




Call for Project Proposals

Under


Coastal Monitoring (CM)
2019-2024 (FY)

Online Project Proposal Application

File Number : INCOIS/CM/2019/0116

S.No	Particulars			
1.	Title of the Project: ENVIRONMENTAL FORCING ON JELLYFISH POPULATION IN COASTAL WATERS OFF RUSHIKULYA ESTUARY, EAST COAST OF INDIA			
2.	Name, Designation and Corresponding Address of the Project Principal Investigator (PI) (Include Phone, FAX, and Email):			
	Name of Principal Investigator:	KAMAL KUMAR BARIK		
	Designation:	Assistant Professor		
	Corresponding Address:	Centurion University of Technology and Management, At: Ramchandrapur, P.O.: Jatni, Dist: Khurda, Pincode: 752050, Odisha, India		
	E-mail:	kamalkumar@gmail.com	Phone Number:	06742492495
	Mobile Number:	943947777	Fax:	06742490480
3.	Name, Designation and Corresponding Address of Co - PI (s) (Include Phone, FAX, and Email) -NA-			
4.	Name and Address of the Institution where work is proposed to be undertaken: Centurion University of Technology and Management, At: Ramchandrapur, P.O.: Jatni, Dist: Khurda, Pincode: 752050, Odisha, India			
5.	Details of completed and ongoing research project(s) by PI during the last five years : -NA-			
6.	Selected Theme : <ul style="list-style-type: none"> In situ time-series observations 			
7.	Research Background of the PI in the relevant area (also provide brief CV along with list of relevant publications): 			
8.	Research Background of the Co-PI in the relevant area (also provide brief CV along with list of relevant publications): No Other Documents Available			
9.	<p>Background</p> <p>Jellyfish constitute an important group of marine animals widely distributed in coastal and offshore water. Jellyfish represent short-lived plankton phase of some invertebrates and also occur as holoplankton. Some species of the jellyfish forms dense aggregations upon prevalence of favorable environmental conditions. Jellyfish growth and reproduction rate varies extensively with changes in the environmental conditions. The characteristics life process make jellyfish suitable for highly dynamic environment as they can survive in extremely adverse circumstances and can quickly multiply upon setting up of favorable conditions. Jellyfish in higher abundances play a major role in nutrient budgets of the ecosystem. Decomposed material from of jellyfish bloom sink quickly to ocean bottom and effects deep sea species distribution mechanisms. Jellyfishes disturbs the marine ecosystem and socio-economic aspects of coastal regions when prevails in large patches. Jellyfish predate on zooplankton, hence, competes with fish for zooplankton food material and results in fish population decline. The dense patches of jellyfish hinders in fishing operation by chocking the fishing nets. The predominance of jellyfish over fish may also be detrimental for food chain as jellyfish also predate on fish eggs, larvae and juveniles resulting population decline. The jellyfish swarming in coastal waters and beach stranding exerts adverse effect on human enterprise by affecting the tourism, recreational activities, and human health through toxic stinging. Ingress of large quantities of jellyfish in to seawater based cooling systems of coastal power plants and desalination industries clog the intake screens resulting temporary shutdowns. Jellyfish preponderance also put adverse effect on the coastal water finfish aquaculture systems through toxic stinging, metabolic distress and mass mortality resulting growth retard.</p> <p>Despite multitude impact of jellyfish swarming events on the coastal and deep-sea ecosystems as well as on the socio-economic aspects, less number of scientific studies have reported such events. In context of peninsular Indian seas and coastal regions, the jellyfish blooms as well as beach stranding events have been reported sporadically from both west (eastern Arabian Sea) and east (western bay of Bengal) coast. The jellyfish aggregations and consequent environmental deterioration in India's coastal waters are evident from several local print and electronic media reports. In spite of that jellyfishes are fairly less scientifically investigated and monitored faunal community in Indian coastal waters.</p> <p>Therefore, the present investigation is proposed in coastal waters off Rushikulya estuary, one of the frequently reported jellyfish swarming sites along east coast of India to report swarming events with consequences and to discern conducive environmental factors for possible remote monitoring.</p>			
10.	Scientific Rationale			

The jellyfish swarming and patchy aggregations events are in rise in global seas attributed to overfishing, eutrophication, climate change, translocation and habitat modification. The jellyfish bloom often results in water quality deterioration, trophic malfunction, and socio-economic loss. Although consequences of jellyfish bloom events are detrimental for the environment, a very less number of scientific studies have been carried out on this gelatinous animal group in comparison to other marine biota. In order to decipher the conducive conditions for jellyfish swarming and to monitor the bloom dynamics, it's imperative to understand the physico-chemical-biological parameters that control their growth, reproduction rate and aggregation mechanism. In a broader scale, the warming of oceans is inducing higher birth rates of jellyfish resulting higher abundance. Eutrophication, higher turbidity and lower dissolved oxygen concentration in the aquatic milieu sets conducive environment for jellyfish leading to patchy aggregation and swarms. Jellyfish swims well, prefers to remain in the surface waters and depend on the surface currents for advection. Hence, jellyfish aggregates at transport barriers due to the alongshore currents. Jellyfishes also concentrates in the nearshore waters associated with onshore wind bursts. The oceanic physical processes such as tidal fronts and small linear surface convergences during Langmuir circulation also accumulates jellyfish. In addition, divergent ocean fronts disperse jellyfish aggregations while convergent flow accumulates jellyfish assemblages. Jellyfishes contain fluid of same ionic concentration of surrounding seawater, and hence, these gelatinous animals exhibit tendency to remain in isohalines forming localized accumulation. In concomitant, low salinity, freshwater pulse attributed to river discharge also results in reduction in jellyfish aggregation. Local re-distribution or re-dispersion in concentration of a stable jellyfish assemblage also results in aggregation. The onshore jellyfish swarming or stranding events can also be offshore expatriates. Therefore, it's very important to discern the environmental forcing on jellyfish in order to study the factors responsible for swarming and to develop monitoring strategies.

Proposed study area and its significance :  Proposed map of study area

11. The study area forms a complex ecosystem attributed to influx from Rushikulya estuary, terrigenous discharge, coastal upwelling, anthropogenic discharge, sea-port activities, recurring phytoplankton blooms and episodic mass nesting of Olive Ridley sea turtles. Formation of two local water types, with variable environmental parameters, on either side of 30 m isobath, forms a distinct environmental characteristics of the study area. Annual precipitation magnitude is largely governed by tropical southwest monsoon, which brings adequate rainfall during July-October. The tropical cyclones during the post-monsoon period also result in heavy precipitation. The seasonally reversing East India Coastal Current, driven by the monsoonal winds is a major driver for mass transport in the study area. The planktonic ecology in the coastal waters exhibits seasonality mainly due to variability in concentration of inorganic macronutrients, especially silicate and nitrate. The variability in phytoplankton biomass evidenced with bimodal annual distribution with primary peak during the pre-monsoon while secondary peak during post-monsoon. The recurrence of pre-monsoon phytoplankton blooms affecting the ambient water quality is one of the important environmental phenomenon. The study area have been frequently observed with jellyfish beach stranding events as well as swarming in the estuary and coastal waters. Jellyfishes have been observed with providing competitive advantage in proliferation of red tide forming heterotrophic dinoflagellate by consuming the grazers of their prey. Jellyfish serves as important food for the turtles and simultaneous prevalence of jellyfish during Olive Ridley residence period in the study area is an important ecological feature in attracting these turtles to this region. However, a comprehensive understanding on linkages of jellyfish to ambient physico-chemical-biological parameters and tropic cascade still stands incomplete.

Proposed Objectives:

12. Identification of physical-chemical-biological drivers controlling jellyfish distribution and swarming.

Sustenance of INCOIS time-series measurement of water quality parameters in coastal waters off Rushikulya estuary.


Relevance of proposal towards now-casting and forecasting water quality:

13. Continuous monitoring on jellyfish distribution and swarm events will aid in developing remote monitoring strategies.

Monthly monitoring of phytoplankton with report of bloom events will be helpful in validating and tuning INCOIS "Algal Bloom Service".

Sustained measurements of physico-chemical-biological variables will act as important information for water quality prediction.

Water quality parameters of the time-series location can be inter-compared with sensors mounted on moored buoys for future water quality prediction (if any planned by INCOIS)

Approaches / Methodologies to be followed (Provide flow-chart as an attachment) :  Flowchart

14. Field campaigns will be conducted at monthly scale at the time-series station in coastal waters off Rushikulya estuary. The sampling protocol specified by INCOIS will be strictly followed for sample collection, pre-treatment, preservation and analysis. In case of jellyfish outbreaks in coastal waters / beach stranding, the population densities and diversity will be quantified and catalogued, respectively. Important water quality parameters such as salinity, dissolved oxygen, and concentration of inorganic macronutrients (nitrite, nitrate, ammonium, phosphate, and silicate) will be measured to monitor the conducive conditions for jellyfish growth. In addition, plankton (phyto and zoo) diversity and distribution will be interlinked with ambient water quality to investigate the combined effect on jellyfish evolution and distribution. The study region experiences recurring algal blooms resulting surface water discolouration, hence, such events will be specifically monitored and investigated. Fishing, river discharge and habitat modifications in the coastal region influences jellyfish growth leading to outbreaks. Information on fish catch will be collected from the nearby landing centers. River discharge magnitude will be obtained from responsible authorities. Natural and anthropogenic habitats in the nearshore waters and estuary providing hard substrate for jellyfish polyp settlement and growth will be closely monitored. Apart from monthly field campaigns, regular interaction will be carried out with the daily sea venturing fishermen to monitor the occurrences of jellyfish aggregation in coastal water and capture in fishing nets. Wind (direction and speed), sea surface current (direction and speed) and sea surface temperature magnitude will be retrieved/obtained from satellite, coastal radars and automatic weather stations to monitor the physical environment in relation to algal bloom and jellyfish aggregation.

15. **Annual Activity Schedule**

S.No	Annual years	Annual Activity
1	2019-2020	Recruitment of project personnel. Instrument calibration and methodology standardization. Set up of sampling plan and experimental design. Execution of field sampling, sample analysis and data interpretation. Monthly and annual report preparation and submission to INCOIS. Annual project progress presentation during yearly review meeting at INCOIS.




2	2020-2021	Execution of field sampling, sample analysis and data interpretation. Identification of environmental drivers triggering jellyfish growth and aggregation. Monthly and annual report preparation and submission to INCOIS. Annual project progress presentation during yearly review meeting at INCOIS.
3	2021-2022	Execution of field sampling, sample analysis and data interpretation. Evaluation of jellyfish aggregation monitoring advisory. Research outcome presentation in workshop/conference. Monthly and annual report preparation and submission to INCOIS. Preparation of scientific manuscripts for communication to SCI journals. Annual project progress presentation during yearly review meeting at INCOIS.
4	2022-2023	Execution of field sampling, sample analysis and data interpretation. Validation of jellyfish aggregation monitoring advisory. Research outcome presentation in workshop/conference. Preparation of scientific manuscripts for communication to SCI journals. Monthly and annual report preparation and submission to INCOIS. Annual project progress presentation during yearly review meeting at INCOIS.
5	2023-2024	Execution of field sampling, sample analysis and data interpretation. Operational jellyfish aggregation monitoring advisory. Research outcome presentation in workshop/conference. Preparation of scientific manuscripts for communication to SCI journals. Monthly and annual report preparation and submission to INCOIS. Preparation of final consolidated project report and submission to INCOIS. Annual project progress presentation during yearly review meeting at INCOIS.

Instruments available that will be used in the proposed project

Note: no instruments will be provided by INCOIS

S.No	Instrument	Make	Model	Serial Number
1	Spectrophotometer	Equitron	CL 1320	90273020
2	Compound microscope	Blisco	BLS 113	7154
3	Digital weighing balance	Aczet	CY224	9113680
4	Hot Air Oven	Equitron	7047T-091	AB.002786.A
5	BOD Incubator	Equitron	7142-091	AIB.002896.A
6	Research Centrifuge	Remi	REMI R-24	ZELN-40274
7	Microprocessor pH meter	AE Lab	RS232	254
8	Double Distillation Plant	Bhanu Scientific	EASY-STILL DDQ	MARK 2000
9	Thermo Reactor	Millipore	TR 320	18491558
10	DGPS	SOKKIA	GCX3	1387-10766

16.	<p>Short Term Deliverables (Annual):</p> <p>17. Monitoring report on jellyfish population, aggregation, swarming evolution and swarm dynamics. Database on physico-chemical variables at monthly frequency. Taxonomic inventory phytoplankton and zooplankton at monthly temporal scale.</p> <p>Long Term Deliverables (Entire Project Period):</p> <p>18. Environmental drivers controlling jellyfish distribution and swarming. Operational jellyfish aggregation monitoring advisory. Long-term sustained measurements of physico-chemical-biological parameters. Capacity building towards development of well trained researchers and technical personnel in the field of marine biogeochemistry.</p> <p>Expected Ph.D. from the project:</p> <p>19. The eligible meritorious students of the university and project personnel will be encouraged to register for doctoral degree using the dataset generated from the project.</p> <p>Expected Patent items, if any:</p> <p>20. Dependent on the specific research outcome.</p> <p>Internal Project monitoring mechanism:</p> <p>21. Weekly meeting involving project personnel for discussion on sampling strategy implementation, field observation, sample analysis and data interpretation. Quarterly progress of the project will be intimated to INCOIS subsequent to verification by university.</p> <p>Risk factors involved in delay / failure of the project and mitigation factors, if any:</p> <p>22. Adverse weather condition and extreme events.</p>
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23.	What operational product the project will deliver at the end of proposed time frame:							
	Remotely monitorable and moored sensor based proxies for monitoring of jellyfish swarm dynamics.							
Manpower Required								
	S.No	Manpower(Designation)	No. of Posts	Responsibilites	Fellowship	HRA	Total	
24.	1	Research Associate	1	Field campaign designing, execution and participation. Sample collection, field measurements and sample analysis. Database preparation and interpretation. Presentation of research finding in workshops/conference. Preparation of monthly, quarterly and annual progress reports. Publication of research outcome in peer-reviewed SCI journals.	54000	10800	64800	
	2	Technical Assistant	1	Participation in field campaigns, sampling gear operation and field measurements. Sample collection and assistance in sample analysis. Laboratory maintenance and calibration of instruments.	16000	3200	19200	
Budget Details (should be proposed with annual breakup for the entire duration of the project):								
	S.No	Budget Head	2019 - 2020 (INR)	2020 - 2021 (INR)	2021 - 2022 (INR)	2022 - 2023 (INR)	2023 - 2024 (INR)	Total
25.	1.	Manpower	504000.0	1008000.0	1008000.0	1008000.0	1008000.0	4536000
	2.	Domestic Travel Expenses (Including DA, TA)	162304.0	162304.0	162304.0	162304.0	162304.0	811520
	3.	Office Expenses (CONTINGENCY and consumables, boat hiring)	524800.0	595600.0	595600.0	595600.0	595600.0	2907200
		(A) Recurring	1191104.0	1765904.0	1765904.0	1765904.0	1765904.0	8254720
	4.	Software / Hardware (Limit maximum to 1.0 Lakh)	100000.0	100000.0	100000.0	100000.0	100000.0	500000
		(B) Non - Recurring	100000.0	100000.0	100000.0	100000.0	100000.0	500000
	5	(C) Over head charges (% of A above) - should be <= 15%	(15.0%) 178665.6	(15.0%) 264885.6	(15.0%) 264885.6	(15.0%) 264885.6	(15.0%) 264885.6	1238208
		Total (A+B+C)	1469769.6	2130789.5	2130789.5	2130789.5	2130789.5	9992928
Bank Details for Electronic transfer of funds (Standard ECS Mandate Form is to be submitted attested by Banker's before release of funds)								
26.	a. Name and Style of the Account: Centurion University of Technology and Management, BBSR b. Type of Account: Running c. Account Number: 36700033488 d. Bank Name: State Bank of India e. Bank Address: Jatni Branch, Sitaram Chhak, Jatni f. Bank Branch Code: 002071 g. IFSC Code: SBIN0002071							
Other Uploaded Documents :								
27.	i. Endorsement from the head of the institution  ii. Self Certification  iii. Information for agency creation in PFMS Portal 							

KAMAL KUMAR BARIK
(Principal Investigator)

Acknowledgment Receipt

Coastal Monitoring (CM)

Duration of the Project 2019-2024 (FY)

File Number: INCOIS/CM/2019/0116

Date of Submission 26-Aug-2019 04:51:39 PM

Title of Project :

ENVIRONMENTAL FORCING ON JELLYFISH POPULATION IN COASTAL WATERS OFF RUSHIKULYA ESTUARY, EAST COAST OF INDIA

8/26/2019

Name of the Principal Investigator: KAMAL KUMAR BARIK

This is to acknowledge the receipt of the above Project Proposal. Kindly quote file number and date of receipt of Project Proposal in your future communication. Director, Indian National Centre for Ocean Information Services, Ministry of Earth Sciences , appreciates your interest in submitting the Project. Final outcome of your proposal will be communicated to you in due course.

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