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Read about

Leucism in Indian Flying Fox reported from Gujarat

Editorial Board

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A Quarterly Newsletter of
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(*Pteropus giganteus*)
By Hiren Patel

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EDITORIAL NOTE

पर्यावरणनाशेन विस्मेत् विस्तो भवेत्, मानवो मानवो भूत्वा कुर्यात् प्रकृति रक्षणम् ।

The word Sustainable livelihood explains the essence of maintaining the values of the assets and enhancing the capabilities of the system, for the current as well as future scenario, while conserving and respecting the natural resources. The second issue of the newsletter 'Prithivya' attempts to draw the attention of the readers to various aspects of sustainability through traditional conservation to high-tech environmental monitoring practices. It offers a wide range of articles ranging from Tribal artifacts and life style to Earth restoration, contributed by young researchers. From endemic species to sacred sites, all natural habitats inherit conservation values. Those biological, ecological, social or cultural values of outstanding significance are known as 'High Conservation Values' or HCVs and an observer's role is pivotal in keeping the meticulous records that help in assigning these HVC's. The Stewardship of Biodiversity Conservation has been ably carried forward by the young brigade of learners, who belong to diverse disciplines but converge towards their common goal of protecting the Mother earth. The recent disasters of untimely, uncontrollable rains and floods, landslides and raging forest fires at glocal levels, point towards an undesirable climatic shift in earth's environment and the human species is racing against time to be disaster ready. The 'Code Red for Humanity' flashed in the latest U.S.Climate Change report demands for doubling our efforts in ecological restoration regimes. It would happen only and only when the old conservation practices and new technological insights work in tandem to bring about the synergistic effect. 'Prithivya' is the right platform for the caregivers of environment to showcase their ideas and outcomes. We thank all the contributing authors of this 2nd issue and appeal to each reader of this newsletter to participate in some activity that will make a positive difference in sustainable livelihood of the species around us. Let's come together to build a greener tomorrow…

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DIRECTOR'S COLUMN

Wildlife conservation has captivated great attention from all the sectors of the community. Stakeholders including scientists, policymakers, local and global organizations and citizens have been putting relentless efforts in conserving the wildlife and the wilderness on the earth. This emphasizes on need for adopting foresighted approach and using scientific measures for producing desired results. However, all we need is to adopt a scientific approach in such conservation activities so that it retains for longer period of time and give the desired results. The key to wildlife conservation is target oriented awareness and appreciation of the relationship between wildlife conservation policies and practices. In order to build such relationship, it is crucial that the correct scientific information about the wildlife reaches ground level. Wildlife researchers should be recognised as an important disseminator of science-based information, with education in schools and universities. Along with that, the media should bolster the social responsibility for communicating accurate and reliable conservation information.

At WCB Research Foundation, we strive to bring different stakeholders and media on a single platform to spread the science-based information about wildlife and encourage the community to appreciate wildlife. Our community based conservation approach has now become our mission of "Adding science to the Conservation".

The foundation will now complete one year! And during this first year of establishment, we initiated several activities through which the scientific information can reach to every single or all sectors of the society. We have started the sloth bear conservation education program in the central Gujarat, where people and sloth bear co-exists and the territorial forest patches connects two important protected areas. We have transformed the scientific information into the fun learning materials such as animation film, documentary videos, stories, comics and activity book. We distribute these products among the school children and the local community and we expect that this will enhance the tolerance and appreciation of locals towards the sloth bears. In this difficult time of the pandemic, we have organized several webinars, online workshops and spread the message on wildlife conservation through social media. In order to provide the platform to wildlife researchers and students, we initiated WCBinars allowing students to present their research and the same we broadcast on our YouTube channel.

WCB is now connected with several national and international organizations through signing MoU and I am sure this will enhance our capacity and network to reach out more people and help wildlife conservation. We are always open to collaborate with organizations and institutions working in the area of mutual interest and I welcome you all to join us, work with us and collaborate with us to serve for Mother Nature and conserving her wilderness.

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Range Extension of Asian Pied Starling *(Gracupica contra)* in Gujarat state, Western India

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India has more than 1300 bird species, which is about 12.5% of world's total avifauna (Grimmett et al. 2011). Among them, a total of 576 bird species have been reported from Gujarat state (Ganpule, 2016). Asian pied starling *(Gracupica contra)* commonly found in foothills of south Asiauntil elevation of 700m. It is also commonly found near water bodies of human dominated areas, grasslands and farmland (Ali & Ripley, 1983). Ali & Ripley (1983) recorded three subspecies of Pied starling in India, whereas Grimmet et al. (2005) mentioned only two subspecies of Asian pied staling in India; viz. *G. superciliaris*, observed around Manipur only while, *G. contra* is widely observed in North, central and Eastern parts of India (Grimmet et al. 2005). Monga & Naoroji (1983) mentioned sighting of pied starling in Jamnagar and south Gujarat as rare/vagrant. Presence and breeding of *G. Contra* was also reported from Rajkot and Dahod districts of Gujarat consequently (Rasmussen & Anderton, 2005; Ganpule, 2016) this species was introduced in Mumbai of Maharashtra state, India (Rasmussen & Anderton, 2005).

Asian pied starling (G. contra) in Vadnagar town of northern part of Gujarat (N 23.7896, E 72.6291)

During field visit of Vadanagar, Mehsana district in northern part of Gujarat (February 28, 2021), we have observed bird with white on the black wings with white ventral mark and orange bill at 07:30 hrs. After validation through reference book (Grewal, 2016) we have identified it as Asian pied starling *(Gracupica contra)*. We have found this individual near the water body of human habitation (N 23.7896, E 72.6291). The individual was

observed for 10 minutes and its behaviour was recorded. Bird was feeding on some unknown excreta material while foraging with other bird species viz., Glossy ibis *(Plegadis falcinellus),* Streak-throated swallow *(Petrochelidon luvicola).* Another individual of the same species pair was observed on April 5, 2021, 16:13 hrs at Kheralu town, approximately 11 km far from previous observation (N 23.8831 E 72.6109) where the bird was sitting on electric wire above the agriculture farm.

Asian pied starling (G. contra) perching on electric wire above the agriculture farm (N 23.8831 E 72.6109)

Asian pied starling (G. contra) feeding on some unidentified excreta

Asian pied startling was recorded for the first time the semi-arid region of Gujarat, as we did not found any record of this species in this area. This observation reflects the possible range expansion of species. Both of our sightings were around agriculture and human dominated areas indicating the generalist niche and adaptability of this species in human dominated landscape.

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Observationson nesting pattern of different bird species around University road, Rajkot

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The dense vegetation near Saurashtra university circle provided a preferable avifaunal habitat (Trivedi & Vaghela, 2020). This helped in the study of Avifaunal nesting sites in the urban area of Rajkot (22°17'7.37"N, 70°44'53.88"E, 22°17'10.26"N 70°44'44.03"E, 22°17'2.38"N 70°44'45.14"E, 22°16'58.27"N 70°44'52.31"E), Gujarat. A 2hours study was conducted while exploring the area 2km away from my residence in the morning for a week in May 2021. Up to, 33 Avifaunal species and seven nesting sites were reported. The nesting sites reported during the survey were of Black Drongo (*Dicrurusmacrocercus*), Eurasian collared Dove (*Streptopeliadecaocto*), Indian Thick knee (*Burhinus indicus*), Shikra (*Accipiter badius*), Rufous Treepie (*Dendrocittavagabunda*), Red wattled Lapwing (*Vanellus indicus*), and Cattle egret (*Bubulcus ibis*).

Figure 1. Detailed Map of Study area

Point1 from the above figure indicates my residence, where fieldwork was started. Based on vegetation and human disturbance, the study area was divided into two parts: Sub-urban Area and Rural Area. Point 7 and 8 indicates plantations done by the Saurashtra University. The line transect method was used for the field survey. Images were captured with the help of Canon 1200D, 55-250 mm lens.

Figure 2(a)

Figure 2(b)

Figure 2(c)

Figure 2(d)

Figure 2: Different photographs of saurashtra university plantation area (Study Area)

Black Drongo (*Dicrurusmacrocercus*):

The nesting season for Black Drongo is April to August, with 3-4eggs as clutch size and 14-15days incubation period. The nest of Black drongo was observed at Point 8 (22°17'7.37"N 70°44'53.88"E) in the plantation site of Saurashtra University. It is about 9 to 10 feet high from ground level and built with twigs, rootlets and threads. Drongo is known to be a protective parent and its mobbing behaviour towards Greater Coucal (*Centropus sinensis*), Rose-ringed Parakeet (*Alexandrinuskrameri*) and Asian Koel (*Eudynamysscolopaceus*) were

observed during the survey (Nijman, 2004). Interspecies interaction between Eurasian Collared-Dove and Black Drongo was observed during the survey and in previous studies (Jahan et al., 2018) as well, where two Eurasian collared Dove made nest near the nest of Black Drongo. Usually, birds like Dove do not cause any harm to Drongo. Feeding gills for both species is different as well (Ali, 2017, Grimmett*et al.,* 2011). Therefore, to protect their eggs from other predators, Dove makes their nest in the vicinity of Drongo's nest.

Figure 3 (a) *Figure 3 (b)*

Figure 3: Photographs presenting nest of Black Drongo (*Dicrurusmacrocercus*)

Eurasian collared Dove (*Streptopeliadecaocto*):

The nesting season for Eurasian collared Dove is throughout the year. The nest was observed at Point 8 in the plantation site of Saurashtra University (22°17'7.37"N 70°44'53.88"E). It was made with twigs and rootlets at 8-9feet height. The clutch size is 1-2 (Robertson, 1990) and incubation period of eggs is 15-19 days. Within a distance of 3 meters, two nests of Eurasian collared Dove were found. Both nests were in the vicinity of Black Drongo's nest. It's a great example of species-species interaction. By making nests nearby aggressive Drongo's nests,

Figure 4: A photograph presenting the nest of Eurasian collared Dove (Streptopeliadecaocto) Detailed Map of Study area

Dove could gain protection from other predator species (Jahan et al., 2018).

Indian Thick-knee (*Burhinus indicus*):

Indian Thick-knee is also known as Indian Stone curlew. Its nest was found at Point 8 in the plantation site of Saurashtra University (22°17'7.37"N 70°44'53.88"E). The breeding season is from March to April. The nest was made on the ground surrounded by dead leaves and few twigs. The clutch size for stone curlew is two (Sharma & Sharma, 2015) with incubation period around 24 days. While exploring the study area, one egg and one hatchling were observed, which were wonderfully camouflaged with the colour of the ground. The egg was off-white coloured with random brown spots on it. At the end of May 2021, another egg was found broken. Both, male and female are involved in caring and protecting the hatchlings against predators (Sharma & Sharma, 2015).

Figure 5 (a) Nest with hatchling and egg

Figure 5 (b) Egg

Figure 5 (c) Hatchling

Figure 5 (d) Adult Indian Thick-knee

Figure 5: Different photographs of Indian Thick-knee (Burhinus indicus) presenting developmental stages

Shikra (*Accipiter badius*):

The nesting season for Shikra is March to June. Shikra's nest was found at Point 8 (22°17'10.26"N 70°44'44.03"E) in the plantation site of the Saurashtra University. The nest built with twigs and rootlets at 20feet height from ground level was observed on the tallest tree. The clutch size for the Shikra is 3 to 4 eggs with 18-21days incubation period. Usually, females hatch the eggs but in rare cases males hatch eggs as observed by Suryawanshi (2021). During the survey female Shikra was observed chasing Large-grey Babbler (*Argyamalcolmi*).

Figure 6: A photograph of Adult female Shikra (Accipiter badius) and her nest

Rufous Treepie (*Dendrocittavagabunda*):

The breeding season for Rufous Treepie is April to June and with clutch size 3-6eggs.

Figure 7: Adult Rufous treepie (Dendrocitta vagabunda) and her nest

At Point 8 of Saurashtra University plantation site (22°17'7.37"N 70°44'53.88"E) two to three individuals of Rufous Treepie were seen.

One of them was seen carrying food material while the other was collecting the nesting materials. A single nest of Rufous Treepie was observed and was built with twigs, dead leaves, threads, old clothing material, rootlets, and cotton. The nest was found at a height of approximately 20 feet. On May 16th, 2021 Rufous Treepie was seen feeding juvenile Koel. After a few days, another Rufous Treepie was found hatching the eggs.

Red-wattled Lapwing (*Vanellus indicus*):

Breeding season for Red-wattled Lapwing is April to June. The egg or nest was not part of the observation, however, a juvenile was observed at Point 3 of the Sub-urban area (22°17'2.38"N 70°44'45.14"E). A survey was conducted in May and the eggs might be laid during April. The clutch size is 3 to 4 with an incubation period of 28-30 days. The nesting of this bird has no protection strategies other than camouflaging the eggs with the surroundings to protect those (Balkhande et al., 2017).

Figure 8 (a) Juvenile Red-wattled Lapwing *Figure 8 (b) Adult Red-wattled Lapwing*

Figure 8: Photographic presentation of juvenile and adult Red-wattled Lapwing (Vanellus indicus)

Cattle Egret (*Bubulcus ibis*):

The breeding season for Cattle Egret is June to August. Between Point 5 and 6 (22°16'58.27"N 70°44'52.31"E), ten to twelve Cattle Egret nests were found and Egrets were observed in their breeding plumage. During their breeding season, adults develop orange buff plumage on the back, breast and crown area. Cattle Egrets from their nest in

colonies. Rootlets and twigs are used to build nests. Clutch size for Cattle Egret is 2-4 and the incubation period is between 22-28 days (Patankar et al., 2007).

Fig. 9 (a) *Fig. 9 (b)*

Figure 9: Cattle egrets (Bubulcus ibis) and their colony

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Record of Leucism in Indian Flying Fox *Pteropus giganteus* (Mammalia: Chiroptera: Pteropodidae) from South Gujarat, India

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Abstract:

Leucism in fruit bat species Pteropus giganteus (Brunnich, 1782) is recorded for the first time from India based on photographic evidence collected from the Anaval Village located in Surat District of South Gujarat, India. A total lack of pigmentation in the whole body due to the failure of melanocytes to migrate to the skin, and hair follicles, resulting in white or whitish hairs, pale skin, but normal coloured eyes are the sign of leucism. The present record can serve as baseline data and will also help understand colour aberration in bats.

Key Words: Colour aberration, Chiropteran, Pigmentation, Mutation

Introduction:

The Indian Flying Fox is one of the most common and widely distributed chiropterans found in India, Pakistan, Sri Lanka, Bhutan, Nepal, Bangladesh, Maldives, Myanmar and China (Tsang 2020; Johnsingh & Manjrekar 2013; Srinivasulu & Srinivasulu 2012). Flying Fox is the largest fruit bat known to occur on mainland India (Bates et al. 1994) out of 13 Indian fruit bat species (Bates & Harrison 1997; Srinivasulu et al. 2010). It has a reddish-brown head with a darker, sometimes blackish, snout; pale brownish-yellow shoulders and hindneck, yellowish-brown ventrally and black wings (Prater 1971). It is a colonial species and roosts during the day, often in the midst of busy towns, villages, on large trees along the roadside, near cropland and water bodies (Bates et al. 1994; Johnsingh & Manjrekar 2013; Menon 2014). Their roosting

Figure 1: Leucistic individual roosting along with the normal individuals

colonies are generally found on large trees such as *Ficus benghalensis, F. religiosa*, *Tamarindus indica*, *Mangifera indica*, *Dalbergia sissoo* and *Eucalyptus sp* (Vendan 2003) and the colony size can vary from hundreds to several thousands of individuals (Bastawade & Mahabal 1976). Although fruit bats are responsible for many ecological services (Saikia 2018), yet Indian Flying Fox is one of the most persecuted fruit bats in South Asia and is listed as vermin under Schedule V of the Indian Wildlife (Protection) Act and IUCN Red List Data included it as a Least Concern species (Tsang, 2020).

In mammals, a wide variety of colours and forms are found as a result of the presence of certain pigments, mostly melanin which provides colour to the skin, hairs and eyes (Nordlund et al. 1998; Uieda 2000; Lucati & López Baucells 2016). Often this pigment is affected as a result of mutations giving rise to diverse colour aberrations. The effect of such abnormal colouration is generally the pigmentation anomalies of chromatic disorders (Rook et al. 1998). Similar to other mammals, bats are also vulnerable to genetic disorders that affect pigmentation. Globally, such chromatic disorders are being reported at an increasing rate in bats (Lucati & López Baucells 2016) and are caused by either an increase or a decrease in the production of melanin in some regions or over the entire body (Hofreiter & Schoneberg 2010; Abreu et al. 2013). These include albinism, leucism, piebaldism, hypomelanism and melanism (Lucati & López Baucells 2016). Among these conditions, leucism stands out as a rare phenomenon in nature.

Leucism is a total lack of pigmentation in the whole body due to the failure of melanocytes to migrate to the skin, and hair follicles, resulting in white or whitish hairs, pale skin, but normal coloured eyes. It occurs regardless of the normal production of the enzyme tyrosinase and melanin. Moreover, it can be caused by one of the several mutations that will give rise to apparently similar phenotypes (van Grouw 2006, 2013; Abreu et al. 2013; Lucati & López- Baucells 2016). The occurrence of colour aberration in 55 Indian mammalian species has been compiled by Mahabal et al. (2019). Although cases of albinism and piebaldism have been reported in the family Pteropodidae (Neal 1971; Karim 1983; Anonymous 2012; Anonymous 2013), however, there is no report on colour aberration in Indian Flying Fox (*Pteropus giganteus*). Here we report the first case of leucism in Indian Flying Fox from Surat district of South Gujarat, India.

Observations:

On 18 June 2017, we were on the way to Vansda National Park and at 1230 h we stopped as we saw a group of Indian Flying Fox roosting on *Ficus religiosa*, near Anaval Village (20.838°N, 73.263°E) in Surat District, Gujarat. Suddenly all the fruit bats flew in the sky, as a local was hunting them with the help of a catapult maybe for eating purposes. In the middle of all these, at 1249 h a white bat flying in the sky grabbed our attention as it flew further to roost on one of the branches with other Indian Flying Fox. We took some photographs (Figure 1) and observed with the help of binoculars to note down its characteristics. Its whole body i.e. both fur and skin were white or whitish including patagium and ears but it had normal black coloured eyes. With the help of the classification proposed by Lucati & López Baucells (2016), we identified it as a case of leucism and not albinism.

The roosting colony had around 250 individuals and was situated near a village pond among human habitation on the roadside. We observed the leucistic individual at least for an hour and also alerted the locals to cease hunting of bats. The leucistic individual was probably a female and showed similar activity as that of normal individuals such as opening and closing of wings, folding the wings around belly and grooming.

Discussion:

Although physiological causes of colouration, including melanism, are evident (Caro 2005), the genetic processes responsible for these colour variations remain unknown in most mammals (Lucati & López Baucells 2016). Moreover, chromatic disorders in bats can affect both fur and skin, including patagium, ears, and muzzle, and their impact on the survival rate is vague (Lucati & López Baucells 2016). However, bats are most likely less vulnerable to predation than the majority of diurnal animals as they are active at night and prefer dark roosting sites (Buys et al. 2002; Rocha et al. 2013). Lucati & López Baucells (2016) states that aberrant individuals roosting in sheltered places such as caves, mines, and buildings may have greater survival rates than the one roosting in the open leaves. Here, we found the leucistic Indian Flying Fox roosting in the open leaves and is likely to be vulnerable to predation.

Albinism is one of the most commonly occurring colour aberrations in bats (Lucati & López Baucells 2016). In the family Pteropodidae, albinism has been reported in *Cynopterus sphinx*

from Nepal (Anonymous 2013), *Lissonycteris angolensis* from Uganda (Neal 1971) and *Rousettus leschenaultia* from India (Karim 1983), while piebaldism is reported in *Rousettus amplexicaudatus* from Philippines (Anonymous 2012). However, another such colour aberration leucism is not yet reported from the family Pteropodidae. In this regard, our report of leucism in *Pteropus giganteus* can be the first of its kind in the entire range of its distribution.

Today, bats in India face the harsh reality of declining habitats and resources, ultimately making them disappear altogether (Graham 2001; Tsang 2020) and the people's perception regarding the presence of bats in their surroundings for different myths. These facts raise an urgent need to protect bats throughout the world by studying more about their behaviour and ecology. Further, studies on *Pteropus giganteus* from Gujarat are mainly sighting reports (Mahato et al. 2012) and on roosting sites (Vyas & Upadhyay 2014). Due to the lack of information on colour aberration in the family Pteropodidae, this report can add importance to bat biologists.

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Notes on behavioural observation of some water birds during the Annular Solar Eclipse

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Abstract:

In this communication, we report the behaviour of various water birds observed during the annular solar eclipse which happened on 26th November 2019. We observed the behaviour of eight species of birds' viz. Greater Flamingoes Phoenicopterus roseus, the Indian Cormorant Phalacrocorax fuscicollis, Pied Avocet Recurvirostra avosetta, Black-winged stilt Himantopus himantopus, Eurasian spoonbill Platalea leucorodia, Northern shoveler Spatula clypeata, Little grebe Tachybaptus ruficollis and Dalmatian pelican Pelecanus crispus throughout the eclipse period i.e. from 8:05 AM to 10:51 AM. Various behavioural chan`ges were observed in all the targeted species except the Indian cormorant. It rested on a pole for the whole eclipse period. Detailed observations are given in the note. Reduction in light levels due to solar eclipse does affect the activity of birds.

Key Words: Solar Eclipse, Behaviour, Birds, Bhavnagar

An annular solar eclipse was visible from 8:05 to 10:51 AM on 26 December 2019 in India. Solar eclipse, a rare and uncommon environmental event, can influence and modulate the behaviour of animals (Murdin 2001; Gil-burmann & Beltrami 2003). Following observations were made during the eclipse at airport Road Lake (21.762837° N, 72.183624° E) in Bhavnagar city using Nikon binoculars (10*50).

Greater flamingos (n=24) on the day of the eclipse were seen foraging constantly from 8:05-9:20 AM. All of them started calling together from 9:21 to 9:35 AM. After the peak of the eclipse (i.e. after 9:21 AM), many flamingo individuals started preening. Activities of Indian cormorants varied throughout the eclipse period. Pied avocets (n=13) were observed feeding through the initial phase of the eclipse i.e. from 8:05 to 8:50 AM. But pied avocets went onto the resting phase from 8:51 to 9:35 AM. Eight of them continued resting even after 9:35 AM while the other five started feeding again. Black-winged stilts (n=50) were seen resting in a flock throughout the study period. But as the eclipse increased, flocks of black-winged stilts from outside the lake started arriving and joined the original flock of 50. A group of five black-winged stilts arrived at 8:52 followed by a flock of 20 at 9:06 AM. Three other groups of 30, 50, and 10 black-winged stilts arrived from 9:21 to 9:35 AM. Eurasian spoonbills (n=30) were seen resting in water during the initial stage of eclipse i.e. from 8:08 to 9:20 AM. From 9:21 to 9:35 AM five spoonbills started feeding, 21 continued resting while 12

started vocalizing and four flew away from the lake. After 9:35 AM, 12 individuals continued calling, 29 rested in water whereas eight individuals arrived from outside the lake. Activities of northern shoveler (n=80) varied throughout the eclipse. Little cormorant (n=1) rested on a pole for most of the observation. It started feeding at 9:21 to 9:35 AM along with one little cormorant which arrived from somewhere outside the lake. After 9:35, both perched at the wood in the lake. Little grebe (n=1) spent most of the time feeding. Between 9:35 and 9:50 AM, it was joined by a flock of eight grebes that arrived from outside the lake. Pelicans (n=2) rested on a small patch of land in the lake throughout the study period.

Table 1: Ethogram

	Time intervals						
Bird	08:05-08:20	08:21-08:35	08:36-08:50	08:51-09:05	09:06-09:20	09:21-09:35	09:36-09:50
Greater flamingo	FD(n=24)	FD(n=24)	FD(n=24)	FD(n=24)	FD(n=24)	C(n=24)	PR(n=4), FD(n=17),C (n=3)
Indian Cormorant	Rp(n=2)	Rp(n=2)	Fi(n=2), FD(n=4)	Rp(n=2),Fb (n=2)	Rp(n=1)	Rp(n=1),Fb(n=1)	_
Pied Avocet	FD(n=13)	FD(n=13)	FD(n=13)	Rw(n=13)	Rw(n=13)	Rw(n=13)	FD(n=5),R w(n=8)
Black winged stilt	Rw(n=50)	Rw(n=50)	Rw(n=50)	Rw(n=50),F i(n=5)	Rw(n=55), Fi(n=20)	Rw(n=75), Fi(n=30), Fi(n=50), Fi(n=10)	Rw(n=165)
Eurasian Spoonbill	Rw(n=30)	Rw(n=30)	Rw(n=30), FD(n=4)	Rw(n=34)	Rw(n=34)	FD(n=5),C(n=12), Fo(n=4), Rw(n=21)	Fi(n=8), C(n=13), Rw(n=29)
Northern Shoveler	PR(n=10), Rl(n= 50), Rw(n=20)	Rl(n= 50), Rw(n=20)	PR(n=4), Rw(n=50), Rl(n=10)	Rw(n=54), Rl(n=10)	FD(n=5), Rw(n=54), Rl(n=5)	Rw(n=54), Rl(n=10)	Rw(n=54), Rl(n=10)
Little Cormorant	Rp(n=1)	Rp(n=1)	Rp(n=1)	Rp(n=1)	Rp(n=1)	FD(n=1), Fi(n=1)	Rp(n=2)
Little grebe	Rw(n=1)	FD(n=1)	FD(n=1)	FD(n=1)	FD(n=2)	Fi(n=8),FD(n=10)	FD(n=18)
Dalmatian pelican	Rl(n=2)	Rl(n=2)	Rl(n=2)	Rl(n=2)	Rl(n=2)	Rl(n=2)	Rl(n=2)

Table 2: Different type of behaviours observed in bird species

	BEHAVIOURS
FD	Feeding
R	Resting
Rp	resting on an object; prolonged perching on a pole or a stick in water
Rl	resting on land; simply sitting or standing with no noticeable movement
Rw	resting in water; no efforts for movement and neck resting on body(in case of ducks)
F	Flight
Fb	taking off from place 'A' within a lake and settling at place 'B' within a lake
Fa	taking off from place 'A' within a lake and settling at same place
Fo	taking off from within lake and flying outside the lake
Fi	arrived at lake from outside the lake
PR	Preening
C	Calling; making some kind of voice, could either be begging call, roosting call, or some other
B	Bathing; Rapid action of submerging in water and coming out

Kumar S. (1981) observed the changes in the activity of cattle egrets because of the solar eclipse. Trigunayat (1997) observed that roosting Black-crowned Night-herons altered a variety of behaviours, including increased calling, preening, and perch shifting. Nanikov et al. (2001) also mention behavioural changes in several birds due to solar eclipse. A similar trend was observed in this study as well. From these limited field observations, we can conclude that reduced light level due to annular solar eclipse does interrupt normal bird behaviour patterns.

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Restoration of Earth with Biobased Polymer

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Humanity is facing increasingly numerous challenges in life despite the great advancements in science and technology over the last century. All the needs of modern society, e.g. food, fuel, energy, and materials, are highly dependent on diminishing fossil resources. The demand for creating and using plastic throughout the world, driven by the increasing usage of plastic-based materials has been increasing and adding stress to the current waste management infrastructures. There is significant interest to decrease the reliance on petroleum-based plastic products, which causes global environmental pollution. The advancement in science and technology has enabled mankind to live longer and consume more of the world's resources. More than eight million tons of plastic waste leak into oceans every year, which can be eased through innovative redesigns of packaging materials.

Issues such as global climate change and depletion of fossil fuels, both resulting from the increased usage of energy, have triggered alarms among scientists and politicians worldwide. Therefore, governments, industries, and academia are inputting much effort towards finding a sustainable solution for the increasing energy crisis. However, a similar concerted effort is still lacking to bring about the creation and usage of sustainable materials in the modern lifestyle. In addition to the increasing demand for energy, the usage of materials in the modern lifestyle has also been increasing rapidly. Considering the widespread usage of plastics in food packaging, clothes, shelter, communication, transportation, construction, health care, and leisure industries; plastics are the most dependable material among the other materials that mankind is currently dependent upon. Currently, most of the plastics that are widely used in various sectors are produced from petrochemical products. The plastic industry has been among the most profitable businesses and is expected to grow further, especially because of their increased demands from rapidly developing countries like India and other parts of South-East Asia. While plastics are superior materials in terms of their production costs and diverse properties, the sustainability of this synthetic material is undoubtedly an issue that needs to be addressed. Biobased and biodegradable polymeric materials are considered amongst the most suitable alternatives for some applications. The

excessive usage of petroleum also contributes to the increased emission of CO_2into the atmosphere, which is thought to be among the principal reasons for global warming and climate change. These are some of the strong and valid reasons leading towards the development of technologies to produce biobased and biodegradable plastics.

Science and technology have created the modern lifestyle that mankind is living in which efficiency is the keyword. Drawing an analogy from a bacterial culture in a shaken flask, the depletion of nutrients and the simultaneous accumulation of toxic wastes are the main reasons for the onset of the stationary growth phase and the subsequent death phase. However, unlike bacteria, mankind is aware of the consequences of such activities. As a result, the world population is now concerned about sustainable development.

Biobased and biodegradable plastics most likely to remain less superior in terms of production cost and material properties compared to petrochemical plastics. Petroleum-based plastics have serious environmental and social impacts due to their non-degradable nature and the leaching of carcinogenic substances like dioxin when exposed to scratch or heat. Compared to the ease at which fossil resources are utilized; renewable biobased materials will need more effort and efficiency to be used in daily life. However, biobased materials are considered superior in terms of sustainability and environmental friendly provided that they are used judiciously and in a contented manner. Hence, it is in our hands to utilize our knowledge of the environment to work towards the restoration of the earth and make it free from single-use plastics.

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Single-use surgical mask: Human lifesaver or Biodiversity destroyer

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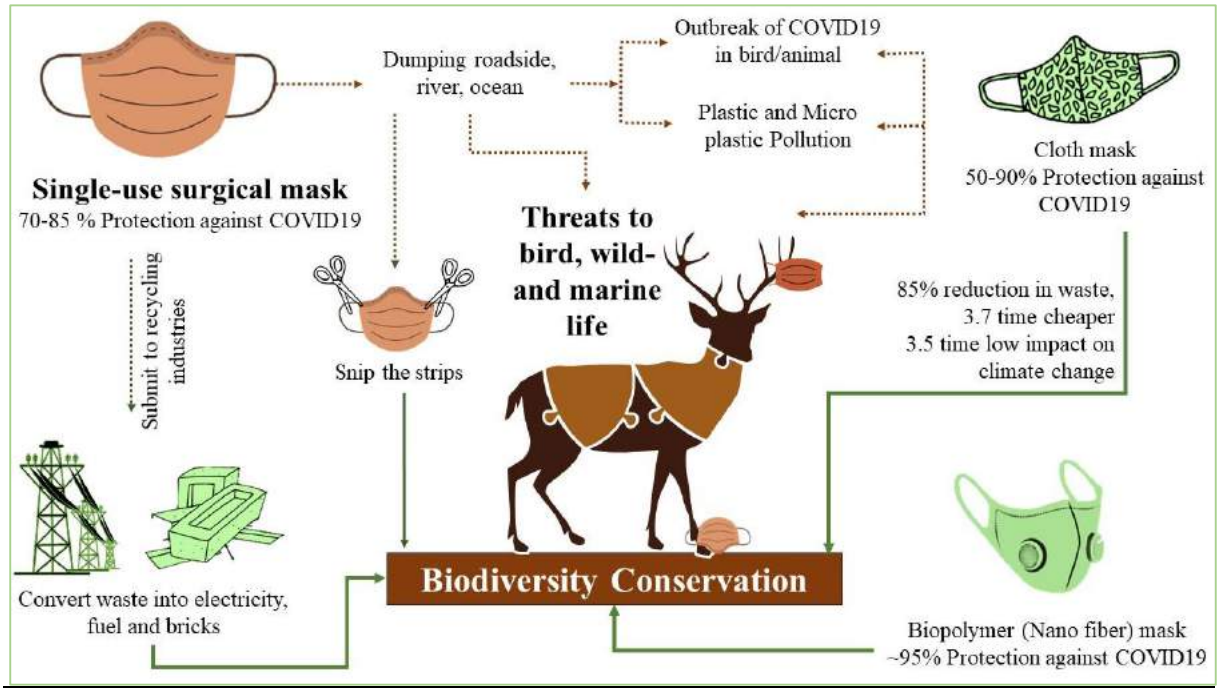

The green lines represent sustainable and biodiversity conservation ways. The dark brown lines represent possible threats of single-use surgical mask to the biodiversity.

Key Words: Disposable mask; Plastic and micro plastic pollution; Conservation; Threats

The COVID-19 is transmitted by respiratory droplets or aerosols and can survive in the air for more than 24 hrs, which was detected and momentarily created a pandemic situation, globally. The only way to stop the transmission is to wear face mask, washing hands frequently and to maintain social distance. Wearing a mask is declared as one of the important precautionary measures by the World Health Organization (WHO) and policymakers in every country, because masks help in the significant reduction of infection caused by touching the face/mouth/nose with contaminated hands (Schmutz et al. 2020). The virus, COVID19has increased the demand for the surgical single-used mask in the healthcare professionals as well as among the community. Such masks are made up of polypropylene or

high-density polyethylene (HDPE), a fossil-derived plastic which has a very high half-life (Dharmaraj et al. 2021).The mask production to the disposal statistics is presented in Table 1. Based on the reusability, the mask is divided into two major groups' disposable (made up of polymers) and reusable mask (made up of cloth material) in terms of production. In present study, the details of only disposable mask is presented.

Table 1: Global mask production, usage and disposable statistics

No	Statistics	Reference
1	Estimated worldwide usage of disposable mask: 129 billion/month	Prata et al. 2020
2	Production in China as on Feb. 2020: 116 million/day	Adyel 2020
3	Order of mask in Japan as of April 2020: over 600 million/month	Fadare and Okoffo 2020
4	Mask disposal in the UK: 53 million/day	Website URL 1
5	Gloves and mask entered into the environment: 200 million/month	Website URL 2
6	Mask reached to oceans: 1.5 billion Marine plastic pollution increased in last year: 6200 tonnes	Website URL 3
7	Mask waste generation in India: Minimum: 928/week; Maximum: 4640/week	Selvaranjan et al 2021
8	*Plastic footprint in the environment due to mask and gloves: 4.5×10^5 Kg/Month	Present Study

*Calculated based on the global entries of masks and gloves mentioned (200 million/month). The average of one mask and single glove weight is 2.25±0.01.

Mask: a threat to the ecosystem:

In current situation, recycling of any household medical waste is not a feasible and advisable solution, as there is a chance that it may be exposed to infectious particles. There are no particular laws or guidelines for separation and segregation, which might involve several issues. Globally, the dumping of masks was observed in areas such as, roadside, river, oceans and several open areas. Usually, such masks sustain in the environment for a longer period of time (more than 400 years)(Hasan et al., 2021). The misconception of masks to various birds, animals and marine creatures, considering as a food and leads to trapping and entangling in the strips of masks. The single-use surgical mask not only adds litter to the environment, but

also hurting and killing a wide range of terrestrial and marine living organisms. Moreover, the production process of such masks also releases greenhouse gases (Prata et al. 2021). The disposal of mask also reported as a novel source of micro plastic pollution in the environment and entry point of the food chain (Hasan et al. 2021). The single-use surgical masks are also noted as a major causative agent of secondary disease outbreaks in all life forms, including humans (Fadare and Okoffo 2020). India does not have any sufficient resources for the household medical waste management (Prata et al. 2021). Every minute 10 kg of disposed masks and gloves entered into the environment (Table 1).Hence, it is very important to deal with the mentioned issues and look into more sustainable sources at individual level. Herewith, we suggest some measures by which we can protect the environment without compromising human health in current pandemic situation.

- Snip the strips of the masks before the disposal to avoid the entangling and entrapping issues.
- Dispose masks as a separate medical waste and submit it to plastic recycling companies.
- Moving towards the development of biopolymer mask (Torres and Torre 2021). Biopolymer mask were made up of gluten and nanofibers having 95% efficiency.
- A reusable mask could be applied in routine life for the general community. Regular cloth masks having multi-layer of high thread-count and textiles are moderately effective and reported to block 50-70 % fine droplets and particles. Reusable masks help in the reduction of waste production (85 %). Moreover, economically viable option in a country like India as it is 3.7 times cheaper than other masks (Prata et al. 2021).

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Does the contemplation of forest field staff about wildlife differ than a common man?

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Introduction:

A field-based training was organized by Vadodara wildlife division, Gujarat forest department and WCB Research Lab of Hemchandracharya North Gujarat University from September 17th to 19th, 2020 with the aim to enhance the capacity of forest field staff for monitoring and rescue of sloth bear and associated fauna. The training was organized at Jambughoda wildlife sanctuary, Central Gujarat. Along with the awareness about sloth bear, a small survey was carried out to understand how the field staff envisages the wildlife that is found in their work place. Total 18 frontline forest staff of different cadre such as beat guards and round foresters from different forest ranges of central Gujarat has participated in this survey.

Figure 1: Forest frontline staff organizing photos on Q Board © Nishith Dharaiya

This study provides an insight on how forest staff's perception differs in different animals. As Q method provides qualitative and quantitative data which helps identifying people's perception in detail. As participants have to provide justification of their answers, it reveals some underlying conflicts or reasons. These justifications of participants can help identify the gaps and can be better used for conservation planning as well as capacity building of forest field staff.

Methodology:

We used Q methodology for this study; this method is designed and developed by William Stephenson in 1930s (McKeown & Thomas, 1988)and allows to disclose underlying reasons. This method is widely used in social sciences studies. In this method, photos were used instead of statements to know respondent's perception allowing them to justify their answer in detail without any restriction. This method allows both qualitative and quantitative data on perception of the person being interviewed.

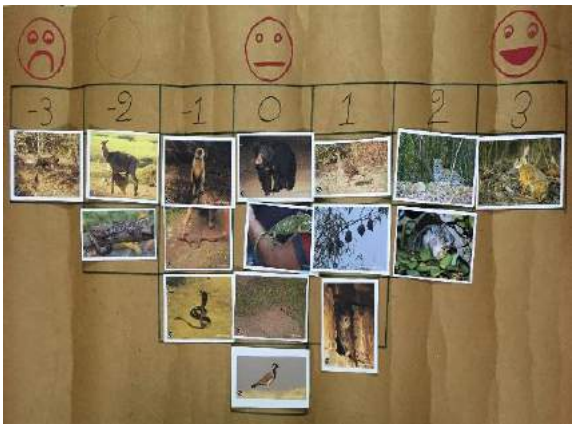

Figure 1(a): Representative sort of organized Q-board by a participant

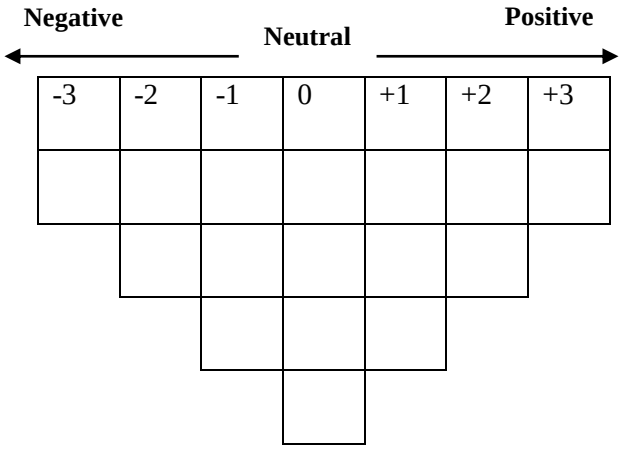

Figure 1(b): A Q-board on which the respondents organize the photos

We categorised the Q Method into two parts, first, organising 16 photos of locally found animals on a Q-board (figure 1(b)) followed by explanation for each photo which are placed on Q-board by the respondent. As shown in the figure 1(a), the participants were asked to organise photos in Q- board as per their liking and disliking towards the animals and to provide reasons which were recorded in mobile phone devise. A list of all the wildlife photos used for this survey is provided in table 1.

Table 1: Photos of wildlife used for this study

Photo ID	Common name	Scientific name
1	Wild boar	*Sus scrofa*
2	Hanuman langur	*Semnopithecus entellus*
3	Indian cobra	*Najanaja*
4	Indian giant flying squirrel	*Petauristaphilippensis*
5	Small Indian civet	*Viverricula indica*
6	Sloth bear	*Melursus ursinus*
7	Indian hare	*Lepus nigricollis*
8	Indian python	*Python molursus*
9	Barn owl	*Tyto alba*
10	Grey francolin	*Francolinuspondicerianus*
11	Red-wattled lapwing	*Vanellus indicus*
12	Rhesus macaque	*Macaca mulatta*
13	Black kite	*Milvus migrans*
14	Common krait	*Bungarus caeruleus*
15	Indian crested porcupine	*Hystrix indica*
16	Blue bull	*Boselaphustragocamelus*

Q sort analysis:

In this study, three factors were derived based on participant'sjustification which is explained in detail in the result section. A factor in this study is a category representingthe group of people who have similar perspective(Brown, 1980). The higher the factor loading, the more highly that sorts are correlated with that factor (Ramlo, 2008**,** Ramlo & Newman, 2011).The sorts refer to the photos assembled by participants on Q-board (figure 1(b)).In order to analyse the data, a software, PQMethod(http://schmolck.org/qmethod/)was used which is specially designed for Q-analysis. Q sorts are the number of participants that took part in the survey. All the data were entered manually in this software and correlation was calculated among each sort. The correlation matrix for the extracted factor was analysed through a principal component factor analysis with varimax rotationfor which options are provided in the software (figure 2).

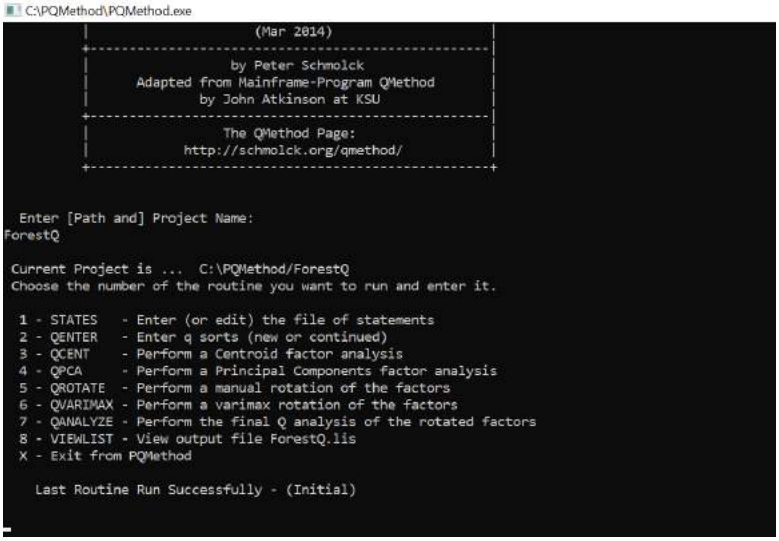

Figure 2: Screenshot of analytical option available in PQM method Software

Results and Discussion:

The three factors that emerged are shown in Table 2 with automatic pre-flagging. Participants having similar perceptions are put together in their respective factors and marked in bold and have "X" next to their score. Out of 18 sorts, 17 sorts were found complete by the software and were further analysed. Each of three factors represents a different perspective towards the photos provided to them. Participants were named as PART001, PART002 and so on to keep their identity unrevealed.

In table 2, there are 8 participants belonging to factor 1 with 29% of the variance explained followed by 7 participants in factor 2 having 26% explained variance and 2 participants belonging to factor 3 with 14% explained variance.Once factor score calculated by the software, distinguishing tables were developed in this analysis for each factor which differ from each other that is explained further in this section. The distinguishing tables for each factor explains differences between factors(Brown, 1971**,** Ramlo & Newman, 2011, Brown, 1993)**.**In order to determine distinguishing statements, average Z-score of respondent's factor score was calculated by the software.

Table 2: Extracted factor score from Q-sorts

Q-Sorts	ID	Factor 1	Factor 2	Factor 3
1	PART001	**0.8530X**	0.1248	-0.1223
2	PART002	0.0414	**0.8084X**	0.1708
3	PART003	**0.6945X**	0.0471	0.3983
4	PART004	**0.7683X**	0.1839	-0.0156
5	PART005	**0.5450X**	0.0166	0.2332
6	PART006	0.4208	**0.7241X**	0.4006
7	PART007	0.1728	0.1377	**0.9013X**
8	PART008	**0.6930X**	0.5214	0.3237
9	PART009	**0.6516X**	0.4289	0.4265
10	PART010	0.5119	**0.6142X**	0.0921
11	PART011	**0.8475X**	-0.0072	-0.2626
12	PART012	0.3742	-0.5333	0.4456
13	PART013	0.0481	**0.8292X**	0.3240
14	PART014	-0.0002	**0.6395X**	-0.3574
15	PART015	**0.6577X**	0.2179	0.1940
16	PART016	-0.0614	0.1991	**0.6372X**
17	PART017	0.4469	**0.7611X**	0.1835
18	PART018	0.5679	**0.7564X**	0.1465
%	**Explained variance**	**29**	**26**	**14**

Note: number in bold shows respondents belong to those respective factors.

Table 3 shows different factor score for each animal photo and depending on statistical significance the photo load to a specific factor. The above table contains 16 photos and their grid position for all three factors (perception, table 2). For example, Indian python was disliked by participants therefore it is scored at -2 for respondents grouped under factor 1, +1 for factor 2 andfor factor 3 it was scored at +2. For factor 1 the most liked species by participants is Indian hare and most disliked species is wild boar. Most liked species for factor 2 is Indian leopard and most disliked animal is fruit bat. For factor 3, most liked species is Indian hare scored at +3 and most disliked species is wild boar scored at -3 by the participants.

Table 3: Aggregate factor values of each 16 photos

		Aggregate values		
No.	**Photos**	**Factor 1**	**Factor 2**	**Factor 3**
1	Indian python	-2	1	2
2	Hanuman langur	0	0	2
3	Monitor lizard	-1	-2	-1
4	Red-wattled lapwing	1	-1	1
5	Sloth bear	2	2	0
6	Indian hare	3	1	3
7	Leopard	2	3	0
8	Grey francolin	1	-1	-1
9	Indian giant flying squirrel	1	1	-2
10	Blue bull	0	0	0
11	Small Indian civet	0	0	-1
12	Fruit bat (Flying fox)	-1	-3	-2
13	Indian cobra	-2	2	1
14	Barn owl	0	0	0
15	Indian chameleon	-1	-1	0
16	Wild boar	-3	-2	-3

Factor 1: Economic impact

This factor was described by 8 participants mainly concerning economic impact. Animals that cause harm economically by destroying crops and threat to human life and livestock. Participants of factor 1 thinks fruit bat, Indian python and Indian cobra causes high level of economic harm. Grey francolin is scored +1 due to its contribution to reduce impact by eating pest insects from agricultural field. Though the most disliked animal is wild boar for factor 1 as shown in table 3.

Table 4: Distinguishing photos for factor 1

Photo ID	Photos	Grid position for Factor 1	Z-score of Factor 1	Grid position for Factor 2	Z-score of Factor 2	Grid position for Factor 3	Z-score of Factor 3
8	Grey francolin	1	0.95	-1	-0.46	-1	-0.67
12	Fruit bat (Flying	-1	-0.2	-3	-1.82	-2	-1.1
1	Indian python	-2	-1.03	1	0.34	2	1.22
13	Indian cobra	-2	-1.19	2	1.27	1	0.37

Factor 2: Aesthetic, spiritual values and conservation aspects

This factor explains aesthetic, spiritual values and conservation aspects which includes appearance, tourist attraction, rehabilitation and religious belief. There are 7 responses in this factor (table 2). Respondents are observed to have negative opinions towards animals which play major role in economic loss but positive towards animal's beauty and its natural charisma. Table 5 shows how score of animals for factor 2 is different from the score of factor 1 and factor 3. For example, Indian cobra is scored at +2 in factor 2 as it is attractive to participants but it is scored -2 for factor 1 as it threatens human life.

Table5: Distinguishing photos for factor 2

Photo ID	Photos	Grid position for Factor 1	Z-score of Factor 1	Grid position for Factor 2	Z-score of Factor 2	Grid position for Factor 3	Z-score of Factor 3
13	Indian cobra	-2	-1.19	2	1.27	1	0.37
6	Indian hare	3	1.48	1	0.67	3	1.89
1	Indian python	-2	-1.03	1	0.34	2	1.22
4	Red-wattled lapwing	1	0.14	-1	-0.65	1	0.79
16	Wild boar	-3	-1.89	-2	-1.25	-3	-2.01

Factor 3: Lack of awareness

This factor describes lack of awareness which includes lack of interest compared to other animals and species. This factor mainly concerns individuals who lacks knowledge, proper information and are not aware about the species. For example, in table 6, the score of Indian giant flying squirrel differs from factor 3 to factor 1 and 2 as it is scored at -2, +1 and +1 respectively. The justification for negative score given by the participants is that they are not aware about the presence of the species therefore they do not have any information on the species.

Table 6: Distinguishing photos for factor 3

Photo ID	Photos	Grid position for Factor 1	Z-score of Factor 1	Grid position for Factor 2	Z-score of Factor 2	Grid position for Factor 3	Z-score of Factor 3
1	Indian python	-2	-1.03	1	0.34	2	1.22
2	Hanuman langur	0	-0.2	0	-0.45	2	1.10
13	Indian cobra	-2	-1.19	2	1.27	1	0.37
5	Sloth bear	2	1.38	2	1.35	0	-0.00
7	Leopard	2	1.33	3	1.81	0	-0.00
9	Indian giant flying squirrel	1	0.96	1	0.62	-2	-1.22

Conclusion:

The perception of forest field staff was better understood using Q method analysis considering various aspects. It is seen that participants tend to like animals such as Indian leopard, sloth bear, Hanuman langur and Indian hare as they are scored positive or neutral. The animals that are not given negative score in any factor due to their appearance, are seen frequently and does not lack awareness. It is observed from the data that frontline forest staff lacks knowledge about animals that are not seen or present in their forest range/beat. As frontline forest staff, they should be aware about existence of animal species that are found in Gujarat state along with their ecological importance, threats and conservation values. Some participants were not even aware about the existence of the species in the wild such as Indian giant flying squirrel. Although, being frontline forest staff, their perception is biased towards animals such as wild boar, monitor lizard and flying fox bat due to the economic loss they

may cause and weird appearance. Their perception becomes the same as a common man when every animal should be equal to frontline forest staff as it is their job to protect forest and its animals. Some participants believe in superstitions of bad luck of barn owl and monitor lizard which shows their common man perception and lack of right information.

Recommendations:

A separate training or workshops should be organised by forest department focused on animal species found in Gujarat. This will help them enhancing their existing knowledge and it will provide them with some scientific insights. Having basic scientific knowledge will help remove some barriers like superstitions and other beliefs. Field trips should be organised in different part of state to gain practical experience. Team building activities should be conducted between staff of different forest divisions.

Acknowledgements:

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Qualitative phytochemical analysis of some medicinal plants (leaves) from the surrounding area of Talod Taluka, North Gujarat, India.

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Abstract:

The tremendous biological variety of North-Eastern India has long been recognised. Five medicinal plants were chosen for this study: Manilkara zapota (L.) van Royen, *Manilkara hexandra* (Roxb.) Dub., *Mangifera indica* L., *Madhuca indica* J.F. Gmel., *and Annona squamosa* L. *The purpose of this study was to look into the existence of Phytochemicals such as Alkaloid, Amino acid, Carbohydrate, Protein, Glycoside, Tannin, Terpenoid, Saponin, Flavonoid, and Steroids in the medicinal plants that were chosen. For the organic solvent extraction, the Soxhlet apparatus was utilized. Water, acetone, and chloroform were utilised as solvents. Our findings show that the examined plants' crude aqueous and organic solvent extracts contain medicinally relevant bioactive components, justifying their usage in traditional medicines for the treatment of various ailments.*

Key Words: Qualitative phytochemical analysis, Manikara zapota, M. hexandra, Madhuka indica, Mangifera indica, Annona squamosa.

Introduction:

Phytochemicals are non-nutritive substances. Chemical compounds are produced naturally on plants during metabolic processes and contain a wide range of proactive and disease-preventive qualities. These compounds are known to be produced by plants in order to defend themselves. Recent study has shown that they can also play a vital role in illness prevention in humans. Even some of these herbs have been used for millennia as traditional medicine. Most phytochemicals, such as flavonoids, carotenoids, and polyphenols, have antibacterial action and can be used to treat infections. The following plant species were studied*:* *Manilkara zapota* (L.) van Royen, *M. hexandra* (Roxb.) Dub., *Mangifera indica* L., *Madhuca indica* J.F. Gmel., and *Annona squamosa* L.

Plants play a universal function in the treatment of sickness, as seen by their use in every major system of medicine, regardless of philosophical foundation. Plants are vital to the pharmaceutical industry because they are a rich supply of pharmaceuticals and a vast reservoir of chemical variety for drug development screening procedures. The majority of the medications mentioned in the Indian medicinal system are derived from plants.

Medicinal plants have been used to treat disease all across the world for thousands of years. It is generally understood that some plants with active chemicals can limit microbial development. Plants' ability to generate chemicals via secondary metabolism determines their antimicrobial potency. Secondary metabolites emerged as the most important class of chemicals, with a wide spectrum of antibacterial and antifungal properties. When compared to conventional fungicides used to inhibit microbial growth and survival, these plant chemicals have different structures and activities.

Plants are a major source of Traditional medicine and can be used to cure a variety of conditions with little adverse effects. Traditional medical practises are not only beneficial in the treatment of diseases, but they also aid in the discovery of pharmaceutically active compounds in plants, which can aid in the commercial manufacture of pharmaceuticals. From ancient times, the importance of plant diversification in health care has been extensively recognised. According to a literature review, more than 50,000 plant species have been successfully employed for medical purposes globally, with flowering plants accounting for over 13% of these.

Material and methods:

Plant collection and Identification

M. zapota (L.) van Royen, *M. hexandra* (Roxb.) Dub., *M. indica* L., *M. indica* J.F. Gmel., and *A. squamosa* L. were among the plant species studied. The plants were harvested from the land in the Talod taluka in North Gujarat, India. The washed plant leaves were kept in for drying after being cleaned with tap water around 2-3 times to evaporate the water content. With the use of a mechanical blender, the sample was ground into a fine powder after drying. The powder is then kept in an airtight plastic container for future usage with adequate labelling.

Extraction technique

Extraction is the separation of inert plant tissue constituents from medicinally active plant tissue constituents using a conventional extraction process. Menstrum is a selective solvent that is used to eliminate inert material and to obtain the curative part of the procedure through therapy.

Method and Plant extraction:

Solvent extraction

The crude plant extract was made using the Soxhlet extraction method. 10 gm of powdered plant material was placed into a thimble, and 300 ml of solvents were extracted separately. Acetone and chloroform were utilized as solvents. In a syphon tube of an extractor, the extraction process continued for 24 hours until the solvent became colourless. The extract was then placed in a beaker. The extract was then retained and cooked on a hot plate at 30- 40 °C until all of the solvent had evaporated. The dried extract was stored at 4°C in a refrigerator for future phytochemical investigation.

Methods of phytochemical analysis:

Alkaloid

Wagner's test: A few drops of Wagner's reagent were applied to 2mg of extract that had been acidified with 1.5 percent v/v hydrochloric acid. The presence of alkaloids is indicated by a yellow or brown ppt.

Carbohydrates

Molisch's test: 2mg of ethanolic extract was mixed with 10ml water, filtered, and concentrated. 2ml of conc. sulphuric acid was added to these 2 drops of freshly prepared 20% alcoholic alpha-naphthol solution, forming a layer below the mixture red-violet ring, showing the existence of carbohydrates that disappears when sufficient alkali is added.

Amino acid

Ninhydrin test: Boil for a few minutes 2ml Ninhydrin reagent + 2ml extract. The production of blue colour indicates the presence of amino acids.

Steroids

Salkowski reaction: 2mg of dry extract was combined with chloroform, to the chloroform layer sulphuric acid was gently introduced by the sides of the test tube. The emergence of a red colour indicated the presence of steroids.

Tannin: A few drops of a 5 percent w/v Fecl3 solution were added to 1-2 ml of the ethanolic extract. Gallo tannins are shown by a green colour, whereas pseudo tannins are indicated by a brown colour.

Flavonoids: After mixing 2ml of each extract with a few drops of 20% sodium hydroxide, a bright yellow colour was seen. A few drops of 70% dilute hydrochloric acid were added to

this, and the yellow coloration disappeared. The presence of flavonoids in the sample extract is shown by the formation and disappearance of yellow colour.

Saponins: 6ml distilled water was added to 2 ml of each extract and rapidly shaken; the presence of saponin is indicated by the production of bubbles or persistent foam.

Proteins: adding 1 ml of 40 percent sodium hydroxide and a few drops of 1 percent copper sulphate to 2ml of each extract. The production of violet colour shows the presence of peptide linkage molecules in the sample extract.

Glycosides: 0.5ml of glacial acetic acid and 3 drops of 1% aqueous ferric chloride solution added in to 1ml of each extract. The creation of a brown ring at the interface shows the presence of glycosides in the sample extract.

Terpenoids: 1ml of each solvent is mixed with 0.5ml chloroform and a few drops of strong sulphuric acid to produce a reddish-brown precipitate that confirms the presence of Terpenoid in the extract.

Table 1: Preliminary Phytochemical analysis

Class of compounds	***Manilkara zapota***			***Manilkara hexandra***			***Mangifera indica***			***Madhuka indica***			***Annona squamosa***		
	AE	CE	WE	AE	CE	WE	AE	CE	WE	AE	CE	WE	AE	CE	WE
Alkaloid	+	+	-	+	-	-	+	+	-	+	-	-	+	-	-
Amino acid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbohydrate	+	+	-	+	-	+	+	-	-	-	-	-	-	-	-
Protein	-	-	+	+	-	+	+	-	+	-	-	-	-	-	+
Glycoside	+	-	-	+	-	+	-	-	-	-	-	+	-	-	-
Tannin	-	-	+	-	-	-	+	+	+	+	-	+	+	+	+
Terpenoid	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-
Saponin	-	+	+	+	-	+	+	-	+	+	-	+	+	-	-
Flavonoid	-	+	+	-	-	+	-	-	+	-	-	+	+	-	-
Steroid	+	-	+	-	-	+	-	-	+	-	-	-	-	-	-

Where, '+' = positive and '-' = negative

AE= Acetone extract, CE= Chloroform extract, WE= Water extract

Alkaloid, carbohydrate, glycoside, and steroid are all found in Acetone extract of *M. zapota* leaves. Chloroform extract of *M. zapota* leaves contains alkaloid, carbohydrate, terpenoid,

saponin, and flavonoid. Protein, Tannin, Saponin, Flavonoid, and Steroid can be found in the aqueous extract of *M. zapota* leaves., alkaloid, carbohydrate, protein, glycoside, and saponin are all found in Acetone extract of *M. hexandra* leaves. All phytochemicals are missing in the chloroform extract of *M. hexandra* leaves. Aqueous extract of *M. hexandra* leaves contains carbohydrate, protein, glycoside, saponin, flavonoid, and steroid. Alkaloid, Carbohydrate, Protein, Tannin, and Saponin are all found in Acetone extract of *M. indica* leaves. Alkaloid and Tannin are found in Chloroform extract of *M. indica* leaves. Protein, Tannin, Saponin, Flavonoid, and Steroid are found in aqueous extract of *M. indica* leaves. Alkaloid and Tannin are found in Acetone extract of *M. indica* leaves. Chloroform extract of *M. indica* leaves is devoid of all phytochemicals. Aqueous extract of *M. indica* leaves contains Glycoside, Tannin, Terpenoid, Saponin, and Flavonoid. Alkaloid, Tannin, Saponin, and Flavonoid are all found in Acetone extract of *A. squamosa* leaves. Aqueous extract of *A. squamosa* leaves contains protein and tannin.

Discussion:

Plant samples were subjected to phytochemical analysis, which confirmed the existence of elements with medicinal and physiological properties. Phytochemicals such as carbohydrate, amino acid, protein, tannin, flavonoid, saponin, glycoside, steroid, terpenoid, and alkaloids were found in the plant extracts.

Tannins attach to proline-rich proteins, preventing them from being synthesized. Flavonoids are hydroxylated phenolic compounds that plants produce in response to microbial infection and have been discovered to have antibacterial properties in vitro against a wide range of pathogens. Their capacity to combine with extracellular and soluble proteins, as well as the bacterial cell wall, is most likely the reason for their activity. They are also powerful antioxidants with anticancer properties.

Saponins, which are known to have an anti-inflammatory impact, were also discovered in the plant extracts. Saponins have the ability to coagulate and precipitate red blood cells. Saponins are known for their ability to produce foams in aqueous solutions, as well as their hemolytic activity, cholesterol binding capabilities, and bitterness. Steroids have been shown to have antimicrobial characteristics, and they are extremely essential molecules, particularly in regard to sex hormones. For millennia, alkaloids have been associated with medical purposes, and cytotoxicity is one of their most prevalent biological features. Alkaloids have been shown

to have analgesic, antispasmodic, and antibacterial effects by several researchers. Glycosides have been shown to reduce blood pressure in numerous studies. The findings of this study indicate that the detected phytochemical substances may be bioactive constituents, and that these plants are proving to be a valuable reservoir of bioactive compounds with significant medical value.

Conclusion:

The findings demonstrated that the plants investigated contained medicinally essential components. Many previous investigations had accumulated evidence that the discovered phytochemical was bioactive. Several studies have demonstrated that these phytochemicals contribute pharmacological and physiological qualities to the plants researched in the treatment of various illnesses. As a result, extracts from these plants could be considered a valuable source of drugs. Further research should be carried out to separate, purify, and characterize the active ingredients responsible for the activity of these plants, as well as further work to isolate, purify, and characterize the active constituents responsible for the action of these Plants. In addition, more research into the putative mechanisms of action of these extracts is urged.

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Remote sensing: An overview with fundamentals and applications

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Introduction:

The general concept of remote sensing can be inferred by a simple statement, i.e., the acquisition of information from a specific distance. Scientifically, it is the science of acquiring information about an object or phenomenon by measuring emitted and reflected radiation (Ray, 2013). According to Lillesand et al. (2015), remote sensing is defined as the science and techniques of obtaining information about an object, land area, phenomenon, or ecosystem process acquired by a device that is not in direct contact with the object, area, or phenomenon under investigation. The data collection is done remotely using various sensors, which may be further analyzed to obtain information about the objects, areas or phenomenon. These acquired data can be of many forms, such as variations in force distributions, acoustic wave and electromagnetic energy distributions. Joseph, (2005) has discussed modern remote sensing as an extension of the natural phenomenon of visual perception of objects. Apart from visible spectrum, the electromagnetic radiation from the ultraviolet to far infrared and the microwave regions is used for remote sensing. The observations, which are directly inferred through electromagnetic radiation (EMR) from the sun or self-emitted radiance, is called passive remote sensing. Whereas, in active remote sensing, the electromagnetic radiations of a specific wavelength or band of wavelengths are generated to illuminate the targets and reflected or back-scattered EMR are recorded to gain information, for example LiDAR, RADAR, SAR, etc. Based on its applicability, remote sensing is defined as sensing of the earth's surface from the space by making use of the properties of electromagnetic wave emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resource management, land use and environmental protection. The classification of remote sensing is further based on the selection of EMR (e.g. optical and microwave, Navalgund et al. (2007)). When the sensors detect the solar radiation in the visible, and infrared wavelength regions, reflected/scattered or emitted from the earth is said as optical remote sensing and in microwave remote sensing uses interference and polarization concepts with electromagnetic energy that detects the scattered energy returning from the terrain and records it as an image. The main purpose of remote sensing is to have an organized systematic and large amount of

data collection in order to acquire information about 2 or 3 dimensions of real objects. One can get large and broad, global coverage and repeatability of data to obtain a multipurpose information through various earth observation satellite sensors which helps in detecting things that are normally absent in visible spectra such as, Land-surface temperature, Underground or sub-surface water, etc., There are several Earth Observation (EO) Satellites namely, Cartosat series, Landsat series, Sentinel 1, 2, MODIS, RISAT 1 and RADARSAT 2, Resourcesat, Envisat, IRS 1A, Oceansat 2, and many more.

Electromagnetic Spectrum:

Electromagnetic radiation or EMR is the term used to describe all of the different types of energies released by electromagnetic processes. Visible light is just one of many forms of electromagnetic energy. Radio waves, infrared light and X rays are all forms of electromagnetic radiation. The electromagnetic waves are formed by the vibrations of electric and magnetic fields, these vary in magnitude in a direction perpendicular to the direction of propagation of radiations at a constant speed of light (c= $3*10^8$ m/s).Figure 1 shows a generalized concept of EMR. These differ from mechanical waves as they need not require a medium to propagate, hence it is able to travel through air and solid materials, and can also travel through the vacuum of space. Thus, to define the EMR scientifically, it can be said as a form of energy emitted or absorbed by charged particles which exhibits wave-like behavior as it travels through space.

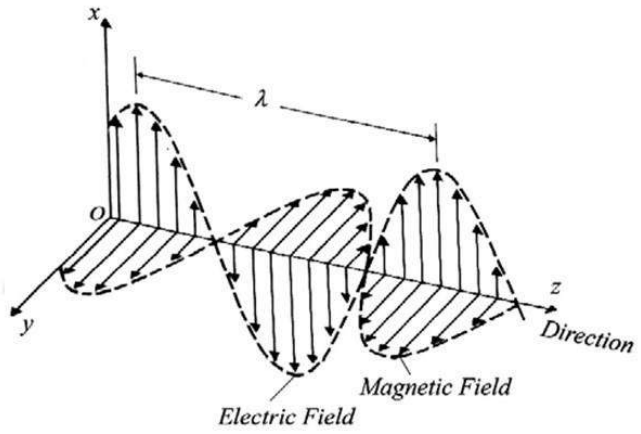


Figure 1. Illustration on the concept of EMR in which propagation of electric and magnetic field is shown

Source - http://www.fao.org/3/t0355e/T0355E02.HTM, accessed on 25th April, 2021.

The electromagnetic spectrum is the entire range of all possible frequencies of electromagnetic radiation (Figure 2). This includes the electromagnetic energy ranging from Gamma rays to radio waves, where the wavelength becomes longer, so the energy and frequency gradually decreases. There are four kinds of resolution that are described from the EMR spectrum are as follows:

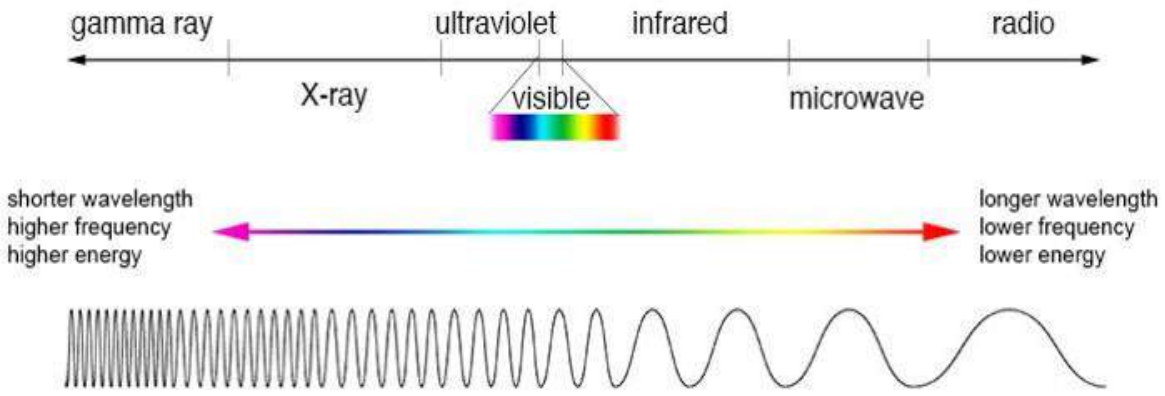


Figure 2: Electromagnetic spectrum showing waves and the radiations with respect to wavelength and frequency

Source -http://gsp.humboldt.edu, accessed on 8th April, 2021.

1. Spectral resolution – it is the variation in the reflectance/emittance as a function of wavelength. Spectral responses are recorded by separate spectral bands such as Red, Blue, Green, Thermal, NIR, etc. Figure 3 depicts the spectral resolution through a reflectance curve. It is further divided into 4 class sub classes:

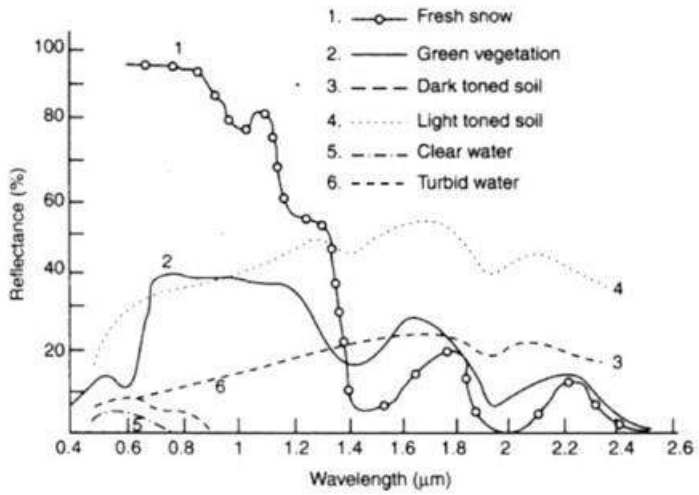


Figure 3: Spectral reflectance curve to determine spectral resolution

Source –Lillesand et al. (2015). Remote sensing and Image interpretation. 7e.

a. Panchromatic – It consists of only 1 band (B/W)

b. Colour – It consists the combinations of 3 colors of visible spectrum (RGB)

c. Multispectral – consists of 3 to 10 bands and offers Medium level spectral resolution(Feng et al., 2020)

d. Hyper spectral – consists of 100s of band and offers higher spectral resolution (Feng et al., 2020)

The combinations of spectral reflectance from two or more wavelength that indicate the relative abundance of feature of interest are known as spectral indices. Vegetation indices are the most popular type, but other indices are available for burned area, built-up features,

hydrologic and geologic features. The band combinations for formulating spectral indices vary from satellite to satellite. Some of the most common spectral indices are listed in Table1.

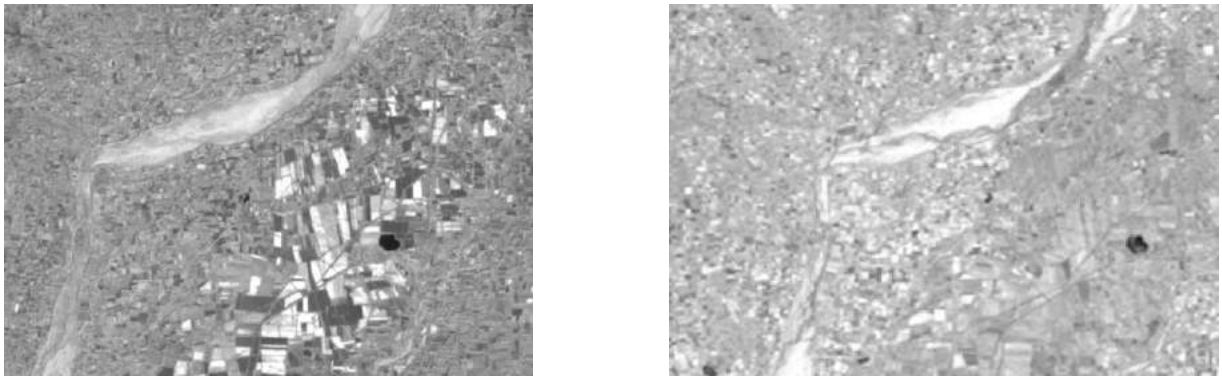
Table 1: Different kinds of Spectral indices with respect to their formulations of band

Source -https://giscrack.com/list-of-spectral-indices

No	Spectral indices	Formulation (Band combinations)
1.	NDVI (Normalised Difference Vegetation Index)	NIR – Red / NIR + Red (Where, NIR is Near-infrared band)
2.	NDWI (Normalised Difference Water Index) NDMI (Normalised Difference Moisture Index)	NIR - SWIR / NIR + SWIR
3.	AVI (Advanced Vegetation Index)	**[NIR * (1-Red) * (NIR-Red)] $^{1/3}$**
4.	NDSI (Normalised Difference Snow Index)	Green – SWIR / Green + SWIR
5.	SAVI (Soil Adjusted Vegetation Index)	**((NIR – R) / (NIR + R + L)) * (1 + L) Where, L is soil brightness correction factor**
6.	MSI (Moisture Stress Index)	MIR / NIR Where, MIR is Middle-wave Infrared
7.	NDGI (Normalised Difference Glacier Index)	NIR – Green / NIR + Green
8.	NDBI (Normalised Difference Built-up Index)	SWIR – NIR / SWIR + NIR
9.	BSI (Bare Soil Index)	((Red + SWIR) – (NIR + Blue)) / ((Red + SWIR) + (NIR + Blue))

2. Spatial resolution–It is described as the measure of the smallest object that can be resolved by the sensor or the ground area imaged for the instantaneous field of view (IFOV) of the ground sensor, or the linear dimension on the ground represented by each pixel. in the reflectance/emittance determined by the shape, size and texture of the target, as discussed in the book entitled, Advance Remote Sensing, 2012. It is expressed in meters, like (250 m, 80 m, 10 m, 1 m resolutions, etc.,). Figure 4 is an example of spatial resolution.

10 m resolution **30 m resolution**



(a) **(b)**

Figure 4: Example of Spatial Resolution by imagery acquired from Sentinel (a) and Landsat (b) satellite sensors

3.Temporal resolution – the amount of time needed to revisit and acquire data for the exact same location, is called temporal resolution, for example, the revisit time period of Landsat is 16 days, and that of Sentinel is 10 days. Figure 5 shows the processed temporal resolution.

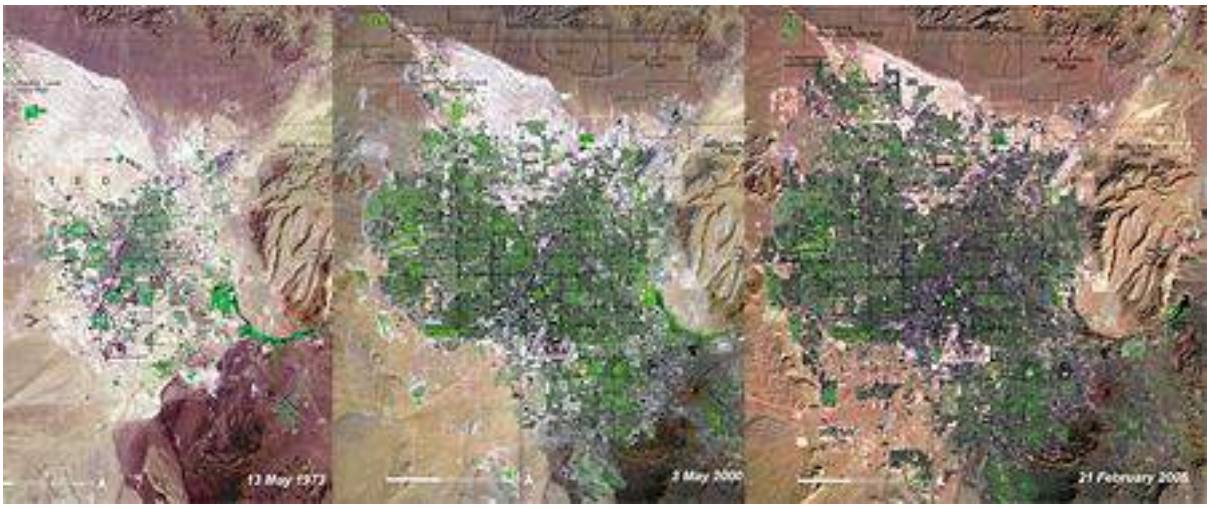


Figure 5: Example of Temporal resolution of Las Vegas over time in 1973, 2000 and 2006

Source- https://seos-project.eu/remotesensing

4. Radiometric resolution – When an image is acquired by a sensor, its sensitivity to the magnitude of the electromagnetic energy determines the radiometric resolution. The finer the radiometric resolution of a sensor, the more sensitive it is to detecting small differences in reflected or emitted energy.

Components and process of remote sensing:

Figure 6 briefly describes the process of remote sensing. Though the methods for collection, processing, and interpretation of remotely sensed data are diverse, imaging systems have the following essential components:

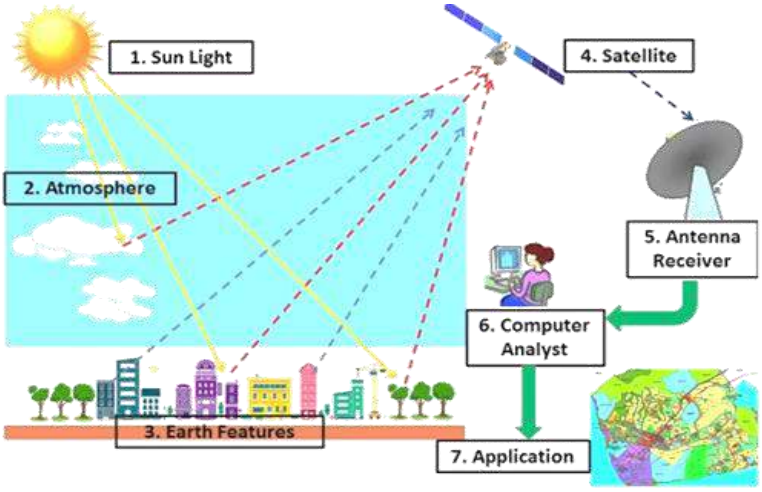


Figure 6: A generalized process components of remote sensing technology

Source - https://www.gisoutlook.com/2019, accessed on 8th April, 2021.

1. Energy source or illumination:

This is the basic requirement for process of remote sensing, to have a source of energy that illuminates electromagnetic energy to the target of interest, for example, Active and passive ensors. Mostly the sensors are passive which tends to measure the solar radiation reflected from the target.

2. Interaction with the atmosphere:

Before the electromagnetic radiation reaches the Earth's surface it has to travel through some distance of the Earth's atmosphere. Particles and gases in the atmosphere can affect the incoming light and radiation and such type of effects are caused by the mechanisms of scattering and absorption (Figure 7).Scattering occurs when particles or large gas molecules present in the atmosphere interacts and cause the electromagnetic radiation to be redirected from its original path. It depends on several factors including the wavelength of the radiation, the abundance of particles or gases, and the distance the radiation travels through the are described in Table 2, All the different types of scattering with examples are briefly shown in figure 8.

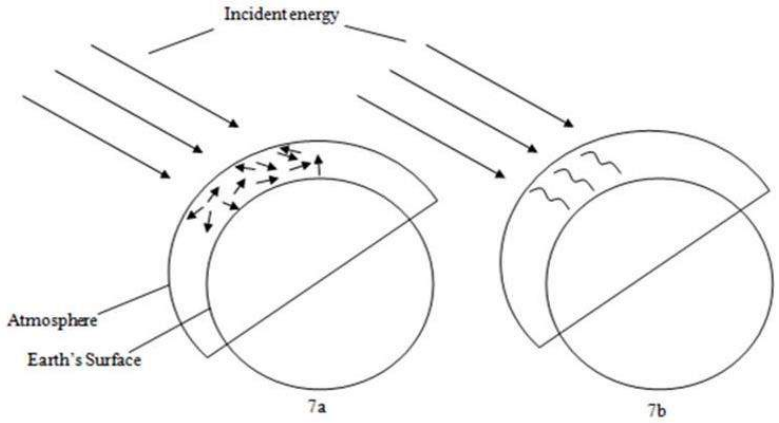


Figure 7: Interaction of EMR with atmosphere (a) Scattering and (b) Absorption

Table 2: Different types of scattering occur when EMR interacts with the atmosphere:

Reference: https://www.nrcan.gc.ca/maps-tools-publications

No.	Types of Scattering	Particle size (Micro meters µm)	Examples
1.	Rayleigh	< 0.1 µm	Small specks of Dust, N_2, O_2 molecules.
2.	Mie	~ 1 to 10 µm	Pollen, Smoke, Water vapour
3.	Non – Selective	> 10 µm	Water droplets and large dust particles

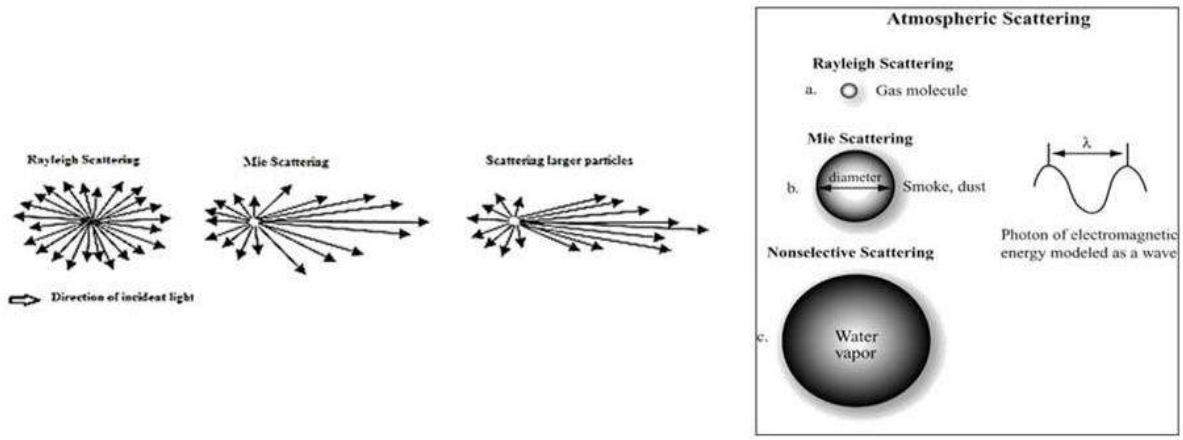


Figure 8: Different types of scattering when EMR interacts in the atmosphere or with the Earth's surface

Source - http://www.geo.oregonstate.edu/ , accessed on 8th April, 2021.

Contrast to scattering, it causes molecules in the atmosphere to absorb specific amount of energy at various wavelengths. O_3, CO_2, and water vapour are 3 main atmospheric constituents which absorbs radiation. Those areas of the EMR spectrum which are not severely influenced by atmospheric absorption and thus are useful for remote sensors, are called Atmospheric windows (Figure 9). The visible portion of the spectrum, to which our eyes are most sensitive, corresponds to both, the atmospheric window and the peak energy level of the sun.

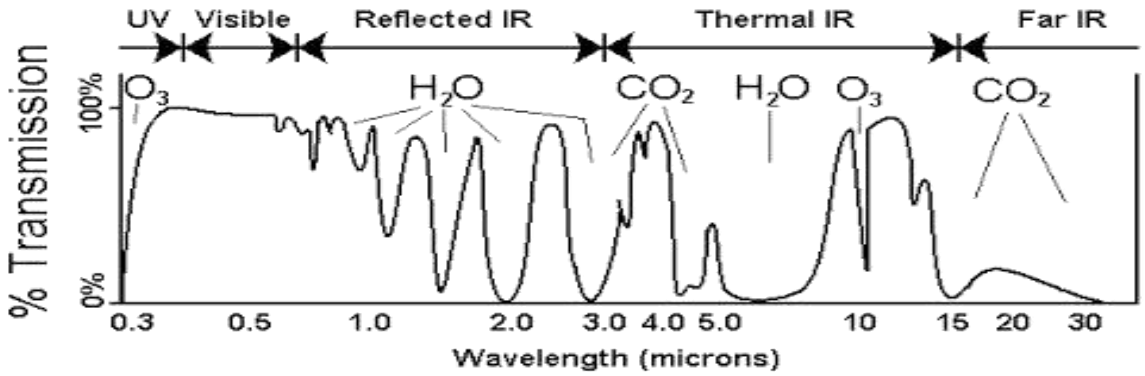


Figure 9: Atmospheric window showing the transmission of molecules at different wavelength with respect to different radiations

Source - http://www.sarracenia.com/astronomy, accessed on 8th April, 2021.

3. Interaction with the target:

After the interaction with atmosphere, once the energy makes its way to the target through the atmosphere, it interacts with the target depending on the properties of both the target and the radiation. Figure 10 shows such examples of interaction. This can take place a second time as the energy travels back from the target to sensor. Several interactions are possible when electromagnetic energy encounters matter, whether solid, liquid or gases are as follows:

- Radiation may be transmitted or passed through the substance.
- It may be absorbed and give up its energy largely to heating the substance.
- It may be emitted as a function of its emissivity and temperature.
- It may be reflected in 2 ways, specular and diffused (Scattered).

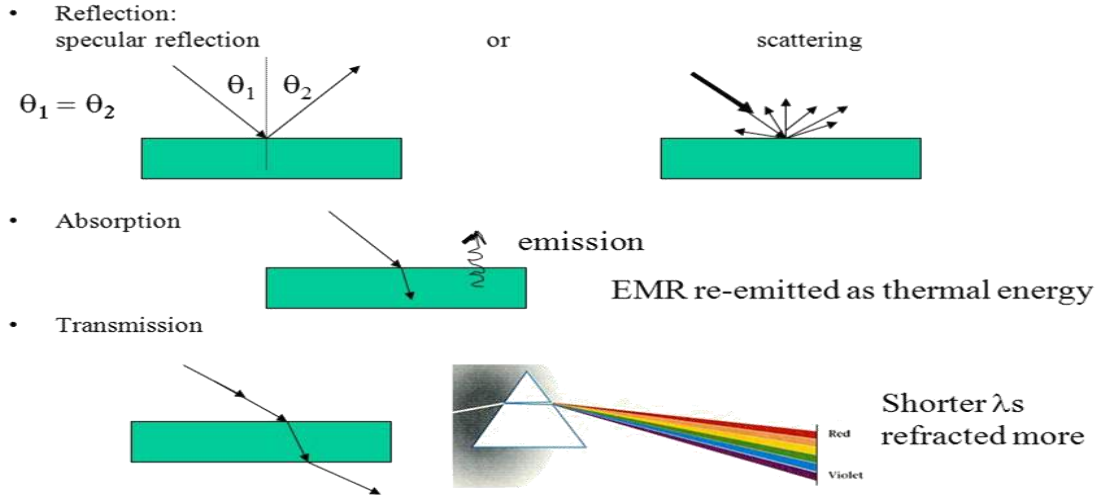


Figure 10: EMR interaction with the Earth's Surface

Source: https://www.slideserve.com/portia © Rick Lathrop, accessed on 25th April, 2021.

4. Recording of Energy by the sensor:

After the energy has been scattered by, or emitted from the earth's surface, there is a need for a sensor which is mounted on a satellite, to collect and record the EMR. The sensors are popularly known by EMR region they sense. Remote sensing has a broad classification of optical and microwave as well as active and passive remote sensing as discussed by Navalgund et al.,(2007); Feng et al., (2020); Ray, (2013). The sensors, for taking observations, needs to be mounted on a platform. This could be ground based (e.g., handheld radiometers), airborne (e.g., Drone, AVIRIS sensor of NASA on board aircraft) or space-borne (i.e., satellite based).

5. Transmission, Reception, and Processing:

The energy recorded by the sensor has to be transmitted, often in electronic form, to a receiving and processing station at the earth where the data are processed and stored in digital form.

6. Interpretation and analysis:

Furthermore, this processed data is interpreted, visually and digitally to extract information about the target which was illuminated. There are numerous specialised instruments or hardware and software used that are commonly known as image processing tools which involves four basic steps viz. image correction/restoration, image enhancement, image transformation and image classification.

7. Application:

The final element or component of remote sensing process is achieved when we apply the extracted and processed information in solving a particular issue or problem. Specialists who work in each application theme are able to perform and carry out this task.

Applications of remote sensing:

Every application itself has some specific demands for spectral, spatial, radiometric and temporal resolution of the satellite sensor (Shandilya et al., 2013). In modern era, the remote sensing proved very effective to understand and resolve the challenges in almost all the fields, few of its major applications are illustrated in this article.

1. Geology:

In the field of geosciences, the remote sensing techniques are applied to interpret and analyse the bedrock, lithological, structural formations, sedimentation,(Merritt et al., 2014; Stead et al., 2019) planetary, surface monitoring, (Clark et al., 2003; Des Marais et al., 2002; Shepard et al., 2001)geo-hazards and mineral exploration through observation and modelling techniques.

2. Hydrology:

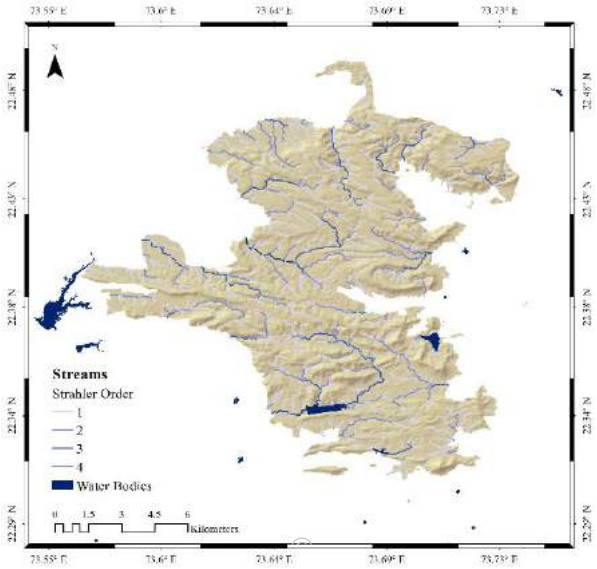


Figure 11: Drainage modelling in Jambughoda Wildlife sanctuary, Gujarat (after Dharaiya, 2020a)

Some examples of applications of remote sensing in hydrological science include, soil moisture estimation, flood and wetland monitoring, watershed and drainage modelling, river delta change detection, and many more. Figure 11 and 12are an example of one of the studies undertaken for hydrological modelling and mapping of wetlands, respectively (Dharaiya, 2020a; Dharaiya et al., 2021).

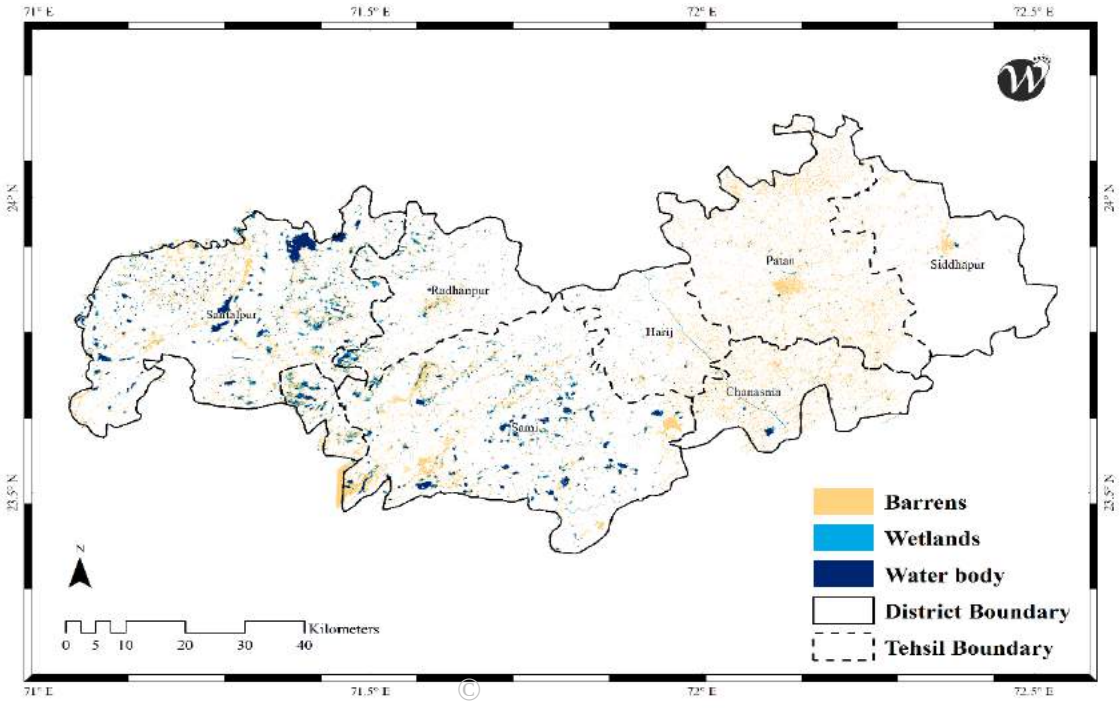


***Figure 12: Mapping of wetlands in Patan district, Gujarat (Dharaiya et* al., 2021)**

3. Glaciology:

By means of remote sensing, one can acquire information and map the ice concentration, ice type or motion(Frey et al., 2014; Jiyang Chen & Ohmura, 1990), iceberg detection, glacier

dynamics (Pratibha & Kulkarni, 2018; Remya et al., 2019), monitor snow thickness (Gantayat et al., 2014; Kulkarni et al., 2002), meteorological change research, snow-water equivalence, snowmelt run-off estimation and many more.

4. Agriculture:

In the science of agriculture, the remote sensing is mostly used as a decision-making tool viz. for crop type classification, crop condition assessment, crop yield estimation, soil characters, soil management practices and compliance monitoring (Zheng et al., 2014).

5. Forestry:

Forestry is one of the major sectors where remote sensing has proved as very effective tool. It has been used for reconnaissance mapping, commercial forestry and environmental monitoring are some objectives which can be fulfilled and that further helps in managing and conserving the natural resources. Figure 13 is an example of mapping the forest coverat Ratanmahal wildlife sanctuary, Gujarat, using spectral indices.

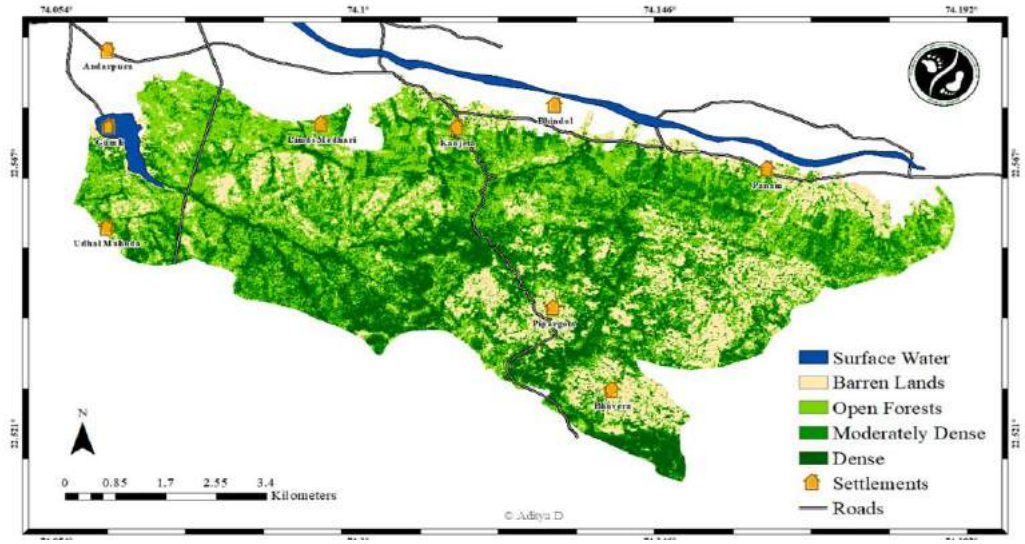


Figure 13: Forest cover map of Ratanmahal wildlife sanctuary, Gujarat © Aditya Dharaiya

6. Land use Land cover (LULC):

Yacouba et al., (2010) has discussed the LULC with reference to two terms ‘land use’ which refers to the purpose the land serves and ‘land cover’ refers to natural surface cover on the ground. For example, it is widely used in habitat and natural resource management, urban expansion, baseline mapping, risk assessment, legal boundaries for tax evaluation, change

detection, etc. Figure 14 and 15depicts the LULC classification and change detection of wetlands, respectively (Dharaiya, 2020b; Dharaiya et al., 2021).

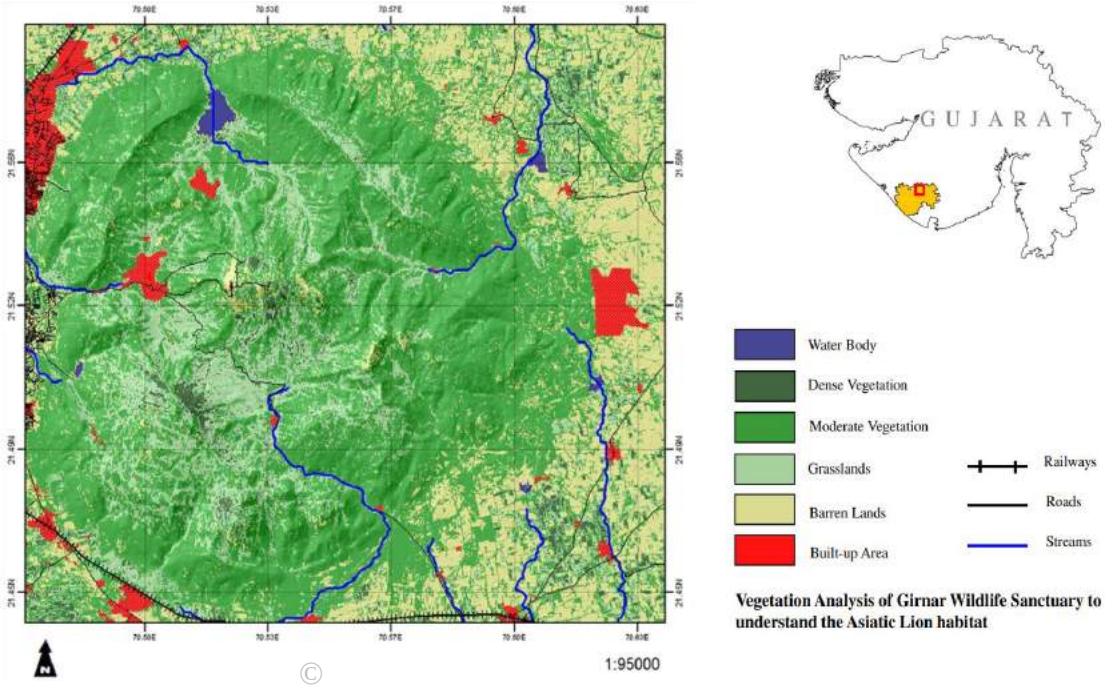


Figure 14: LULC classification with vegetation cover in Girnar Wildlife sanctuary, Gujarat (After Dharaiya, 2020b)

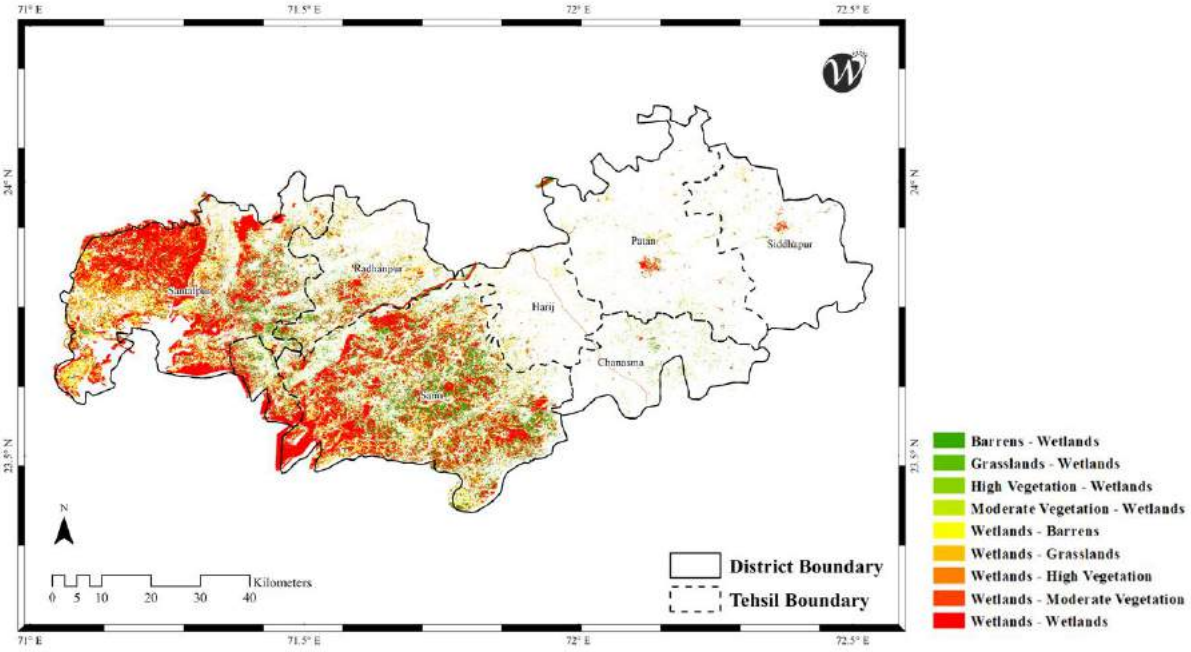


Figure 15: Change detection of wetlands in Patan district, Gujarat using Landsat 8 OLI (Dharaiya et al., 2021)

7. Coastal monitoring:

Remote sensing can be used to gather information about oceanic processes(physical and biological), oil spill (Alesheikh et al., 1997; Fingas & Brown, 1997), and shipping by means of remote sensing.

Several other applications according to Shandilya et al., (2013) include planimetry or land surveying using very high spatial resolution satellites (30 cm). Generating Digital Elevation Models (DEMs) from remote sensing products are used to generate elevation profiles by means of radar interferometry, radargrammetry and photogrammetry. To extract the planimetric details about mineral exploration activities, topographic mapping and surface monitoring, base map imagery provides a priori information about the areas.

Conclusion:

This emerging technique of remote sensing is a significant tool to monitor the Earth's surface. It has progressively expanded applications which allow users to collect, interpret, and manipulate data over vast areas. Multi-temporal satellite data help to delineate changes of the earth's surface, thus it can be also said to be a useful and handy tool for all the users, as it increases the accuracy, efficiency and quality of the analysis in such a way that it can be helpful in decision-making process. Furthermore, the products can be conveniently used by other scientists too, who are even not much familiar with this technology and for the greatest level of detail to be extracted.

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M. I. Patel Award for Young Wildlife & Conservation Biologist

Nominations for 2021 Award

Ms. Shivangi Mishra

Shivangi is a Senior Research Fellow (Basic Scientific Research Fellow, UGC) at University of Lucknow and is currently working on Egyptian Vultures. She has also worked on Butterflies of Uttar Pradesh from 2014- 2016. She has presented her research on Egyptian Vultures in Conference of Raptor Research Foundation in 2018 (South Africa) 2019 (USA) and awarded with William C Andersen Award and James Koplin Award respectively. In future also she wants to contribute her research for the conservation of Egyptian Vultures in India.

Dr. Tarang Kumar Shah

Tarang is an Assistant Professor in Fisheries polytechnic at Dau Shri VasudevChandrakarKamdhenuVishwaVidyalaya, Durg. He studied the Effect of Thymus linearis plant Extract on Growth Performance and Non-Specific Immune Responses of endangered Golden Mahseer (Tor putitora)against the disease caused byOomycetesSaprolegniaparastica. He found that the leaf extract of Thymus plant has the antifungal properties and a small quantity of which can control the population against saprolegniosis.

Dr. Sujit Kolangath

Sujit is a subject specialist in animal biotechnology at Wildlife Research & Training Center, Gorewada, Nagpur. He studied the qualitative and quantitative aspect of hepatoozoonfelis epidemiology in a tiger cub. He reported that the infection is transmitted by ingestion of infected ticks, infected prey and carrion and concurrent infection with bacterial or viral infections may be fatal to the infected animal.

Ms. Jis Sebastian

Jis recently completed her doctoral research in Botany from Madurai Kamraj University, Madurai- Tamil Nadu. She is studying the pattern of diversity, spatial distribution and community structure of epiphytic orchids of southern Western Ghatsresponds to availibility of microenviornments (Microhabitat supported by Microclimates) in the structurally diverse trees. There for Conservation of epiphytic orchids would ensure conservation of old aged, natural, structurally complex trees in the forest ecosystem.

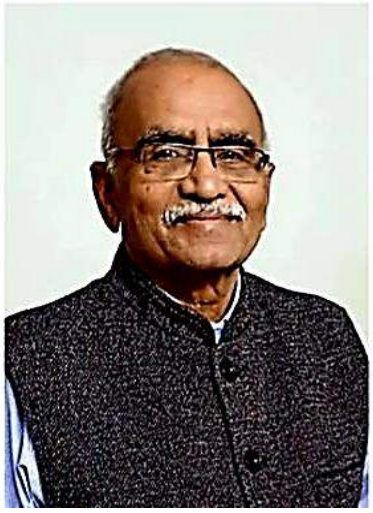
Dr. Harshil Patel

Harshil is a naturalist working mainly on systematics and taxonomy of reptiles and amphibians. He studied the amphibians & reptiles of northern Western Ghats of Gujarat. He found a new, Miocene divergent, endemic lineage of a racer snake; evolutionary history of an endemic snake resulted in the resurrection of a genus; reinvestigation of a gecko species complex that resulted into the discovery of two new species.

The final round including the presentation by the nominees followed by the award ceremony will be conducted on September 27, 2021 at M N College, Visnagar (Gujarat). WCB and the M I Patel Award committee congratulate all the nominees and wishing all the best for their presentation.

Applications and nomination for the 2022 awards are now open through our website (www.wcbresearch.in) till June 30, 2022.

PROF. M. I. PATEL AWARD



Award for Young Wildlife & Conservation Biologist

The Award will be conferred to any young scientist / student/ researcher below the age of 35 years working in the field of wildlife and conservation biology (Zoology/ Botany/ Environmental Science/ or allied subject) and carried out significant research in the respective field.

How to apply:

Register online with an extended research abstract in 1000 words and the outstanding contribution to the wildlife conservation along with your one page CV and one letter of nomination/ recommendation. The registration fees is Rs. 200 (non refundable)

Selection criteria:

A selection committee will review your application and invited you for the online presentation before the Jury Panel and the best five researchers will be selected for grand finale.

Announcement

As United nation declared this decade (2021-2030) an Ecosystem Restoration Decade; We, WCB Research Foundation with CNEW are organizing a field based workshop and hands-on training on

Ecological Restoration: Principles and Field applications

A four days training course in **October 2021** with very limited seats.
A renowned, nationally and internationally recognized eco-restoration experts will be providing the hands-on training and sharing their experiences.
An ecology student, researcher, faculty member, policy makers, industrialist, architecture, civil engineers should participate in this field based workshop.
Keep looking at our website for date and registration details
www.wcbresearch.in
Write us for more details:
wcbresearch@gmail.com | cnew.1099@gmail.com

Internship Opportunities

@ WCB Research Foundation

We, at WCB Invites applications for internship, training and dissertations in hybrid mode (*Online and Offline*) under our team of experts in the following areas

- ***Research methodology***
- ***Wildlife Biology***
  - Mammalian ecology
  - Human-wildlife interaction
  - Avifaunal diversity
  - Herpetology
  - Marine biology
  - Invertebrate diversity
- ***Environment & Ecology***
  - Biodiversity & Ecosystem Assessment
  - Eco-restoration
  - Urban Environment
  - Wetland Conservation
  - Solid-waste Management
- ***Forestry & Plant biology***
  - Plant diversity
  - Ethnobotany
  - Habitat Assessment
- ***Geo-Spatial Analysis***
- ***Biotechnology & Conservation Genetics***
  - Bio and Eco Informatics
  - Environmental Biotechnology

Adding Science to Conservation

For more details contact to
Director of Research:
8320519903

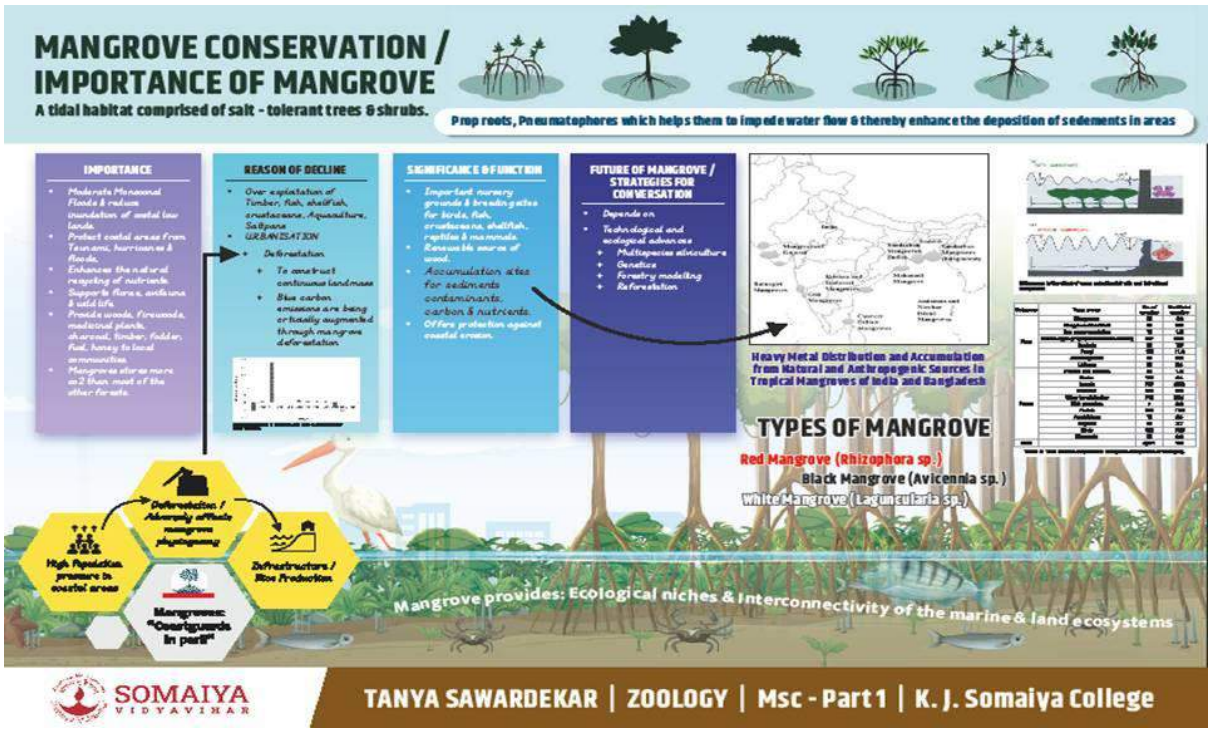
Admin Officer:
9712315698

Email:
wcbresearch@gmail.com
Apply online at
www.wcbresearch.in

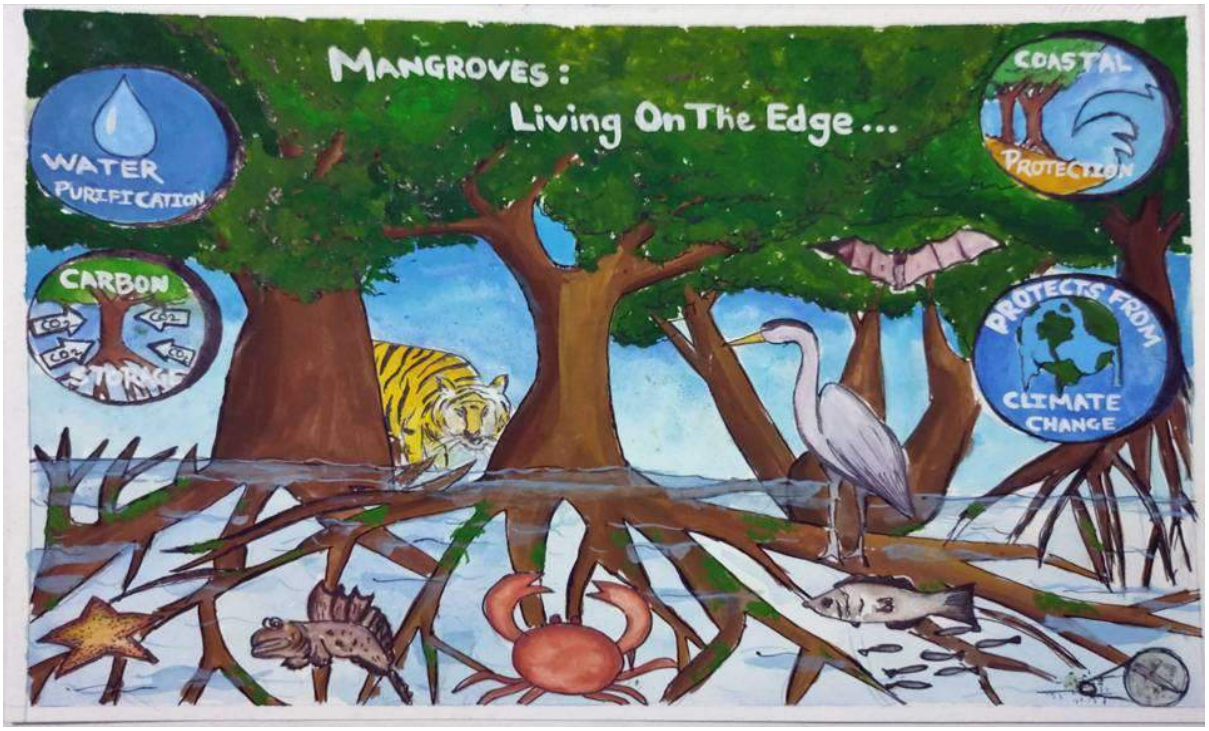
WCB Research Foundation with K J Somaiya College, Mubai have organized Digital and Handmade Posters Competition on the occasion of World Mangrove Day July 26, 2021. Out of entries of thirty participants three best posters were selected by the committee and awarded.

Posters of Winners

1st Prize Digital Poster Ms. Yukta Sawant



1st Prize Digital Poster Ms. Yukta Sawant



1st Prize Handmade Poster Ms. Tanya Sawardekar

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Instructions for authors

Scope: Prithivya is a tri-annual newsletter of WCB Research Foundation and will publish manuscripts on wildlife, conservation biology and its allied areas.

Guidelines to contributors of Prithiviya

- *Manuscript Types: Prithiviya* publishes, original research articles, short notes, field notes, reviews and comments. Submissions should be in English (UK) only.
- All manuscripts should be easy to read and comprehend. Manuscripts may be edited for length, content and style, and be sent to referees when found to be appropriate. The editor will discuss contributions with authors and advise to modified whenever required.
- Submission is considered on the condition that papers are previously unpublished, have not been offered simultaneously elsewhere, and that all contributors have read and approved the contents.
- The editor will acknowledge manuscript contributions and assign them a unique registration number, which latter must be quoted in correspondence. Papers are peer-reviewed, although the editor reserves the right to reject one without a review.

Preparation and submission of manuscripts

1. Title page:
    - Add full title,
    - Author/s name and affiliation with email of all the Authors
    - Abstract (250 Words) and Key words (4-5)
2. Submitted manuscripts should generally follow the normal convention of scientific manuscripts, keywords, generally not appearing in the title, Introduction, Materials and Methods, Results and Discussion, Acknowledgments, Authors contribution (optional), Appendices (optional) and References) with the replacement or addition of sections allowed in between the Introduction and the Acknowledgments.
3. The manuscript should be typed in MS Word with left-aligned typesetting and only true type fonts (Times new roman preferable) should be used. The line spacing must be 1.5 and the font size of 12. Headings should be bold and sub-headings should be made italicized.

4. **Title**: A concise, informative and attractive and short title with 5-20 words will be encouraged

5. **Abstract:** Word limit for the abstract is 250 words and should contain a summary of all major findings or conclusions of the study; however abstract is not required in case of short notes, field notes and other short communication.

6. **Introduction**: should be clearly written and must covering the objectives and significance of the study.

7. **Methodology**: A detailed methodology is always encouraged. The methodology should contain the study area (if applicable), data collection, analysis and interpretation. Authors should also mention the instruments, software used for the experiments and analysis.

8. **Result and discussions**: which contain main result, with proper references and authentic justifications include, graph, table, photographs (No checklist, it directly goes into appendix or supplementary data).

9. **Conclusions**: A short and comprehensive conclusion with significant /novel findings and depicting your research in a nut-shell.

10. **Acknowledgments**: which contain all funds support, persons who help during project or research or findings, name of university other than they work etc.

11. Checklist-based papers, like trip reports, should contain dates of the trip, total number of birders or participants, Mammals, reptiles, amphibians, invertebrates etc.
12. Manuscripts should be sent electronically as an email attachment to the Editorial Assistant with a cover letter to ……..

13. The text, tables, figure/photograph captions (which must be self-explanatory), and appendices should be combined in one Microsoft Word® (".doc," OR ".docx") file format. The preferred font is 'Times New Roman' in 12 point.

14. Photographs, artwork, maps (the outlines of the Republic of India should conform to Government of India regulations), diagrams, *etc.*, should be digitized and sent separately along with the manuscript, or if they are large

files, in separate, trailing e-mails. These should be in TIFF and at least 8×11 inches in 300 dpi resolutions. JPEG files must be 'maximum' quality, i.e., at their minimum compression. Maps should be marked with a scale and North arrow, and should carry a clear caption.

15. Authors, whose work involves the handling of any necessary permissions from the requisite government agencies, to do so. The editor reserves the right to view such permissions at her/his discretion.

16. While photographing nesting/courtship display or any behavioural activity, including those of nests, eggs, courtship *etc.*, authors/photographers must ensure the safety of the animals involved, and also ensure that they do not disturb in any way whatsoever, in the course of their photography. The editor reserves the right to view permissions for such activities within protected areas. The editor/referee reserves the right to query an author regarding the ethics of photography, and the methodology followed while photographing including that of rejecting a manuscript if unsatisfied on these counts.

Types of Manuscript

1. Short Research articles: 2000 to 2500 words
2. Short notes: Up to 1500 words
3. Important sightings: 250-350 words with proper GPS location and photographic evidence
4. Important findings: 250-500 words with proper GPS location with image
5. Full-length Research paper: Up to 10000 words with appendix excluding photographs only.

Other important Guidelines

- Scientific binomials should comprise the generic and specific names, but should not include the name of the author and year of citation. Scientific trinomials should be mentioned only if the nature of the manuscript requires them.
- For example, both the English and scientific name must be given, thus, "House Crow *Corvus splendens*", thereafter, only the English name, "House Crow" will suffice. English and scientific names should follow the proper book, that should be mention in reference and title of the table

- Metric units and their international symbols must be used, e.g., "sq. km", and "1,000 m asl."; dates and times should be of the form of MMDDYYYY (January 01, 2021", and "1345 h" respectively.
- Tables should be within gridlines (which may or may not be printed). Tables should never be formatted with wrap-around text.
- Latitude and longitude coordinates should follow the format, "27.807°N, 74.094°E".
- Enzyme Nomenclature: The trivial names recommended by the IUPAC-IUB Commission should be used. When the enzyme is the main subject of a paper, its code number and systematic name should be stated in its first citation in the paper.
- Symbols and Abbreviations: Use only standard abbreviations. The use of non-standard abbreviations can be extremely confusing to readers. Avoid abbreviations in the title. The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement.
- Page number (page 1 0f 10 formats) must be on top right corner of the word documents, font size 10 and times new roman word type.

Citation and References

Prithivya encourages the authors to use Mendely, EndNote or other reference management tools for proper citations. We follow APA referencing style.

- Do not abbreviate references; pagination should be given in the expanded form, e.g., "i–vi, 1–250", not "vi, 250"; the page numbers should be separated by an 'En' dash.
- Italics should be used for book titles but not volume numbers; when citing periodicals use italics for the journal name, not the article title.
- References should be arranged alphabetically by the first author (and in the case of more than one author, by second and subsequent authors).
- Citations to references in the text should follow the style, "(Santharam 1978)", "(Barua & Sharma 1999)", "(Pande et al. 2002)", "(Lainer 1999, 2004)", "(Lainer 1999a,b,c,d; Lainer 1999a, 2000a)" [for several papers by an author/s from

a/multiple calendar year/s], and "(Neelakantan et al. 1993; Sashikumar et al. 2011)".

- A string of citations in the text should follow a chronological, not an alphabetical order, thus: "(Ali & Ripley **1981**; Kazmierczak **2000**; Grimmett et al. **2011**)".
- When citing unpublished sources, please use the following formats: if the source is written material, "(Harkirat Sangha, *in litt.*, e-mail/letter dated 02 January 2013)"; if oral, "(Rajah Jayapal, *verbally*, dated 15 December 2013)".
- When citing from e-Bird or any other magazine checklist, please enter the author of the e-Bird checklist's name or others name, and the year the checklist was uploaded, in the text, "(Raman 1994)". If a checklist that's shared amongst multiple observers is being referred to, only the relevant checklist(s) should be used for citation.

See examples below for detailed formatting:

Journal articles

- Pittie, A., 2011. The dates of seven new taxa described by W. E. Brooks (*Certhia Hodgsoni*, *Sitta Cashmirensis*, *Dumeticola major*, *Horites* [*sic*] *Pallidus*, *Phylloscopus Tytleri*, *Motacilla Cashmirensis*, and *Alauda Guttata*). *Prithiviya*7 (2): 54–55.
- Naoroji, R., & Sangha, H. S., 2011. Threats to habitat and wildlife in Changthang and Rupshu areas of Ladakh: a case study at Hanle. *Prithiviya*7 (1): 2–6.
- Choudhary, D. N., Mandal, J. N., Mishra, A., & Ghosh, T. K., 2010. First ever breeding record of Black-necked Stork *Ephippiorhynchus asiaticus* from Bihar. *Prithiviya*6 (3): 80–82.

Books

- Futehally, Z. (ed.) 2006. *India through its birds*. 1st ed. Bangalore, India: Dronequill Publishers Pvt. Ltd. Pp. i–ii, 1–214.
- Pittie, A., 2010. *Birds in books: three hundred years of South Asian ornithology—a bibliography.* 1st ed. Ranikhet: Permanent Black. Pp. i–xxi, 1–845.
- Sashikumar, C., Praveen J., Palot, M. J., & Nameer, P. O., 2011. *Birds of Kerala: status and distribution.* 1st ed. Kottayam, Kerala: DC Books. Pp. 1–835.

Book chapter

- Pittie, A., 2011. Stray Feathers (1872–1899) (p. 247). In: *Priority! The dating of scientific names in ornithology: a directory to the literature and its*

reviewers. Dickinson, E. C., Overstreet, L. K., Dowsett, R. J., & Bruce, M. D. (eds.). Northampton, UK: Aves Press Limited.

Website

- 2013. Kadalundi makes history with new gull species. *The Hindu* (Thiruvananthapuram ed.) dated February 7, 2013. Website: http://www.thehindu.com/todays-paper/tp-national/tp-kerala/kadalundi-makes-history-with-new-gull-species/article4388171.ece. [Accessed on 21 July 2014.]

Any magazine checklist

- Raman, T. R. S., 1994. Website URL: http://ebird.org/ebird/view/checklist?subID=S21694571. [Accessed on 15 December 2015.]

ETHICAL MATTERS

Authors involving in the usage of experimental animals and human subjects in their research work should seek approval from the appropriate Institutional Animal Ethics Committee in accordance with "Principles of Laboratory Animal Care". The material and methods section of the manuscript should include a statement to prove that the investigation was approved and that informed consent was obtained.

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