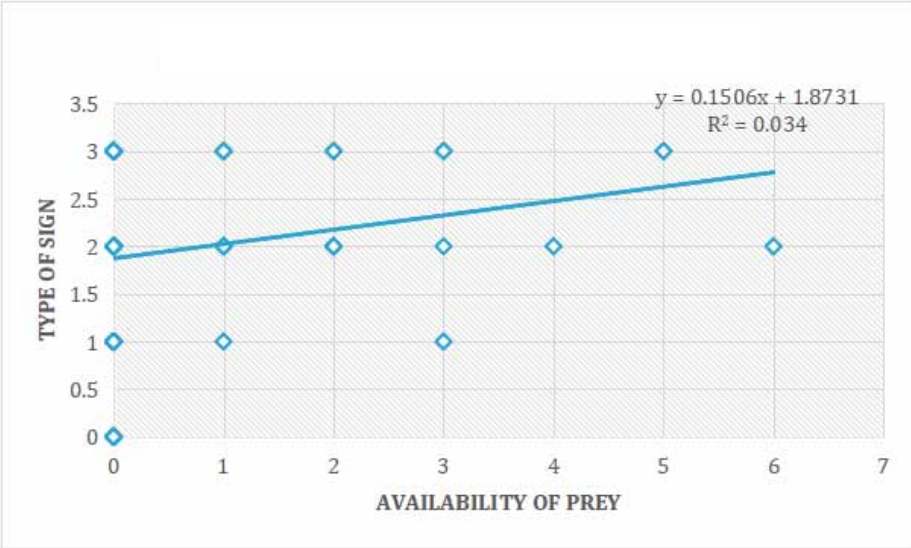


***Figure 6. Pearson's correlation showing availability of prey and type of signs***

***Table 5. Showing that Pearson's correlation is positive***

| | Type of sign | Availability of prey |
|---|---|---|
| Type of sign | | 0.18442 |
| Availability of prey | 0.18442 | |

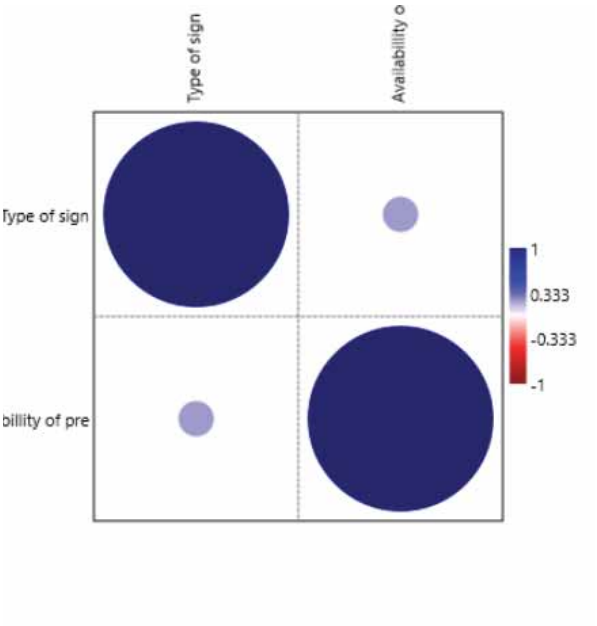


***Figure 7. Spearman's correlation plotted against the type of sign and availability of prey***

*Pearson's correlation*

When the availability of prey was correlated with the type of otter signs, Pearson's correlation coefficient was given as 0.18442 and the *p*-value for Pearson's correlation coefficient is ($p = 0.5$).

In this case $p = 0.5 < 0.18442$ (Figures 6 and 7).

When the correlation coefficient is more than 0.5 or close to 1, the correlation of the variables that were plotted against each other is positive, which suggests that as one variable increases the other variable increases too or vice versa.

### *Abundance distribution models*

Abundance distribution models consider species evenness and richness. If the curve is steep then it indicates that the species is not evenly distributed and the species richness is low. There are four kinds of abundance distribution models, geometric model, log series model, broken stick model, and lognormal model (Figures 8 and 9).

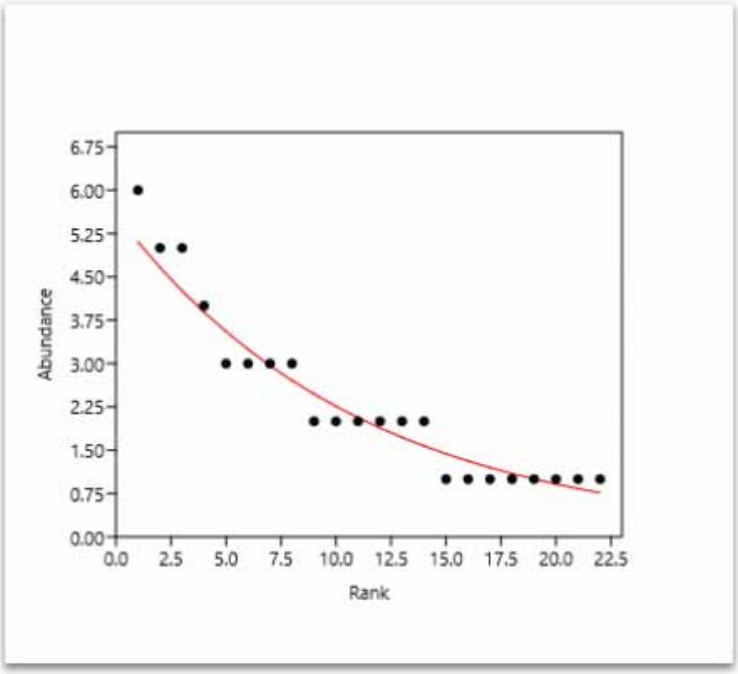


***Figure 8. Geometric distribution model showing steep rank curve indicting low evenness and low richness***

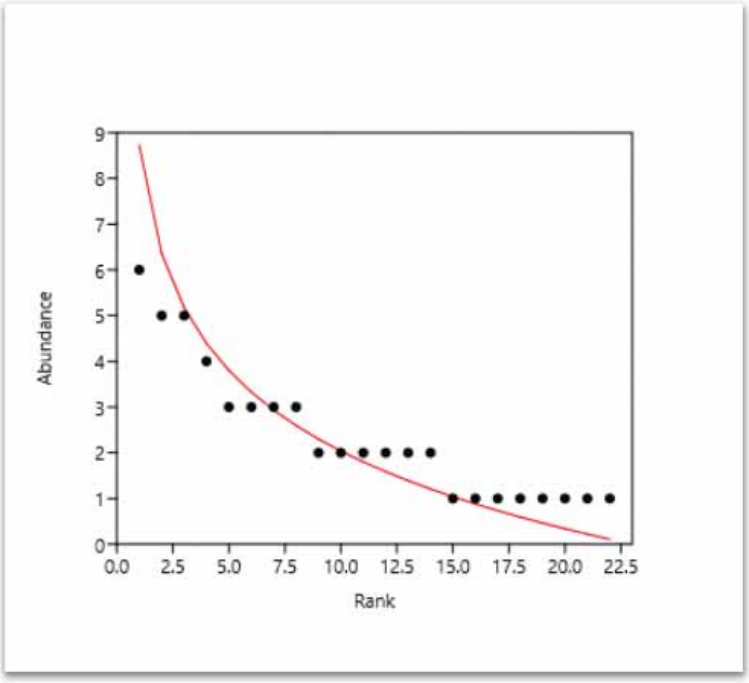


***Figure 9. Broken stick model showing the distribution evenness and richness is low***

### *Distribution maps*

The distribution data for the smooth-coated otter was collected from both of the study sites and then exported into the ARC Map to make distribution maps to show visually how the otters were distributed in the given sites (Figures 10, 11 and 12).

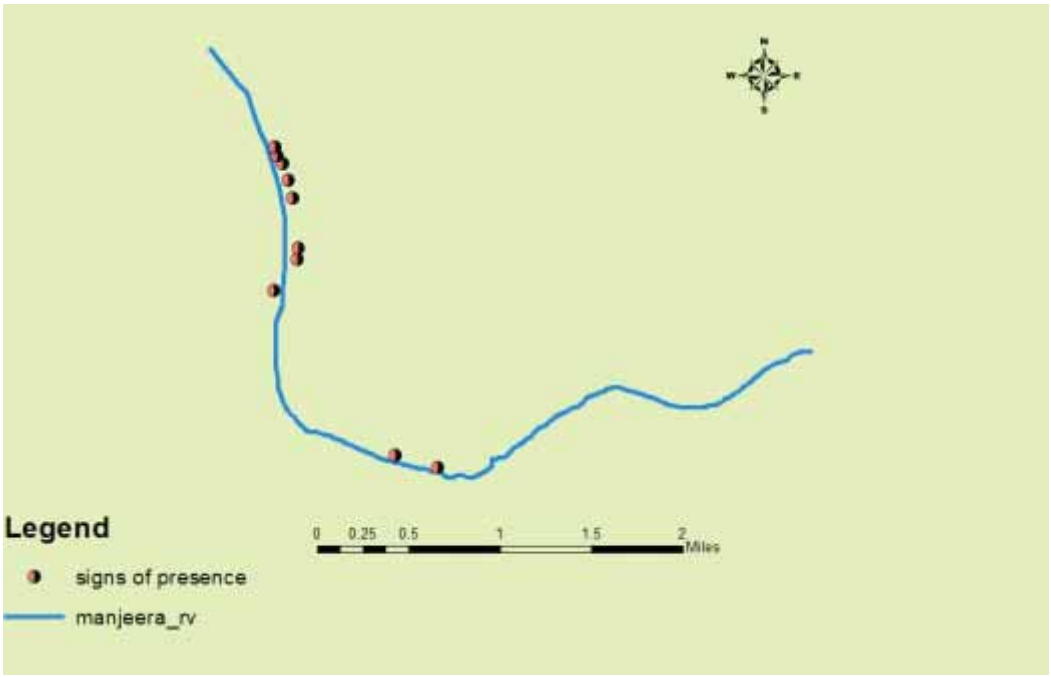


***Figure 10. The above map presents all the areas which showed positive signs of the presence of otters in Manjeera. Out of 134 transects, only 10 transects showed any presence of signs.***

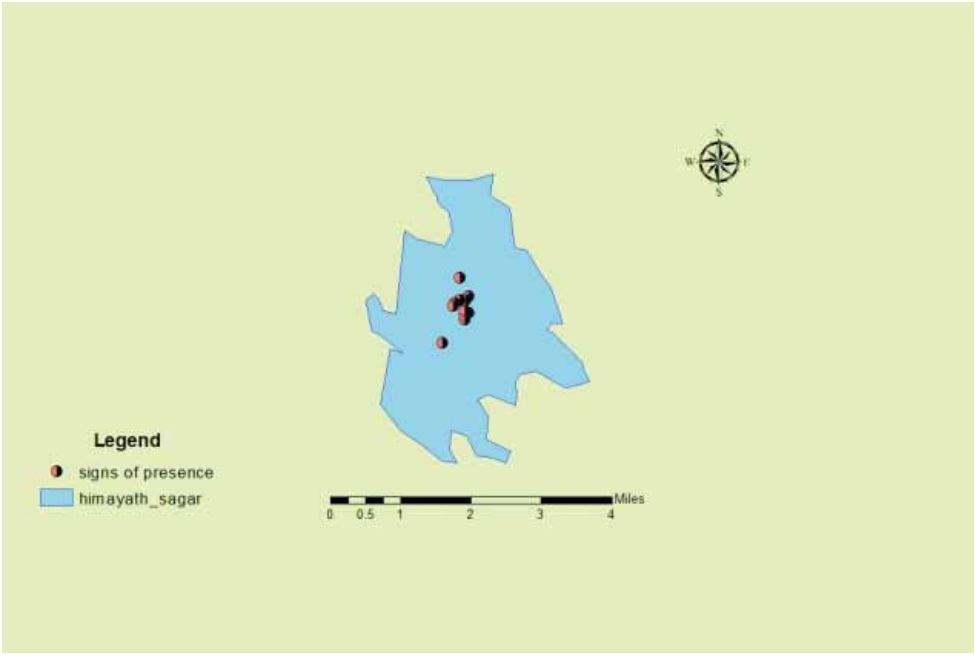


***Figure 11. The map depicts all the areas in the Himayath Sagar lake that showed any signs of the presence of smooth-coated otters. Out of 38 transects, 12 transects were positive for otter presence.***

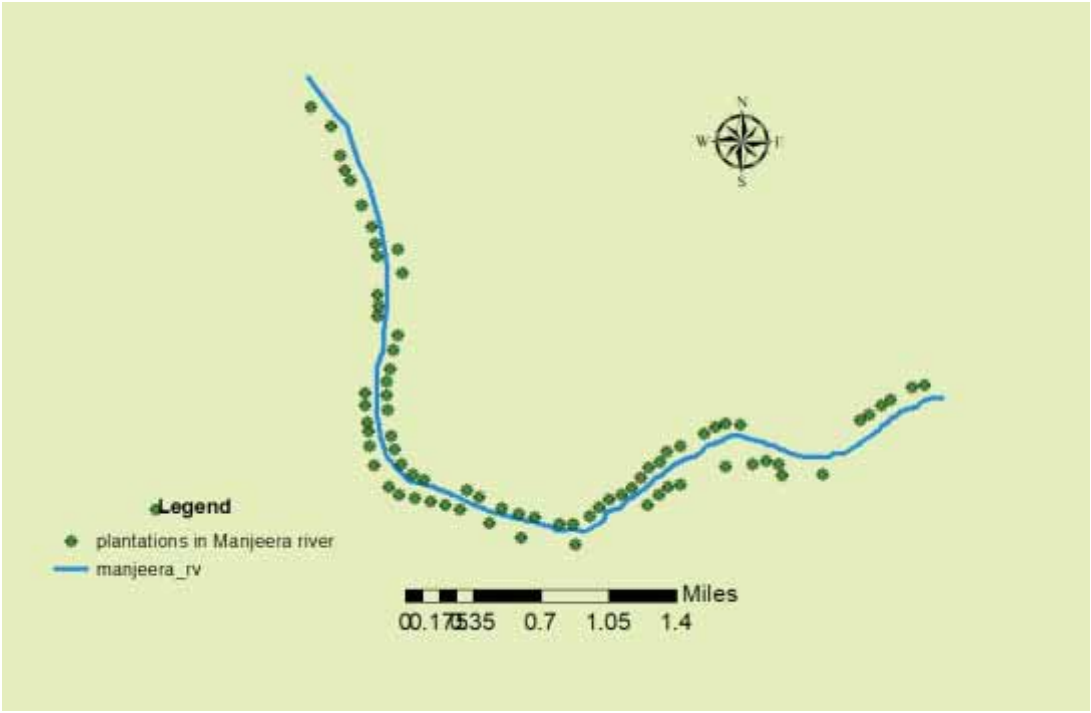


***Figure 12. The map shows the presence of plantations in the otter habitat in Manjeera river which is noted as a possible disturbance/threat***

### *Social survey*

Initially, it was planned that the interview would be semi-structured so that it would be easy to understand the perspective of the villagers about smooth-coated otters. However, due to the pandemic it had to be changed to a structured interview limiting the number of interviews to half of what was planned. A total of 50 interviews were conducted and the information was exported to an Excel sheet for analysis.

Figure 13 shows that most of the villagers consider that sightings of otters have decreased.

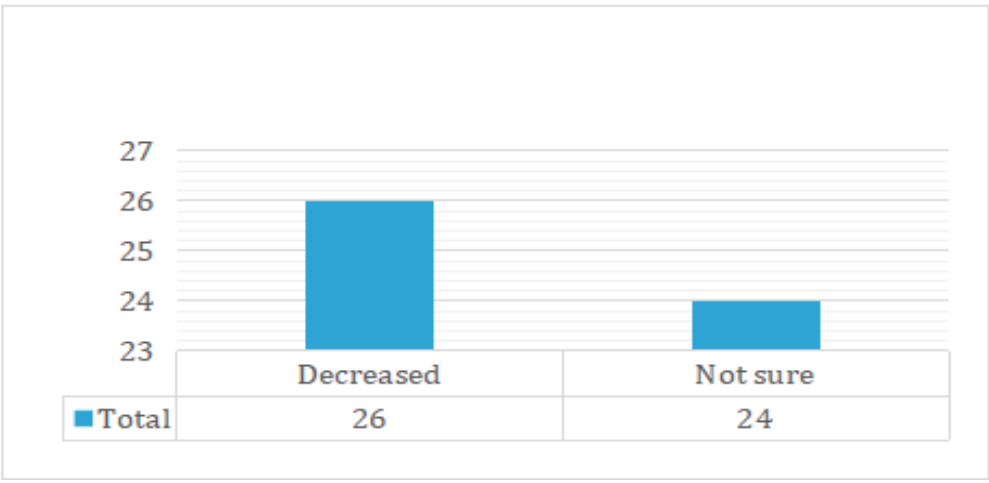


***Figure 13. The graph shows how sightings of otters by villagers has drastically decreased***

Figure 14 shows why the villagers believe this is the case with pollution regarded as the main cause. Deforestation, poaching and increase in human population are considered to be less important.

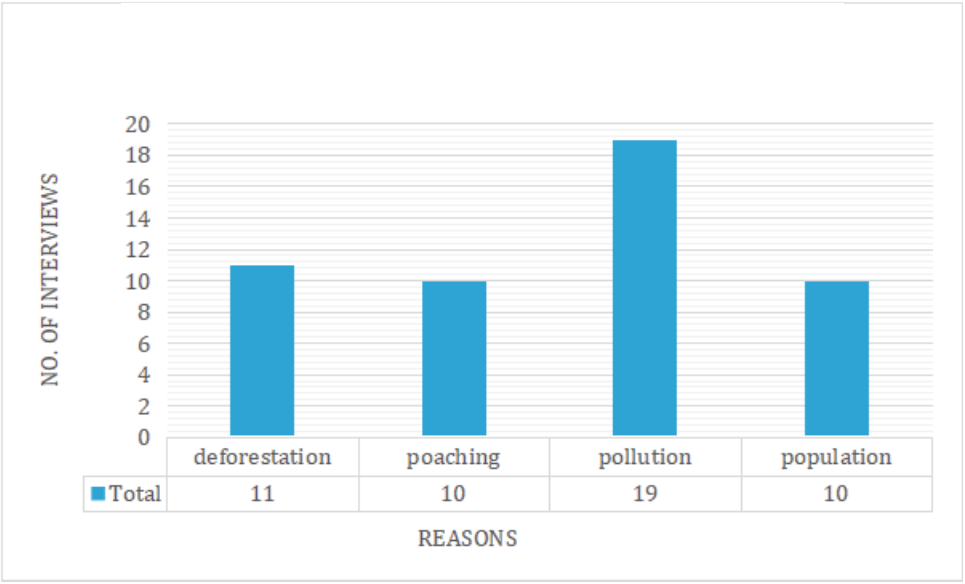


***Figure 14. The bar chart shows the different reasons that villagers think have caused the smooth-coated otters to disappear***

Figure 15 shows what the villagers consider to be the reasons behind human-otter conflict. Clearly competition for food is thought to be the most significant followed by the effect of the otters on the fishing grounds and then "being a nuisance". A few blame them for stealing poultry. There have been other studies on the interactions between fishermen and smooth-coated otters e.g. **Trivedi and Variya (2023)** and **Kulkarni (2016)**. They all recommend that there should be more sensitisation programmes for otters in fishing communities with possible compensation for losses.

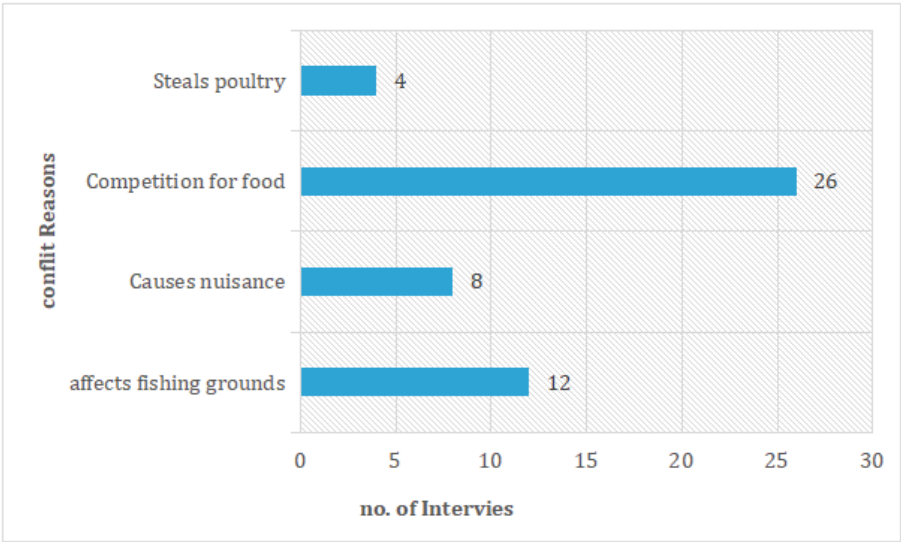


***Figure 15. The graph shows the different reasons that villagers think might have caused conflicts between fishermen and smooth-coated otters***

## DISCUSSION

The study was conducted in Hyderabad and Medak, Telangana state, using field sign surveys and social surveys. Himayath Sagar lake was surveyed for the first time, so this study was able to generate base line data for the site. This site was selected because two local birders, who were at the lake, photographed a smooth-coated otter there **(Reddy, 2020)** during the pandemic lockdown period. Lockdown might be the main reason behind this rare sighting as there was much less to no human activity near the lake for a few months. This enabled the otters to become active without any fear of disturbance.

Different signs were seen during the four months of the study and the surveys helped in understanding the movement patterns of otters in different habitats and enabled the calculation of abundance of signs. The total abundance in Himayath Sagar lake was around 31%, which is higher than the average because the study was conducted in the middle of a global pandemic. The abundance in Manjeera river was slightly less than the expected result at nearly 8%. Even though the Manjeera river is the larger area compared to Himayath Sagar lake, lockdown had ended by the time the survey started, which made the area busier than before. The signs that were found were mostly footprints (8%), then spraints (3%), holts (2.32%), and direct sightings were very rare (1.16%). Another reason why the lake had more abundance than the river might be due to the fact that Himayath Sagar lake has no predators which would affect the otters. Up to our study it was recorded that some stray dogs and a few migratory birds may attack an otter. However, in the Manjeera river, it is known that the top predator of that habitat is the Indian crocodile and some locals shared stories of how they have witnessed Indian crocodiles preying on smooth-coated otters. This might have decreased their activity pattern as it is known that otters reduce their activity period according to nearby predators **(Hussain, 2013; Reddy, 2020).**

The overall results showed that the disturbances and signs of otter presence were negatively correlated i.e. disturbances negatively affect the otter population. Even though previous studies **(Reddy, 2020**) stated that otters prefer paddy field habitats, this sampling site was covered with 95% cotton plantations and 5% paddy fields. The cotton plantations ruined the surrounding habitat because extra human help is needed for harvesting.

A social survey was conducted to understand the local peoples' perspective about otters and their distribution. It was known that people in Telangana called otters *Neeti pilli* (water cat) but when the survey was conducted all the local fishermen and villagers used other names to identify otters. Locally otters were called *Siri kukka* (water dog) and this was the first time the term "*Siri kukka*" was recorded. Upon interviewing villagers about the otter population 55% agreed that their population has decreased while 45% were not sure and no-one said the population had increased. On asking the reasons behind the population reduction, 38% said it might be due to pollution, 22% claimed it might be due to deforestation, 20% said it was due to an

increase in human population and 20% claimed it might be due to poaching (**Venkataraman, 2002)**. In the previous study by **Nagulu et al.** (**1998**), around 50 otters were sighted in the Manjeera river. Comparatively the number of otters that were sighted during this study in 2020 was only two, which shows how drastically the population has reduced in the past years.

While interviewing one of the fishermen in Himayath Sagar lake, he claimed to be fishing there illegally as it was not permitted to breed fish there. He stated that he bred fish along with another 20 fishermen and released them in to the lake to increase production. He also stated that he has been at the lake for the past 30 years and had seen several groups of otters as a teenager. This implies that the development of the city led to the destruction of habitat in important wetlands, which in turn affected the apex predators that are dependent on them, such as the otter.

## CONCLUSIONS

Smooth-coated otters are considered as "Vulnerable" in the IUCN Red List, the major issue being that they are facing habitat loss. India is a growing country with a high human population and this naturally increases the demand for natural resources, competition for food, etc. This leads to the conversion of natural habitats into agricultural lands and the destruction of wetlands and other habitats where otters prefer to live (**Anoop and Hussain, 2006**). Manjeera river is one such river which is highly affected because of anthropogenic activities, such as agricultural fields at river banks, extensive fishing, and a drinking water project (Singur Dam). This causes drying of the river in summer causing food shortage for the smooth-coated otters living in that habitat.

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No potential conflict of interest was reported by the author.

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