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FIELD GUIDE

INPRE - 7

LACUSTRINE WONDERS: DISCOVERING THE
ECOSYSTEM AND GEOLOGICAL SIGNIFICANCE
OF CHILIKA LAKE

Raj Kumar Singh and Pitambar Pati



बीरबल साहनी पुराविज्ञान संस्थान

Birbal Sahni Institute of Palaeosciences

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Anupam Sharma, BSIP, Lucknow
Akhilesh K Yadava, BSIP, Lucknow
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Creative Team, Expression 360, New Delhi

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Field Guide Book

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Lacustrine Wonders: Discovering the Ecosystem and Geological Significance of Chilika Lagoon

Principal Investigator

Dr. Raj Kumar Singh

Associate Professor, School of Earth, Ocean and Climate Sciences Indian Institute of Technology Bhubaneswar, Argul, Jatni – 752050, Odisha, India

Co-Principal Investigator

Prof. Pitambar Pati

Professor, Department of Earth Sciences,
Indian Institute of Technology Roorkee, Roorkee, Uttarakhand

Team Members

Mrs. Sunita Rath and Mr. Suman Datta

Senior Research Fellow, School of Earth, Ocean and Climate Sciences
Indian Institute of Technology Bhubaneswar, Argul, Jatni – 752050, Odisha, India

Email of Contact Person

rk Singh@iitbbs.ac.in

Mobile No.

+91 8895381431



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Team Leaders



Dr. Raj Kumar Singh

Associate Professor and Head, School of Earth, Ocean and Climate Science, Indian Institute of Technology Bhubaneswar, Argul, Jatni - 752050, Odisha, India

Dr. Raj Kumar Singh is Associate Professor and Head, School of Earth, Ocean and Climate Science, Indian Institute of Technology Bhubaneswar. Dr. Singh worked focussed on assessing paleoclimate and paleoceanographic changes using micropaleontological, sedimentological and geochemical proxies. Dr. Singh was a shipboard scientist of IODP expedition 346 (Asian Monsoon) and expedition 383 (Dynamics of the Pacific Antarctic Circumpolar Current) and worked on the samples from Japan Sea, East China Sea and Southern Ocean. Dr. Singh's work also focuses on evaluating coastal processes and he has extensively worked in the Chilika lagoon and various other estuaries along the Eastern Indian coasts.



Prof. Pitambar Pati

Professor, Department of Earth Sciences, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand

Prof. Pitambar Pati is professor at Department of Earth Sciences, Indian Institute of Technology Roorkee. His current research investigates how Himalayan tectonics, climate variability, and anthropogenic activities shape landscapes in the Indo-Gangetic Foreland Basin. Prof. Pati examined soils, soft sediments, and river channels as archives of past environmental and tectonic processes to reconstruct the timing and magnitude of landscape transformation. His work aims to improve understanding of Himalayan geodynamics at the foreland for the sustainable regional development. Prof. Pati also have extensively worked in the Chilika and its nearby region to reconstruct high-resolution Holocene climate variability.

Abstract

Chilika, the largest lagoon in Asia and the second largest in the world, receives large suspended sediment loads from both northeastern and western catchments. The interaction between the river and the sea creates three distinct environments in the lagoon: marine, fluvial, and terrestrial, with lower salinity on the northeastern side (Northern Sector) and higher salinity on the southeastern side (Outer Channel). Both natural and anthropogenic influences, in addition to sea mouth shifting and the widening of the barrier spit's sand bar, further exacerbate the lagoon ecosystem. Additionally, the water and sediment influx into the lagoon is interrelated with Indian Summer Monsoon (ISM) precipitation and intensity, making the lagoon important for studying modern and past monsoon dynamics and patterns over central India over the last 10 kyr or beyond. The origin and geographical setting of the lagoon provide a perfect setting to study present ecological conditions along the salinity gradient and to assess paleoecology and paleomonsoon conditions in the Mahanadi basin. The nearby coast also contained sediments, whose depositional variability suggests the influence of extreme weather like cyclones. Hence, this field excursion provides participants with an opportunity to examine modern sedimentary processes, lagoon evolution, Holocene palaeoenvironmental archives, and human–environment interactions within one of South Asia's most important coastal lagoon systems.



Preamble

Chiika lagoon, recognised as a 'Ramsar site' under the Ramsar Convention, 1981, receives suspended sediments of 1.2×10^6 tons/yr and 0.3×10^6 tons/yr from the northeastern and western catchment regions, respectively (Ghosh et al., 2006), in addition to seasonal fresh water influx. The seasonal interaction of both fresh and marine water makes the lagoon environment/ecology very dynamic, and both natural and anthropogenic influences further exaggerate the lagoon ecosystem (Barik et al., 2020; Kumar et al., 2024). The semi-diurnal (12.4 h) and fortnightly (12 days) tides significantly influence the hydrology of the lagoon (Danish et al., 2019). Evaporation dominates over precipitation during the summer/drier seasons of the lagoon. In recent years, the position of the sea mouth has continuously shifted towards the northeastern direction, and the sand bar of the barrier spit is widening (Sahu et al., 2014). Additionally, the water and sediment influx into the lagoon has an interrelation with ISM precipitation and intensity, making the lagoon important for studying modern and past monsoon dynamics and patterns over central India (Rath et al., 2026). The origin and geographical setting of the lagoon make a perfect scenario to study the modern ecological conditions along the salinity gradient and to assess paleoecology and paleomonsoon over the

Mahanadi basin. Recently, Rath et al. (2026) have reviewed all the published core records from the Chilika lagoon, along with new records from the northern sector. Their study suggests that ISM was overall strong during the Roman Warm Period and Medieval Climate Anomaly, and weak during the Dark Age Cold Period and Little Ice Age. However, heterogeneity is observed across the various ISM proxies. Nearly six core records are published from the Chilika lagoon covering the last 13.5 kyr. Based on the hydrodynamics and sedimentation pattern and rate, the lagoon is divided into Northern sector (NS) near the river mouth, Outer Channel (OC) near the sea-mouth regions, Central Sector (CS) in between NS and OC, and Southern Sector (SS), relatively isolated.

Regional Geology, including Quaternary Geology

Chilika lagoon is surrounded by Quaternary alluvium along with the Precambrian Eastern Ghat rocks comprising granites, khondalites, gneisses, migmatitic charnockite-leptynite complexes, anorthosites, and ultrabasic rocks (Bastia and Equeenuddin, 2016; Panigrahy and Raymahashay, 2005; Sarkar et al., 1981). The anorthosites outcrop near the western catchment of the Chilika lagoon (Banpur-Balugaon) have high $\text{CaO}/\text{Na}_2\text{O}$, $\text{Na}_2\text{O}/\text{K}_2\text{O}$, and Sr/Ba ratios (Sarkar et al., 1981), indicating their formation through magmatic differentiation. The downstream of the river Mahanadi around the Chilika lagoon shows laterite and deltaic river alluvium deposits (Bastia and Equeenuddin, 2016). The catchment area of the river Mahanadi comprises various mines (coal and metals), agricultural fields, domestic farms, and a few industries, which contribute heavy and trace elements into the lagoon. The other anthropogenic activities, like fishing and tourism, also contribute heavy elements within the lagoon (Barik et al., 2022; Kumar et al., 2024). All these activities together impact the geochemical signature in the sediment of the lagoon. The significant seasonal changes in water characteristics modulate the element concentrations in the lagoon sediments (Barik et al., 2020).

There are various distributary channels of the river Mahanadi are drained into the Chilika lagoon. Various paleochannels of the river Mahanadi, like the river Ratnachira, also drained into the Chilika lagoon during the Meghalayan age (Mahalik, 2006). The distributary channels of the river Mahanadi carried a huge amount of sediment and fresh water during the high precipitation period into the Chilika lagoon and formed a huge delta (Barik et al., 2019).

A comparison of published chronologies from different sectors of the Chilika lagoon reveals differences in sediment accumulation rate. The NS covers ~3500 cal yr BP (Rath et al., 2026), and the western part of the NS covers an age of ~4200 cal yr BP (Pandey et al., 2014). The western CS covers ~7800 cal yr BP (Dash et al., 2022), while the CS has a record of ~13500

cal yr BP (Khandelwal et al., 2008). Two cores from SS cover ~8490 cal yr BP and ~10500 cal yr BP, (Ahmad Shah et al., 2022; Amir et al., 2021), while OC covers ~200 cal yr BP (Rath et al., 2025). Sedimentation rate across the lagoon highlights these temporal and spatial variabilities, with the highest rate recorded in the NS and OC (Rath et al., 2025, 2026) and the lowest in the SS (Ahmad Shah et al., 2022; Amir et al., 2021). This contrast is also observed in the weathering-intensity proxies and terrigenous-input indicators like Al/Na , Al/Ca , and Al_2O_3 content, which is much higher in SS in comparison to the NS, whereas silt content is higher.

Flora, Fauna, Climate and weather conditions

The Chilika lagoon supports a wide range of flora and fauna due to the presence of freshwater, brackish and marine water ecology at the different parts of the lagoon. The major flora comprises diverse aquatic and marine plants, phytoplankton (399+ species) and algae. Many key seagrass species are found in the lagoon, which include *Halodule uninervis*, *Cymodocea rotundata*, and *Syringodium isoetifolium* (Acharyya et al., 2023a). Various vascular plants are also reported from the lagoon. The island and shoreline feature a range of mangroves, including *Avicennia officinalis*, *Rhizophora apiculata*, and *Sonneratia apetala* (Samal et al., 2023). The lagoon also comprises various exotic species, including Irrawaddy dolphin (*Orcaella brevirostris*). The lagoon ecology also supports the Dugong, Green Sea Turtle, and the rare limbless skink (*Barkudia insularis*). The marine and aquatic life of the lagoon includes over 267 fish species, 28 prawn species, and 34 crab species (like *Scylla serrata*; Archaryya et al., 2023b). During the winter, the lagoon attracts various migratory birds. The Nalabana island within the lagoon is declared as a bird sanctuary and hosts the majority of these migratory birds on the 16 sq. km island. Most of the migratory birds visit during the winter, and the lagoon hosts over 1 million birds, with the majority of them being Flamingos, White-bellied Sea Eagles, Brahminy Ducks, Pintails, Bar-headed Geese, and Spoonbills. The Nalabana bird sanctuary is the core breeding and resting site for the migratory birds, and several tourists visit the Chilika lagoon to view these birds.

The region does not have much cold during the end of January and early February. The temperature is generally pleasant and ranges between 14 and 28 oC. Generally, there used to be no rainfall during the period of the field excursion.



Literature Review

Chilika lagoon may have formed through coastal submergence, followed by coastal emergence (Venkatarathnam, 1970). All coasts undergo submergence during the interglacial period, and subsequent emergence with sea level fall, and acquire the present-day conditions (Shepard, 1937; Yamano et al., 2019). Chilika has shorelines of emergence reflected from the straightness of the coast and the presence of offshore bars (Johnson, 1919). According to historical evidence, Chilika was a part of the Bay of Bengal (BoB) about 6000 years back, and commercial boats were sailing to Indonesia and Cambodia (Ghosh, 2003). The deposition of sediments by the littoral drift of the sea initiated the barrier spit formation (Venkatarathnam, 1970), which separated the lake from the BoB and helped its development.



The seasonal and spatial variabilities in the lagoon sediment, elemental parameters and ecology, along with the salinity gradient, were studied by Barik et al. (2019, 2020, 2022). A comparison of published chronologies from different sectors of the Chilika lagoon reveals differences in sediment accumulation rate. Various studies suggest an average sediment accumulation rate of ~3.5 mm/yr in OC (Rath et al., 2025), NS records ~0.3 mm/yr except for the last few decades (Rath et al., 2026). Intermediate rates of sedimentation characterise CS, and consistently the lowest and most stable sedimentation rate, ranging from ~0.04 mm/yr in the SS (Amir et al., 2021; Ahmed Shah et al., 2022). These contrasts reflect the influence of hydrodynamics within the lagoon system, which influenced the rate of sedimentation. Collectively, fluvial discharge, hydrodynamics, monsoonal variability, and basin morphology exert a primary control on sediment accumulation and chronological resolution within the Chilika lagoon.

The geography and geometry of barrier spit and mouth have changed periodically over the years due to huge sediment influx from the fluvial discharge of the catchment and sediment deposition near sea mouth influencing the lagoon hydrology to a great extent and affecting the lagoon salinity regime and ecosystem (Ghosh et al., 2006; Gopikrishna et al., 2014; Pradhan et al., 2017; Sahu et al., 2014). Hence, the lagoon is the perfect natural setting to assess the ISM dynamics, ecological variability and its influence on biota, and variability in sedimentation pattern during the Holocene.

The outstanding issues still persist regarding how coastal lagoons respond to the agricultural and industrial disturbances, along with the natural or human-made hydrological modifications, and the probable impact on the biodiversity of seasonal changing ecosystems. There are limited studies dealing with the seasonal changes in ecological processes and their impact on biodiversity, and the role of elements sinking in the lagoon. Barik et al. (2019) reported a significant improvement in the biodiversity of the Chilika lagoon after the opening of the artificial sea mouth; however, as the mouth width, depth and position change frequently, their impact is not regularly monitored. Further, the long sediment core study from the Chilika lagoon is not yet available, which may provide the detailed scientific evidence of its formation and the role of ISM variability and sea-level changes.



Field Transect

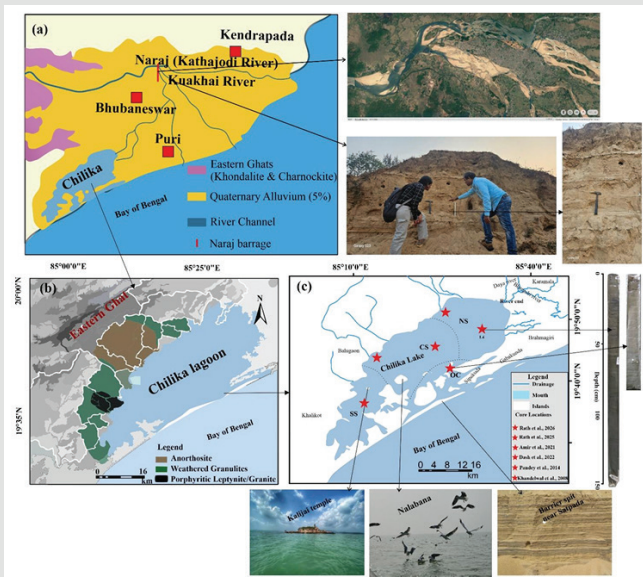


Figure 1. (a) Regional Geological map of the Mahanadi basin (b) Rock exposed near the Chilika lagoon (Source: Dash et al., 2022); (c) Sediment core studies from the Chilika lagoon (Source: Rath et al., 2026)

Number of days – 5 days

1st Day – Visit to Naraj, Cuttack, to visualise the Mahanadi deltaic plain and formation of various distributaries to understand river geomorphology. This will be followed by traversing along the distributaries of the river Mahanadi (Kuakhai) to observe riverine deposits and sedimentary structure. Evening, an important tourist place like Dhauli– Mode: Car/Taxi; Stay in Bhubaneswar.

Tentative travel time: (i) Bhubaneswar to Naraj (Site 1) ~40 Km (60-90 mins), (ii) Site 1 to Kuakhai riverine deposit (Site 2) (~45 Km, 120 mins), (iii) Site 2 to Dhauli (Site 3) – ~ 18 km (45 min).

Tentative time spent at each site: Site 1- ~40 min; Site 2; ~60 min; Site 3: 60-90 min.

2nd Day – Visit to Tapang (EGMB rock exposure), Kalijai island within the Chilika lagoon, having highly weathered khondalite. Exotic bird viewing at Nalaban island, sample collection/measurement in the Central Sector of Chilika lagoon – Mode: Boat; Stay in Balugaon or Barkul.

Tentative travel time: (i) Bhubaneswar to Tapang (Site 1) ~45 Km (1 hrs), (ii) Site 1 to Chilika lagoon (Site 2) (~60 Km, 1.5 hrs), Board on boat and visit to Nalban Island (3-3.5 hrs); While on boat sampling, view khondalite exposure and Bird watching.

Tentative time spent at each site: Site 1- ~40 min; On Boat; ~180 – 210 min.

3rd Day – Chilika, Development Authority (CDA) Lab visit, Water and sediment collection from central and northern sector of the Chilika lagoon, visualization of 150 cm sedimentary record; fieldwork along barrier spit and Dolphin viewing, – Mode: Boat; Stay in Puri Tentative travel time and time spent: On boat 240-260 hrs (sampling, coring, etc.); CDA Lab – 60 min; Barrier spit – ~20-30 min; Dolphin view on route from boat.

4th Day – Visit to historic Puri and Konark, Visit to Blue flag beach, observe coastal berms; Observe sedimentation along the coast and influence of cyclones on sedimentary deposits; fieldwork along the river Bhargabi and return to Bhubaneswar– Mode: Car/Taxi; Stay in Bhubaneswar.

Tentative travel time and time spent: Puri to Konark (45 km) 240 min; On the way Blue flag beach (30 min); Fieldwork along Bhargabi river (30 min); Coastal sediment deposits (40 min); Konark (60-90 min); Konark to Bhubaneswar (70 km) 120 min.

5th Day – Departure from Bhubaneswar.

(Travel time and time spent at each site and activity are tentative; exact time and route will be communicated to the participants before the Fieldwork)

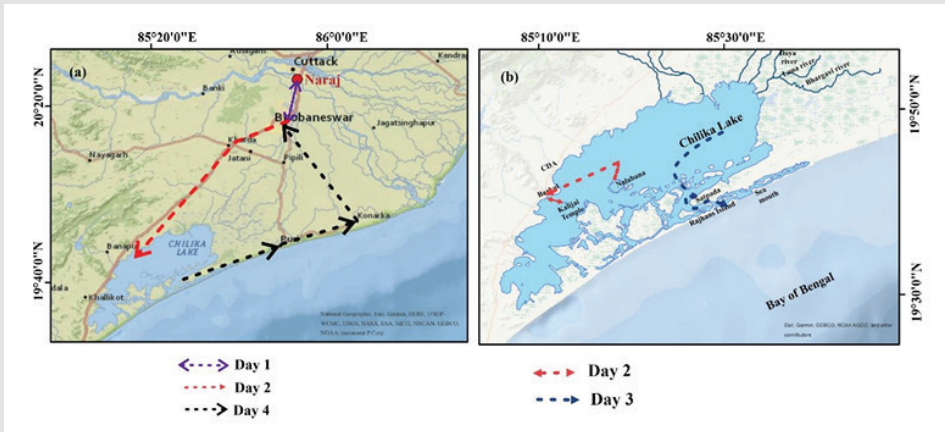


Figure 2. Day-wise road map for the field trip.

Location(s) description

Day 1

Naraj: Naraj is located near Cuttack on the east coast of Odisha ($20^{\circ}27'33''\text{N}$, $85^{\circ}46'46''\text{E}$). The Mahanadi River forms a delta with the delta head at Naraj, from where the river Mahanadi comes out from the confined state (within the Precambrian and the Gondwana rocks) to an unconfined state (Quaternary alluvial deposits). Here, the river Mahanadi splits into several branches, like Kathajodi, Birupa, Kuakhai, Devi, and Surua, of which the Kathajodi is more significant. The geology of Naraj is primarily defined by the Athgarh Formation, having gritty sandstone (Upper Gondwana) and a capping of around 3–5m thick laterite, formed on the ironstone. Naraj barrage is critical for monitoring eastward sediment transport (roughly 200–400 MT/km annually) and managing the downstream siltation. This point is also known for its natural beauty, scenic sunsets, cultural heritage and rich biodiversity. Its natural beauty increases manifold during the bank-full river flow in the monsoon period. The ancient **Sidheswar Shiva Temple** and the remnants of historic Buddhist culture found at the delta head are the principal tourist attractions. The Peacock Valley near the delta-head is known for its natural biodiversity and frequent peacock sightings.

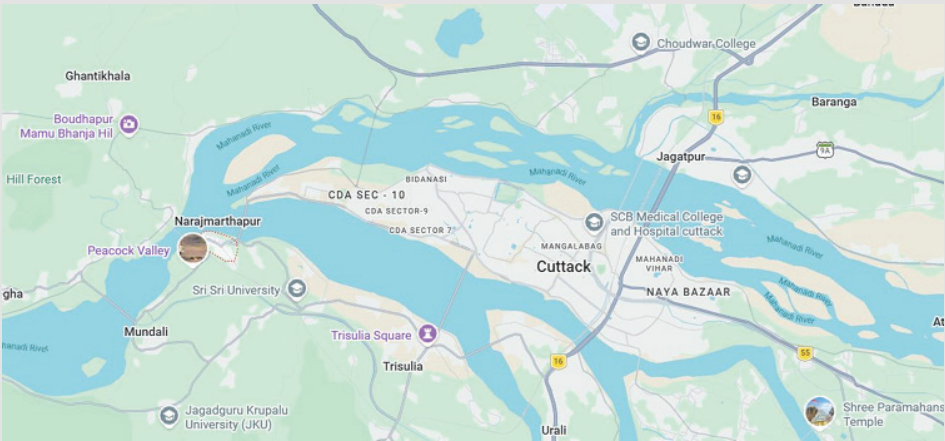


Figure 3. Google map view of distributaries from the Naraj.

Kuakhai River Section: The Kuakhai River section presents an excellent site for Quaternary alluvium deposit and river migration. Around 5 m thick section shows well developed trough cross bedding representing the channel flow and the cross-cutting trough sets indicating the ripple migration. Sharp horizontal lines between sets are truncation surfaces. They show where later currents scoured away previous deposits before laying down new ones. The intermittent mud layers represent temporal flooding-related siltation.



Figure 3. Google map view of distributaries from the Naraj.

Dhauri: Dhauri, also known as Dhaurigiri, is located 8 km south of Bhubaneswar city on the Daya River bank. This historic site is where the battle of Kalinga (Kalinga War) took place in 261 B.C., leading Emperor Ashoka to convert to Buddhism and embrace non-violence. The Ashokan rock edicts are well preserved by the Archaeological Survey of India on the Khondalite rocks. It is a 3rd-century Buddhist pilgrimage site renowned for the dome-shaped Vishwa Shanti Stupa (Peace Pagoda) built in 1972 with Japanese collaboration.

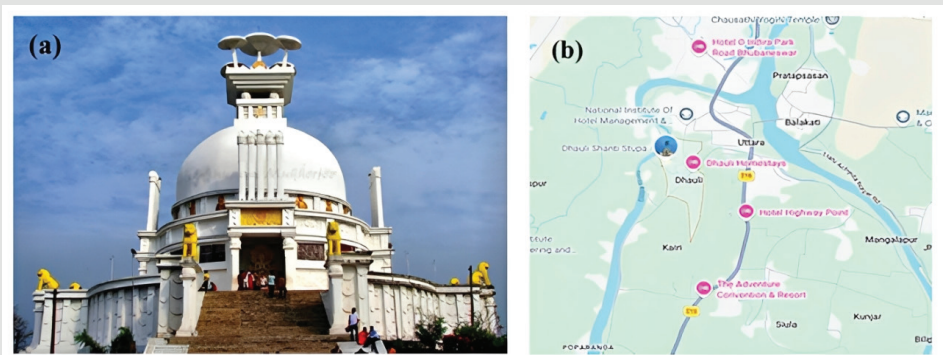


Figure 4. (a) Buddha stupa at Dhauri (www.dhauri.net.in) (b) Google map showing Dhauri along the distributary of the river Mahanadi.

Day 2

Tapang: Tapang is located on the way to Chilika lagoon and consists of Eastern Ghats Mobile Belt (EGMB) rocks, characterised by charnockite and khondalite. These rocks are a sediment source in the western and southern boundary of the Chilika lagoon.



Figure 6. Rock exposed at Tapanag, Khordha.

Indraprasth Island and the exposed Khandagiri rocks: Indraprasth Island is situated in the Central Sector of the Chilika lagoon, having an intermediate rate of sedimentation. Nalabana Bird Sanctuary lies on this island, which is the home of various exotic migratory birds. On the way, we will measure the water parameter and collect lagoon floor sediment using the grab sampler and the sediment core and characterise the same based on the visual lithologs and will discuss the sedimentation pattern. The participants will be informed about the various proxies' responses from this sector based on existing and published records.



Figure 7. Weathered khondalite exposure in the Kaljai island of the Chilika lagoon.

Day 3

Chilika Development Authority: Chilika Development Authority (CDA) has been created with an objective for conservation of the ecology of Chilika lagoon and to bring an all-round development in and around the lagoon. Wetland Research and Training Centre (WRTC) is one of the research centres within the CDA and maintains the ecological diversity museum. We will assess the biodiversity and start fieldwork in the northern sector (NS) of the Chilika lagoon, which has the highest rate of sedimentation and is relatively fresh. We will measure the water parameter and collect the sediment core and characterise the same based on the visual lithology, and will discuss the sedimentation pattern. The participants will be informed about the various proxies' responses from this sector based on existing and published records and their limitations.

Chilika lagoon barrier spit: Chilika Lake is the largest brackish water lagoon in Asia. It is separated from the Bay of Bengal by a 60–65 km long, 500 m to 1 km wide sandy barrier spit (barrier beach), stretching from the mouth of the Rushikulya River in the south to the outer channel in the northeast. This dynamic, sandy barrier restricts the lagoon from direct marine influence and keeps the lagoonal ecosystem unique. It is highly dynamic, frequently shifting, breaching, and reforming, particularly in the northeast, where the inlet connects to the sea. The barrier is essential to the lagoon's existence, regulating its salinity, protecting its unique ecosystem of fish, dolphins, and migratory birds, and providing a livelihood for local fishing communities. It will also be informed about the suitability of the proxies for the ISM, ecology and paleoenvironment reconstruction, as well as to assess the anthropogenic disturbances.



Figure 8. (a) View of the Sandy barrier spit (b) Section within the Sandy barrier spit.

Although the published age of the barrier spit indicates a very recent age, the thickness and the degree of consolidation do not seem to match the published dates. Therefore, OSL samples have been collected from the bottom, middle and top parts of the barrier spit to determine its formation age. Previous experience suggests that the presence of heavy minerals incorporates errors in the OSL ages.

Day 4

Puri Beach: A visit to 'Blue flag' Puri beach is planned to show the coastal berms, which shifted over time and provide a holistic view of Coastal Geomorphology.

River Bhargabi Section: The river Bhargabi section is an estuarine deposit on the way to Konark. We will evaluate the estuarine deposits of the Holocene along the bank of river Bhargabi.



Figure 9. (a) Google map view of Puri beach showing coastal berms (b) vertical section on the bank of the river Bhargabi, a distributary of the river Mahanadi.

Konark: In the Konark near the Chandrabhaga beach, a trench will be dug to study the cyclogenesis deposits. In trenches, sediment variability will be identified, which may be associated with the extreme cyclone period in the region. In addition, the world heritage site 'Konark Sun Temple' will also be visited.



UNESCO and Geoheritage, archaeological sites in the vicinity, cuisines, and culture

There are several UNESCO and archaeological sites located in the vicinity of the Chilika lagoon and near Bhubaneswar city.

The important Geoheritage and Geological Sites include Tapang Region (Khordha), on the way to Chilika lagoon from Bhubaneswar, known for unique geological formations like





aluminous granulites, lyptinites and sapphirine-bearing gneisses. It is a key site to study the Precambrian metamorphic history of the Eastern Ghat Mobile Belt (EGMB; Mohapatra, 2022). The occurrences of extensive red laterite rock formations are common in areas formed by intense chemical weathering. Local villagers use the laterite blocks to build their houses. Laterite block mining is very common in the region. One of the important distributaries of the river Mahanadi, River Daya, which debouches into the Chilika lagoon, has yielded palaeolithic artefacts, indicating human activity during the Pleistocene and early farming culture. The archaeological materials are also recovered from the Chilika lagoon, suggesting it was used for navigation in the past (Tripathi and Vora, 2005).

A UNESCO World Heritage Site located in the vicinity and on our route is the Sun Temple, Konark (Puri), which was declared a World Heritage Site in 1984. This 13th century monument is an architectural marvel designed as a chariot for the Sun God. The Chilika lagoon itself is listed as a tentative UNESCO site for its immense biodiversity.

The Odisha region has several archaeological sites and several ancient temples in addition to old forts. The most prominent among all the Puri Sri Jagannath Temple, which is known for the annual chariot festival. Recent excavations have identified 43 potential buried sites, including ancient walls and pottery near the Jagannath Temple. The Lingaraj temple, dedicated to lord Shiva and several other 10th and 11th century temples or their relics are found in and around Puri and Khordha districts. Some of the important forts found in the vicinity are from the 3rd century BCE, Sisupalgarh and the ruins of Khordha fort. A significant Neolithic-Chalcolithic site indicating early farming is found in the Golbai Sasan, while inscriptions of the Ashoka period are found at Dhauli near Bhubaneswar. In the south of Bhubaneswar city, the Udayagiri and Khandagiri caves are located, which were carved out during the 1st century BCE as a residential complex for Jain monks by the Kharavela kings. Archaeological explorations and excavations around Chilika lagoon suggest habitational remains of the Neolithic-Chalcolithic period onwards, dated to the 3rd millennium BC. Well-known ports of the bygone era, such as Manikapatna on the Chilika coast, Palur on the extreme south and Che li-ta-lo had close contacts with Africa, Ceylon, China, and Southeast Asian countries (Tripathi and Vora, 2005).

The cuisine of Odisha (Odia cuisine) is defined by its subtle, non-oily, and mildly spiced flavours. Centred around a staple of rice, it heavily features indigenous vegetables, fresh seafood, and lentils, with distinct influences from tribal traditions and the sacred Mahaprasad of the Jagannath Temple in Puri. Signature Dishes are Pakhala Bhata: fermented cooked rice soaked in water; Dalma: stew combining yellow lentils, local vegetables (like pumpkin, papaya, and plantain); Machha Tarkari: A classic freshwater fish curry (using rohu or catla) prepared in mustard oil; Santula: A lightly sautéed or boiled mixed vegetable dish; Chhena Poda: slow-baked fresh cottage cheese (chhena), sugar, and cashews.

The culture of Odisha is vibrant and deeply centred on the worship of Lord Jagannath. State heritage is globally renowned for its classical Odissi dance, intricate temple architecture, indigenous tribal art, and rich handloom fabrics. A detailed and intricate traditional cloth-based scroll painting, Silver Filigree (Tarakasi), hand-woven tie-dyed sarees, and Sambalpuri, Bomkai, and Ikat fabrics are also part of Odisha culture.

Local Conveniences

Bhubaneswar is the capital of Odisha state and has good hospital facilities. The place of stay has local hospitals for minor treatment. Please contact the organizers in case of a stolen

passport, who will help in reporting the same to the local police station. There are several shops in the field area from where visitors can buy the local traditional items.



Conclusion

The planned fieldwork will expose the participants to visualise the river geomorphology in the deltaic setting, coastal geomorphology and estuarine deposit and most important deposits in the lagoonal setting. Within the lagoonal setting, participants may experience the variations in ecology and its influence, and sedimentation pattern and its influences and will be informed about the suitability of the different proxies for the ISM, ecology and paleoenvironment reconstruction, as well as to assess the anthropogenic disturbances and impact of sea-mouth shifting. The participants will also experience the influences of EGMB rock, Quaternary alluvium and laterite on the lagoon environment. The sandy bar between the Chilika lagoon and the Bay of Bengal, and the formation of many small islands within the lagoon, will suggest the importance of sedimentation rate and water level in the lagoon. Most importantly, the participants will experience diverse flora and fauna, culture and archaeological heritage, along with understanding the Indian Summer Monsoon, cyclones, and Holocene deposits. A schematic representation of the same is shown in Figure 10.

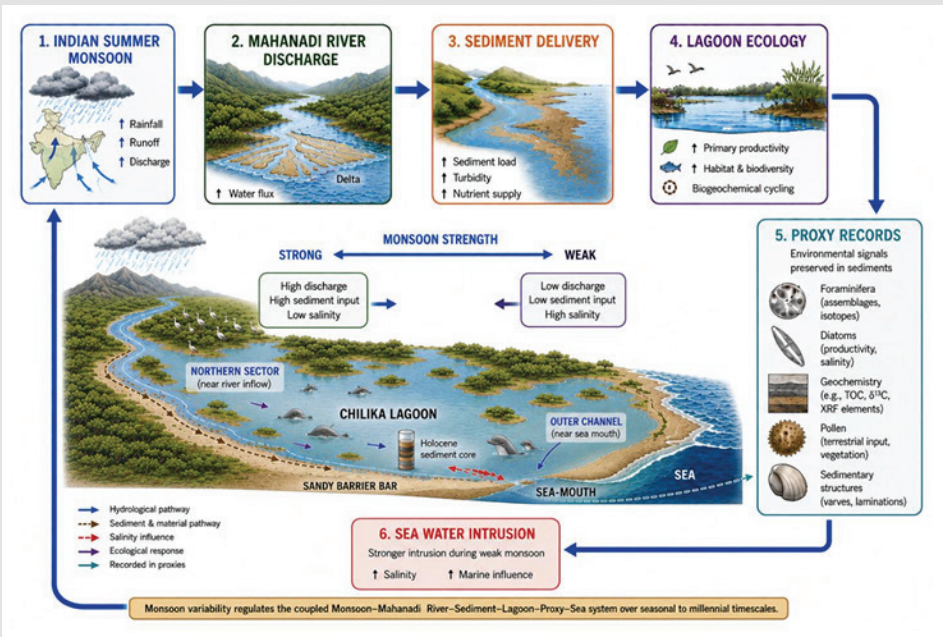


Fig. 10 A schematic showing concise conceptual Indian Summer Monsoon, River Mahanadi discharge, Sediment delivery, Lagoon ecology, Proxy records, and influence of sea. The schematic is AI-generated using ChatGPT.

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Annexure

Field Excursion Guidelines: Do's and Don'ts

To ensure the safety of all participants and to promote responsible scientific field practices, all participants are requested to adhere to the following guidelines throughout the field excursions.

Keep a valid passport (for international participants) or a government-issued photo ID (for Indian participants) with you at all times during the field excursion.

Do's	Don'ts
1. Follow the instructions of the excursion leaders, coordinators, and local authorities at all times. 2. Remain with the group and inform the excursion leader before leaving the designated route. 3. Wear appropriate field attire, including sturdy closed-toe footwear, full-length trousers, a hat or cap, and weather-appropriate clothing. 4. Carry sufficient drinking water, personal medications, sunscreen, insect repellent, and other essential field supplies.	1. Do not collect rocks, fossils, archaeological artefacts, biological specimens, or any other materials without prior authorization. 2. Do not damage, deface, or remove material from geological outcrops, caves, monuments, heritage structures, or other natural features. 3. Do not wander alone or separate from the excursion group without informing the field leaders. 4. Do not climb unstable slopes, cliffs, rock formations, or enter hazardous areas unless specifically instructed or supervised.





5. Keep a valid photo identification and your excursion registration details with you during travel.
6. Respect local customs, religious sites, cultural heritage, and private property.
7. Follow the Leave No Trace principles by carrying back all waste and helping to keep field sites clean.
8. Use designated trails and approved observation areas to minimise environmental disturbance.
9. Observe geological, ecological, archaeological, and cultural features carefully without causing any damage.
10. Record field observations systematically and collect samples only with prior permission from the excursion leaders and the relevant authorities.
11. Exercise caution near cliffs, riverbanks, caves, unstable slopes, road cuts, and other potentially hazardous terrain.
12. Respect wildlife by maintaining a safe distance from animals, birds, reptiles, insects, and their habitats.
13. Immediately report any illness, injury, emergency, or hazardous situation to the excursion organizers.
14. Be prepared for changing weather conditions and comply with all safety advisories issued by the excursion leaders.

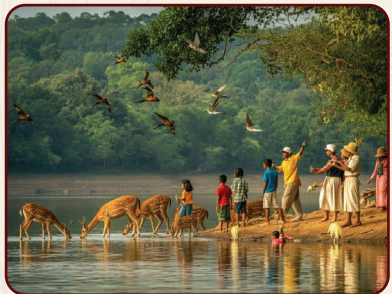
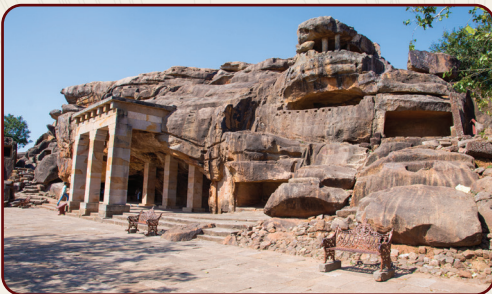
5. Do not swim or enter rivers, lakes, lagoons, or coastal waters unless expressly authorized by the excursion leaders.
6. Do not consume alcohol, recreational drugs, or engage in unsafe or irresponsible behaviour during the excursion.
7. Do not operate drones or other restricted equipment without obtaining the necessary permissions.
8. Do not photograph restricted installations, sensitive locations, or local residents without prior permission.
9. Do not create excessive noise or disturb local communities, religious activities, wildlife, or natural habitats.
10. Do not leave valuables unattended or rely solely on mobile phone connectivity in remote areas.
11. Do not undertake any activity that may compromise your safety, the safety of fellow participants, or the conservation of the area's geological, ecological, archaeological, or cultural heritage.



Disclaimer

Participation in the field excursions is entirely at the participant's own risk. While the Organising Committee and excursion leaders will make every reasonable effort to ensure participant safety and provide appropriate guidance, they shall not be held responsible for any personal injury, illness, loss of personal belongings, property damage, delays, or unforeseen incidents arising during travel or field activities. Participants are expected to act responsibly, follow all instructions issued by the excursion leaders, and comply with applicable local laws and regulations throughout the excursion.







Scan for
Field Guide Book



Contact Details:

INQUA Secretariat

Birbal Sahni Institute of Palaeosciences (BSIP),
53, University Road, Lucknow-226 007 U.P, India

Email: inqua.india@gmail.com | inqua.india@bsip.res.in

Phone: +916386696896 | +916392507990