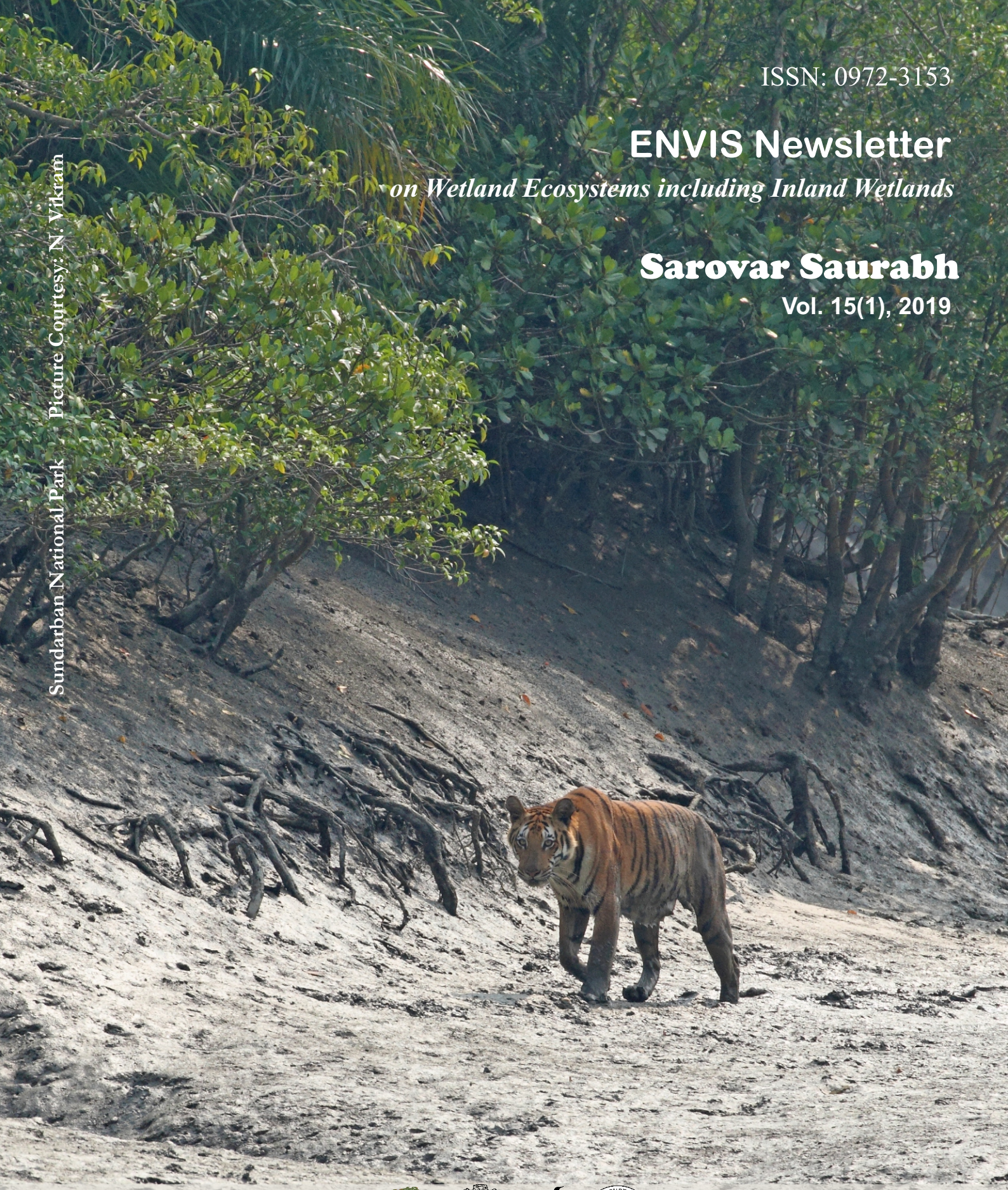
ISSN: 0972-3153

ENVIS Newsletter

on Wetland Ecosystems including Inland Wetlands

Sarovar Saurabh

Vol. 15(1), 2019



Sundarban National Park , Picture Courtesy: N. Vikram

SÁLIM ALI CENTRE FOR ORNITHOLOGY AND NATURAL HISTORY

(A Centre of Excellence under the Ministry of Environment, Forest and Climate Change, Govt. of India)
Anaikatty, Coimbatore - 641 108 (INDIA)

ENVIS Newsletter *on Wetland Ecosystems including Inland Wetlands*

Sarovar Saurabh

Vol. 15(1), 2019 **ISSN: 0972-3153**

Published by
Environmental Information System (ENVIS)
Sálim Ali Centre for Ornithology and Natural History (SACON),
Anaikatty (P.O.), Coimbatore-641108,
Tamil Nadu, India.

Sponsored by
Ministry of Environment, Forest and Climate Change
Government of India, New Delhi.

Contents

Instructions to Contributors

We welcome original research and popular articles, reviews, reports, research highlights, notes, news, snippets, etc., related to the thematic area of the ENVIS Resource Partner for publication in 'Sarovar Saurabh the ENVIS Newsletter on Wetland Ecosystems including Inland Wetlands'.

The articles and other information should be neatly typed in double space not exceeding five pages. The figures, graphs/drawings should be of good quality and clarity. Photographs should be of minimum 300 dpi resolution. References should be limited and cited in the text by name and year. Council of Science editors style may be referred to for listing references at the end.

Email your articles in MS-Word 2003 or 2007 format to sacon-env@nic.in or salimalicentre@gmail.com

Send the articles in hard copy by post to:

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From the Editors' Desk

The importance of conservation of wetlands was emphasized during 1971 by the signing of the Ramsar convention in Iran. Ever since countries have joined as party to the convention and promoted the cause of conservation of the vital resource i.e. wetlands. India has been a party to Ramsar since its inception in 1971 and has worked towards promoting the objectives of wetland conservation. In continuation, in the beginning of the year 2019 in January the Country has declared its 27th Ramsar site i.e. the Sundarban wetland – the globally known unique mangrove forest.

In this issue, we bring some compilation of articles on the Sundarban wetland while also highlighting the flagship species from the wetlands i.e. the Royal Bengal Tiger. We have also included articles on the World Wetlands Day and other activities that we conducted during the quarter. Here I also take the opportunity to thank Mr. N. Vikram, Ms. Aysha Nourein and Mr. K. Shanmugakumar for providing the photographs from the Sundarban landscape.

Here I request all readers to contribute your events, activities, articles and keep us updated on the happenings of the wetlands around you. Your inputs will help us in disseminating the message of environmental well being to the masses.

The Sundarbans is the largest mangrove forests in the world. It is located at the delta formed by the confluence of the Ganges, Hooghly, Padma, Brahmaputra and Meghna rivers in the Bay of Bengal between India and Bangladesh that spans from the Hooghly River in the state of West Bengal, India to the Baleswar River in Bangladesh. It encompasses closed and open mangrove forests, agriculturally used land, mudflats and barren land, and is intersected by multiple tidal streams and channels.

The Sundarban mangrove forest covers 10,000 km^2 (3,900 sq mi) of which about 6,010 km^2 (2,323 sq mi) are in Bangladesh. The Indian part of Sundarbans is estimated to be about 4,260 km^2 (1,640 sq mi), of which about 1,700 km^2 (660 sq mi) is occupied by waterbodies in the forms of river, canals and creeks of width varying from a few meters to several kilometers. The Indian Sundarbans became inscribed as a UNESCO world heritage site in 1987 (Source: unesco) Where as the Bangladesh part of the Sundarbans was designated as an UNESCO world heritage site in 1997 (Source: unesco).

The Sundarbans of Bangladesh called as "Sundarbans Reserved Forest" was designated as a Ramsar site on 21st May 1992 and the Indian portion called as "Sundarban Wetland" has been designated as a Wetland of International Importance under the Ramsar Convention on 30th January 2019. This is the 27th Ramsar site (No. 2370) from India which is the largest protected wetland in the country.

The Indian Sundarban covers the south-western most part of the delta constituting over 60% of the country's total mangrove forest area and includes 90% of Indian mangrove species (Source: Ramsar).

The Sundarbans support an excellent biodiversity with a vast range of flora and fauna that includes more than 27 mangrove species, 40 species of mammals, 35 species of reptiles, and 260 bird species (Giri *et al.*, 2007). The forests of the Sundarbans are characterized by two main tree species *Heritiera fomes* (Sundari) and *Excoecaria agallocha* (Gewa). Other species of the forest assemblage include *Sonneratia apetala* (keora), *Ceriops decandra* (goran), *Avicennia*, *Xylocarpus*, *Sonneratia*, *Bruguiera*, *Rhizophora, Nypa* palm, *Imperata cylindrica* (spear grass) and *Phragmites karka* (khagra) (Giri *et al.*, 2007).

The Site is a habitat to a large number of rare and globally threatened species such as endangered Bengal Tiger, the critically endangered northern river terrapin (*Batagur baska*) a rare turtle once believed to be extinct, the endangered Irrawaddy dolphin (*Orcaella brevirostris*) and the vulnerable fishing cat (*Prionailurus viverrinus*). It is also a home to the King Cobra, water monitor lizard, the Indian python, sharks, crocodiles, spotted deer, Rhesus macaque and wild boar (Giri *et al.*, 2007; Source: Ramsar, IUCN). This site also serves as nurseries to shellfish and finfish and protracts the fisheries of the entire eastern coast.


Picture Courtesy: K. Shanmugakumar

The Sundarban Tiger Reserve is located within the site and part of it has been declared as a "Critical Tiger Habitat" under national law. Moreover, it has also been affirmed as a "Tiger Conservation Landscape" of global importance. The Sundarbans are the only mangrove habitat which supports a major population of tigers which have unique aquatic hunting skills (Source: Ramsar).

The Sundarban wetland is also economically and ecologically important as it also provides sustainable livelihoods for millions of people in the vicinity of the site, acts as a storm barrier, a shore stabiliser, nutrient and sediment trap, a source of timber and natural resources, and important source of fish and shrimps along the East Coast of India. They are an excellent illustration of the ecological processes of monsoon rain flooding, delta formation, tidal influence and plant colonisation. The ecosystem services of the mangrove forests include guarding the vicinity of Sundarban wetlands from storms, cyclones, tidal surges, and the leaching and intrusion of saltwater inland and into waterways.

The conservation of this site has always been a priority for its protection and management as the uniqueness of the habitat inhabits several rare and endangered flora, fauna including avian and aquatic species and also the global services they provide.

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https://www.ramsar.org/news/indian-sundarbans-named-as-a-wetland-of-international-importance

https://www.ramsar.org/news/iucn-and-world-heritage-mission-to-the-sundarbans-in-bangladesh

Kingdom: Animalia | Phylum: Chordata | Class: Mammalia

Order: Carnivora | Family: Felidae | Genus: *Panthera*

Species: *P. tigris* | Subspecies: *P. t. tigris*

Conservation Status: **Endangered (IUCN)**

The Sundarbans is a cluster of low-lying islands in the Bay of Bengal, spread across India and Bangladesh, famous for its unique largest single tract of mangrove forest in the world. The Sundarbans forest is about 10,000 sq km across India and Bangladesh, of which 40% lies in India and 60% lies in Bangladesh. India's Sundarban Wetland and Bangladesh's Sundarbans Reserved Forest were designated as Ramsar sites on 30th January 2019 and 21st May 1992 respectively.

The Bengal tiger, also known as the Royal Bengal Tiger or the Indian tiger (*Panthera tigris tigris*) is the flagship species of Sundarbans. It is the national animal of India and Bangladesh. The mangrove forests of the Sundarbans shared between India and Bangladesh are the only mangrove forests where tigers are found. The Bengal tiger is the heritage of the Sundarban and its population is supposed to be one of the largest surviving tiger population in the world (Source: Sunderbanmangrove). The Bengal tiger is found primarily in India with smaller populations in Bangladesh, Nepal, Bhutan and Myanmar. It is the subspecies with the major population of more than 2,500 left in the wild (Source: worldwildlife). The Sundarbans are increasingly threatened by sea level rise as a result of climate change. Poaching and habitat loss are the major threats to the Bengal tiger.

The Bengal tiger is gorgeous and impressive with thick legs, strong teeth and jaws and coat with the characteristic coloration pattern. Its skin has a yellow to light orange color that in the belly and the internal

areas of the legs becomes white or cream. Black, gray or brown stripes run vertically down all its body before the tail, where they become rings. There is a rare variant of the Bengal tiger. Due to a genetic mutation, some specimen exhibits a white coat with dark stripes and blue eyes which is just a genetic variety and they are not albino tigers (Source: tigers-world).

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http://sunderbanmangrove.com/wildlife.php

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Abstracts from published literature

Sea-Level Rise and Species Conservation in Bangladesh's Sundarbans Region

Susmita Dasgupta[1], Mainul Huq[1], Istiak Sobhan[1] & David Wheeler[2]

[1] Development Research Group, World Bank, Washington, DC, United States

[2] World Resources Institute, Washington, DC, United States

Journal of Management and Sustainability (2018) Vol. 8(1).

Abstract:

This paper develops a methodology for identifying high-priority species conservation areas in Bangladesh's Sundarbans region, an UNESCO World Heritage site, considering both species vulnerability and the likelihood of inundation by future sea-level rise (SLR). Our species vulnerability analysis develops a composite spatial vulnerability indicator based on total species counts, endangered species counts, endemicity, and four measures of extinction risk from the high-resolution range maps and conservation status assessments for 378 terrestrial vertebrate species provided by IUCN Bangladesh, IUCN International and BirdLife International. We extend the analysis by identifying areas where protection will fail if they are inundated by SLR in this century. We project SLR by 2100 at 120 cm, near the upper bound of the current consensus, and develop digital maps of the Sundarbans region that incorporate alternative assumptions about interim subsidence (8 cm, 35 cm) and deposition of alluvial sediment (0 cm, 40 cm). We overlay these maps with our composite species vulnerability map to produce SLR-risk-adjusted maps for priority assessment. While it would be highly desirable to protect all species of Sundarbans, resource scarcity may necessitate focusing protection on the highest-priority areas. Our analysis indicates that the highest-priority conservation status should be assigned to Sundarbans core region that has both high species vulnerability and the lowest likelihood of inundation in this century. We also identify other critical areas in four echelons of descending priority, depending upon their likelihood of inundation by sea-level rise. We hope that our methodology will contribute to cost-effective conservation management in the Sundarbans region.

Keywords: Sundarbans, biodiversity, conservation, species vulnerability, climate change, sea-level rise.

Effect of competing landuse practices on Chakaria Sundarbans mangrove in Bangladesh using Landsat imagery

Husni Mobarak Prince[1*], Mohammed Oludare Idrees[1], Helmi Zulhaidi Mohd Shafri1, Mehedi Iqbal[2], Md Zaheer Iqbal[3], Md Tariq Aziz[3]

[1]Department of Civil Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM, Serdang, Malaysia

IOP Conf. Series: Earth and Environmetal Science (2018) 169: 012038

Abstract: This paper quantifies the extent to which Chakaria Sundarbans mangrove has been depleted through human interference using Landsat imagery of 1972 and 2017. The images were corrected for radiometric and atmospheric effects. To improve the classification process, the Chakaria Sundarbans's Landsat 2017 image was pan-sharpened. The earlier image which comprises of the virgin forest was classified into three classes (water, mangrove, wetland) while the later was classified into four classes – waterbody, mangrove, pond scum and saltpan using supervised classification method and support vector machine classifier. Using the statistical bias adjustment, precise area estimates for each land cover class was obtained. The result shows that between 1972 and 2017, Chakaria Sundarbans mangrove forest has reduced by about 87.5% (from 6000.27 to 877.76 hectares). Currently, about 21% of the land is being used for salt mining, 45% for shrimp farming while the water body takes 26%. It is observed that the river has reduced in width; however, water surface area increased by 2%. The bias adjusted overall classification accuracy yields 95.44% and 94.70% for classified maps of 1972 and 2017, respectively. Evidently, the mangrove has been completely lost to over-exploitation of resources.

Keywords: Landsat, mangrove, unbiased error estimation, land use conversion.

Mangrove Methane Biogeochemistry in the Indian Sundarbans: A Proposed Budget

Manab K. Dutta[1,2],Thomas S. Bianchi[3] and Sandip K. Mukhopadhyay[1*]

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[3]Department of Geological Sciences, University of Florida, Gainesville, FL, United States

Frontiers in Marine Science (2017) 4: 187

Abstract: Biogeochemical cycling of CH_4 was investigated at Lothian Island, one of the relatively pristine islands of Indian Sundarbans and its adjacent Saptamukhi estuary, during June 2010 to December 2012. Intertidal mangrove sediments were highly anoxic and rich in organic carbon. Mean rates of methanogenesis were 3,547 and 48.88 μmol m^{-3} wet sediment d^{-1}, for intertidal (up to 25 cm depth) and sub-tidal sediments (first 5 cm depth), respectively. CH_4 in pore-water was 53.4 times more supersaturated than in adjacent estuarine waters. This resulted in significant CH_4 efflux from sediments to estuarine waters-via advective and diffusive transport. About 8.2% of the total CH_4 produced in intertidal mangrove sediments was transported to the adjacent estuary through advective flux, which was 20 times higher than diffusive CH_4 flux. Mean CH_4 concentrations in estuarine surface and sub-surface waters were 69.9 and 56.1 nM, respectively, with a dissolved CH_4 oxidation rate in estuarine surface waters of 20.5 nmol L^{-1} d^{-1}. An estimated 0.09 Gg $year^{-1}$ of CH_4 is released from estuaries of Sundarbans to the regional atmosphere. The mean CH_4 mixing ratio over the forest atmosphere was 2 ppmv. On annual basis, only 2.75% of total supplied CH_4 to the forest atmosphere was transported to the upper atmosphere via biosphere-atmosphere exchange. Mean CH_4 photo-oxidation rate over the forest atmosphere was 3.25×10^{-9} mg cm^{-3} d^{-1}. Using new and previously published data we present for the first time, a CH_4 budget for Sundarbans mangrove ecosystem which in part, revealed the existence of anaerobic CH_4 oxidation in the mangrove sediment column.

Keywords: Methane, Methanogenesis, Methanotrophy, Budget, Mangrove, Sundarbans.

Participation in the training program for "National Green Corps (NGC)" Coordinators

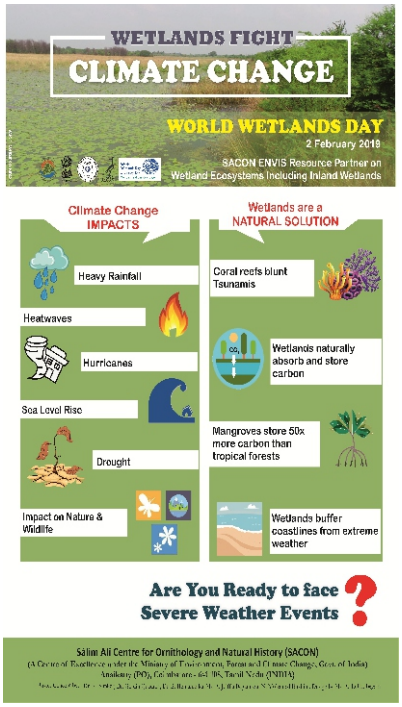
One day training program for the coordinators of National Green Corps of Coimbatore District was organized by the Tamil Nadu Forest Department on 8th February 2019 at Geethanjalee Matriculation Higher Secondary School, Coimbatore. Total of 180 teachers from various government and private schools participated in the training programme. Thiru. N. Balusamy, Coordinator, NGC, Coimbatore District welcomed the participants. He emphasized the importance of NGC and the role of NGC Coordinators in molding the school students.

Mrs. R. Geetha, CEO, S. S. Kulam delivered the inaugural address and urged the participants to conserve nature and environment.

The inaugural function was followed by three sessions covering the topics such as "Swachh Bharat activities", "Biodiversity Conservation" and "Bird watching". Ms. A. Julffia Begam, Information Officer, ENVIS Centre, SACON attended the training program and delivered a talk on "Wetlands and Climate Change". She highlighted the need for wetland conservation and explained how wetlands can help fight Climate Change. She also briefed the participants about ENVIS and Green Skill Development Program (GSDP) and distributed the ENVIS publications and GSDP brochures. The vote of thanks was delivered by Thiru. M. Alagiriswamy, Correspondent, Geethanjalee Matriculation Higher Secondary School, Coimbatore.

World Wetlands Day 2019 Report

World Wetlands Day (WWD) is celebrated every year since 1997 on 2nd February to mark the date of the adoption of the Convention on Wetlands on 2nd February 1971, in the Iranian city of Ramsar on the shores of the Caspian Sea. The Ramsar Secretariat provides outreach material to help raise public awareness about the importance and value of wetlands. Every year, the Ramsar Secretariat decides on a specific theme for the WWD. The theme for WWD 2019 was "Wetlands and climate change"; it aims to emphasize the important role played by wetlands as natural solutions in adapting to and mitigating the impact of climate change.



World Wetlands Day 2019 Poster by SACON ENVIS Resource Partner

OSAI Environmental Organisation in collaboration with the Sri Krishna Arts & Science College, Kuniamuthur, Coimbatore organised the "Ecological Festival for Saving the Western Ghats - National Conference 2019" from 1st February to 3rd February, 2019. This event was also partnered by several industries, agriculture, research, social and youth organisations and media. SACON ENVIS Resource Partner promoted the message of WWD 2019 at the event by releasing the poster on the theme "Wetlands and Climate Change".

SACON ENVIS RP also put up a stall to showcase the ENVIS publications and the knowledge products which were distributed to almost 2000 students from schools, colleges and the public who visited the stall. The Green Skill Development Programme (GSDP) brochure was also distributed. Honourable State Rural Development Minister Mr. S.P. Velumani visited the stall and released the WWD 2019 poster.

Photo Gallery

Showcase of SACON ENVIS RP publications and knowledge products at the conference stall

Honourable State Rural Development Minister Mr. S.P. Velumani releasing the WWD 2019 poster of SACON ENVIS RP

Visitors at the SACON ENVIS RP stall

WWD 2019 poster of SACON ENVIS RP released in the "Ecological Festival for Saving the Western Ghats - National Conference 2019"

This Hawaiian tree snail is the first extinction of 2019

George, of the species Achatinella apexfulva, died on New Year's Day, 2019

A Hawaiian tree snail, who was an 'Endling', died on New Year's Day 2019, making his species the first to be declared officially extinct in 2019.

"The DLNR Division of Forestry and Wildlife is sad to report that George, the last known Achatinella apexfulva, died on New Year's Day 2019. According to David Sischo, wildlife biologist with the Hawaii Invertebrate Program, George was approximately 14 years old. Unfortunately, he is survived by none," the Hawaii DLNR (Department of Land and Natural Resources) said in a Facebook post on January 4 at 7:35 AM (local time).


Credit: Hawaii Department of Land and Natural Resources

The DLNR further said that Achatinella apexfulva was the first of over 750 species of land snail from the Hawaiian Islands to be described by Western science. The first description came from a shell on a 'lei' (traditional garland used by indigenous Polynesian Hawaiians) given to British seaman, Captain George Dixon, while he docked on the island of O'ahu around 1787. 'Apex fulva', or 'yellow tip', was a trait that many of their kind displayed and is what they were named for.

The snails, said the DNLR, were once widely distributed on O'ahu in the central-northern Ko'olau Mountains, and because they occurred in lower elevations, they were easily accessible and heavily used for making lei due to the beauty of their shells.

In 1997, the last 10 known Achatinella apexfulva were brought to a laboratory at the University of Hawai'i for captive rearing. A few babies were born, but when the lab experienced a die-off for unknown reasons, all the Achatinella apexfulva perished expect for one lone individual, George.

George was named as homage to the famous tortoise on the Galapagos archipelago, who was also an endling, the last of his kind. The snail was a hermaphrodite, having both male and female parts. And since Achatinella apexfulva is a species that is an 'obligate outcrossing species', meaning that it needs a partner to reproduce, George could not further his species, given that all of them had died and he himself was a hermaphrodite.

The DNLR also noted that George's passing is emblematic of the plight of the tree and land snails of Hawaii, most of which are facing imminent extinction due to invasive species and climate change.

However, the DNLR also revealed that in 2017, a small two-millimeter snippet of George's foot had been collected and plopped into a vial of pink-colored media. This piece of living tissue from George was currently in a deep freeze at the San Diego Zoo's Frozen Zoo.

The Department said that 'while it is currently not possible to clone a snail, it certainly will be some day. George may yet live again!'

Source: *https://www.downtoearth.org.in/news/wildlife-biodiversity/this-hawaiian-tree-snail-is-the-first-extinction-of-2019-62798*