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Note

Efficacy of different modes in disseminating Potential Fishing Zone (PFZ) forecasts - a case study from Andaman and Nicobar Islands

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ABSTRACT

Potential Fishing Zone forecasts based on Indian Remote Sensing satellite P4 Ocean Colour Monitor derived chlorophyll concentration and National Oceanographic Aerospace Administration-Advanced Very High Resolution Radiometer derived sea surface temperature were disseminated through different modes *viz.,* Digital display boards, e-mail, telephoning/text messaging, radio, community networking and distribution of print-outs in person to the targeted fishermen and the efficacy was tested. Profound reach of technology dissemination was observed in telephoning/text messaging with an average of 72 users per forecast. Printouts of PFZ maps were distributed to an average of 35 fishermen/boat-masters in person. Digital Display Boards were viewed by 30 fishermen per forecast. E-mail message containing PFZ forecasts were sent to regional fisheries sub-stations of remote islands and it was inferred that an average of 15 fishermen per forecasts were benefitted. Further, PFZ messages were transmitted through All India Radio and Agromet Field Unit for extensive reach all along the inhabited islands. Since the validity period of PFZ forecasts is limited to 2-3 days, near real-time dissemination through telephoning/text messaging was found as an optimal tool for efficient utilisation. Field level constraints in different dissemination modes are illustrated in the paper.

Keywords: Andaman and Nicobar Islands, Chlorophyll, Dissemination, IRS-P4, NOAA-AVHRR, Potential Fishing Zone, SST

Remote sensing satellites, with their capability of covering large spatial areas on a repetitive basis (Desai *et al.,* 2000) provide synoptic views of the ocean and detect mesoscale features through thermal infrared and visible sensors (Solanki *et al.,* 2005). An integrated approach was developed by Solanki *et al.* (2000) using Indian Remote Sensing satellite P4 Ocean Colour Monitor (IRS P4-OCM) derived chlorophyll concentration and National Oceanographic Aerospace Administration-Advanced Very High Resolution Radiometer (NOAA-AVHRR) derived sea surface temperature (SST) features for locating Potential Fishing Zones (PFZ) in the Indian waters. Indian National Centre for Ocean Information Services (INCOIS), Hyderabad delineates PFZ forecasts indicating the availability of fish stocks for 2-3 days all along the Indian coast (Solanki *et al.,* 2003) to about 225 nodes (Nayak *et al.,* 2003) for operational use.

Validation of PFZ forecasts has indicated substantial increase in catch per unit effort (CPUE) in Gujarat (Solanki *et al.,* 2001; Nayak *et al.,* 2003; Solanki *et al.,* 2003 and Dwivedi *et al.,* 2005) and all over the country (Choudhury *et al.,* 2002). Although Andaman and Nicobar Islands (ANI) are unique in possessing high magnitude of harvestable fishery resources of more than 1.48 lakh tonnes per annum (Roy and George, 2010), the present level of marine fish production constitutes a meagre 19% of the estimated potential (Grinson-George *et al.,* 2011). With an objective to exploit the under-utilised fishery resources of ANI using satellite based fishing technologies, PFZ forecasts

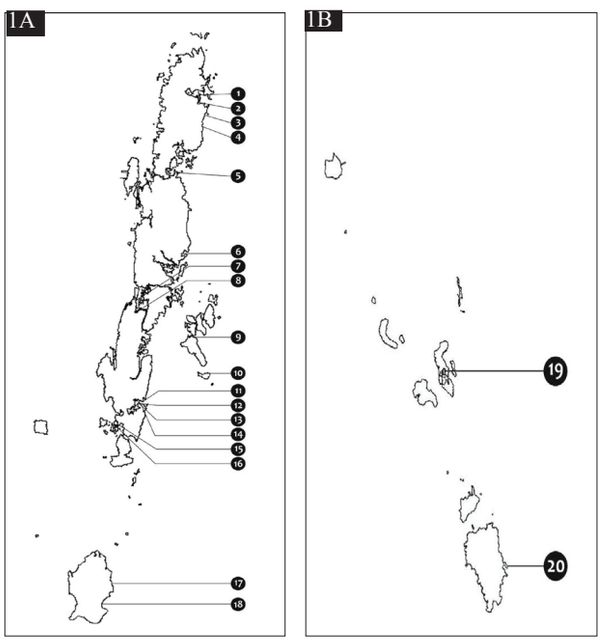


Fig. 1. Map showing the fish landing centres visited in (1A) Andaman and (1B) Nicobar group of islands. (See Table I for names of the landing centres).

Table 1. The 20 fish landing centres visited during the study period

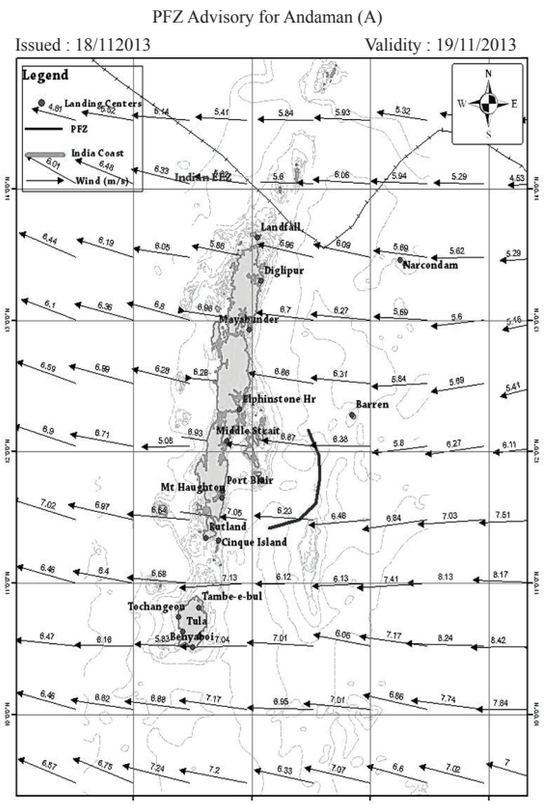
Andaman group of islands		Nicobar group of islands
Aerial Bay	Durgapur	Kamorta
Kalighat	Kalipur	Campbell Bay
Machidera	Rangat Bay	
Baratang	Kadamtala	
Havelock	Neil	
Dignabad	Junglighat	
Chatham	Panighat	
Wandoor	Guptapara	
V.K. Pur	Hut Bay	

were disseminated through different modes and the efficacy was tested. During the study period, 20 major fish landing centres (FLC) across ANI (Fig.1, Table 1) were covered with 912 visits.

Fishermen were sensitised on satellite-based fishing technologies through awareness campaigns and other extension methods *viz*., multilingual videos and power-point presentations. A network has been established with heads of fishermen associations and with the local development department for downstream

Table 2. Reference points for delineating PFZs in ANI

Reference points inAndaman	Reference points in Nicobar
Landfall lighthouse	Keating Port
Narcondam	Mus
Diglipur	Sawai
Mayabunder	Malaca
Elphinstone lighthouse	Batti Malv
Barren	Chowra
Neil	Bampoka
Port Blair North Point	Kai-Ho
Mount Haughton	Katchall East Bay
Rutland lighthouse	Katchall West Bay
Cinque lighthouse	Cape Connaught
Hut Bay	Sombrero Port
Tochangeou	Kabra Port
Tula	Pulo Kunji
Kwate-tu-Kwage lighthouse	Takaroach
Benyaboi lighthouse	Rosen Port
	Indira Port



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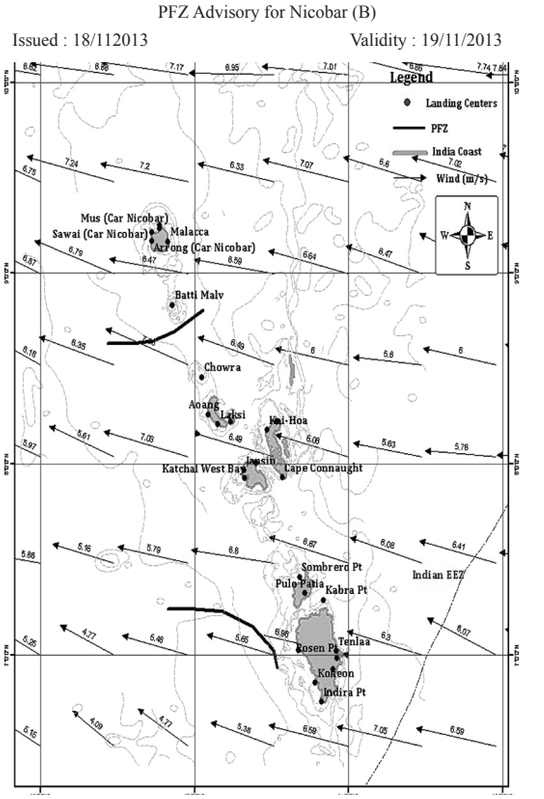

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Fig. 2. PFZ map for (2A) Andaman; (2B) Nicobar sector

ANDAMAN ISLANDS

अन्दामान द्वीप

Satellite Data shows likely availability of Fish Stock till February 22, 2010

उपग्रह आकडों से February 22, 2010 तक की संभावित मत्स्थ भंडार की उपलब्धि ।

From the Coast of कि समुद्र तट से	Direction दिशा मे	Angle in Degrees कोण (डिग्री मे	Distance in Kilometres दूरी (किलोमीटर मे)		Depth in Metres गहराई (मीटर मे)		Latitude / Longitude रेखांश /अक्षांश
			From कहाँ से	To कहाँ तक	From कहाँ से	To कहाँ तक	
Landfall Lt H लेण्डफॉल लईट हाउस	NE	62	23	28	--	--	13 44 52.11 N 93 15 17.20 E
Narcondam नाघौ-डॅम	NW	283	107	112	--	--	13 42 05. 01 N 93 15 42. 83 E
Diglipur दीग्लीपुर	SE	168	143	148	--	--	12 53 52. 89 N 93 09 05. 44 E
Mayabubunder माय्याबुन्दर	SE	121	19	24	--	--	12 49 22. 96 N 93 08 52.62 E
Elphinstone Hr Lt H एल्मीन्स्तोने हेड्र लाईट हाउस	SE	93	26	31	--	--	12 18 06. 29 N 93 09 31.08 E
Barren बारेन	SW	267	69	74	--	--	12 15 44. 90 N 93 11 00.81 E
Neill Island नील आईलैण्ड	NE	69	7	12	--	--	11 48 51.74 N 93 10 09.54 E
Port Blair North Pt पोर्ट बलेयर उतर पी टी	NE	72	47	52	--	--	11 50 34.57 N 93 11 26.45 E
Mt Haughton माउन्ट हाउघ्टोन्	NE	82	108	113	--	--	11 46 56.06 N 93 45 18.28 E
Rutland Lt H रुटलेण्ड एल टी एच	SW	238	15	20	--	--	11 15 52.25 N 92 28 36.23 E
Cinque Lt h चिन्क्यू लाईट हाउस	SW	243	27	32	--	--	11 12 00.88 N 92 28 49.05 E

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Fig. 3. Technical details of PFZ

dissemination of PFZ forecasts and feedback collection. For disseminating PFZ forecasts, 16 sites from Andaman and 17 sites from Nicobar (Table 2) were used as reference points. Along with PFZ maps (Fig. 2), technical details *viz.,* GPS coordinates of fishing grounds, direction, angle in degrees, distance in kilometres and depth in metres from the reference points were also provided (Fig. 3).

PFZ forecasts were distributed through various dissemination modes *viz.,* digital display boards (DDB), e-mail, telephoning/text messaging, radio, community networking and distribution of print-outs of forecasts in person to the targeted fishermen. The advantages and field-level constraints of each of the dissemination modes are discussed in this paper.

DDBs have been installed at three stations *viz.,* Fisheries Sub-station, Rangat (Middle Andaman), Administrative building of Junglighat FLC (South Andaman) and Fisheries Sub-station, Hut Bay (Little Andaman). An estimated, 30 fishermen viewed the DDBs per every forecast. Accessibility to ocean information at any time is facilitated in this mode since the DDBs were installed in proximity to the fishers' residence. In addition to the PFZ forecasts, DDBs are capable of reducing occupational hazards through real-time dissemination of ocean state (wind speed and direction, wave-height and *Tsunami* warnings), which certainly has advantage over other dissemination modes. Every day before venturing into sea, at least a volunteer in a crew checks with DDB for information pertaining to ocean state and for any warnings. However, limited installation, prevalence of poor GPRS signals in Middle and Little Andaman islands, lack of local expertise to address issues in DDB units and issues related to power supply at the installed sites hindered effective utilisation of DDB. Measures are being taken for solar based battery back-up for constant power supply to DDB.

E-mails containing PFZ forecasts were sent to seafood companies and local functionaries of Department of Fisheries. It was observed that on an average, 15 fishermen were benefitted per forecast. Further, e-mails were also sent to Agromet Field Unit, Port Blair and All India Radio, Port Blair Kendra for dissemination through local newspapers and transmission all along the inhabited islands respectively. Since this is a passive mode of dissemination involving numerous personnel, follow-up activities and precise feedback data collection from remotely residing fishers were difficult.

PFZ forecasts were distributed free to an average of 35 fishermen/boat-masters on the day of notification from INCOIS. This mode has the advantage of sensitising fishermen orally on navigation to the demarcated zones and shifting pattern of PFZ. Though follow-up activities and feedback data collection are comparatively easier, distribution of PFZ maps in person to all the landing centers across ANI is not feasible and hence restricted to FLCs of South Andaman sector alone.

According to the report of National Council of Applied Economic Research (2010), the use of mobile phones among fishermen in fishing and other operations varies from 21% in Kalyani District of West Bengal to 71% in Puducherry. Initially, mobile numbers of active fishermen along with necessary details including fishing grounds, gears deployed *etc*., were obtained during awareness campaigns and other sensitisation programs and categorised. Forecasts were immediately disseminated to the targeted fishermen through phone followed by text messaging of technical details. At least 2 fishermen in a crew knew to read messages which facilitated successful dissemination of forecasts through text messaging. Profound reach of technology dissemination is achieved with a mean of 72 beneficiaries per forecast. Since the validity period of PFZ forecasts is limited to 2-3 days, near real-time dissemination of PFZ through telephoning/text messaging was found as the optimal tool for efficient utilization of PFZ forecasts. With this mode of technology dissemination, conveying information about subsequent forecasts to the fishermen operating at sea was also possible. Poor accessibility beyond five nautical miles from shore (Mittal *et al.,* 2010) and poor network coverage in Nicobar group of islands were some of the constraints in this mode. However, in contrast to mainland, mobile network coverage from the surrounding islands assists in disseminating the PFZ forecast information to some extent even during farsea fishing operations.

During 2010-12, a total of 104 forecasts were received of which, 52 (50%) were validated. PFZ forecasts have been proved to be a potent tool for harvesting the under-exploited fishery resources of ANI with significant increase in total fish catch (Grinson-George *et al.,* 2011). Since ANI receives rainfall for

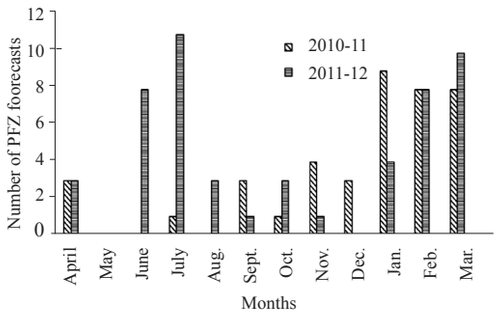

Fig. 4. Temporal variations in receipt of PFZ forecasts during 2010-12

almost 250 days in a year PFZ forecasts were inconsistent due to non-availability of cloud free satellite data (Fig. 4). In order to generate round-the-year PFZ forecasts, possibility of using the satellite altimetry data for pelagic fisheries with emphasis on prediction of tunas and allied species is being studied.

The study has demonstrated that mobile phone/text messaging is the most efficient method of dissemination of PFZ forecasts. However, still some fishers rely on traditional knowledge for identification of fishing grounds. It is believed that sensitisation on advantages of satellite-based fishing would enhance the level of adoption of this technology for improved profitability.

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