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## **THE POTENTIAL ROLE OF SOCIAL MEDIA IN SUPPORT OF OTTER CONSERVATION IN THE INDIAN HIMALAYAN BIODIVERSITY HOTSPOT**

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### **Abstract**

*Anthropogenic stressors in the Indian Himalayan biodiversity hotspot over recent decades have taken a toll on otter populations. Low public awareness and a lack of routine monitoring data hamper conservation strategies. Social media has the potential to generate both positive and negative perceptions about otter species among target stakeholder groups. This approach can serve as a tool to generate vital conservation information and promote public knowledge and interest. This paper examines the role of social media as a tool to reinforce contemporary conservation initiatives, advocating its stronger utilisation for the potential protection of otter species in the Indian Himalayan biodiversity hotspot. The proposed approach is also maintained through a case study from the region.*

**Keywords:** *Freshwater; Lutrinae; Mustelidae; Uttarakhand; wetlands*

## **BACKGROUND**

Potential threats to otter species in the Indian Himalayan biodiversity hotspot include destruction or degradation of essential habitat and illegal poaching activities (**Gupta et al., 2016, 2020**). Compounded pressures arise from a projected increase in mean temperature across the region of 1–2°C by 2050 compared to a 1960s baseline, a likely extended and less predictable monsoon, precipitation varying by 5% on average, and a likely increase in intensity of extreme rainfall events (**Alfthan et al., 2018**). All of these pressures potentially affect the habitat of otter species, including the viability of prey populations.

Social media, defined as a collection of online information sources (**Barker et al., 2012**), has played an increasingly influential role in advancing communication (**Mangold and Faulds, 2009**) due to its broad outreach and availability, enabling a speedy and increasingly broad circulation of content. Social media can therefore potentially play an important role in otter species monitoring and conservation initiatives. Existing examples include internet sites such as iNaturalist (**www.inaturalist.org**) which provides platforms to post photographs of species and obtain information from the wider scientific community. Inputs to biodiversity databases can also provide species observations with specific dates and locations, with potentially thousands of users contributing to databases available to conservationists and ecologists. As one large-scale example, the Global Biodiversity Information Facility (GBIF) (**www.gbif.org**) is a free and open access portal to biodiversity data (**GBIF, 2013**). Such databases can serve as valuable tools to evaluate, for example, the arrival/departure time of summer and winter resident populations in an area.

Mobile apps such as Pakshi (**https://pakshiapp.appspot.com/**) and Frog Find 1.0 (**https://gubbilabs.in/Launch-Frog-Find-1.0**) provide an opportunity to share faunal data on social networking platforms, and analyse/monitor ‘big data’ using crowd-sensing technology (**Herlekar and Prakash, 2014**). Nonetheless,

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accessibility issues persist, especially among communities in high mountain areas due to geographical, social, and economic isolation. In the majority of these regions, access to the internet has developed rapidly, but research interest in the role of social media in otter conservation is still embryonic.

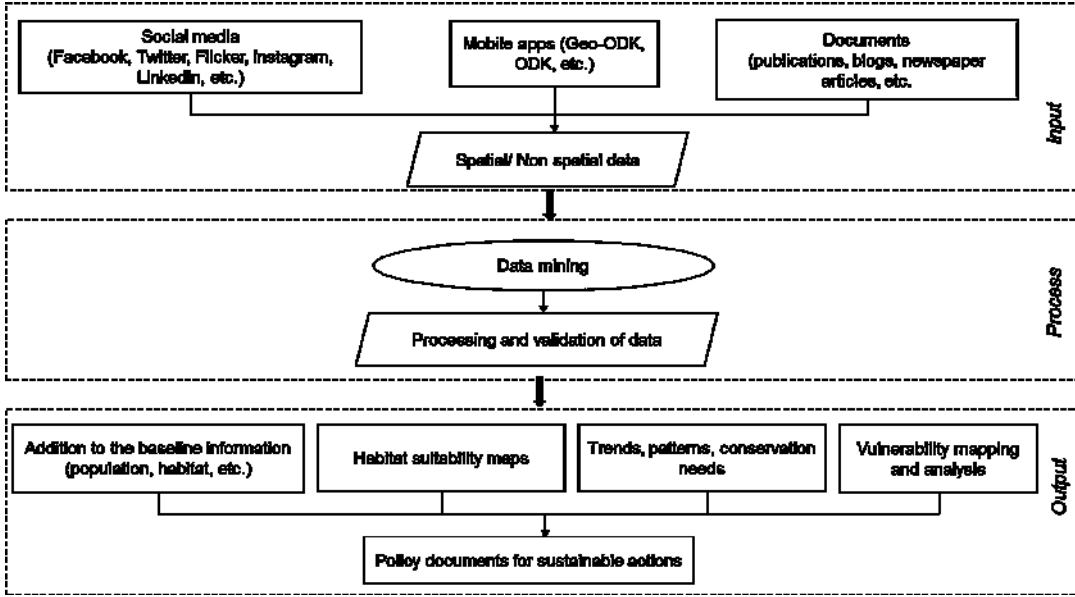
## **THE ROLE OF SOCIAL MEDIA FOR OTTER CONSERVATION: A POTENTIAL FRAMEWORK**

Social media can play a crucial role in data mining (a process through which raw data are converted into useful and usable information) for otter species. Posts, comments, tweets, images, locations, etc. shared on platforms such as Facebook, Instagram, Flickr, Twitter, etc. have been used in business analytics, market research, prediction, and wildlife conservation previously. Regrettably, there is also evidence of poachers using information on social media (**Springer, 2016**), though conversely social media has also been used as a weapon to track down poachers (**“Social media used as weapon”, 2018**). These considerations sound a note of caution about widespread communication of locations of threatened and tradable species such as otters.

Social media datasets can be characterised into two types: spatial and non-spatial data. Spatial data refers to information which can be represented by numerical values in a geographic coordinate system (i.e. latitude, longitude of a location, geo-tagged photographs and posts). Non-spatial data doesn't have any geographical information (e.g. posts on Twitter, Facebook, blogs, texts, etc.).

Figure 1 shows a proposed framework for data mining to assist with otter conservation in the Indian Himalayan biodiversity hotspot in three possible steps.

*Figure 1. Proposed framework for data mining*



**Step 1 [Input]:** The species-related data from multiple sources (both spatial and non-spatial) can be harnessed to extract the relevant data. Here, the assistance from local stakeholders will be crucial for on the ground information throughout the various seasons.

The input steps involve the use of social media platforms. The data obtained here will be through photographs and latitude/longitude information and we will obtain the highest number of posts of otters. This has the potential to assist with otter species determination and promotion. Further, it will help to generate habitat suitability maps, and identify potentially vulnerable sites, i.e. where human intervention is the most. Android applications such as Geo-ODK will provide field- based information. This will help with topographic analysis based on remote sensing datasets after data processing. This will provide information for land cover analysis to understand habitat locations/types of otters. It also has the potential to obtain social survey data to understand community support for otters, greatly providing inputs for planning and implementation of targeted conservation strategies. Published/non-published documents can provide research data for understanding baseline information and research gaps and needs. More importantly, location specific information, and an inventory of scientific research in a particular

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area and on a particular otter species, can also be obtained.

**Step 2 [Processing]:** The data acquired requires processing and validation to extract valuable information. This could be conducted by field trips to the observation sites, and will require financial assistance from donor and government agencies. Data assimilation on a common platform is the key here, and will potentially avoid redundancy of data. Data cleaning can be conducted with validation based on expert knowledge at this stage. Open source data will ensure its authenticity. Further, data cleaning can be achieved by organising annual workshops for scientists and non- scientists working on otters.

**Step 3 [Output]:** Data can then be used to develop different useful strategies to assist with the protection of otters.

Importantly, the knowledge products generated through this process have the potential to assist in the development of policy documents, advisories, and recommendations for sustainable actions for the protection of otters. Some of the advantages of the proposed framework for otter conservation include the creation of a centralised data system which is easily accessible by all as an open source. This will avoid data redundancy and repetition of otter-related work. The data can be used for further research work, saving both time and money. It is important to note that coordination at various levels will be required through a multi-stakeholder approach involving all otter scientists on a national and international scale. Initial stage capacity building will be needed for field researchers and non-scientists/scientists to bridge the knowledge gap on otters.

## **CASE STUDY: OTTERS OF UTTARAKHAND**

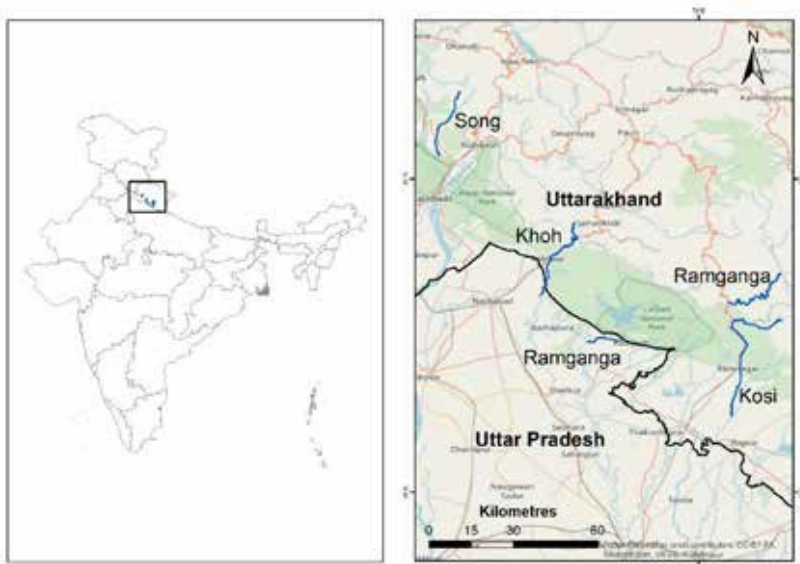
### ***Background***

Three species of otter have previously been reported from the Indian state of Uttarakhand, one of three Indian Himalayan biodiversity hotspots (**Hussain, 1999; Nawab, 2007; Khan et al., 2014**). They are the Eurasian otter (*Lutra lutra*), smooth-coated otter (*Lutrogale*

*perspicillata*), and Asian small-clawed otter (*Aonyx cinereus*). The local threats faced by these three species of otter are similar at the local level, in comparison to the global assessments (Gupta et al., 2020). These otter species play critical roles as top carnivores in the balance and processes of riverine ecosystems, significantly influencing the overall spatiotemporal dynamics of river systems and thus the beneficial ecosystem services that they provide (Gupta et al., 2016, 2020).

### Study area

The study was focused in the state of Uttarakhand (30.0668° N, 79.0193° E), located in the Western region of the Indian Himalayas. Uttarakhand has rich aquatic habitat diversity including numerous rivers, reservoirs, freshwater lakes and wetlands, which in turn support rich biodiversity (Gupta et al., 2016). This work focused on four significant catchments in the region (see Figure 2). The Kosi River originates from Budha Peenath village in the Kausani area of Almora District of Uttarakhand, and has a total length of about 240 km and a catchment area of 3,420 km<sup>2</sup>; the Western Ramganga River is an important tributary of the Ganges River, and originates from the Shivalik Himalayas at Dudhatoli in the District of Chamoli in



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Uttarakhand; the Khoh River is a tributary of the Western Ramganga, originating from Langur in Dwarikhal and has a catchment basin of over 250 km<sup>2</sup>; and the Song River is a tributary of the Suswa River, which in turn is a tributary of the Ganges and originates as spring-fed stream in the southern slopes of the Mussoorie ridge of the Himalayan range (Gupta et al., 2016).

*Figure 2. River catchments in study area*

### ***Methods***

Despite the numerous perennial rivers in the region, the above-mentioned rivers were judged representative by the authors. This is because a previous field study conducted by the corresponding author in the region during 2018–2019 reported otters (direct and indirect sightings) from these rivers (Gupta et al., 2020). These rivers also have villages along their reaches with whom the research team has strong

links. The rivers and the villages were also accessible by road. In addition, some research team members could converse in the local dialect and were sensitive to local customs.

The social science surveys were conducted between 2018 and 2019 with the aid of semi-structured interviews to document the perspective of local community members on the effectiveness of social media for otter conservation under the following sections: (a) the respondents' gender and age in years; (b) tools and strategies used by local people currently indulged in leisure activities to attract tourists; (c) the likelihood of the application of social media working for otter conservation in the region; and (d) any additional comments or suggestions.

The respondents were from the communities located along the rivers. As many households as possible were approached for the survey (both men and women) to ensure that a significant number of individual responses were obtained for the analysis. The community selection was based on the voluntary willingness and the availability of members in the study area during the field survey. Consent was requested and obtained from all the participants to make notes of the conversations. All responses were kept anonymous so that respondents felt free to express their views (following **Everard et al., 2019**). Written notes were transferred into spreadsheet format.

Discussions took place primarily in Hindi. Gender sensitivity was considered, including questioning of women by a female member of the research team, though no inhibition was encountered in wider discussions with female or other informants. Conversation flowed freely with no evidence of it being dominated by any individuals. Researchers fluent in Hindi translated the responses, taking written notes in English and collating them following the meeting. Additional input was derived from literature searches (as seen in the citations used in this paper).

## ***Results***

A total of 279 semi-structured interviews were conducted during the survey period. Participants included local community members,



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aged between 18 and 70 years old, with 204 men and 75 women being interviewed. An attempt was made to understand the perspective of local community members on the effectiveness of social media for otter conservation, and if such an approach could act as a conservation strategy in the region.

Almost all the respondents were aware of the increasing opportunities for local communities to participate in the existing and upcoming ecotourism opportunities. The community members currently indulged in tourism activities (e.g. birding, wildlife safaris, catch-and-release angling, and trekking) and paid attention to social

media platforms such as Facebook to attract incoming tourists. This was sometimes their main channel to market, locate, and communicate with their tourists, and for the tourists to schedule their visits well in time. Sixty-eight percent of the respondents pointed out that they could not comment on the application of social media for otter conservation as not enough information was provided to them to take advantage of such an opportunity. The remaining 32% stressed that such an approach could be beneficial for otters. Seventy-two percent of the respondents also mentioned that appropriate and timely support from concerned officials, and guidelines for maintaining a healthy ecosystem could go hand-in-hand for the long-term success of such initiatives in the region. The rest (28%) mentioned that information gathered through social media could inform the concerned officials, who would then be more likely to be more favourable towards otter protection in the region.

### ***Discussion and way forward***

The authors acknowledge the significant limitations and uncertainties imposed in this study by focusing efforts on just the villages located along four of the rivers in the region, particularly given the high socio-ecological diversity across the region. To a substantial degree, this was enforced by resource limitations, field visits and interviews in particular taking substantial patience and time. However, other features noted in the study area section [reported otters (direct and indirect sightings) from these rivers; villages along the river reaches with whom the research team has strong links; the rivers and villages being accessible by road; some research team members being able to converse in the local dialect and sensitive to local customs] mean that it was a suitable study site, with all of these features not readily available elsewhere. Although the findings of this study are therefore subject to some unquantifiable uncertainty, the findings are nonetheless significant.

## **DISCUSSION**

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This paper suggests how the involvement of a data mining approach can potentially act as a supplementary tool for protecting otters and their habitats. This is supported by testing this proposal through the case study in Uttarakhand. Social media has been used to report illegal hunting and trade, and local stakeholders in the region can play a critical role in this. Social media not only has the potential to provide basic information on otters, but also to play a role in promoting public awareness of their conservation needs.

Data mining through social media is an emerging technique in wildlife conservation, and for understanding the patterns and process of ecological systems (**Hochachka et al., 2007**). For example, **Gallant et al. (2016)** used data mining techniques for studying the trends, population, and identifying hotspots of the wolverine (*Gulo gulo*) in Canadian Maritime provinces. Further, **Perumal et al. (2015)** demonstrated its use for the analysis of traffic and tourist monitoring, and biodiversity conservation.

Nonetheless, it is important to note that social media may have negative implications for otter populations. For example, social media is popularising the keeping of otters as pets and the illegal trade in otters across Asia (**Siriwat and Nijman, 2018**). As noted above, there is also possible abuse of locational information by poachers, so this information has to be carefully monitored and controlled. Active intervention in social media messaging may be needed to maintain a positive perception of otters and support for their conservation, using the medium as a public education platform.

Another challenge for the use of social media for species awareness is that otters in the area could be elusive and shy, and even villagers who are on the site most days still see them rarely (**Gupta et al., 2020**). Therefore, posting photos of and information about otters would be challenging. Here, building the capacity of interested stakeholders through targeted outreach will be needed for social media to be valuable in the region. This was also pointed out by the respondents (see the results section of the case study above). Given the local awareness and the potential of social media to make a positive impact on otters, an approach as mentioned above could be

trialled further to assess its sustainable applicability to protect otters (**Cianfrani et al., 2011**), with due caution about detailed locational information that may be abused. Further research needs to include a deeper understanding of sustainable ecosystem–community relationships by additional assessments of community relationships with their supporting environments in more villages in Uttarakhand.

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### **Disclosure statement**

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