Fisher Folk Safety in India

Case Study of Vulnerability of Fishermen of Ratnagiri and Sindhudurg Districts, Maharashtra

A Dissertation Submitted in Partial Fulfilment of the Requirement for the Award of Master of Philosophy in Social Sciences from Panjab University, Chandigarh under the Advanced Professional Programme in Public Administration **(APPPA)**

By

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CERTIFICATE

I have the pleasure to certify that Deputy Inspector General Dushyant Kumar, has pursued his research work and prepared the dissertation titled, '**Fisher Folk Safety in India: Case Study of Vulnerability of Fishermen of Ratnagiri and Sindhudurg Districts, Maharashtra'** under my guidance and supervision. The same is result of research done by him and to best of my knowledge; no part of the same has been part of any monograph, dissertation or book earlier. This is being submitted to the Panjab University, Chandigarh for the purpose of Master of Philosophy in Social Sciences in partial fulfilment of the requirement for the Advanced Professional Programme in Public Administration (APPPA) of Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Deputy Inspector General Dushyant Kumar is worthy of consideration for the award of M. Phil degree of Panjab University, Chandigarh.

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Date: Mar 23 **Dushyant Kumar**

EXECUTIVE SUMMARY

The fishing industry in India plays a significant role in contributing to the country's economy. The Economic Survey of India 2021-22 brings out that fishing industry provides employment to over 28 million people especially the marginalised and vulnerable communities. However, the industry is plagued by numerous safety issues, resulting in a high number of fatalities and injuries. The objective of this research is to pinpoint the significant safety concerns prevalent in the Indian Fishing Industry and propose suggestions for enhancing the safety of fishermen while they are out at sea.

One of the major safety issues identified is the lack of compliance with safety regulations by fishing vessels. Many fishing boats do not carry the required safety equipment, such as life jackets, fire extinguishers, and first aid kits. Additionally, there is a lack of proper training and education for fishermen on safety procedures and the use of safety equipment. The study found that the educational qualification and financial condition of fishermen were directly associated with their knowledge of safety procedures.

Another safety issue identified is the underreporting of accidents and injuries in the fishing fleet. Fishermen often do not report accidents or injuries for fear of losing income or facing legal action. This underreporting results in a lack of accurate data on safety incidents in the industry, making it difficult to identify and address safety issues.

The study also found that fishing boats engaged in the Purse Seine method are more crowded compared to the size of the boat, and these boats often do not carry enough life-saving equipment to meet any eventuality. This poses a significant risk to the safety of the crew in the event of an accident or emergency.

In terms of communication systems onboard fishing boats, the study found that there is a lack of standardization in communication equipment and procedures. This can

cause confusion and delays in communication during emergencies, jeopardizing the safety of the crew. The study recommends that standard communication equipment and procedures be adopted across the industry, and crew members be trained in the proper use of communication equipment.

Another major safety issue identified is the non-following of prescribed navigation lights onboard fishing boats. This can lead to collisions with other vessels, posing a significant risk to the safety of the crew. The study recommends that all fishing boats be required to comply with navigation light regulations and that appropriate penalties be imposed for non-compliance.

To address these safety issues, the study recommends that the Indian Government take a more proactive approach to safety regulation in the fishing industry. This includes implementing and enforcing safety regulations, providing education and training to fishermen on safety procedures and the use of safety equipment, and promoting a culture of safety within the industry.

Additionally, the study recommends the establishing a National Sea-Safety Working Groups to improve communication and cooperation between regulators and the industry. This will enable regulators to better understand the needs and concerns of fishermen, and industry members to provide input into the regulatory process.

In conclusion, the Indian fishing industry faces numerous safety issues that require urgent attention. The recommendations outlined in this study provide a roadmap for improving the safety of fishermen at sea. It is crucial that the Indian government and the fishing industry work together to implement these recommendations and promote a culture of safety within the industry. Only through such efforts can the safety of fishermen be ensured, and the industry's potential for sustainable growth be realized.

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INTRODUCTION

1.1 Background of Study

The practice of fishing dates back to very many centuries ago, much before the evolution of modern methods and practices, and became a major recognized contributor to the Indian economy. Fishing is very prominent industry in the coastal states of India with more than 28 million Indians, especially the marginalized and vulnerable communities, are earning a living from fishing.

It is estimated that India has about 2,54,786 Registered Fishing Vessels. These include, but not limited to, Deep-Sea Fishing Vessels (149), Motorised Mechanical Vessels (64491), Motorised Non-Mechanical Vessels (143303) and non-Motorised/Traditional Boats (46886). These boats operate from 1,265 marine Fish Harbour and Fish Landing Centres along the 7,516.6 kilometer (km) Indian coastline including Andaman & Nicobar and Lakshadweep islands. These fishing boats need Fishing Harbours (FH) and Fish Landing Centre (FLC) facilities for landing their fish catch, berthing their fishing vessels, outfitting and undertaking repairs.

However, the fact remains that there are not enough FH/FLC facilities in the country. The existing facilities are just adequate to meet the requirements of only about 54.10 % of the total mechanised fishing vessels. As of now, nearly 46 % of the total mechanised fishing boats i.e., about 1,17,201 operates without any harbour facilities.

The fishing industry faces a critical concern with regard to safety at sea. It ranks very high in terms of occupational dangers, injuries, and fatalities. International Labour Office (ILO) in its press release dated 13 Dec 99 declared that as many as 24,000 fishermen

and persons engaged in fishing and fish processing are killed every year, declaring fishing and related occupations among the most dangerous of all professions.

1.1.1 Fishing Industry in India

India has a Long Coast Line of 7516 Km which boasts of an Exclusive Economic Zone (EEZ) which spans over 2.02 million square km, which is rich in natural resources including fisheries. The fishing industry in India plays a crucial role in the country's economy, providing employment to millions of people and contributing to the national food security.

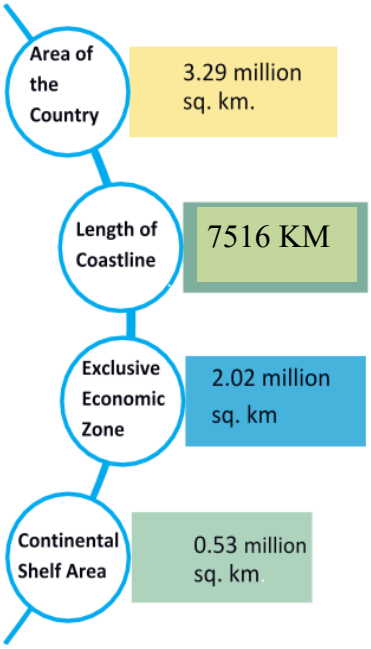


Fig 1.1: India's Maritime extent

According to the fisheries statistics of India 2022, the total production of marine and inland fisheries was 121.21 Lakh Tons and 41.27 Lakh Tons respectively, total Fish Production amounting to 162.48 Lakh Tons. In recent years, the fishing industry in India has seen significant growth, and this is reflected in the increasing value of fish exports, which was 13,69,262 Tonnes contributing 1,32,620 Crores to Indian Economy.

Summary India's Fish Production

Fig 1.2: Summary of India's Fish Production

Source: Handbook of Fisheries 2022

Fish Production in India for the period 1980-81 to 2021-22 has seen a steady pace, where the Total fish production has increased from 24.42 Lakh Tons to 162.48 Lakh Tons with an average growth rate 10.34 %.

Fish Production in India for the Period 1980-81 to 2021-22

Year	Fish production (In Lakh Tonnes)			Annual Average Growth Rate (Percent)		
	Marine	Inland	Total	Marine	Inland	All India
1980-81	15.55	8.87	24.42	4.22	4.60	4.36
1981-82	14.45	9.99	24.44	-7.07	12.63	0.08
1982-83	14.27	9.40	23.67	-1.25	-5.91	-3.15
1983-84	15.19	9.87	25.06	6.45	5.00	5.87
1984-85	16.98	11.03	28.01	11.78	11.75	11.77
1985-86	17.16	11.60	28.76	1.06	5.17	2.68
1986-87	17.13	12.29	29.42	-0.17	5.95	2.29
1987-88	16.58	13.01	29.59	-3.21	5.86	0.58
1988-89	18.17	13.35	31.52	9.59	2.61	6.52
1989-90	22.75	14.02	36.77	25.21	5.02	16.66
1990-91	23.00	15.36	38.36	1.10	9.56	4.32
1991-92	24.47	17.10	41.57	6.39	11.33	8.37
1992-93	25.76	17.89	43.65	5.27	4.62	5.00
1993-94	26.49	19.95	46.44	2.83	11.51	6.39
1994-95	26.92	20.97	47.89	1.62	5.11	3.12
1995-96	27.07	22.42	49.49	0.56	6.91	3.34
1996-97	29.67	23.81	53.48	9.60	6.20	8.06
1997-98	29.50	24.38	53.88	-0.57	2.39	0.75
1998-99	26.96	26.02	52.98	-8.61	6.73	-1.67
1999-00	28.52	28.23	56.75	5.79	8.49	7.12
2000-01	28.11	28.45	56.56	-1.44	0.78	-0.33
2001-02	28.30	31.26	59.56	0.68	9.88	5.30
2002-03	29.90	32.10	62.00	5.65	2.69	4.10
2003-04	29.41	34.58	63.99	-1.64	7.73	3.21
2004-05	27.79	35.26	63.05	-5.51	1.97	-1.47
2005-06	28.16	37.56	65.72	1.33	6.52	4.23
2006-07	30.24	38.45	68.69	7.39	2.37	4.52
2007-08	29.20	42.07	71.27	-3.44	9.41	3.76
2008-09	29.78	46.38	76.16	1.99	10.24	6.86
2009-10	31.04	48.94	79.98	4.23	5.52	5.02
2010-11	32.50	49.81	82.31	4.70	1.78	2.91
2011-12	33.72	52.94	86.66	3.75	6.28	5.28
2012-13	33.21	57.19	90.40	-1.51	8.03	4.32
2013-14	34.43	61.36	95.79	3.67	7.29	5.96
2014-15	35.69	66.91	102.60	3.66	9.04	7.11
2015-16	36.00	71.62	107.62	0.87	7.04	4.89
2016-17	36.25	78.06	114.31	1.14	8.63	6.12
2017-18	37.56	89.48	127.04	3.61	14.62	11.13
2018-19	38.53	97.20	135.73	2.58	8.62	6.84
2019-20	37.27	104.37	141.64	-3.2	7.37	4.35
2020-21	34.76	112.49	147.25	-6.7	7.80	4.0
2021-22	41.27	121.21	162.48	18.7	7.76	10.34
Source: Department of Fisheries, State Govt. / UT Administration						

Table 1.1: India's Fish Production Since 1980-81 to 2021-22

Source: Handbook of Fisheries 2022

State wise distribution of Marine Fish production is as given in figure below with Gujarat being highest at 6.88 Lakh Tons for Fisheries.

Marine Fish Production: 2021-22 (in Lakh Tonnes)

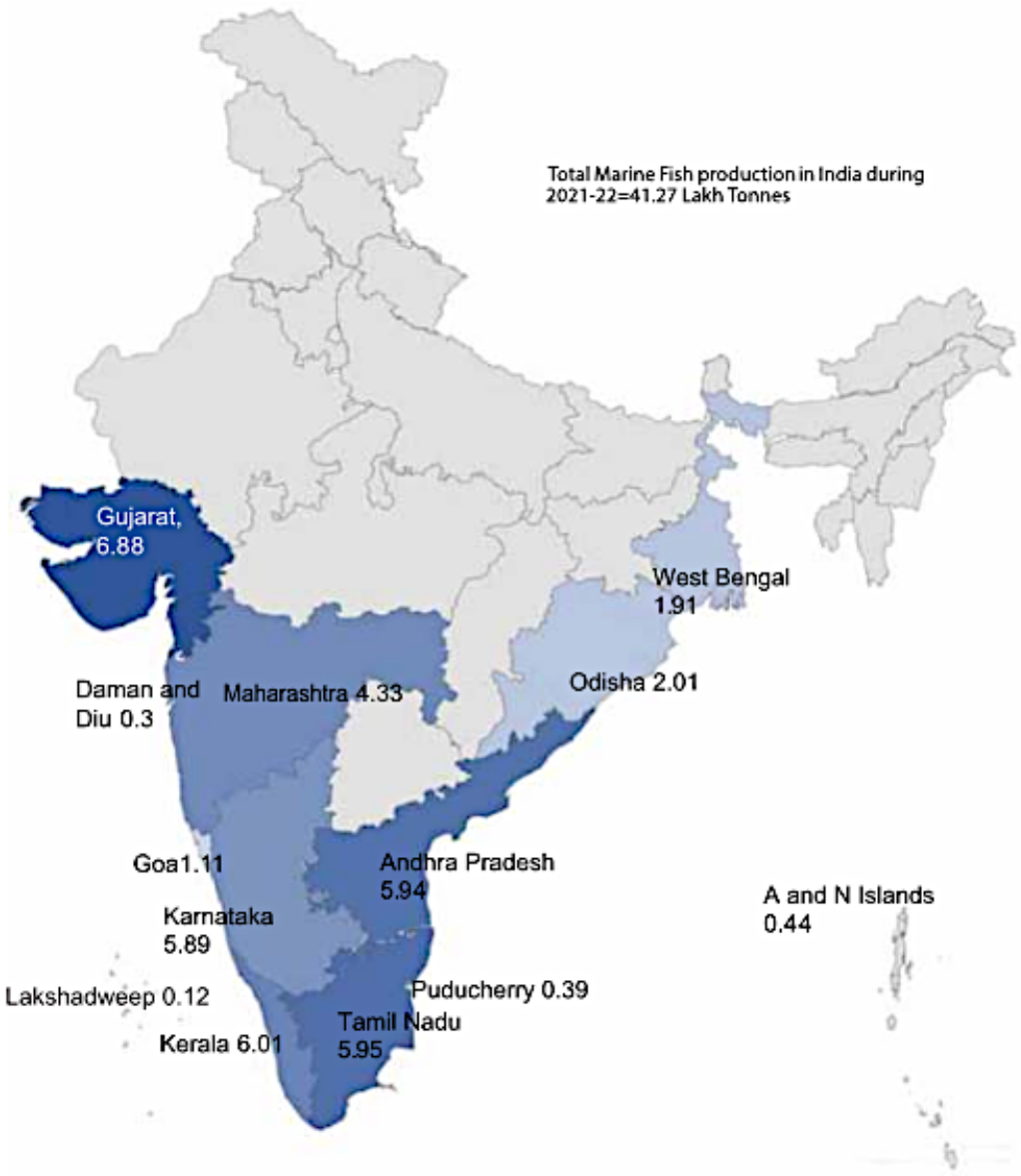


Fig 1.3: Total Marine Fish Production during 2021

Source: Handbook of Fisheries 2022

Inland Fish Production: 2021-22 (in Lakh Tonnes)

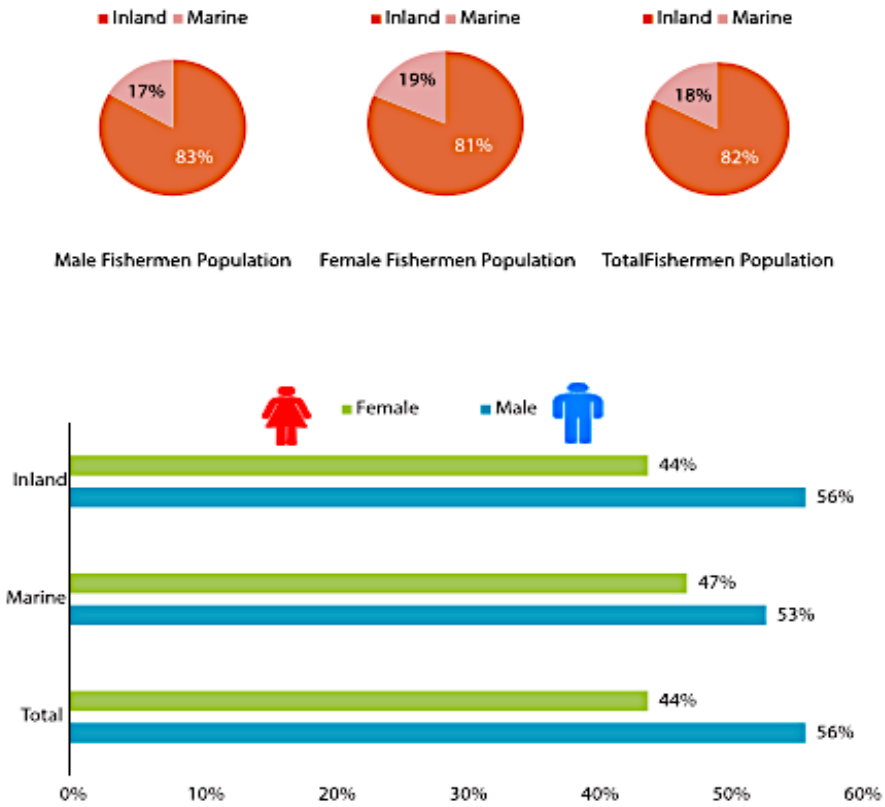
Andhra Pradesh recorded highest Inland Fish production at 42.19 Lakh Tons.

Fig 1.4: Total Inland Fish Production during 2021-22

Source: Handbook of Fisheries 2022

Fishing has been a major source of livelihood for millions of people in India, particularly in the coastal regions of the country. The fishing industry provides employment to a significant portion of the population and contributes significantly to the economy. It is estimated that there was a total of 2,80,63,537 fishermen in India, which included 49,45,717 marine fishermen.

Total Gender-wise Inland and Marine Fishermen Population 2020-21



	Male	Female	Total
Inland (2020-21)	1,30,13,978	1,01,03,842	2,31,17,820
Marine (2020-21)	26,51,652	22,94,066	49,45,718
All India (2020-21)	1,56,65,630	1,23,97,908	2,80,63,538

Fig 1.5: Gender wise details for inland and marine fishermen, India
Source: Handbook of Fisheries 2022

1.1.2 **Fishing Community in Maharashtra**

Maharashtra is India's 2nd most populated and 3rd largest state by land, and is located adjacent to the Arabian Sea on western part of the country. The history of Maharashtra dates back to 1300-700 BCE. Maharashtra was historically the name of a region which consisted of *Aparanta* (meaning 'western border'), *Vidharbha* (east of Maharashtra), *Mulak, Asmaka* (located between the Godavari River and the present-day Telangana and Maharashtra) and *Kuntala* (western Deccan and some parts of central and south Karnataka).

During ancient times, the region was inhabited by the tribal communities of "*Bhil"*. It was also home to an ancient race known as "*Rattha,*" which referred to themselves as "*Maharattha*" (meaning Great). The recorded history of Maharashtra began with the construction of five Buddhist Caves in the 2nd century BC. The name "Maharashtra" first appeared in the 7th century in the account of a Chinese traveller named Huan Tsang.

Based on the languages, Gujarat and Western Maharashtra were merged into a single state, named Mumbai after independence. The present Maharashtra was established on 01 May 1960 and Mumbai was made its capital. Marathwada from erstwhile Hyderabad state and *Vidarbha* region from Central Provinces and Berar were later added as they were largely Marathi speaking districts.

Maharashtra is divided into five regions based on geography, history and political inclinations.

(a) *Vidarbha/Berar (*Nagpur and Amravati divisions)
(b) Western Maharashtra/*Desh* (Pune division)
(c) Konkan (Konkan division)
(d) *Marathwada* (Aurangabad division)
(e) Northern Maharashtra and Khandesh (Nasik division)

The state of Maharashtra has 36 districts with a total population of 12,31,44,223. The Total fishermen population is 15,18,228 which amounts to about 42,173 fishermen per district.

If we bifurcate gender wise, Maharashtra has 529,433 Female against 602,536 Male fishermen as Inland Fishermen. Marine Fishermen population consists of 188,499 Female against 197,970 male fishermen.

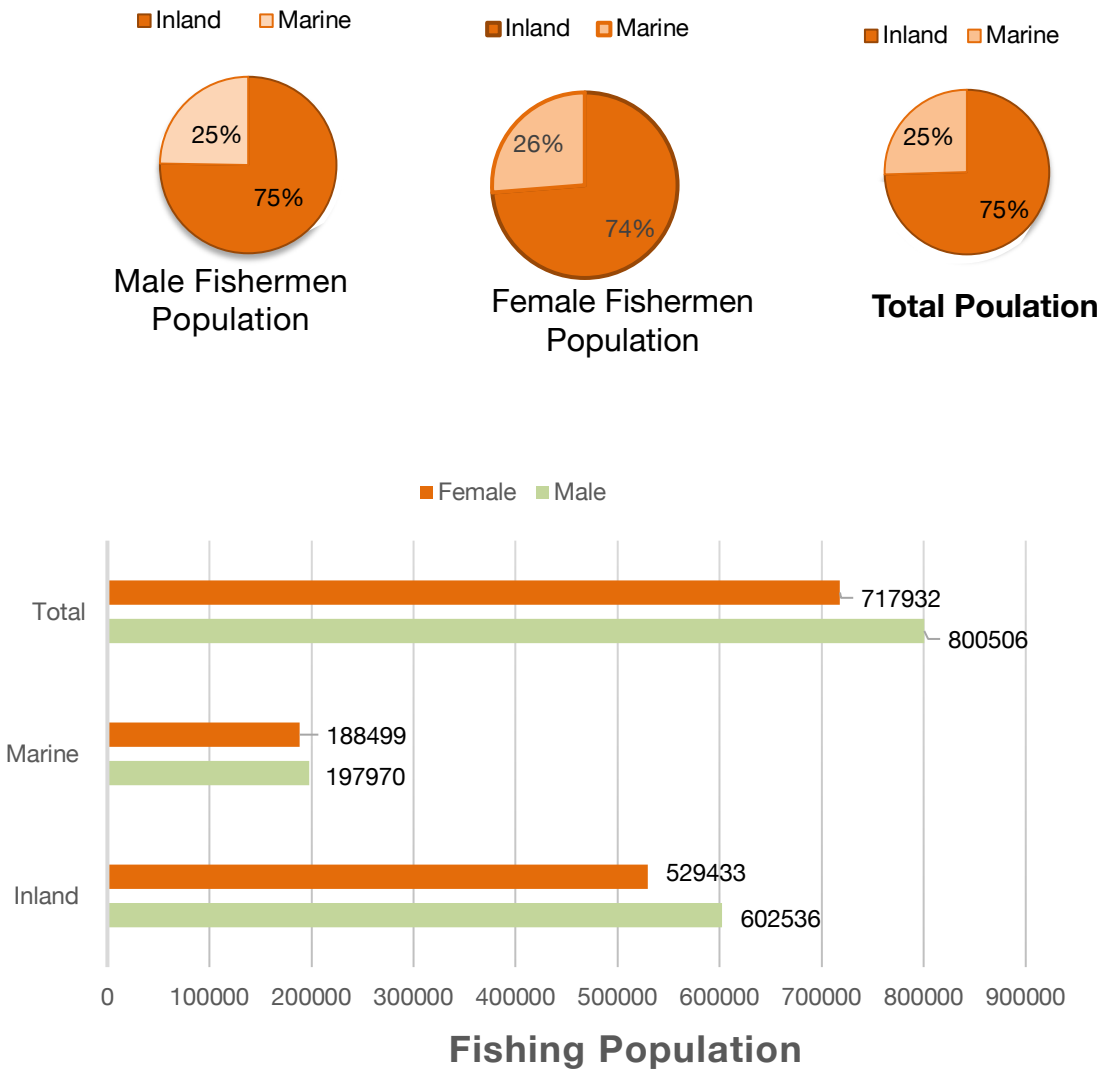


Fig 1.6: Gender wise Fishermen Population in Maharashtra
Source: Handbook of Fisheries 2022

	Male	Female	Total
Inland (2020-21)	602536	529433	1131969
Marine (2020-21)	197970	188499	386469
Total (2020-21)	800506	717932	1518438

Table 1.2: Gender wise Fishermen, Maharashtra
Source: Handbook of Fisheries 2022

The state of Maharashtra is one of the major Marine fish producing state in India. The state has a coastline of 720 Km. which spreads along the 7 maritime districts viz. Thane, Palghar, Mumbai city, Mumbai Suburban, Raigad, Ratnagiri and Sindhudurg. The Continental shelf has an area up to 40 fathoms i.e., 55,529 sq. kms, which is 50% of the total continental shelf being exploited. There are 25 Zones in the 7 districts and 173 fish landings centres in the state. Ratnagiri has 46 Fish Landing Canters whereas Sindhudurg has 34 Landing Centres.

There are total of 6 Government Training Centres for fishing community. Ratnagiri and Sindhudurg has 01 training centre each.

The state contribution towards total national fish production is as given below: -

	Maharashtra (Lakh Tonnes)	National (Lakh Tonnes)	% Share
Inland (2020-21)	1.57	121.21	1.29%
Marine (2020-21)	4.33	41.27	10.49%
Total (2020-21)	5.90	162.48	11.78%

Table 1.3: State Contribution in Total National Fish Production
Source: Handbook of Fisheries 2022

Fisheries are of two types, namely, Inland fisheries and Marine fisheries. During 2020-21 total fish production in the Maharashtra state was 5, 23, 098 Tonnes valued at 7, 665 crores out of which 1,24,587 Tonnes valued at 1,659 crores came from Inland sources and 3,98,511 Tonnes valued at 6,006 crores from Marine sources.

During 2019-20 state contribution in Marine, Inland and total fish production of India was 9.64%, 1.25 % and 3.99% respectively at all India level. There are 1,5218 Marine fishing boats in operation out of which 12,946 are mechanised and 2,272 are non-mechanised boats in the state during the year 2020-21.

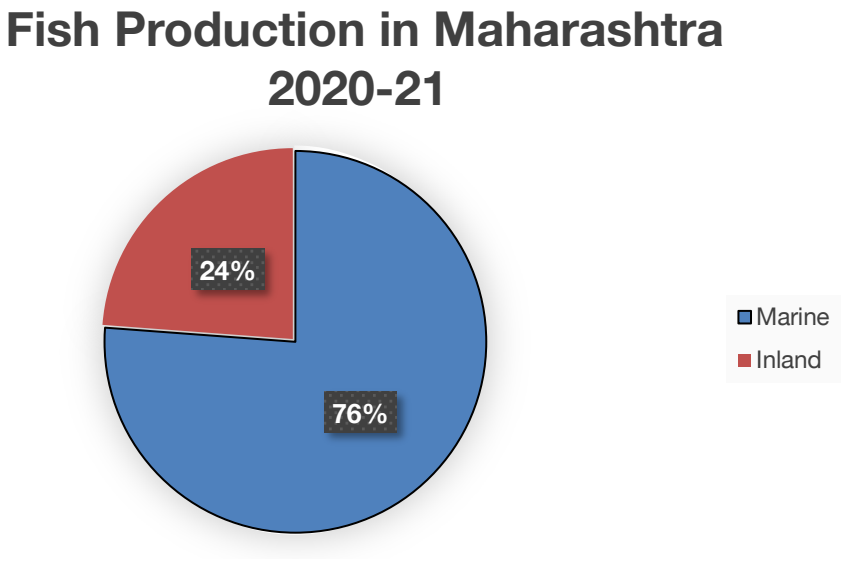


Fig 1.7: Fish Production in Maharashtra, Marine/Inland
Source: Handbook of Fisheries 2022

1.2 **Problem Statement**

The fishing industry plays a crucial role in India's economy, contributing significantly to the country's food security and employment. However, despite its importance, and various regulations and guidelines issued by Central and State Governments, the safety of fishermen in India remains a major concern. The state of Maharashtra, with its long coastline and rich fishing resources, is home to a large number of fishermen. In particular, the districts of Ratnagiri and Sindhudurg have a significant number of fishing communities that rely on fishing as their main source of livelihood.

As already mentioned earlier, Fishing ranks among the most hazardous professions globally, as fishermen are exposed to various risks at sea, including extreme weather conditions, personal and vessel hazards which directly affects the safety of fishermen. The lack of adequate safety measures, inadequate training, and the lack of access to timely medical aid in the event of accidents have made fishing a hazardous occupation in India. As a result, the fishing communities including those of Ratnagiri and Sindhudurg face numerous challenges in ensuring their safety at sea.

The vulnerability of fishermen in Ratnagiri and Sindhudurg is further compounded by the lack of awareness about safety measures, the lack of access to essential safety equipment, and the inadequate infrastructure and support systems in place. The absence of effective safety regulations and enforcement mechanisms has also made it difficult for fishermen to adhere to the necessary safety standards, putting their lives at risk.

In light of these challenges, it is important to study the state of safety of fishermen in Ratnagiri and Sindhudurg and to understand the various factors that contribute to their vulnerability at sea. **This research will aim to explore the current situation and identify the challenges faced by fishermen in ensuring their safety at sea, with a view to developing practical recommendations for improving their safety**. The findings of this study will contribute to the development of effective policies and programs aimed at improving the safety of fishermen in India and, in particular, in the state of Maharashtra.

1.3 Objectives of the Study

(a) To assess the current status of safety measures for fishermen in Ratnagiri and Sindhudurg districts of Maharashtra

(b) To assess occupational hazards faced by fishermen

(c) To assess reasons behind occupational hazards and accidents

(d) To study the impact of various environmental, social and economic factors on the safety of fishermen in Ratnagiri and Sindhudurg.

(e) To understand the awareness levels of fishermen about safety measures and the measures they take to ensure their safety while fishing.

1.4 Justification for the Study

Fishing is also an important contributor to the Indian economy, as well as the livelihood of millions of families, particularly in the coastal areas. Fishing is also regarded as one of the most hazardous occupations in the world, and it is imperative to assess the safety of fishermen to ensure their well-being and ensure the sustainability of the fishing industry.

The issue of safety at sea is a global concern, and the Indian context is no different. The lack of safety measures and poor working conditions of the fishermen put them at risk of accidents and fatalities, and it is imperative to address these concerns to ensure that their rights are protected and their lives are safe.

The study is justified as it aims to provide a comprehensive analysis of the safety of fishermen in the two districts of Ratnagiri and Sindhudurg in Maharashtra, which are both renowned for their rich marine resources and high concentration of fishing activities.

The study will help to identify the specific challenges and vulnerabilities that the fishermen face and will provide recommendations to enhance their safety.

Therefore, it is an important and necessary research, as it will provide valuable insights into the safety of fishermen and contribute to the development of effective measures to enhance their safety and well-being.

CHAPTER-2
LITRATURE REVIEW

2.1 Definition of Fishermen Safety

Fishermen safety refers to the measures and conditions that ensure the well-being and protection of fishermen while they are engaged in their fishing activities. It encompasses a range of factors such as appropriate training, proper equipment, safe working conditions, and effective rescue and response systems. Fishermen safety is a crucial aspect of the fishing industry as it affects not only the lives and livelihoods of the fishermen, but also the sustainability of the fishing industry itself. To ensure the safety of fishermen, it is necessary to comply with various International and National Laws and regulations. These regulations include the International Convention of the Safety of Life at Sea (SOLAS), the International Labour Organisation (ILO), Work in Fishing Convention (2007), and the International Maritime Organisation (IMO), International Safety Management (ISM) Code. These laws and regulations provide a comprehensive framework for ensuring the safety of fishermen at sea and cover areas such as working hours, manning levels, safety equipment, emergency response, and medical care.

2.2 Overview of Fishermen Safety in India

Fishermen safety is a complex issue in India, which involves various factors such as weather conditions, sea state, vessel design and maintenance, working hours, gear and equipment, fishing methods, and access to support services. The safety of fishermen is affected by several factors, including lack of proper training, inadequate equipment, and limited access to safety measures and facilities. The Indian government and other organizations have taken several measures to improve the safety of fishermen, but the situation is still far from ideal.

According to Ministry of Agriculture and Farmers Welfare, the number of fishing vessels in India was 1,34,399 in 2019-20. The Indian fishing fleet consists of both

mechanized and traditional fishing vessels. While the former is equipped with modern fishing gear and facilities, the latter are still reliant on traditional methods and equipment.

The Indian coastline spans 7,516 km and has an Exclusive Economic Zone (EEZ) of 2.02 million sq. km. The fishing industry in India is an important contributor to the country's economy, with a total fish production of 162.48 Lakh Tons in 2021-22. Out of this, marine fisheries production was 41.27 Lakh Tons, while inland fisheries production was 121.21 Lakh Tons.

Despite the significance of the fishing industry, fishermen in India continue to face several challenges, including lack of safety measures, inadequate compensation for accidents, and poor working conditions. The number of casualties among fishermen in India is alarmingly high. This highlights the need for immediate action to improve the safety of fishermen and secure their livelihoods.

2.3 Previous studies on Fishermen Safety in Maharashtra or Elsewhere

Literature review is very important step for initiating any research on the subject. The literature available on the subject covers various issues of demographic profile of fishermen in the state of Maharashtra. Some of these studies are reviewed as mentioned below: -

1. **Handbook on Fisheries Statistics 2022.** Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, New Delhi. It presents the latest data for the FY 2020-21, 2021-2022. The data covers various aspects of the fisheries sector, including fish production and consumption, fisheries economy, expenditure incurred on the fisheries sector, fisheries exports, fishermen population, welfare, fisheries training institutes, fisheries development, and improvements.

   (a) Fisheries and agriculture are an important source of income and livelihood to millions of people. Indian fisheries sector has evolved gradually over the years

and has become an important social economic attribute for the nation. India is the world's third-largest producer of fish and aquaculture, contributing to approximately 16 % of the total inland, and 5% of the total global marine fish production. In 2021- 22, India's total marine and inland fish production stood at 162.48 lakh tons, which includes 121.21 lakh tons from Inland and 41.27 Lakh tons from marine sectors. Fisheries sector is a key contributor to the county's foreign exchange earnings and plays a crucial role in the National Economy. India's fish production has increased from 56.56 lakhs in 2000-01 to 162.48 Lakh tons in 2021-22. Andhra Pradesh, West Bengal. Karnataka, Odisha and Gujarat evolved to be the five major fish producing states in India during 2021- 22.

(b) The handbook also provides a comprehensive analysis of the fish production, distribution, and utilization of fish and fish products in India including the state of Maharashtra. It covers key topics such as the contribution of fisheries sector to the Indian economy, the distribution of fishing activities across the country, the distribution of fishing vessels, fishing gear, and the status of fishing communities.

(c) The handbook provides a detailed overview of the different types of fishing activities in India, including marine and inland fishing, and provides a comprehensive analysis of the status of each. It also covers important topics such as the contribution of fishing to the national economy, the distribution of fishing activities across the country, and the status of fishing communities.

(d) In terms of the contribution of fishing to the Indian economy, the handbook provides a comprehensive analysis of the value of fish exports, the value of the fishing industry, and the impact of fishing on local communities. The handbook also provides an analysis of the status of fishing communities in India, including the socio-economic status of fishermen and their families. The challenges faced by fishing communities, and the measures being taken to address these challenges.

(e) The handbook on Fisheries Statistics 2022 is an important resource understanding the status of the fishing industry in India and an important resource for policy makers, researchers, and others interested in the fishing industry in India. The findings of this report will be used as a secondary source of data for this current study.

2. **Safety at Sea for Small-Scale Fisheries in Developing Countries. FAO (UN) Publication Sep 2010.**

(a) The book highlights the fact that fishing is perhaps the most hazardous profession globally, and those who suffer from maritime accidents are frequently among the most financially deprived in society.

(b) The West African project aimed to achieve the objectives such as; enhancing national and regional capabilities for implementing safety at sea programs, raising awareness among government officials regarding current challenges, and establishing a better system for reporting and analysing accidents involving small-scale fishermen.

(c) The intended outcomes of the South Asian project component included enhancing the reporting and analysis system for sea incidents causing fatalities or severe injuries to fishers, modifying the guidelines for constructing and equipping small-scale fishing boats based on the FAO/ILO/IMO draft voluntary guidelines and presenting them in a format accessible to the small-scale boat building industry, and integrating the notion of "safety at sea" into fishery management as a crucial element.

(d) Incorporating safety at sea projects into initiatives related to fisheries livelihoods, coastal management, sustainable coastal development, coastal vulnerability, fisheries management, the ecosystems approach to fisheries, and climate change is crucial to promote fishermen safety.

(e) Since December 2006, the FAO has been working to enhance safety for fishermen worldwide through its project, Safety at Sea for Small-scale Fisheries in Developing Countries (GCP/GLO/200/MUL). The project is aimed at promoting safety at sea to improve the livelihoods of small-scale fishing communities, and is being carried out in two regions, West Africa and South Asia (including India).

(f) The efforts include developing safety protocols for boat building, equipment, and design, providing training to boat builders, and increasing awareness among fishermen, their families, and other stakeholders. To enhance safety, recommendations and guidelines for constructing, equipping, and designing small fishing vessels are necessary.

(g) Fisheries managers need to recognize the crucial connection between safety for fishermen and fisheries management since safety at sea has not been perceived as an essential aspect of fisheries management.

(h) The purpose of this document is to share the insights gained from the FAO project "Safety at Sea for Small-Scale Fisheries in Developing Countries" (GCP/GLO/200/MUL) and to assist countries in enhancing the safety of their fishermen.

Few important issues covered are as follows: -

(a) Understand the risks and dangers of small-scale fisheries.

(b) Communication between Government Fisheries and Maritime Bodies.

(c) Highlighting the importance of knowing the numbers and causes of accidents at sea, and integrating "Safety at Sea" as a fundamental component of fisheries management.

(d) Training of fishermen community in the concept of Sea Safety.

(e) Developing and implementing safety guidelines for fishermen to follow.

(f) This report is intended for a diverse group of stakeholders, including project planners, government agencies, fisheries administrations, fishermen's cooperatives, fishing vessel owner organisations, training institutions, and experts, who work to improve the welfare of fishermen.

(g) Sandvist and Forsman (2008), are developing guidelines for competent authorities on how to implement an Accident Reporting and Analysis System for small fishing vessels. Analysing and reporting accidents are crucial for improving management of resources and safety in fisheries. A system for reporting accidents has been put in place in the region, and the causes of accidents are currently under analysis.

(h) The development of guidelines for implementing an accident reporting and analysis system for small fishing vessels is underway (Sandvist and Forsman, 2008), which is crucial for improving resource management and safety within the fisheries industry.

(j) At the local accident scene, a detailed accident report is drafted to bring out all essential details such as date, time, type, cause, nautical location, meteorological conditions, identity of crafts and vessels involved, distress reporting and action taken, and human and material loss, among other circumstantial details.

The first step suggested is to study and understand the situation is by implementing analysing the databases of the accidents and incidents that occur at sea. The findings from this analysis will help to develop legislation, training program, better boat designs, fisheries management, etc. Focus should be, thus, on prevention and mitigation measures, which are highly cost effective.

3. **Knowledge and Practice on Safety /Measures Among Fishermen of Udupi District** by Anusuya Bengre, published in International Journal of Science and Research (IJSR) · September 2014

The article gives out that the work of marine Fishermen is considered as one of the most dangerous and life-threatening professions. The International Labour Organization (ILO) estimates that, over 24000 fatalities and as 24 million non-fatal injuries occur worldwide each year. The fatality rate of the world's Fishermen is estimated to be 80,000 to about 1, 00,000 workers per year. There are some practical difficulties in fishing occupation like exposure to cold wind, rough seas, and physical injuries during work, unpredictability and abruptness of threats, machinery and equipment failure, psychological and economic stress. Thus, the Occupational hazards faced by the fishermen are many.

Fishermen are at high and increased risk for drowning, Work Related Injuries (WRI), health problems like asphyxiation, skin allergies, eye and musculoskeletal problems. Extreme and unpredictable Weather, Isolated working conditions, long shifts without sufficient rest due to poor financial condition, Lack of formal safety training, Inadequate personal protective equipment, inadequate Sea Safety Devices.

The study aimed to evaluate the level of knowledge and implementation of safety measures among fishermen, as well as to identify any correlations between knowledge and specific demographic variables.

A cross-sectional study was conducted within the fishing community to evaluate their knowledge and practice safety measures. The study involved 80 participants who were surveyed using validated questionnaires focused on fishing-related safety measures. The survey was limited to adults aged 20-50 years who were present at the fishing harbour of Maple, willing to participate, and had given their consent for data collection.

The study showed that most of the fishermen had moderate knowledge (78.8%) and good knowledge (16%) of safety measures, and a favourable safety practice

of 49%. There was a positive correlation between their knowledge and practice. These findings were consistent with a similar study conducted by Rodrigues, DE, Kiran in Mangalore DK District, Karnataka, which showed that knowledge on prevention of occupational hazards was 55%, and adequate practice was 55.29%. Moreover, there was a significant relationship between knowledge and practice scores.

4. **Safety Practices Related to Small Fishing Vessel Stability**. Fisheries and Aqu aculture Technical Paper 517, published by FAO of UN (Rome) in 2009, Written by Ari Gudmundsson.

The aim of this study was to provide simple guidelines and basic principles on stability factors of small fishing vessels for maintaining adequate stability. The target audience includes fishermen, vessel owners, boat builders, cooperatives, and anyone interested in fishing vessel safety, serving as a guide for safety training.

The updated edition of Part A of the Code primarily targets competent authorities, training institutions, fishing vessel owners, crew representative organizations, and non-governmental organizations with a recognized role in promoting the safety, health, and training of crew members.

5. A Literature Review on Stakeholder Participation in Coastal and Marine Fisheries. by Heike Schwermer, Fanny Barz and Yury Zablotski, published in 15 October 2019 by Springer, Cham.

According to the researcher, stakeholder participation is a crucial aspect of fisheries legislation worldwide for many states and local agencies. For instance, the European Common Fisheries Policy (CFP) has shifted towards a holistic approach in managing marine resources, which involves taking into account stakeholders' knowledge, values, needs, and social interactions in decision-making processes.

The study concluded that in order to enhance the science and practice of stakeholder involvement in coastal and marine fisheries management, it is necessary to establish clear definitions of what constitutes a stakeholder and the type of participation is required.

6. **Safety of Fisherfolk at Seas: Points for Critical Intervention.** Article written by A Suresh, V Sajesh, A Mohanty, M Baiju, C Ravishankar, M Mohanan and C Joshy published in Economic and Political Weekly in October 2018.

The safety of fisherfolk at sea is a matter of concern for important international agencies such as the FAO, ILO, and IMO. The FAO (2015) has developed the "Code of Conduct and Technical Guidelines on Responsible Fisheries", which clearly outlines the role of states in ensuring the safety of fisherfolk. Safe fishing is an essential part of the code of conduct of responsible fisheries proposed by the FAO.

Kerala has made it mandatory for mechanized boats to possess life jackets, lifebuoys, life rafts, and fire-fighting appliances to be registered. The boats are also required to be equipped with necessary navigational lights (all-round lights), fishing signal lights, day signals for fishing, at least one torch, mirror reflector (heliograph), and pyrotechnics (consisting four rocket parachutes and six red hand fliers) to meet emergency situations.

The high number of fatalities in India is largely attributed to factors such as unpreparedness to deal with disasters, inadequate institutional mechanisms for early warnings, and the fisherfolk's disregard for warning signals.

The India Meteorological Department (IMD) is responsible for providing weather forecasts to state governments well in advance. However, land-based communication networks are only available a few nautical miles from the shore, beyond which very high frequency (VHF) radio and telephone sets, operating on standard international frequencies, are the most commonly used means of communication.

Currently, fishing vessels do not possess the MMSI number. The Global Maritime Distress and Safety System (GMDSS) was created and developed by the IMO to ensure quick alerting of shore rescue authorities and nearby vessels during a marine emergency, utilizing both terrestrial and satellite technology.

Area A3 is defined as the region outside of areas A1 and A2, which includes the area between 70º N and 70º S. In this region, fishing vessels are permitted to use high frequency (HF) sets or satellite communication systems (such as INMARSAT). Fisherfolk and boat owners reported during discussions in February 2018 that they must buy the necessary equipment and pay a monthly user fee or subscription charges

The safety of the vessel is also a matter of concern. Boat owners, in order to outdo other vessels, install high-power engines and make changes to boat specifications, which deviates from the recommended technical guidelines, posing a risk to the safety of vessels at sea.

Although it is obligatory to create a stability booklet after constructing a vessel, fishing boats are not required to have one for registration. Therefore, it is strongly recommended that all vessels undergo annual/biannual inspections after the first five years to ensure safety standards, such as the boat's durability, engine condition, navigation lights, communication devices, life-saving and firefighting equipment, water tightness of doors, engine room, and portholes, as well as hull inspections.

Fisherfolk around the world, particularly those engaged in non-industrialized and traditional fishing, primarily depend on their own experience, practical knowledge, and expertise to tackle life-threatening circumstances (McDonald and Kucera 2007). Additionally, boat owners are observed to be somewhat careless in providing safety and communication equipment on their vessels and while evaluating the durability and stability of their boats.

An effective extension system is crucial to promote safety measures among fisherfolk. Raising awareness among traditional fisherfolk and providing incentives for adopting safety practices, even if it incurs state expenses, can serve a greater purpose.

The use of motorised boats has enabled traditional fisherfolk to venture into offshore fishing, which provides an opportunity to avoid competition in coastal waters and access new resources. However, this also increases the level of risk involved.

The study proposes enhancing the safety of fisherfolk and improving the information system on marine fishing as a crucial measure. Additionally, community support from fisherfolk is recommended to promote awareness and implementation of safety measures, as part of long-term strategies to safeguard the lives of fisherfolk residing in coastal areas.

7. **A Pilot Study on Knowledge & Practice Regarding Prevention of Occupational Hazards and Attitude Towards Utilisation of Safety Measures Among Fishermen Working at a Selected Harbour.** by Devina E. Rodrigues, Udaya Kiran published in NITTE Journal of Health and Allied Sciences NU, 2020

The pilot study found that 55% of the subjects had insufficient knowledge about work-related hazards, while the rest had adequate knowledge. The fishermen had negative attitudes towards safety and protective devices, with a score of 50.57% and 53.71%, respectively, but they had a positive attitude towards vessel safety. The R values showed a positive correlation, suggesting that an increase in knowledge leads to an increase in practices among fishermen, and an increase in practice tends to improve their attitude towards safety.

The study found a significant correlation between the source of information and the practice scores. Around one-third of the fishermen expressed doubt about their knowledge of using the essential five safety equipment in the event of an emergency, which is consistent with the study's findings.

8. **Factors Contributing for Vulnerability on Livelihood of Fishers of Ratnagiri, Maharashtra State, India.** by B. M. Yadav, S. M. Wasave, S. S. Mandavkar, S. V. Patil, M. M. Shirdhankar, K. J. Chaudhari. Article published in Asian Journal of Agricultural Extension, Economics & Sociology in Dec 2020.

According to the journal, individuals who depend on small-scale fisheries in developing countries are vulnerable to climatic shocks and stresses such as cyclones, floods, droughts, sea-level rise, land erosion, and changes in temperature and rainfall. They also suffer physical injuries and health effects. Cyclones and floods can damage boats, nets, fishing gear, and fish landing centres, as well as community infrastructure such as educational, health, and housing facilities.

The data for the present study was collected from the three fishing villages of Ratnagiri district namely Kasarveli, Kalbadevi and Varvade. These villages have the status of minor fish landing centres of Ratnagiri district of Maharashtra state.
The major population in the study area represents the fisher communities i.e., Kharvi, and Bhandari involved in fisheries and allied activities as income sources for their livelihood.

9. **India's Fisheries: Past, Present, and Future**. by Mahima Jaini published in IDR on 02 Jul 2020.

There was an amendment in the National Fishing Ban due to Monsoons. The modification made to the yearly fishing ban was limited to 2020 and failed to address the present challenges. Instead of resolving the issue, it escalated competition and jeopardized the safety of fishers in hazardous weather conditions to provide for non-existent markets. Additionally, it increased the chances of migrant fishers falling into bonded labour due to debt.

The program also aims to increase inland and cultured fish production, introduce new technologies, and expand fisheries development in new regions (including Ladakh) to make productive use of idle land and water resources. However, the potential hazards of aquaculture operations, such as invasive species, water pollution, and disease, must be

considered. Additionally, in the current era, only fishing enterprises that provide local supply or have short and simple commodity chains can survive. This paper emphasizes the risks involved in shortening the monsoon fishing ban.

10. **Knowledge and Practice on Safety measures among Fishermen of Udupi District** by Ansuya, Manjula, Jane Maria Serrao. Article published in International Journal of Science and Research (IJSR) · September 2014.

The article discusses occupational health hazards encountered by fishermen, which are vast. Factors such as prolonged exposure to sun and weather extremes, extreme working conditions, extended duration of work with insufficient rest, lack of formal safety training, and inadequate personal protective equipment are significant contributors to the safety risks in the fishing industry.

The study tested the association between practice score and demographic variables like age, work experience, and training attendance by using chi-square. However, no statistical association could be established between practice and the selected demographic variables. Since the knowledge and practice scores did not follow the principle of normal distribution, it was concluded that an increase in knowledge leads to an increase in the practice of safety culture.

The study findings showed that the majority of fishermen (78.8%) had average knowledge, 16% had good knowledge regarding safety measures, and the favourable practice rate was 49%. These results were consistent with a study conducted by Rodrigues in Mangalore DK District, Karnataka.

11. **Human and Fishing Vessel Losses in Sea Accidents in the UK fishing Industry from 1948 to 2008**. by S E Roberts, Bogdan Jaremin, Peter B. Marlow. Paper published in International Maritime Health 2010.

Over the past 40 years, there has been a significant increase in the number of commercial fishermen worldwide, from 13 million in 1970 to 43.5 million in 2008, with the majority of them located in Asia and Africa. Poorly maintained and/or unseaworthy fishing vessels and adverse weather conditions have been identified as significant factors contributing to fishing vessel accidents and resulting in significant loss of life.

The study aimed to achieve three main objectives. Firstly, it aimed to examine mortality rates for accidents to UK fishing vessels from 1948 to 2005. Secondly, it aimed to investigate the causes and circumstances which lead to these accidents. Thirdly, it aimed to explore trends in fishing vessel accidents.

Out of the 1,039 deaths resulting from fishing vessel accidents in the UK fishing industry between 1948 and 2008, most of them (65%) were caused by vessels that sank, overturned, or went missing. This includes 3% of accidents where vessels capsized due to getting entangled with fishing gear.

The percentage changes in annual mortality rates over a 20-year period (1989-2008) were; a 1.03% reduction in all casualties ($p=0.40$), a 1.28% reduction in foundered/capsized/disappeared incidents ($p=0.115$), a 1.74% reduction in capsized-snagged gear incidents ($p=0.001$), a 1.68% reduction in incidents of collisions ($p=0.17$), a 2.68% increase in incidents of grounded ($p=0.47$), a 2.14% increase in cases of fires and explosions ($p=0.034$), and water obstructions. It was also noted that about 21% of fatalities were due to the vessels being wrecked post grounding or stranding, 7% of fatalities were from collisions with other vessels, 5% fatalities were from fires and explosions, and 1% fatalities were from other causes.

During the 61-year study period, between 1948 and 2008, the mortality rate for fishing vessel accidents was observed to be 70 per 100,000 fishermen. However, there were no significant trends in mortality rates related to different causes such as vessels that foundered, capsized, or disappeared, capsized after snagging fishing gear, were involved in collisions, or had fires or explosions on board.

The majority of the vessels (54%) losses were due to foundering, capsizing, and disappearances, followed by grounding/stranding (24%), fires and explosions accounted for 11%, collisions (9%), and other causes were 3%. The mortality risks were highest for vessels that foundered, capsized or disappeared (with a ratio of 0.76 fatalities per vessel loss), followed by vessels that grounded (0.57), collisions (0.46), and fires and explosions (0.31).

Both the vessels' loss rates and mortality rates from vessel accidents were lower for small vessels, which indicated lower exposure levels with few fluctuations over time.

Out of 588 fatalities recorded between 1965 and 2008, about 66% (387) were caused by fishing vessels that foundered, capsized, or disappeared. For 74% (288) of these fatalities, severe weather conditions were identified as the major factor. Among the 72 fatalities caused by grounding, 38 were attributed to fog, poor visibility, or severe weather. The highest percentage of deaths were due to foundering, capsizing, or disappearance, which occurred between noon and 4 pm (44%), while most of the fatalities from fires, explosions and groundings which happened during night (69%).

Collisions and fires/explosions were frequently responsible for fatalities on larger fishing vessels, while fatalities from vessels capsizing after snagging fishing gear were more common on smaller vessels.

During the recent 15-year period from 1994 to 2008, mortality rates from fishing vessel accidents were analysed according to the regions of the UK, where the fishing vessel was registered. The study found that fishing vessels registered in the northwest of England had the highest mortality rate of 215 per 100,000 fishermen-years.

The highest mortality rate (215 per 100,000 fishermen-years) from fishing vessel accidents was observed in the north west of England, followed by the south west of England, Wales, and Scotland (east and west coasts) with mortality rates ranging from 58 to 66 per 100,000. However, the mortality rates for the south west of England and Wales

were influenced by two major incidents involving Anglo-Spanish fishing vessels, namely the *Arosa* (12 fatalities) and the *Pescalanza* (six). The study found no significant correlation between the fatal accident rate in each geographical region and the average distance from port ($p = 0.20$) or the shore ($p = 0.47$).

This study encompassed a significant amount of data, including over 1,000 fatalities, over 1,500 vessel losses, and 1.49 million fishermen-years at risk, making it one of the largest investigations of its kind into loss of life caused by fishing vessel accidents.

One of the study's limitations was that the population of fishing vessels and fishermen in the UK fishing industry during the 61-year study period was typically estimated or surveyed by various governmental departments and agencies, which may have resulted in some degree of error that varied over time.

Before the publication of the report, it appeared that unstable, overloaded, or unseaworthy vessels had become a more significant cause of mortality in UK fishing vessel accidents than weather and sea state conditions in recent years. This was evidenced by several casualties involving fishing vessels that had undergone modifications that adversely affected their stability.

A recommendation was made to prioritize the inspection of fishing vessels that have undergone significant modifications, especially those that have been converted for a different mode of fishing operation, in marine surveys. Case series of marine investigations provided evidence that the issue of poorly maintained and unseaworthy fishing vessels has grown, potentially due to increased economic pressures, although it could also be due to improvements in the investigation and documentation of marine accidents over time.

The paper clearly established correlation between the area of operation, construction and sea worthiness of fishing boats with the number of accidents and casualties.

12. **Bivalve Fishery of Sindhudurg and Ratnagiri Coast, Maharashtra, India** by Santosh Nagnath Bhendekar, Vaibhav Dinkar Mhatre, Geetha Sasikumar, Kolliyil Sunil Mohamed and Anulekshmi Chellappan. Published in Coastal Education & Research Foundation, Inc. on 16 Sep 19.

This paper provides an insight into the bivalve fishery of Sindhudurg and Ratnagiri coast, Maharashtra and helps to understand the landing estimates for different species in this region which can be used by fisheries managers while planning their activities. The correlation matrix shows that condition index (a measure of health) and percentage edibility are correlated with water temperature in creeks, thus providing useful information about how environmental conditions affect these parameters. Additionally, it also highlights the importance of handpicking during low tide as mostly women were observed doing so when mechanised fishing was banned from June-July period due to high demand for bivalves in local markets at that time

This paper provides an overview of the bivalve fishery in Sindhudurg and Ratnagiri coast, Maharashtra with estimated landing estimates for different species as well as correlations between environmental conditions and condition index/percentage edibility. This paper, however does not provide any information on the safety issues, sustainability of bivalve fisheries in Sindhudurg and Ratnagiri coast, Maharashtra. It also does not discuss potential solutions to address these issues or suggest ways for improving fishery management practices.

13. **Awareness Towards the Sea Safety Measures Among Fishers of Varsova Fishing Village, Mumbai Maharashtra**. By S V. Pattl and Shweta Kumari. Published in 2017.

The International Labour Organization (ILO) reports that worldwide, capture fisheries result in 24,000 fatalities each year. Ensuring the safety of fishing vessels and their crew involves multiple components such as vessel design, construction, and onboard

equipment. However, safety regulations for small-scale fishing fleets are limited and mainly focus on basic life-saving, communication, and portable fire lighting equipment

The study was conducted in the state of Maharashtra, India to assess the sea safety measures used by fishers during fishing in the sea. The data was collected from 40 respondents in the Versova fishing village with the help of a pre-tested interview schedule. The results showed that the number of boats operating in Versova was declining year by year, and most of the boats were operating in Versova, with the majority being trawlers. The study highlights the need to understand how fishermen perceive sea safety measures in fishing and to reduce the rate of injury and death in the fishing industry.

2.4 **Theories Related to Fishermen Safety**

There are several theories which can be related to Fishermen Safety, that aim to understand and explain the various factors that contribute to the safety and well-being of fishermen. Some of the commonly used theories, not being in any sequence of priority, are as follows:-

Human Factors Theory. This theory focuses on the role that human factors, such as knowledge, skills, experience, and training, play in determining safety outcomes.

Safety Culture Theory. This theory emphasizes the importance of a strong safety culture in organizations and the role that values, beliefs, and norms play in shaping safety behaviours.

Risk Perception Theory. This theory explores how individuals and organizations perceive and respond to risks and how this perception can influence safety outcomes.

Accident Causation Theory. This theory seeks to identify the root causes of accidents and incidents in order to prevent them from happening again in the future.

Systems Theory. This theory explores how different components of a system, such as technology, processes, and human factors, interact to determine the overall level of safety.

Social Ecological Systems Theory. This theory focuses on the interplay of various factors, including human behaviour, institutions, and the physical environment, to understand how these factors influence the safety of fishermen.

Human Factors Theory. This theory emphasizes the role of human factors, such as lack of training, fatigue, and stress, in increasing the risk of accidents and incidents for fishermen.

Risk Management Theory. This theory explains the need for fishermen to assess and manage the risks associated with fishing, including the development of risk management strategies and the use of safety equipment.

The Prevention Paradox Theory. This theory states that even though there may be a decrease in the number of accidents and incidents in a particular region, there may still be a need for increased safety measures due to the increasing size and complexity of fishing operations.

Theory of Organizational Safety Culture. This theory emphasizes the importance of organizational culture in promoting and maintaining a safe working environment for fishermen.

CHAPTER-3
RESEARCH DESIGN AND METHODOLOGY

The Research Design of a Research Study refers to the framework or structure that details the methods, strategies, and procedures employed to conduct the research. It involves identifying the research question, selecting the appropriate research methods, determining the sample size and sampling method, data collection procedures, and data analysis techniques. The research design helps in ensuring that the research study is systematic, efficient, and achieves its objectives effectively.

In the context of this dissertation on Fishermen Safety, the research design should be developed after carefully reviewing the literature and considering the research question, research objectives, and the target population. The research design should be flexible and adaptable to accommodate changes during the course of the study, if required. The data collection methods and techniques should be selected in such a way that they are relevant to the research question and capable of providing accurate and reliable data. The data analysis techniques should be chosen based on the type of data collected and the research objectives. The research design should also consider ethical considerations and ensure that the rights of the participants are protected.

3.1 **Research Objectives**. Following are the Research Objectives: -

(a) To understand dangers and risks in fishing.

(b) To understand significance of addressing safety at sea as an integral part of fisheries management.

(c) To study the number of accidents at sea and their causes.

(d) To evaluate the importance of training fishermen and their families in aspects of safety at sea.

(e) To identify areas/regions of high concentration of incidents involving fishing boats and relation with methods of fishing.

3.2 **Research Questions**. Research questions are the central questions that are required to be answered through their study. These questions will guide the research process and help to determine the specific objectives of the study. Research questions are typically formulated based on the research problem and the literature review, and provide the basis for the development of the research methodology and the collection and analysis of data.

Null Hypothesis

Accidents, incidents involving fishing boats and loss of life and property at sea is not attributed to internal factors such as knowledge level, crew proficiency, safety culture onboard and availability of safety equipment onboard.

Alternate Hypotheses

Following are the research questions: -

(a) Accidents, incidents involving fishing boats at sea resulting in loss of life and property at sea are attributable to internal factors such as insufficient knowledge amongst fishermen and owners, crew proficiency, safety culture, presence of safety equipment onboard.

(b) Ratnagiri and Sindhudurg districts of Maharashtra have high concentration of accidents involving fishing boats in Arabian Sea.

(c) Human error is a causative factor for incidents involving fishing boats at sea.

(d) Number of accidents involving fishing boats causing loss of life and injuries to fishermen are directly related to methods of fishing.

(e) Adverse weather conditions and rough seas cause casualties of fishermen despite pre-warning by Agencies.

3.3 **Research Methodology**

A Mixed methodology consisting of both qualitative and quantitative methods, has been employed to study the research question as a single research methodology is not sufficient to fully understand the research problem.

Mixed methodology has facilitated collection and analysis of data from multiple sources. Primary data has been collected by qualitative methods such as in-depth interviews, focus group discussions with officials of following: -

(a) Indian Coast Guard
(b) Coastal Security Police
(c) Fisheries
(d) IMD
(e) College of Fisheries
(f) Fishing Boat Owners
(g) Fishermen and *Tandel*

Primary Data has also been collected by referring to various government regulations and guidelines on the subject. Quantitative method has been employed by survey, feedback on a questionnaire from participant at field level to gather rich, detailed information about their experiences and perspectives, which was used to test hypotheses and to collect data was analysed statistically.

Data was also gathered by referring to the replies given to questions raised in Parliament to the Government on this subject.

Secondary Data was collected by referring to books, records, archival data, documents and journals on the subject.

The use of mixed methodology provided a more complete picture of the research problem and enabled triangulation of the data, which increased the validity and reliability of the results. It also provided the opportunity to explore and compare the results obtained from different methodologies, which helped to address limitations in individual methodologies and to provide a more comprehensive understanding of the research problem.

3.4 Data Collection Methods

The selection of data collection method depended on several factors, including the research questions, the type of intended data collected (Qualitative and Quantitative), the resources available, and the population being studied. The data collection method utilised were as follows: -

(a) **Survey** A online survey using google forms was administered to officials of Indian Coast Guard, Indian Navy and Coastal Security Police. A total of 85 samples were received.

(b) **Interviews** Face-to-face and over-the-phone interviews with pre-determined and open-ended questions were held with various officials of Indian Coast Guard, Indian Navy, IMD, Fisheries (both at Delhi and Maharashtra), Coastal Security Police of Maharashtra, Boat Owners, Fishermen and *Tandel* were conducted.

(c) **Focus Groups Discussion** Focus group discussion were held during Community Interaction Program with fishermen and boat owners at fishing villages of Mirkarwada, Guhagar Ratnagiri and of Sindhudurg. Focus groups can provide rich qualitative data about the views and experiences of the fishermen and boat owners.

(d) **Observational research** was also carried out by ICG ships while on patrol where they observed the fishing boats and recorded their behaviours, in a natural setting where these boats operate.

(e) **Secondary Data Analysis** Secondary data analysis involves the use of existing data from sources such as government reports, surveys, and databases.

3.5 Sampling Techniques

(a) **Simple Random Sampling**. In this method samples from the fishermen population were randomly selected. Each fisherman in the population had an equal chance of being selected.

(b) **Stratified Sampling.** This method involved dividing the fishermen population into homogeneous subgroups, or strata consisting of fishermen fishing with Traditional Crafts, Motorised Crafts and Mechanised Crafts and selecting a sample from each stratum.

3.6 Data Analysis Methods

(a) **Data Preparation.** Data, which was collected through various methods, such as surveys, interviews, focus groups, observations, and document analysis was cleaned off incomplete and ambiguous content and organised.

(b) **Qualitative Data Analysis.** Qualitative data was analysed through content analysis, thematic analysis, discourse analysis, and grounded theory. These methods were used to identify patterns, themes, and relationships in the data.

(c) **Quantitative Data Analysis.** Quantitative data was analysed through statistical methods such as descriptive, inferential, and regression analysis. These methods aim to summarize, describe, and draw inferences from the data.

(d) **Integration and Interpretation.** The results obtained from qualitative and quantitative methods were integrated and interpreted to draw meaningful conclusions.

CHAPTER-4

FISHERIES IN MAHARASHTRA

4.1 General Information

Maharashtra

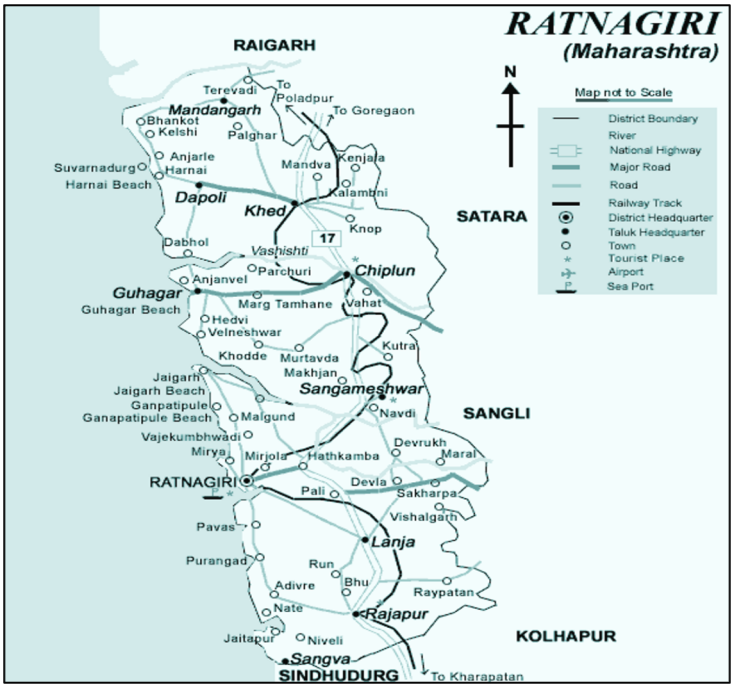
Fig 4.1: District wise map of Maharashtra

Geographical Area (000 Sq KM)	308
Administrative Structure	
Divisions	6
Districts	36
Tahsils	355
Towns *	534
Zilha Parishads	34
Panchayat Samitis	351
Gram Panchayats	27,920
Municipal Corporations	26
Municipal Councils	230
Nagar Panchayats	13
Cantonment Boards	7
Population As Per Census- 2011 (In Thousand)	
Male	58243
Female	54131
Total	1,12,374
Rural	61556
Urban	50818
Scheduled Castes	13276
Male	6767
Female	6509
Scheduled Tribes	10,510
Male	5313
Female	5195
Literacy Rate (%)	
Male	88
Female	76
Total	82
Density of Population (Sq. Km)	365
Sex Ratio (Females Per Thousand Males)	929
Percentage of Urban Population	45.2
Percentage of Rural Population	54.8
Human Development Index 2011	0.572

Table 4.1: Facts about Maharashtra

Source: Economic Survey of Maharashtra 2015-16

Ratnagiri and Sindhudurg



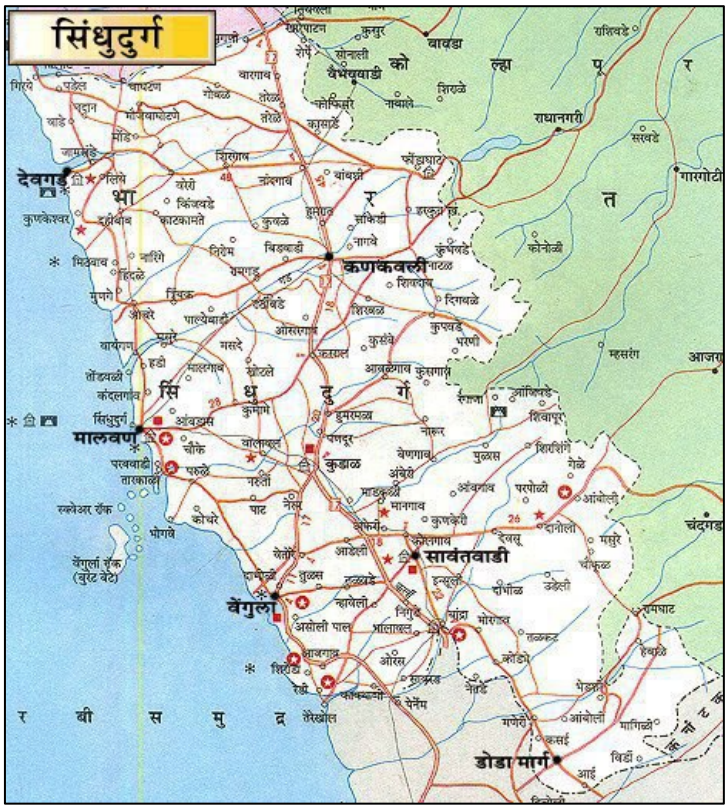


Fig 4.2: Maps of Ratnagiri and Sindhudurg

Source: *konkankatta.in*

4.2 **Marine Fishery Statistics of Maharashtra State**

Item	**Ratnagiri**	**Sindhudurg**	**Total for Maharashtra**
Geographical Area (000 Sq KM)	308		
Fishing Villages	110	87	526
Fisher Folk Population	71620	32017	364899
Male	35957	16548	185622
Fishermen Families	16696	7304	87717
Traditional Fishermen Families	15065	6193	80906
BPL Families	3322	2510	274009
Active Fishermen	14416	7174	76928
Sex Ratio (Female per 1000 Males)	992	935	966
Fish Landing Herbal	1	-	3
Landing Centres	46	34	173
Government Training Centres	1	1	6
Operating Fishing Boats			
Mechanised	2267	1618	12946
Non-Mechanised	771	667	2272
Total Boats	3038	2285	15218
Marine Fish Production (MT) 2020-21	65374	17311	398511
Inland Fish Production of Maharashtra			124587

Table 4.2: Marine Fisheries Statistics, Maharashtra

Source: Economic Survey of Maharashtra 2015-16

4.3 Marine Fisheries

Marine sector dominates the entire fishery sector in Maharashtra coastline, and is divided into 25 zones. Marine fishery deals with the fishery aspects of the sea water or ocean. Marine fish harvested in the state consist of about 49 commercially important species. Important marine fish in the state is Sardine, Non-Penaeid Prawns, Harpoon Nehereus, Penaeid Prawns, Pomfret, Seer fishes, Black pomfret, Eles, Lobster, and Mackerels etc.

Amongst the 25 zones, there are 173 landings centers and 526 Fishing Villages of which 110 are in Ratnagiri and 87 are in Sindhudurg districts, in Marine districts of Maharashtra State. There are 15218 Marine fishing boats in operation out of which 12946 are Mechanised boats & rest are 2272 of Non-mechanised boats during the year 2020-21.

4.4 Fishing Fleet

There are 15218 Marine fishing boats in operation out of which 12946 are Mechanised boats and rest are 2272 of non-mechanised boats during the year 2020-21. An operating boat is one which was in operation for at least 15 days in a month and at least two such months in a year.

4.5 Fishing Methods and Efforts

The main fishing techniques utilized in the state of Maharashtra are Trawl fishing, Bagnet fishing, Gillnet fishing, and Purse-Seine fishing. The number of efforts made by the fishing fleet under different methods of fishing is given in the following table: -

Fishing Methods and Efforts

Fishing Method	Mechanised Boat	Non-Mechanised Boat
Trawl net Fishery	218890	0
Bagnet Fishery	321348	7122
Gillnet Fishery	735459	18904
Purse seine	29556	0
Long lines	293	0
Rampan	0	632
Other Boats	62327	50691
Total Efforts	1367873	77349
Total no of Operating Boats	12946	2272
Per Boat No of Efforts	106	34
Per Boat Production in Tonne	31	1
Per Unit efforts catch in KG	290	18

Table 4.3: Fishing Efforts during 2020

Source: Fish Production Report 2020-21

It is seen that on an average, in 2020-21, there were 106 operating Mechanized Boats and 34 operating Non-Mechanized Boats. The Mechanized Boats made 99.9% of the total catch, with an average catch per unit effort of 290 kg. On the other hand, the Non-Mechanized Boats only caught an average of 18 kg per unit effort. In total, there were 1,445,222 efforts made during 2020-21, which was a 21.07% increase from 2019-20 and a 30.02% increase from 2016-17. Out of these efforts, 1,367,853 were made by Mechanized Boats and 77,349 were made by Non-Mechanized Boats.

During the year 2020-21, the highest proportion of efforts made by Mechanized boats were by Gillnet boats fishing, accounting for 53.77% (735,459) of the total efforts. This was followed by Trawl net boats fishing, which made up 16.00% (218,890) of the

efforts, and Bagnet boats fishing, which made up 23.49% (321,348) of the efforts. Other boats fishing made up 4.56% (62,327) of the efforts, while Purse Seine boats fishing and Longlines fishing accounted for 2.16% (29,556) and 0.02% (293) of the efforts, respectively.

On the other hand, among non-Mechanized boats, other boats efforts made up the highest proportion of efforts at 65.54% (50,691) of the total efforts. Gillnet boats fishing accounted for 24.44% (18,904) of the efforts, while Bagnet boats fishing and *Rampan* boats made up 9.21% (7,122) and 0.82% (632) of the efforts, respectively.

In 2020-21, the average catch per unit effort for Mechanized boats was 290 kg. The highest average catch per unit effort among all the boat types was for Purse Seine boats, which caught 1884 kg of Marine fish per unit effort, followed by Trawl net boats with 796 kg, Bagnet boats with 367 kg, Gillnet boats with 60 kg, other boats with 85 kg, and longlines with 85 kg.

In contrast, the average catch per unit effort for non-Mechanized boats was only 18 kg. *Rampan* boats had the highest average catch per unit effort among non-Mechanized boats with 486 kg, followed by Bagnet boats with 23 kg, Gillnet boats with 24 kg, and other boats with 9 kg during 2020-21.

CHAPTER-5

INTERNATIONAL CONVENTIONS AND GUIDELINES ON SAFETY AT SEA

POLICIES AND LEGAL FRAMEWORK

5.1 IMO-ILO-FAO

There are three specialized agencies within the United Nations, namely the International Maritime Organization (IMO), the International Labour Organization (ILO), and the Food and Agriculture Organization (FAO), who are responsible for ensuring safety of fishermen at sea. The IMO's main function is to improve maritime safety and prevent pollution caused by ships, while the ILO sets international labour standard of basic labour rights in the form of conventions and recommendations, promoting independent employers' and workers' organizations and providing training and advisory services. Specifically for fishermen, ILO has approved seven measures that cover aspects such as minimum age, medical check-ups, employment conditions, certification of competency, accommodation, working hours, and vocational training. The FAO completed the Code of Conduct for Responsible Fisheries in 1995, which provides voluntary guidelines for responsible fisheries and is monitored biennially by member states.

Artisanal and small-scale fishermen, by virtue of their working methods, are unlikely to benefit from the safety recommendations and conventions of IMO and ILO. The primary focus is on larger vessels, particularly those engaged in international voyages within the merchant fleet. Moreover, some conventions have exemptions for fishing vessels, and those that do not apply to fishing vessels less than of 24 meters, which excludes most fishing vessels in developing countries.

5.2 FAO

The mandate of FAO is to enhance food productivity and distribution, and improve the living standards and rural conditions for people. Currently, FAO operates around 1,800 field projects, and has implemented numerous fisheries projects focused on improving

fishing vessel design, construction, equipment, and establishing fisheries training institutions. FAO also works directly with fishing communities.

The Code of Conduct for Responsible Fisheries. In 1995, the FAO completed the Code of Conduct for Responsible Fisheries, which is a comprehensive set of voluntary guidelines for responsible fisheries. The Code includes the main elements of various international conventions and legislation related to fisheries and environmental issues. FAO member states are monitored for their implementation of the Code on a biennial basis.

5.3 SOLAS

The initial international agreement on sea safety, SOLAS (Safety of Life at Sea), was in response to the Titanic tragedy of 1911. The convention was initially ratified in 1914, with revisions made in 1929 and 1948. In 1958, the establishment of IMO focused on the modification of SOLAS in 1960 as its primary mission, with continuous implementation of its revisions.

SOLAS sets minimum standards for the safety of ships in terms of their construction, equipment, and operation. It is widely considered the most significant international treaty for ensuring the safety of commercial vessels and is recognized as a generally accepted international regulation in the United Nations' 1982 Law of the Sea Convention. However, with the exception of Chapter V, SOLAS does not apply to fishing vessels, primitive wooden ships, or non-mechanically propelled vessels, which excludes a large portion of the developing world's fleet.

Chapter V of the Convention focuses specifically on navigation safety and specifies certain services that Contracting Governments are obligated to provide, as well as outlining operational provisions that apply to all ships on all voyages, in contrast to the rest of the Convention, which applies only to specific categories of vessels engaged in international voyages.

At the international conference where SOLAS 60 was adopted, three additional resolutions were passed regarding fishing vessels. The first one focused on the enforcement of SOLAS 60 regulations for fishing vessels and included specifications for rescue equipment to be carried onboard.

The second resolution encouraged governments to notify IMO about the implementation of SOLAS regulations for fishing vessels. The third resolution addressed the stability of fishing vessels and required input from FAO experts and subcommittees.

In 1985, the IMO Maritime Safety Committee established weather criteria guidelines for intact stability, which applied to cargo and passenger ships of at least 24 m in length and fishing vessels of at least 45 m in length. However, these criteria do not apply to most fishing and passenger vessels in developing countries.

In 1987, a resolution was adopted with the aim of reducing the danger caused by submarines, which are known to be a major cause of fishing boat accidents. The resolution recommended operational practices for submarines to follow..

5.4 **UN Law of the Sea (UNCLOS) Convention**

The United Nations Conference on the Law of the Sea (UNCLOS III) was completed in 1982, but it did not formally enter into force until 1994, where it was not ratified by the required number of countries. As of May 2000, the UNCLOS had been ratified by only 133 countries.

The UNCLOS is a widely accepted set of regulations that cover various aspects of the Law of the Sea, including the responsible and sustainable use of marine resources by nations. With regards to safety, the convention mandates that each state must exercise its authority and control in all administrative, technical, and social aspects over ships flying its flag. Further, the flag nation shall take such measures for ships flying its flag as are necessary to ensure safety at sea with regard to following: -

(a) The construction, equipment and seaworthiness of ship

(b) Manning of ships, Labour Conditions and the Training of crews, taking into account the applicable international instruments.

(c) Use of signals, maintenance of communications and the prevention of collisions. In taking such measures, each State is required to conform to generally accepted international regulations, procedures and practices and to take any steps necessary to secure their observance.

5.5 Torremolinos Convention and the Torremolinos Protocol

The Torremolinos International Convention for the Safety of Fishing Vessels was formulated to provide more structured guidelines than the Code and Voluntary Guidelines. Modelled after SOLAS, it was adopted at a conference in Torremolinos, Spain, and outlines safety regulations for new, decked, seagoing fishing vessels that are at least 24 m in length, including those that process their catch. Existing vessels were only subject to radio requirements.

The Convention was significant as it included stability requirements for the first time in any international convention. It also addressed a range of subjects, including construction, watertight integrity and equipment, machinery and electrical installations, fire protection, crew protection, lifesaving equipment, emergency procedures, radio communication, and shipborne navigational equipment.

Representatives from 45 countries agreed upon the Convention in 1977. However, it did not come into effect due to insufficient ratifications, as some states deemed it either too strict or too lenient for their fishing fleets. As a result, a Protocol was developed to address these concerns and aid its implementation. This was accomplished by increasing the minimum vessel size limit in several chapters from 24 m to 45 m. The Protocol also

required the development of Regional Guidelines for vessels ranging from 24 m to 45 m, taking into consideration the region's operating conditions, climate, and sheltered areas.

5.6 Code of Safety for Fishermen and Fishing Vessels

The three organizations of the United Nations, namely the ILO, IMO and FAO have jointly prepared a “Code of Safety for Fishermen and Fishing Vessels”. The codes are divided into two parts, namely: -

(a) **Part A.** "Safety and health practices for skippers and crews”, Adopted in in 1968 is an educational tool that deals with the fundamentals of safety and health.

(b) **Part B**. "Safety and health requirements for the construction and equipment of fishing vessels,” adopted in 1974. This serves as a guide to those concerned with framing National Laws and Regulations. However, it is applicable to vessels of length more than 24 m. These excluded recreational fishing vessels and processing vessels. This code is currently under revision.

5.7 FAO-ILO-IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels.

Since the 1977 Torremolinos Convention and Part B of the Code for Safety do not cover fishing vessels under 24 meters in length, which make up the majority of fishing vessels, the FAO, IMO, and ILO developed voluntary guidelines in 1980. These guidelines focus on the design, construction, and equipment of fishing vessels between 12 and 24 meters in length and are based on the principles of the safety codes.

Similar to the Code for Safety, these guidelines aim to provide guidance rather than replace national laws. The FAO, ILO, and IMO prepared voluntary guidelines for fishing

boats between 12m and 24m in length in 1980, based on safety code points. The FAO, along with the ILO and the IMO, participated actively in the revision of two publications by the IMO Subcommittee on Stability, Load Lines, and Fishing Vessels, led by Iceland. The publications being revised are the FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels and the FAO/ILO/IMO Voluntary Guidelines for the Design, Construction, and Equipment of Small Fishing Vessels.

5.8 **Standards of Training, Certification and Watchkeeping For Fishing Vessel Personnel (STCW-F) Convention.**

The IMO's STCW-F Convention, which was adopted in 1995, mandates the essential qualifications for skippers and watchkeepers on vessels of length more than 24 m, engineering officers and chief engineers on vessels with 750 kW or more propulsion power, and radio communication personnel. Chapter III of the Convention's Annex outlines the basic safety training requirements for all fishing vessel crew. Only 15 countries had ratified the STCW-F Convention as of May 2000, with India holding accession.

The STCW-F Convention is comparatively short, concise, and consists of 15 Articles and an annexure containing technical regulations in four chapters.

STCW-F had only one training included that is required for all fishing vessel personnel, regardless the position aboard, the size of the vessel, propulsion power or area of operation.

This training is the basic safety training for all fishing vessel personnel in Chapter III of the convention. However, chapter III of STCW-F only gives an indication what topics need to be addressed in the Basic Safety Training without further guidance on their content.

Chapters of STCW - F

CHAPTER			
I	II	III	IV
General provisions	Certification of Skippers, Officers, Engineer Officers and Radio Operators	Basic safety training for all fishing vessel personnel	Watchkeeping

Table 5.1: STCW (F) Chapters

The revised version of 2020, the Basic Safety training address the following issues: -

(a) Personal survival techniques (PST), including donning of lifejackets and, appropriate immersion suits

(b) Prevention of Fire and firefighting.

(c) Emergency procedures.

(d) Elementary First Aid.

(e) Prevention of marine pollution.

(f) Prevention of shipboard accidents.

5.9 Document for Guidance on the Training and Certification of Fishing Vessel Personnel (FAO/ILO/IMO)

This guidance document considers the ILO and IMO Conventions and recommendations, as well as the extensive practical knowledge of the FAO in training fishing vessel personnel. Its purpose is to provide guidance in the development, amendment, or implementation of national training programs for all categories of fishing vessel personnel. It is important to note that this additional guidance on training complements the knowledge requirements outlined in the ILO and IMO Conventions and recommendations, rather than replacing them.

The revised publication provides guidelines for the training and certification of fishing personnel in both small-scale and industrial marine fisheries. However, for fishing vessels that are less than 24 m in length or powered by machinery with less than 750 kW propulsion power, certification is not required but can be implemented at the discretion of the competent authorities. The publication has been updated to include the STCW-F (1995), the FAO Code of Conduct for Responsible Fisheries, and recent advancements in the fishing industry.

5.10 The Code of Conduct for Responsible Fisheries.

In 1995, the FAO Conference adopted the voluntary Code of Conduct for Responsible Fisheries. Some of its provisions are based on international law rules reflected in the United Nations Convention on Law of the Sea (UNCLOS) of 10 December 1982. The Code contains provisions that could become legally binding in the future, or that have already become legally binding through other agreements, such as the 1993 Agreement to Promote Compliance with “International Conservation and Management Measures by Fishing Vessels on the High Seas”.

The approach of this instrument is unique as it combines key elements from the previous international conventions and guidelines related to fisheries and environmental issues.

The Code provides guidance on responsible fisheries by setting out principles and standards for the conservation, management, and development of fisheries. It acknowledges the significance of fisheries from a nutritional, economic, social, environmental, and cultural perspective, and takes into account the interests of all stakeholders. Additionally, the Code emphasizes the importance of safety, with multiple provisions related to living and working conditions, health, safety standards, education and training, fishing vessel safety, search and rescue, and accident reporting.

The Code's non-mandatory nature has been advantageous, making it an appealing model for fisheries management without the same formal implications as the conventions it is built upon. This flexibility enables the Code to be adapted to different situations, as it is not bound to standards that may not be suitable for a specific country.

FAO conducts biennial monitoring of member countries' compliance with the Code of Conduct. A response rate of 60% during the year 2000, including those of landlocked countries, was considered encouraging. Many countries have customized the Code to their fisheries and level of development, and it appears to be an effective framework for developing various management systems.

The principles of the Code of Conduct are closely followed by the Philippine Fisheries Code of 1998. Apart from the Code, FAO has also developed nine Technical Guidelines for Responsible Fisheries.

5.11 IMO Code for the Investigation of Marine Casualities and Incidents

The aim of the above Code is to establish a process for investigating marine casualties that identifies relevant circumstances, discloses the causes of the casualty, and recommends safety measures. The Code also applies to the investigation of injuries that result in incapacitation for more than 72 hours within seven days of the incident. Its Appendix includes a set of guidelines to aid investigators in implementing the Code. An IMO Assembly Resolution is expected to append the ILO/IMO Guidelines on investigating human factors in marine casualties and incidents, which were prepared by a joint ILO/IMO Working Group in 1997 and 1998, to the Code.

5.12 Other Related IMO Conventions

The International Convention on Maritime Search and Rescue, 1979, and the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS), 1972 (as amended), are IMO Conventions that are pertinent to fishing safety and health. The International Aeronautical and Maritime Search and Rescue Manual is also important in improving the success rates of fishermen's rescues, as it assists states in meeting search and rescue obligations.

The international conventions and recommendations listed above demonstrate significant efforts made at an international level to enhance safety at sea. These efforts meticulously address various aspects such as vessel design, vessel construction, stability, safety equipment, communication, weather effects, working conditions and working hours, and training of personnel. However, what remains lacking is the effective implementation and enforcement of these regulations and administrative guidelines at the national level.

5.13 Regional Arrangements

Certain countries have integrated safety at sea into the workplans of regional organizations like the “Organization of East Caribbean States (OECS)”, the “Sub Regional Fisheries Commission of North West African States”, the “South Pacific Commission” (SPC), and the “Bay of Bengal Programme” (BOBP), signed by the governments of Bangladesh, India and Sri Lanka at Chennai on 26 Apr 2003 and the Government of Maldives at Chennai on 21 May 2003. These efforts are sometimes connected to fisheries management and could be useful in developing universal standards through a harmonization program for fisheries regulations.

5.14 Application of Conventions and Regulations to Fisheries

Despite many nations adopting legislation on sea safety, there is currently no international convention in effect that addresses fishing vessel safety, primarily due to significant differences in design and operation between fishing vessels and other ship types, making their inclusion challenging.

At the National Level, this very reason has somewhat delayed the inclusion of fishing vessels in the regulations which are formulated by maritime administrations, while at the same time, industries have, in some cases with success, lobbied for exemption for a variety of reasons. This indicates that the fishing industry is hesitant to comply with a comprehensive regulatory program.

The fishing industry has a strong tradition of being independent, with many considering it as the final frontier of free enterprise. As a result, there is, often, resentment towards the involvement of the government, which is seen as lacking sufficient knowledge of the risks and nature of fishing operations, as well as the narrow profit margins that could be diminished by mandatory compliance with regulations on vessel construction, equipment, and training.

Additionally, lawmakers may avoid imposing regulations or laws on fishing activities that could be viewed as oppressive or result in added expenses.

The research findings emphasize that fishermen's perceptions of safety can differ significantly from those of the government and government agencies', such as the Indian Coast Guard. Therefore, there is a pressing need for a better understanding of fishing culture and safety attitudes. Involving fishermen in the safety regulatory process is crucial, as the "human factor" and fishermen's input provide essential information for enhancing safety regulations' effectiveness.

To ensure safety at sea for the fishing industry, government policies must be accompanied by a complete commitment to implementing regulatory regimes with the necessary resources. Implementation strategies could include education, assistance, persuasion, promotion, economic incentives, monitoring, enforcement, and sanctions, and involve setting up or improving administrations and associated costs. Implementation should be considered at all stages of regulation formulation, rather than merely as a consequence of regulation.

While enforcement is crucial, improving legislation is equally important. In many regions, there is no need for additional fisheries regulations, but rather a need to review and revise existing regulations to address root problems. This process of regulatory review must be dynamic and involve the fishing industry. To ensure compliance and effective enforcement, both regulators and the regulated need training and a working relationship based on mutual respect and trust. The creation of National Sea-Safety Working Groups may be a positive step. In some areas, enforcement infrastructure is lacking and would need to be built from scratch.

5.15 **Governance for Fishing Safety**

The governance of fishing operations, which includes fishing safety consists of range of institutions, policies, legal frameworks, and management plans. Fishing Safety Governance has International, Regional, National and Local dimensions to it. The safety governance includes legally binding rules, National Policies and Legislation or International Conventions and Agreements, voluntary guidelines and safety codes, and customary arrangements at Local level.

Governance for fishing safety is focused on Long-Term Strategies as well as Short-Term Safety Improvements, Policies and Plans. Therefore, generally speaking, the National Level Fishing Safety governance is provided by an institutional framework consisting of National Fisheries, Maritime and Safety Authorities.

The measures recommended and implemented to promote safety and enhance chances of survival in case of accidents/incident at sea are often outlined in safety regulations and policies, which may include Sea Safety Devices (SSD), e.g., Fire Extinguishers, Life Buoys, Life Jackets, Life Rafts, Emergency Locator Beacons, AIS, DAT, Vessel Monitoring Systems, VHF radios, Radars, safety training requirements, vessel build standards, periodic surveys and Boat and Fisher Licensing procedures.

The International Labour Organisation (ILO), International Maritime Organisation (IMO), and Food and Agriculture Organization (FAO) have collectively established several international mechanisms that offer a robust legal framework for responsible fisheries, as well as the safety of fishing vessels and fishermen.

Few of the international fisheries instruments, which are related to fishing safety, are legally binding for those countries, which have ratified these agreements and conventions, and their fishing boat owners and fishermen crew. These instruments apply to foreign-flagged fishing vessels within their EEZs and ports of countries/States that have ratified these binding agreements.

International legally binding instruments, which are relevant to fishing safety are as follows: -

(a) UNCLOS (United Nations Convention on Law of the Seas, 1982.

(b) IMO's International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995.

(c) IMO Cape Town Agreement of 2012.

(d) ILO Work in Fishing Convention (C188) of 2007.

(e) FAO Agreement on Port States Measures to Prevent, Deter and Eliminate Illegal Unreported and Unregulated Fishing (PSMA) of 2009.

The international legal framework which is relevant to fishing safety further consists of various voluntary tools, such as the 1995 FAO Code of Conduct for Responsible Fisheries, which mentions various safety codes, recommendations, technical and implementation guidelines.

In accordance with Article 6, Para 6.17 of The FAO Code of Conduct for Responsible Fisheries, States are responsible for ensuring that fishing facilities, equipment, and activities provide safe, healthy, and fair working conditions in compliance with internationally agreed standards set by relevant international organizations. Additionally, Article 8, para 1.5 highlights the need for States to implement health and safety standards for all individuals employed in fishing operations, with minimum requirements aligned with relevant international agreements on working and service conditions.

Detail information about the voluntary instruments can be referred from the following: -

(a) **Code of Safety for Fishermen and Fishing Vessels, 2005.** The Code of Safety is a Two-Part guidebook that recommends **"safety and Health Practices for Fishermen as Part A"** and **"Safety and Health Requirements for the Construction and Equipment of Fishing Vessels as Part B".**

(i) **Part A.** This section outlines the roles and responsibilities of Competent Authorities, *Tandels*, and fisher crews, and covers topics such as fishermen education, training, safety awareness, and health and medical care in the fishing industry. These instructions are applicable to fishing vessels of all sizes, including those less than 12 meters in length.

(ii) **Part B**. This part provides detailed information to Boat/Shipbuilders and Boat Owners on the design, construction and equipment fittings on the fishing vessels, with a view to promoting the safety of Fishing Vessels as well as the safety and health of the crew. **However, Part B applies only to fishing vessels more than 24 m in length.**

(b) **Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005**. The Guidelines offer overall direction for the safe practices in designing, constructing and equipping decked fishing vessels between 12-24 m in length. They cover areas such as construction, stability, machinery, fire protection, crew protection, lifesaving equipment, emergency procedures, radio communication, navigational equipment and crew accommodation.

(c) **Safety Recommendations for Decked Fishing Vessels of Less Than 12 - Meters in Length and Undecked Fishing Vessels,** 2012.

These safety guidelines offer guidance on the design, equipment fit, crew training, and protection of Small Fishing Vessels to ensure the safety of the vessel and the well-being of the fishing crew. These provisions are applicable to both decked vessels of less than 12 m in length and undecked vessels that operate on seas, oceans, rivers, lakes, and dams.

The guidelines cover a range of practical recommendations, including vessel construction, stability and seaworthiness, machinery and electrical installations, fire protection and firefighting, crew protection, life-saving appliances, emergency procedures, safety training, radio communications, navigational equipment, crew accommodation, and crew competence development.

(d) **Technical Guidelines for Responsible Fisheries**: **Fishing Operations: Best Practices to Improve Safety at Sea in Fisheries Sector, 2015.** The Technical Guidelines aim to help authorities improve safety, working conditions, and health in fisheries operations by providing information on data and information collection, safety analysis, conducting National Fisheries Surveys to understand causes of accidents, identifying problems and solutions, developing safety strategies, and offering advice on managing change.

(d) **FAO/ILO/IMO Document for guidance on Training and Certification of the Fishing Vessel Personnel, 2001.** This document provides information for Administrations and Educational & Training Institutes on the organization of training of fishing boat personnel, as well as the subjects to be covered, training methods to used, and certification requirements.

5.16 **Personal Safety**

The implementation of proper safety measures onboard fishing vessels is of utmost importance as it can save lives, prevent serious accidents and injuries, promote occupational health and good working conditions, protect the vessel from damage, safeguard the marine environment, and ultimately contribute to sustainable and profitable fishing operations.

Safety on fishing vessels is a shared responsibility among boat owners, *Tandels,* fishing crew, and cooperatives. Therefore, it is crucial for all individuals involved in fishing operations to have a comprehensive understanding of the potential hazards and risks associated with working at sea, as well as knowledge of contingency planning and measures to mitigate risks.

Training in personal survival techniques, such as using lifejackets, life-buoys, life rafts, fire prevention and firefighting, emergency procedures, basic first aid, prevention of marine pollution, and shipboard accident prevention, is necessary for every person working onboard a fishing vessel. The STCW-F, 1995 by the IMO, establishes minimum training and certification requirements for seagoing fishing vessel personnel to promote safety at sea and protect the marine environment.

There are several ways to improve and ensure personal safety onboard. These include wearing appropriate gear such as life jackets, helmets, proper footwear, clothing, gloves, and sunglasses. It is also important to carry enough water and food, as well as necessary safety equipment like a first aid kit, fire extinguisher, safety knife, and a thermal protective blanket.

The presence of lifesaving apparatus is crucial on fishing vessels, and it is important to comply with national policies and regulations regarding such apparatus. For small-scale fishing vessels of up to 12 m and un-decked vessels, it is generally recommended to have the following equipment on board: -

(a) Lifejackets for every person on board

(b) Lifebuoy

(c) Distress signals, including at least 2 handheld flares

(c) Capsize rope

(d) Whistle, Mirror and Emergency Torch

Life rafts and additional distress signals in the form of parachute rockets are recommended for small-scale fishing vessels that operate further into the sea. Emergency smoke signals, radar reflectors, and fluorescent emergency marker dye are additional emergency materials that could be useful to carry on-board.

A basic First Aid Kit is absolute essential equipment onboard.

CHAPTER - 6
REGULATIONS AND POLICIES IN INDIA

India has a vast coastline of approximately 7,516 km and a large population of fishermen who depend on the sea for their livelihood. Fishing is a hazardous profession, with fishermen facing various safety risks such as accidents, storms, and natural disasters. To mitigate these risks, the Indian government has put in place various regulations and policies to ensure the safety of fishermen at sea. These regulations and policies are designed to prevent accidents and provide assistance in case of emergencies, such as Search and Rescue operations, Medical Evacuations, and Disaster Management.

The government also provides welfare schemes and financial assistance to fishermen and their families in case of accidents or loss of life at sea. This article aims to provide an overview of the regulations and policies for fishermen safety in India, including the various safety devices and equipment required to be onboard fishing boats, the training and education of fishermen, and the role of government agencies such as the Indian Coast Guard in ensuring the safety of fishermen at sea.

Regulations and Enforcement

6.1 Merchant Shipping Act and Rules

Every Indian fishing boat must undergo an inspection to ensure that it has the required life-saving appliances, fire appliances, lights, shapes, and sound signals, as specified in the Merchant Shipping (Life Saving Appliances) Rules, 1991, the Merchant Shipping (Fire Appliances) Rules, 1969, and the Merchant Shipping (Prevention of Collisions at Sea) Regulations, 1975.

6.2 **Maharashtra Marine Fishing Regulation Act (MMFRA), 1981 and Amendment Act 2021.**

The Maharashtra Marine Fishing Regulation Act, 1981 governs the regulation and sustainable management of fisheries. The Act was amended with the publication of the Maharashtra Marine Fishing Regulation (Amendment) Act, 2021 on January 25, 2022.

The primary purpose of the Act is to regulate fishing activities by fishing vessels along the coastline of the State of Maharashtra and address related issues.

Various orders and notifications have been issued in these Acts regarding necessary qualification and training certificate in sea navigation as a necessary eligibility criterion for getting a licence for operating a fishing vessel. Apart from these various other aspects of fishery's management in the state like the Trawl net mesh size, purse seine fishing regulation, LED light fishing ban, etc.

The MMFRA's salient features are as given below: -

(a) Tehsildar was acting as Adjudicating Officer, and due to the increase in pendency of cases with Tehsildar, as an officer from Fisheries Department, namely Assistant Commissioner of Fisheries, was declared as Adjudicating Officer.

(b) Terminologies such as Master, non-motorised, motorised, and mechanised vessel were clearly defined.

(c) To provide for the sate Advisory and Monitoring Committee to recommend to the State Govt. the regulations to be enforced in Chapter – II and to coordinate, monitor and to give advice or directions to the District Committees.

(d) To govern the crew size and fishing equipment used for various fishing vessels and fishing methods.

(e) To ensure the safety of fishermen and maintain law and order, it is mandated that both fishermen and their cooperative societies comply with any instructions or directions issued by officers of the Fisheries Department and coastal police.

(f) Providing licence to master of operator *(Tandel)* of a motorized or mechanized fishing vessel.

(g) To provide for seizing accessories and fishing gear fitted onboard the vessel.

(h) The Act provides for increased penalties based on the type of vessel used in fishing and the type of regulation contravened, for any violation of the Act, its orders, rules, or license conditions.

(k) Make a provision of cognizance of offenses.

Enforcement

The monsoon fishing ban **(**1st June and ending on the 31st of July (both days inclusive)**)** imposed as per the instructions from the Government of India is imposed with a view to preventing fishing by Mechanized fishing vessels during the fish breeding period and to safeguard the fishermen from venturing into the sea during the rainy period.

For the enforcement of these regulations, 23 Licensing officers are appointed for the Maharashtra coast. The Licensing officers carry out patrolling using the Patrolling vessels in the Territorial waters along their respective districts.

In addition, for the 91 sensitive fish landing centres, fishery supervisor and fishery warden are appointed. Presently, out of the sanctioned 23 supervisor posts, 20 have been filled and out of the sanctioned 273 warden posts 256 have been filled.

Government of India Initiatives

6.3 Blue Revolution Scheme

The Government of India launched "Blue Revolution Scheme for Integrated Development and Management of Fisheries" in FY 2015-16 with a central outlay of Rs 3,000 Cr for 05 years. The consistent efforts made by the Government of India to bring about the reforms through the Blue Revolution Scheme has yielded appreciable results. The fisheries sector recorded an average growth of 10.87% as against the GDP growth rate of 7% during the same period.

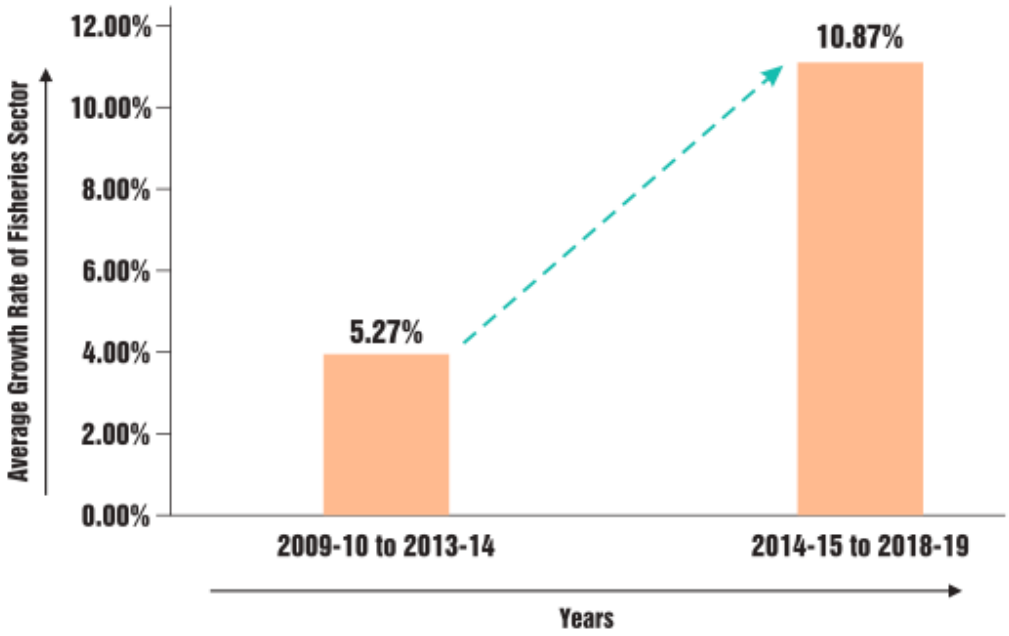


Fig 6.1: Average Growth Rate of Fisheries Sector

Source: PMMFSY handout by DOF, GOI

6.4 PM Matsaya Sampada Yojana (PMMSY)

The Blue Revolution Scheme marked the initial efforts to strengthen the fisheries sector's economic viability. As a result, the Indian government introduced the Pradhan Mantri Matsya Sampada Yojana (PMMSY) to further elevate the sector and ensure the socio-economic well-being of fishers, fish farmers, and other stakeholders.

PMMSY was intended to address following gaps in Fisheries Sector: -

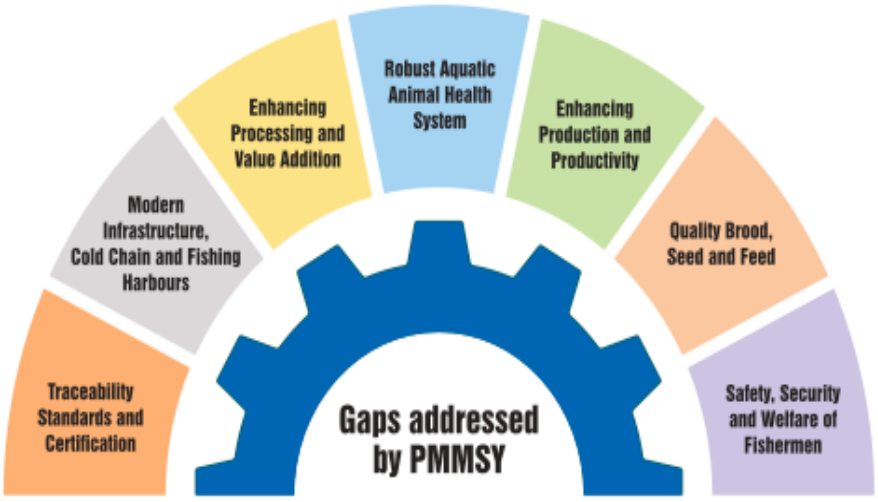


Fig 6.2: Gaps in Fisheries sector

Source: PMMFSY handout by DOF, GOI

Safety, Security and Welfare of Fishermen was also one of the important gaps to be addressed.

The Government of India introduced and launched PMMSY on 10 September 2020 with the goal of promoting sustainable development in the fisheries sector and achieving the Blue Revolution over a period of five years (2020-2025). The scheme was announced in the union budget 2019-20.

The PMMSY is a comprehensive scheme aimed at the development of the fisheries sector in India, with a total budget of Rs. 20,050 crores. The scheme has two main components, namely the

(a) **Central Sector Scheme (CS).** The CS is a non-beneficiary-oriented scheme, while the beneficiary-oriented scheme provides assistance to general category beneficiaries at 40% and 60% for SC/ST/Women.

(b) **Central Sponsored Scheme (CSS).** The CSS provides central assistance of 90% for North Eastern states, 60% for other states, and 100% for UTs. The CSS also has both beneficiary and non-beneficiary-oriented schemes.

The PMMSY's central sponsored scheme component covers three broad sub-components, namely Enhancing the Production and Productivity, Infrastructure and Post-harvest Management, and Fisheries Management and Regulatory Framework.

Objectives of PMMSY

The PMMSY aims to promote the development of the fisheries and aquaculture sectors in a sustainable, responsible, inclusive, and equitable manner. It seeks to enhance fish production and productivity through efficient use of land and water resources. The scheme also aims to modernize the value chain by focusing on post-harvest management and quality improvement, with the goal of doubling the incomes of fishers and fish farmers. Furthermore, the PMMSY has objectives to increase employment opportunities in the fisheries industry, augment its share in the agricultural Gross Value Added (GVA) and exports, provide social, economic, and physical security to fish farmers and fishermen, and establish a strong framework for fisheries management and regulation.

To maximize the benefits of PM Mastya Sampada Yojana, it will be linked and converged with various schemes including: -

(a) Ministry of Shipping's ***Sagarmala*** **Project.**

(b) ***PM Kisan Sampada Yojana*** of the Ministry of Food Processing Industries.

(c) **National Rural Livelihood Mission (NRLM)** of the Ministry of Rural Development.

(d) **Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)** of the Ministry of Rural Development.

(e) ***Rashtriya Krishi Vikas Yojana*** **(RKVY)** of the Ministry of Agriculture, among others.

Presently, for the safety and emergency response**, the subsidy from the Central and State Governments** is provided through the following schemes to the fishermen under the Pradhan Mantri Matsya Sampada Yojana: -

(a) Communication and /or Tracking Devices for traditional and motorized vessels like VHF/DAT/NAVIC/ Transponders etc. **(Unit cost Rs.35,000)**

(b) Support for providing safety kits for fishermen of Traditional and motorized fishing vessels (other than Communication and/or Tracking Device mentioned above) (Unit cost Rs. 1,00,000)

(c) Support to Fishermen for Potential Fishing Zone (PFZ) devices and network including the cost of installation and maintenance etc. (Unit cost Rs. 11,000)

6.5 **Insurance Schemes**

As per the data and *Panchanama* report received, the affected fishermen or their nominee receive the benefit of the **Group Accident Insurance scheme (GAIS).**
As part of the Pradhan Mantri Matsya Sampada Yojana (PMMSY), a Group Accident Insurance Scheme (GAIS) is being provided to offer insurance coverage to all fishers across the country. The National Fisheries Development Board (NFDB) is responsible for implementing the scheme, which is being administered by M/s Oriental Insurance Company Limited (OICL). For this purpose: -

(a) Fishers include fish workers, fish farmers and any other category of persons directly involved in fishing and fisheries related allied activities.

(b) Men or women fishers in the age group of 18 to 70 years shall be eligible for insurance coverage

Under the insurance scheme, eligible beneficiaries receive benefits without making any contributions since the entire premium amount is shared between the Centre and State based on the funding pattern of PMMSY. Eligible beneficiaries covered under insurance scheme receive: -

(a) Rs. 5.00 lakh against death or permanent total disability.

(b) Rs. 2.50 lakh against Permanent Partial Disability.

(c) Rs. 25,000 against Accidental Hospitalization.

Cooperation with Other Stake Holders

Various programs are implemented along with the agencies like the Indian Coast Guard such as the ***Sagar Kavach***, Coastal Security drill - ***Sajag*** and with the Indian Navy, for the Coastal Defence Exercise- **Sea Vigil** is conducted. During these programs and the awareness programs of the department, the fishermen are

6.6 Promotion of Sustainable Fishing

In order to promote sustainable fishing practices and protect marine environment in the region, Amendment to MMFRA, 1981 to MMFR (Amendment) Act, 2021 has been made. Various training and awareness programs have been implemented at the grass root level which is supplemented by Indian Coast Guard Community Interaction Program. At the same time strict implementation of the Act and the rules and regulations are being enforced at sea.

6.7 Implementation of Long Pending Schemes

Various initiatives have been taken for 100 % implementation of long pending schemes which directly affect fishermen safety and security.

(a) **Distress Alert Transmitters**. Subsidy was provided for installation of around 2664 nos. of DATs on fishing vessels of Maharashtra through the Blue Revolution scheme during 2018-19. The fishermen are sensitized regarding the importance of the use of DATs onboard the fishing vessels.

(b) Issuance of **Biometric Cards to Fishermen.** Department of Fisheries issued Biometric ID Cards to fishermen. In this regard a sum of 72 Crore was provided by the MHA, MoF enrolled 19,74, 098 fishermen for issuing Biometric ID Cards. Fisheries Department of the States/UT have received 3070 card readers against their requirement. RGI, MHA provided 4000 smart card readers to Navy, Coast Guard and other Coastal Security Agencies in coastal areas.

Department of Fisheries provided Biometric ID cards to 2359 Nepali fishermen engaged in fishing in Maharashtra. However, security agencies were confronted with problem scanning the biometric cards due to absence of internet at sea. Due to this problem, a possible solution was worked out for, hence forth, Aadhar Card with QR codes can be used as a substitute for Biometric card as the former can be scanned

without using internet. The fishermen apply to the Asst. Commissioner of Fisheries Office of their respective district or may approach the Aadhar centres.

(c) **AIS for eligible boats and Installation of Vessel Monitoring System.** Vessels of more than 20 meters length are required to be fitted with Automatic Identification System (AIS). To discuss about formal mechanism to track the movements of boats less than 20 meters, a committee was constituted under the Chairmanship of Secretary (Border Management) with representatives from concerned ministries and state departments. The committee concluded that satellite tech. is the only mechanism to track transponders on small boats. Tamil Nadu and Gujarat were entrusted to test the efficiency of using satellite-based transponders in small boats on a pilot basis.

MHA after evaluating and receiving Proof of Concept (POC) project for installation of 1050 satellite-based transponders in sub 20 m fishing boats has been completed by ISRO, IN and ICG. In the 17th NCSMCS meeting held on 23 Sep 19, comprehensive evaluation of the project was discussed. The committee opined that DoF should make provisions to make installation of transponders in Sub 20-meter fishing boats in National Marine Fisheries (Regulations and Management) Bill 2019. Installation for eligible boats is proposed by MoF.

6.8 Welfare Schemes and Involvement of Local Fishing Communities

Uniform Fishing Ban

In order to promote sustainable use of marine resources and combat overfishing, the government has implemented an Annual Fishing Ban period as a precautionary measure. Previously, the ban period lasted for 45 to 47 days, beginning on April 15, but it has now been extended to 61 days by the Central Government. The larger boats are not allowed to venture into the sea during this period to allow fish to spawn and replenish their populations. This extension aims to preserve aquatic life and promote their long-term conservation. Moreover, natural disasters such as the 2004 Indian Ocean earthquake and

Tsunami and cyclone *Hudhud* have caused extensive damage to mechanised boats and led to the depletion and disappearance of fish species.

The local fishing communities of Maharashtra traditionally used to stop marine fishing during the first two months of monsoon and re-commence fishing from the day of the *Nirali Purnima* festival.

The Government of Maharashtra, following the order of Government of India, imposes the Uniform Fishing Ban for all fishing vessels in the Indian Exclusive Economic Zone (EEZ) beyond territorial waters from 01 June to 31 July, (61days) every year for conservation and effective management of fishery resources and also for sea safety reasons.

The traditional non-motorized units are however exempted from this uniform fishing ban imposed in the Indian EEZ beyond territorial waters.

The extension of the fishing ban period has sparked a debate on its effectiveness as it deprives fishermen of their main source of employment. The fishing community is dissatisfied with both the increased number of ban days and the compensation of Rs 2,000 per head, which falls short of their demand for Rs 4,000. They are at loggerheads with the government over the compulsory fishing ban and are demanding adequate compensation for the two-month loss of business during the ban period.

The fishermen who are economically disadvantaged feel that a complete ban on fishing would negatively impact their livelihoods. Despite the Centre's decision to impose a 61-day ban, Kerala had chosen to defy it and allow fishermen to continue operating until 15 June in year 2015, which was the traditional start date for the mandatory annual ban.

The Indian government has clarified that the Uniform Fishing Ban does not impact traditional fishermen as it is not enforced in territorial waters, which falls under the jurisdiction of state governments and extends up to 12 Nautical miles. The ban only applies to the EEZ, beyond the territorial waters. Therefore, the livelihood of traditional fishermen

is not be affected. The government has also stated that foreign fishing vessels are not permitted to fish in Indian waters.

Advantages of Fishing Ban

The primary intention of the fishing ban is to support marine fish production and replenish dwindling fish in our seas. A **uniform ban with a control on violations can prevent poaching** by fishermen from other States and allow regeneration of marine resources during the breeding season/fishing ban period.

The ban period offers enough time to fishermen for Annual Maintenance of their boats. It is estimated that in the near future, there will be a noticeable increase in catch value per unit fishing effort if measures like ban and other fisheries management measures with adequate Government support are implemented and enforced correctly.

Disadvantages of Fishing Ban

According to an article published in '**The Pioneer**' dated 06 July 2015, "Statistics indicated that the effectiveness of the fishing ban has decreased since the year 2000, resulting in a significant level of unemployment during the two-month ban period. Insufficient support from the government has contributed to the fishermen's hardship. There is a large disparity in income levels between the ban and non-ban periods, which greatly affects their livelihood. Some claim that the ban is futile due to high pollution levels in the Coastal Sea, which have depleted resources." The other disadvantages are: -

(a) Inadequate compensation from Government during the lean period leaves fishermen financially vulnerable. Compensation provided was grossly inadequate

(b) All mechanised crafts with engine of more than 10 HP remain idle during the ban.

(c) Local unavailability of fish results in soaring prices which affects seafood lovers.

(d) Fishermen, who Specialised only in the particular field and lacked education, felt challenged looking for alternative employment.

Considering the above advantages and disadvantages, the Government of Maharashtra, and other stake holders, through various awareness programs, involve fishermen in a combined and concerted efforts in the conservation of fisheries resources and thus also ensure safety of fishermen during these months

6.9 Training Programs

Marine Training in Marine Fisheries, Navigation and Marine Diesel Engine Maintenance and Operation: -

There are Six (06) Fisheries Training Centres in Maharashtra located at Satpati, Vasai (Thane), Versova, (Mumbai), Alibag (Raigad), Ratnagiri (Ratnagiri), Malvan (Sindhudurg). These Training Canters impart training in the operation of modern fishing gears, Navigation, methods to improve marine fish production, and maintenance of marine diesel engines. **This course is, however, optional**.

6.10 Financial Assistance / Subsidies

Subsidy on Construction of Non-Mechanised Boat to Fishermen: -

(a) **Fishermen In Marine Sector**. Economically weak fishermen are awarded an amount equal to 50% of the construction cost of boat up to 10 Ton capacity or Rs. 60,000/- whichever is less. The amount of difference between the prevailing interest rate of the concerned financial institute and the 4% is awarded as interest subsidy if the loan is repaid in schedule period.

(b) **Fishermen in Inland Sector.** Economically weaker Fishermen are provided with an amount equal to 50% of the building cost of boat or Rs. 3000/- whichever is less.

Reimbursement of VAT on High-Speed Diesel

Since April 2005, mechanized fishing boats have been reimbursed for the Value Added Tax (VAT) on Diesel oil, with a rate of 35% in Mumbai area and 31% outside of Mumbai area. Fishermen are also provided with a concession of Rs. 1.50 per litre on Diesel oil used for fishing boats. The diesel limit that is admissible for fishing boats is as follows:-

Fishing Boat (Cylinder)	**Ceiling limit of Diesel (litres)**	
	Daily	**Annual**
1	12	3,600
2	20	6,000
3	30	7,500
4	96	20,160
6	170-230	35,700

Table 6.1: Ceiling Limit of Diesel Used

Source: https://fisheries.maharashtra.gov.in/en/reimbursement-of-vat-hsd

Assistance For Installation of OBM & IBM – CSS

The Traditional fishermen has been economically vulnerable. The purpose of this scheme is to provide fishing facility to the community. The Government has brought this scheme for the benefit of traditional fishermen, with an aim of making fisheries and their fisheries cooperative societies, for external engine on small boats making fishing more viable.

Cooperatives and NGOs

6.11 Cooperatives

India's fishery resources are abundant and have a huge potential for substantial progress. According to Fish Base (Froese and Pauly, 2013), there are 862 species of freshwater fish in India, and a total of 788 marine fish species. The fisheries sector recorded an average growth of 10.87% as against the GDP growth rate of 7% during the same period.

However, the fishing industry, despite being a 'sunrise sector', faces several constraints, including: -

(a) The majority of people engaged in the fisheries business for their livelihood belong to socio-economically backward communities.

(b) A lack of proper institutional support, such as infrastructure and finance, is a significant challenge.

(c) Non-availability of quality seeds is a major constraint.

(d) The absence of organized marketing is also a challenge.

(f) Non-availability of quick transport facilities adds to the difficulties.

(g) Poor knowledge of fishermen is also a significant issue.

(h) There is a paucity of funds/Bank credits for the sector.

(i) Lack of participatory fisheries management is another constraint.

(j) Social issues also pose a challenge for the fisheries sector.

The concept of establishing Fisheries Co-operative Societies in India was conceived to address the challenges faced by fishing communities and improve their socio-economic status. This involves incorporating appropriate inputs such as education, finance, marketing, communication, technology, transport, seed availability, health, and government policies. The fishery co-operative movement in India began as early as 1913 when the first fishermen's society was organized under the name of ***"Karla Machhimar Cooperative Society"*** in Maharashtra.

The formation of Fishery Cooperatives in India was initiated by **Sir Frederic Nicholson**, the Director of Fisheries in the former Madras Province. In 1944, the **'fish sub-committee'** on Agricultural policy committee recommended that the fishing sector should be provided with both direct and indirect assistance.

In 1946, the Cooperative Planning Committee proposed that state assistance for the fishing industry should be provided primarily through cooperative societies. These societies were tasked with providing financial aid to their members, as well as stocking and selling fishing equipment and ensuring fair pricing and appropriate marketing of fishery products. However, the development of fishery cooperatives was slow in their early years, with only about 200 cooperatives operating in all of India by 1944. These societies were mainly lending institutions that focused on providing credit to their members and did not give much attention to cooperative fishing, processing, and marketing.

It was not until the implementation of the Five-Year Plans that the importance of fishery cooperatives was fully recognized, leading to a significant increase in their formation throughout the marine and inland sectors of India. As per the data available with National Federation of Fisheries Cooperatives Ltd. (under Min. of Fisheries, Animal Husbandry and Dairying) **Today, India boasts of 33,53,115 Cooperative Fishermen Memberships, 21,741 Cooperative Fishermen (Members), 132 District Level Societies, 07 Regional Level Federations, 21 State Level Federations and 01 National Level Federations across the country.** *(Source: http://www.fishcopfed.in)*

These cooperatives have been instrumental in improving the socio-economic status of fishermen by incorporating appropriate inputs from the field of education, finance, marketing, communication, technology, transport, health, and government policies.

The state of Maharashtra has One State level Fisheries Cooperative, 02 Regional Level, 36 District Level Cooperatives and 3775 Primary Level Cooperatives**.**

Types of Fishery Co-operative Societies

Broad types of fisheries cooperatives working in different Indian states are as follows-

(a) **Producer's Cooperative Societies**. These societies are formed to produce goods and services through a common ownership and management structure. They aim to eliminate the employee-employer relationship and are typically composed of workers.

(b) **Fish Consumer's Societies**. These societies are comprising of agricultural workers and the personnel who operate a consumer store. Members can purchase fish at wholesale price and sell them at the market or lower prices to other members.

(c) **Fishery Credit Societies**. These are voluntary associations that provide credit to members based on personal or nominal security.

(d) **Marketing Cooperative Societies**. These are run by small producers to promote their trade by selling goods at reasonable prices and eliminating middlemen.

(e) **Insurance Cooperative Societies**. These societies negotiate with insurance companies to minimize risk for members and their produce. They

purchase individual and group insurance policies for their members at lower premiums.

(f) **Transport Cooperative Societies.** These provide vehicle and transportation services to members at lower rates.

(g) **Storage Cooperative Societies.** These provide cold storage facilities to members for perishable items.

Objectives of the Fisheries Co-operative Societies.

The Fisheries co-operative programme has several objectives, including providing livelihood opportunities to coastal communities through fishing, promoting fish production through the use of mechanized boats, and providing credit to cooperative members for the purchase of boats.

Additionally, the programme aims to provide essential supplies like kerosene and nets to fishermen and to maintain facilities such as boat building yards, ice plants, cold storage, processing plants, and transport vehicles. Proper marketing of fish and fish products is also an important aspect of the programme, as is recovering loans from the sale price of fish products. The programme seeks to uplift the socio-economic status of fishermen and women by providing them with the necessary support to conduct their business smoothly.

Cooperatives have played an important role in safeguarding the safety of fishermen by providing them with essential safety equipment and training. Many fisheries cooperatives provide their members with life jackets, first aid kits, and other safety equipment, which can help to prevent accidents and injuries at sea. They also provide training on safe fishing practices and emergency response, which can help fishermen to navigate hazardous conditions and respond effectively in case of an emergency.

In addition, fisheries cooperatives have been instrumental in advocating for the rights of fishermen and in promoting safe working conditions. They work with government agencies and other organizations to develop and enforce regulations that ensure the safety of fishermen, such as requirements for safety equipment on boats and regulations on fishing practices that can endanger the lives of fishermen.

6.12 **Non-Government Organisations (NGOs)**

It is a well-known fact that no Government can build a Society. However, voluntary action can. To address the growing need for community development and social welfare activities in various areas, the government has identified certain broader schemes and areas where NGOs and Voluntary Organizations (VO) can participate due to the limitations experience by the government in undertaking these activities on their own.

These areas include Fisheries also. NGOs and VOs have contacts at the grass-roots level, making them aware of the essential needs and problems of the local community, allowing them to provide multiple services and perform various roles simultaneously. Their main contribution to development is organizational rather than financial. NGOs can assist government agencies in extension services, and their role in social development is more pronounced in developing countries.

NGOs have the capability to transfer technology through various means such as training programs, demonstrations, awareness campaigns, exhibitions, and regular dissemination of information via mass media and publications. With their strong network at the grassroots level, NGOs can encourage community involvement in these activities. Self Help Groups (SHGs) are a common approach used by many NGOs to reach their clients. As members of these groups, individuals have a say in the decision-making process. Therefore, involving NGOs and voluntary organizations in technology transfer programs can expedite the process.

NGOs are increasingly venturing into research activities, allowing them to generate technology. They can act as a bridge between the research and client systems and provide essential feedback on field performance and problems with innovations. Additionally, some NGOs offer services such as laboratory analysis and input supplies while also helping clients access institutional credit to adopt innovative practices. Therefore, NGOs now play various roles in the technology transfer process, including technology generation, diffusion, and supporting adoption in the field.

Reliance Foundation is one of the NGO working at the grassroots level in Ratnagiri, Sindhudurg, Raigad and Palghar. Reliance Foundation has been providing warning and lifesaving information and alerts prior to disasters. This NGO also provides pre-disaster advisories to fishermen for safeguarding their livelihoods including fishing vessels at Fishing Villages.

In the aftermath of severe disasters, Reliance Foundation teams reach out to people in affected areas, distributing immediate relief items through an inclusive and transparent process.

The Reliance Foundation has been working on enhancing the disaster response activities and utilizing technology for disaster risk management by providing training to local communities, volunteers, and networks. Additionally, the NGO's Information Services have been aiding people affected by cyclones by utilizing Information Technology (IT) before, during, and after the disaster.

The NGO utilizes various IT services such as Audio Bridge Conferences, WhatsApp, and voice SMS to quickly reach a significant number of people, minimizing the potential risk and impact of disasters while safeguarding their livelihoods.

In the fiscal year 2020-21, the NGO provided its services to over 1 million people through various means such as pre/post-cyclone advisories using **Audio Bridge Conferences, WhatsApp, voice SMS and other IT services**. This was done in collaboration with various organizations such as IMD, Indian National Centre for Ocean

Information Services (INCOIS), Department of Fisheries, Agriculture and Animal Husbandry, District Disaster Management Authority, *Krishi Vigyan Kendras,* local administration and community-based organizations.

CHAPTER-7
SAFETY CONCEPTS

7.1 Definitions

Before proceeding further, it is advisable to learn some definitions and key terms. These definitions have been promulgated by the United Nations International Strategy for Disaster Reduction (UNISDR). These definitions have been reproduced below: -

Mitigation. "The lessening or limitation of the adverse impacts of hazards and related disasters".

Preparedness. "The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions".

Recovery/Rehabilitation. "The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors".

Response/Relief: "The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected".

Risk. The combination of the probability of an event and its negative consequences.

Fishing Village. "An assemblage of houses/ dwelling place where marine fishermen live, which is recognized by state fisheries department. A settlement of households which comes under a separate village-panchayat is a Hamlet".

Fish Landing Centre: “The place or harbour where fishermen land their fishing craft with catch”.

Marine Fisherman: “A person (male/ female/LGBTQ) who is engaged in marine fishing or any other activity associated with marine fishery or both”.

Traditional Fishermen: “Those who are fishermen by birth and fishing is their ancestral occupation”.

Mechanized Craft. “Any fishing craft with engine permanently fitted to the hull, which uses machine power for both propulsion as well as fishing operation like casting and pulling the net, operating lines, etc., is identified as mechanized craft”.

Inboard Craft. “Any fishing craft that has an engine permanently fitted to the hull or central portion of the craft, which is used only for propulsion and not for fishing operation, is identified as Inboard craft”.

Motorized (Outboard) Craft. “Any fishing craft that has an engine fitted temporarily outside the craft, which is used only for propulsion and not for fishing operation, is identified as motorized craft”.

Non-motorized Craft. “Any fishing craft that does not use any kind of machine power for propulsion as well as fishing operation”.

Authorized Officer Indian Coast Guard (ICG) or Indian Navy (IN) personnel, or any other such person authorized by Ministry of Fisheries, Government of India.

Operator *(Tandel).* “Any person or enterprise, that controls the operation or management of a fishing vessel or who has assumed the responsibility for the operation of the Vessel”.

Owner. "In relation to a fishing vessel, means the owner of the vessel as well as any other person, including any organization or association of persons, whether incorporated or not, by whom the vessel or a share in the vessel is owned".

Sustainable Fishing. "Fishing activities that do not cause or lead to undesirable changes in the biological and economic productivity, biological diversity or ecosystem structure and functioning from one human generation to the next".

Maritime Zones of India

The United Nations Convention on the Law of the Sea (UNCLOS) 1982 classifies marine areas into five maritime zones; namely, Internal Waters, Territorial Sea, Contiguous Zone, Exclusive Economic Zone (EEZ), and High Seas. These Maritime Zones are defined as follows: -

Baseline. "It is the low-water line along the coast as officially recognized by the coastal state".

Internal Waters. Internal waters refer to the water bodies on the coastal side of the baseline used to determine the extent of the territorial sea. Such waters include bays, ports, inlets, rivers, and even lakes that are connected to the sea. Each coastal state exercises complete sovereignty over its internal waters, much like its land territory.

Territorial Sea. The area known as the Territorial Sea extends 12 nautical miles (nm) from a coastal state's baselines. Each coastal state exercises sovereignty and jurisdiction over this zone, including the seabed, subsoil, and airspace. However, these rights are subject to innocent passage through the territorial sea, which limits the coastal states' control. One nautical mile is equivalent to 1.1508 land miles or 1.85 km.

Contiguous Zone. The zone known as the contiguous zone stretches 24 nautical miles from its baselines and acts as a transitional zone between the territorial sea

and the high seas. The coastal state has the authority to prevent and punish any violation of fiscal, immigration, sanitary, and customs regulations within its territory and territorial sea. However, the contiguous zone does not grant the state jurisdiction over airspace and space rights, unlike the territorial sea.

Exclusive Economic Zone (EEZ). A coastal State is entitled to claim an Exclusive Economic Zone (EEZ) beyond and contiguous to its territorial sea that extends outward up to 200 nautical miles (nm) from its baselines. Within this zone, the coastal state has the following rights: -

(a) A coastal state within its EEZ has sovereign rights to explore, exploit, conserve and manage natural resources, both living and non-living, of the seabed and subsoil.

(b) Rights to carry out activities such as production of energy from the water, currents and wind.

(c) Unlike the territorial sea and the contiguous zone, the EEZ only allows for the above-mentioned resource rights. It does not give a coastal state the right to prohibit or limit freedom of navigation or over flight, subject to very limited exceptions. Thus, the Indian Government exercises exclusive right to exploit fisheries resources in the Indian EEZ.

High Seas. The high seas, which refer to the ocean surface and water column beyond the EEZ, are not subject to any national jurisdiction and are considered "the common heritage of all mankind." States are allowed to engage in peaceful activities in this area, such as transit, marine science, and undersea exploration.

Maritime Zones

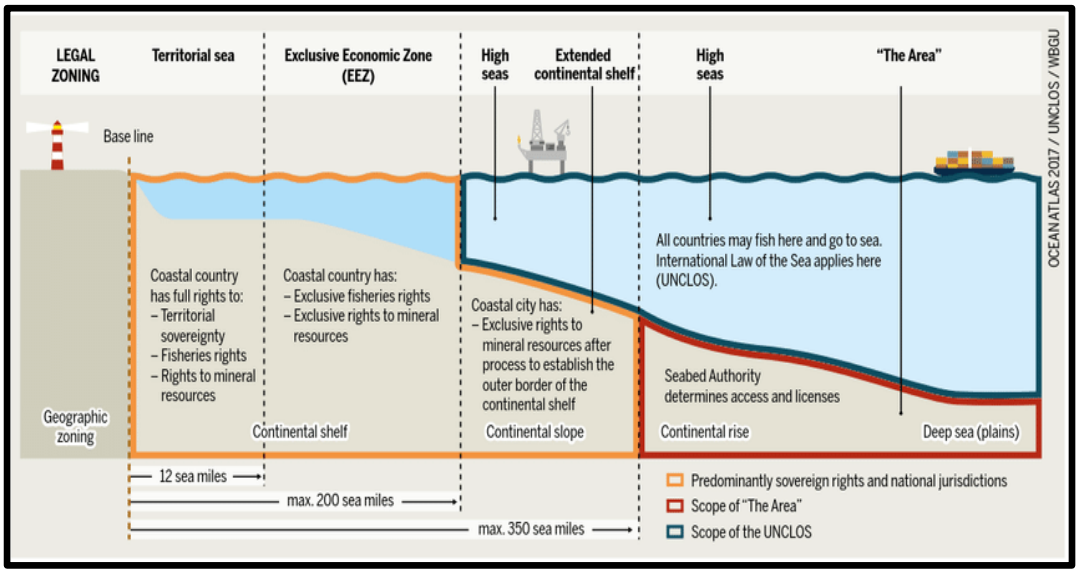


Fig 7.1: Maritime Zones

Source: ResearchGate

Fishing Vessels. As defined under the Merchant Shipping Act of 1958, a fishing vessel means "a ship fitted with mechanical means of propulsion which is exclusively engaged in sea fishing for profit". The fishing boats are classified under class XIII and XIV under the Merchant Shipping (Life Saving) Rules 1991. Where: -

Class XIII - Fishing vessels other than those specified in Class XIV

Class XIV - Sailing vessels including sailing boats or vessels those which are solely engaged in fishing for profit.

Issuing Authority. The Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, or any other authorized issuing authority on its behalf, can issue it.

Permit. A permit issued by the Issuing Authority on behalf of the Central Government to fishing vessels for fishing in the high seas.

High Seas. As defined by the United Nations Convention on the Law of the Sea- UNCLOS

Pelagic Fish. Pelagic fish reside in the water column, which refers to the area of coasts, open oceans, and lakes that are not near the bottom or shore. The pelagic zone, where these fish live, is the earth's largest habitat and encompasses a volume of 330 million cubic miles. Various species of pelagic fish can be found throughout the pelagic zone, with their numbers and distributions differing regionally and vertically, influenced by the availability of light, nutrients, dissolved oxygen, temperature, salinity, and pressure. Depending upon depth where these fish inhabit they may be further classified as :-

Coastal Pelagic (depth up to 655 feet) typically above the continental shelf. For e.g. forage fish such as anchovies, Sardines, shad, and menhaden and the predatory fish that feed on them.

Oceanic Pelagic Fish typically inhabit waters below the continental shelf. Examples include larger fish such as Sword fish, Tuna, Mackerel and even Sharks.

7.2 Types of Fishing

(a) Purse Seine Fishing. Seine fishing is a method of fishing that uses a surrounding net, called a Seine, which hangs vertically in the water with its bottom edge held down by weights and its top edge buoyed by floats. It is primarily used in the open ocean to target dense schools of midwater (pelagic) fish such as tuna and mackerel. The method involves surrounding the school of fish with a vertical net "curtain," which is then drawn together to enclose the fish. It can also be used to catch fish congregating around fish aggregating devices.

This method has been under the scanner of Hon. Supreme Court of India wherein this method has been prohibited by many and Union Territories, including Tamil Nadu, Kerala, Puducherry, Odisha, Dadra and Nagar Haveli and Daman and Diu, Andaman and Nicobar Islands in their respective territorial waters of up to

12 Nautical Miles. However, States like Gujarat, Andhra Pradesh, Goa, Karnataka, West Bengal have not yet imposed any such ban on Purse-Seine fishing. Maharashtra has issued certain orders for regulation of purse seine fishing in its territorial waters.

A typical fishing boat engaged in Purse-Seine fishing has about 15-25 crew depending upon the size of the boat.

Concerns with Purse Seine Fishing

Prohibiting Purse-Seine fishing by some states is primarily due to its negative impact on the decreasing stock of small, pelagic shoaling fish, like sardines, mackerel, anchovies, and trevally, along the Western Coast of India. However, the scientific community suggests that climatic conditions, including the El Nino phenomenon, may also contribute to the declining catch of such fish over the last decade.

Fishermen using traditional methods have placed the blame entirely on the rise of purse seine fishing, and they fear a further fall in the availability of these small fish if the ban is lifted.

Purse seine is a non-targeted fishing gear and catches all sorts of fish, which come in the way of the net, including juveniles. Hence, this method is very much detrimental to marine resources. It is estimated that in year 2021, Kerala recorded a catch of just 3,297 Tonnes of sardine, a sharp decrease from the haul of 3.9 lakh tonnes in 2012, which is being attributed to the method of Purse Seine Fishing.

However, The Fisheries Department of the Union government has recommended the lifting of the ban on Purse-Seine fishing on a report, which has been submitted by an expert committee in November 2022. Wherein, the expert panel had recommended that Purse Seine fishing vessels to fish in territorial waters and the Indian Exclusive Indian Exclusive Economic Zone (EEZ) subject to certain conditions.

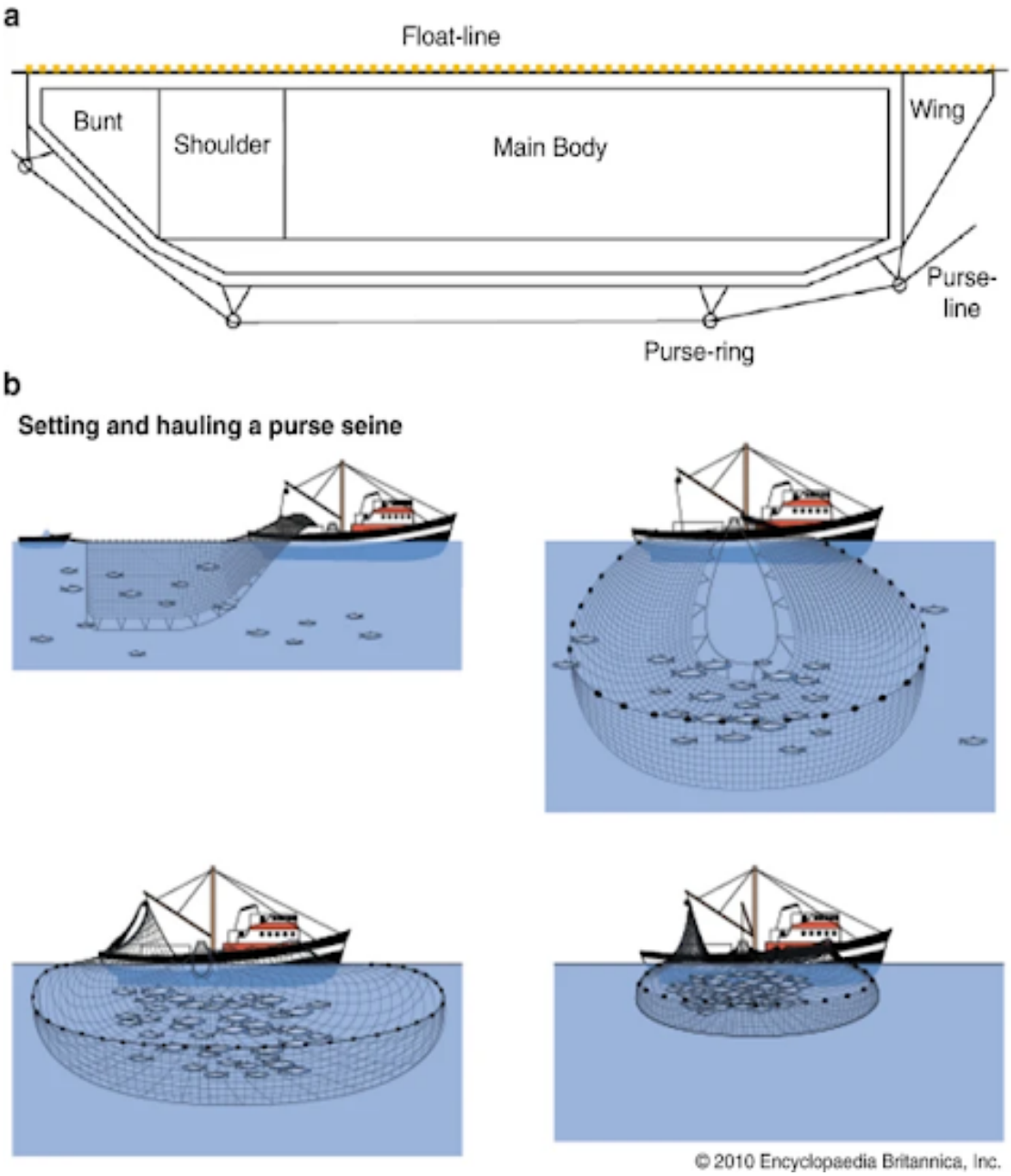


Fig 7.2: Purse seine fishing

Source: NOAA

Fig 7.3: Purse seine fishing Boat

Source: The Hindu

(b) **Long Line Fishing**

Longline consists of a main line, where many branch lines are attached. Each branch line is fitted with a baited hook at its end. The line is suspended in the water by float lines attached to floats, which may have flagpoles, lights, or radio beacons. Longlines are usually set and hauled once daily and are allowed to drift freely, or soak, for several hours while fishing. A typical Long Line Fishing vessel has a crew of 6 to 15 persons.

Longlines are set, either by hand or mechanically, as the boat makes way away from the line and are usually hauled mechanically while the boat makes way toward the line. The species targeted are tunas and some billfish.

Technically, longlines are proven to be a good fishing method for catching large, species of fish of high quality. Therefore, over the years, it has become a popular method from 1980s. Longline gear is used all over the world, from small-scale fishing to modern mechanised longline operations.

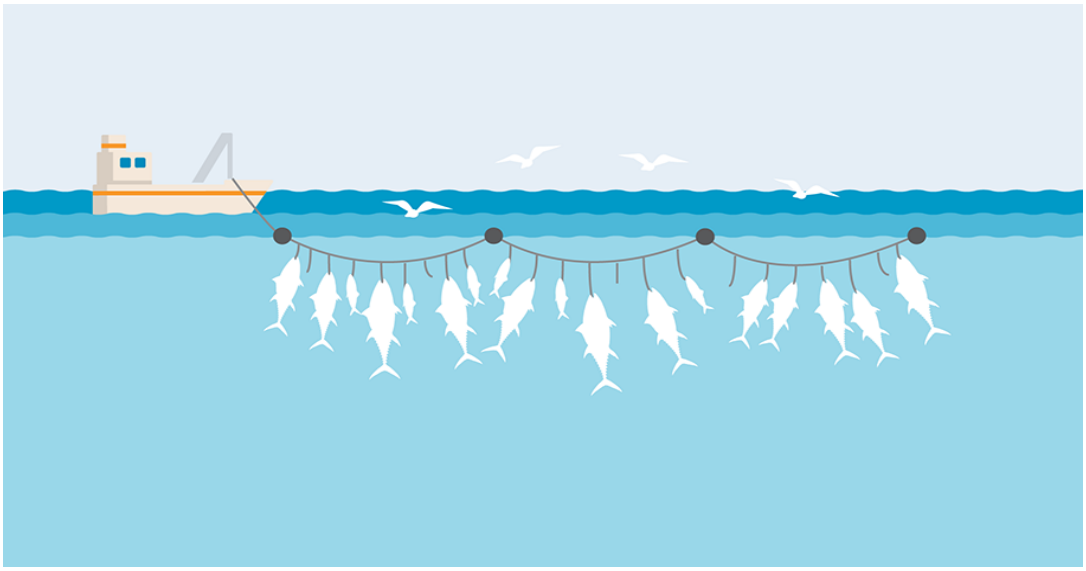


Fig 7.4: Long Line Fishing.

Source: NOAA

Concerns with Long Line Fishing

The design of longlines unfortunately leads to the unintended capture of non-target marine life, also known as bycatch. This can include a variety of animals such as sea turtles, sharks, seals, seabirds, and marine mammals that may become caught on hooks or entangled in the fishing line.

(c) **Gillnet Fishing Operations**.

Gillnetting is a fishing method that employs vertical panels of netting known as gillnets, which hang from a line with regularly spaced floats to keep the line on the surface of the water. The line at the bottom of the panels is typically weighted, traditionally with lead, and referred to as the "lead line." Gillnets are usually set in a straight line and can be distinguished by their mesh size, as well as the color and type of filament used to make them.

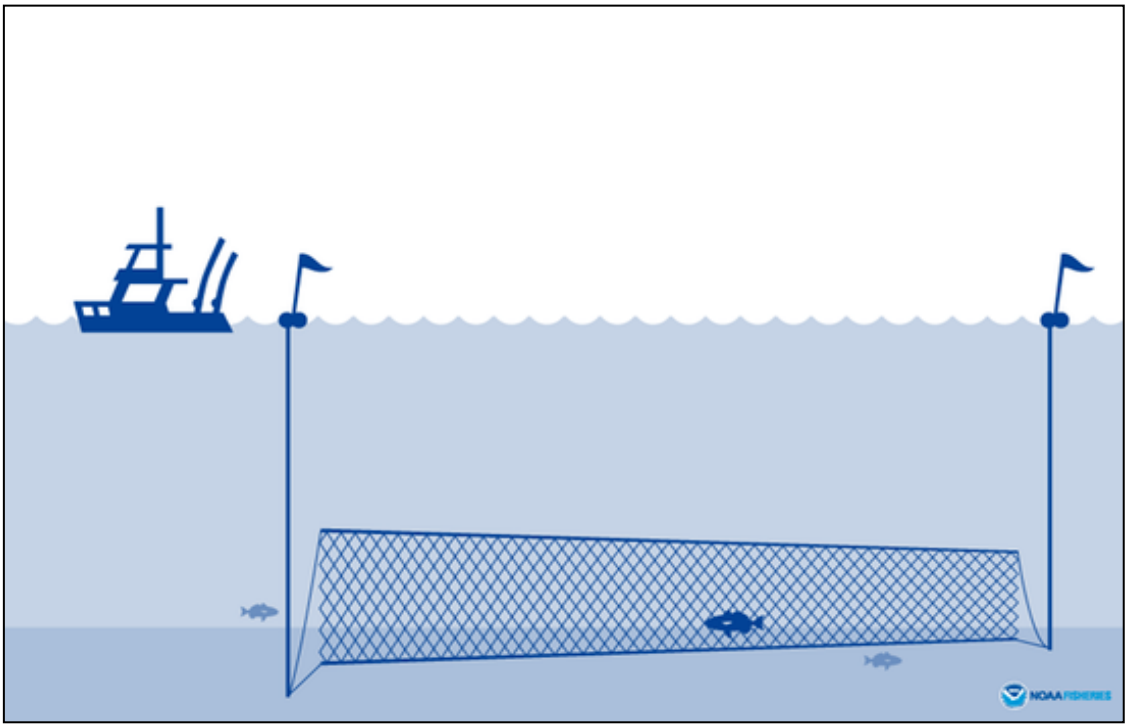


Fig 7.5: Gillnet Fishing.

Source: NOAA

There are two types of Gill Nets: -

(i) Fixed gillnets, which are attached to poles fixed in the substrate or an anchor system to prevent movement of the net.

(ii) Drift gillnets, which are kept afloat at the proper depth using a system of weights and buoys attached to the headrope, footrope, or float line.

(d) **Trawling Fishing**

Trawls are netting devices shaped like a cone, made from multiple panels and towed by one or of a pair of boats, either in midwater (pelagic) or at the bottom. The gear's horizontal opening is maintained by beams, otter boards, or the distance between the two towing vessels (pair trawling), while vertical opening is provided by floats, weights, and/or hydrodynamic devices. Twin trawls, consisting of two parallel trawls rigged between two otter boards, can also be used. Mesh size is regulated to determine the size and species of fish to be caught.

Fishing by trawling involves towing a net to capture fish and/or shellfish either in midwater or with bottom contact. The trawls are kept open horizontally by devices such as otter boards, beams, and two vessels, and vertically by floats and weights. The method of catch is by filtering the water. The towing speed varies depending on the type of trawl, target species, and other factors, typically ranging from 1 to 7 knots with the most common being 3 to 5 knots. Trawls are primarily utilized in marine fisheries and are occasionally used in freshwater environments where there is enough room for towing and a clean bottom without many obstructions or excessive floating debris.

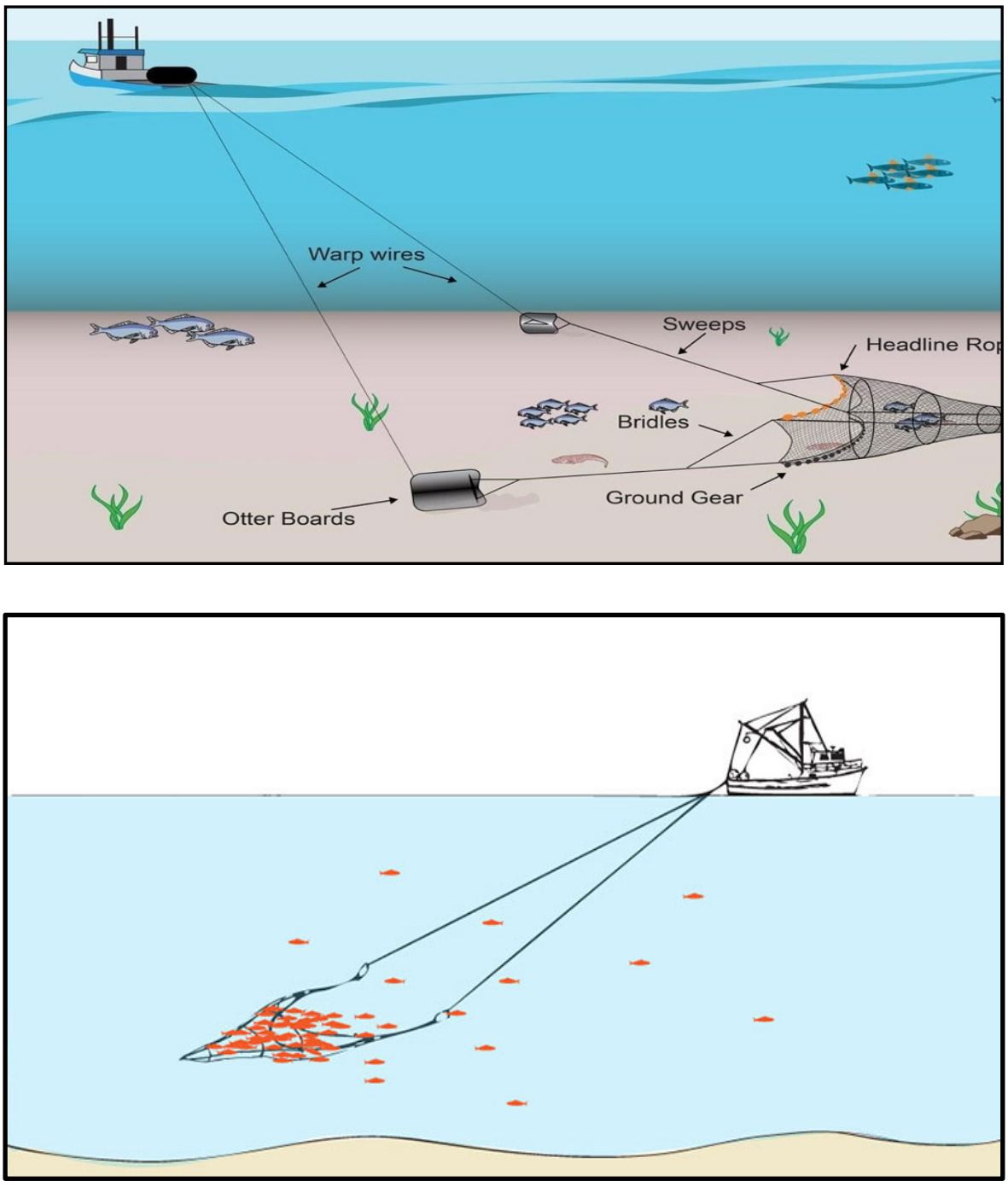


Fig. 7.6: One Boat Trawling

Source: seafish.org

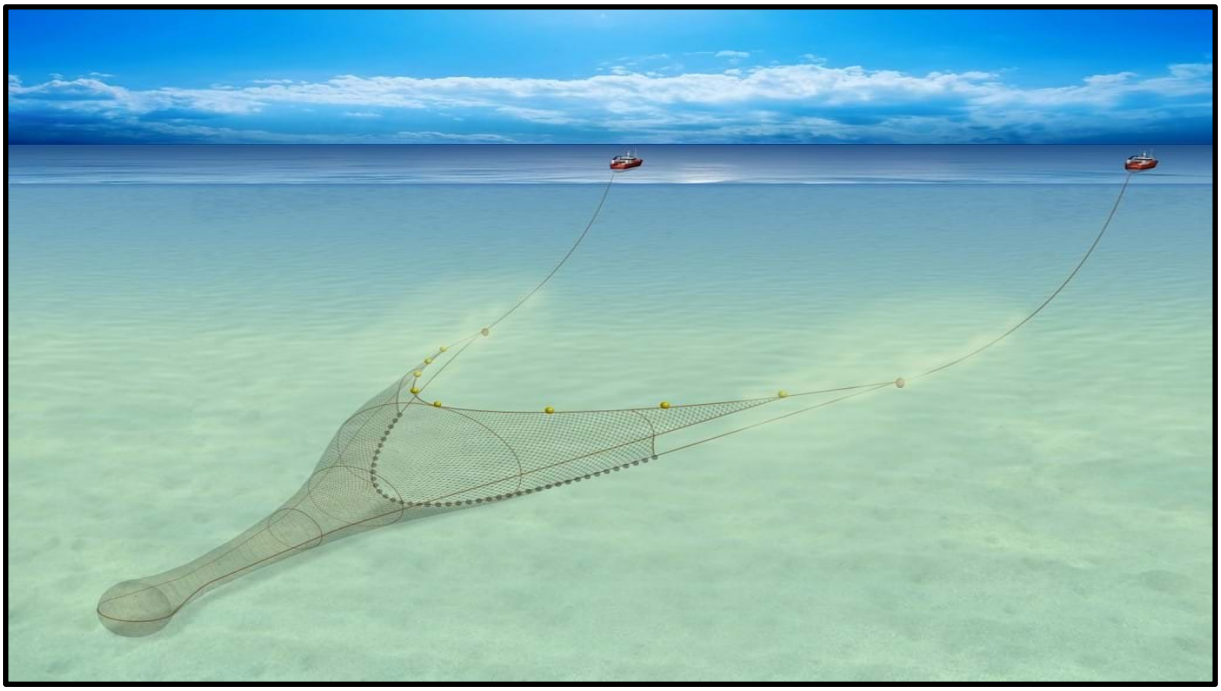


Fig 7.7: Pair Trawling

Photo Credit: seafish.org

Squid Jigging

Jigging is a fishing technique that involves the use of a weighted lure called a jig, which has a fish hook attached to it. The jig is typically made of a heavy metal object or a sinker, usually lead, and can be adorned with soft lure or feather-like decorations. By creating a jerky, vertical "jumping" motion, the jig is designed to attract fish. It is a versatile technique that can be used in both freshwater and saltwater, and is particularly popular among anglers for catching deeper water fish species.

The jigging technique requires quick lifting movements of the fishing rod to create an upward pull on the sinking lure, enticing the target fish to swallow it. Once the fish takes the lure, the angler sets the hook to pierce and secure it in the mouth. Due to the weight of the jig, a strong hookset is often necessary to ensure a successful catch. Jigging is typically used to attract slow-moving fish, particularly during spawning seasons.

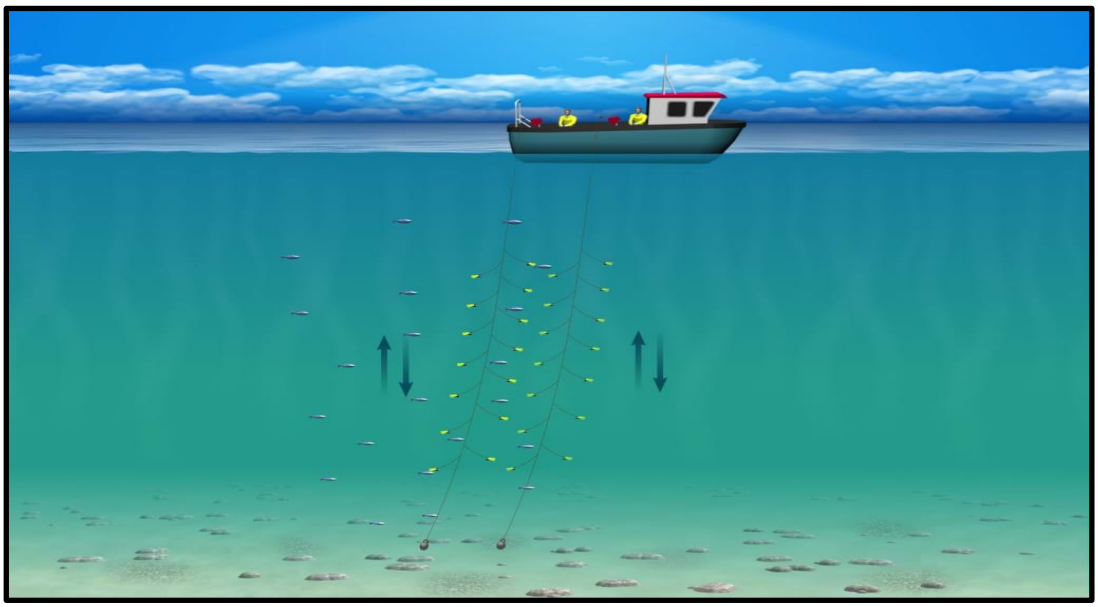


Fig 7.8: Squid Jigging

Source: seafish.org

Pole and Line Fishing

A fishing technique called pole and line involves a pole with a hooked line attached to it. While it is commonly used in sport or leisure fishing (angling), it is also employed in commercial fishing. Pole and lines can be, both, hand operated and mechanized, e.g., for tuna fishing, with the pole movement being entirely automatic.

Pole and line fishing can be done from either from the shore or from any type of vessel, making it suitable for both commercial and sport fishing purposes. In industrial fishing, Tuna fish is commonly caught using Pole and Line Vessels, which range from 15 to almost 40 meters in length. These vessels are equipped with special arrangements to maximize the number of poles used from the side of the boat and to keep the bait on board in the best possible condition, preferably alive.

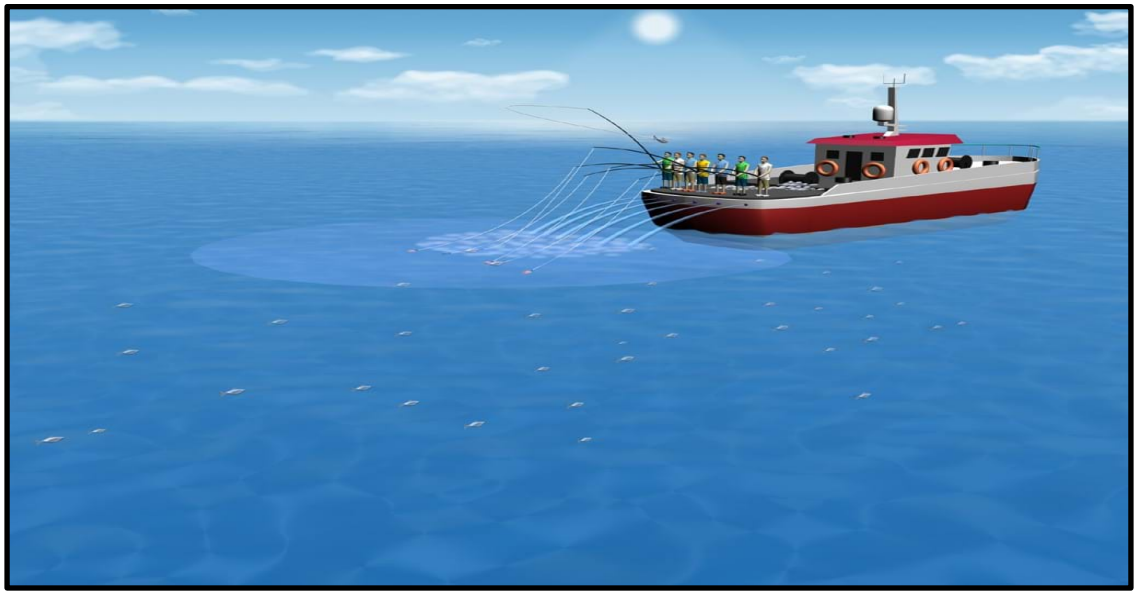


Fig 7.9: Pole and Line Fishing.

Source: seafish.org

Fig 7.10: Pole and Line Fishing-2

Source: seafish.org

Pots and Trap Fishing

Fish and shellfish are attracted to and directed into pots and traps, which are typically stiff structures with funnels that facilitate entry but make escape challenging. Different designs and styles have been created to match the habits of the targeted species, and many of these have been adapted over time to fit the coastal region and seafloor, while also integrating modern materials.

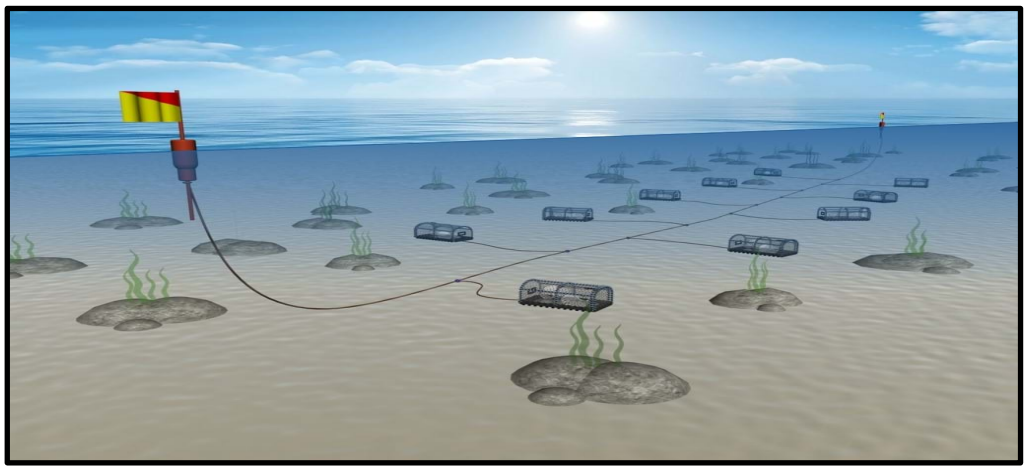


Fig 7.11: Pot and Trap Fishing.

Source: seafish.org

Troll Fishing

Trolling is a fishing technique that involves towing one or more lines with hooks and either a natural or artificial lure to attract fish swimming near the water's surface. In some parts of England, inshore vessels use trolling to catch bass, while overseas, multiple lines are used to target tuna.

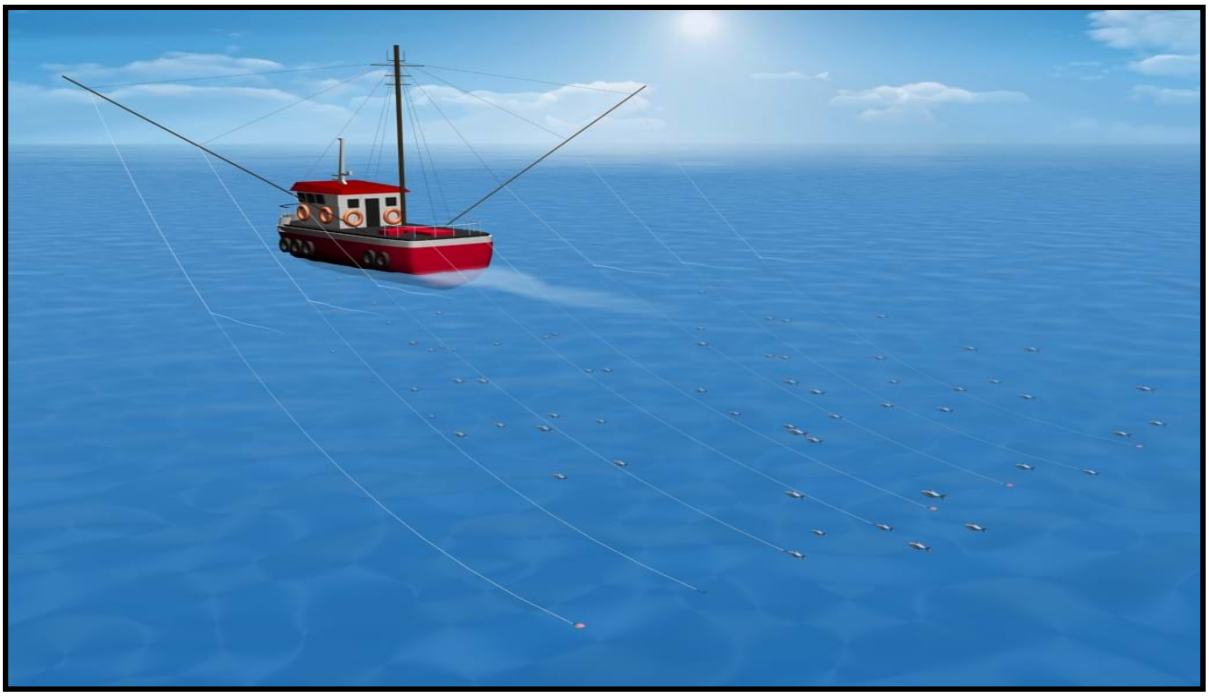


Fig 7.12: Troll Fishing

Source: seafish.org

These are simple fishing lines that are pulled behind a boat either close to the surface or at a particular depth depending on the desired catch. They are equipped with one or more hooks, baited with natural or artificial lures. Small-scale inshore trolling is often practiced by small boats with one, two, or three lines, with one line trailing from the stern and two from outriggers on either side. The lines are towed slowly through areas where the target species is known to be. Once a fish is caught, the line is reeled in, and the fish is unhooked and stored on ice until the vessel returns to shore in the evening. However, this method is not popular in India.

7.3 Fishing Boats of Maharashtra

Maharashtra's physical and geographical features resemble those of southern Gujarat up to Mumbai, while its southern coast is rocky with protected bays, creeks, and harbours. The state has a variety of traditional fishing boats, including: -

Bombay *Machwa* (Karanja Boat)

Length 15 m, breadth 3-5 m and depth 1 m

Long raking bow with great over hang and sheer. The actual keel is short in relation to the overall length.

There are two masts, sails are of lateen type.

Satpati Type *(Gal Boat)*

Length ranges from 10-15 m

Carvel planking

Medium pointed bow, broad stem, straight keel, high gunwale, and transom stern

Used for gill netting

Bassein Boat

Long, straight, pointed fine entry bow with abrupt round stern

Carvel planking

Broad hull straight keel and average gunwale

Versova Boat (Hoda)

Arched keel, round stern and deep fore foot

Stem less raked than Bassein boat, it resembles Bassein boat in other respects

Aft deck is present but no fore deck

Used for operation of dol nets.

Hodi (Toni)

It is widened replicate of ordinary dugout, but built by planks

Length varies from 7-10 m and breadth 0.75-3 m

Single mast with lateen sail

Stem and stern are curved like dugout

A weather board about 30 cm high is fitted along the gunwale from the stem to just abaft the mast to keep out sea and spray.

Ratnagiri Machwa

Length 10 m, breadth 3 m and depth 1.15 m

Broad beam, long over hanging bow, round stern and raked stem post

Open boat with low free board, single mast lateen sail

Used for deep sea gill net fishing

***Rampini* Boat**

Length about 16 m

Narrow keel, stem and stern

No mast is carried as the boat is rowed

Fitted without riggers to give stability

Used for operation of Rampini nets.

In Maharashtra, fishing boats are typically constructed using Indian teak, a durable wood. These boats are known for their sturdiness and feature a long overhanging bow that provides reserve buoyancy and deflects spray in rough waters. The planks are connected using tongue and groove fittings.

North of Mumbai to Jaigarh, Bombay *machwas* are used while Satpati type is used up to Ratnagiri. From Mumbai to Jaigarh, Hodi boats are used, Ratnagiri *machwas* operate from Jaigarh to the Karnataka border, and the *Rampini* boats are used in Southern Maharashtra and Northern Karnataka.

7.4 Weather Factors Affecting Safety of Fishermen

Every year, India is impacted by natural disasters like cyclones, which result in significant loss of life and property damage. Tropical Cyclones (TC), which are intense low-pressure weather systems with winds of at least 34 knots (62 kmph), are common in tropical regions across the globe. Hazards associated with these cyclones include long-lasting, rotating high-speed winds, heavy rainfall, and storm tides (a combination of storm surge and astronomical tide). Among these hazards, storm surges pose the greatest risk to life and property during cyclones.

For a better understanding of weather-related factors certain basic terminologies need to be understood, these definitions have been sourced from IMD: -

Cyclone Alert. "A priority message for the Government officials containing tropical cyclone information and advisories issued generally 48 hours before the commencement of adverse weather".

Cyclone Warning Bulletin. "A priority message for exchange of tropical cyclone information and advisories".

Cyclone Warning. "A priority message containing tropical cyclone warning and advisories issued generally 24 hours in advance of the commencement of adverse weather".

Cyclone. Tropical cyclone

Cyclonic Disturbance. "A non-frontal synoptic scale low pressure system originating over tropical waters with organized convection and definite cyclonic wind circulation. It is called as a depression if the associated sustained maximum wind speed at surface level is 17-27 knots. It is called as a Deep Depression if the sustained maximum wind speed is 28-33 knots".

Cyclonic Storm. "A cyclonic disturbance in which the maximum average surface wind speed is in the range of 34 to 47 knots (62 to 88 kmph)".

Depression. "A cyclonic disturbance in which the maximum sustained surface wind speed is between 17 and 33 knots (31 and 61 kmph). If the maximum sustained wind speed lies in the range 28 knots (50 kmph) to 33 knots (61 kmph) the system may be called a "Deep Depression".

Direction of Movement of The Tropical Cyclone. "The direction towards which the centre of the tropical cyclone is moving".

Divergence. "Divergence is the opposite situation to convergence, the moving away of air from a common area. In the upper troposphere, an elevated zone of divergence can establish an updraft region below it. Upper-level divergence that can induce sustained updrafts from the surface is one sign that severe-weather forecasters look for as an indicator of cyclone formation or severe thunderstorm potential".

Exceptionally Heavy Rainfall. "When the amount is a value near about the highest recorded rainfall at or near the station for the month or season. However, this term will be used only when the actual rainfall amount exceeds 12 cm".

Extremely Heavy Rainfall. "24 hours cumulative rainfall at a station is greater than 204.5 mm as recorded at 0830 hrs IST".

Extremely Severe Cyclonic Storm. "A cyclonic disturbance in which the maximum average surface wind speed is 90 knots (167 kmph) to 119 knots (221kmph)".

Eye of The Tropical Cyclone. "The relatively clear and calm area inside the circular wall of convective clouds, the geometric centre of which is the centre of the tropical cyclone".

Fairly Widespread Rainfall. "(51 – 75) % of area gets rainfall".

Gale force wind. "Average surface wind speed of 34 knots or more".

Gust. "Instantaneous peak value of surface wind speed recorded or expected. Heavy"

Rainfall. "24 hours cumulative rainfall at a station is 64.5-115.5 mm as recorded at 0830 hrs IST".

High Sea Condition. "Wave height is 6.0 - 9.0 metres corresponding to sea surface wind speed of 34 - 40 knots".

Knots. "Nautical miles per hour. 1 Knots = 1.86 KM per hour. Light Rain rainfall: 24 hours cumulative rainfall at a station is 2.5–15.5 mm as recorded at 0830 hrs IST".

Low or Low Pressure Area. "An area enclosed by a closed isobar with minimum pressure inside when mean surface wind is less than 17 knots (31 kmph)".

Maximum Sustained Wind. "Maximum value of the average wind speed at the surface".

Maximum Sustained. "Surface Wind Speed. Highest 3 minutes surface wind occurring within the circulation of the system. These "surface" winds are those observed (or, more often, estimated) to occur at the standard meteorological height of 10 m (33 ft) in an unobstructed exposure (i.e., not blocked by buildings or trees)".

Moderate Rain Rainfall. "24 hours cumulative rainfall at a station is 15.6-64.4 mm as recorded at 0830 hrs IST".

Moderate Sea Condition. "Wave height is 1.25 - 2.5 metres corresponding to sea surface wind speed of 17 - 21 knots".

Name of the Tropical Cyclone. "Once wind speed in a cyclonic disturbance attains a 34 kt threshold value it will be given an identification name by RSMC tropical cyclones New Delhi from the consolidated name list".

Pre-Cyclone Watch. "This bulletin contains early warning about likely development of a cyclonic storm and an indication of the coastal belt likely to experience adverse weather. It is issued 72 hrs in advance of the commencement of adverse weather".

Pressure Gradient. "The pressure gradient is a physical quantity that describes in which direction and at what rate the pressure changes the most rapidly around a particular location. The pressure gradient is a dimensional quantity expressed in units of pressure per unit length".

Rough Sea Condition. "Wave height is 2.5 - 4.0 metres corresponding to sea surface wind speed of 22 - 27 knots".

Severe Cyclonic Storm. “A cyclonic disturbance in which the maximum average surface wind speed is in the range of 48 to 63 knots (89 to 117 kmph)”.

Slight Sea Condition. “Wave height is 0.5 - 1.25 metres corresponding to sea surface wind speed of 11 - 16 knots”.

Smooth (waveless) Sea Condition. “Wave height is 0.1-0.5 metres corresponding to sea surface wind speed of 04-10 knots”.

Speed of Movement of the Tropical Cyclone. Speed of movement of the centre of the tropical cyclone.

Squally Wind. “When sudden increases of wind speed occur in squalls with the increased speed reaching a minimum of 22 knots (40 kmph) and persist for at least one minute”.

calm, smooth, slight, moderate, rough, very rough, high, very high and phenomenal sea. However, these qualitative terms correspond to a range of height of waves based on the surface wind speed.

Storm Season. “The periods April to May and October to December during which most of the cyclonic storms occur in the Bay of Bengal and Arabian Sea”.

Storm Surge. “The difference between the actual water level under the influence of a meteorological disturbance (storm tide) and the level, which would have been reached in the absence of the meteorological disturbance (i.e., astronomical tide). (Storm surge results mainly from the shoreward movement of water under the action of wind stress. A minor contribution is also made by the hydrostatic rise of water resulting from the lowered barometric pressure.)”

Storm Tide. “The actual water level as influenced by a weather disturbance. The storm tide consists of the normal astronomical tide and the storm surge”.

Super Cyclonic Storm: “A cyclonic disturbance in which maximum wind speed is 120 knots and above (222 kmph and above)”.

T Number: “T stands for tropical cyclones. It indicates the intensity of cyclonic disturbance bases on Dvorak’s technique. It varies from 1.0 to 8.0 at an interval of 0.5”.

Tropical Cyclone Advisory. “A priority message for exchanging information, internationally, on tropical cyclones in the Bay of Bengal and the Arabian Sea”.

Tropical Cyclone. “Generic term for a non-frontal synoptic scale cyclone originating over tropical or subtropical waters with organized convection and definite cyclonic surface wind circulation”.

Very Heavy Rainfall. “24 hours cumulative rainfall at a station is 115.6-204.4 mm as recorded at 0830 hrs IST.

Very High Sea Condition. Wave height is 9.0 - 14.0 metres corresponding to sea surface wind speed of 41 - 63 knots”.

Very Light Rainfall. “24 hours cumulative rainfall at a station is Trace –2.4 mm as recorded at 0830 hrs IST”.

Very Rough Sea Condition. “Wave height is 4.0 - 6.0 metres corresponding to sea surface wind speed of 28 - 33 knots”.

Very Severe Cyclonic Storm. “A cyclonic disturbance in which the maximum average surface wind speed is 64 knots (118 kmph) to 89 knots (166kmph)”.

Visual Storm Signals. “Visual signals displayed at coastal ports to warn ships of squally winds, gales and tropical cyclones”.

Vorticity. “Vorticity is a mathematical concept used in fluid dynamics. It can be related to the amount of "circulation" or "rotation" (or more strictly, the local angular rate of rotation) in a fluid. The average vorticity in a small region of fluid flow is equal to the circulation around the boundary of the small region, divided by the area of the small region”.

Weather Warning. “Meteorological message issued to provide appropriate warnings of hazardous weather conditions”.

Wide Spread Rainfall. “(76 – 100) % of area gets rainfall. WMO: World Meteorological Organization”.

WV imagery. “Water vapor Channel imagery”.

Zone Of Disturbed Weather. “A zone in which the pressure is low relative to the surrounding region and there are convective cloud masses which are not organized”.

Coastal Areas of Maharashtra Prone to Cyclones and Depression

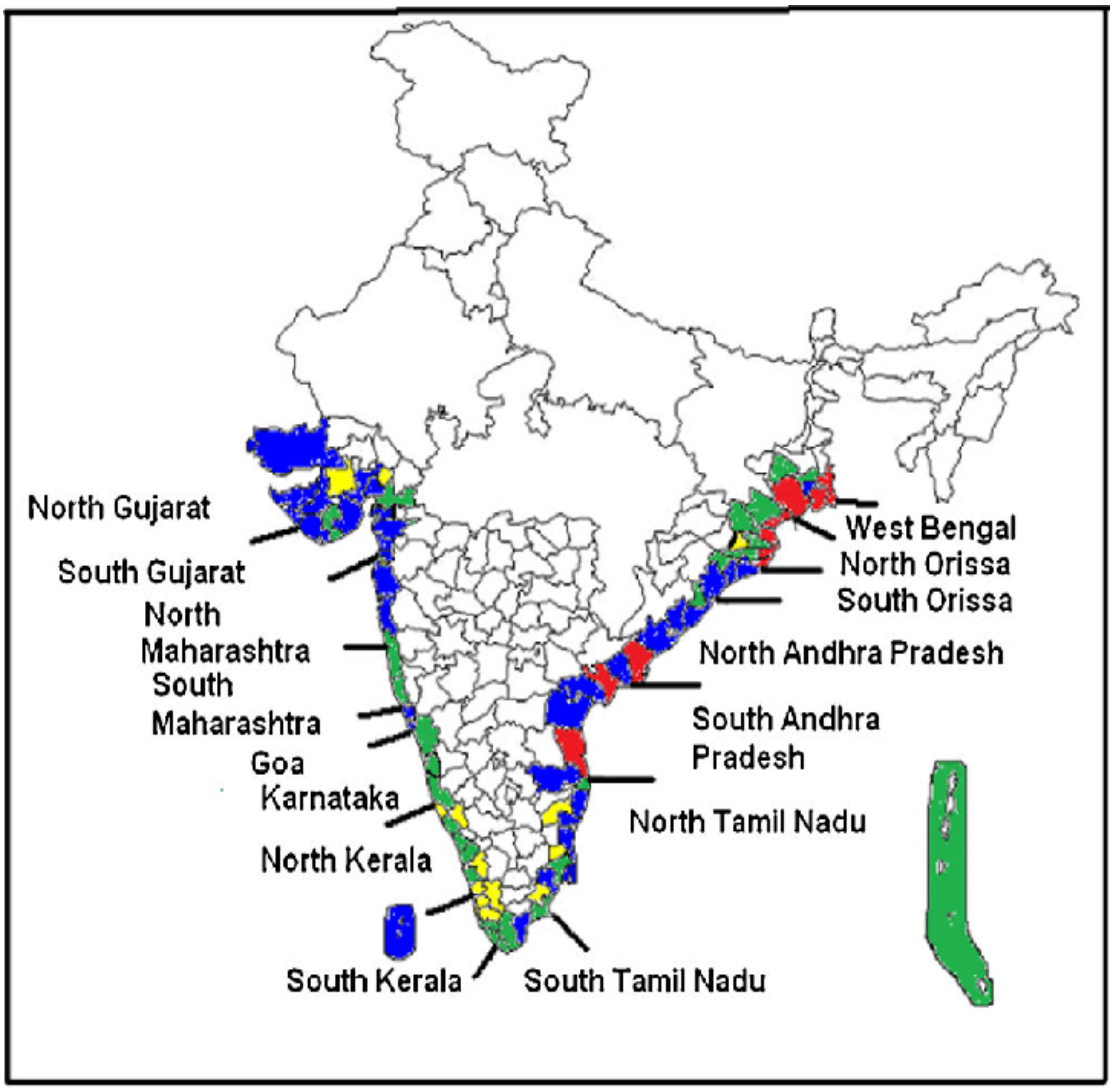


Fig 7.13: **Coastal Areas Prone to Cyclones and Depression**

Source: IMD

North Maharashtra is highly prone and South Maharashtra is Moderately prone coastal area for cyclonic storms and landfall of depression.

The table below shows the monthly variation of frequency of Cyclones and Depressions for the duration of year 2016 to 2021 which indicates months the fishing boats are vulnerable to bad weather. The table shows that the months of May, June and October are prone to cyclones and depressions with 11 counts of Cyclones and Depressions in October.

Monthly Variation of Frequency of Cyclones and Depressions													
Period : 2016-2021													
Basin : AS													
Intensity(Type) : Maximum													
Description	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Frequency of D+CS+SCS	00	00	01	00	04	03	00	00	02	05	01	04	20
Frequency of CS+SCS	00	00	00	00	03	02	00	00	02	03	01	01	12
Frequency of SCS	00	00	00	00	02	02	00	00	02	03	01	00	10
Percentage Frequency of D+CS+SCS	000.0	000.0	005.0	000.0	020.0	015.0	000.0	000.0	010.0	025.0	005.0	020.0	100
Percentage Frequency of CS+ SCS	000.0	000.0	000.0	000.0	025.0	016.7	000.0	000.0	016.7	025.0	008.3	008.3	100
Percentage Frequency of SCS	000.0	000.0	000.0	000.0	020.0	020.0	000.0	000.0	020.0	030.0	010.0	000.0	100
Probability(D to CS)	-10.0	-10.0	000.0	-10.0	075.0	066.7	-10.0	-10.0	100.0	060.0	100.0	025.0	060.0
Probability(D to SCS)	-10.0	-10.0	000.0	-10.0	050.0	066.7	-10.0	-10.0	100.0	060.0	100.0	000.0	050.0
Probability(CS to SCS)	-10.0	-10.0	-10.0	-10.0	066.7	100.0	-10.0	-10.0	100.0	100.0	100.0	000.0	083.3

BOB:Bay of Bengal ; AS:Arabian Sea
D:Depression ; CS:Cyclonic Storm ; SCS:Severe Cyclonic Storm

Note :
1. Percentage Frequency is the monthly / seasonal frequency expressed as percentage of annual frequency.
2. Probability is the probability of intensification expressed as percentage.
3. Probability,shown as negative,indicates indeterminate probability due to zero frequency.

Source : Cyclone eAtlas - IMD

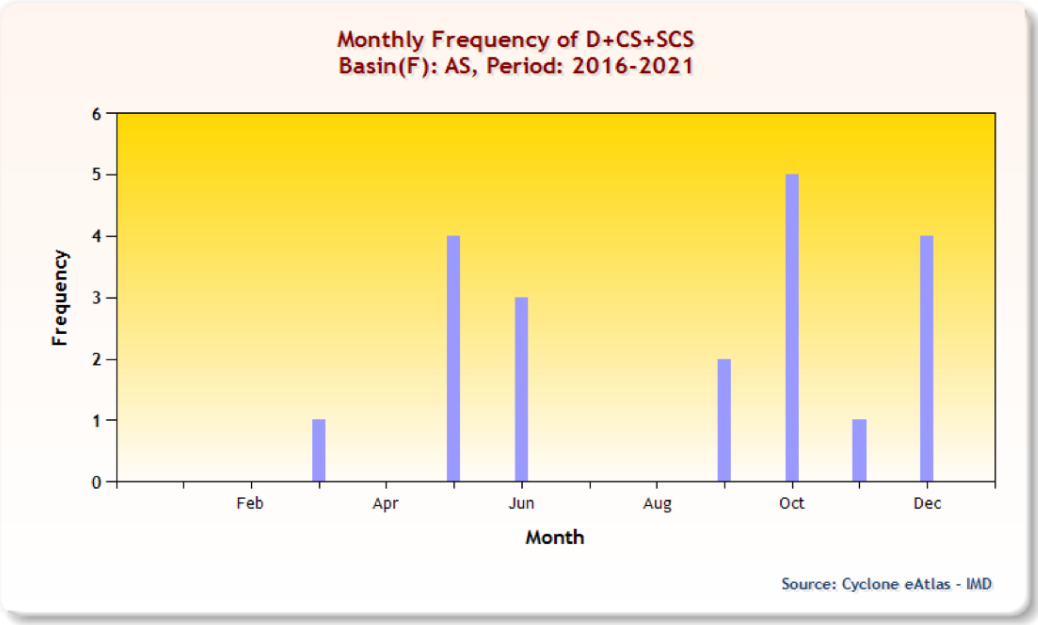


Fig 7.14: Monthly Variation of Cyclones and Depression 2016-2021

Source: IMD

The record of seasonal variation of frequency of cyclone and depressions for the period 2016-21 indicates that months of June, Jul Aug and Sep had 15 and Oct, Nov and Dec had 19 counts of Cyclones and Depressions.

Seasonal Variation of Frequency of Cyclones and Depressions					
Period : 2016-2021					
Basin : AS					
Intensity(Type) : Maximum					
Description	**JF**	**MAM**	**JJAS**	**OND**	**Annual**
Frequency of D+CS+SCS	00	05	05	10	20
Frequency of CS+SCS	00	03	04	05	12
Frequency of SCS	00	02	04	04	10
Percentage Frequency of D+CS+SCS	000.0	025.0	025.0	050.0	100
Percentage Frequency of CS+SCS	000.0	025.0	033.4	041.6	100
Percentage Frequency of SCS	000.0	020.0	040.0	040.0	100
Probability(D to CS)	-010.0	060.0	080.0	050.0	060.0
Probability(D to SCS)	-010.0	040.0	080.0	040.0	050.0
Probability(CS to SCS)	-010.0	066.7	100.0	080.0	083.3

BOB:Bay of Bengal ; AS:Arabian Sea
D:Depression ; CS:Cyclonic Storm ; SCS:Severe Cyclonic Storm

Note :

1. Percentage Frequency is the monthly / seasonal frequency expressed as percentage of annual freque
2. Probability is the probability of intensification expressed as percentage.
3. Probability,shown as negative,indicates indeterminate probability due to zero frequency.

Source : Cyclone

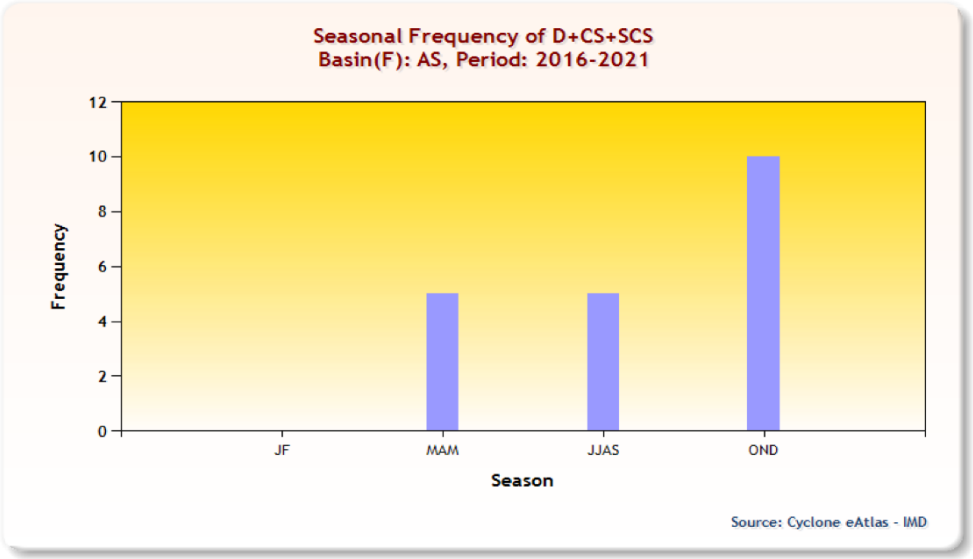


Fig 7.15: Seasonal Variation of Depression, Cyclones and Severe Cyclonic Storms 2016-2021
Source: IMD

The map below shows, **historical data for the period 1891-2021,** of number of times the cyclones and depressions have hit the coastal areas. North Maharashtra and South Maharashtra coasts have been hit 07 times each.

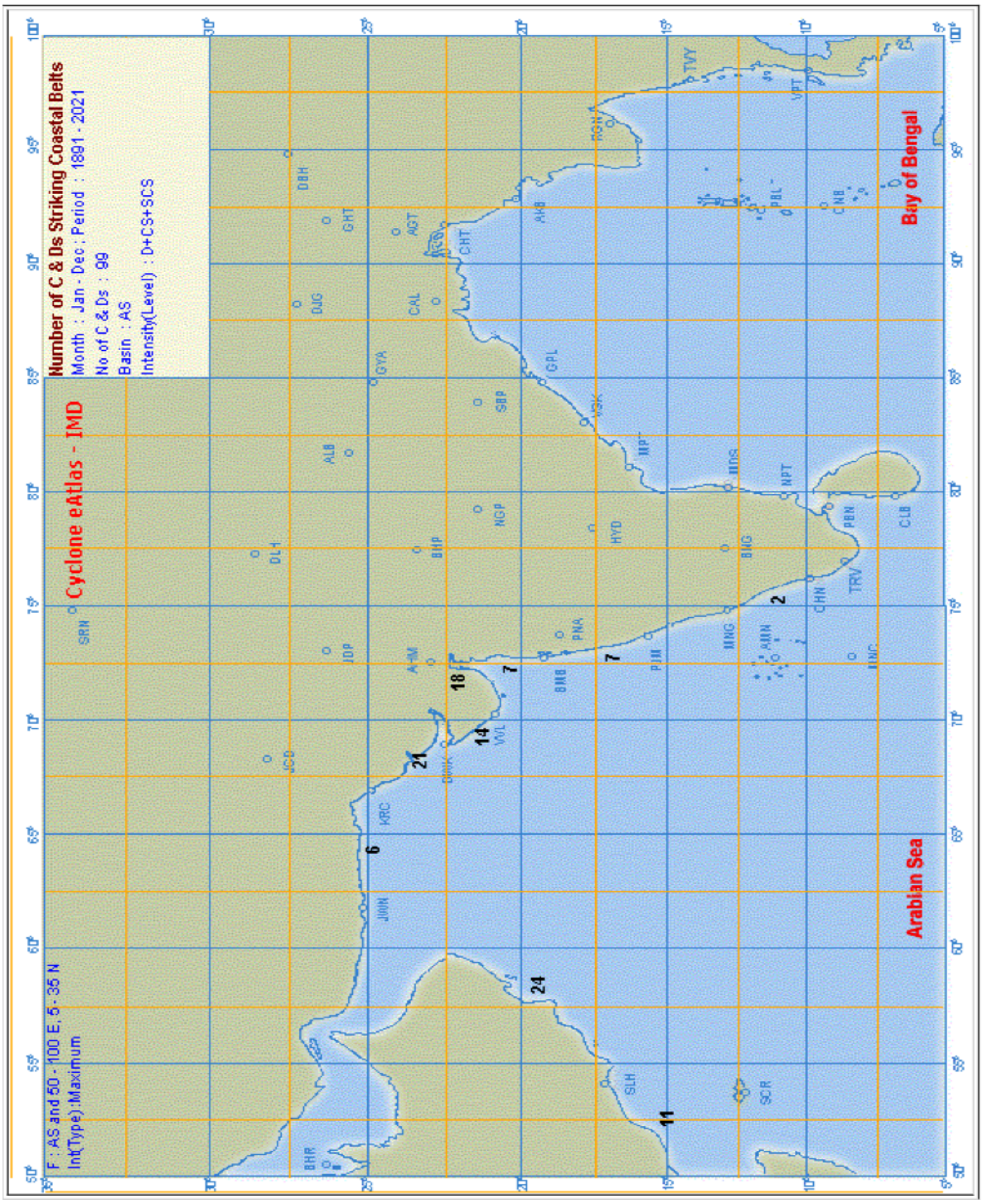


Fig 7.16: Number of Cyclones and Depressions Striking Coastal Belts 1891-2021

Source: IMD

The map below shows, **historical data for the period 2016-2021,** of number of times the cyclones and depressions have hit the coastal areas. South Maharashtra coast have been hit once during these years.

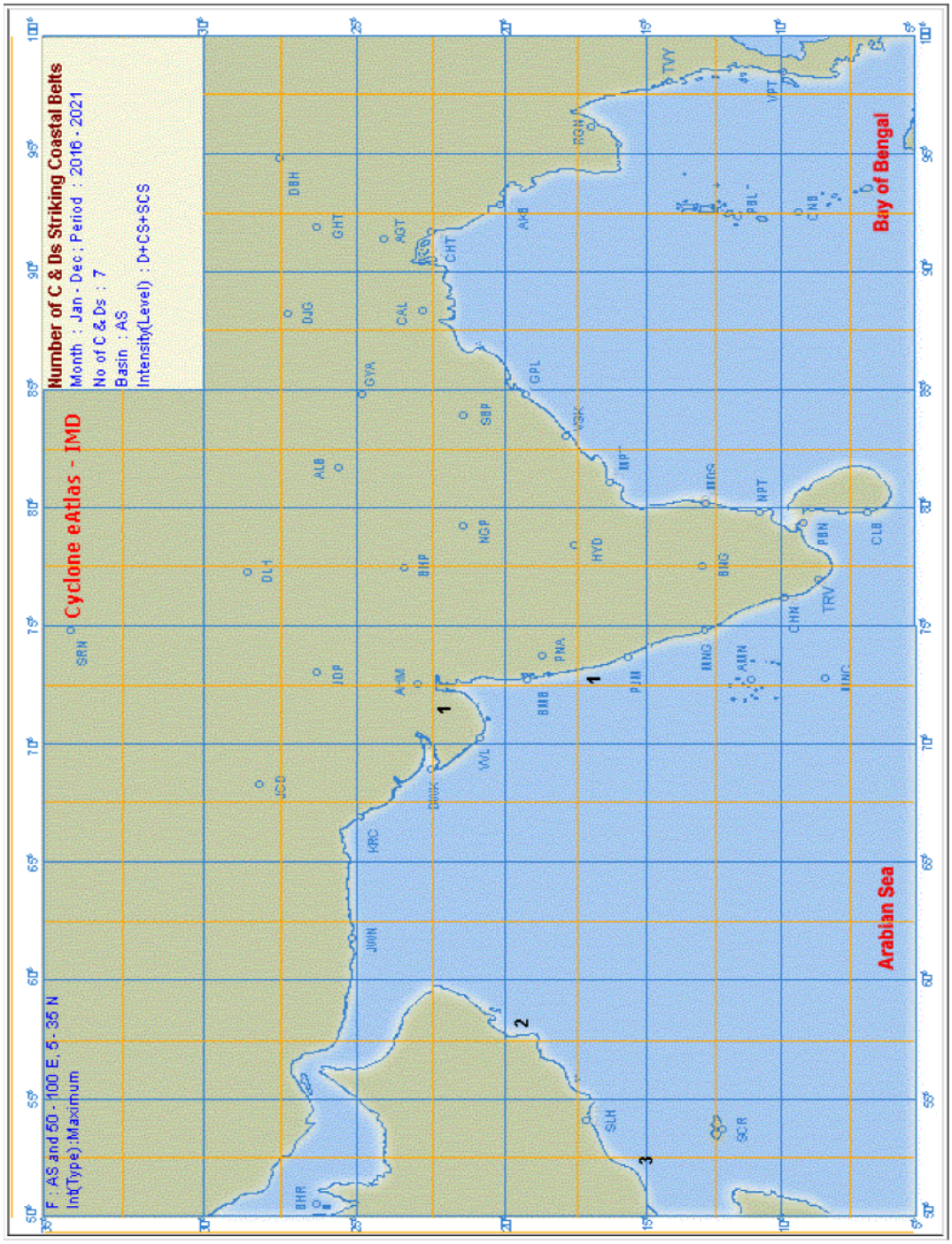


Fig 7.17: Number of Cyclones and Depressions Striking Coastal Belts 2016-2021

Source: IMD

The table below gives a month-wise list and origin of cyclones and depressions for the period 2016 to 2021. This indicates that the months of Feb, June and October are particularly prone to Cyclones and Depressions.

List of Cyclones and Depressions

Period : 2016-2021

Sl.No.	Year	Max Intensity	Initial Date	Beginning Position Lat(°N)	Lon(°E)
Month of January					
1	2020	SCS	01	13.00	71.40
Month of February					
2	2016	D	02	12.70	88.00
3	2019	CS	02	05.70	56.60
4	2021	CS	02	11.00	89.00
5	2021	D	02	11.00	96.30
Month of March					
6	2019	D	03	12.70	71.00
Month of April					
7	2019	CS	04	08.50	99.70
Month of May					
8	2019	SCS	05	13.10	91.50
Month of June					
9	2016	D	06	24.80	81.50
10	2016	SCS	06	08.50	91.00
11	2017	D	06	08.50	88.50
12	2018	D	06	21.80	88.00
13	2018	SCS	06	11.20	67.00
14	2019	D	06	20.50	88.00
Month of July					
15	2021	D	07	14.00	67.50
Month of August					
16	2018	SCS	08	14.00	88.80
17	2019	D	08	09.40	62.20
Month of September					
18	2016	D	09	22.00	88.50
19	2017	D	09	22.40	88.40
Month of October					
20	2018	SCS	10	11.70	92.50
21	2019	SCS	10	11.70	71.00
22	2021	D	10	10.60	83.40
Month of November					
23	2017	D	11	20.50	89.50
24	2020	D	11	15.30	86.50
Month of December					
25	2021	D	12	20.30	87.40

BOB:Bay of Bengal ; AS:Arabian Sea
D:Depression ; CS:Cyclonic Storm ; SCS:Severe Cyclonic Storm

Source : Cyclone eAtlas - IMD

Table 7.1: Month Wise List and Origin of Cyclones and Depressions 2016-2021
Source: IMD

CHAPTER-8

TYPES AND CAUSES OF ACCIDENTS AND INCIDENTS

8.1 **Accident**

Article 5.1 of FAO Technical Guidelines for Responsible Fisheries "Fishing Operations, 1 Suppl 3 Best practice to improve safety at sea in Fisheries Sector" defines accident as: -

Any occurrence on board a vessel or involving a vessel whereby: -

(a) There is loss of life, occurrence of a major injury to any person on board, any person is lost or falls overboard from the vessel or one of its boats.

(b) **A vessel:** -

(i) Causes loss of life, major injury or material damage.

(ii) Is lost or presumed to be lost.

(iii) Is abandoned.

(iv) Is materially damaged by fire, explosion, weather or any other cause.

(v) Runs aground.

(vi) Involved in collision.

(vii) Disabled.

(viii) Causes significant harm to the environment.

(c) Any of the following occurs: -

(i) A collapse or bursting of any pressure pipeline or valve.

(ii) A collapse or failure of any lifting equipment, access equipment, hatch-cover, staging or boatswain's chair or any associated load-bearing parts.

(iii) A collapse of cargo, 2 unintended movement of cargo or ballast sufficient to cause a list, or loss of cargo overboard.

(iv) Snagging of fishing gear, which results in the vessel heeling to a dangerous angle.

(v) A contact by a person with loose asbestos fibre, except when full protective clothing is worn.

(vi) The escape of any harmful substance or agent, if the occurrence, taking into account its circumstances, might have been liable to cause serious injury or to cause damage to the health of any person.

8.2 **Injuries**

"Major Injury" means: -

(a) Any fracture, other than to a finger, thumb or toe.
(b) Any loss of a limb or part of a limb.
(c) Dislocation of the shoulder, hip, knee or spine.
(d) Loss of sight, whether temporary or permanent.
(e) Penetrating injury to the eye.
(f) Any other injury: -
(i) Leading to hypothermia or to unconsciousness.
(ii) Requiring resuscitation, or requiring admittance to a hospital or other medical facility as an inpatient for more than 24 hours.

"Serious Injury means any injury, other than a major injury, to a person employed or carried on a vessel, which occurs on board or during access, which results in incapacity for more than three consecutive days, excluding the day of the accident, or as a result of which the person concerned is put ashore and the vessel sails without that person, unless the incapacity is known or advised to be of three consecutive days or less, excluding the day of the accident".

8.3 Causes of Accidents

There are various causes which can be attributed to accidents, they are listed below:

TYPE OF ACCIDENTS	CAUSE OF ACCIDENT*
Collision Grounding Drifting Fire Explosion Flooding Capsize severe List Loss of hull integrity Man overboard Missing Piracy	Human error Vessel ran out of fuel Overload Entanglement of fishing gears Operational error Steering gear failure Engine failure/breakdown fouling of propeller Water Ingress Structural failure Electrical break down Fuel leakage Act of other vessel Extreme weather Navigation Error Other external cause * May not be restricted to a single cause

8.4 Types of Accidents

Let's elaborate some of the common accidents involving fishing boats at sea.

Capsize of Fishing Boat. Process of a boat or ship overturning and becoming inverted in the water. This can occur for several reasons, including overloading, poor stability, heavy loads on deck, poor weather conditions, or poor design. Capsizing is sudden and often occurs without warning, leaving fishermen little time to utilize safety equipment.

Collision. When two or more vessels make contact with each other, it is referred to as a collision. Factors that may contribute to collisions include poor visibility, lack of communication, or human error. Night time is a particularly common time for collisions to occur due to inadequate lighting, navigational lights, and lookout. In the case of fishing boats, collisions can be particularly hazardous as they may occur in congested waterways and can result in harm to the crew, damage to the boats, or loss of life.

To prevent collisions, fishing boat crew and owners should be aware of the risks and take necessary precautions such as maintaining a proper lookout, communicating with other boats, and following navigation rules. Additionally, fishing boats should be equipped with navigation lights and sound signalling devices to reduce the risk of collision.

Engine Failure. Engine failure occurs when a boat's engine is unable to function properly and can result from several causes such as poor fuel quality, lack of maintenance, or insufficient fuel. If fishermen are not proficient in repairing the engine, it can leave them stranded and helpless at sea.

In the case of fishing boats, engine failure can be highly perilous, especially if it happens in isolated regions or unfavourable weather conditions. It can result in a loss of propulsion, rendering the boat unable to move or steer effectively. This may cause problems in returning to shore or finding a place of refuge. In extreme situations, the vessel may be left stranded and incapable of sending distress signals.

Fishing boat crew and owners should be aware of the risks associated with engine failure and take preventive measures, including proper maintenance of the engine and related systems, use of high-quality fuel, and following the manufacturer's instructions for operation and maintenance. It is also essential to have spare parts and emergency repair tools on board and a communication device for calling for assistance in case of engine failure.

Onboard Injuries. Injuries that occur on a fishing vessel while at sea are known as onboard injuries. These injuries may result from incidents such as falling, slipping, or being struck by heavy equipment or machinery, and can range from minor cuts and bruises to serious injuries like broken bones, head injuries, or even fatalities.

Onboard injuries are injuries that happen on a fishing vessel during its voyage. These injuries can happen due to various reasons such as falling, slipping, or getting hit by heavy equipment or machinery, and can cause minor cuts and bruises to serious injuries, including broken bones, head injuries or even death. For fishermen, onboard injuries can be especially hazardous as they usually occur in remote areas, far from medical facilities, and immediate medical assistance may not be available. It is crucial for fishing vessel crew and owners to recognize the hazards of onboard injuries and take precautions to prevent them, such as maintaining a safe work environment, providing proper training, and keeping appropriate safety equipment on board.

Additionally, having a First Aid Kit and someone trained in first aid on board can be critical in case of an injury.

Man Overboard An incident in which a person falls or jumps from a fishing vessel into the water is known as Man overboard (MOB). This can happen for various reasons, such as rough seas, slippery decks, human error, or the influence of alcohol.

For fishing vessels, a MOB incident can be particularly dangerous as it can occur in remote areas or far off from the coast and can result in loss of life if the person is not quickly recovered.

Fishing vessel crew and owners should prioritize the prevention of MOB incidents by ensuring a secure working environment, providing adequate training, and equipping their vessel with proper safety gear like life jackets, lifebuoys, and emergency signalling devices. In the event of a MOB incident, having a well-rehearsed drill can be crucial for a quick and effective response.

Fire Onboard. "Onboard fire" refers to a situation where a fire breaks out on a fishing vessel while it is in the sea. This situation can arise due to different factors such as mishandling of fire elements, electrical malfunctions, or cooking accidents.

Fishing vessels are particularly vulnerable to fire incidents as they can happen in isolated areas, far from the coast and can result in loss of life or injury, as well as damage to the vessel and its equipment. In severe cases, abandoning the vessel may become the only option if the fire cannot be contained.

To prevent fire incidents on fishing vessels, it is crucial for the crew and owners to maintain a safe working environment, provide proper training, and have appropriate firefighting equipment onboard. A fire on a fishing vessel can be especially dangerous as it can occur in remote areas, far from shore, and can result in injuries, loss of life, and damage to the vessel and its equipment. To ensure safety, a clear fire drill should be established and the crew should be trained to handle such emergencies.

Loss of Way or Disorientation. A fishing vessel experiences a loss of way or disorientation when it is no longer able to determine its location, direction, or bearing while at sea. This can be caused by poor visibility, navigation errors, or equipment failure, and is more likely to occur on boats that lack important navigation tools such as a compass, nautical chart, or GPS.

Loss of way or disorientation can pose a significant threat to fishing vessels as it can happen in remote areas or far from the shore, leading to the vessel being stranded, running aground, colliding with obstacles or other vessels. Additionally, it can result in the loss of precious resources, time, and even lives.

Fishing vessel crew and owners should be aware of the risks of loss of way or disorientation and take preventive steps, such as maintaining navigation equipment, having a clear navigation plan, and providing crew training. In addition, they should have communication devices like a VHF radio and emergency signalling devices to call for help in case of such an incident.

Running Aground. Running aground is a situation when a fishing vessel accidentally touches the seabed or shoreline, typically because it is not in deep enough water. This can happen due to factors such as poor visibility, navigation errors, or equipment failure, and can also occur in unfamiliar fishing grounds or adverse weather conditions, where the vessel may encounter underwater rocks, reefs, and banks.

Running aground is when a fishing vessel unintentionally contacts the seabed or shoreline, often due to poor visibility, navigation errors, equipment failure, or unfamiliar fishing grounds. This can cause damage to the vessel, equipment, and the environment, and can endanger the crew, as well as lead to the vessel becoming stranded and loss of resources. To prevent running aground, fishing vessel crew and owners should maintain proper navigation equipment, a clear navigation plan, and provide training to the crew. It is also important to have communication devices such as VHF and HF sets, and emergency signalling devices in case of running aground.

Hull Damage. The term "hull damage" describes any damage or deterioration that weakens the fishing vessel's hull, which is the central structure that keeps water out and provides buoyancy. Hull damage can result from various causes such as collisions with other vessels, rocks, or debris, as well as corrosion, insufficient maintenance, use of

substandard boat building materials, poor construction, overloading of catch, aging of the boat, and stresses caused by waves pounding against it.

Hull damage can pose a significant threat to fishing vessels as it can result in the vessel taking on water, jeopardizing the safety of the crew and the vessel's ability to stay afloat and navigate. Moreover, it can lead to loss of valuable resources, time, and even life.

To prevent hull damage, fishing vessel crew and owners should conduct regular inspections, maintain the vessel in good condition, and follow manufacturer's guidelines for maintenance and repair. They should also have communication devices like VHF/HF sets and emergency signalling devices available to call for help in case of hull damage.

Entanglement in Fishing Lines. Entanglement of fishing gear and lines occurs when fishing equipment becomes caught on underwater objects such as rocks, wrecks, or debris, and when fishermen become caught in fishing lines while moving around the boat or hauling in the catch. Poor visibility, navigation errors, or equipment failure can contribute to this situation.

Entanglement of fishing nets and lines can be especially perilous for fishing vessels since it can result in loss of valuable fishing gear, harm to the vessel, endangering the crew, and may also compromise the vessel's safety. Additionally, it can lead to the loss of precious time, fuel, resources and even human lives.

Regularly inspecting fishing gear, keeping the vessel in good condition, and following the manufacturer's recommendations for maintenance and repair are crucial steps that fishing vessel crew and owners should take to prevent the risks of entanglement of fishing nets and lines. In addition, having communication devices for calling for help and emergency signalling devices can be critical in case of entanglement.

Equipment Malfunctions. Equipment malfunction refers to the failure or suboptimal functioning of fishing vessel's mechanical, electrical or electronic systems and

components, owing to design flaws, inadequate maintenance, wear and tear, or inadequate crew training. This can result in damage of the vessel, loss of equipment, and endangerment of the crew, as well as impede the vessel's operational capabilities.

Regular equipment inspections and maintenance, as well as following manufacturer specifications, are crucial for fishing vessel crews and owners to mitigate these risks. Implementing preventative measures and having appropriate emergency communication and signalling devices on board can also be critical in case of equipment malfunction.

Extreme Weather. Extreme sea weather in India encompasses severe and uncommon weather phenomena that arise in the oceanic waters surrounding the Indian subcontinent. Examples include tropical storms, cyclones, monsoons, high waves, storm surges, sea surface temperature anomalies, and deep depression.

Extreme weather events in the waters surrounding the Indian subcontinent can have a significant impact on the fishing industry, leading to vessel damage, loss of life, and reductions in fish populations. These events are often unpredictable and can change rapidly, posing a significant risk to fishing vessels and crew. It's crucial for fishing boats and crew to remain aware of potential risks and take necessary precautions, such as monitoring weather forecasts, having an emergency plan, and ensuring that the vessel is equipped with suitable safety gear to mitigate the risk of injury from storms, high winds, or large swells.

CHAPTER-9

COMPONENTS OF SEA SAFETY

Sea safety involves various actions and procedures aimed at protecting the wellbeing of individuals who work or travel on water. It covers a broad spectrum of activities such as constructing, maintaining, and operating vessels, training crew members, complying with regulations, utilizing emergency equipment, navigation and communication systems, and weather forecasting. Its primary aim is to avoid accidents, injuries, and fatalities while safeguarding the marine environment. Sea safety is a fundamental concern for individuals engaged in marine activities, including commercial fishing, shipping, and recreational boating.

Sea safety is a comprehensive and multi-disciplinary field that involves various technical and operational aspects. It encompasses a wide range of activities and practices, including: -

9.1 **Vessel Design and Construction**. The design, materials and construction techniques of vessels must be appropriate for the intended use and the marine environment, in order to ensure stability, buoyancy and seaworthiness.

9.2 **Maintenance and Operation**. Regular maintenance and proper operation of the vessel are critical to ensure its ongoing safety. This includes regular inspections, testing and maintenance of mechanical, electrical and electronic systems, as well as adherence to safety procedures and protocols.

9.3 **Crew Training and Qualifications**. The crew must be properly trained and qualified to handle the vessel and emergency situations. This includes training in navigation, communication, and emergency procedures, as well as safety management, and familiarization with the vessel's equipment and systems.

9.4 **Emergency Equipment**. The vessel should be equipped with appropriate emergency equipment such as life jackets, life rafts, Life Rafts and emergency signalling devices, and the crew must be trained in the use of such equipment.

9.5 **Navigation and Communication**. The vessel should be equipped with navigation and communication equipment that allows the crew to safely navigate and communicate with other boats and shore-based authorities. Global Navigation Satellite Systems (GNSS), VHF radios, GPS navigation systems, AIS (Automatic Identification System), Navigation Radars, SAS (Ship Security Alert Systems), VMS (Vessel Monitoring Systems), Satellite phone or communication systems, Weather forecasting equipment, Compass and navigation charts or maps are examples of such equipment.

9.6 **Weather Forecasting**. It is important for the crew to have access to precise weather forecasts and to be able to monitor weather conditions to make informed decisions about when and where to fish. Additionally, they should be knowledgeable about the meteorological and oceanographic conditions that can lead to extreme weather.

The Indian Meteorological Department (IMD) employs a weather forecasting technique that relies on examining past weather data and patterns. This information is then shared with the public through various channels, including marine radios and safety equipment. Furthermore, real-time and forecasted weather updates including specific information related to the safety of fishermen, are available through the INCOIS weather channel and mobile weather apps.

Weather forecasts for fishermen in Maharashtra, typically reach them through a variety of channels. Some of the ways that weather forecasts are disseminated to fishermen include: -

9.7 **Indian Coast Guard**. The service has devised various novel ways to alert fishermen and seafarers during cyclones. At the first report of prediction of significant weather system by IMD, ICG field formations both air and surface, are put on high alert

and in a high state of preparedness. As a two-pronged measure, ICG warns fisheries authorities, state authorities and local administration about the impending cyclone so that the information reaches to ground level while the units at sea broadcast radio warnings in area and shepherd the ill-informed fishers back to safety of harbours. Close liaison is also maintained with state administration, various departments including IMD to ensure wide spread precautionary measures in affected areas. Additional units are deployed so as to cover a wide area along the predicted path of cyclone. The cyclone warnings are relayed in vernacular language as well so that fisher folks can understand and return to the harbour immediately.

Warning messages are transmitted in following ways: -

(a) **Radio.** The India Meteorological Department (IMD) broadcasts weather forecasts over the radio, which can be heard by fishermen out at sea.

(b) **SMS Alerts.** The IMD sends out weather alerts and forecasts via SMS to registered mobile numbers, which can be useful for fishermen who may not have access to other forms of media.

(c) **Mobile App**. Some of the government organizations and private companies that provide weather forecasts in India also have mobile apps that fishermen can be download and used to access forecasts. Examples of such apps are Windy, AccuWeather, Weather Live etc.

(d) **Fishermen Cooperatives**. The Department of Fisheries, Government of Maharashtra reports that there are 108 and 43 fishermen cooperatives in the Ratnagiri and Sindhudurg districts, respectively. Some of these cooperatives receive weather forecasts from the IMD and other private agencies, which they then share with their members.

(e) **TV and Newspapers**. Weather forecasts are also broadcast on television and published in newspapers, which can be accessed by fishermen when they return to shore.

(f) **Coastal Security Police**. Coastal security police also receive the forecasts and alerts from IMD and other agencies and share the same with the fishermen at the time of their departure and return. It's worth noting that the availability and accessibility of these channels may vary depending on the location and accessibility of the fishermen.

(g) **NGOs.** Various NGOs are undertaking voluntary work at grass root levels. They provide information through group messaging and by personal calls to the target audience.

9.8 **Safety Management**. Implementing a safety management system is crucial to identifying and mitigating hazards and risks, as well as fostering a safety-oriented culture among crew members. Regular safety drills, risk evaluations, and incident inquiries should be conducted as part of this system.

9.9 **Compliance with Laws and Regulations:** Adherence to safety regulations and standards such as SOLAS and the FAO's Code of Conduct for Responsible Fisheries is essential for the vessel and crew to ensure safety at sea.

The integration of these components of sea safety is essential to ensure the safety of the vessel, crew, and marine environment. It's important to note that technology, regulations, and best practices are continuously evolving and vessels and crew should keep updated accordingly.

CHAPTER-10

SEA SAFETY DEVICES REQUIRED ONBOARD

10.1 Categories of Sea Safety Devices

In order to ensure the safety of the crew and adhere to global regulations, it is crucial that fishing vessels are equipped with appropriate safety gear due to the challenging and hazardous nature of their working environments.

Depending upon usage, Sea Safety Devices are broadly classified into three categories

(a) Life Saving Equipment
(b) Communication Equipment
(c) Navigation Equipment

10.2 Life Saving Equipment

Life-saving equipment is crucial for protecting the crew and ensuring survival in emergency situations at sea. Proper maintenance, upkeep, and usage of these equipment according to instructions can significantly improve the safety levels of fishing boats.

Various Life Saving Equipment and their usage is described in succeeding paragraphs.

Life vests/ Life jackets Life Buoys. A life jacket is One of the fundamental and indispensable life-saving equipment on board is a life jacket. It must be made of an approved buoyant material, have a bright and highly visible color, and be equipped with a whistle that is secured by a cord, retro-reflective tapes, and a fixed or flashing light that can last for a minimum of 8 hours.

Fig 10.1: Life Jacket

Merchant Shipping (Life Saving Rules) 1991, Section V, Rule 40 (6) states that "every such ship **shall carry life jackets equal to the number of persons it is certified to carry** complying with the requirements specified in Part II of the Second Schedule and shall be so placed as to be readily accessible and their position shall be clearly indicated".

Life Buoy

It is an essential life-saving equipment on fishing vessels, a life buoy is a circular flotation device typically made of hard, water-resistant materials such as polyethylene or polyurethane foam. It is equipped with a rope or line for throwing to a person in the water and is designed to keep one or more persons afloat until rescue arrives. Additional features such as lights, whistle, and reflectors are often included to enhance their visibility and location in low light conditions. Located strategically on the deck and in the wheelhouse for quick access during emergencies, life buoys are crucial safety equipment for fishing vessels.

Merchant Shipping (Life Saving Rules) 1991, Section V, Rule 40 (2), (3) and (4) specifies each vessel must carry a specific number of life buoys depending on its length. For vessels up to 24 meters in length, at least Two (2) life buoys are required. For vessels between 24-60 meters in length, at least Four (4) life buoys are needed. Vessels greater than 60 meters in length must carry at least Six (6) life buoys. Additionally, at least 50% of the life buoys must be fitted with self-igniting light and a buoyant line of 30 meters in length.

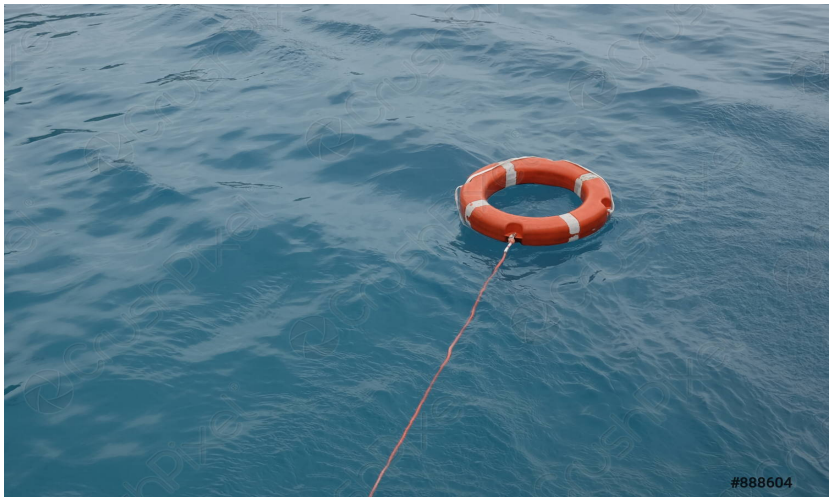


Fig 10.2: Life Buoy

Life Raft

A life raft is an inflatable or rigid boat used as a lifesaving appliance in emergency situations, designed to evacuate people from a sinking or endangered vessel. They can be manually inflated or automatically activated during emergencies, and are typically stored on the open deck of the vessel. Certain life rafts have canopies to provide shelter and others are self-righting to stay afloat if capsized. They are a crucial safety equipment for vessels at sea where abandoning the vessel is a risk.

Life rafts are equipped with a variety of life-saving equipment, including a first aid kit, knife, whistle, buoyant smoke, signalling buoyant bailer, sponges, daylight signalling mirror, efficient radar reflector, sea anchors, buoyant paddles, tin-openers, rocket parachute

flares, waterproof electric torch with spare batteries and bulb, handheld flares, a copy of life-saving signals, a set of fishing tackle, food rations packaged in metal containers or vacuum-sealed with packaging and expiry dates, watertight receptacles, rust-proof graduated drinking vessels, sea-sickness tablets, thermal protective aids, and more.

Fig 10.3: Life Raft

Image Source: *cultofsea.com*

Rule 43 (c) of Merchant Shipping (life Saving Equipment) Rule 1991 specifies fishing boats under class XIII and XIV to carry Life Rafts of sufficient capacity to carry all persons the ship is certified to carry;

Provided that--

(a) "Every such ship of less than 24 meters in length engaged on the coasting trade of India may carry in lieu of life rafts a boat complying with the requirements specified in the 14th Schedule".

(b) "Every such ships of less than 12 meters in length may not comply with the requirements of clauses 9(a) and (b), if they do not go beyond 12 miles from the coast, which deals with display of operating instructions at a conspicuous location".

Fire-Fighting Equipment

Fire Pump. A fire pump is a crucial equipment on a fishing boat that serves to pump water during a fire emergency. Its main purpose is to extinguish the fire and prevent it from spreading, thereby safeguarding the vessel and its crew. The pump can be either manual or power-driven and is capable of drawing water from the sea or a storage tank on board. The water can then be delivered through a hose and nozzle to any part of the vessel for fire suppression.

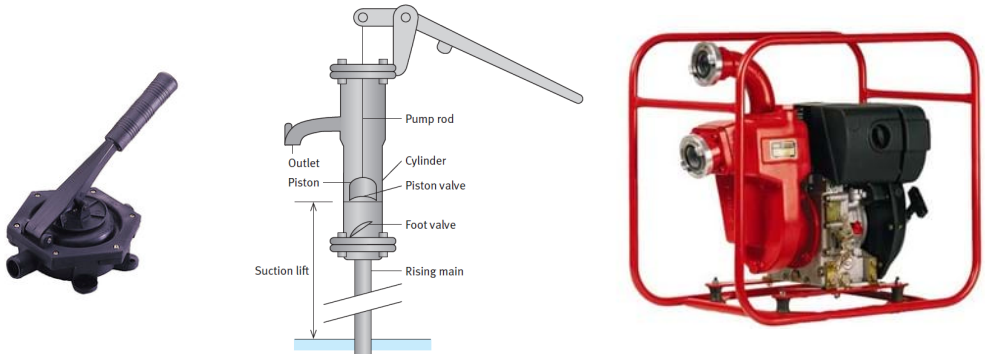


Fig 10.4: Manual Fire Pump, Diesel Driven Fire Pump
Image Source: *cultofsea.com*

Fire Extinguisher: A fire extinguisher on a fishing boat is a portable tool that can be used to control or put out small fires. It usually contains a fire-suppressing substance, such as water, foam, or dry chemical powder, that is released by pressing a trigger. Fire extinguishers are a crucial part of fire safety equipment on fishing boats and can be used to rapidly suppress fires before they spread. The portable fire extinguisher should comply with recognized standards and be easily accessible on the vessel.

Fig 10.5: Portable Fire Extinguishers
Image Source: India Mart

A fire Bucket A fire bucket is a crucial firefighting tool that fishing boats must have on board as a backup in case of a fire emergency. Typically made of heavy-duty plastic or metal, fire buckets are filled with water or other fire-suppressing substances.

Fig 10.6: Fire Bucket and Fire Extinguisher
Image Source: *Adobe Stock*

In the event of a fire, crew members can use the fire bucket to scoop water from the sea or from a storage tank and throw it on the fire to extinguish it. This type of fire-fighting method is simple and effective for controlling and suppressing small fires, giving crew members a critical tool for keeping the fire under control until help arrives.

It should be noted that fire buckets are not a replacement for well-maintained fire extinguishers or other fire suppression systems. They are used in conjunction with other firefighting equipment to provide optimal fire protection for both the fishing vessel and its crew.

First Aid Kit

A first aid kit is a container that holds medical supplies for treating injuries and illnesses, such as sterile bandages, gauze, antiseptic wipes, scissors, antiseptic cream, liquid antiseptic, and commonly used tablets and pain relievers.

Fig 10.7: First Aid Kit and its Content
Source: Indiamart.com

10.3 Communication Equipment

Having communication equipment on fishing boats is essential for addressing emergency situations as it enables the crew to contact SAR authorities when needed. Communication equipment also enhances safety by allowing the crew to stay connected with other boats or authorities ashore and receive updates on weather and other potential hazards.

Various communication equipment and their usage is described in succeeding paragraphs.

Very High Frequency (VHF) Communication Set

VHF means Very High Frequency is an important part of communication for seafarers, as it enables them to send distress messages and stay in touch with other boats or authorities ashore. It is a wireless communication device that combines a transmitter and a receiver, allowing for two-way communication with responding stations through the use of very high frequency (VHF) marine mobile radio service.

The VHF system comprises an antenna that transmits high-frequency waves measured in MHz The range of VHF radio can reach up to 30 nautical miles with a high enough antenna. The system operates solely on standard international frequencies called MMB channels.

However, the most critical function of a Marine VHF Radio is that it is used for transmitting distress signals across the channels to Indian Coast Guard and other vessels in vicinity.

Channel 16 VHF (156.8 MHz) is a Marine Very High Frequency (VHF) radio frequency which is designated as 'International Distress Frequency', primarily intended for transmitting distress, urgency and safety messages/priority calls, and is monitored 24x7 by Indian Coast Guard. This channel is also used as a calling channel to establish communication before switching to a working channel.

Fig 10.8: Portable and fixed VHF Set
Source: Uniden and Icom

Benefits of having a VHF set on a Fishing Boat

Availability of a VHF set onboard a fishing boat provides a range of benefits to the fishermen.

(a) A fisherman in distress at sea can communicate with other fishermen in vicinity for assistance.

(b) Fishers in dress may call for assistance of Indian Coast Guard or Coastal Security Group.

(c) Fishers can share information of prevailing sea state, information of fish availability, sighting of suspicious activity with other fishers in nearby boats or with agencies like Indian Coast Guard and Coastal Security Group for quick action.

(f) Warn and guide other vessels of their nets.

Single Side Band (SSB) Radios The High Frequency (HF) radio equipment is utilized for long-distance communication, covering a range of 25 nautical miles or more. Low to Medium frequency transmissions usually cover distances of 50-150 miles, while high frequency transmissions can cover up to thousands of miles, depending on weather conditions. Hence, this equipment enables communication for fishing boats over longer ranges.

The equipment for SSB requires slightly more complicated installation compared to VHFs as it requires proper grounding and a longer antenna.

Fig 10.9: Single Side Band Radio

Source: Icom

Emergency Position Indicating Radio Beacon (EPIRB). An Emergency Position Indicating Radio Beacon (EPIRB) is an emergency beacon used to send a distress signal to Search and Rescue Authorities in the event of a maritime distress situation. It operates by transmitting the signal on the 406 MHz frequency.

The 406 MHz frequency signal transmitted by an Emergency Position Indicating Radio Beacon (EPIRB) is detected by satellites operated by an International Consortium of Rescue Services, COSPAS-SARSAT. This signal can be detected anywhere on Earth and includes the beacon's unique identifier and GPS position.

The satellites calculate the position or utilizes the GPS coordinates of the beacon and quickly transmits the information to the appropriate local First Responder organization, which then undertakes the Search and Rescue SAR).

When SAR Units are near the search areas, they utilize Direction Finding (DF) equipment to locate the beacon, which can be done through the 121.5 MHz homing signal or, in more recent EPIRBs, the AIS location signal.

The primary objective of this system is to aid rescuers in locating the survivors within the critical first 24-hour period following a traumatic event, also commonly known as the "Golden Day," (the first 24 hours following a traumatic event) during most survivors can be rescued.

EPIRBs are installed on vessels and are usually positioned in an easily accessible location. They can be activated automatically or manually depending on the type of device in the event of an emergency.

Fig 10.10: GPS EPIRB
Source: Icom

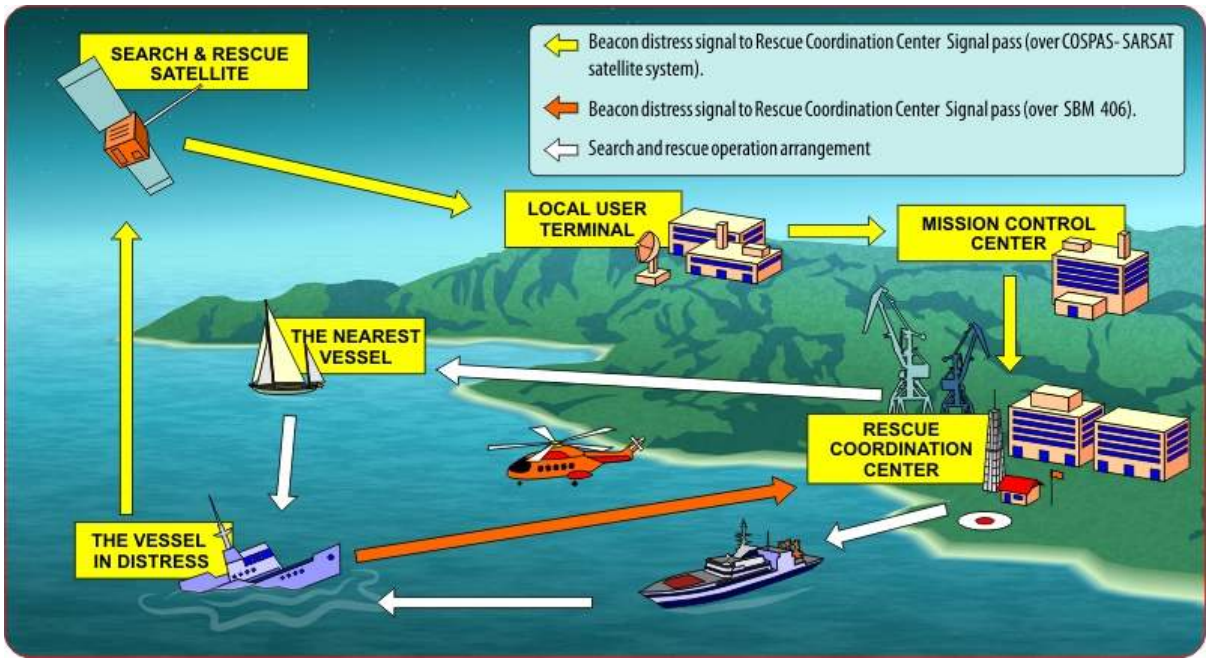


Fig 10.11 : SAR Setup

Source: Wikimediacommons

EPIRBs are a critical safety equipment for boats navigating in areas where there is a possibility of getting lost or incapacitated. They are compulsory on most commercial and recreational vessels and are strongly recommended for all boats operating in offshore waters. As per Rule 43 (a) and (b) of Merchant Shipping (Life Saving Appliances) Rules 1991, each fishing boat under class XIII and XIV shall carry: -

(a) A Survival Craft Emergency Position Indicating Radio Beacon (EPIRB) that meets the specifications outlined in Part IV of the 7th schedule and must be stored in a secure and easily accessible location, ready to be transferred to any survival craft during an emergency

(b) One manually operatable locating device complying with the requirements of Part V of the 7th schedule, which shall be so stowed that it can be readily placed in any survival craft.

Search and Rescue Transponder (SART)

A Search and Rescue Transponder (SART) is an emergency device designed for use at sea, available in two types: radar-SART and GPS-based AIS-SART. The radar-SART helps to locate a distressed vessel by producing 12 dots on a rescue ship's radar. By detecting X-band radar signals, the SART responds by transmitting 12 pulses on the same frequency, which results in 12 dots on the radar screen with gaps of 0.6 miles. As the rescue vessel approaches, the dots turn into arcs, and when the SART is activated, the signal appears as 12 full circles on the radar screen.

The AIS SART utilizes its built-in GPS to transmit eight position report messages, identical in content, to update the rescue vessel with its location every minute. AIS-equipped vessels can detect AIS SART distress signals up to 5 miles away, while aircraft can detect them from 20 to 40 nautical miles. Vessels below 500 gross tonnages must carry one SART, whereas those above 500 tons are required to have at least two. SARTs were originally built using RADAR technology. Upon activation, the SART would wait for a RADAR signal from a nearby vessel and then emit a series of RADAR pulses, which would appear as a sequence of RADAR returns on the ship's display, pinpointing the location of the SART.

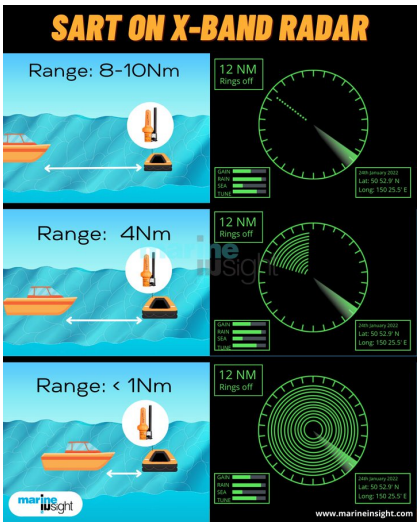


Fig 10.12: SART image on X-Band Radar

Source: Superyachtmarinestore

The AIS SART doesn't rely on RADAR technology but rather transmits AIS messages with precise GPS position data. Any AIS-equipped vessel can receive these messages and generate an alarm with the SART's exact location. Maritime authorities consider AIS and RADAR SARTs to be equally effective

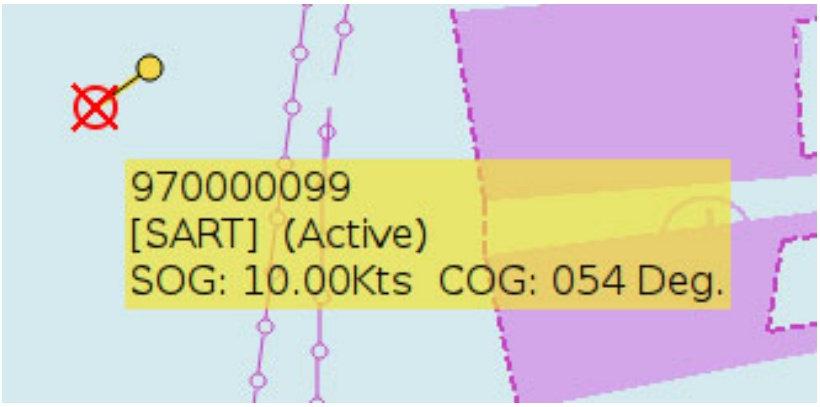


Fig 10.13: AIS SART image on AIS
Source: Superyachtmarinestore

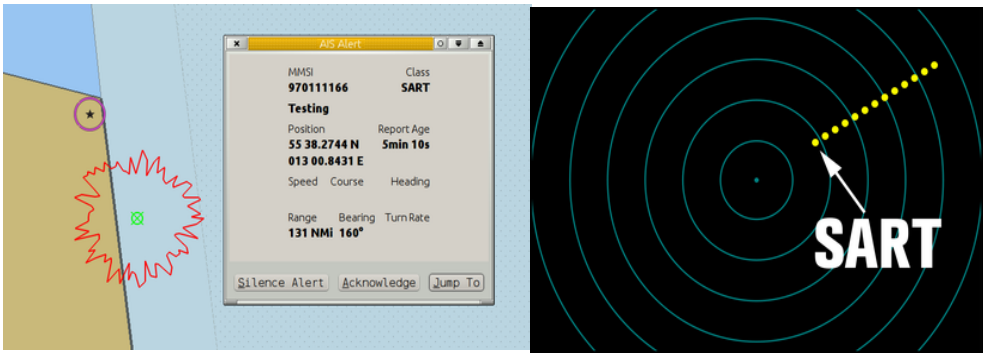


Fig 10.14: AIS and RADAR SART image
Source: Superyachtmarinestore

Distress Alert Transmission System (DATS)

The Distress Alert Transmitter was created by Space Applications Centre (SAC)/ISRO for deep-sea fishermen, equipped with a GPS receiver. It sends a brief message with its location and emergency type when activated manually during an emergency. The device was produced with industry collaboration and distributed to fishermen through the Indian Coast Guard. A reception station has been established at the Indian Coast Guard Regional Headquarters in Chennai, which includes a web portal for accessing the transmitter's position and emergency information online.

Fig 10.15: DAT

Source: marineinsight.com

A new version of the Distress Alert Transmitter (DAT), called the Second-Generation DAT-SG, has been developed by the Space Applications Centre (ISRO) to keep up with the latest satellite-based communication and navigation technology. This UHF transmitter uses the NavIC receiver module, which enables both position determination and reception of broadcast messages through the NavIC messaging service.

The device is primarily used by small boat fishermen who can send emergency messages along with their location information. Additionally, the NavIC messaging service provides them with helpful information, such as weather alerts and Potential Fishing Zones.

Satellite based Automatic Identification System (AIS) / Vessel Monitoring System (VMS)

The Automatic Identification System (AIS) is a coastal tracking system that is required by the International Maritime Organization (IMO) for ships on international voyages with a gross tonnage of 300 or more, cargo ships with a gross tonnage of 500 or more sailing in local waters, and all passenger ships regardless of size.

Following the events of 26/11, vessels larger than 20 meters were required to have AIS installed. The AIS transponder continuously transmits a distinct signal from the vessel on which it is installed, which is received by both ground-based radars and AIS receivers. This signal provides information such as the vessel's identification, owner, and registration.

ISRO has developed a space-based transponder that enables boats to transmit signals to the shore and send distress messages in case of emergencies such as cyclones. Trials have been conducted for tracking of vessels under 20 metres, which were successful.

The range of AIS signals is limited to approximately 40 nautical miles (74 km) horizontally, which implies that AIS traffic details are solely accessible in ship-to-ship or coastal zones.

Vessel Monitoring System (VMS)

The Vessel Monitoring System (VMS) is a satellite-based communication and data monitoring system used for transmitting data from vessels to other vessels or between land and vessels. When a vessel sends data reports through the system, they are transferred to a

satellite, then to an earth station, which validates and stores the data before making it available to the monitoring agency.

The primary application of this system is to track and monitor fishing vessels in authorized areas. The system utilizes onboard transceiver units that communicate via satellite and cellular networks, which are mandatory for the vessels to carry. The transceiver units transmit position reports that include vessel identification, time, date, and location. These reports are then mapped and presented on the user's display unit.

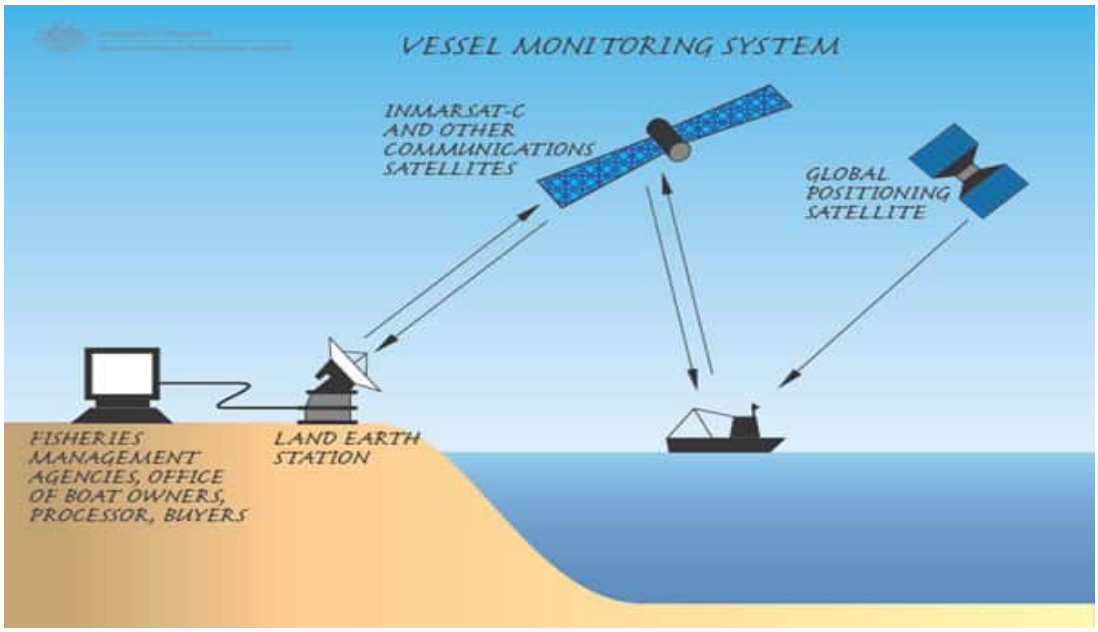


Fig 10.16: VMS system

Source: marineinsight.com

VMS is employed for aiding law enforcement efforts and preventing any violations of laws at sea, as well as for providing instantaneous vessel location to Search and Rescue Agencies in cases of emergency.

10.4 Navigation Equipment

Navigation equipment are devices utilized to determine a ship's location, course, track, and plan routes for operation at sea. The purpose of this equipment is to provide precise vessel position and surroundings to prevent accidents, as well as improve the

efficiency of fishing operations by enabling crew members to locate fishing grounds and navigate to them more accurately.

Some essentially required navigation equipment and their usage are discussed in succeeding paragraphs: -

Magnetic Compass.

The magnetic compass is an essential and fundamental navigation tool. It consists of a magnetized needle that is suspended freely and always points towards the North direction, thanks to the Earth's magnetic field. By determining North, the other directions can be easily established.

The magnetic needle operates without requiring any external power source and is functional in most navigable waters worldwide, with the exception of regions in close proximity to magnetic poles.

Fig 10.17: Magnetic Compass

Source: *boats.com*

Global Positioning System (GPS)

The Global Positioning System (GPS), which was originally known as NAVSTAR GPS (Navigational Satellite Timing and Ranging Global Positioning System), is a type of Global Navigation Satellite System (GNSS). It was developed by the United States Department of Defence.

The GPS is a satellite-based device used for navigation and sea safety, providing the fastest and most accurate means to determine position, navigate, and measure speed. It

relies on a network of approximately two dozen GPS satellites positioned in Medium Earth Orbit (between 2,000 to 35,786 km).

The GPS receiver gathers and analyses signals from visible GPS satellites to determine and exhibit various information such as location, speed, and time. It should be noted that the GPS receiver does not transmit any data back to the satellites.

A GPS receiver simplifies the process of determining one's location and navigating to a desired destination. It can also identify areas with high fishing potential, resulting in a more efficient and fuel-saving fishing experience. Moreover, it enhances safety while sailing.

The GPS receiver functions by receiving and processing signals from GPS satellites that are in view, which is then used to display the user's location, speed, time, and other relevant information. It should be noted that the receiver does not transmit any data back to the satellites.

For accurate positioning, the GPS need to receive good strong signals from at least 4 satellites and an unobstructed view of the sky.

Fig 10.18: GPS Display

Source*: garmin.co.in*

The most common method of display of GPS coordinates are Latitude and Longitude, in ‘Degrees/Minutes/Seconds’. For example: the coordinates 17° 01’ 04” N &

73° 14’ 16” E indicates that the north/south position is 17 degrees, 01 minutes and 04 seconds North of the Equator and the east/west position at 73 degrees, 14 minutes and 14 seconds East of the Prime Meridian.

Marine Radar

Radar is an important navigation aid which transmits on ‘X’ and ‘S’ band frequencies of radio waves. Radar is an important aid to avoid collision by locating and identifying nearby ships/ boats or coastline during the time of darkness or poor visibility position, fixing own boat’s position using terrestrial objects, and determining whether to certain extent apart from certain other high-tech use when calibrated to other navigation aids.

Fig 10.19: Marine Radar

Source: onwamarine.com

Radar Reflectors. Radar reflectors are simple metallic objects designed in such a way that it reflects the radar signals transmitted by bigger ships, and thus help to spot smaller boats on their radar screens from far away. This helps in collision prevention, and also helps in locating a boat in SAR mission.

A radar reflector thus enhances the safety of fishing boats especially in poor visibility. For maximum viability to a radar, the reflectors should be placed as high as possible onboard a fishing boat, clear from any superstructure of the boat.

Fig 10.20: Radar Reflector

Source: onwamarine.com

Echo Sounder.

An echo sounder is an electronic instrument utilized to gauge water depth and detect underwater structures or features. The device emits sound waves into the water and records the time taken for the sound waves to reflect back or create an "echo." The elapsed time is then utilized to determine the water depth and locate underwater objects or the sea floor.

Fishing boats frequently use echo sounders to detect fish schools, underwater topography, and other structures that may be home to fish. Additionally, they help determine water depth and ensure that the fishing vessel remains in safe and navigable waters.

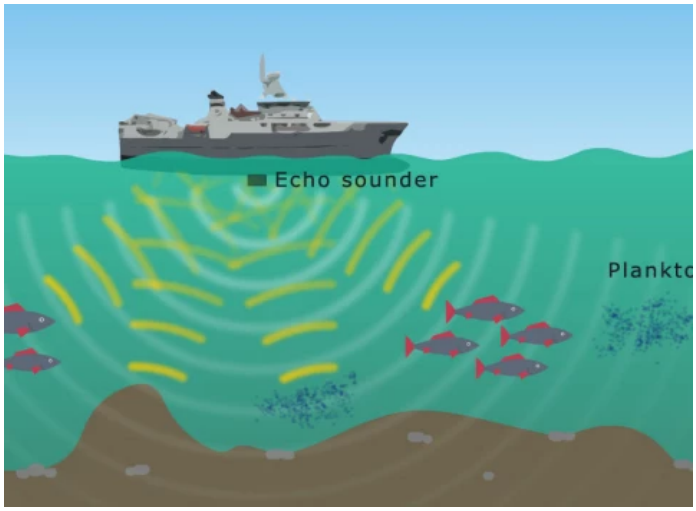


Fig. 10.21: Echo Sounder of Fishing Trawler

Source: Garmin.com

Fig 10.22: Echo Sounder Display Unit
Source: *Garmin.com*

10.5 Navigation Lights, Shapes and Signals

The primary function of marine navigation lights is to aid navigation at night and prevent collision . All vessels are required to have night lights as a part of the marine navigation systems.

Nav Lights onboard vessels were first introduced in 1838 by the United States, and later followed by the United Kingdom in 1849. The International Maritime Conference was established in the year 1889 by the United States to establish guidelines to prevent marine accidents.

The international marine navigation rules were adopted in 1897, with the UK specifying the colours of required lights. These rules led to the selection of three colours,

namely Red, Green, and White, which continue to form the basis of marine navigation lighting till today.

Definitions

Enumerated below are few important definitions which should be known to all sea going Fishing vessels' crew and owners.

(a) **Masthead Light.** A white light placed over the fore and aft centreline of the vessel showing an unbroken light over an arc of the horizon of 225° and so fixed as to show the light from right ahead to 22.5° abaft the beam on either side of the vessel.

(b) **Sidelights**. A green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of the horizon of 112.5° and so fixed as to show the light from right ahead to 22.5° abaft the beam on its respective side. In a vessel of less than 20 metres in length the sidelights may be combined in one lantern carried on the fore and aft centre line of the vessel.

(c) **Stern light.** A white light placed as nearly as practicable at the stern showing an unbroken light over an arc of the horizon of 135 degree and so fixed as to show the light 67.5° from right aft on each side of the vessel.

(d) **Towing light**. A yellow light having the same characteristics as the "stern light" defined above.

(e) **All-round Light.** A light showing an unbroken light over an arc of the horizon of 360 degrees.

(f) **Flashing Light.** A light flashing at regular intervals at a frequency of 120 flashes or more per minute.

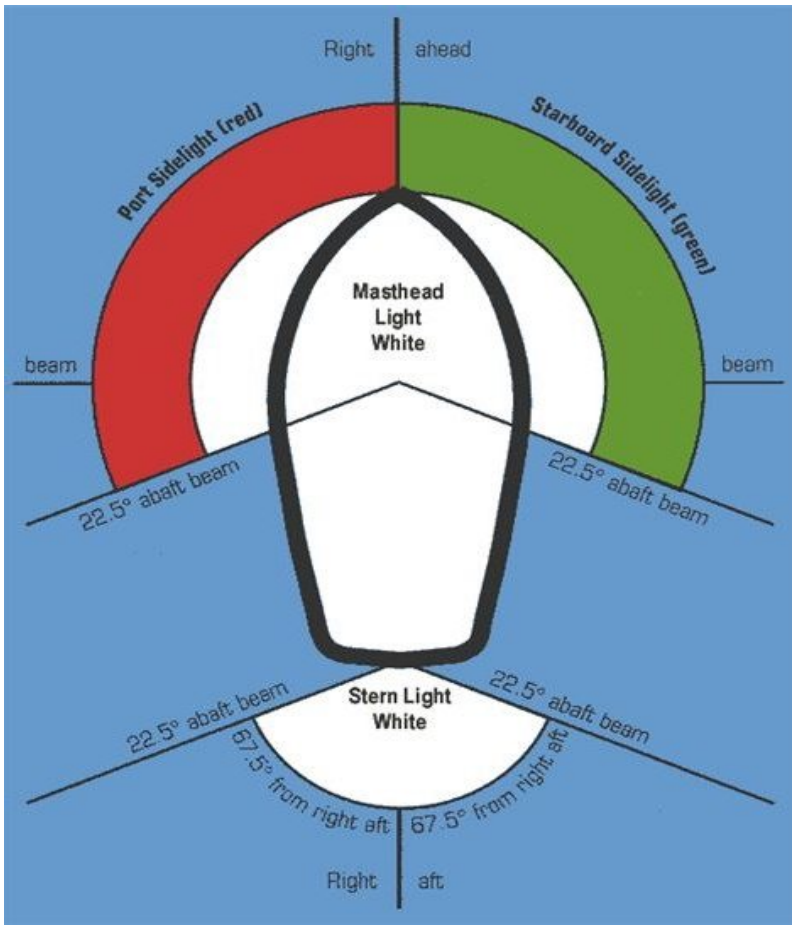


Fig. 10.23: Navigation Lights
Source: Marineinsight.com

Ruel 26 of COLREGS specifies lights for fishing vessels, which are as given below: -

(a) A vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed by this rule.

(b) A vessel when engaged in trawling, the vessel is dragging through the water a dredge net or other apparatus used as a fishing appliance, this vessel shall exhibit: -

(i) Two all-round lights in a vertical line, the upper light will be green and the lower will be white, display shape consisting of two cones with their apexes together in a vertical line one above the other.

(ii) A vessel is required to exhibit a masthead light that is positioned aft of and higher than the all-round green light. However, vessels that are less than 50 meters in length are not obligated to display this light, but they may choose to do so.

(iii) When a vessel is underway, it needs to display sidelights and a stern light in addition to the lights specified in this section.

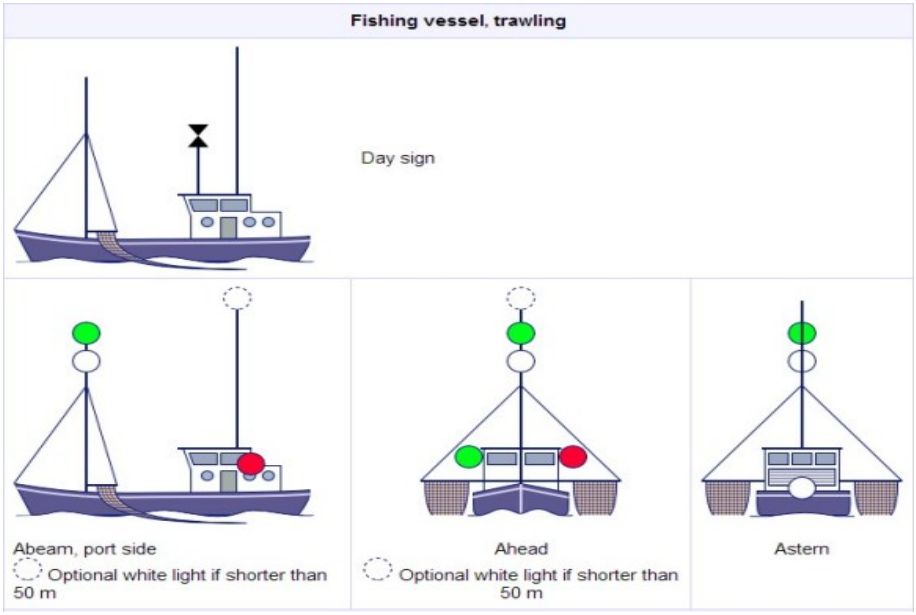


Fig 10.24: Fishing Vessel, Trawling Lights
Source: *Captaindamley.net*

(c) A vessel engaged in fishing, other than trawling, shall exhibit:

(i) The vessel should display either two all-round lights in a vertical line, where the upper light is red and the lower light is white, or a shape comprising two cones with their apexes situated in a vertical line, one above the other during the day.

(ii) When a vessel has outlying gear that extends horizontally for more than 150 meters, it must display either an all-round white light or a cone pointing upwards in the direction of the gear.

(iii) In addition to the lights prescribed in this paragraph, vessels making way through the water are also required to display sidelights and a stern light.

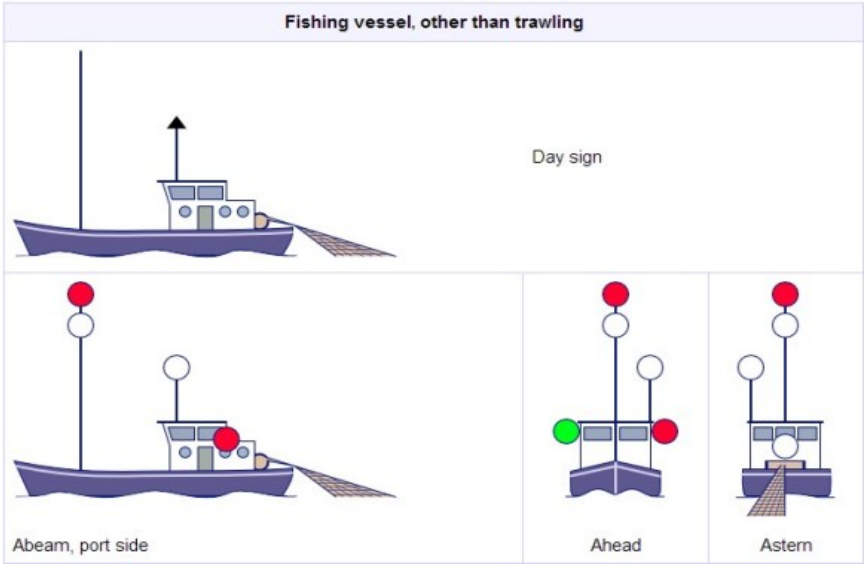


Fig.10.25 : Fishing Vessel, other than trawling
Source: *Captaindamley.net*

(d) The supplementary signals outlined in Annex II of these Regulations are applicable for a fishing vessel operating in close vicinity to other fishing vessels.

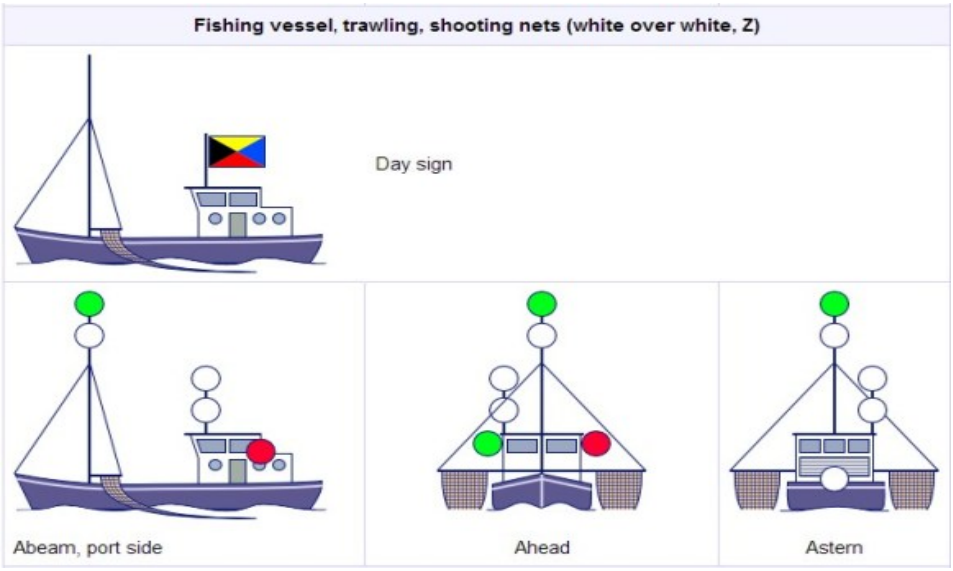


Fig.10.26: Fishing Vessel, shooting nets
Source: Captaindamley.net

(e) A fishing vessel operating near other fishing vessels must follow the additional signals specified in Annex II of these Regulations.

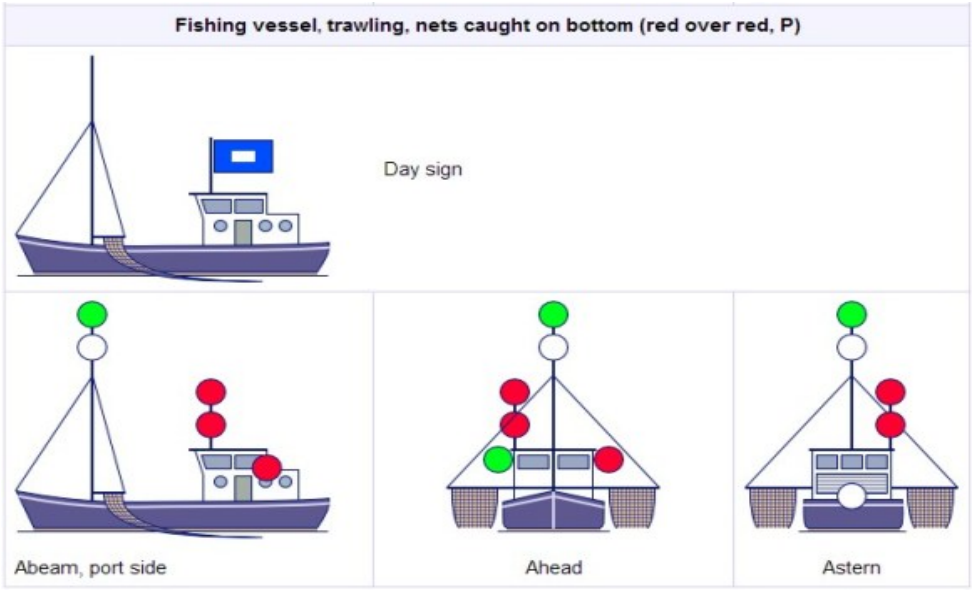


Fig. 10.27: Fishing Vessel with nets caught in obstruction
Source: *Captaindamley.net*

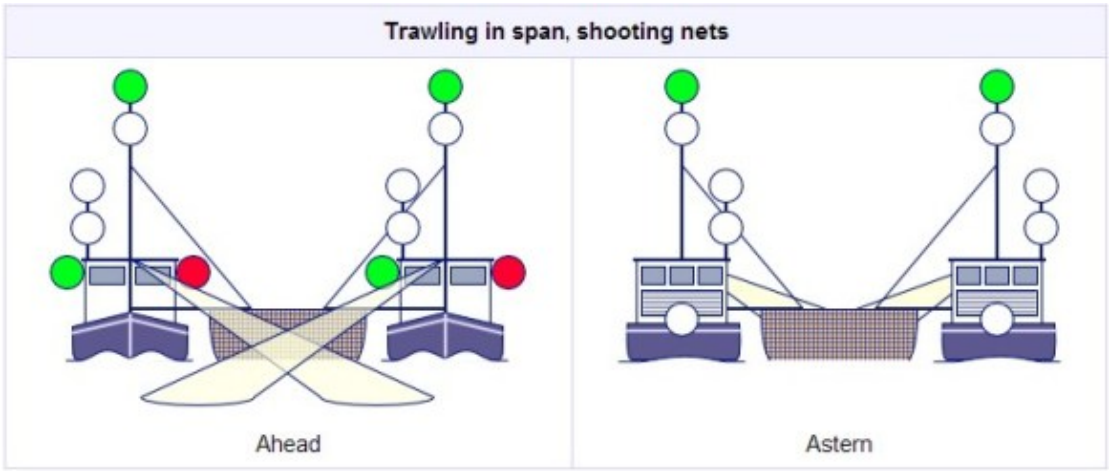


Fig. 10.28: Fishing Vessel, shooting nets
Source: *Captaindamley.net*

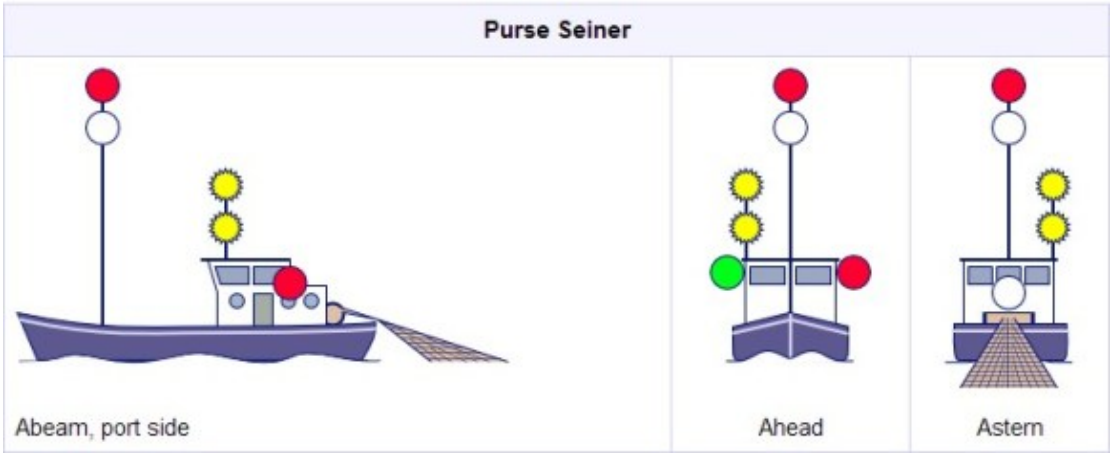


Fig.10.29: Fishing Vessel, Purse Seiner
Source: *Captaindamley.net*

(f) When a vessel is not fishing, it should display only the lights and shapes required for a vessel of its length, and not those specified in this rule for fishing vessels.

Small fishing vessels must display the lights prescribed in the Rule as given above, without any relaxation. They cannot be regarded as Not Under Command (NUC) or Restricted in Ability to Manoeuvre (RAM), even if their engines or steering gear become defective. As per Rule 18, vessels engaged in fishing are given a high degree of privilege over other vessels and must show only the lights and shapes prescribed in Rule 26, while only "so far as possible" having to keep clear of other hampered vessels.

Vessels engaged in fishing must display their sidelights and stern light when moving through the water, making it easier to determine whether they are underway and making way or simply underway. This is one of the few categories of vessels for which such determination can be made with reasonable certainty.

It is to be noted that Rule 26(b) provides a specific definition for a vessel engaged in trawling operation, which is not included in Rule 3. While trawlers and fishing vessels are essentially considered as fishing vessels under these rules, they have distinct light characteristics.

It should also be noted that for fishing vessels engaged in trawling, a single masthead light is mandatory if they are more than 50 m in length and optional if they less than 50 m in length. This is in addition to the green and white lights required for all fishing vessels under the Rules.

When a fishing boat stops trawling, it should display lights as required for a power-driven vessel of its length. A fishing vessel engaged in fishing, regardless of its length, cannot exhibit an extra masthead light

Regardless of its length, a fishing vessel when engaged in fishing is prohibited from displaying the additional masthead light. Other important rules that fishing boat must pay close attention to are: -

Rule 5 - Keep a constant look-out, by sight, hearing and all as well as all available means available.

Rule 8 - Collision Avoidance, any manoeuvre, changing course and or speed, and stopping, done to avoid a collision must, if the circumstances allow, be carried out without hesitation, in good time in accordance with good maritime practice.

Rule 9 - Narrow Channels and Fairways:

(a) When navigating through a narrow channel or fairway, a vessel should stay as close as possible to the starboard side of the channel or fairway, provided it is safe to do so.

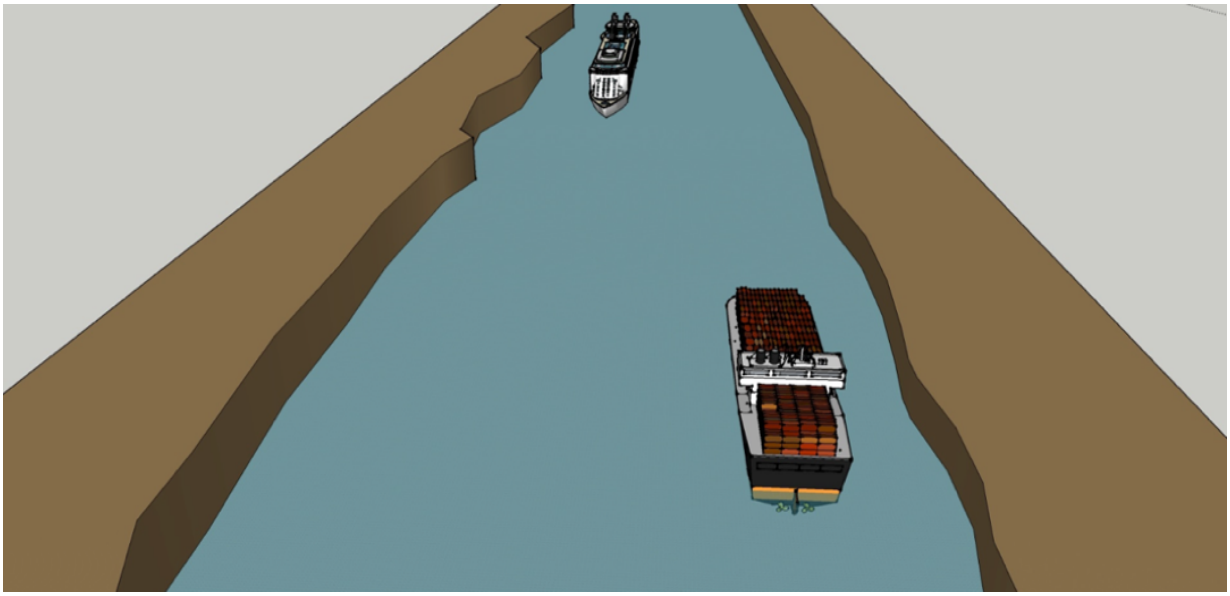


Fig. 10.30: Narrow Channel
Source: *future-seafarers.com*

(b) A vessel that is less than 20 meters in length or is a sailing vessel should not obstruct the passage of a vessel that can only navigate safely through a narrow channel or fairway.

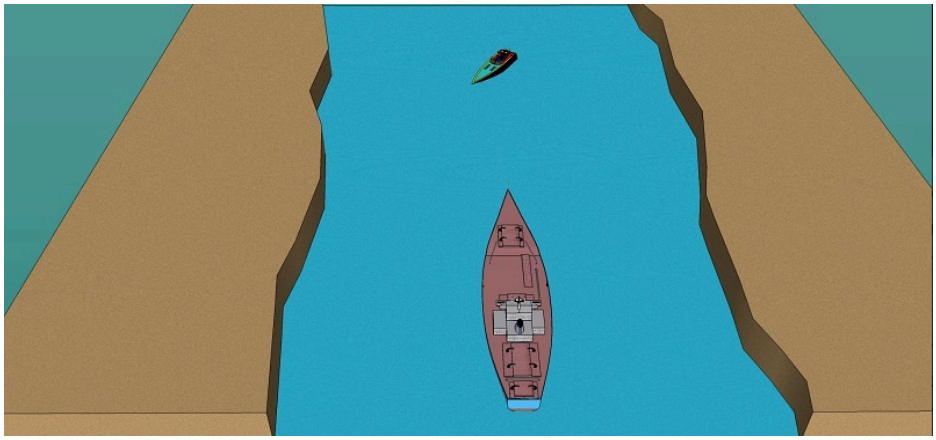


Fig. 10.31: Narrow Channel with fishing boat
Source: *future-seafarers.com*

(c) A narrow channel or fairway should not be obstructed by a vessel engaged in fishing while any other vessel is navigating within it.

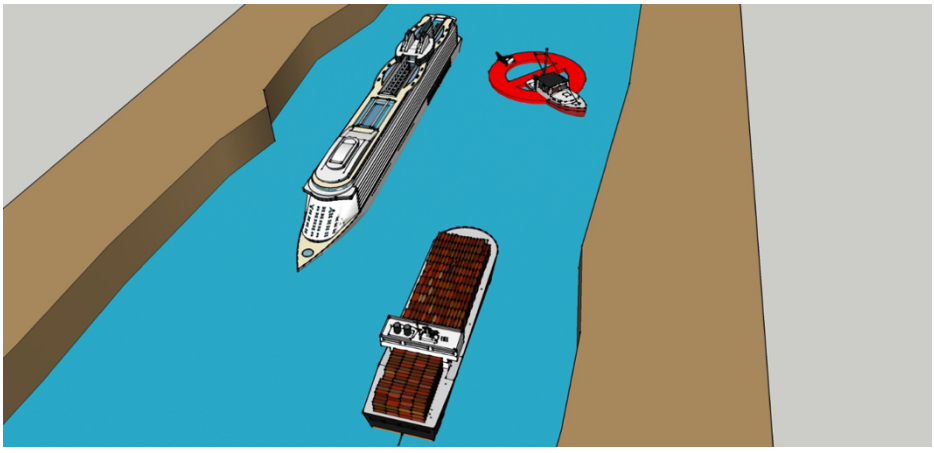


Fig. 10.32: Narrow Channel with fishing boat impeding passage
Source: *future-seafarers.com*

Rule 13 Overtaking. An overtaking vessel must keep out of the way of the stand-on vessel.

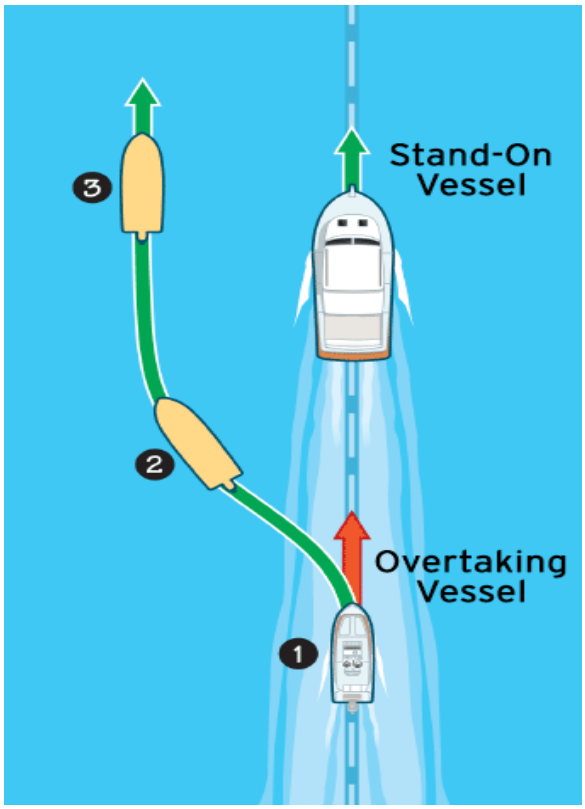


Fig.10.33: Overtaking situation
Source: boatUS.com

Rule 14 - Head-on situations. If two power-driven vessels meet on reciprocal or nearly reciprocal course (head-on), both must give way by altering their course to starboard so that each shall pass on the port side.

If a power-driven or sailing vessel encounters a fishing vessel head-on, the power-driven or sailing vessel is required to give way, while the fishing vessel should maintain its course and speed.

If a vessel engaged in fishing meets a vessel, which is restricted in her ability to manoeuvre or a vessel not under command head-on, the fishing vessel must give way.

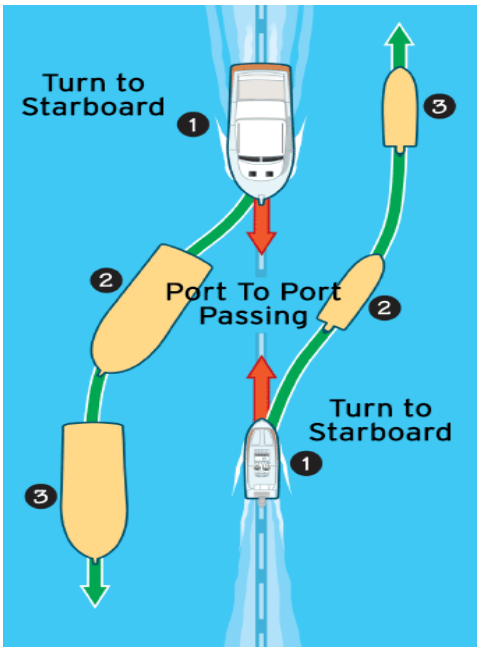


Fig. 10.34: Head. on Situation

Source: *boatUS.com*

<u>Rule15 Crossing the Path of Another Vessel.</u> When a power-driven vessel or a vessel engaged in fishing approaches another power-driven vessel or fishing vessel on its starboard side, it should give way and avoid crossing ahead of the other vessel.

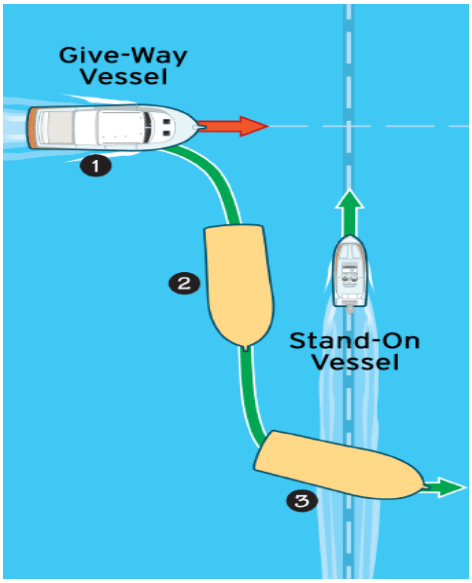


Fig. 10.35: Crossing Situation

Source: *boatUS.com*

Rule 19 - Restricted visibility If unable to see other vessels because of fog or bad weather, speed should be reduced and appropriate sound signals to be sounded and navigate with extreme care and be prepared to stop.

CHAPTER-11
STAKE HOLDER'S OPINION: DATA ANALYSIS AND INTERPRETATION

It is important to consider the opinions and perspectives of stakeholders when addressing issues related to marine fisheries safety. Fishermen, boat owners, government agencies, and other organizations all have a stake in ensuring the safety of those who work and travel on the water. Fishermen and boat owners may have insights into the specific risks and challenges faced by those in the industry, as well as ideas for practical solutions to address these issues. Government agencies can provide regulatory oversight and funding for safety initiatives, while organizations such as fishing associations and unions can advocate for the needs and concerns of their members. It is crucial to engage with these stakeholders and incorporate their input in the development and implementation of safety measures, in order to create effective and sustainable solutions that reflect the needs and realities of those working in the industry.

11.1 Fishermen and *Tandel*

Samples were collected from fishermen, both at **Sea and in fishing Villages** of Ratnagiri and Sindhudurg districts of Maharashtra Total of 84 samples from Ratnagiri and 36 samples from Sindhudurg were collected.

Fig. 11.1: **Data Collection during Routine Investigation - 1**
Source: Indian Coast Guard

Fig. 11.2: Data Collection during Routine Investigation-2

Source: Indian Coast Guard

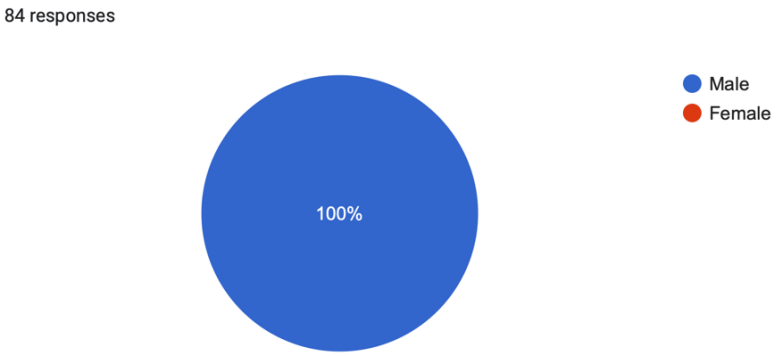
Fig. 11.3: Data Collection During CIP

Source: Indian Coast Guard

The fishermen were interviewed and were administered a set of questions, which covered various aspects.

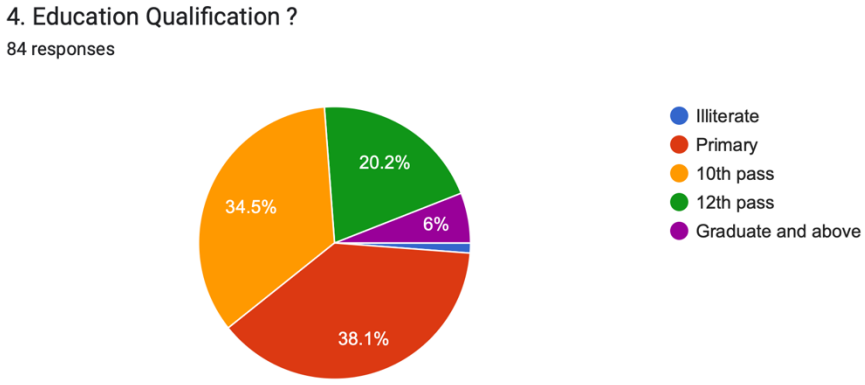
Gender

All 84 samples were Male, which were involved in Marine Fishing.



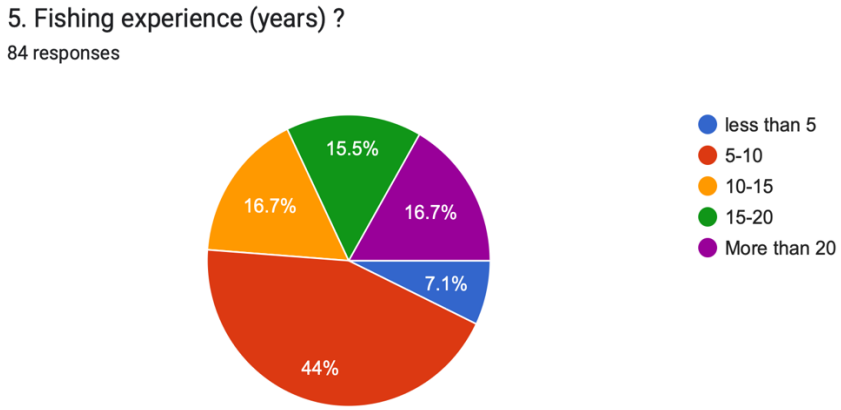
Education Qualification

Majority of the fishermen were below 10th pass. Only 6 % (05 samples) of the fishermen were graduate and above. One Fisherman was also illiterate.



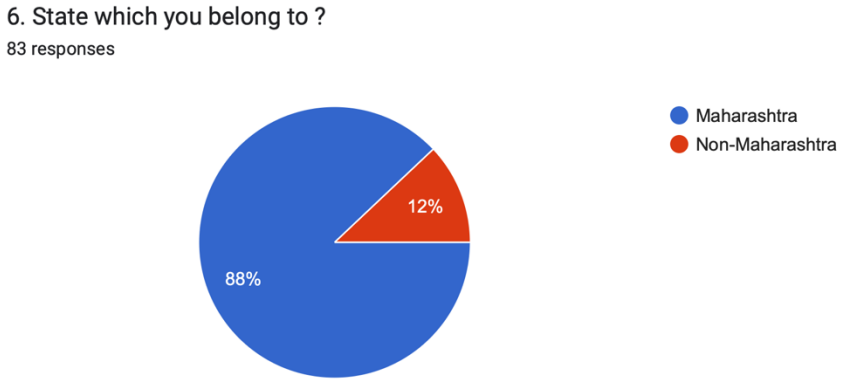
Fishing Experience (in Years)

Majority of the fishermen, 44 % had an experience of 5-10 years of fishing experience in marine environment, and 16.7 % had 10-15 years of sea experience. 16.7 % had more than 20 years of experience.



State Belonging to

88% of the samples (73) belonged to the state of Maharashtra whereas 12 % of the fishermen were from states other than Maharashtra. Many of them belonged to Nepal.

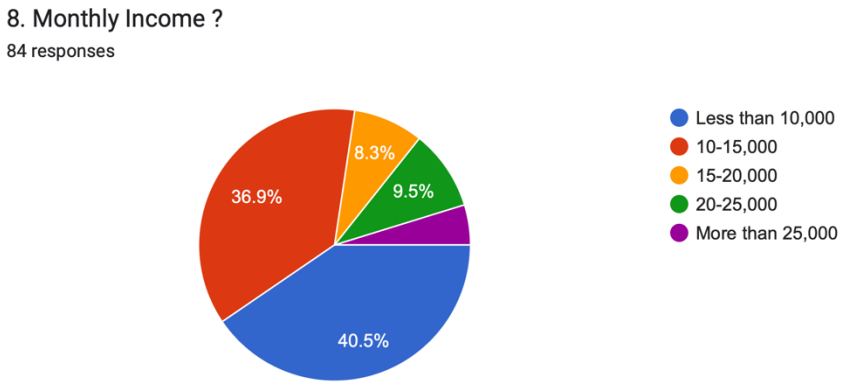


Swimming

All fishermen were swimmers

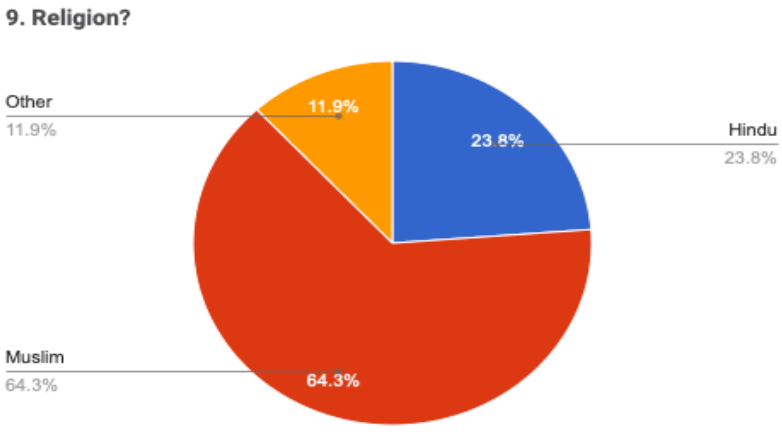
Monthly Income.

Monthly income of majority of fishermen were below Rupees 15,000/-. Where 40% of the respondents (34 fishermen) had a monthly income of less than Rupees 10,000/-.



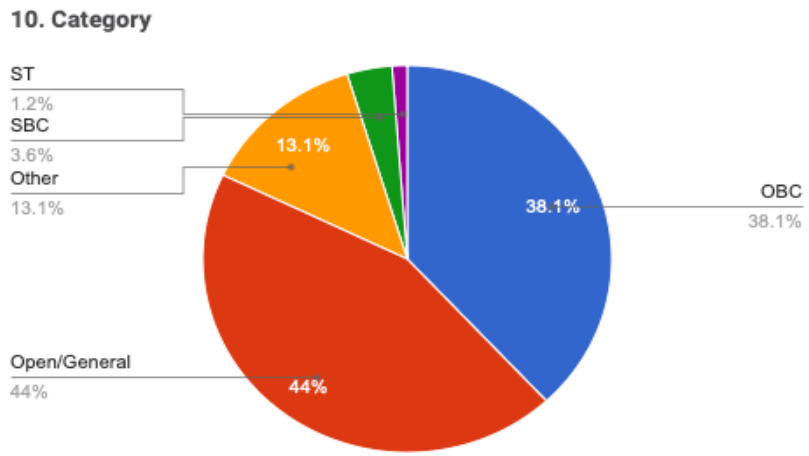
Religion

Majority of the fishermen, 64%, were Muslim, whereas 23.8 % were Hindu and 11.9% belonged to other communities.



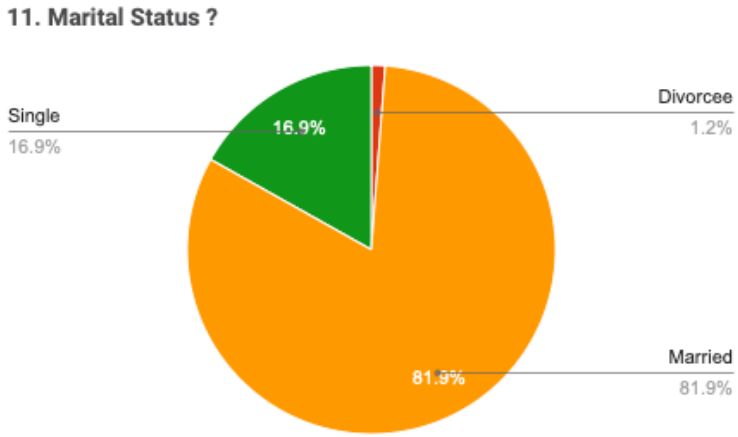
Category

About 44% of fishermen belonged to General and 38.1% belonged to OBC



Marital Status

Majority of the fishermen were married, 81.9%, whereas 16.9% were Single and about 1.2% were divorcee.

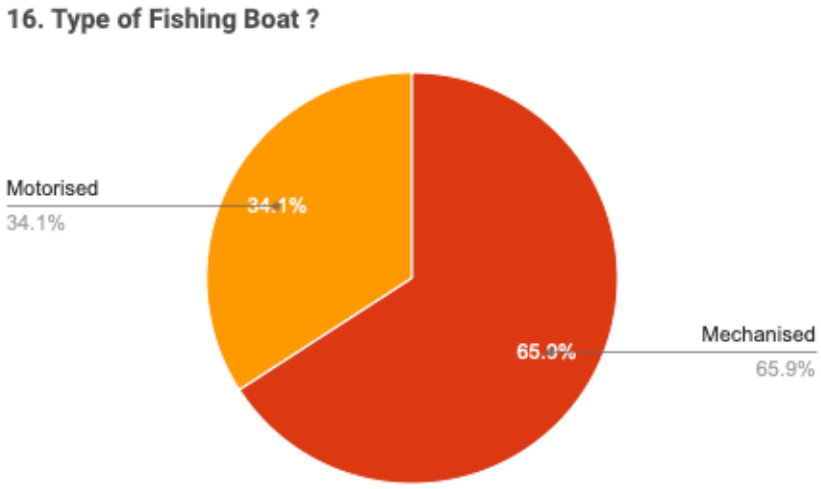


Registration of Boat.

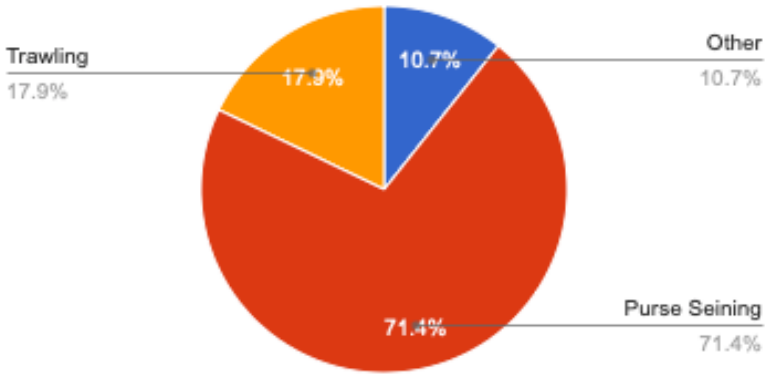
About 95.2% of the boats had a valid registration number. Others either had expired registration number or were not in-date.

Type of Fishing Boat

About 65.9% of the boats were Mechanised and 34.1% of the boats were Motorised.

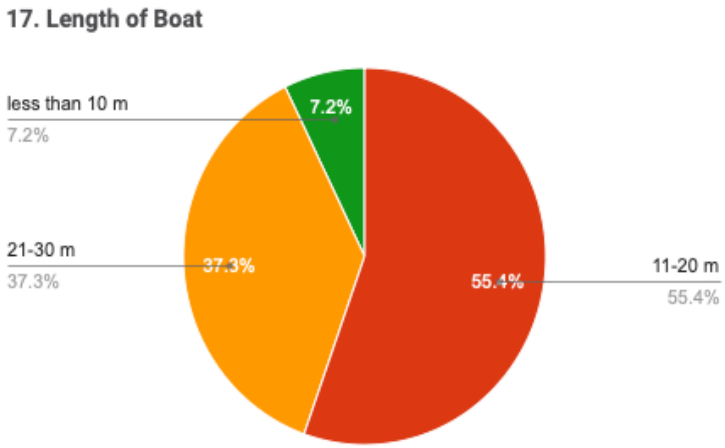


Type of Fishing Method



71 % of the fishermen said that they did Purse Seining

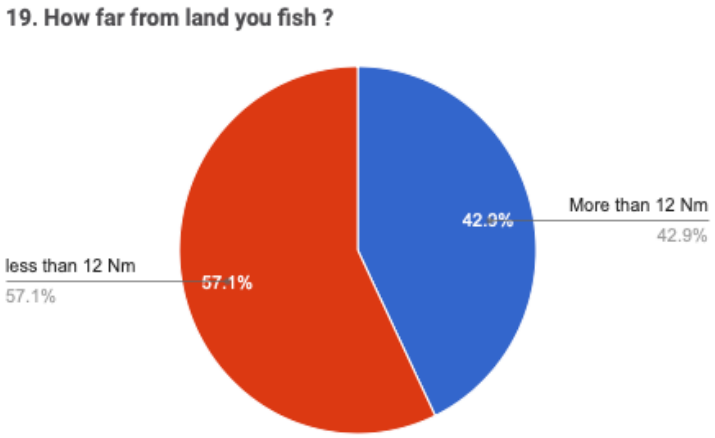
Length of Boat



About 55.4 % of the boats were about 11-20 m in length and 37.3% of the boats were 21-30 m were as about 7.2% boats were less than 10 m in length.

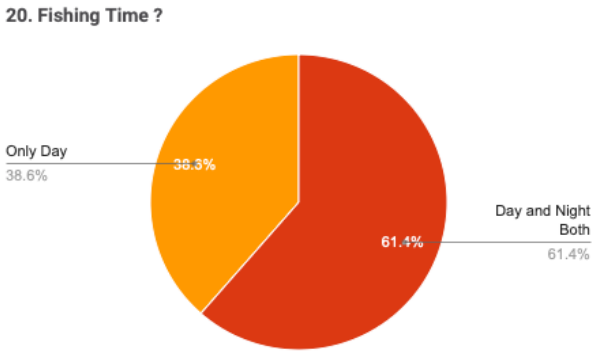
Distance of Fishing Ground from Shore (Base Line)

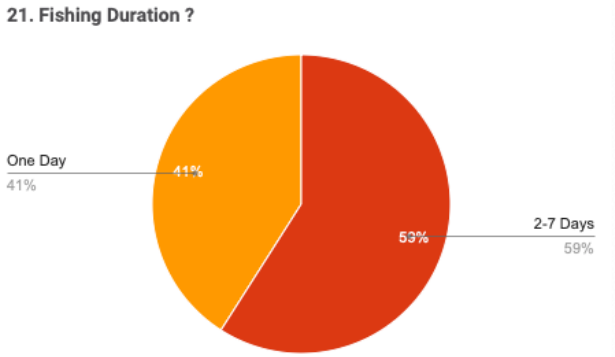
About 57.1 % of the respondents declared that they fish in Territorial Sea and 42.9% fish beyond 12 Nm.



Fishing Time of the Day and Duration.

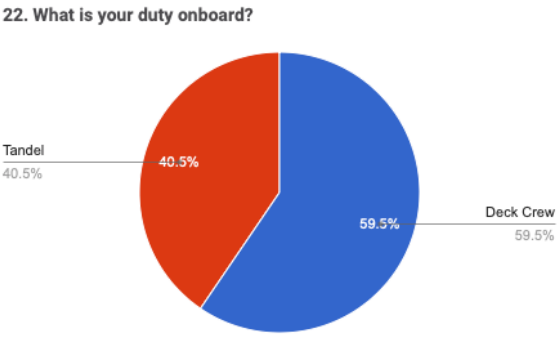
Majority of the respondents reported that they did fishing both day and night, whereas 38.6% reported that they fish only during day time. As many as 59% of the fishermen fish for about 2-7 days at a stretch, whereas 41% of the fishermen fish one day at a time.





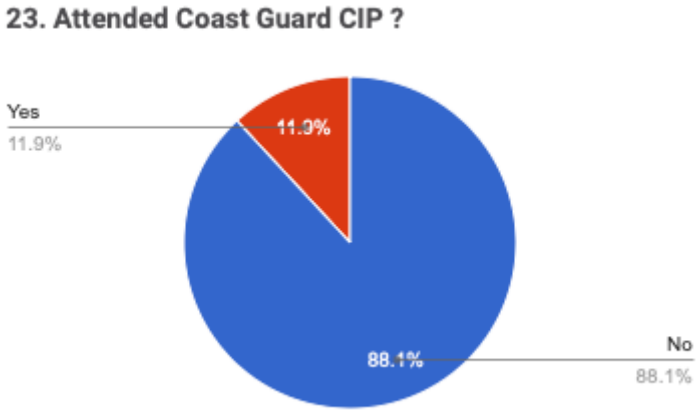
Duties.

From amongst the total fishermen interviewed, 59.5% (50 persons) were Deck Crew and 40.5 % (34 persons) were *Tandels*. This distribution brings out the perceptions of both, the *Tandel* and Deck Crew w.r.t., safety aspects at sea.



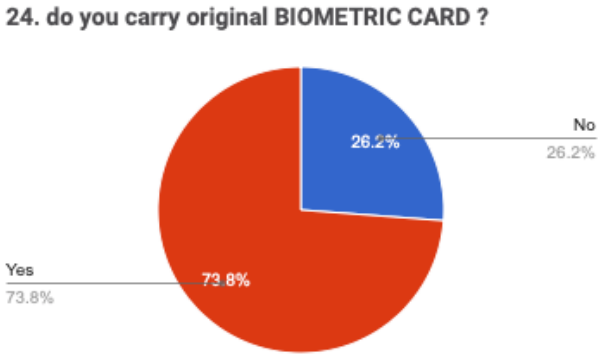
Community Interaction Program

Indian Coast Guard frequently conducts Community Interaction Programs (CIP) wherein the organisation interacts with fishermen, boat owners, cooperatives, NGOs and various other stake holders to discuss various aspects of safety at sea. Amongst the respondents 11.9% reported having attended the CIPs.



Possession of original Bio Metric Cards at Sea

Fishermen are required to carry chip based Biometric Cards at sea, so that their identity can be proved when investigated at sea by Law Enforcement Authorities. However, 26.2 % fishermen do not carry their original Biometric Cards at sea.

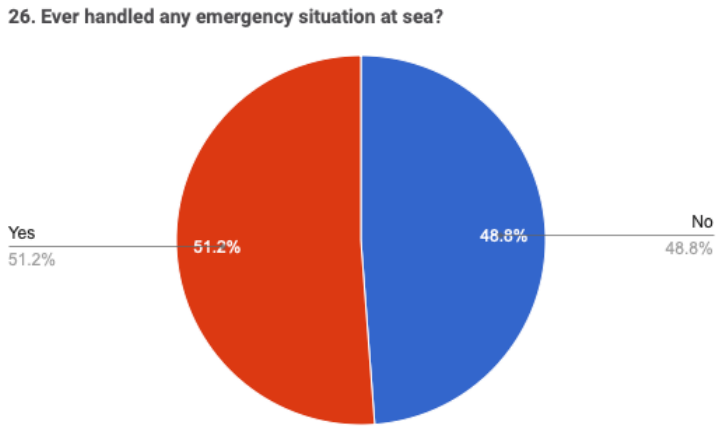


Maintenance of Safety Equipment Onboard

All respondents admitted that they maintain available safety equipment for their optimal performance.

Handling Emergency Situation at Sea

Emergency situations may arise at sea due to any reasons. About 51.2 % of fishermen admitted that they handled some or the other emergency situation at sea.



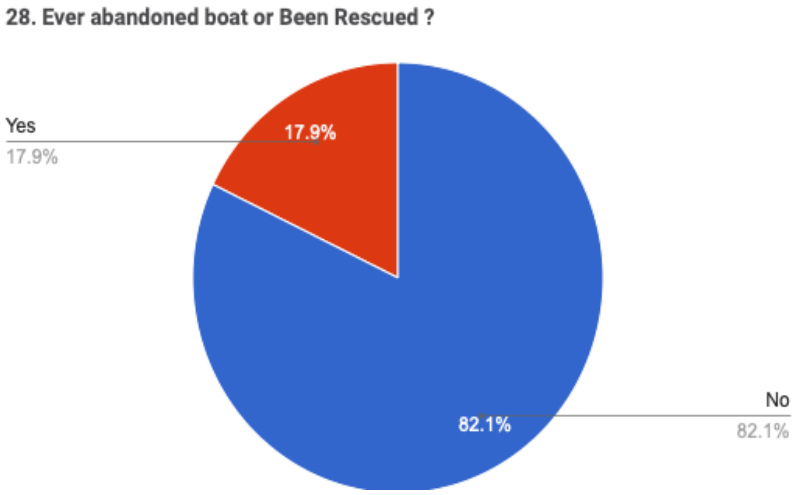
Type of Emergency at Sea

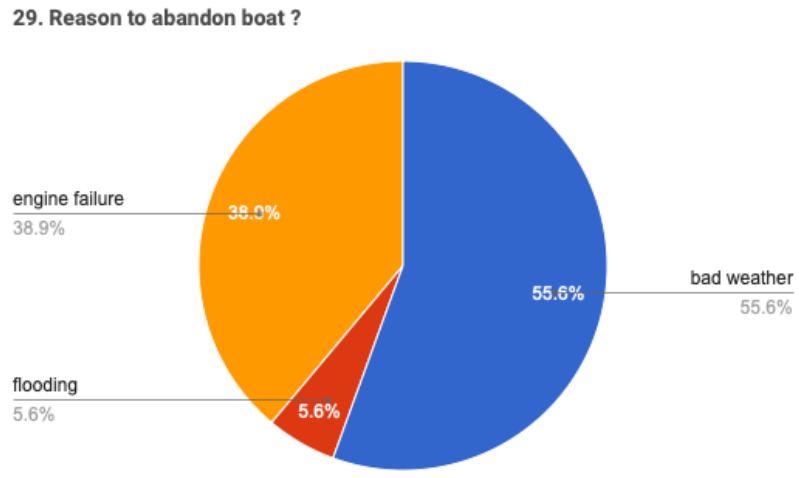
Below mentioned are the number of Fishermen who faced various types of emergencies at sea. Bad weather was highest causative factor for emergencies onboard fishing vessels, followed by Engine Failures.

27. What type of emergency at sea?	Top results ▲
sinking	1
flooding	2
man over board	3
engine failure	14
bad weather	35

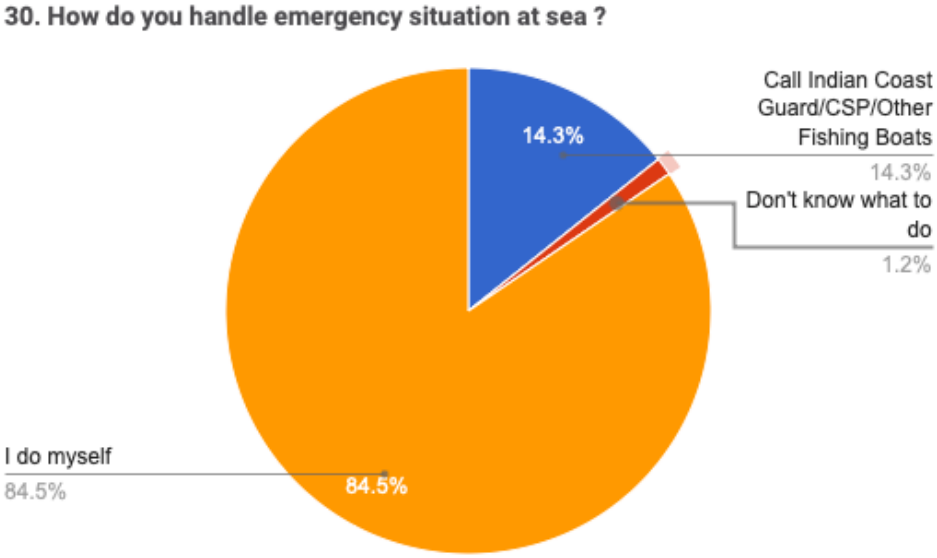
Abandoning the Boat

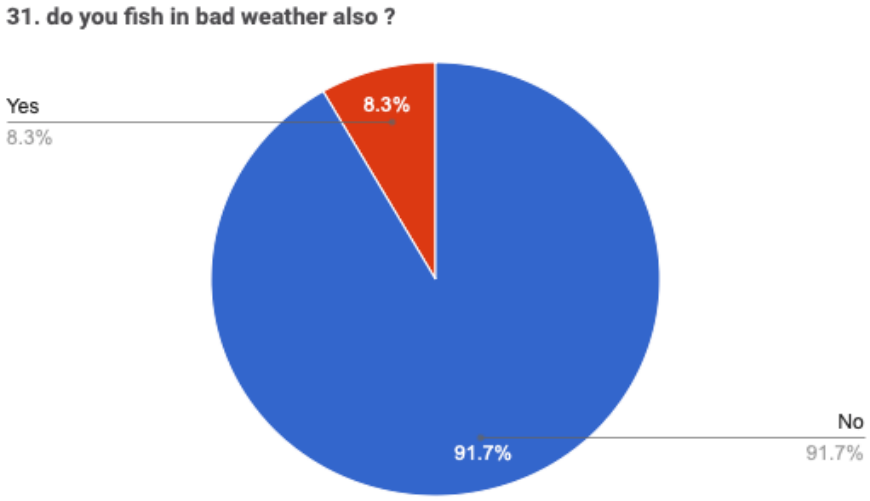
The fishermen may have to abandon their Fishing Boat in case of emergencies such as fire, flooding, capsizing, or severe weather conditions that pose a threat to their safety. 19.9 % of the fishermen had to abandon their boats. Bad Weather has caused maximum number of fishermen to abandon their boats (55.6 %), whereas Engine Failure forced 38.9% of fishermen to abandon their boats. Flooding caused 5.6% of cases to abandon their boats.





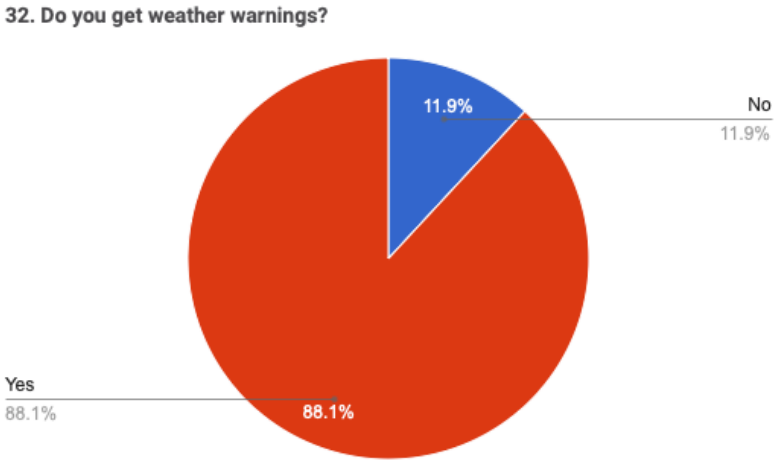
When asked, how they handled the emergency situation at sea, 14.3% of the fishermen stated that they called for Indian Coast Guard/CSP/Other Fishing boats for assistance. 84.5% fishermen said they try and handle the situation themselves. One 1.2% said that they did not know what to do. However, 91.7% of the respondents declared that they do not fish in bad weather.





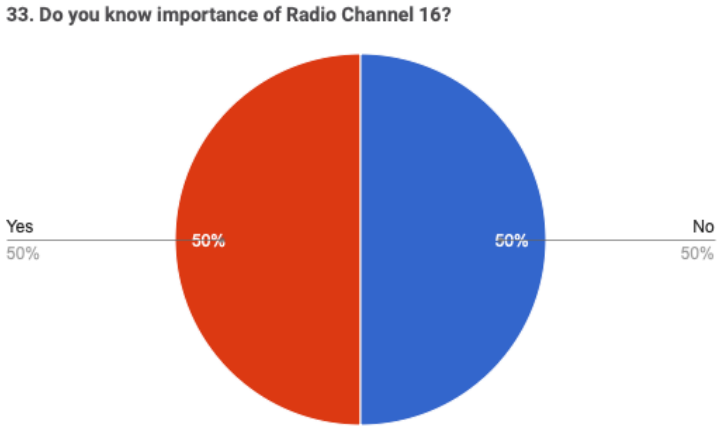
Receipt of Weather Warnings

About 88.1 % of fishermen acknowledged that they get weather warnings regularly.



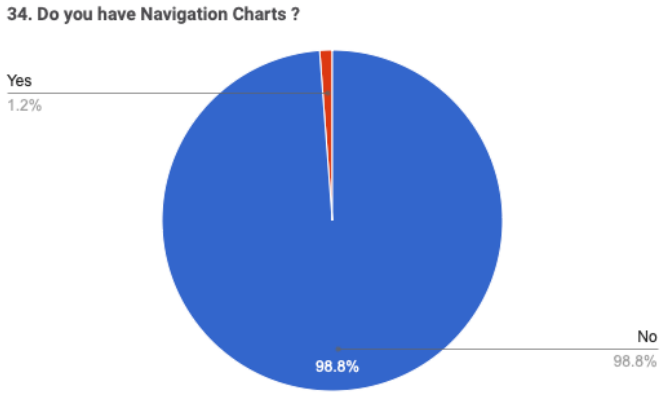
Importance of Radio Channel – 16

It came to light that 50 % of the fishermen did not know the importance of MMB VHF channel 16.



Navigation Charts

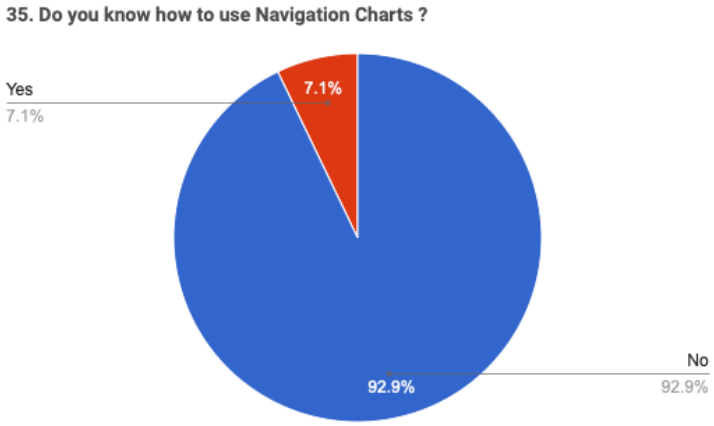
Navigation charts, also known as nautical charts, are maps specifically designed for use in marine navigation. They provide information on water depth, underwater hazards, tides, currents, and other features that are important for safe navigation at sea. Navigation charts may also include information on landmarks, port facilities, and navigational aids such as lighthouses and buoys. These charts are typically produced by national hydrographic offices or other organizations that specialize in maritime cartography, and are used by mariners to plan and execute safe and efficient voyages at sea.



Only 1.2% of the fishermen had Navigation Charts, 98.8 % of fishermen did not use Navigation Charts. Only 7% of the fishermen knew how to use Navigation Charts.

Knowledge of Navigation Charts

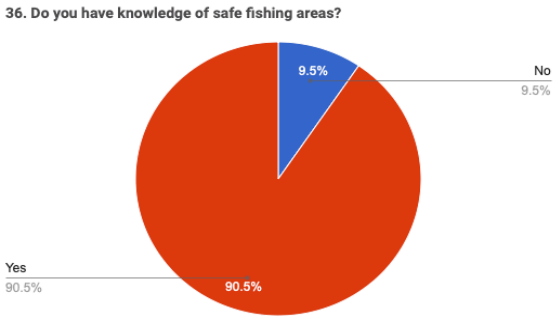
Navigation charts, both digital and paper, are used to navigate at sea and find out own position at any given time. But, 92.9% of fishermen did not know how to use Navigation Charts

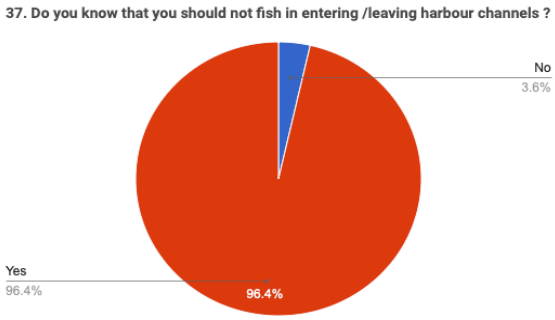


Knowledge of Safe Fishing Areas

Fishing in entering and leaving harbour channels can be a hazardous activity and is generally not recommended. Harbour channels are designed to provide safe passage for larger vessels entering or exiting the harbour, and the presence of fishing boats in these channels can increase the risk of collision or other accidents. Additionally, fishing boats may obstruct the passage of larger vessels, potentially causing delays or other disruptions to harbour operations. Fishermen should always prioritize safety and avoid fishing in areas where their activities may pose a risk to themselves or other vessels. If fishing in or near a harbour channel is necessary, fishermen should exercise extreme caution and be aware of other vessels in the area, as well as any relevant local regulations or guidelines.

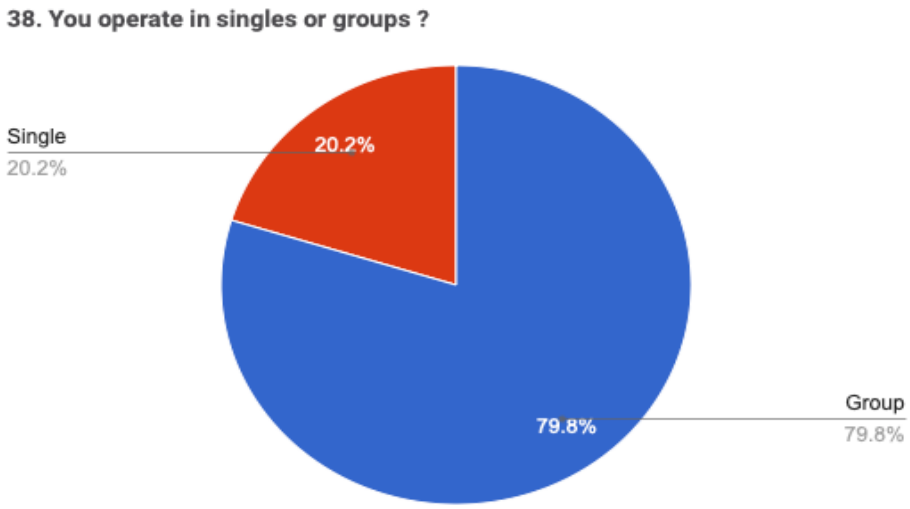
About 90.5 % of Fishermen claimed that they had knowledge of Safe Fishing Areas. 96.4 % of the fishers were also aware that they should not fish in entering and leaving harbour channels.





Operation in Groups/Single.

Fishing alone can be dangerous for a number of reasons. First and foremost, if a fisherman were to suffer an injury or become ill while fishing alone, there would be no one around to assist them. Additionally, fishing alone means that there is no one to help operate the boat or assist with tasks such as pulling in a large catch. This can increase the risk of accidents or injuries, especially in rough or unpredictable weather conditions. Fishing alone also means that there is no one to provide an extra set of eyes to monitor the environment and watch for potential hazards. It is generally recommended that fishermen do not fish alone, but instead fish in pairs or groups to minimize the risk of accidents or injuries.

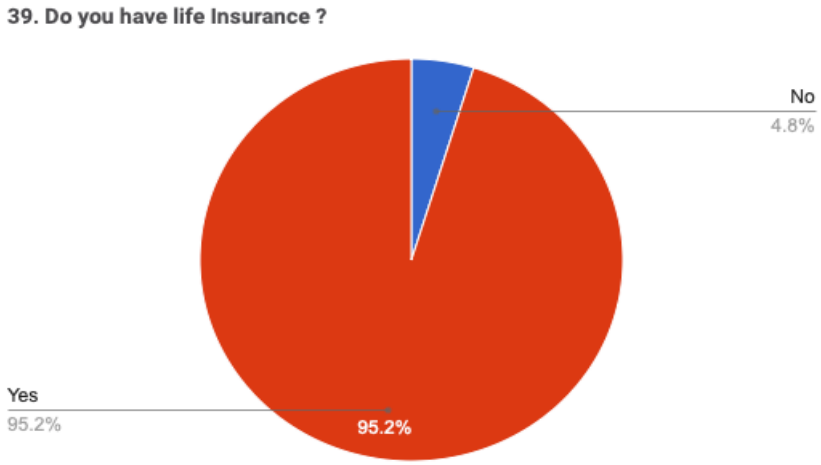


About 20.2 % of fishermen do not fish in groups.

Life Insurance of Fishermen

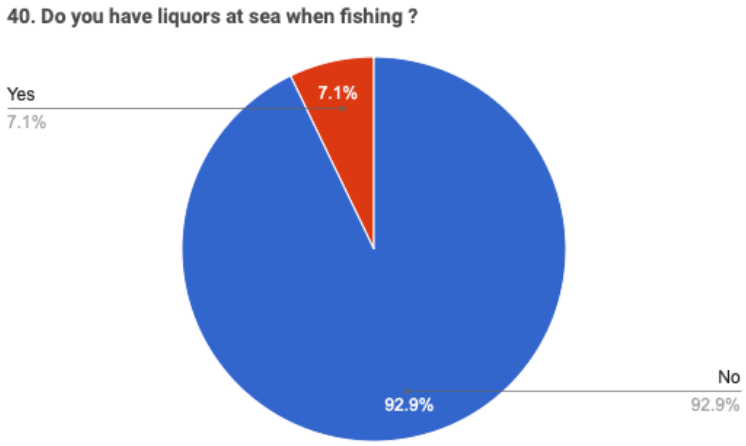
Fishermen work in a high-risk environment, and their job can be dangerous due to various factors like unpredictable weather, heavy machinery, and working with sharp tools. Therefore, having life insurance can be a good idea for fishermen to provide financial protection to their families in case of any unfortunate event. It can cover expenses such as medical bills, funeral costs, and provide income support to the family.

About 95.2 % fishermen had Life Insurance.



Consumption of Liquor at Sea

Consumption of liquor at sea by fishermen can be extremely dangerous and can lead to accidents, injuries, and even fatalities. Alcohol impairs judgment, coordination, and balance, which are all critical for safe navigation and fishing operations. It can also increase the risk of hypothermia, dehydration, and drowning. Moreover, the use of alcohol may lead to conflicts, poor decision-making, and reckless behaviour among the crew, putting everyone on board in danger.



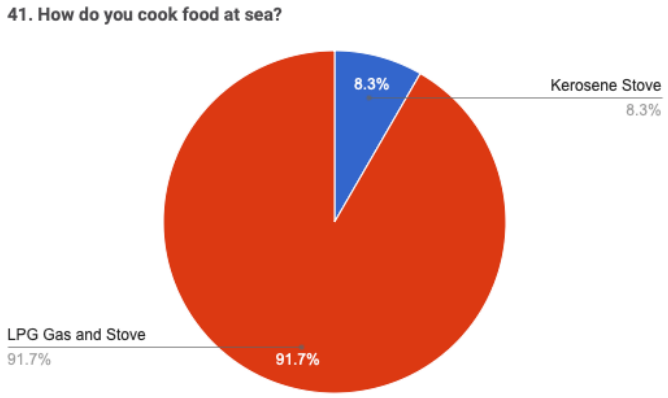
About 7.1% of fishermen acknowledge having liquor at sea.

Cooking at sea using LPG/Kerosene Stoves

Cooking food at sea is a common practice among fishermen who spend extended periods on their vessels. While using LPG and kerosene stoves can be a convenient and efficient way to cook meals, it can also pose a significant risk of fire and explosion.

It is important for fishermen to follow proper safety protocols when using such stoves, including regular maintenance of the stove and its components, proper ventilation of the cooking area, and the use of fire extinguishers and smoke detectors. It is also essential to store LPG and kerosene safely and away from any potential sources of ignition.

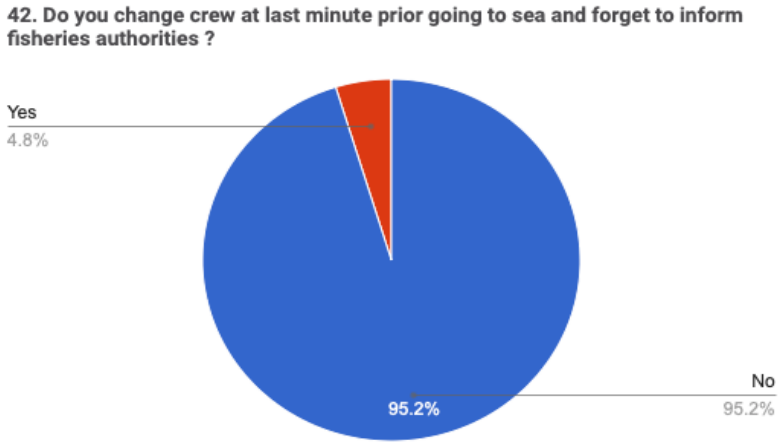
Additionally, it is crucial to ensure that the fuel supply is adequate for the duration of the trip, and to carry spare fuel canisters in case of emergencies. Proper training and education on the safe use of cooking equipment can help to minimize the risk of accidents and injuries while at sea.



Change of Crew at Last Minute

Last-minute changes of crew prior to going to sea can be risky and potentially dangerous. Fishing vessels require a well-trained and experienced crew who are familiar with the vessel, equipment, and safety procedures. If a new crew member is not adequately trained or familiar with the vessel and its equipment, they may not be able to perform their duties effectively, which could compromise the safety of the entire crew. Additionally, if there are any communication issues or misunderstandings among the crew, it could lead to mistakes or accidents.

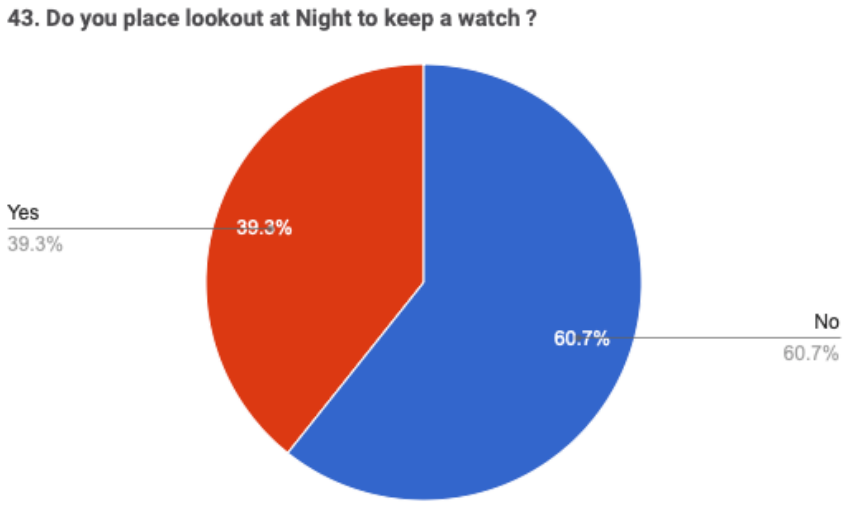
About 4.8 % of the Fishermen do last minute change in crew prior going to sea.



Placing of Lookout at Night onboard Fishing Boats

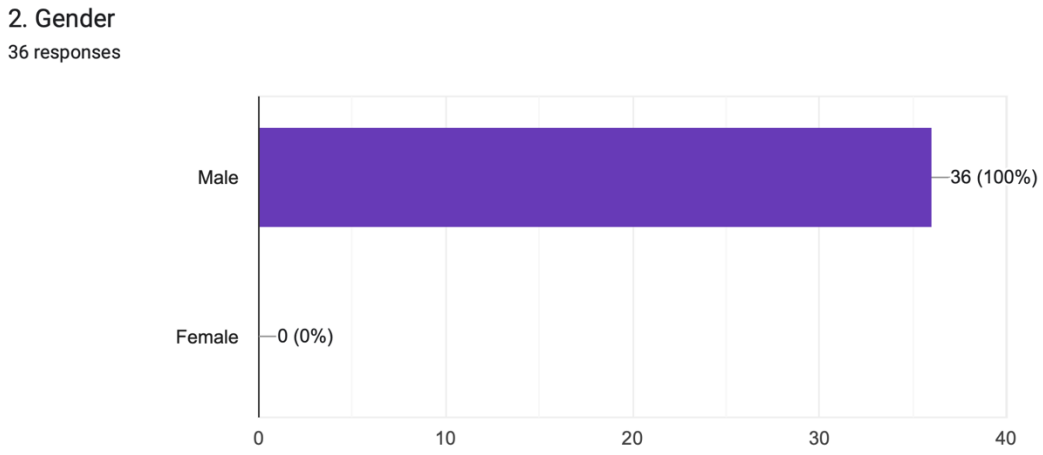
Placing lookouts at night while fishing is an important safety measure that can help prevent collisions and other accidents. The lookout's primary responsibility is to keep a sharp watch for other vessels, obstacles, and hazards, especially during periods of reduced visibility such as at night or in bad weather.

Having a dedicated lookout on board can also help to reduce fatigue and stress on the other crew members, who may be busy operating the vessel or performing other tasks related to fishing. However, it's important that the lookout is properly trained and equipped for the task, and that they are able to communicate effectively with the rest of the crew. Additionally, all crew members should be aware of the lookout's responsibilities and be ready to assist in any way necessary to ensure the safety of the vessel and its occupants. 60% of the responders said they do not place lookouts at night.



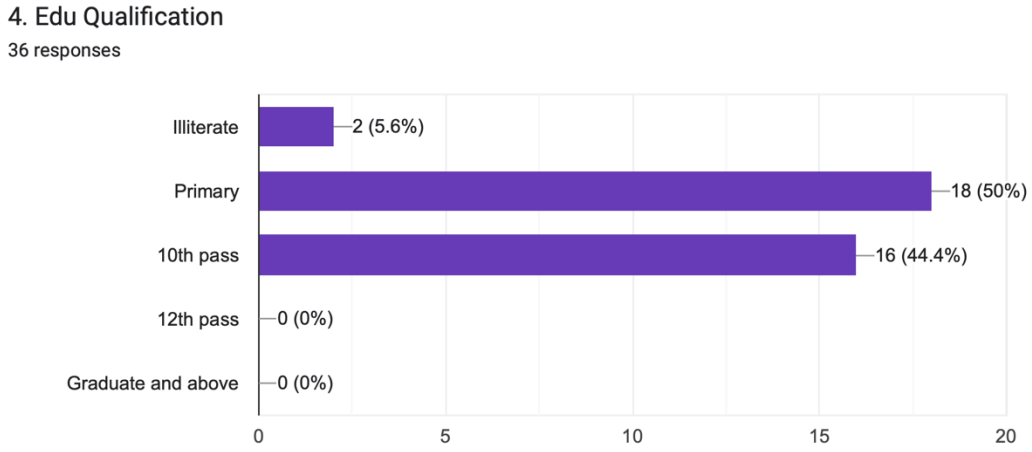
Fishermen of Sindhudurg

Gender



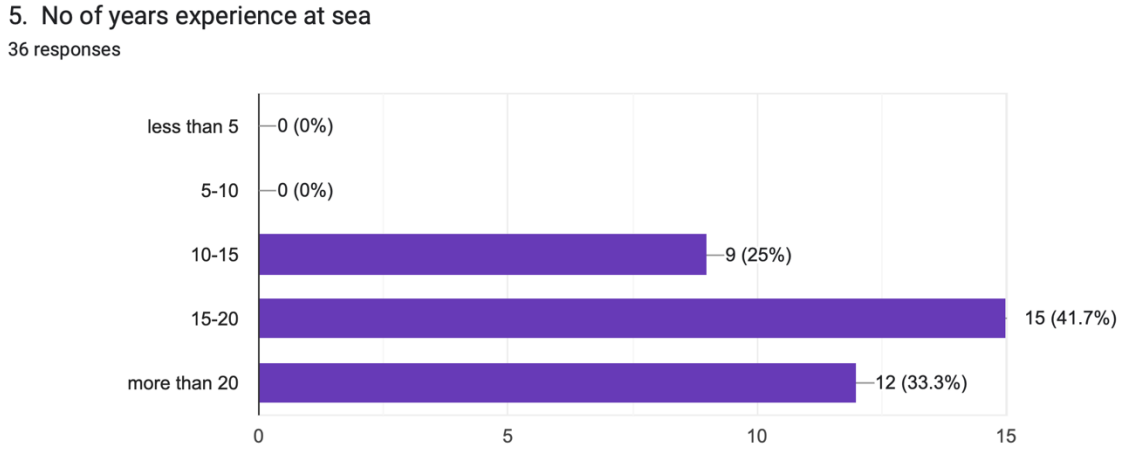
All respondents were Male.

Education Qualification



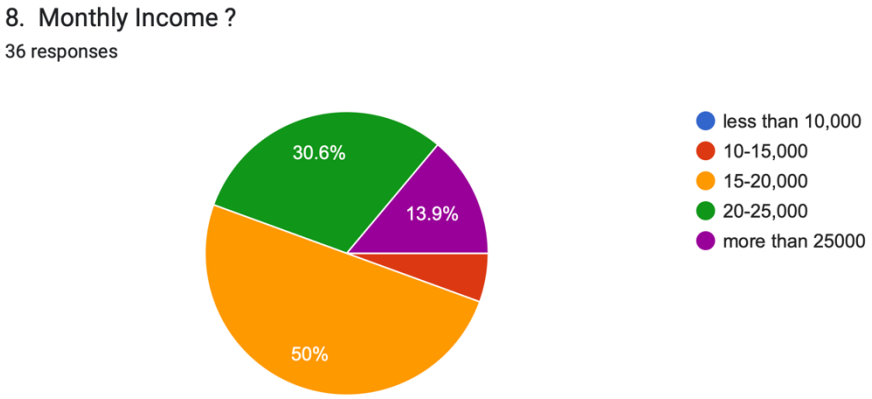
About 50% of fishermen were Primary Educated, and 44.4 % were 10^{th} pass, 5.6% were illiterate.

Experience at Sea



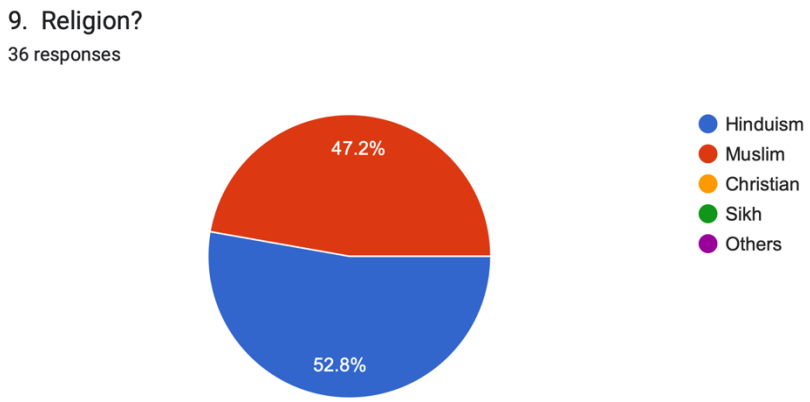
About 41.7% of fishermen had 15-20 years experience and 33.3 % had more than 20 years of experience.

Monthly Income.



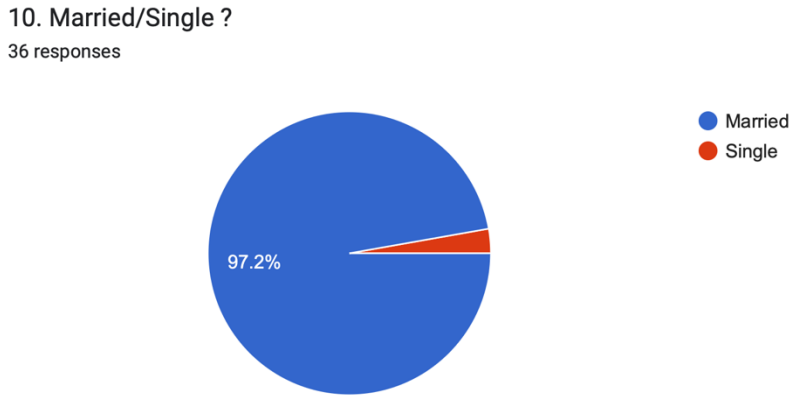
About 50% of fishermen had their monthly income 15-20,000 and 30.6% had an income of 20-25,000.

Religion.



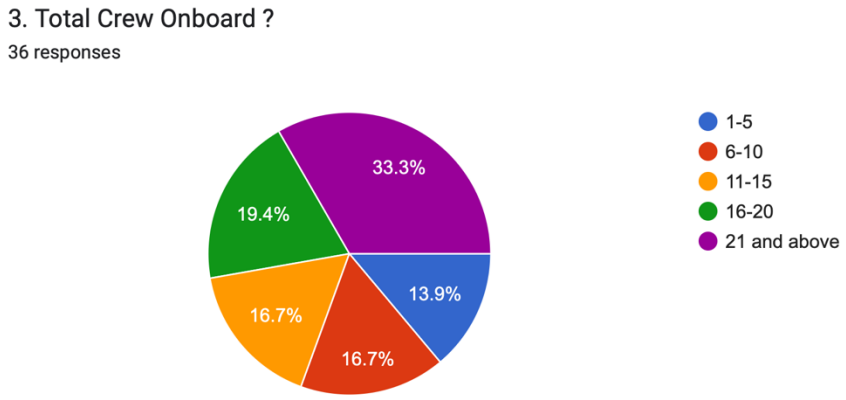
About 52.8 % of fishermen were Hindu and 47.2 % were Muslims.

Marital status



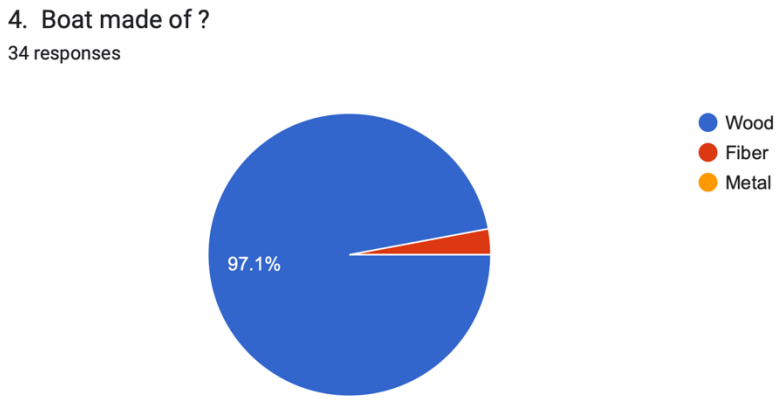
About 97.2 % of fishermen were married.

Total Crew Onboard



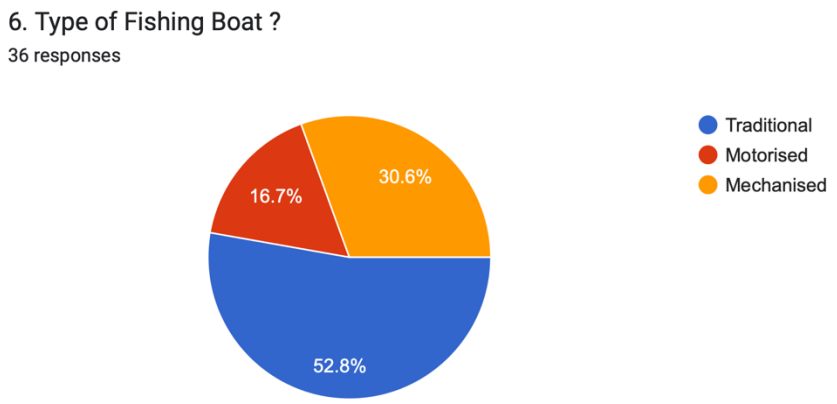
About 33.3 % of boats had more than 21 crew members onboard, and 19.4 % of boats had 16-20 crew onboard.

Boat Construction



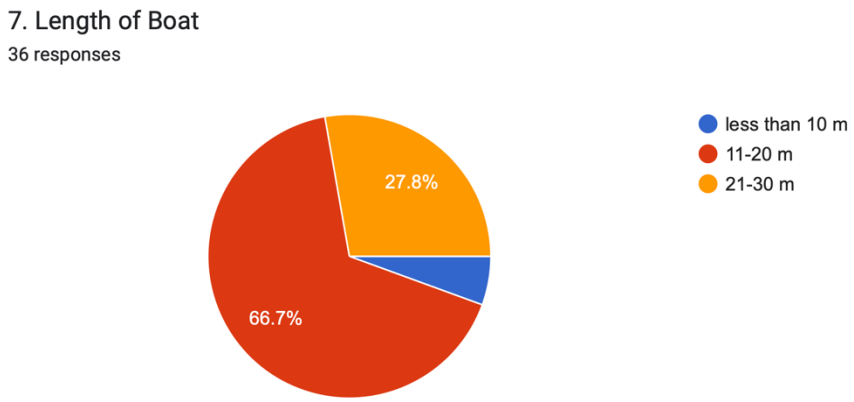
About 97.1% of the boats were made of Wood, and 2.8% of Fiber.

Type of Fishing Boat



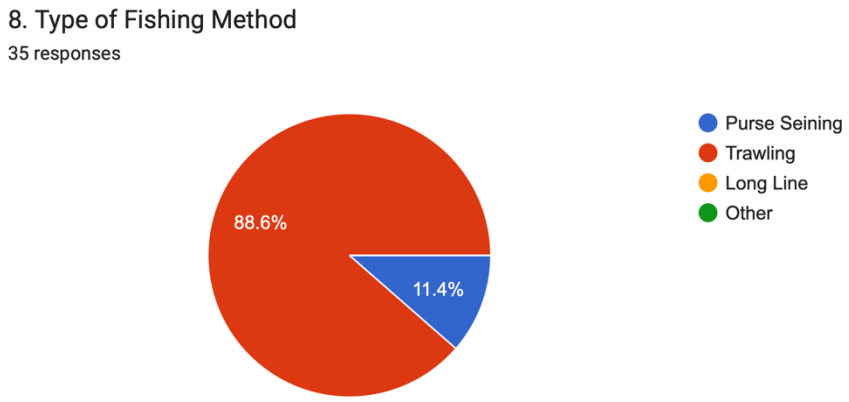
About 52.2 % of the boats were Traditional types, 30.6 % were Mechanised and 16.7 % were Motorised.

Length of Boat



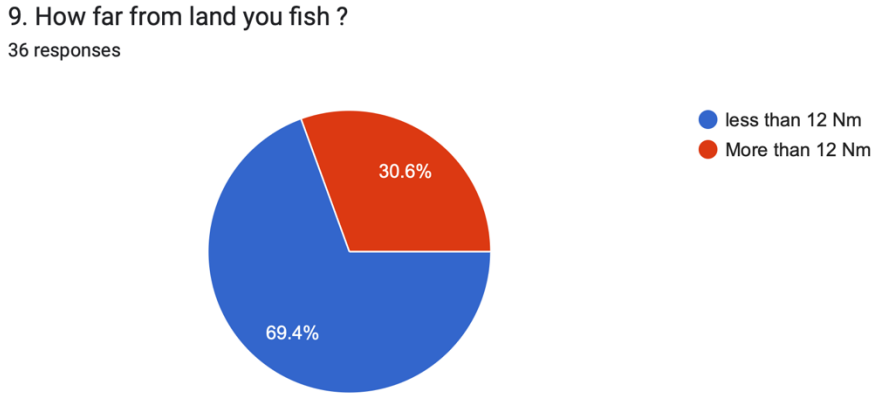
About 66.7 % of the boats were 21-30 M in length and 27.8 % of boats were 11-20 m and remaining were less than 10 m.

Type of Fishing Method



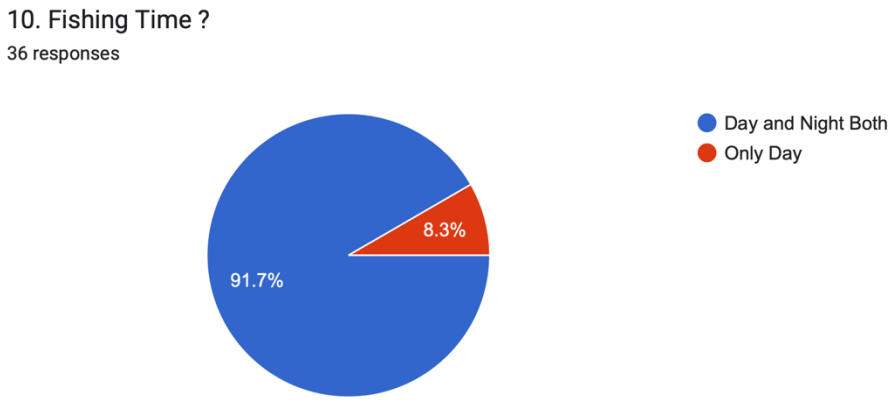
About 88.6 % of the boats were Trawlers and 11.4% were Purse Seining Boats.

Location of Fishing



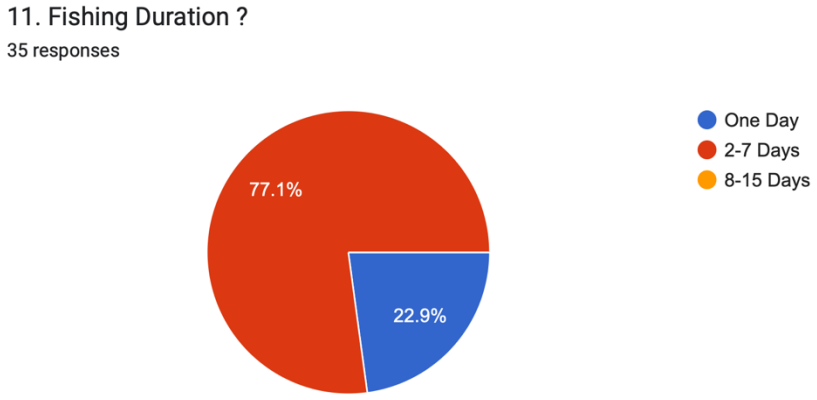
About 69.4 % if boats fish less than 12 Nm however 30.6 % fish beyond 12 Nm.

Fishing Time.



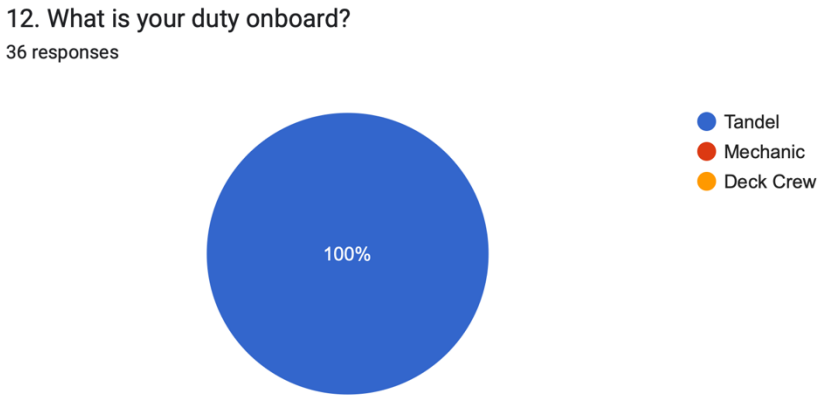
About 91.7 % of fishing boats fish day and night, however only 8.3 % fish only day.

Fishing Duration



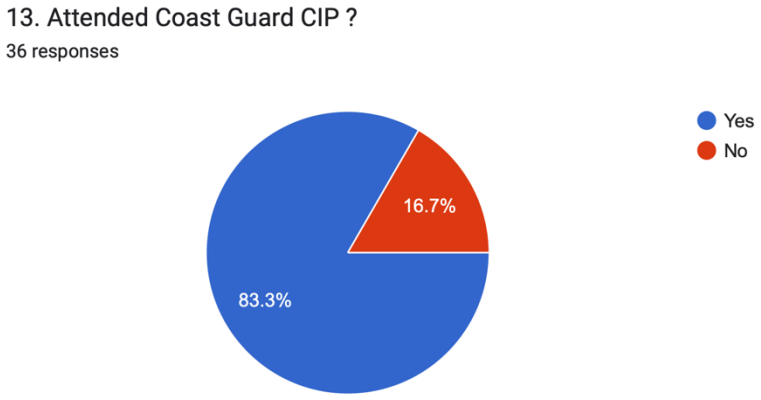
About 77 % of respondents said that they fish 2-7 days at a stretch, and only 22.9% fish during the day only.

Duty Onboard.



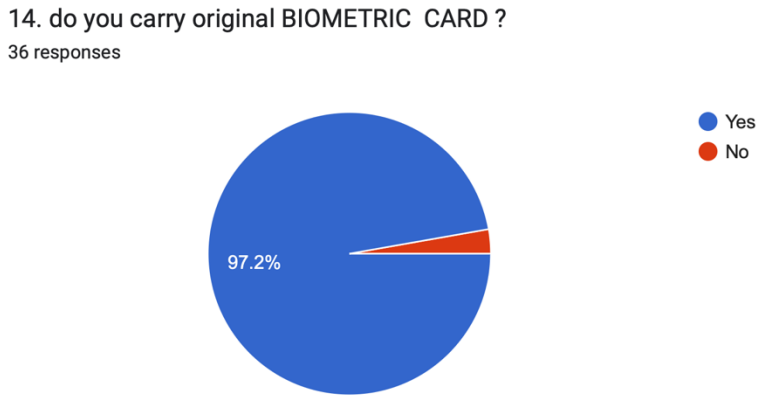
All responders were *Tandel*.

Attended CIP?



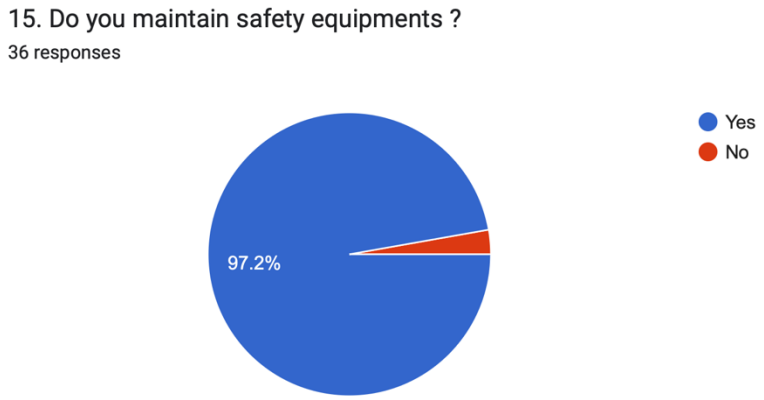
About 83.4% of respondents have attended Community Interaction Program of Indian Coast Guard.

Biometric Cards



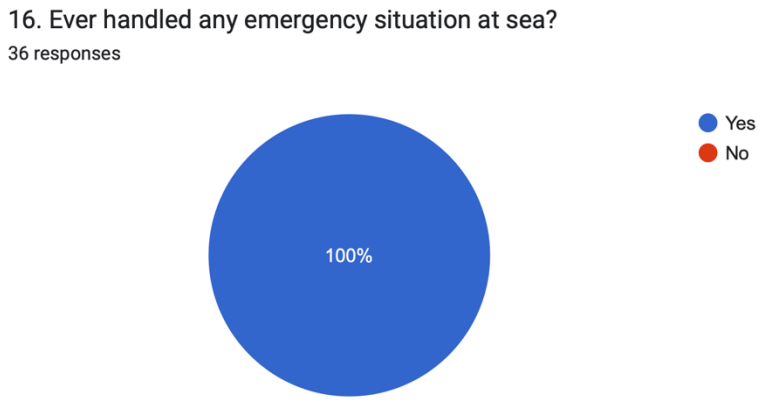
Almost all of crew claimed to carry biometric cards to sea.

Maintenance of Safety Equipment.



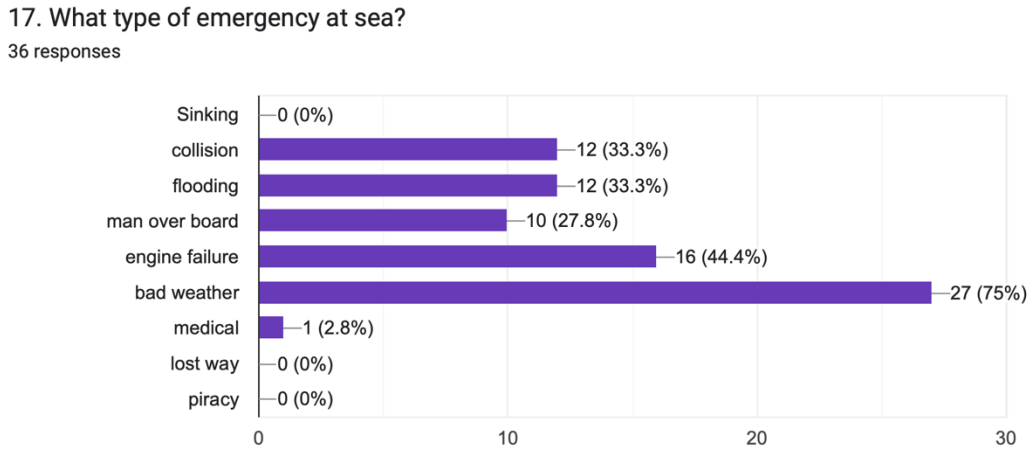
Almost 97 % of boats claimed that they maintained safety equipment onboard.

Handling of Emergency Situation at Sea



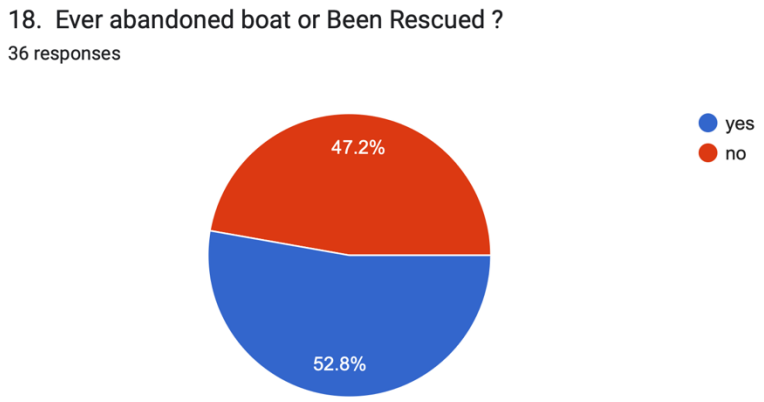
All responders claimed that they have handled emergency situations at sea.

Type of Emergency at sea.



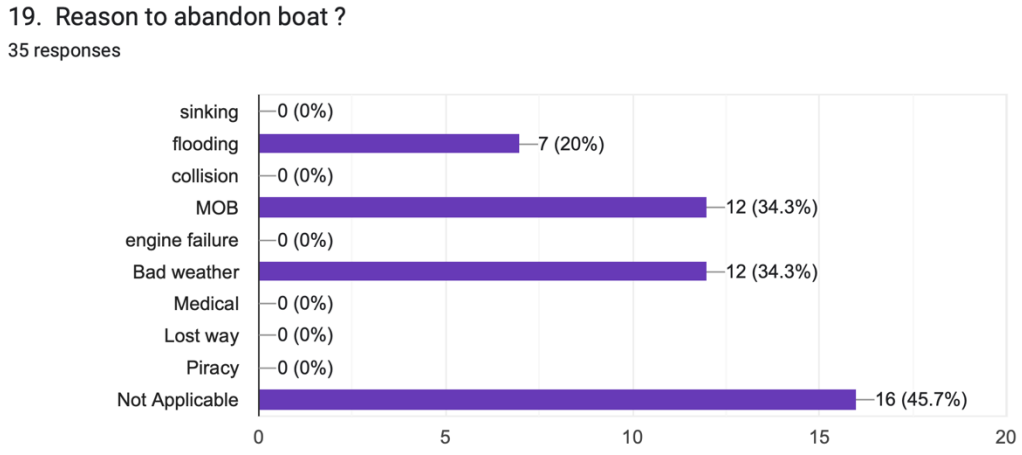
Majority of the respondents, 75% claimed to have faced bad weather, 44.4 % faced Engine Failure, 27.4 % faced Man Overboard, 33.3 % each faced flooding and collision. Only 1% faced Medical Emergency at sea.

Abandoned Boat or Being Rescued.



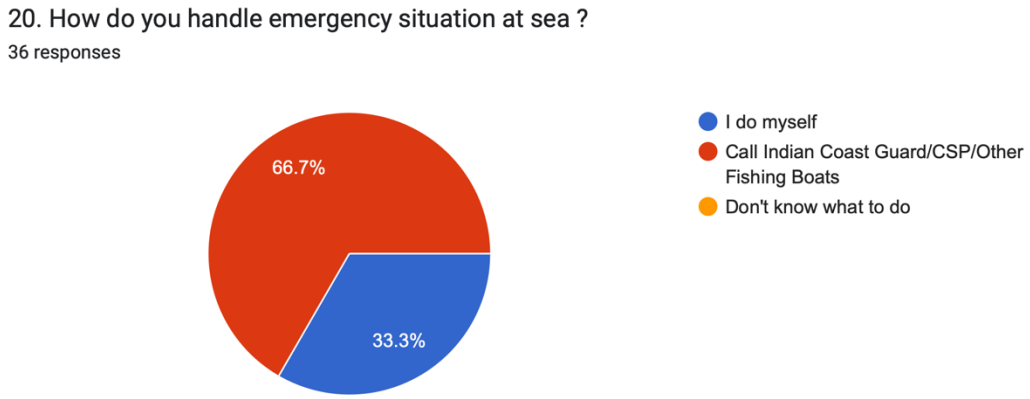
About 52.8 % respondents said that they had to abandon their boats or were rescued.

Reason for Abandon Boat.



About 34 % each said that they abandoned their boats or were rescued due to Bad weather or MOB. Flooding contributed to 20% of abandoning boats.

Handling Emergency Situation at Sea.



About 66.7% of the fishermen said that they call Indian Coast Guard/CSP/Other Fishing Boats when in emergency. However, 33.3 % said that they do themselves.

Weather Warning

All respondents acknowledged that they get timely weather warnings.

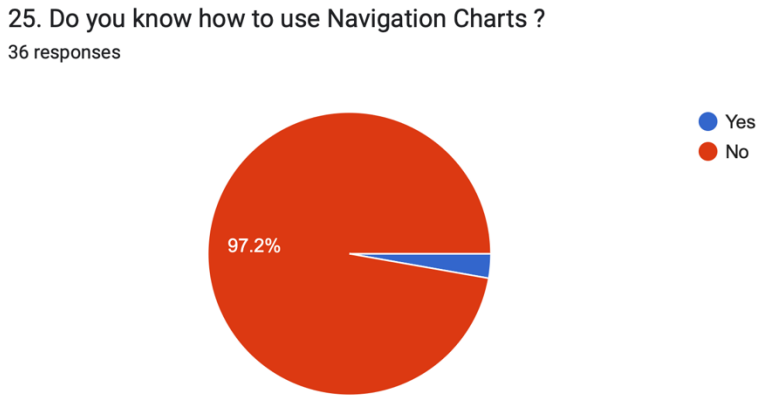
Importance of Radio Channel 16

All respondents said that understand the importance of MMB VHF Channel 16.

Navigation Charts.

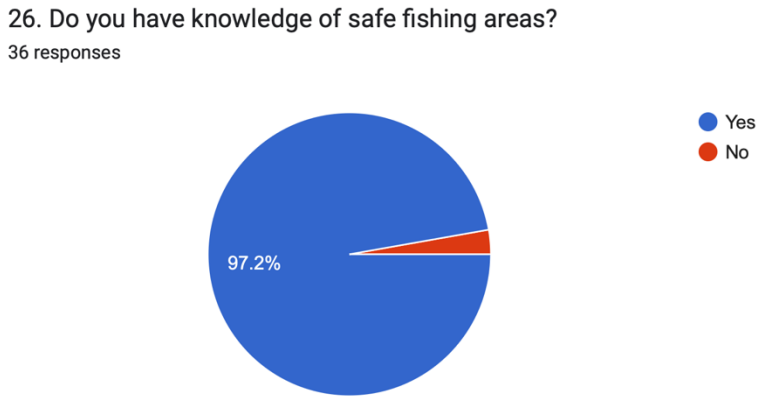
All respondents said that they do not have Navigational Charts onboard.

Knowledge of Navigation Charts



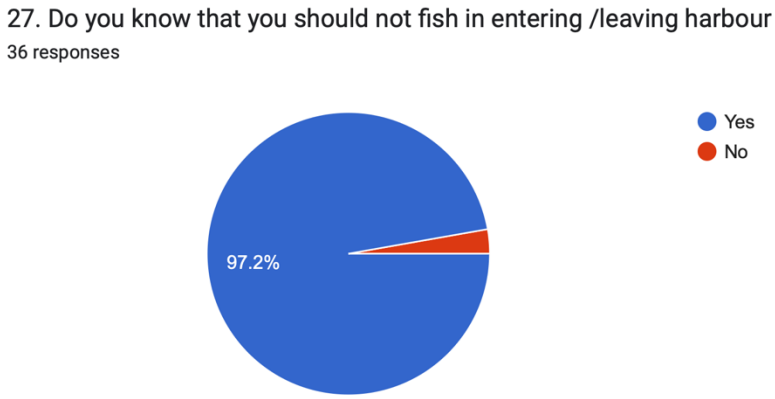
About 97.2 % of the respondents said that they do not know how to use Nav Charts.

Knowledge of Safe Fishing Area.



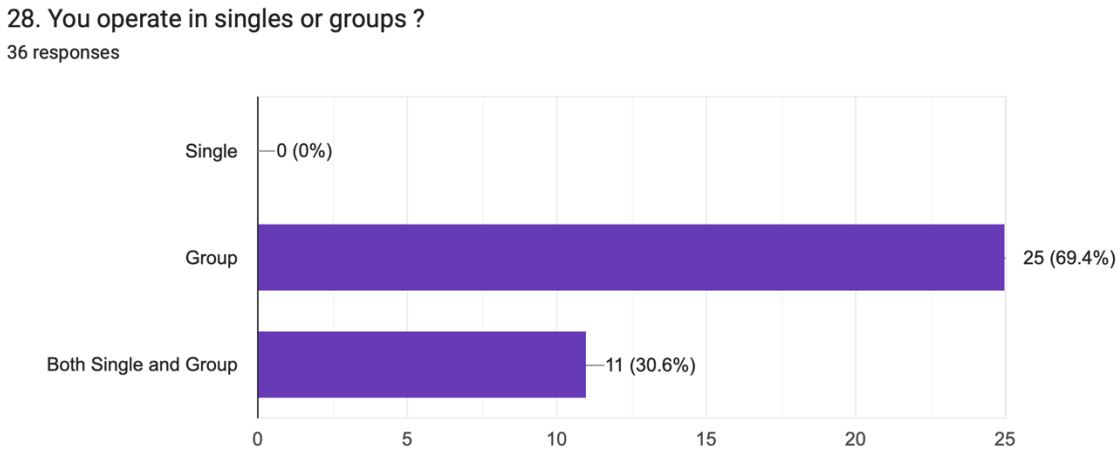
About 97.2 % of the respondents said that they had knowledge of safe fishing areas.

Fishing in Entering/Leaving Harbour Channels



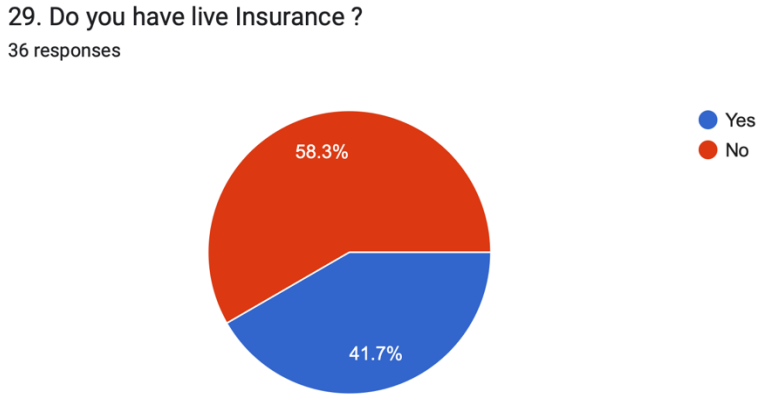
Almost all, 97.2% of respondents know that they should not fish in the entering and leaving harbour channel.

Group or Single Fishing



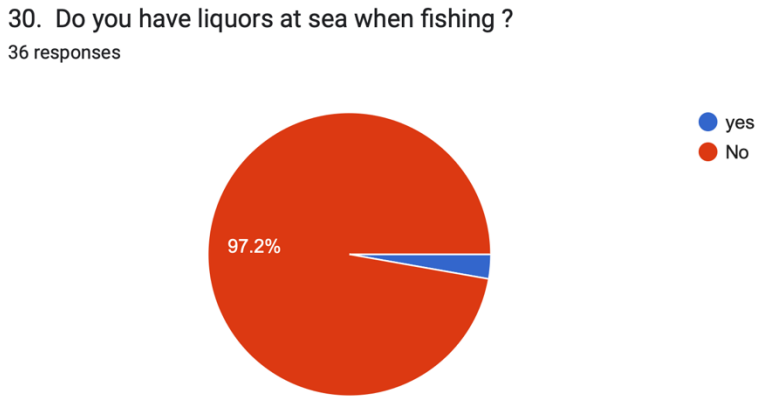
About 69.4 % of fishermen said that they fish in groups, and 30.5% said that they do both group and single boat fishing.

Insurance of Fishermen



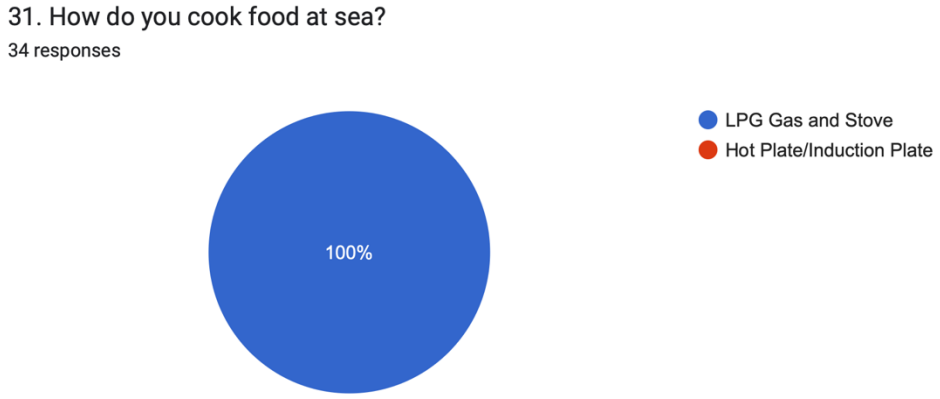
About 58% of fishermen said that they do not have Life Insurance.

Consuming Liquor at Sea



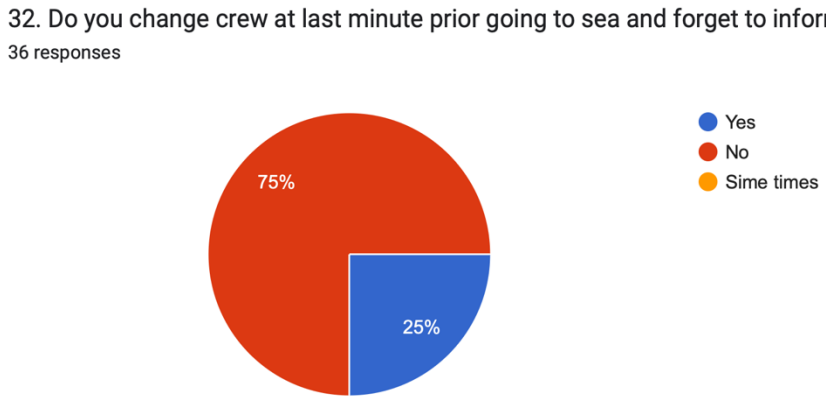
Almost all, 97.2% of respondents said that they do not consume liquor at Sea.

Cooking Food using LPG/Stoves



All respondents said that they use LPG or Kerosene Stoves to cook food at sea.

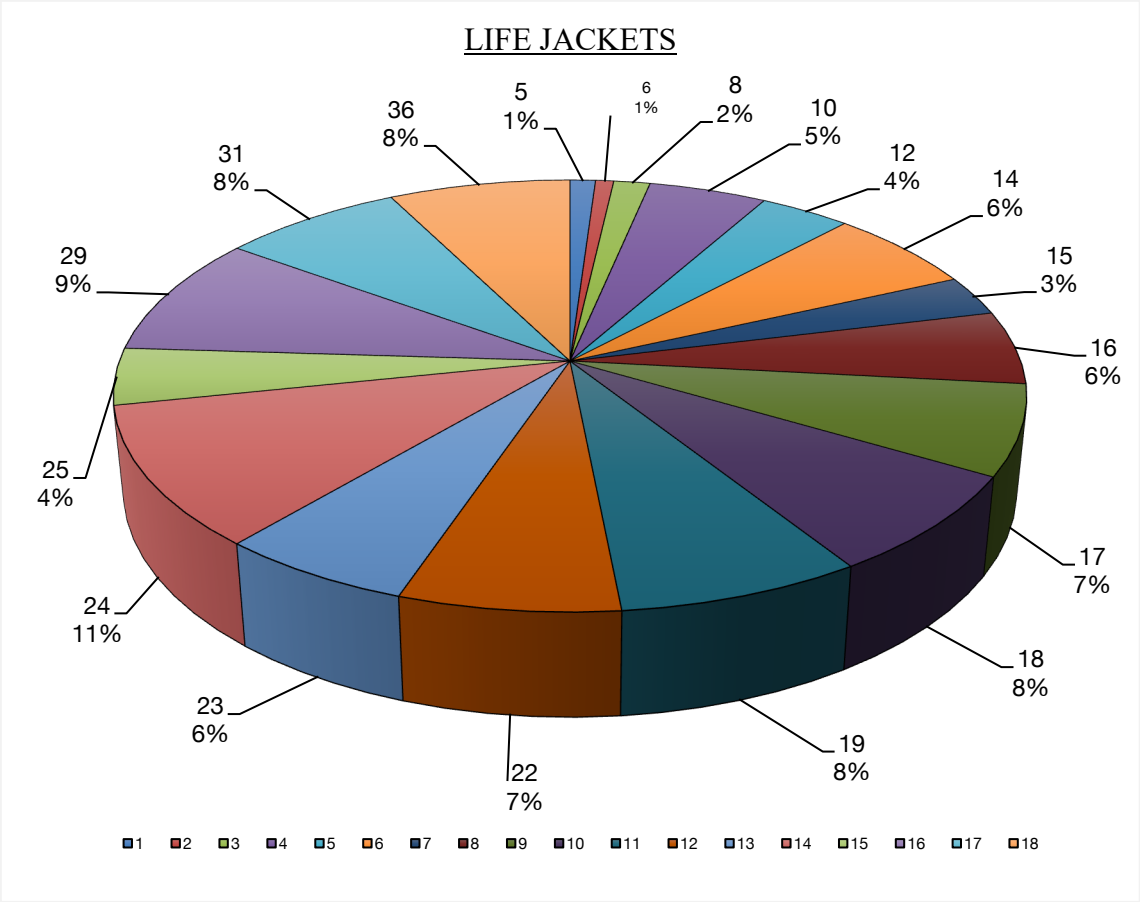
Last Minute Change of Crew.



About 75% of crew denied last minute change of crew prior proceeding to sea, whereas 25% acknowledged that they change crew at last minute.

Night Lookout. Almost all 97.2 % of responders said they place lookouts at night.

CONSOLIDATED DATA OF LIFE JACKETS



Merchant Shipping (Life Saving Rules) 1991 Section V, classifies all fishing boats going to sea as under class XIII and XIV. Where: -

Class XIII - Fishing vessels other than those specified in Class XIV

Class XIV - Sailing vessels including sailing boats or vessels solely engaged in fishing for profit.

Assessment of the Consolidated data for availability of Life Jackets onboard while the boat is at sea for boats from Ratnagiri and Sindhudurg indicates that on an average the boats had not more than 11 % of life jackets w.r.t., crew onboard. Which, is in contrast to the Merchant Shipping (Life Saving Rules) 1991, Section V, Rule 40 (6), which states that every such ship shall carry life jackets equal to the number of persons it is certified to carry

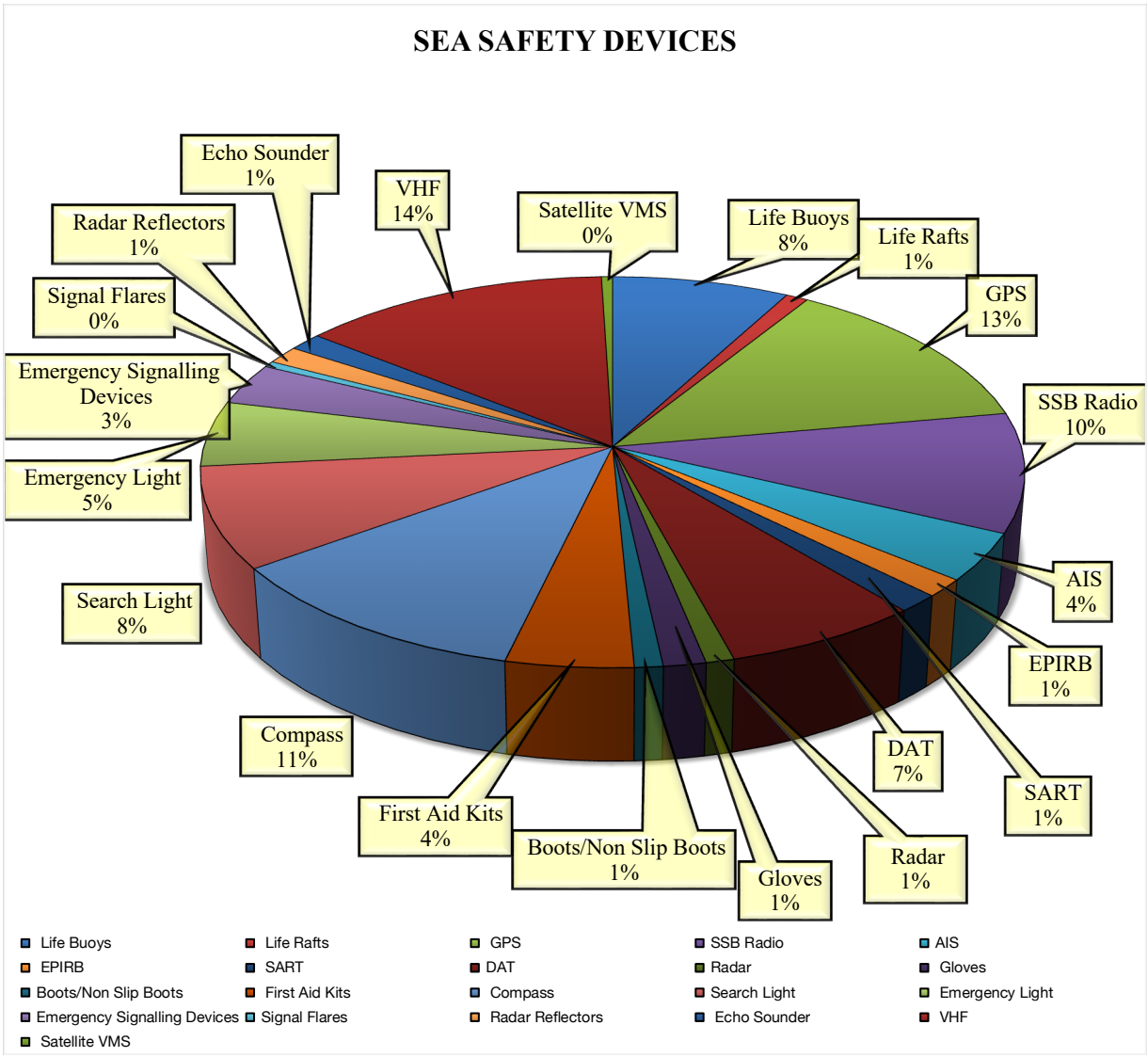
complying with the requirements specified in Part II of the Second Schedule and shall be so placed as to be readily accessible and their position shall be clearly indicated.

The available lifejackets onboard **were not serviced for more than 01 year**, which contradicted to part IV of the above Rule.

Data on boats, of Ratnagiri and Sindhudurg districts, with average number of crew onboard and average number of life jackets carried onboard.

Crew Onboard	**Average number of Life Jackets**
5	1
6	1
8	2
10	5
12	4
14	6
15	3
16	6
17	7
18	8
19	8
22	7
23	6
24	11
25	4
29	9
31	9
35	8
36	8

Table 11.1: Consolidated Data on Life Jackets


SEA SAFETY DEVICES
Echo Sounder 1%
VHF 14%
Satellite VMS 0%
Life Buoys 8%
Life Rafts 1%
Radar Reflectors 1%
GPS 13%
Signal Flares 0%
Emergency Signalling Devices 3%
SSB Radio 10%
Emergency Light 5%
AIS 4%
Search Light 8%
EPIRB 1%
Compass 11%
DAT 7%
SART 1%
First Aid Kits 4%
Boots/Non Slip Boots 1%
Gloves 1%
Radar 1%
Life Buoys
Life Rafts
GPS
SSB Radio
AIS
EPIRB
SART
DAT
Radar
Gloves
Boots/Non Slip Boots
First Aid Kits
Compass
Search Light
Emergency Light
Emergency Signalling Devices
Signal Flares
Radar Reflectors
Echo Sounder
VHF
Satellite VMS

Assessment of consolidated data on Sea Safety Devices onboard the districts of Ratnagiri and Sindhudurg reveals that on an average: -

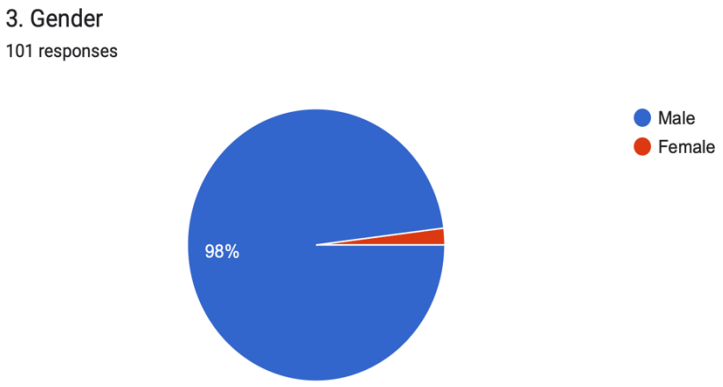
Safety Devices	% Availability Onboard
Life Buoys	8
Life Rafts	1
GPS	13
SSB Radio	10
AIS	4
EPIRB	1
SART	1
DAT	7
Radar	1
Gloves	1
Non-Slip Shoes/Boots	1
First Aid Kits	4
Compass	11
Search Light	8
Emergency Light	5
Emergency Signalling Devices	3
Signal Flares	0
Radar Reflectors	1
Echo Sounders	1
VHF	14
Satellite VMS	0

Table 11.2: Availability of Sea Safety Devices Onboard Fishing Vessels

11.2 **Boat Owners**

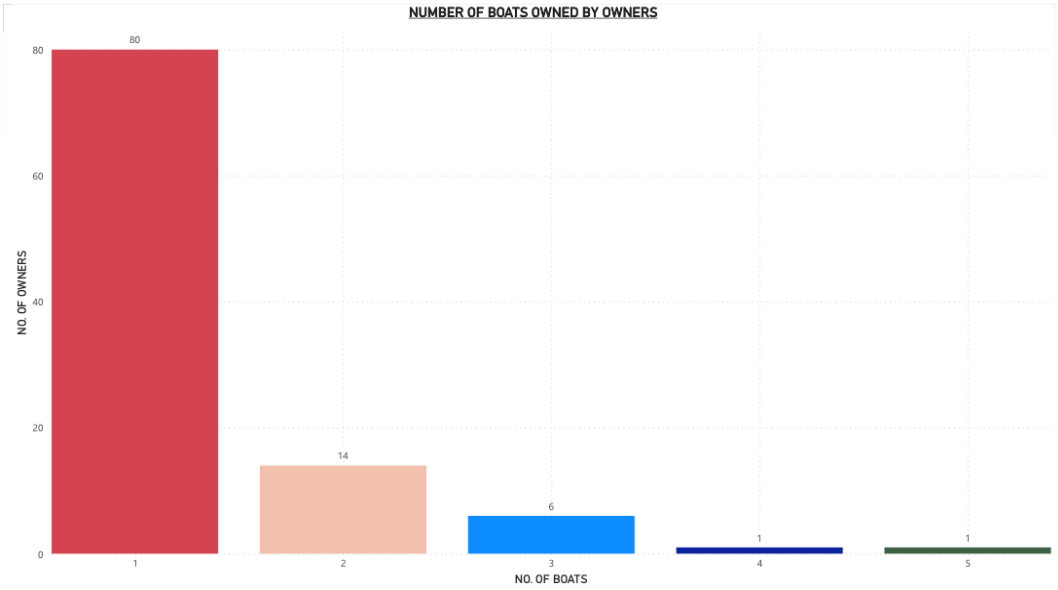
A total of 101 Boat Owners were interviewed. Following are the data and its analysis.

Gender.



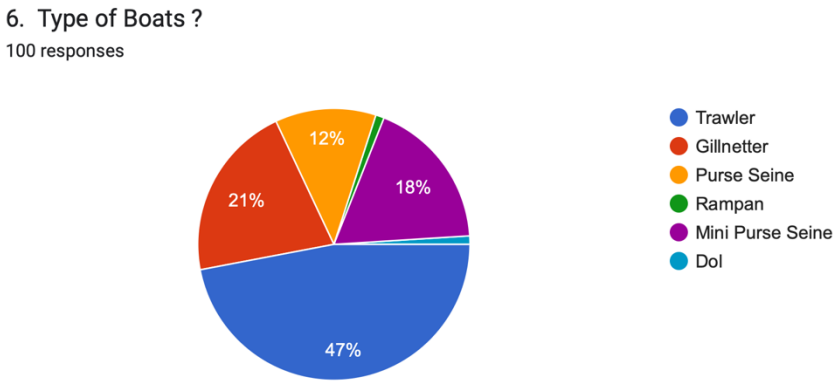
98% of the boat owners were Male.

Number of Boats Owned



80 owners had only One boat, 14 of them had 02 boats, 6 owners had 3 each and 01 each had 4 and 5 boats.

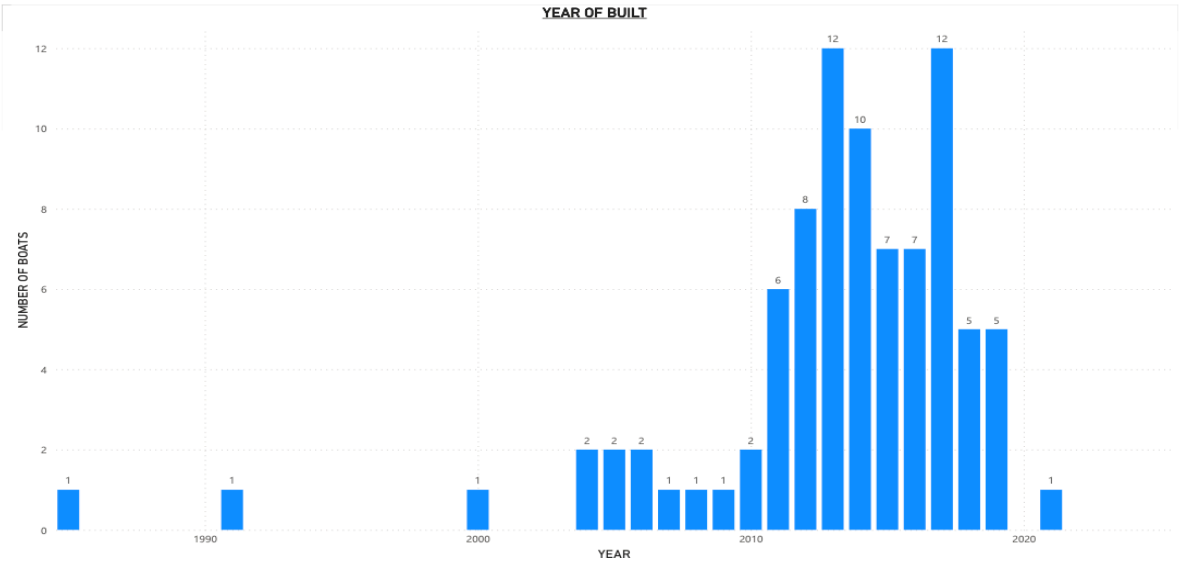
Types of Boats



About 47 % of the Boat Owners had Trawlers, 21 % had Gillnetters

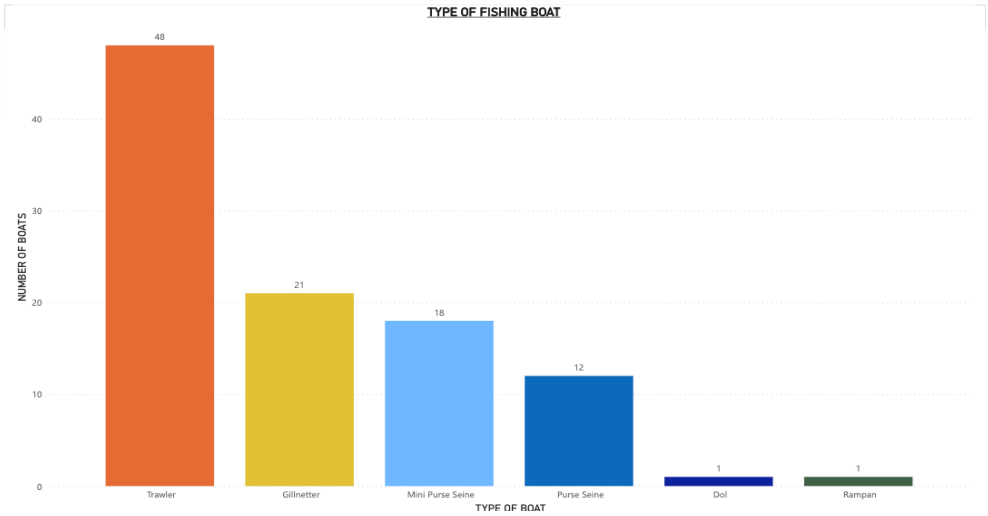
Year of Built

It came to light that the oldest boat was of 1985 built. Twelve boats each were built in 2013 and 2017 respectively. The latest ones were built in 2021.



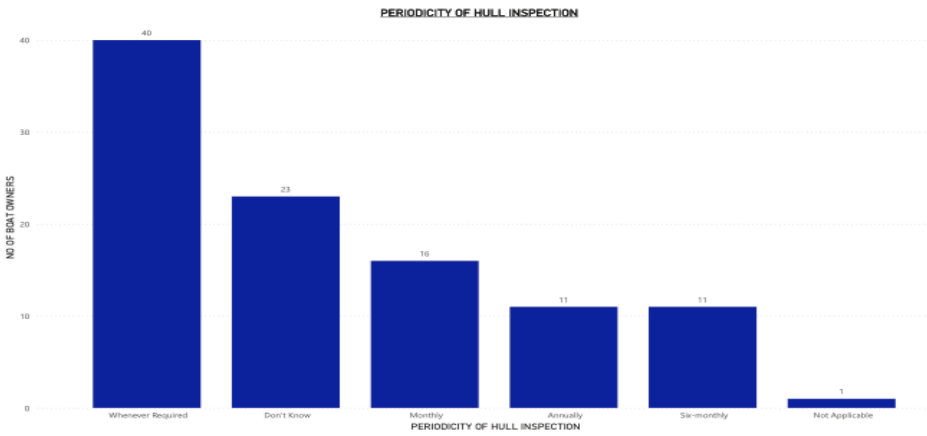
Type of Fishing Boats

Forty-Eight (48) owners had Trawlers, 21 had Gillnetter, 18 had Mini Purse Seiners, 12 had Purse Seiners, one each of Dol and Rampan.



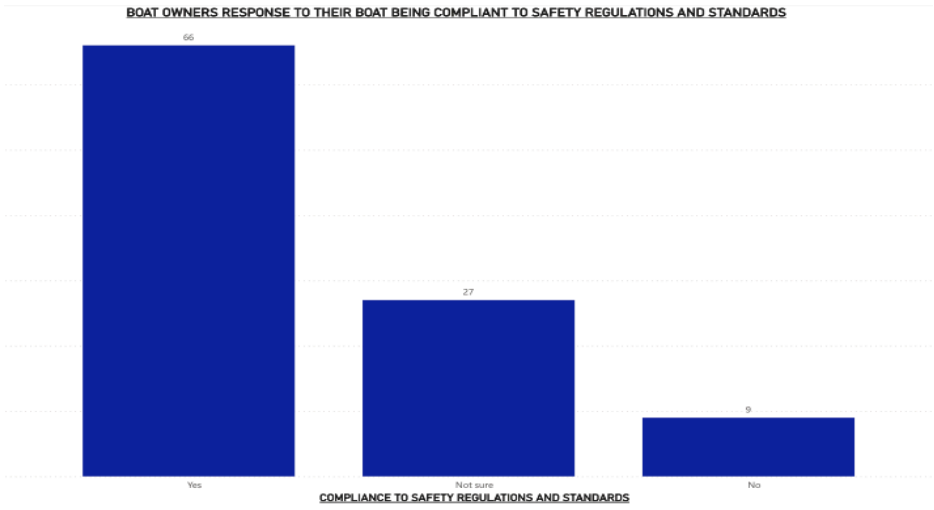
Periodicity of Hull Survey

periodic surveys are conducted to ensure the seaworthiness and safety of the vessel, and to detect and rectify any defects or damages that may affect the vessel's performance or safety at sea. Regular maintenance and inspection of the vessel's hull, machinery, and other equipment are crucial for the safe operation of the vessel and the protection of the crew's lives and property. 40 owners informed that they do whenever required, whereas 23 owners said that they do not know much about periodic Hull Survey.



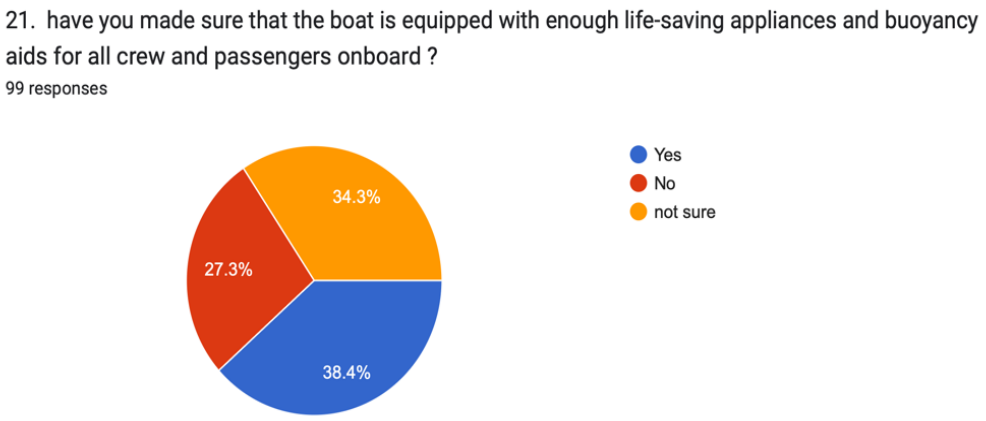
Compliance to Safety Regulations.

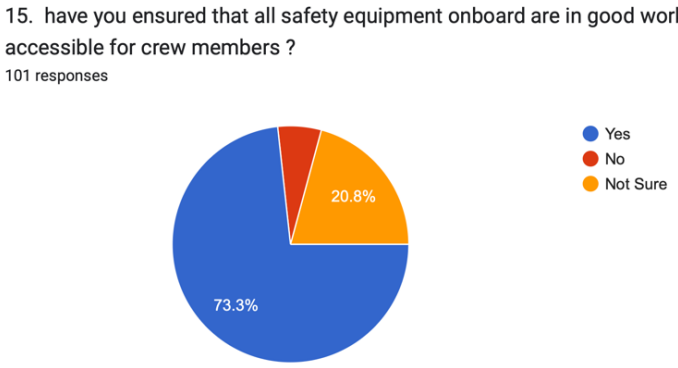
About 66 owners informed that their boats comply with safety regulations and standards, while 27 said they are not sure, and 09 informed that their boats do not comply.



Safety Equipment Onboard

Only 38.4 % of boat owners ensured that their boats are equipped with enough life-saving appliances and buoyancy aid for all crew and passengers onboard. About 20.8 % of the owners were not aware that the safety equipment installed onboard were in good working condition and easily accessible to crew members. Only 43.3 % of the owners made sure that the crew knows the safety and emergency procedures and are reviewed regularly.





About 73.3% of owners said that they ensure that safety equipment onboard their boats are in good worlking condition and easily accessible.

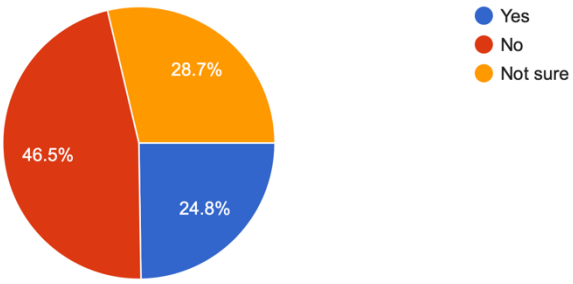
Safety Training to Crew

It is essential for the crew of a fishing boat to have adequate knowledge of safety procedures on board. This includes understanding emergency procedures, using safety equipment such as life jackets and fire extinguishers, and knowing how to respond to different types of emergencies such as man overboard situations, fires, or equipment failure. Having a well-informed crew can significantly reduce the risk of accidents and ensure a safer fishing operation. Therefore, it is recommended that regular safety training and drills be conducted to ensure that all crew members are well-prepared and equipped to handle any emergency situation that may arise during their fishing trip.

Only 24.8 % of the owners acknowledged of providing training to their boat's crew members. And only 43.3 % of owners made sure that the boat crew knows the safety and emergency procedures of the boat and the procedures were reviewed regularly.

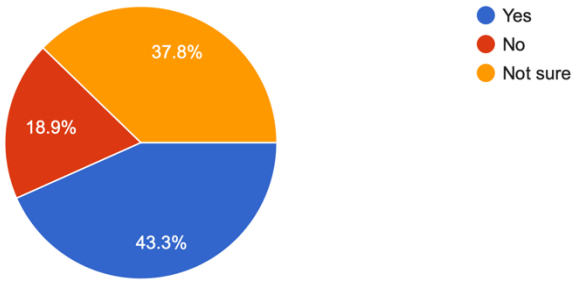
16. Have you provided proper safety training for your crew members ?

101 responses



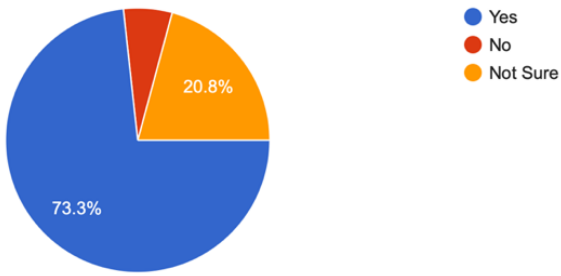
22. Have you made sure that the crew knows the safety and emergency procedures of the boat and the procedures are reviewed regularly ?

90 responses



15. have you ensured that all safety equipment onboard are in good working condition and easily accessible for crew members ?

101 responses



Mode of communication with Boat and Her Crew While at Sea.

There are several methods of communication with boats at sea from shore. Some common methods include: -

VHF Radio: This is the most common method of communication between boats and shore. VHF radios are inexpensive, easy to use, and have a range of up to 20-30 nautical miles.

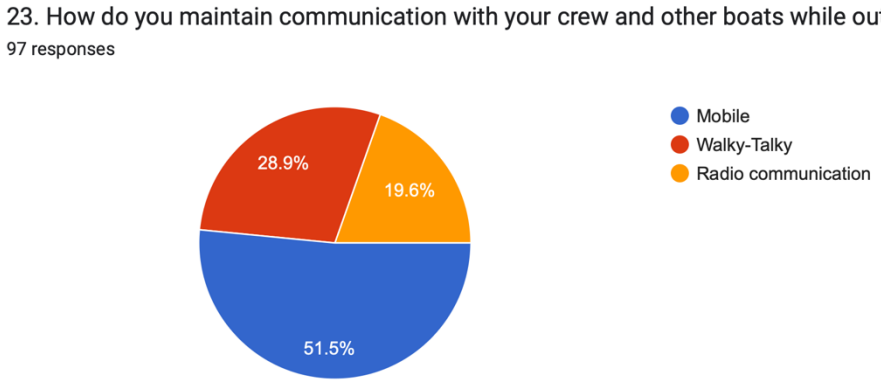
Satellite Phone: Satellite phones are another reliable method of communication with boats at sea. They are more expensive than VHF radios, but have a greater range and can be used in remote areas where there is no cell phone coverage.

Cell Phone: Cell phones can be used to communicate with boats within a certain range of the shore, depending on the signal strength. However, cell phone coverage may not be available in remote areas.

AIS (Automatic Identification System): AIS is a tracking system used by ships and vessels to transmit and receive information about their position, course, and speed. AIS can be used by shore-based authorities to communicate with boats at sea.

It is important for fishermen to have multiple methods of communication with shore-based authorities to ensure safety at sea.

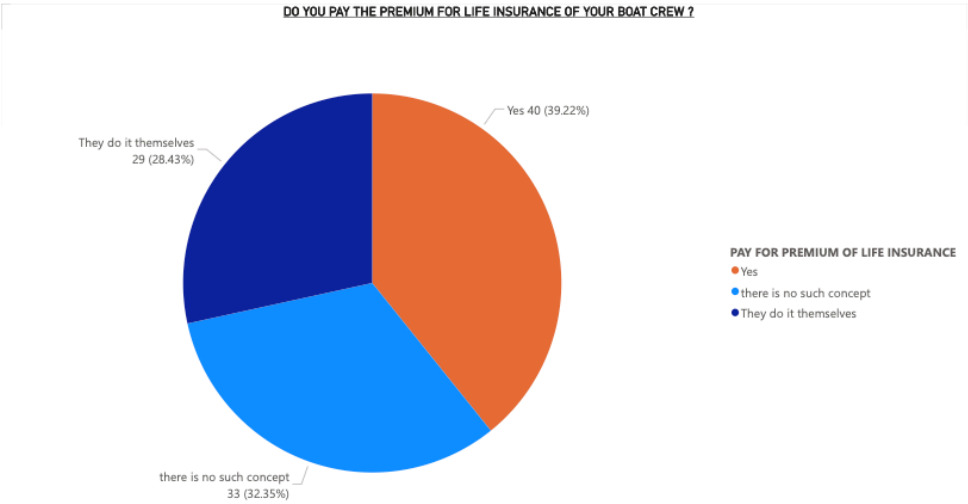
Majority of owners, 51.5 %, said that they communicated only with Mobile phones with their fishing boats, which are limited with mobile network ranges.



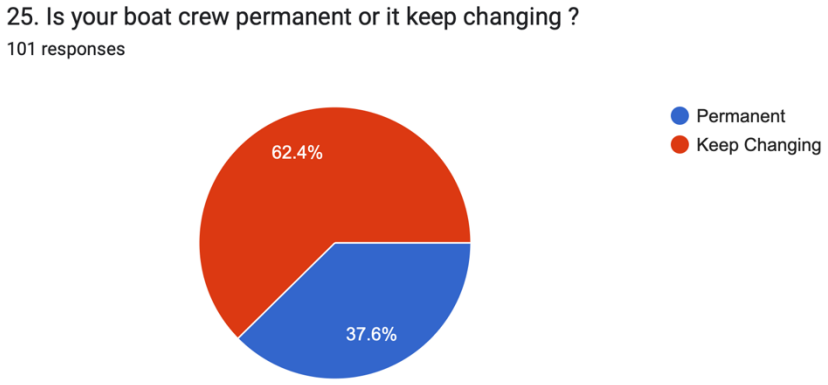
Insurance for Fishermen by Owners

Government has launched several initiatives to provide social security and life insurance to fishermen. The Pradhan Mantri Suraksha Bima Yojana and Pradhan Mantri Jeevan Jyoti Bima Yojana are two such schemes that offer life insurance coverage to fishermen and their families at affordable premiums. Additionally, the National Fisheries Development Board has also introduced a scheme called the "Fishermen Welfare Fund" that provides financial assistance to fishermen in case of accidents, disability, or death. However, despite these initiatives, the coverage and awareness of life insurance among fishermen in India remain relatively low. More efforts are needed to increase the reach and effectiveness of these schemes to provide better protection and support for the fishing community.

When asked, only 40.4 % of owners acknowledged of paying the premium for Life Insurance of their boat crew.



One of the main reasons for not being able to pay the premium of crew members of their boat was that they crew are not permanent in nature. Only 37.6% of the owners could manage crew of permanent nature.



Knowledge of Welfare Schemes of Government of India.

The Government of India has implemented various welfare schemes for the benefit of fishermen. Some of these schemes include: -

(a) ***Pradhan Mantri Matsya Sampada Yojana (PMMSY)****:* Launched in 2020, this scheme aims to enhance fish production, create infrastructure, and increase the income of fishers and fish farmers.

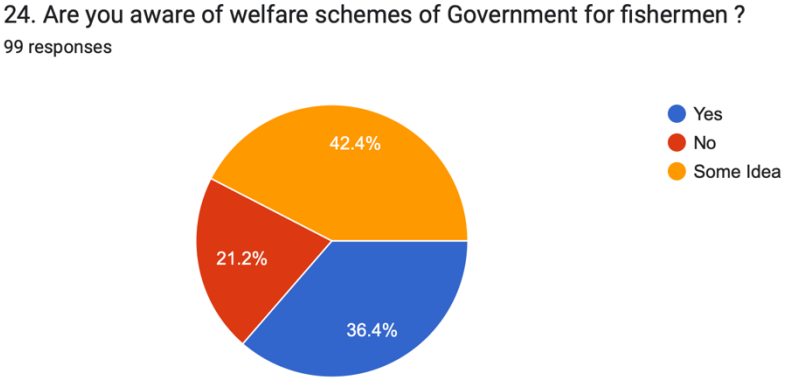
(b) **Blue Revolution Scheme**: Launched in 2015, this scheme aims to increase fish production and productivity by improving infrastructure, providing training to fishers, and promoting aquaculture.

(c) **National Scheme of Welfare of Fishermen**: This scheme provides financial assistance to fishers and their families in case of accidents, disability, or death.

(d) ***Rastriya Krishi Vikas Yojana*** **(RKVY):** This scheme provides financial assistance to fishers for setting up infrastructure and for capacity building.

(f) National Fisheries Development Board (NFDB): This is an autonomous organization under the Ministry of Fisheries, Animal Husbandry, and Dairying, which aims to promote sustainable development of the fisheries sector.

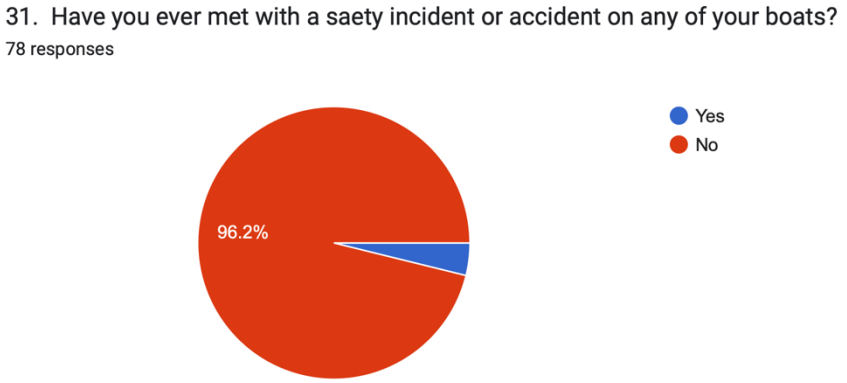
But, only 36.4 % of the boat owners were aware of such welfare schemes of Government for fishermen.



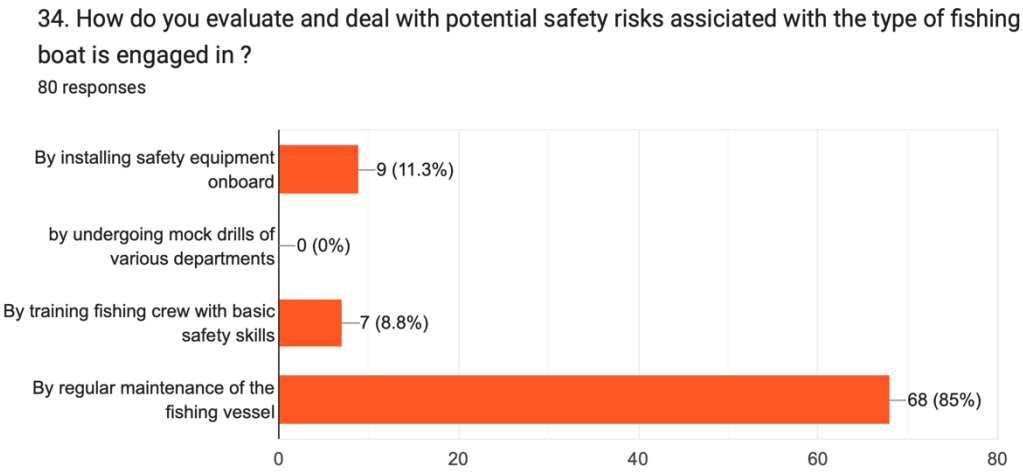
Regular Maintenance of Boats.

Ensuring the safety of their boats is crucial for boat owners, particularly those involved in commercial fishing. Regular maintenance and inspections can help prevent accidents and breakdowns at sea. Boat owners should also provide adequate safety equipment and ensure that all crew members are trained in its use. It is essential to follow safety regulations, including carrying out regular safety drills and ensuring that all required safety equipment is on board. Additionally, boat owners should be aware of weather conditions and avoid going out to sea in adverse conditions. Finally, boat owners should also have adequate insurance coverage to protect their vessels and crew in case of accidents or other mishaps.

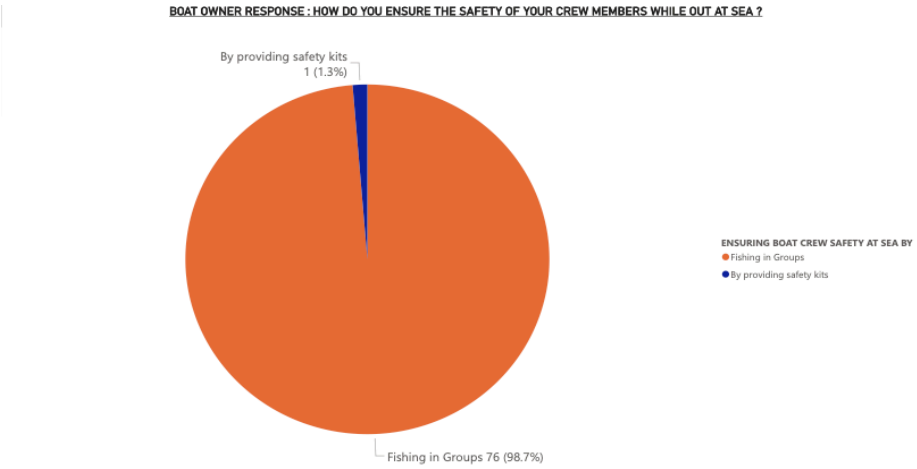
When asked, 96.2 % of the boat owners said they have not met with any safety incident or accident at sea, which is in variance with those mentioned by Fishermen and *Tandel*.



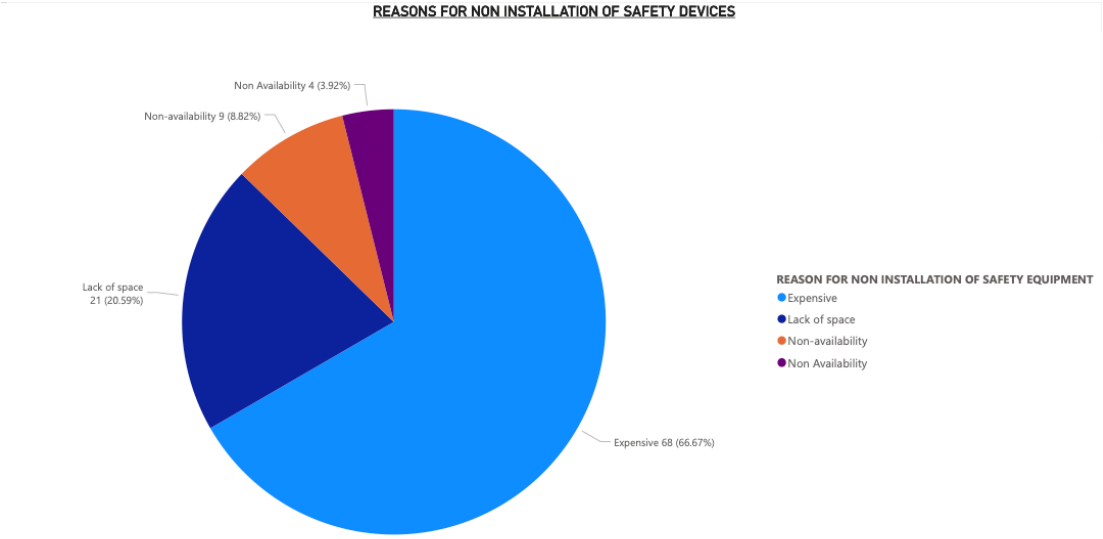
About 85% of the boat owners said that they plan to deal with potential safety risks associated with type of fishing that their boats are engaged in, by regular maintenance of fishing vessel. 8.8 % of owners said that they rely on training their fishing crew with basic safety skills, and only 11.3 % were in favour of installing safety equipment onboard. None of the owners, however, acknowledged that mock drills of dealing with emergencies helps in dealing with safety risks.



The boat owners said that one of the methods to ensure safety of their crew members while out at sea was encouraging them to fish in groups, so that they can seek each other's assistance whenever faced with emergencies at sea, which is also correlated with the opinion of fishermen.



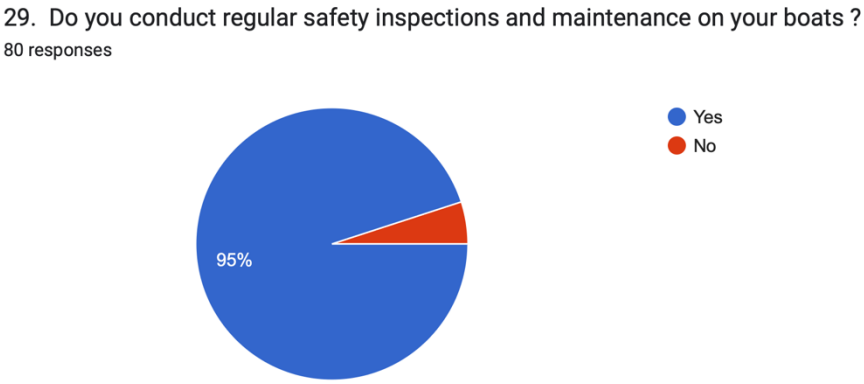
When asked for reasons for non-installation of safety devices, the owners cited various reasons. Maximum owners, 66.6%, said that the safety devices were expensive. 20.59 % owners said that they did not have enough space onboard. Non availability of equipment was cited as one of the reasons by 12.74 % of the owners.



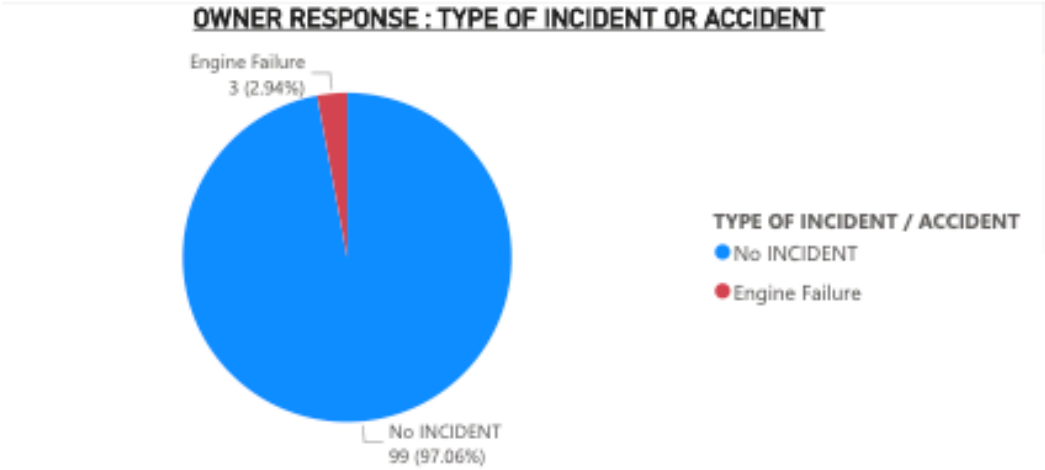
Regular Safety Inspections and Maintenance of Boats by Owners.

Boat owners have a responsibility to ensure the safety of their vessels by conducting regular inspections and maintenance. This includes checking the hull, engines, navigation equipment, safety equipment, and other essential systems on a regular basis to identify and address any potential issues. It is also important for boat owners to keep their vessels in compliance with relevant safety regulations and standards. Neglecting proper inspection and maintenance can result in mechanical failures or other safety issues that can put the crew and passengers at risk. Therefore, boat owners should prioritize safety inspections and maintenance to ensure the safe operation of their vessels.

About 95 % of the boat owners said that they conduct regular inspections and maintenance of their boats.



When asked, 97.06 % of the owners said that they never had any incident or accident at sea, and only 2.94 % of owners said that they had engine failure onboard their boats at sea.

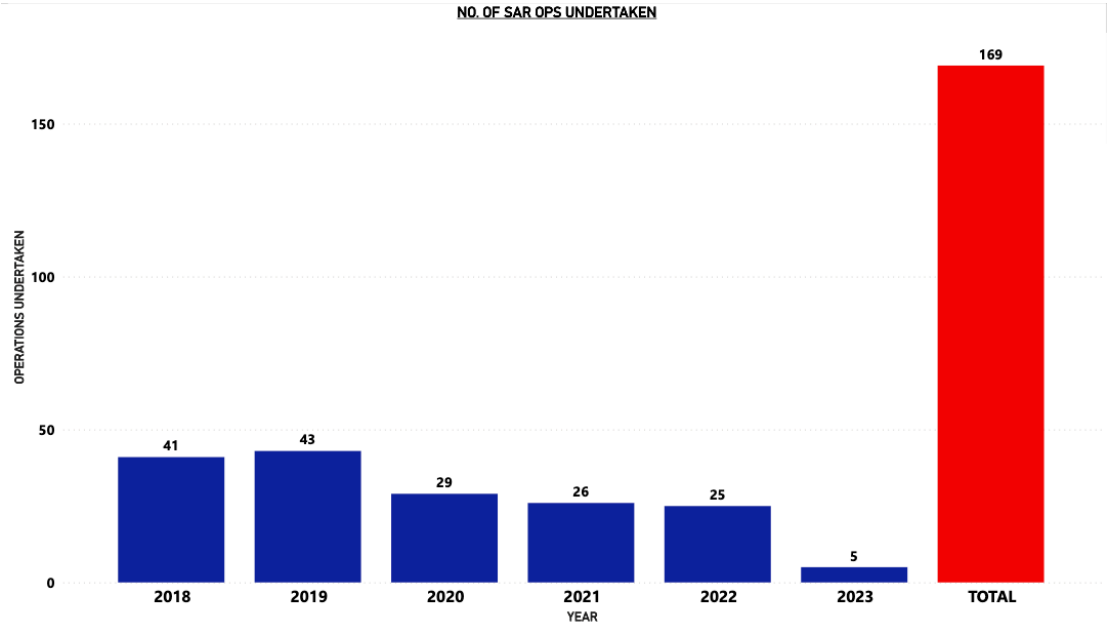


Other Stake Holders

11.3 Indian Coast Guard

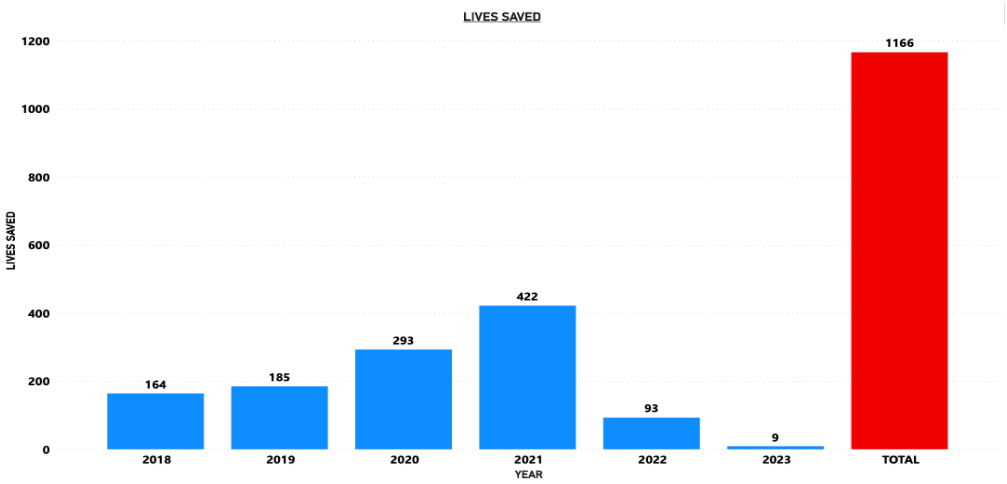
The Indian Coast Guard plays a crucial role in providing Search and Rescue operations to fishermen in distress. Indian Coast Guard is a premier maritime agency which have dedicated search and rescue vessels, aircraft, and helicopters that can be deployed to search for and rescue fishermen in the event of an emergency. The Indian Coast Guard also conducts regular safety awareness programs and training for fishermen to prevent accidents and ensure their safety at sea. They work closely with state marine police and other organizations to coordinate search and rescue operations and respond to distress calls promptly. The efforts of the Indian Coast Guard have helped save the lives of many fishermen and prevent accidents at sea.

ICG has undertaken a total of 169 dedicated SAR missions off the coast of Maharashtra spread over last 05 years, from 2018 till 31 Jan 23, with maximum operations undertaken in 2019.



Lives Saved

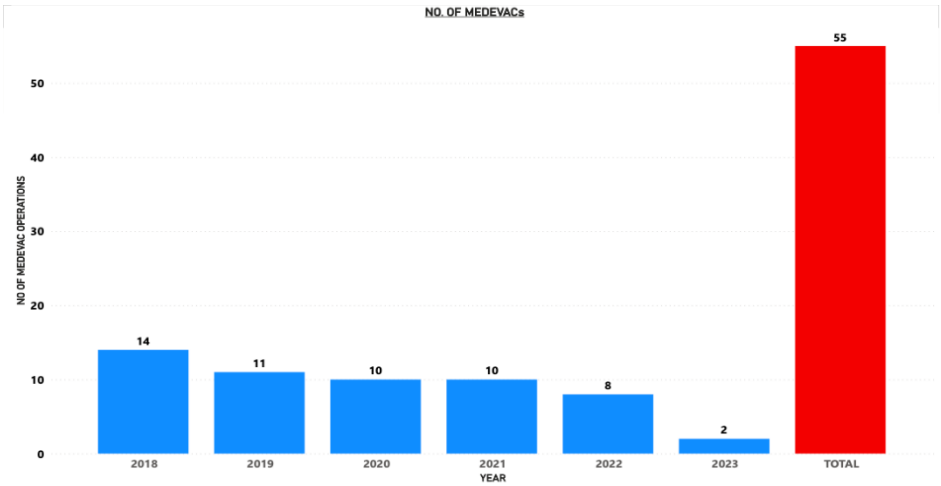
Indian Coast Guard has saved total of 1166 lives during last 05 years, from 2018 to 31 Jan 2023 during various SAR operations.



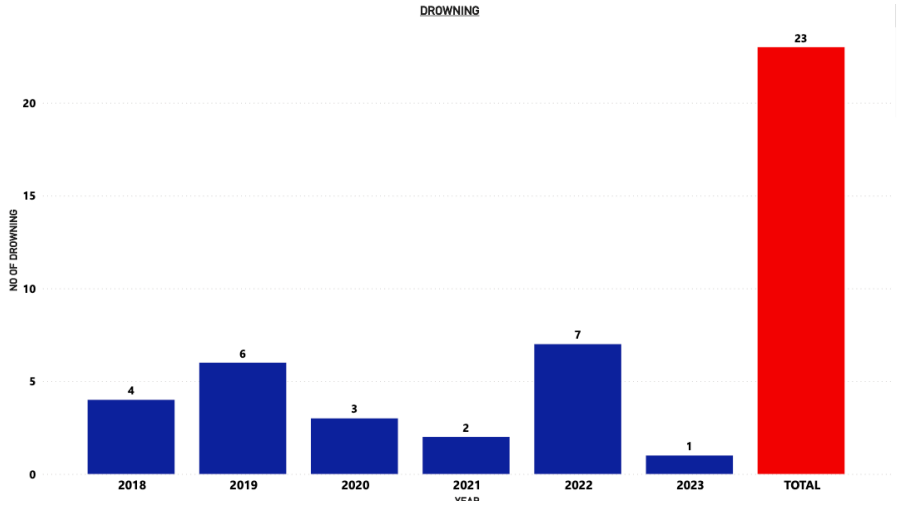
Medical Evacuations (MEDEVAC)

The Indian Coast Guard plays a crucial role in conducting medical evacuations from the sea. They have specially trained medical personnel and equipment on board their vessels and aircraft to provide emergency medical care to fishermen in distress at sea. The Indian Coast Guard responds promptly to distress calls and coordinates with other agencies and medical facilities on land to provide the best possible medical care to the fishermen. The Coast Guard also provides aerial surveillance and support during medical evacuations to ensure the safety of both the fishermen and the rescue personnel.

Since Jan 2018 till 31 Jan 2023, total of 55 MEDEVACs have been conducted successfully.



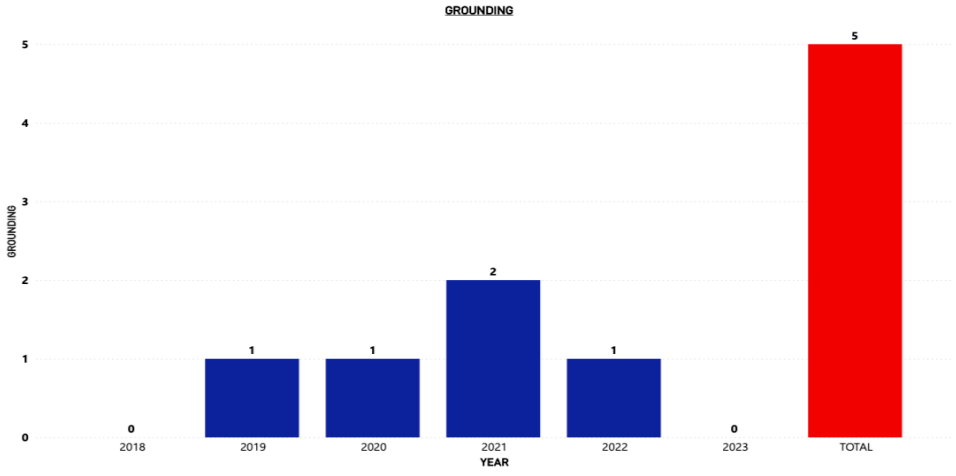
Drowning. Indian Coast Guard has responded to distressed calls for 23 drowning cases since Jan 2018 till 31 Jan 2023, maximum being in year 2022.



Grounding

Grounding refers to the situation where a vessel makes contact with the seabed or the bottom of a waterway. This can happen due to a variety of reasons, such as navigational errors, mechanical failures, adverse weather conditions, or human error. Grounding can cause significant damage to the vessel, and can also pose a risk to the safety of the crew on board. It is a common cause of maritime accidents and incidents.

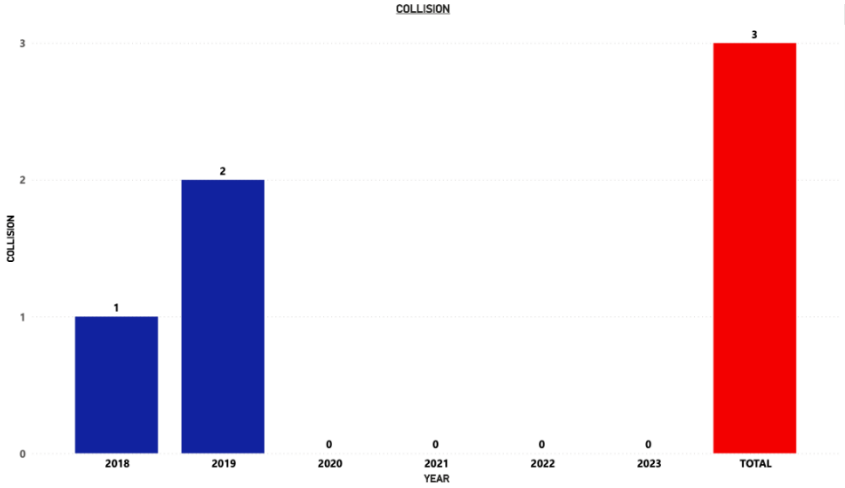
A total 05 cases of incidents of Grounding of vessels have been reported.



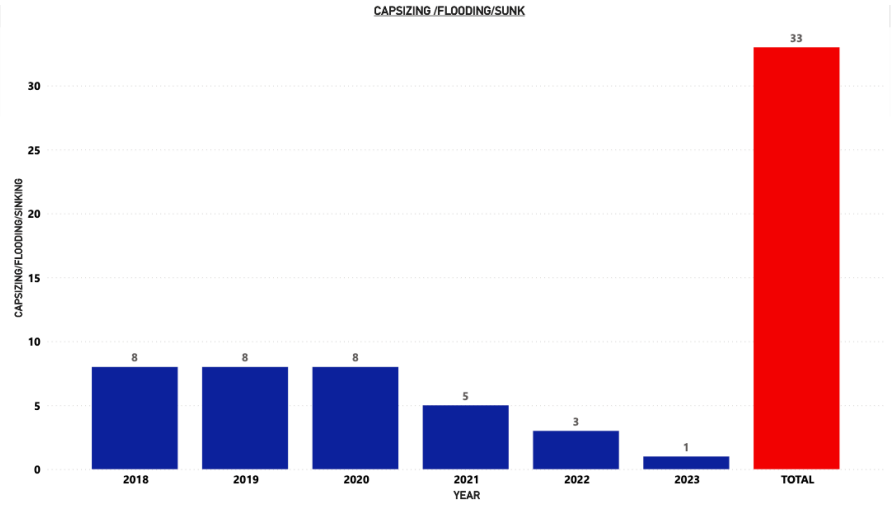
Collision

collision refers to the impact or contact between two vessels, or between a vessel and another object, such as a pier or a buoy. It is an accident that can cause damage to the vessels involved and may even result in injuries or loss of life. The term collision can also refer to the legal liability for the accident and the resulting damages.

Three incidents of collisions have been reported since Jan 2018, with maximum 02 cases in year 2019.

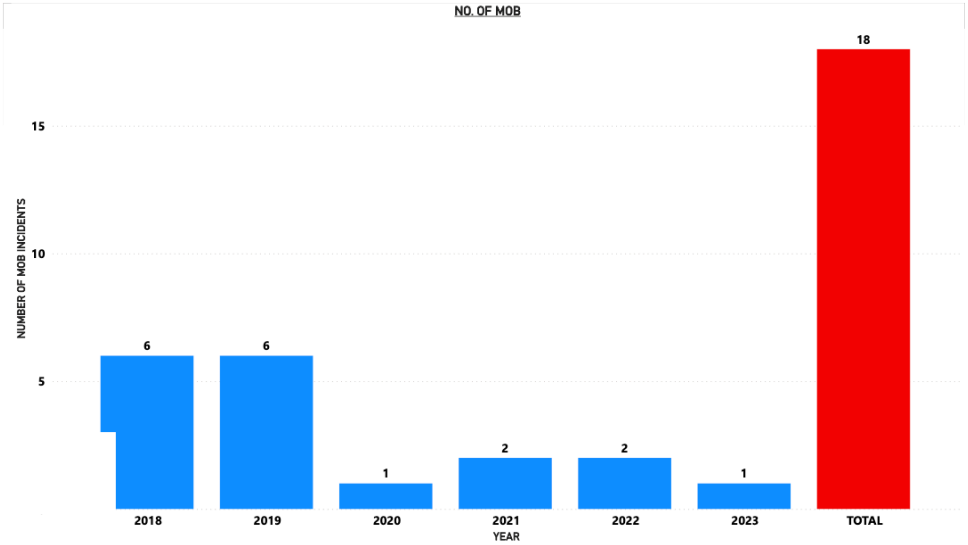


Capsizing Thirty Three (33) cases of capsizing/Flooding/Sinking has been reported and responded by Indian Coast Guard from Jan 2018 till 31 Jan 2023, Maximum being 08 vases each in years 2018, 2019 and 2020.



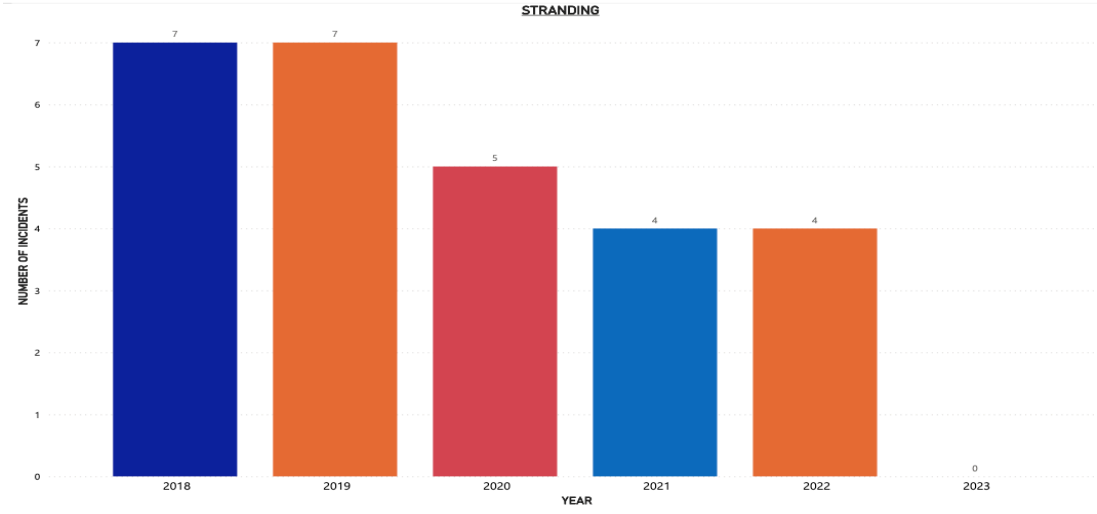
Man Over Board.

A total of 18 Cases of Man Overboard has been reported since Jan 2018, for which Indian Coast Guard MRCC has coordinated the search for the overboard person. The maximum cases were reported in 2018 and 2019 where 08 MOBs were reported.



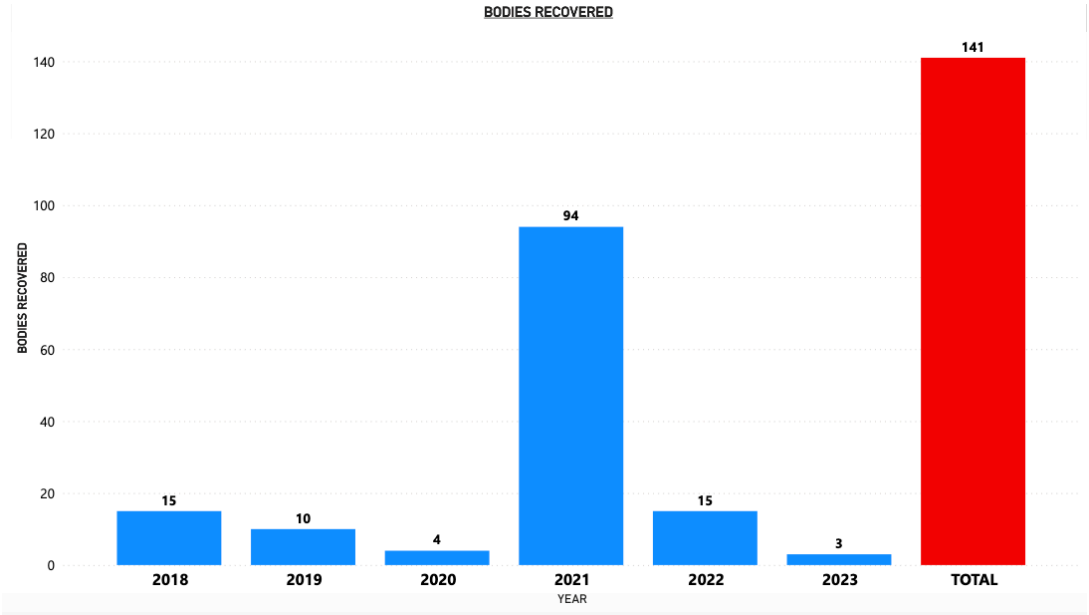
Stranding

Stranding is a term that refers to when a vessel becomes stuck or grounded on the shore or other underwater obstruction. This can happen due to a variety of reasons such as navigational error, equipment failure, or adverse weather conditions. When a vessel is stranded, it may become damaged or even capsize, leading to potential loss of life and environmental damage. Maximum of 07 cases each were reported in 2018 and 2019.



Bodies Recovered.

About 141 lives have been lost and their bodies have been recovered since Jan 2018 till 31 Jan 2023, with maximum causalities reported in year 2021.



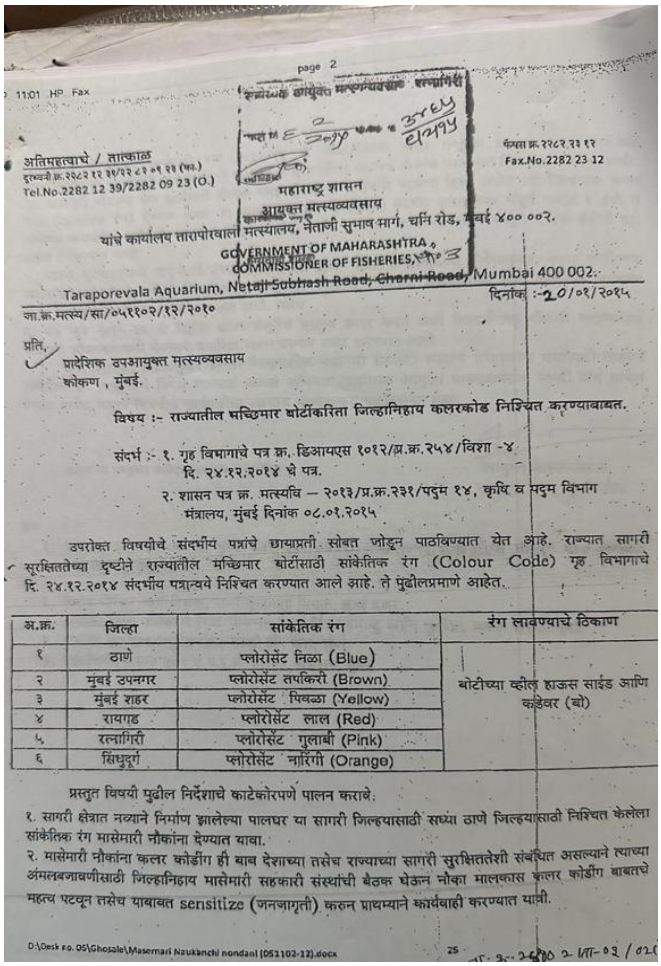
11.4 Discussions with Indian Coast Guard and Indian Navy Officials

A total of 78 officials of Indian Coast Guard and Indian Navy were interviewed with the help of Fixed Questionnaire. The officers had a vast experience in Maritime Boarding Operations at sea, wherein they had also undertaken boarding operations onboard Fishing Vessels along the coast of Maharashtra. The boardings were conducted for varied tasks such as SAR, Routine Investigations, humanitarian assistance etc.

Following are the findings: -

Colour Code Compliance

The Government of Maharashtra, through their official Gazette has notified the color codes for the fishing boats of Maharashtra.



महाराष्ट्र शासन
आयुक्त मत्स्यव्यवसाय
यांचे कार्यालय तारापोरवाला मत्स्यालय, नेताजी सुभाष मार्ग, चर्नि रोड, मुंबई ४०० ००२.
GOVERNMENT OF MAHARASHTRA,
COMMISSIONER OF FISHERIES,
Taraporevala Aquarium, Netaji Subhash Road, Charni Road, Mumbai 400 002.

जा.क्र.मत्स्य/सा/०५११०२/१२/२०१०

दिनांक :- 20/०१/२०१५

प्रति,
प्रादेशिक उपआयुक्त मत्स्यव्यवसाय
कोकण , मुंबई.

विषय :- राज्यातील मच्छिमार बोटींकरिता जिल्हानिहाय कलरकोड निश्चित करण्याबाबत.

संदर्भ :- १. गृह विभागाचे पत्र क्र. डिआयएस १०१२/प्र.क्र.२५४/विशा -४ दि. २४.१२.२०१४ चे पत्र.
२. शासन पत्र क्र. मत्स्यवि – २०१३/प्र.क्र.२३१/पदुम १४, कृषि व पदुम विभाग मंत्रालय, मुंबई दिनांक ०८.०१.२०१५

उपरोक्त विषयीचे संदर्भीय पत्रांचे छायाप्रती सोबत जोडून पाठविण्यात येत आहे. राज्यात सागरी सूरक्षिततेच्या दृष्टीने राज्यातील मच्छिमार बोटींसाठी सांकेतिक रंग (Colour Code) गृह विभागाचे दि. २४.१२.२०१४ संदर्भीय पत्रान्वये निश्चित करण्यात आले आहे. ते पुढीलप्रमाणे आहेत.

अ.क्र.	जिल्हा	सांकेतिक रंग	रंग लावण्याचे ठिकाण
१	ठाणे	प्लोरोसेंट निळा (Blue)	बोटीच्या व्हील हाऊस साईड आणि कंडेवर (चो)
२	मुंबई उपनगर	प्लोरोसेंट तपकिरी (Brown)	
३	मुंबई शहर	प्लोरोसेंट पिवळा (Yellow)	
४	रायगड	प्लोरोसेंट लाल (Red)	
५	रत्नागिरी	प्लोरोसेंट गुलाबी (Pink)	
६	सिंधुदुर्ग	प्लोरोसेंट नारिंगी (Orange)	

प्रस्तुत विषयी पुढील निर्देशाचे काटेकोरपणे पालन करावे.
१. सागरी क्षेत्रात नव्याने निर्माण झालेल्या पालघर या सागरी जिल्ह्यासाठी सध्या ठाणे जिल्ह्यासाठी निश्चित केलेला सांकेतिक रंग मासेमारी नौकांना देण्यात यावा.
२. मासेमारी नौकांना कलर कोडींग ही बाब देशाच्या तसेच राज्याच्या सागरी सुरक्षिततेशी संबंधित असल्याने त्याच्या अंमलबजावणीसाठी जिल्हानिहाय मासेमारी सहकारी संस्थांची बैठक घेऊन नौका मालकास कलर कोडींग बाबतचे महत्व पटवून तसेच याबाबत sensitize (जनजागृती) करुन प्राधान्याने कार्यवाही करण्यात यावी.

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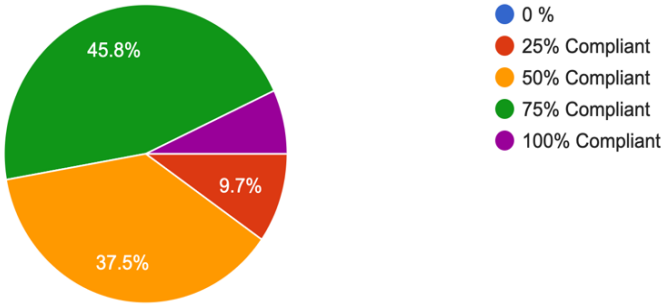
Fig 11.4: Govt. of Maharashtra notification for colour codes-1

9. Following is the colour codes for fishing boats of Maharastra. How many boat comply to this colour coding?

72 responses

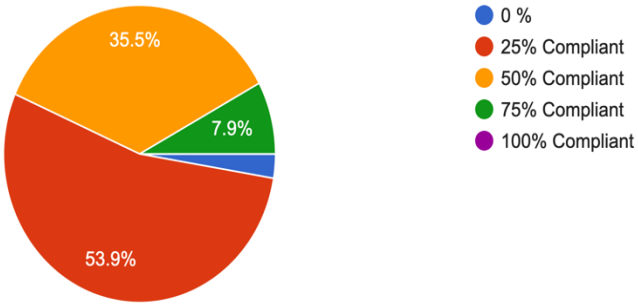


About 45% of the officers said that there has been only 75% compliance to the colour code regulations.

Compliance to Carrying Original Chip Based Biometric Card at Sea

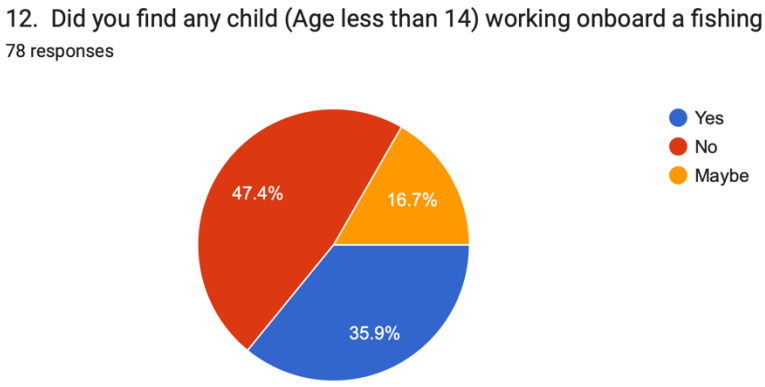
10. Boat crew is required to carry original chip based Biometric Cards, so that their identity can be proved at sea. What has been the compliance ?

76 responses



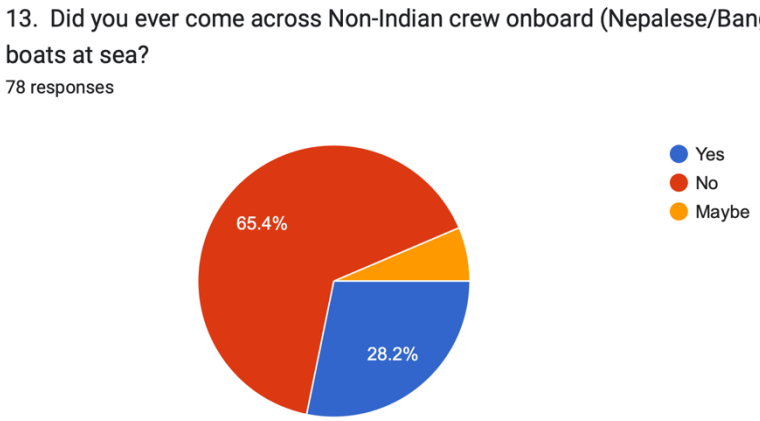
Presence of Child Less than 14 yrs. of Age

About 35.9 % officers said that they encountered children aged less than 14 years onboard fishing boats, but they were carrying ID cards which was showing their age otherwise.



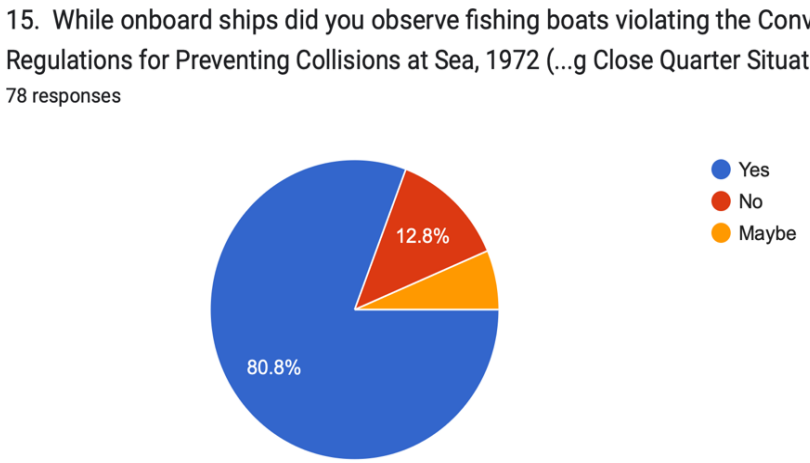
Presence of Crew with Origin from Nepal

About 28.2 % of the respondents said that they have seen Nepalese Crew manning the fishing boat.



Non-Adherence to International Regulations for Preventing Collisions at sea (COLREGS- 1975)

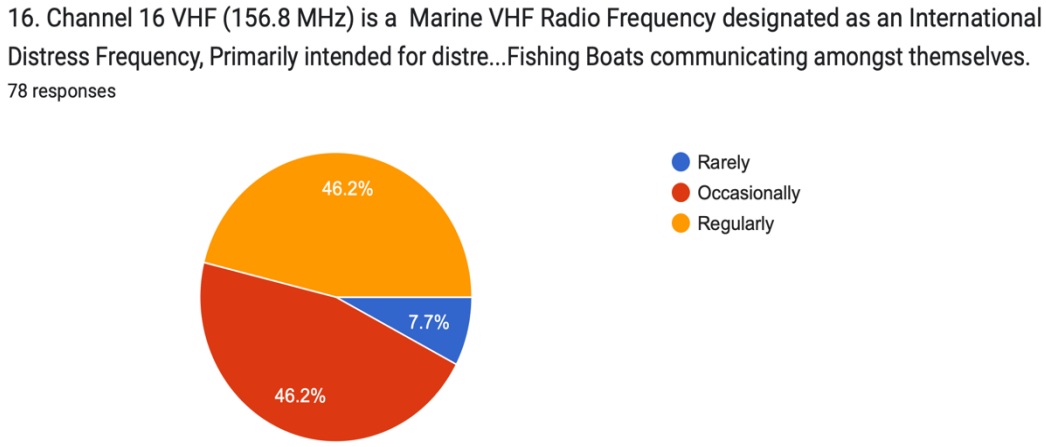
All fishing vessels are required to follow COLREGS-1975 in compliance to Merchant Shipping Act (Prevention of Collision at Sea) Regulations 1975. But 80.5% of officers have observed fishing boats to be violating these regulations thereby causing Close Quarter Situations or other safety issues.



VHF Channel 16

VHF channel 16 is an international distress frequency used by mariners to initiate a radio communication in the event of an emergency or a calling channel after which channel is shifter to other frequency for further communication. It is monitored 24/7 by the Indian Coast Guard and other vessels in the vicinity, and is used to transmit important information such as distress calls, urgency messages, and safety information. It is crucial for fishing vessels to have a VHF radio onboard and to be familiar with the proper procedures for using channel 16 in case of an emergency. Being able to quickly and

effectively communicate with other vessels and authorities can make a critical difference in ensuring the safety of the crew and the successful outcome of a rescue operation.

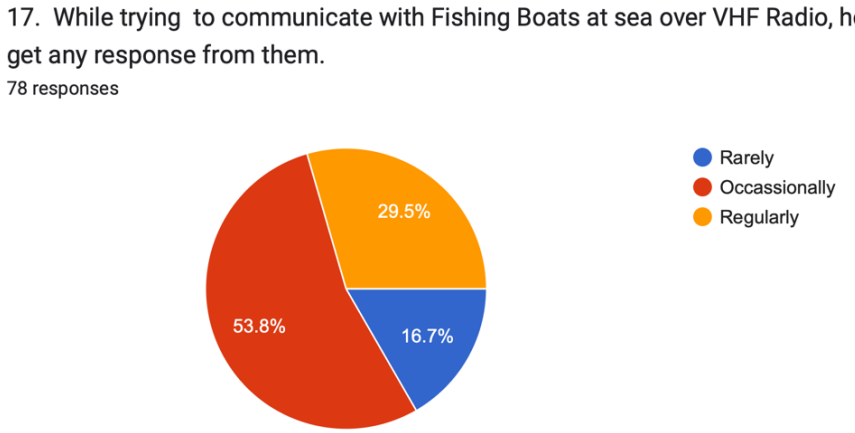


46.2 % of officers revealed that VHF channel 16 was regularly cluttered and 46.2 % of officers said that they have observed occasional clutter of this VHF channel by fishing boats, thereby making it extremely difficult for other vessels to communicate and monitor for any distress message by Indian Coast Guard.

Response from Fishing Boats.

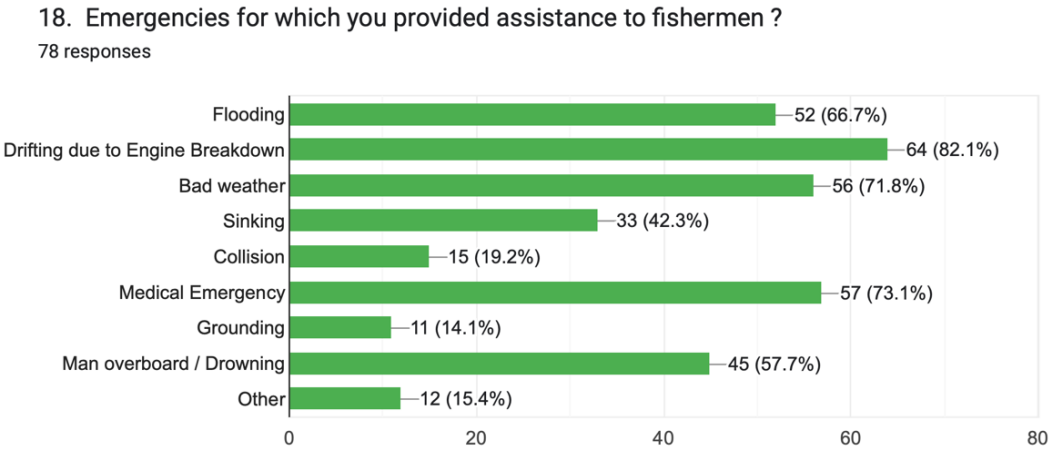
When contacted by Indian Coast Guard, many occasions there was no response by the fishing vessels, which often affects timely sharing of information with fishing boats fishing at sea.

53.8% of officers said they faced occasional difficulty, however 29.5 % of the officers said that they got no response from fishermen when called on VHF radio.



Emergencies for which the Indian Coast Guard Responded

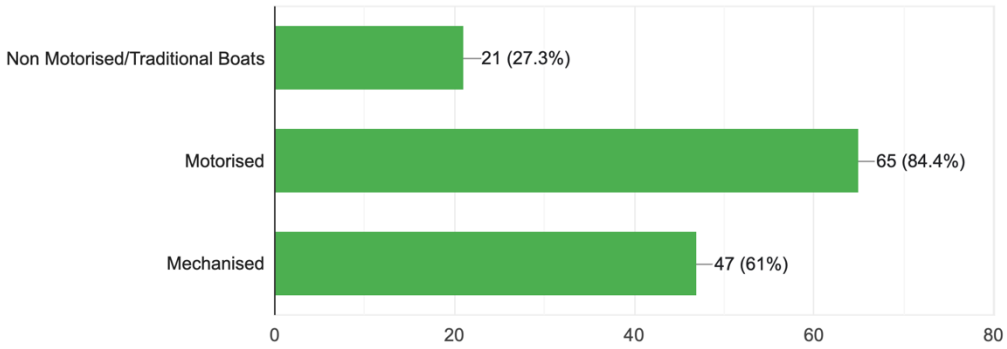
Officers said that Indian Coast Guard respond to various requirements of Fishermen at sea. Emergency due **Engine Failure**, which results in Fishing Vessels to drift causes maximum number of ICG efforts for Rescue Operations, followed by Medical Emergency and Flooding.



Further it was revealed that Maximum number of assistances was required by small Motorised boat followed by Mechanised boats.

19. The boat whom you assisted, was which type of boat ?

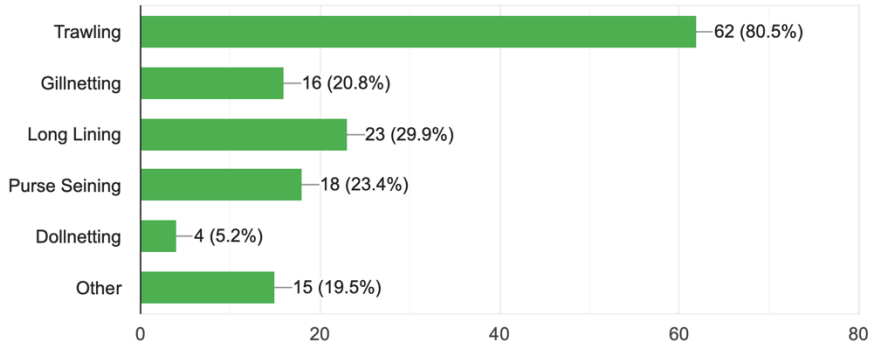
77 responses



Another factor which cannot be neglected was that the max number of assistances was requested was by Trawlers, followed by long liners, Purse Seiners and Long liners.

20. The boat whom you assisted, was fishing with which method ?

77 responses

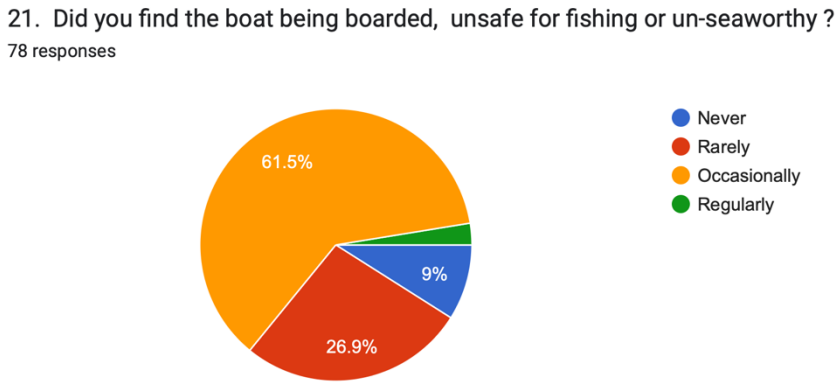


Unseaworthy Boats

Unworthy sea boats of fishermen are a major concern as they pose a significant risk to the safety and security of fishermen at sea. Such boats may have structural or mechanical issues that could cause them to capsize or sink, putting the lives of fishermen at risk. It is important for boat owners to regularly inspect and maintain their boats to ensure that they are seaworthy and in good condition. Law enforcement officers while boarding the vessels carry out an Initial Safety Inspection, which includes assessment of the subject vessel is safe for undertaking further operation onboard.

It is the responsibility of the owner/operator to maintain and operate the fishing vessel in a seaworthy condition, ensuring that insurance coverage for both the vessel and crew against all risks, accidents, and natural calamities are provided, and also providing good working conditions for the crew in accordance with the International Labour Organization (ILO) Convention 188.

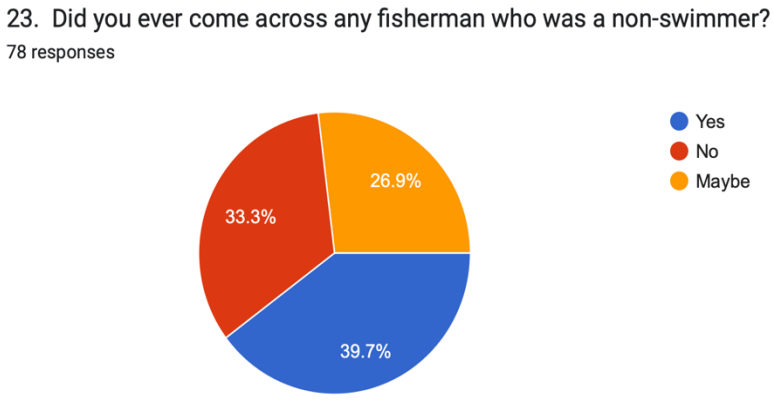
About 61.5% of the boarding officers said that they occasionally observed the subject boat was unsafe.



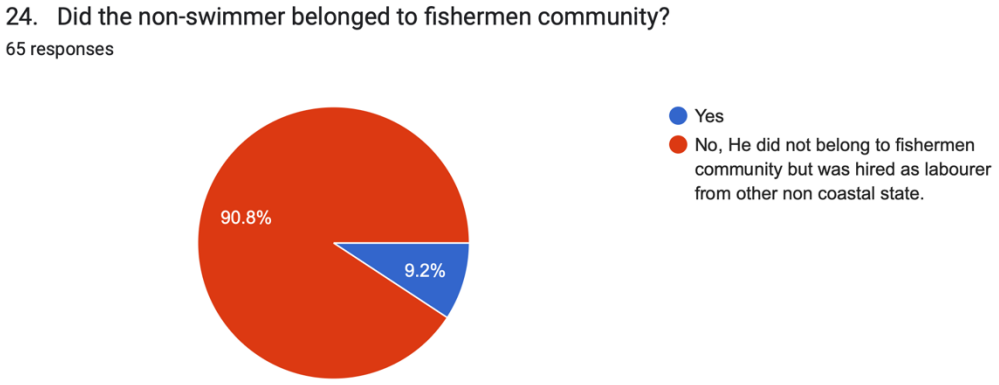
Presence of Non-Swimmers onboard Fishing Vessels

One of the important revelations was that there are large number of non-swimmers onboard fishing vessels. These crewmembers are hired as laborers on a temporary basis for the fishing season. The same has been correlated, when asked from boat owners about paying of insurance premium. Only 37.6% of the owners could manage crew of permanent nature.

About 39% of the officers have seen presence of non-swimmers onboard fishing vessels.

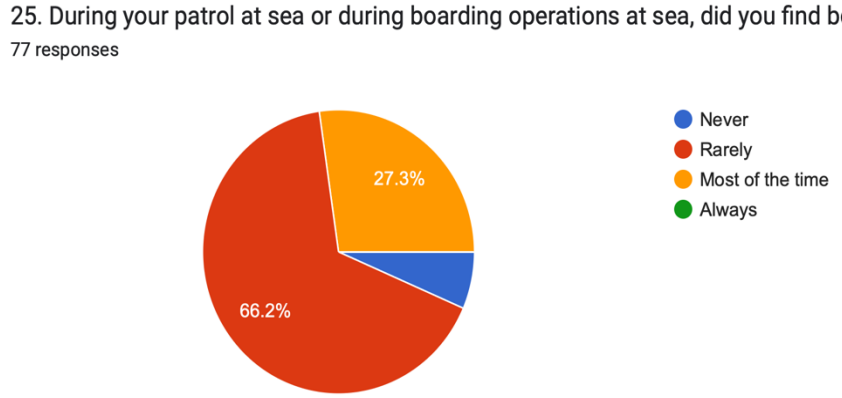


When asked further about the non-swimmers, it was revealed that majority of these crew who were non-swimmers do not belong to fishermen community, and were mostly migrant labors.



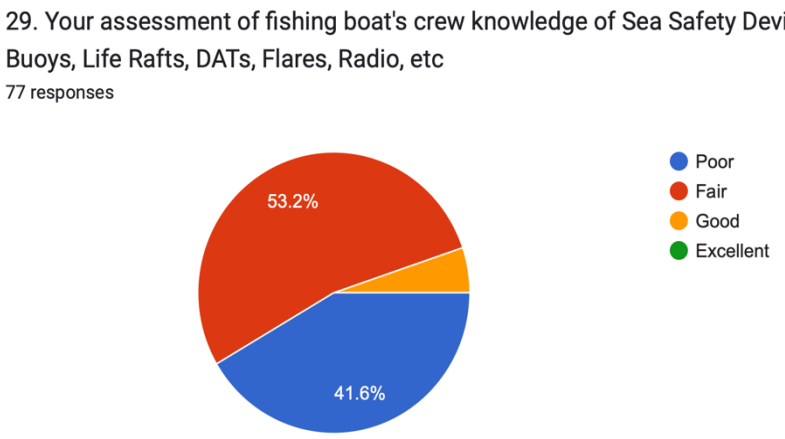
Overcrowding

Another factor which seriously affects safety of fishermen onboard is Overcrowding onboard. 27.3 % of the officers said that have found boats to be over crowded with respect to the size of the boat.



Boat Crew Knowledge of Sea Safety Devices/Equipment

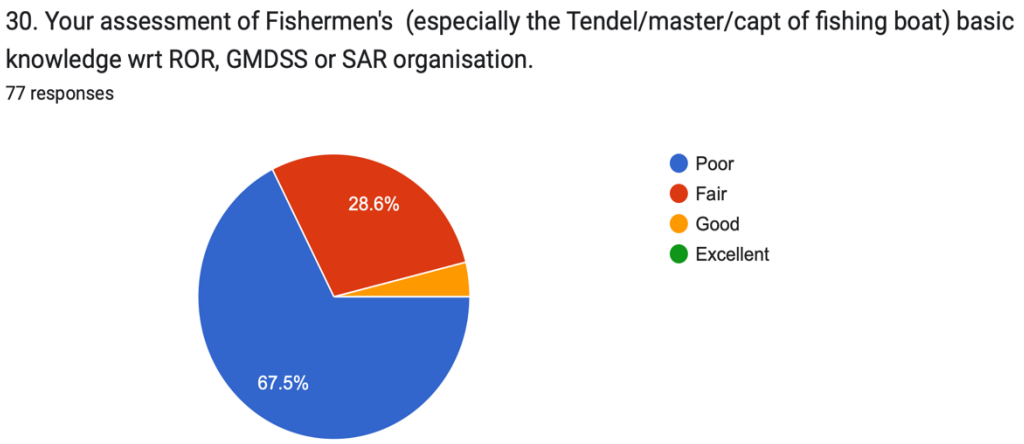
About 53.2% of the officers said that the fishing boat crew had fair knowledge of Sea Safety Devices such as Life buoys, Life Rafts, DATs, Radio, flares etc. However, 41.6 % of officers said that the fishing crew had poor knowledge of the sea safety devices.



Knowledge of *Tandel*/Master/Skipper/Master of Fishing Boat

Having knowledge of ROR (Rules of the Road), GMDSS (Global Maritime Distress and Safety System), and SAR (Search and Rescue) organizations is essential for the *Tandel* /skipper of the fishing boat. ROR provides the guidelines for safe navigation and helps prevent collisions at sea. GMDSS is a set of safety procedures and equipment used for communication and distress calls in emergency situations. SAR organizations are responsible for providing assistance and rescuing vessels in distress. Knowing these procedures and organizations can help the master of the fishing boat to navigate safely, communicate effectively in emergency situations, and receive timely assistance in case of distress. It also helps to ensure the safety of the crew, vessel, and cargo, which is essential for the success of the fishing trip.

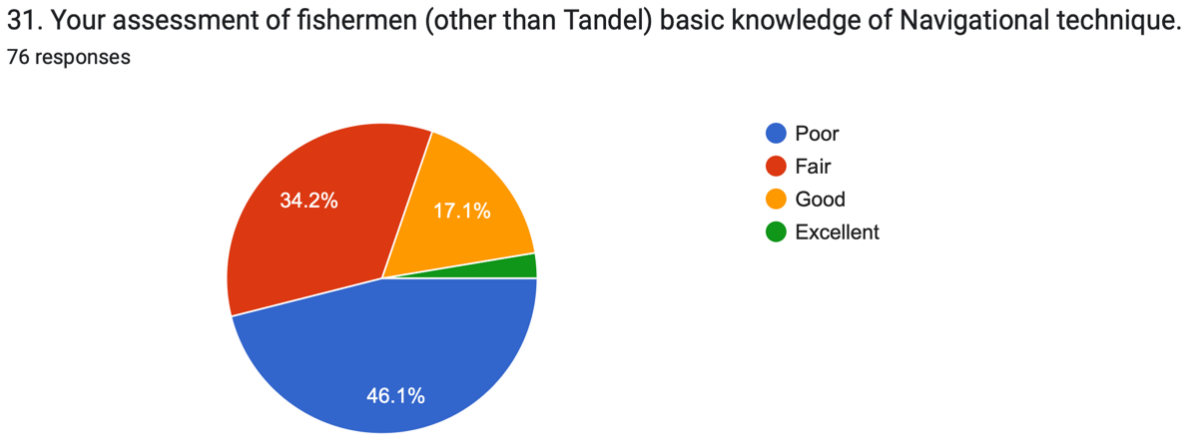
About 67.5 % of the officers said that *Tandel*/Skipper/Captains of the fishing boats had poor knowledge of these subjects, which is corroborated by the fact that it was also observed that there is a continuous clutter on MMB channel 16, boats have been found to be violating various rules of ROR and SAR agencies often find difficult to communicate with boats in distress at sea.



Fishermen (other than *Tandel*) Knowledge of Navigation Technique

It is important for all crew members onboard a fishing vessel to have at least a basic knowledge of navigation techniques, in addition to the skipper of the vessel. This is because in the event of an emergency or the incapacitation of the skipper, other crew members may need to take control of the vessel and navigate it safely back to shore. Basic navigation knowledge includes understanding how to read a nautical chart, use navigation instruments such as a compass and GPS, and recognize landmarks and other navigational aids. Additionally, all crew members should have a basic understanding of the Rules of the Road (ROR) to ensure safe navigation and avoid collisions with other vessels.

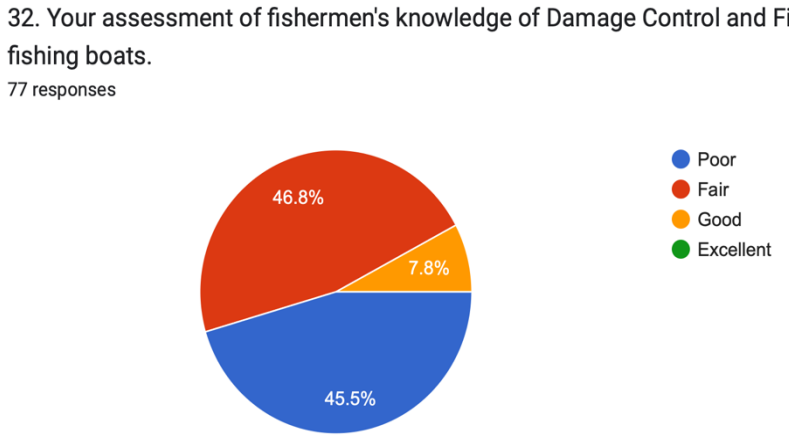
About 46.1 % of the officers said that Fishermen, other than *Tandel*, had Poor knowledge of Navigation Techniques.



Fishermen Knowledge of Damage Control and Fire Fighting onboard Fishing Boats

Knowledge of firefighting and damage control techniques is critical for fishermen as they often have to deal with emergencies such as fire on board, flooding or other damage to the vessel. All crew members, including the skipper, should be trained in firefighting and damage control techniques to ensure a quick and effective response in the event of an emergency. It is important to have appropriate fire-fighting equipment and to know how to use it. Crew members should be familiar with the location and operation of fire extinguishers, fire hoses, and other equipment. They should also know how to identify potential hazards, take preventive measures, and respond to emergencies. This knowledge can make the difference between a minor incident and a major disaster.

About 45.5 % officers reported that Fishermen had poor knowledge of Damage Control and Fire Fighting onboard fishing boats.

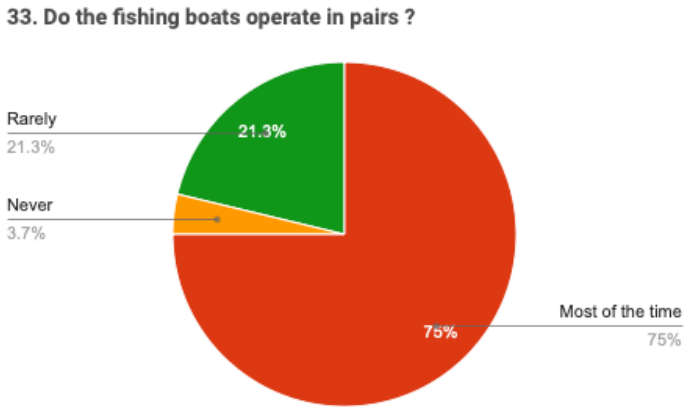


Fishing Boats Operating in Pairs

Fishing boats operating in pairs can have certain advantages when it comes to safety. Having another boat nearby can provide assistance in case of emergencies such as equipment failure or medical emergencies. The boats can also communicate with each other to share information about weather and fishing conditions, as well as any potential hazards. Additionally, fishing in pairs can help to reduce the risk of collisions with other vessels as each boat can keep a lookout for the other. However, it is important for each boat

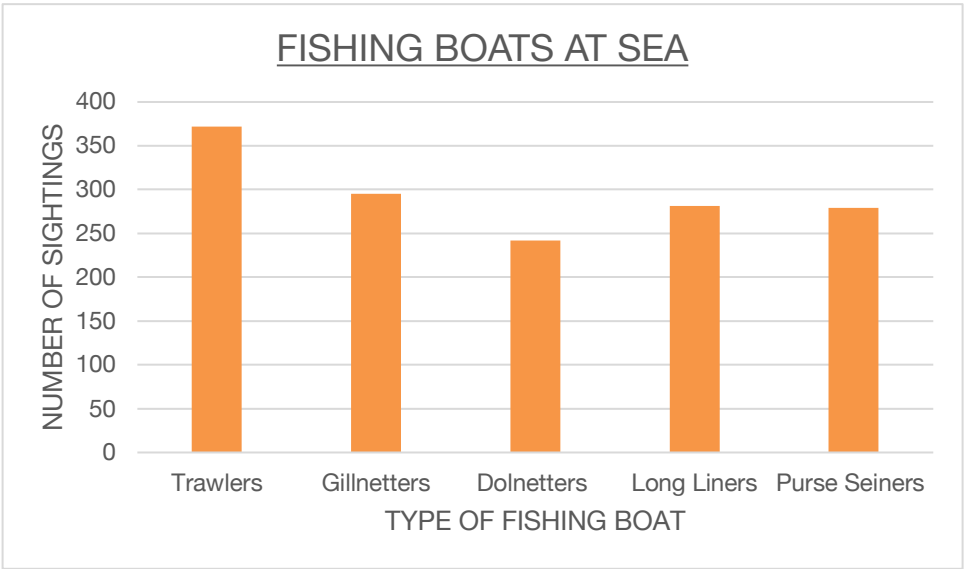
to maintain a safe distance from each other to avoid any accidental collisions. Overall, operating in pairs can enhance the safety and efficiency of fishing operations.

About 75% officers said that most of the time fishing boats do operate in pairs.



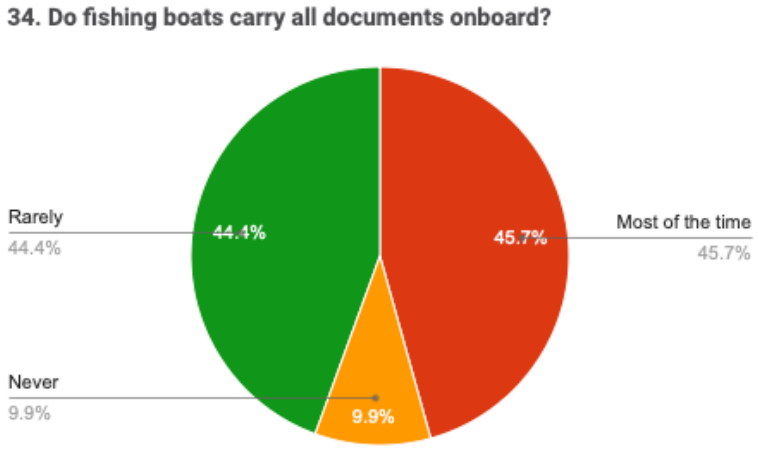
Fishing Boats at Sea

Officers reported that they have encountered Trawlers maximum number of times during their patrol at sea, this was followed by Gillnetters, Purse Seiners, Long Liners and Dolnetters.



Documents Carried by Fishing Boats at Sea

Fishing boats are required to carry certain documents at sea to ensure compliance with regulations and to facilitate communication with relevant authorities in case of emergency situations. Some of the essential documents that fishing boats must carry include Registration or License Certificate, Crew List, Log Book, Navigational Charts, and Relevant Permits for fishing and Navigation in specific areas. Additionally, boats operating in international waters must carry relevant international documents, and International Maritime Organization (IMO) numbers (if eligible). Proper documentation is crucial for ensuring the safety of crew members, complying with regulations, and avoiding legal complications in case of inspections or incidents at sea.



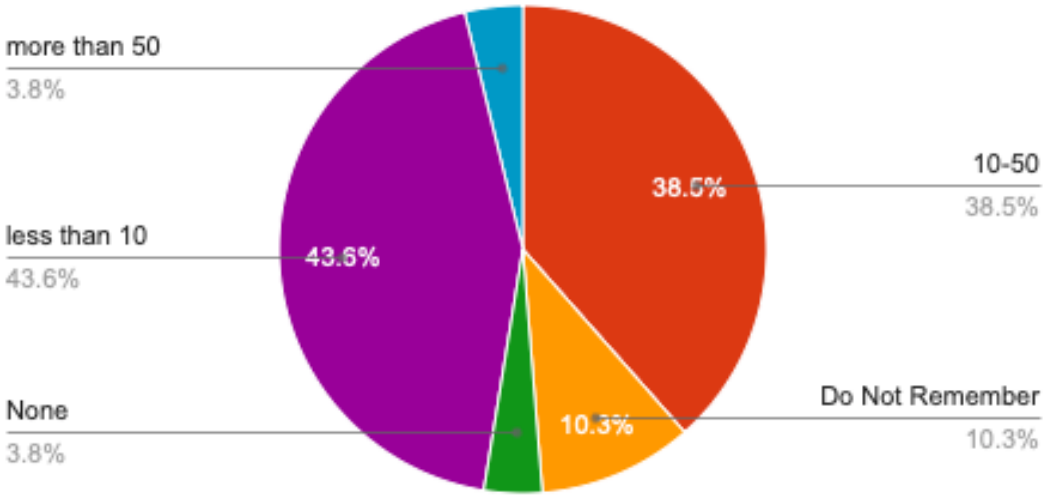
About only 45% officers said that boats carried all documents all the time, and 44 % of officers reported that boats rarely carry all documents onboard when at sea.

Injuries / Fatalities Observed at Sea

Injuries and fatalities are unfortunately common occurrences onboard fishing boats at sea. Fishermen face many hazards while working, including heavy equipment, dangerous weather conditions, and the unpredictable nature of the sea. Accidents can occur due to machinery failure, collisions with other vessels, falling overboard, or getting caught in nets or lines. The isolated nature of fishing vessels can also make it challenging to receive medical attention quickly in the event of an injury.

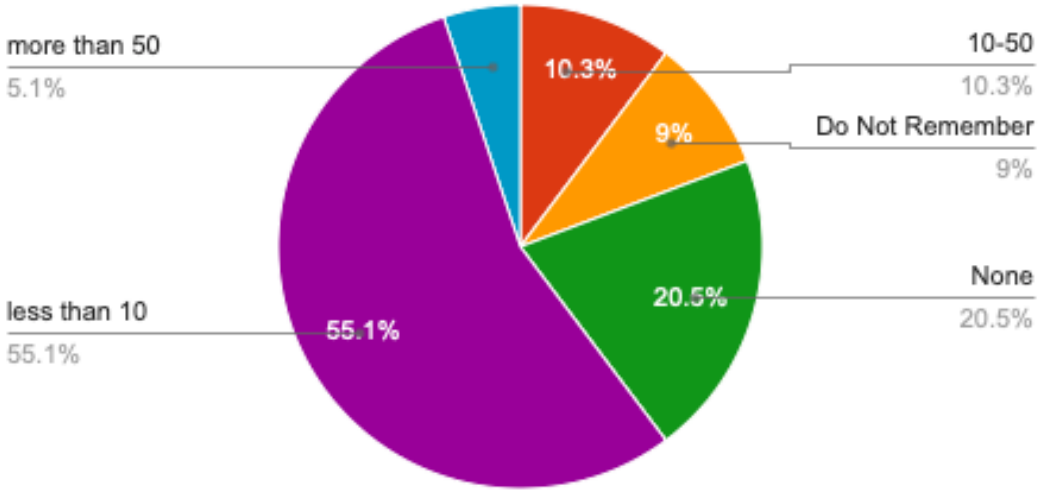
Injuries

About 38.5 % of the officers said that they observed between 10-50 fishermen Injuries at sea during various missions at sea during the last 05 years.



Fatalities

About 10.3 % of officers reported that they have encountered 10-50 fishermen fatalities during the last 05 years.

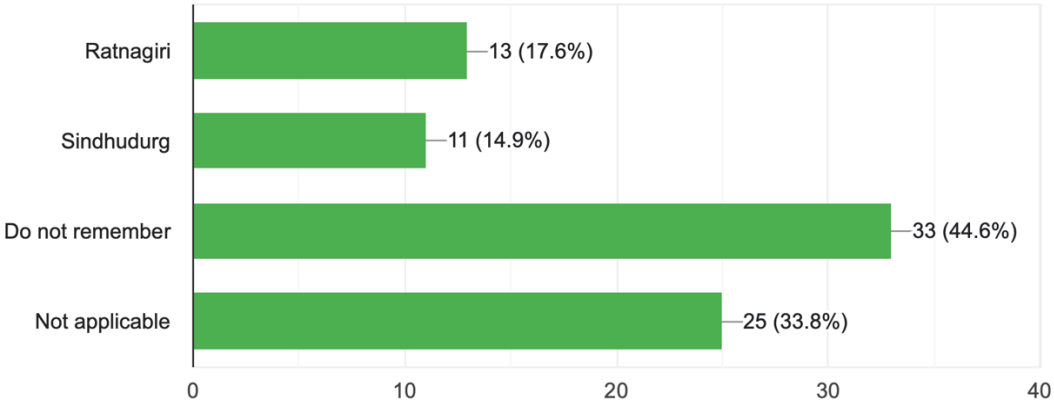


Location

About 16.3 % of officers confirmed that these injuries/fatalities were observed in Ratnagiri and 13.3 % officers said to have observed in Sindhudurg district.

36. If observed, which district ?

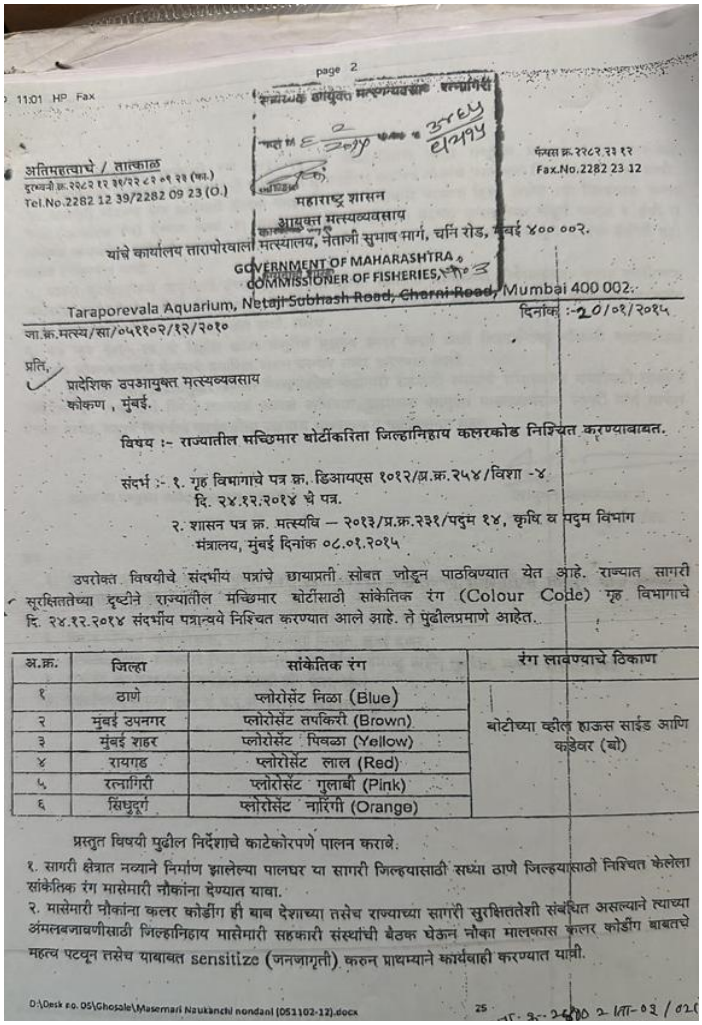
74 responses



11.5 Coastal Security Police (Maharashtra)

Samples were collected from Coastal Security Police at Ratnagiri and Sindhudurg. Three interviews were taken with the help of fixed questionnaire. Following are the responses received: -

Compliance to the Promulgated Colour Codes



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अतिमहत्वाचे / तात्काळ
दूरध्वनी क्र. २२८२ १२ ३९/२२ ८२ ०९ २३ (का.)
Tel.No.2282 12 39/2282 09 23 (O.)

फॅक्स क्र. २२८२ २३ १२
Fax.No.2282 23 12

महाराष्ट्र शासन
आयुक्त मत्स्यव्यवसाय
यांचे कार्यालय तारापोरवाला मत्स्यालय, नेताजी सुभाष मार्ग, चर्नी रोड, मुंबई ४०० ००२.
GOVERNMENT OF MAHARASHTRA
COMMISSIONER OF FISHERIES,
Taraporevala Aquarium, Netaji Subhash Road, Charni Road, Mumbai 400 002.

जा.क्र.मत्स्य/सा/०५११०२/१२/२०१०

दिनांक :- 20/01/2015

प्रति,
प्रादेशिक उपआयुक्त मत्स्यव्यवसाय
कोकण , मुंबई.

विषय :- राज्यातील मच्छिमार बोटींकरिता जिल्हानिहाय कलरकोड निश्चित करण्याबाबत.

संदर्भ :- १. गृह विभागाचे पत्र क्र. डिआयएस १०१२/प्र.क्र.२५४/विशा -४ दि. २४.१२.२०१४ चे पत्र.
२. शासन पत्र क्र. मत्स्यवि – २०१३/प्र.क्र.२३१/पदुम १४, कृषि व पदुम विभाग मंत्रालय, मुंबई दिनांक ०८.०१.२०१५

उपरोक्त विषयीचे संदर्भीय पत्रांचे छायाप्रती सोबत जोडून पाठविण्यात येत आहे. राज्यात सागरी सुरक्षिततेच्या दृष्टीने राज्यातील मच्छिमार बोटींसाठी सांकेतिक रंग (Colour Code) गृह विभागाचे दि. २४.१२.२०१४ संदर्भीय पत्रान्वये निश्चित करण्यात आले आहे. ते पुढीलप्रमाणे आहेत.

अ.क्र.	जिल्हा	सांकेतिक रंग	रंग लावण्याचे ठिकाण
१	ठाणे	प्लोरोसेंट निळा (Blue)	बोटीच्या व्हील हाऊस साईड आणि कडेवर (बो)
२	मुंबई उपनगर	प्लोरोसेंट तपकिरी (Brown)	
३	मुंबई शहर	प्लोरोसेंट पिवळा (Yellow)	
४	रायगड	प्लोरोसेंट लाल (Red)	
५	रत्नागिरी	प्लोरोसेंट गुलाबी (Pink)	
६	सिंधुदुर्ग	प्लोरोसेंट नारिंगी (Orange)	

प्रस्तुत विषयी पुढील निर्देशाचे काटेकोरपणे पालन करावे.

१. सागरी क्षेत्रात नव्याने निर्माण झालेल्या पालघर या सागरी जिल्हयासाठी सध्या ठाणे जिल्हयासाठी निश्चित केलेला सांकेतिक रंग मासेमारी नौकांना देण्यात यावा.

२. मासेमारी नौकांना कलर कोडींग ही बाब देशाच्या तसेच राज्याच्या सागरी सुरक्षिततेशी संबंधित असल्याने त्याच्या अंमलबजावणीसाठी जिल्हानिहाय मासेमारी सहकारी संस्थांची बैठक घेऊन नौका मालकास कलर कोडींग बाबतचे महत्व पटवून तसेच याबाबत sensitize (जनजागृती) करुन प्राधान्याने कार्यवाही करण्यात यावी.

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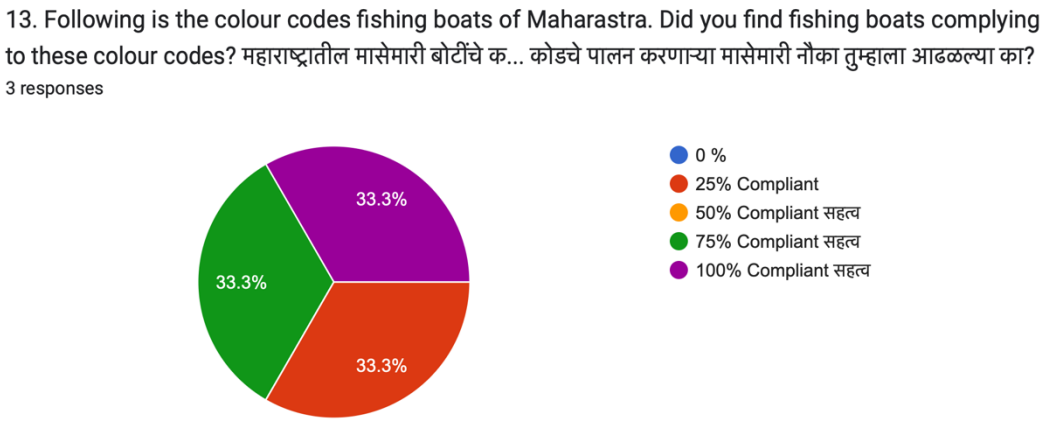
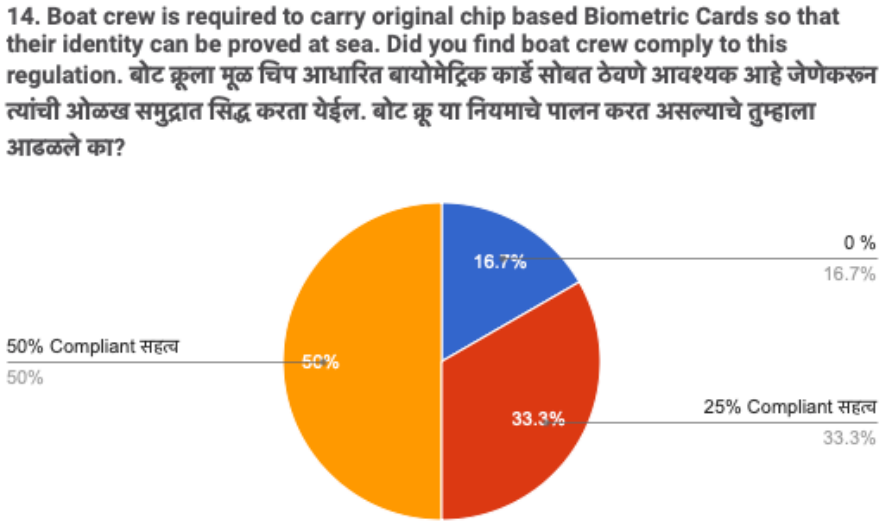
Fig 11.5: Govt. of Maharashtra notification for colour codes-2



The sample size of Coastal Security Police size was small to arrive at any conclusion regarding compliance to color code.

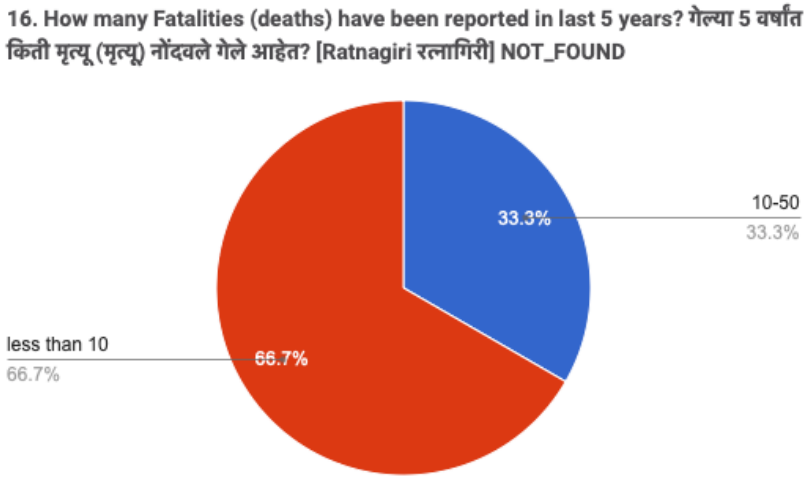
Biometric Cards

In response to the compliance to the regulation of carrying Biometric Card, 50% respondents said that the compliance was 50% and 33.3 % indicated that the compliance was 33.3 %, whereas 16.7% respondents said there was nil compliance.



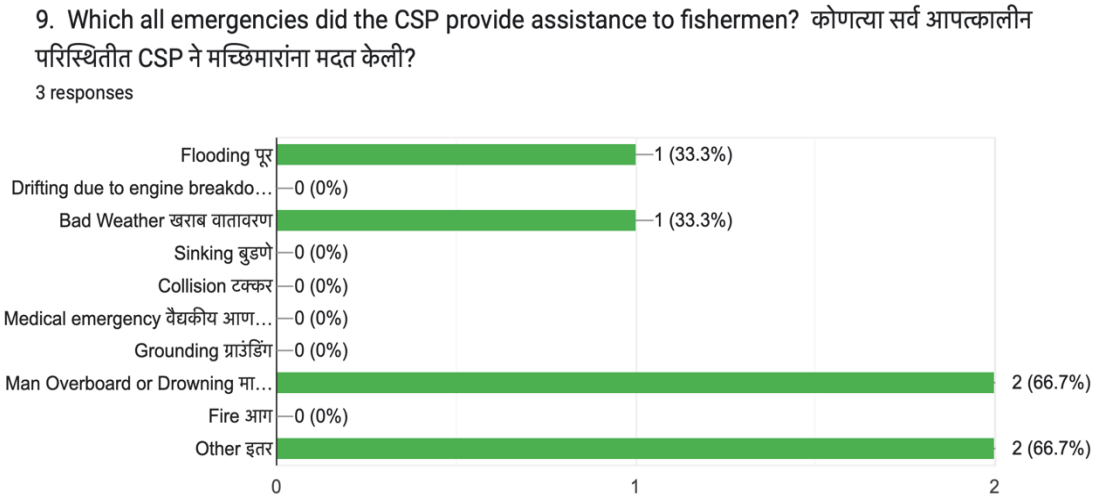
Fatalities

Number of fatalities reported in last 5 years were limited to less than 10 in district, where as one responder said it was 10-50 fatalities.



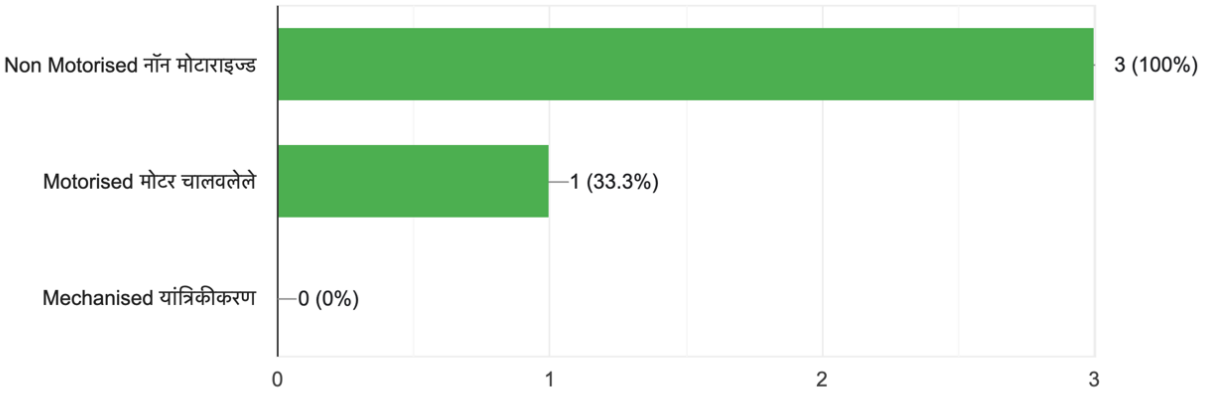
Less than 100 boats have been reported missing last 05 years.

Coastal Security Police rescued fishing boats during emergencies such as Flooding, Bad Weather and Man overboard and other emergency situations. Majority of the boats which required assistance were non-Motorised boats, which coincides with area of operation of CSP.



10. The boat whom you assisted was of which type? तुम्ही ज्या बोटीला मदत केली ती कोणत्या प्रकारची होती?

3 responses



11.6 **Local Fisheries Office**

Local Fisheries officials' responses were requested and following feedback was received with respect to the questions.

Q. 1. How do we involve local fishing communities in the management and conservation of fisheries resources and what has been their role in the past?

Answer. Importance of not violating the traditional rules and rituals is more important to the fishermen communities. They have a deep respect to the cultural values in which they strongly believe. Their livelihood is more or less unpredictable. Educating fishermen about the importance and need to conserve, their fisheries resources with respect to their cultural values and rituals they perform have more impact. In past the fishing ban period imposed was used to end on Nirali Purnima, which coincided with Nirali Purnima festival as per their cultural beliefs and practice from that day onwards they used to start new fishing season.

Q. 2. How do you ensure that fishermen comply with safety regulations and use appropriate safety equipment?

Answer. It is done by inspecting the vessel during the issue of permit, registration certificate, fishing license and etc and also during the patrolling.

Q. 3 What kind of support is available for small-scale fishermen?

Answer. Those fishermen who do not have the resources to purchase safety equipment or devices are given up to 60% subsidy under PMMSY fund.

Q. 4. How are fishing practises regulated to ensure sustainability of fish stocks and prevent overfishing?

Answer Fishing practises are regulated by

(a) Imposing temporal and special closure of fishing practises.

(b) By regulating the mesh size and dimension of fishing Nets and fishing gears.

(c) Limiting the number of fishing vessels. For eg. Purse Seine vessels.

All these regulations are mandatory and violation of any of which is subjected to penalty as per the provisions of marine fisheries act.

Q 5. What kind of training or support programmes or available for new or experienced fishermen and how effective are in promoting safety and sustainability?

Answer. Various training courses were available at Fisheries training centre in each district. This training or given by Fisheries training officers and mechanical instructors. This training includes

(a) Marine fisheries, navigation, marine engine, maintenance and navigation, duration, 06 months.

(b) Marine Diesel engine and maintenance, duration 30 days.

(c) Navigation, duration 30 days.

(d) Use of communication and fish finding equipment on fishing boats, duration 05 days.

Q 6. What is the process of obtaining necessary licences and permits for fishing activities?

Answer. Fishermen need to fill the application form with other papers like Insurance, Vessel Registration Certificate (VRC) form, ID cards etc to the Licencing Officer. After inspection of the vessel, the Licence is issued followed by a token.

Q. 7. What kind of measures are in place to monitor and enforce fishing regulations and what kind of penalties exists for non-compliance.

Answer. Every Coastal district has one patrolling vessel, which monitor fishing regulations. Upon violation of law, case is filed by the enforcement officer against that

fishing vessel in the court of Adjudicating Officer, who has the powers of Civil Court under CPC 1908. After the enquiry if it is found that fishermen are guilty, a fine is imposed, licence suspended, fish catch is seized and or vessel may be impounded.

Q8. What necessary documents are fishermen required to carry prior going to sea for fishing?

Answer. They need to carry VRC, Form V, Licence, Insurance, ID Cards and Token issued by Fisheries office.

Q. 9. What are the safety equipment and devices that fishermen need to carry on their boat as per the regulations.

Answer. They need to carry wireless set, GPS navigator, Life Jackets, Ring Buoy, and DAT.

Q. 10. How often are the safety equipment and devices inspected to ensure they are in working condition?

Answer. They are inspected once in 03 years, during the time of renewal of fishing licence and also during patrolling.

Q. 11. How does the Fisheries department ensure that fishing boats and their equipment are regularly inspected and maintained for safety?

Answer. These are checked before issuing VRC or Licence and every time they renew their licence, and also checked during patrolling.

Q. 12. What measures have been taken by the fisheries department to ensure that fishing boats are not over loaded and do not exceed their capacity?

Answer. There is no such provision under Marine (Fisheries) Act. So, there is no any procedure to avoid these incidents. But Police department may have such provisions in their respective Acts.

Q. 12. How does the fisheries department ensure that fishing boats are not using illegal fishing methods, or fishing in prohibited areas.

Answer. By patrolling with patrolling vessel and doing joint patrolling with other departments like Marine Police, Customs, Coast Guard etc.

Q. 13. What is the process for reporting accidents or incidents at sea and how are these investigated by the Fisheries department?

Answer. Accident or incidents are reported to Head Office and a monthly report sent to Rajyapal. Any incident that are occurring are not investigated by fisheries department. Any such information obtained in last hour is conveyed to Coast Guard and Marine Police to rescue the fishermen at sea.

CHAPTER-12
CONCLUSION AND RECOMMENDATIONS

This dissertation has highlighted the critical issue of safety for fishermen and the need for effective measures to safeguard their lives and livelihoods. The research has shown that despite various efforts by Centre and State Governments, Stake holders, NGOs, and other organizations, the safety of fishermen remains a pressing concern. The dissertation has identified a range of factors that contribute to the high level of risk faced by fishermen, including inadequate safety equipment, lack of training and education, poor working conditions, and inadequate regulatory frameworks.

The findings of this study point to the urgent need for action to improve safety in the fishing industry. The recommendations put forth in this dissertation, including the adoption of better safety equipment and technology, more effective training and education, and improved regulation and enforcement, offer a roadmap for addressing these challenges.

Additionally, the need for a comprehensive approach that involves all stakeholders, including fishermen, fishing communities, governments, NGOs, and industry players, is essential. Such a collaborative approach can help ensure that efforts to improve safety are effective, sustainable, and equitable, addressing the underlying factors that contribute to the high level of risk faced by fishermen.

In conclusion, the safety of fishermen is a complex issue that requires a multifaceted response. It is clear that there is no single solution to the problem, and that a comprehensive, collaborative approach is necessary to address the many challenges faced by the fishing industry. While progress has been made in some areas, much more needs to be done to ensure the safety and wellbeing of fishermen and their families. By working together, we can make a meaningful difference in the lives of those who put themselves at risk to bring food to our tables and support their communities.

Financial Condition of Fishermen

It came to light during the data collection that **majority of Fishermen had a monthly income of less than Rs 15000/-** which is considered grossly inadequate considering the associated risk involved with fishing as a profession. The fishing industry is highly dependent on natural resources and is vulnerable to fluctuations in fish stocks, climate change, and other environmental factors. These uncertainties often lead to a decline in fish catch, resulting in reduced income for fishermen. Moreover, the majority of fishermen come from socio-economically backward communities, and they often lack access to institutional support, including finance and infrastructure, to improve their living standards.

As a result of these financial hardships, fishermen may spend extra time at sea, often bypassing safety regulations to maximize their catch and earnings. This puts them at a greater risk of accidents and injuries, as they may not have the necessary safety equipment and training. Additionally, the cost of safety devices and equipment may be prohibitively expensive for some fishermen, leading them to forego safety measures altogether.

It is crucial to address the financial challenges faced by fishermen to ensure their safety and well-being. This could involve providing access to affordable credit and insurance, as well as promoting alternative livelihoods to reduce their reliance on fishing as the sole source of income during the lull period due to uniform fishing ban, unfavourable sea conditions and breakdown of their boats, etc. Additionally, measures to improve the efficiency of the fishing industry, such as improving storage and transportation infrastructure and developing better marketing channels, could help to increase income and reduce financial strain on fishermen.

Maintenance of Boats

Though Boat Owners, when asked about maintenance of their boats, said that they ensure their boats are kept in good condition, **the analysis of emergencies faced by fishermen at sea revealed that apart from bad weather, Engine Failure has been a major contributor to emergencies faced by the fishermen at sea.** The same has been corroborated by Indian Coast Guard and Coastal Security Police officers. About 61.5% of officers who board Fishing Boats at sea, said that the subject boats were unseaworthy.

Maintenance of fishing boats is essential to ensure the safety of fishermen at sea. Regular maintenance and upkeep of fishing boats can help prevent accidents caused by mechanical failure or equipment malfunction. This includes maintaining the **engine, fuel and electrical systems, steering and control systems**, as well as safety equipment such as life rafts, life jackets, and communication devices. Regular inspections should be conducted to ensure that the boat is in good condition and all equipment is functioning properly. Fishermen should also be trained on how to conduct basic maintenance and safety checks on the boat to prevent problems from arising. By taking these steps, fishermen can reduce the risks of accidents and ensure their safety while at sea.

Assistance from Indian Coast Guard

Interaction with Fishermen revealed that maximum number of emergencies at sea came from bad weather and engine failure. It was because of these two reasons that maximum number of fishermen had to abandon their boats at sea. It also came to light that although they prefer to call Indian Coast Guard or Coastal Security Police for assistance at sea, very few called for assistance from ICG or CSP, and they had to deal with the situation themselves or assistance from other fishing boats in groups.

A further analysis of data revealed that the inability to access communication networks such as VHF, HF Radio, satellite phone, satellite/VHF distress system,

emergency position-indicating radio beacon (EPIRB), DAT, VMS, AIS, etc., prevented them from seeking help in an emergency.

Long-range communication equipment is an essential safety feature for fishing boats. It enables fishermen to communicate with authorities, other boats, and emergency services in the event of an emergency or distress situation. The recommendation for equipping fishing boats with long-range communication equipment is a step towards ensuring the safety of fishermen at sea. With the help of such equipment, fishermen can stay informed about weather conditions, receive timely alerts about any danger or emergency, and coordinate with other boats in the area. This can help in reducing response time and minimizing the risks associated with accidents or distress situations. The use of long-range communication equipment can also aid in the prompt rescue of fishermen in case of an emergency, thus reducing the loss of lives and property. Overall, the recommendation for long-range communication equipment is a crucial step in enhancing the safety and security of fishermen at sea.

VHF Channel 16

During the interaction with Fishermen, it was revealed that 50 % of the fishermen did not know the importance of MMB VHF channel 16, and this channel was regularly cluttered by fishing boats communicating amongst themselves.

VHF channel 16 is an international distress frequency used by mariners to initiate a radio communication in the event of an emergency or a calling channel after which channel is shifter to other frequency for further communication. It is monitored 24/7 by the Indian Coast Guard and other vessels in the vicinity, and is used to transmit important information such as distress calls, urgency messages, and safety information.

It is crucial for fishing vessels to have a VHF radio onboard and to be familiar with the proper procedures for using channel 16 in case of an emergency. Being able to quickly and effectively communicate with other vessels and authorities can make a critical

difference in ensuring the safety of the crew and the successful outcome of a rescue operation.

Use of Kerosene / LPG for Cooking

Fishermen use kerosene/LPG to cook food at sea. Using kerosene or LPG for cooking food at sea can pose significant risks to the safety of fishermen. Kerosene is highly flammable and can cause fires if it comes into contact with a spark or an open flame. Similarly, LPG is a highly combustible gas that can ignite if not handled properly. In the event of a gas leak, LPG can accumulate and create a risk of explosion. Moreover, cooking with kerosene or LPG onboard a fishing boat can also cause carbon monoxide poisoning if there is inadequate ventilation. Carbon monoxide is a colourless and odourless gas that can be fatal if inhaled in high concentrations.

This risk gets even more pronounced by the fact that the fishing boats are ill-equipped wrt firefighting appliances, and the crew is mostly untrained in firefighting and damage control techniques. In case of any assistance required in emergency caused due to fire onboard, they will be unable to call for assistance as most of them do not have VHF or other emergency life saving devices.

Boat Drill and Fire Drill.

Carrying out fire drills or fire-fighting exercises is crucial for effective response to emergencies, yet not all fishing vessels comply with this requirement.

Although it is well acknowledged that small fishing vessels may not have access to the same variety of fire-fighting equipment as larger vessels, the crew should still be prepared for any emergency and be knowledgeable about the safety appliances available to them. This is important because the timely and effective use of these appliances can be critical for the survival of those on board.

Practice of abandoning ship and fire Fighting drills are mandated by global regulations on onboard occupational safety and must be scheduled, organized, and executed in a manner that is reasonably secure and healthy. The drills must be conducted in a way that reduces the interruption of rest periods, fatigue and includes musters, lifeboat, and firefighting exercises prescribed by national regulations and international agreements.

The crew members responsible for operating safety equipment onboard must be familiar with its functioning and operation. The Safety of Life at Sea (SOLAS) Convention (Chapter III, regulations 35 and 36) mandates that detailed training manuals and instructions, easily understood by the crew, must be available on board. These manuals and instructions should be accessible to all crew members, and the instructions must be followed carefully during drills.

Sea Safety Devices

A contrasting revelation has emerged about availability of Sea Safety Devices onboard. About 66% of the boat owners said that their boats comply to safety regulations, 38.4% said that they ensured that their boats are equipped with lifesaving appliances and buoyancy aids and 73.3 % of the owners claimed that all safety SSD were in good working conditions.

But on the other hand, interviews with Fishermen and Indian Coast Guard Officers revealed that fishing boats are ill-equipped and fishing crew are neither trained nor have any idea of these equipment.

It is crucial for boat owners to prioritize the safety of their crew members and provide them with adequate safety devices onboard. This includes ensuring that all safety equipment is properly maintained and regularly checked for faults. Boat owners should also make sure that their crew members are trained to use these safety devices and are aware of safety procedures in case of emergencies.

Neglecting safety equipment can lead to disastrous consequences and boat owners should be held accountable for any incidents that arise due to their negligence. Therefore, it is important for regulatory authorities to enforce regulations that mandate the provision and proper maintenance of safety devices on fishing boats, as well as the training of crew members on their use. This will not only improve the safety of fishermen but also help in preventing loss of life and property at sea.

Crew Training

It came to light that only 24.8 % of the owners acknowledged of providing training to their boat's crew members, and only 43.3 % of owners made sure that the boat crew knew the safety and emergency procedures of the boat and the procedures were reviewed regularly.

Fisherfolk, who come from a fishing background and have experience in the field, often underestimate the risks involved at sea. The STCW-F prescribes the minimum certification and training requirements for crew members serving on seagoing fishing vessels of length more than 12 meters.

The STCW-F modules, such as personal survival techniques, personal security and social responsibility, emergency first aid, and fire prevention and firefighting, are required for commercial vessel crews under merchant navy regulations. Although these modules should also be compulsory for fisherfolk, it would require infrastructure facilities to be available.

The Maharashtra Government has established six Fisheries Training Centres in Satpati, Vasai (Thane), Versova (Mumbai), Alibag (Raigad), Ratnagiri (Ratnagiri), and Malvlan (Sindhudurg). These centres offer training to aspiring fishers on the operation of

modern fishing gears, navigation, methods to augment marine fish production, and maintenance of marine diesel engines. However, participation in this course is optional.

Making seafarer training compulsory is highly recommended and including SAR response training for both rescuers and those needing rescue is strongly advised. Basic elements of this training should include: -

(a) **Prevention**. It is the first line of defense and will save most lives if properly managed. Building awareness, providing affordable and suitable equipment, and training fishermen and other seafarers to make informed decisions can assist them in avoiding trouble at sea.

(b) **Survival and Self-Rescue**. It is the second line of defense and is the result of well-managed prevention activities. A distressed individual who possesses appropriate skills, training, and equipment and maintains a survival attitude is more likely to use them effectively to survive and undertake self-rescue in case of unforeseen circumstances.

(c) **Search and Rescue**. This can be seen as the last line of defence, and its success depends on the capacity of the individuals being rescued to comprehend the importance of earlier stages of survival, which **hinge on the ability to communicate effectively and precisely with other vessels and the shore-based Search and Rescue (SAR) station.**

Communication Systems

It comes to light that majority of the boats do not have proper communication equipment such as VHF/HF Radio, Satellite Phone, AIS but rely heavily on use of Cell Phones which severely limits the communication between boats and shore-based authorities and or SAR units at sea.

Effective communication systems play a vital role in minimizing casualties and facilitating SAR operations as they enable ship-to-shore, shore-to-ship, and ship-to-ship communication.

Communication is crucial for the safety of fishermen at sea and the ease of operation for Search and Rescue (SAR) organizations. It is imperative that fishing boats are equipped with reliable communication systems and the crew is trained in communication procedures. This enables them to call for assistance promptly in case of emergencies and provide accurate information to SAR organizations, which can aid in quick and effective rescue operations. Inadequate communication systems or a lack of crew training on communication procedures can lead to delays in rescue operations, putting the lives of fishermen at risk. Therefore, it is essential that fishing boat owners invest in appropriate communication systems and provide regular training to their crew members to ensure their safety at sea.

Application of Conventions and Regulations to Fisheries

Despite many countries adopting the legislations on sea safety, there is currently no international convention in effect that addresses fishing vessel safety which are binding, but they remain as guidelines and are optional. This is primarily due to significant differences in design and operation between fishing vessels and other ship types, making their inclusion challenging.

At the National Level, this same reason has somewhat delayed the inclusion of fishing vessels in regulations formulated by maritime administrative authorities. Industries, at the same time, have successfully lobbied for exemption of these regulations for a variety of reasons. This indicates that the fishing industry is hesitant to comply with a comprehensive regulatory program.

The fishing industry has a long-standing tradition of being self-sufficient, with many viewing it as the last bastion of free enterprise. Consequently, there is often a reluctance to accept government intervention, which is perceived as being insufficiently knowledgeable about the risks and nuances of fishing operations, as well as the narrow margin of profit that could be further reduced by compulsory compliance with rules and regulations pertaining to vessel construction, equipment, and training.

Additionally, legislators may desist from imposing rules and regulations on the fisheries that may lead to additional costs or may otherwise be seen as repressive.

The findings of the research highlights that the safety perspectives of fishermen can vary greatly from those of government entities like the Indian Coast Guard. Hence, there is an urgent requirement for a deeper comprehension of fishing practices and safety attitudes. It is essential to engage fishermen in the safety regulatory framework as the "human factor" and their input play a critical role in improving the efficacy of safety regulations.

To ensure safety at sea in the fishing industry, the Government policies must be backed by a full commitment for implementation of the regulatory regime and allocation of the required resources. This may involve developing strategies, such as education, assistance, economic incentives, monitoring, enforcement, imposing sanctions, and improving the associated administration. All of which will entail costs. Implementation should be considered at all stages of regulation formulation, rather than being viewed as a final outcome of regulation.

Although enforcement plays a crucial role in the effectiveness of legislation, it's important to note that the quality of the legislation itself is the primary determining factor in its success, and enforcement cannot improve the quality of the legislation. Rather, the focus should be on reviewing and amending regulations to address the root causes of problems in the fishing industry. This review process should be dynamic and involve the industry itself to ensure that regulations are relevant and effective. To achieve compliance and enforcement, both regulators and the regulated require adequate training and a relationship built on mutual respect and trust. One possible approach is the establishment of National Sea-Safety Working Groups. However, in some areas, the necessary infrastructure for enforcement is lacking and would need to be developed.

First Aid Kits

The non-availability of first aid kits onboard the majority of fishing boats poses a significant safety risk to the crew at sea. In the event of an injury or medical emergency, access to basic first aid equipment and supplies could be the difference between life and death. Given the remote nature of fishing operations, it is essential that fishing boats have adequate first aid kits onboard to provide immediate medical attention and stabilize injured or ill crew members until they can receive further medical treatment. Therefore, it is crucial for boat owners and operators to ensure that they have First Aid Kits onboard and that the crew members are trained to use them effectively. Additionally, regulatory bodies should enforce mandatory provisions to ensure that fishing vessels carry first aid kits and that the kits are regularly inspected and restocked.

Fire Extinguishers.

The non-availability of fire extinguishers on the majority of fishing boats is a serious concern for the safety of the crew at sea. Fires on board can spread quickly and cause extensive damage, and in the absence of fire extinguishers, it can be extremely

challenging to contain the fire. Moreover, fishing boats carry large quantities of fuel and other combustible materials, which further increases the risk of fire.

The installation of fire extinguishers on fishing boats is essential to minimize the risk of fire and to ensure the safety of the crew. It is imperative that fishermen are made aware of the importance of fire safety and trained to use fire extinguishers effectively in case of a fire emergency. Additionally, regular maintenance and inspection of fire extinguishers must be carried out to ensure that they are in proper working condition when needed. Overall, the non-availability of fire extinguishers on fishing boats is a grave safety concern that needs urgent attention and action

Safety Culture Vs Demographic Variables

No statistical association could be established between safety compliance, safety culture, and Demographic Variables. However, certain factors like Educational Qualifications and Financial Conditions could have a direct association with crew knowledge on safety. This highlights the importance of crew training and education on safety measures, particularly for those who may have limited access to resources or financial constraints. It also suggests that simply relying on demographic variables such as age, experience, or location may not be sufficient in determining the level of safety knowledge or compliance among fishing crew. Instead, a more targeted and comprehensive approach to training and education may be necessary to ensure the safety of crew members at sea.

Method of Fishing Vs Risks

Statistical data indicated that Trawlers faced maximum number of emergencies, followed by long liners and Purse Seiners. Fishing boats that engage in Purse Seine methods are more crowded compared to other types of fishing boats, given their size. This means that the number of crew members onboard these boats is often higher than what is recommended for safe operation. Such overcrowding can lead to several safety concerns,

such as the increased risk of accidents, capsizing and reduced access to life-saving equipment.

Furthermore, the statistical data also indicates that these fishing boats do not have enough life-saving equipment to meet any eventuality. This is a significant issue, as the lack of proper life-saving equipment can significantly increase the risk of loss of life in case of an accident or emergency.

It was also noted that 61.5% of the ICG officers said that boats they boarded for investigation were unseaworthy.

It is essential to address these issues to ensure the safety of crew members who work on fishing boats that engage in fishing by Trawling and Purse Seine methods. This can include measures such as increasing the number of life-saving equipment on board, limiting the number of crew members allowed on board, and enforcing strict safety regulations for fishing boats. By doing so, we can improve the safety of fishing operations and reduce the risk of accidents and loss of life at sea.

Accident Types

From the analysis of the data received from MRCC (Mumbai), it was ascertained that since year 2018, there has been 05 reported cases of Grounding, 55 MedEvac was required, 23 cases of Drowning, 18 Cases of Man Overboard, and 27 cases of Stranding which were mostly caused by Human errors, and could have been averted if correct sea safety devices were present onboard, or the boat would have been seaworthy.

Decrease in Fatalities

Data held with MRCC (West) indicates that, on an average the reported number of fatalities have gradually decreased from year 2018, except for the year 2021.

Under Reporting of Accidents

Underreporting of accidents and injuries is a significant issue in the fishing industry, with many incidents going unreported or underreported. This is due to a variety of factors, including fear of repercussions, lack of awareness of reporting procedures, and a cultural attitude that sees injuries and accidents as an inevitable part of the job.

Most of the fishermen said, that they are not frightened of any occupational hazards. They are born and brought up in lap of the ocean and will live and die here. Whatever misfortune happens is the sea they are willing to accept.

Underreporting of incidents is a significant problem as it makes it challenging to identify and address the root causes of accidents and injuries. This, in turn, limits the ability to improve safety standards and regulations in the industry. It also makes it difficult to evaluate the effectiveness of existing safety measures and to develop targeted interventions to prevent incidents in the future.

It is essential to encourage fishermen to report accidents and injuries as soon as possible and to provide them with the necessary support to do so. This includes providing clear reporting procedures, training on safety awareness and procedures, and providing access to medical care and counselling. Additionally, there should be measures in place to protect fishermen from retaliation for reporting incidents, including anonymous reporting options and legal protections. Overall, improving reporting rates in the fishing industry is crucial to ensure the safety and well-being of fishermen at sea.

Use of Non-Prescribed Navigation Light

Use of non- prescribed navigation lights onboard fishing boats is a serious safety concern as it often results in close quarter situations and collisions with other vessels. Navigation lights are used to communicate the vessel's position, heading, and status to other vessels, especially during periods of reduced visibility such as at night or in fog.

Fishing boats that do not have or do not use the prescribed navigation lights are at a greater risk of being involved in collisions, especially in busy shipping lanes as these lights often confuse vessels which is further complicated by negligible radar signature. This can cause injuries to crew members, damage to the vessel, and even loss of life.

The non-following of prescribed navigation lights is often attributed to a lack of awareness, training, and compliance with regulations. It is essential that fishermen are educated about the importance of navigation lights and their correct usage to ensure the safety of all vessels at sea. Additionally, regulatory bodies must enforce the mandatory use of navigation lights on fishing boats and ensure that vessels comply with these regulations through regular inspections and penalties for non-compliance.

Recommendations

The safety regulatory process should involve fishermen, as they provide essential information for enhancing safety regulations' effectiveness.

The **regulatory review process** must be dynamic and reflective of the industry being regulated. The industry must be a part of this process to ensure that regulations are effective.

The **implementation of regulations must be reviewed at every phase** of the regulation formulation and should be accompanied by a full commitment to implement that regulatory regime with the required resources.

Fishermen need to be **trained in safety procedures**, including communication systems onboard fishing boats, proper use of safety equipment, and emergency response protocols.

Fishing boats must have adequate safety equipment, including personal flotation devices, life rafts, and fire extinguishers, in sufficient numbers to meet any eventuality. The boats should also have first aid kits and navigation lights that meet regulatory requirements.

Educational qualifications and financial conditions should be given importance while hiring crew members, as it has a direct association with crew knowledge on safety procedures.

The government should make it **mandatory for fisher folk to undergo training** in personal survival techniques (PST), emergency first aid (EFA), and Fire Prevention and Fire Fighting, which are otherwise mandatory for the crew of commercial vessels.

The government may establish **National Sea-Safety Working Groups** to improve safety regulations and enforcement.

Under-reporting of accidents and injuries should be discouraged, and a proper reporting mechanism should be put in place to identify and address safety issues in the fishing fleet.

Fishing boats engaged in purse seine method should be **inspected regularly** to ensure that they are not overcrowded, and adequate safety equipment is available on board. Awareness campaigns should be conducted to emphasize the importance of safety and promote a culture of safety among fishermen.

Collaboration between government agencies, fishing communities, and other stakeholders is critical to achieving safety in the fishing industry.

Sea Safety Devices should be **made more affordable**, compatible in size and reliable which would facilitate a greater number of fishermen who are economically weaker to purchase and install onboard.

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(a) **DIG MK Gujar,** officer in charge, Indian Coast **Guard Maritime Rescue Coordination Centre (MRCC) West, Mumbai**

(b) **Dr. KJ Chaudhry**, Professor and Head, Department of Fisheries Resources Economics, Statistics and Extension Education, **Shirgaon, Ratnagiri**

(c) Dr. Harshvardhan D. Joshi, Senior Scientific Assistant, Fisheries Survey of India, Mumbai .

Annexure – 1

(Refers to Para 3.3)

Questionnaire for Fishermen/*Tandel*

Personal Details			
1.	Name	:	
2.	Age	:	
3.	Gender	:	Male/ Female
4.	Educational Qualification	:	a) Illiterate b) Primary c) 10th pass d) 12th Pass e) Graduate & Above
5.	Fishing Experience (Years)	:	
6.	Which state you belong to?	:	
7.	Do you know swimming?	:	Yes/ No
8.	Monthly Income (Rs.)	:	
9.	Religion	:	a) Hindu b) Muslim c) Christian d) Other
10.	Category	:	a) Open b) OBC c) SBC d) SC e) ST f) NT g) other
11.	Marital Status	:	Married/ Single/ Widower/ Divorcee
Other Details			
1.	Name of boat	:	
2.	Total crew	:	
3.	Boat made of	:	a) Wood b) Fiber c) Metal
4.	Boat Registered	:	Yes/ No If yes, then Reg. No.
5.	Type of fishing boat	:	a) Traditional b) Motorized c) Mechanized
6.	Length of boat	:	a) <10 mtr b) 10-20 mtr c) 20-30 mtr
7.	Type of fishing method	:	a) Purse Seining b) Trawling c) Long Lining d) Gill net e) Other
8.	How far you fish from land?	:	a) Less than 12 Nm b) More than 12 Nm
9.	What is your fishing time?	:	a) Day and Night both b) Only Day
10.	Fishing Duration?	:	a) One day b) 2-7 days c) 8-15 days
11.	What is your duty on boat?	:	a) *Tandel* b) Mechanic c) Deck Crew d) Cook
12.	Have you ever attended Indian Coast Guard CIP?	:	Yes/ No
13.	Do you carry original Biometric Card for fishing at sea?	:	Yes/ No

14.	Do you maintain the safety equipment?	:	Yes/ No
15.	Have you ever handled any emergency situations at sea?	:	Yes/ No
16.	What type of emergency	:	Sinking/Flooding/Collision/Man over board/Engine Failure/Bad weather/Medical/lost your way/piracy
17.	Have you ever had to abandon your boat or been rescued?	:	Yes/ No
18.	Reason to abandon fishing boat	:	Sinking/Flooding/Collision/Man over board/Engine Failure/Bad weather/Medical/lost your way/piracy
19.	How do you handle emergency situation at sea?	:	a) I do myself b) Call Indian Coast Guard c) Don't know what to do
20.	Do you go fishing even if you know cyclone or bad weather is coming?	:	Yes/ No
21.	Do you get weather warning?	:	Yes/ No
22.	Do you know the importance of channel 16 on Radio?	:	Yes/ No
23.	Do you have Navigation chart onboard your boat?	:	Yes/ No
24.	Do you know how to use Navigation Chart?	:	Yes/ No
25.	Do you have knowledge of Safe fishing areas?	:	Yes/ No
26.	Do you know you should not fish in harbor entry and leaving channel?	:	Yes/ No
27.	Do you operate in group or single boat?		a) Single b) Group
28.	Do you have life insurance?		Yes/ No
29.	Do you have liquors at sea when fishing?		Yes/ No
30.	How do you cook food at sea?		a) LPG Gas stove b) Kerosene stove c) Hot Plate/Induction Plate
31.	Do you change crew at last minute before sailing and forget to inform fisheries authority?		Yes/ No

32.	Do you place lookout at night to watch for approaching ships?		a) Yes b) No c) Don't have manpower d) we don't require it

33. What safety measures you have onboard your boat? Any training received?

Sr. No.	Equipment	Have onboard		Training Attended	
		Yes	No	Yes	No
a.	Life Buoys				
b.	Life Raft				
c.	GPS				
d.	Radio				
e.	AIS				
f.	Fire Extinguishers				
g.	First Aid Kit				
h.	Emergency Signaling Devices				
i.	Emergency Lighting				
j.	Survival suit				
k.	Immersion Suit				
l.	Boots/non slip shoes				
m.	Gloves				
n.	Oil Lamp				
o.	Eco Sounder				
p.	Sonar				
q.	EPIRB				
r.	Radar				
s.	Life Jackets				

34.	Why don't you have all safety equipment onboard your boat?	:	a) Lack of Space b) Expensive c) Non availability (d) Other _____
35.	Any suggestions for Government	:	a) Organize training programs b) Involvement of NGOs c) _____

Annexure – 2

(Refers to Para 3.3)

QUESTIONNAIRE-1 FOR BOAT OWNERS OF RATNAGIRI AND SINDHUDURG

Personal Details		
1	Name	
2	Age	Male/Female
3	How many boats you own	
4	Name of boat(s)	
5	Type of boat(s)	
6	Year of Built	
7	Last Survey done on	
8	Is the boat Insured	Yes / No
9	Any insurance claimed earlier	Yes / No
10	If yes, Reasons	
11	How many crew you employ per boat	

Sr No.	**Equipment**	**Equipment Fitted**		**Training given to crew**	
		Yes	**No**	**Yes**	**No**
a	Life Buoys				
b	Life Raft				
c	GPS				
d	Radio				
e	AIS				
f	Fire Extinguishers				
g	First Aid Kit				
h	Emergency Signaling Devices				
i	Emergency Lighting				
J	Survival suit				
k	Immersion Suit				
l	Boots/non slip shoes				
m	Gloves				
n	Oil Lamp				
o	Eco Sounder				
p	Sonar				
q	EPIRB				
r	Radar				
S	Life Jacket				

13.	Why don't you have all safety equipment onboard your boat?	(a) Lack of Space (b)Expensive (c) Non availability (d) Other
14.	Have you ensured that all safety equipment on board is in good working condition and easily accessible for crew members?	(a)Yes (b)No (c)Not sure
15.	Have you provided proper safety training for your crew members?	(a)Yes (b)No (c)Not sure
16.	Have you ensured that the boat is in compliance with all relevant safety regulations and standards	(a)Yes (b)No (c)Not sure
17.	Have you conducted regular safety drills for your crew members?	(a)Yes (b)No (c)Not sure
18.	Have you ensured that the boat's communication systems are working properly and are tested regularly?	(a)Yes (b)No (c)Not sure
19.	Have you conduct routine maintenance of the boat and equipment to ensure the safety of the crew and the boat?	(a)Yes (b)No (c)Not sure
20.	Have you made sure that the boat is equipped with enough life-saving appliances and buoyancy aids for all crew and passengers on board?	(a)Yes (b)No (c)Not sure
21.	Have you made sure that the crew knows the safety and emergency procedures of the boat and the procedures are reviewed regularly?	(a)Yes (b)No (c)Not sure
22.	How do you maintain communication with your crew and other boats while out at sea?	(a)Mobile (b)Walky-talky (c)Radio communication
23.	Are you aware of welfare schemes of Government for fishermen?	(a)Yes (b)No (c)some idea

24.	Is your boat crew permanent or it keep changing?	(a)Permanent (b) Keep changing
25.	Do you pay the premium for life insurance of your crew?	(a)Yes (b)They do it themselves (c) There is no such concept
26.	How do you ensure the safety of your crew members while out at sea?	(a) By providing safety kits (b) Fishing in groups (accompanying another fishing vessel) (c) Emergency contact system
27.	How do you train your crew members on safety procedures and emergency response?	(a) By organizing specialized training programmes (b) By attending the mock drills organized by various departments (c) By providing reading material (d) By their own Indigenous Traditional Knowledge (e) None of the above
28.	Have you conduct regular safety inspections and maintenance on your boats?	(a) Yes (b) No
	If yes,	(a)Annually (b) Six-monthly (c) Monthly (d) Daily (e) Whenever required
29.	Have you ever met with a safety incident or accident on one of your boats?	(a) Yes (b) No
	If yes, What type of incident?	(a)Vessel sinking (b)Engine failure (c)Fire (d)Medical emergency to boat member (e)Accident of boat member (f)Any other
30.	How you have overcome to that incident?	(a) With your own experience (b) By establishing

		emergency contact with other vessels (c) By contacting Government officials (d) Any other
31.	How do evaluate and deal with potential safety risks associated with the type of fishing your boat engages in?	(a) By installing safety equipment on the board (b) By undergoing mock drills of various departments (c) By training fishing crew with basic safety skills (d) By regular maintenance of the fishing vessel

Annexure - 3
Refers to Para 3.3

QUESTIONNAIRE FOR BOARDING OFFICERS OF ICG/IN

FISHERMEN SAFETY IN INDIA:CASE STUDY OF VULNERABILITY OF FISHERMEN OF MAHARASHTRA

Dear Sir/Madam,

1. I am **DIG Dushyant Kumar** from **Indian Coast Guard.** I am undergoing Advance Professional Program in Public Administration (APPPA) at Indian Institute of Public Administration (IIPA), New Delhi. As part of course curriculum, I am doing a research on the above mentioned topic.

2. Fishing is an important economic activity in India, providing livelihoods for millions of people and contributing significantly to the country's food security. However, fishing is also a dangerous occupation, with many hazards that put the lives and well-being of fishermen at risk. The aim of this research is to examine the issue of fishermen safety in India, with a focus on the vulnerability of fishermen in the state of Maharashtra, with particular reference to Ratnagiri and Sindhudurg districts.

3. Being an Indian Coast Guard or Indian Navy Officer, you must have any time during your career service, got opportunities to interact with fishermen in the state of Maharastra; be it as Boarding Officer, while being on Staff Duties at Station/HQ, CIPs or any other missions mandated by ICG / IN charter of duties.

4. Your views are solicited on certain aspects of my research, which would enable me to collect data and do analysis of various factors attributed to the vulnerability of fishermen in Maharashtra.

5. The information provided by you will be **kept strictly confidential and will be used only for academic purpose** at IIPA, New Delhi. The questionnaire will take less than 10 minutes to respond to.

6. This questionnaire is confidential and may not be circulated or shared with anyone else.

7. Any Query, pls call me at 9408497954.

*Required

1. 1. Organisation ?

Mark only one oval.

Indian Coast Guard

Indian Navy

2. 2. Email *

3. 3. Name *

4. 4. Length of Service *

Mark only one oval.

- less than 5
- 5-10
- 10-15
- 15-20
- More than 20

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5. 5. Years of Sea Service *

Mark only one oval.

- Less than 5
- 5-10
- 10-15
- 15-20
- More than 20

6. 6. Years served on Western Coast of India *

Mark only one oval.

- Less than 5
- 5-10
- 10-15
- 15-20
- more than 20
- Not Served

7. 7. Have you ever **boarded** fishing boats **off the coast of Maharastra (Ratnagiri and/or Sindl Durg in particular) ?**

Mark only one oval.

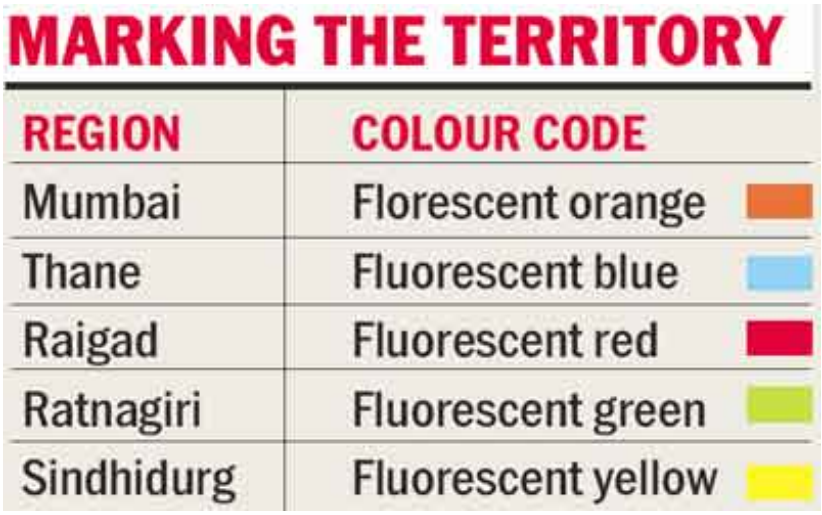
- Yes
- No
- Maybe

8. 8. Have you ever **interacted** with fishermen of Ratnagiri and /or Sindhu Durg ?

Mark only one oval.

- Yes
- No
- Maybe

9. 9. Following is the colour codes for fishing boats of Maharastra.
How many boat comply to this colour coding?



MARKING THE TERRITORY

REGION	COLOUR CODE
Mumbai	Florescent orange
Thane	Fluorescent blue
Raigad	Fluorescent red
Ratnagiri	Fluorescent green
Sindhidurg	Fluorescent yellow

Mark only one oval.

- 0 %
- 25% Compliant
- 50% Compliant
- 75% Compliant
- 100% Compliant

10. 10. Boat crew is required to carry original **chip based Biometric Cards,** so that their identi can be proved at sea.
What has been the compliance ?

Mark only one oval.

- 0 %
- 25% Compliant
- 50% Compliant
- 75% Compliant
- 100% Compliant

11. 11. How many boats carry following **Sea Safety Devices** onboard at sea? *

Select option closest to your observations, expressed in %.

Mark only one oval per row.

	0 %	25%	50%	75%	100 %
Life Buoys					
Life Rafts					
GPS					
SSB Radio Sets					
AIS					
EPIRB					
Search and Rescue Transponder (SART)					
Distress Alert Transmitter (DAT)					
Nav Radar					
Safety Gloves					

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Work Boots/Non-Slip shoes					
1st Aid Kit					
Compass					
Search Light					
Emergency Light					
Emergency Signalling Devices					
Emergency Flares					
Radar Reflectors					
Eco Sounder					
VHF Radio					
Satellite based Vessel Monitoring System					

12. 12. Did you find any **child (Age less than 14)** working onboard a fishing boat at sea?

Mark only one oval.

- Yes
- No
- Maybe

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13. 13. Did you ever come across **Non-Indian crew onboard (Nepalese/Bangladeshi/Srilankan)** fishing boats at sea?

Mark only one oval.

- Yes
- No
- Maybe

14. 14. Did these Non-Indian crew carry identity cards ?

Mark only one oval.

- Yes
- No
- Not Applicable

15. 15. While onboard ships did you observe fishing boats violating the **Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs), thereby causing Close Quarter Situations or other safety issues.**

Mark only one oval.

- Yes
- No
- Maybe

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16. 16. **Channel 16 VHF** (156.8 MHz) is a Marine VHF Radio Frequency designated as an International Distress Frequency, Primarily intended for **distress, urgency** and **safety prior calls**, the frequency may also carry routine calls used to establish communication before switching to another working channel.
How often did you find this **channel cluttered by Fishing Boats communicating amongst themselves.**

Mark only one oval.

- ◯ Rarely
- ◯ Occasionally
- ◯ Regularly

17. 17. While trying to communicate with Fishing Boats at sea over VHF Radio, how often you **did not get any response from them.**

Mark only one oval.

- ◯ Rarely
- ◯ Occassionally
- ◯ Regularly

18. 18. Emergencies for which you provided assistance to fishermen ? *

Tick all that apply.

- ☐ Flooding
- ☐ Drifting due to Engine Breakdown
- ☐ Bad weather
- ☐ Sinking
- ☐ Collision
- ☐ Medical Emergency
- ☐ Grounding
- ☐ Man overboard / Drowning
- ☐ Other

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19. 19. The boat whom you assisted, was which type of boat ?

Tick all that apply.

- [ ] Non Motorised/Traditional Boats
- [ ] Motorised
- [ ] Mechanised

20. 20. The boat whom you assisted, was fishing with which method ?

Tick all that apply.

- [ ] Trawling
- [ ] Gillnetting
- [ ] Long Lining
- [ ] Purse Seining
- [ ] Dollnetting
- [ ] Other

21. 21. Did you find the boat being boarded, unsafe for fishing or un-seaworthy ?

Mark only one oval.

- ◯ Never
- ◯ Rarely
- ◯ Occasionally
- ◯ Regularly

22. 22. Do you agree that fishermen are eyes and ears for Indian Coast Guard to ensure maritime security?

Mark only one oval.

- Yes
- No
- Maybe

23. 23. Did you ever come across any fisherman who was a non-swimmer?

Mark only one oval.

- Yes
- No
- Maybe

24. 24. Did the non-swimmer belonged to fishermen community?

Mark only one oval.

- Yes
- No, He did not belong to fishermen community but was hired as labourer from other non coastal state.

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25. 25. During your patrol at sea or during boarding operations at sea, did you find boats **overcrowded?**

Mark only one oval.

- Never
- Rarely
- Most of the time
- Always

26. 26. Please select types of boats in increasing order of their presence at sea, **upto 12 Nm from shore.** (within Territorial Sea)
1 being lowest and 3 being max

Mark only one oval per row.

	1	2	3
Traditional (Non Motorised)			
Motorised (Inboard / Outboard Motor)			
Mechanised			

27. 27. Please select types of boats in increasing order of their presence at sea, **Beyond 12 Nı from shore.** (Upto EEZ)
1 being lowest and 3 being max

Mark only one oval per row.

	1	2	3
Traditional (Non Motorised)			
Motorised (Inboard / Outboard Motor)			
Mechanised			

28. 28. Please select in increasing order of Sighting of fishing methods * Please scale your observations from 1 to 6, where 1 is least sighting and 6 is Max.

Mark only one oval per row.

	1	2	3	4	5	6
Trawlers	◯	◯	◯	◯	◯	◯
Gillnetters	◯	◯	◯	◯	◯	◯
Dolnetters	◯	◯	◯	◯	◯	◯
Liners	◯	◯	◯	◯	◯	◯
Purse-Seiners	◯	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯	◯

29. 29. Your assessment of fishing boat's crew knowledge of Sea Safety Devices, such as use Life Buoys, Life Rafts, DATs, Flares, Radio, etc

Mark only one oval.

- ◯ Poor
- ◯ Fair
- ◯ Good
- ◯ Excellent

30. 30. Your assessment of Fishermen's (especially the Tendel/master/capt of fishing boat) basic knowledge wrt **ROR**, **GMDSS** or **SAR** organisation.

Mark only one oval.

- Poor
- Fair
- Good
- Excellent

31. 31. Your assessment of fishermen **(other than Tandel)** basic knowledge of **Navigational technique.**

Mark only one oval.

- Poor
- Fair
- Good
- Excellent

32. 32. Your assessment of fishermen's knowledge of **Damage Control and Fire Fighting** onboard fishing boats.

Mark only one oval.

- Poor
- Fair
- Good
- Excellent

33. 33. Do the fishing boats operate in pairs ?

Mark only one oval.

- ◯ Never
- ◯ Rarely
- ◯ Most of the time
- ◯ Always

34. 34. Do fishing boats carry all documents onboard?

Mark only one oval.

- ◯ Never
- ◯ Rarely
- ◯ Most of the time
- ◯ Always

35. 35. How many fishermen **injuries/Fatalities** have you observed in **last 5 years** ? *

Mark only one oval per row.

	less than 10	10-50	more than 50	None	Do Not Remember
Injuries	◯	◯	◯	◯	◯
Fatalities	◯	◯	◯	◯	◯

36. 36. If observed, which district ?

Tick all that apply.

- [ ] Ratnagiri
- [ ] Sindhudurg
- [ ] Do not remember
- [ ] Not applicable

37. 37. Any suggestions for improving safety of fishermen at sea?

Annexure - 4
Refers to Para 3.3

QUESTIONNAIRE FOR COASTAL SECURITY POLICE
RATNAGIRI AND SINDHUDURG (MAHARASHTRA)

FISHERMEN SAFETY IN INDIA:CASE STUDY OF VULNERABILITY OF FISHERMEN OF MAHARASHTRA

Dear Sir/Madam,

1. I am DIG Dushyant Kumar from Indian Coast Guard.

मी भारतीय तटरक्षक दलातील डीआयजी दुष्यंत कुमार आहे

2. I am undergoing Advance Professional Program in Public Administration (APPPA) at **Indian Institute of Public Administration (IIPA), New Delh**i. As a course curriculum, I am doing a research on the above mentioned topic.

मी **इंडियन इन्स्टिट्यूट ऑफ पब्लिक ॲडमिनिस्ट्रेशन (IIPA)**, नवी दिल्ली येथे **ॲडव्हान्स प्रोफेशनल प्रोग्राम इन पब्लिक ॲडमिनिस्ट्रेशन (APPPA) सुरू आहे. एक अभ्यासक्रम म्हणून मी वर उल्लेख केलेल्या विषयावर संशोधन करत आहे**

3. Fishing is an important economic activity in India, providing livelihoods for millions of people and contributing significantly to the country's food security. However, fishing is also a dangerous occupation, with many hazards that put the lives and well-being of fishermen at risk. The aim of this research paper is to examine the issue of fishermen safety in India, with a focus on the vulnerability of fishermen in the state of Maharashtra, with particular focus on Ratnagiri and Sindhudurg districts.

मासेमारी ही भारतातील एक महत्त्वाची आर्थिक क्रिया आहे, जी लाखो लोकांना उपजीविका प्रदान करते आणि देशाच्या अन्न सुरक्षेत महत्त्वपूर्ण योगदान देते. तथापि, मासेमारी हा देखील एक धोकादायक व्यवसाय आहे, ज्यात अनेक धोके आहेत ज्यामुळे मच्छीमारांचे जीवन आणि कल्याण धोक्यात येते. महाराष्ट्र राज्यातील मच्छिमारांच्या असुरक्षिततेवर लक्ष केंद्रित करून, विशेषत: रत्नागिरी आणि सिंधुदुर्ग जिल्ह्यांवर लक्ष केंद्रित करून, भारतातील मच्छिमारांच्या सुरक्षिततेच्या मुद्द्याचे परीक्षण करणे हा या शोधनिबंधाचा उद्देश आहे.

4. Being in **Coastal Security Police**, you must have any time during your career service, got opportunities to interact with fishermen in the state of Maharastra.

कोस्टल सिक्युरिटी पोलिस मध्ये असल्याने, तुमच्या करिअरच्या सेवेदरम्यान तुम्हाला कधीही वेळ मिळाला पाहिजे, महाराष्ट्र राज्यातील मच्छिमारांशी संवाद साधण्याची संधी मिळाली.

5. Your views are solicited on certain aspects of my research, which would enable me to collect data and do analysi of various factors that contribute to the vulnerability of fishermen in Maharashtra.

माझ्या संशोधनाच्या काही पैलूंवर तुमची मते मागितली जात आहेत, ज्यामुळे मला डेटा संकलित करता येईल आणि महाराष्ट्रातील मच्छिमारांच्या असुरक्षिततेमध्ये योगदान देणाऱ्या विविध घटकांचे विश्लेषण करता येईल

6. The information provided by you will be **kept strictly confidential and will be used only for academic purpose** at IIPA, New Delhi. The questionnaire will take less than 10 minutes to respond to.

तुम्ही दिलेली माहिती काटेकोरपणे **गोपनीय ठेवली जाईल** आणि ती फक्त IIPA, नवी दिल्ली येथे शैक्षणिक उद्देशासाठी वापरली जाईल. प्रश्नावलीला उत्तर देण्यासाठी 10 मिनिटांपेक्षा कमी वेळ लागेल

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7. This questionnaire is confidential and may not be circulated or shared with anyone else.

ही प्रश्नावली गोपनीय आहे आणि ती इतर कोणाशीही प्रसारित किंवा सामायिक केली जाऊ शकत नाही

8. Any Query, please call me at 9408497954.

कोणत्याही प्रश्नासाठी, कृपया मला 9408497954 वर कॉल करा

*Required

Coastal Security Police

Please provide your input to the best of your your knowledge.

कृपया तुमच्या माहितीनुसार तुमचे इनपुट प्रदान करा

COASTAL SECURITY POLICE

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4. 4. Length of Service *
नोकरीचा काळ

Mark only one oval.

- ◯ less than 5
- ◯ 5-10
- ◯ 10-15
- ◯ 15-20
- ◯ More than 20

5. 5. How many years in Coastal Security Police ?
कोस्टल सिक्युरिटी पोलिसात किती वर्षे?

_____

6. 6. Have you ever **boarded** fishing boats **in Ratnagiri and/or Sindhu Durg?**
तुम्ही कधी रत्नागिरी आणि/किंवा सिंधुदुर्ग येथे मासेमारीच्या नौकांवर चढला आहात का?

Mark only one oval.

- ◯ Yes होय
- ◯ No नाही

7. 7. How many search and rescue operations have been conducted in the **last 5 years**
गेल्या 5 वर्षात किती शोध आणि बचाव कार्य केले गेले

_____

8. 8. How many fishermen have been rescued in these operations?
या कारवाईत किती मच्छिमारांची सुटका करण्यात आली?

_____

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9. 9. Which all emergencies did the CSP provide assistance to fishermen? *
कोणत्या सर्व आपत्कालीन परिस्थितीत CSP ने मच्छिमारांना मदत केली?

Tick all that apply.

- [ ] Flooding पूर
- [ ] Drifting due to engine breakdown व्यस्त ब्रेकडाउनमुळे वाहणे
- [ ] Bad Weather खराब वातावरण
- [ ] Sinking बुडणे
- [ ] Collision टक्कर
- [ ] Medical emergency वैद्यकीय आणीबाणी
- [ ] Grounding ग्राउंडिंग
- [ ] Man Overboard or Drowning माणूस ओव्हरबोर्ड / बुडणारा
- [ ] Fire आग
- [ ] Other इतर

10. 10. The boat whom you assisted was of which type? *
तुम्ही ज्या बोटीला मदत केली ती कोणत्या प्रकारची होती?

Tick all that apply.

- [ ] Non Motorised नॉन मोटाराइज्ड
- [ ] Motorised मोटर चालवलेले
- [ ] Mechanised यांत्रिकीकरण

11. 11. The boat whom you assisted was what type of fishing boat ? *
तुम्ही ज्या बोटीला मदत केली ती कोणत्या प्रकारची मासेमारी बोट होती?

Tick all that apply.

- [ ] Trawler ट्रॉलर
- [ ] Gillnetter gillnetter
- [ ] Purse seiner पर्स पाहणारा
- [ ] Long Liner लांब लाइनर
- [ ] Dollnetter बाहुली
- [ ] Others इतर

12. 12. Do the CSP coordinate with other agencies, such as the Indian Coast Guard, Indian Navy, Fisheries ar local fishing communities, to ensure the safety of fishermen?
CSP मच्छिमारांच्या सुरक्षिततेची खात्री करण्यासाठी भारतीय तटरक्षक दल, भारतीय नौदल, मत्स्यपालन आणि स्थानिक मासेमारी समुदा यासारख्या इतर एजन्सीशी समन्वय साधतात का?

Mark only one oval.

- ◯ Yes होय
- ◯ No नाही

13. 13. Following is the colour codes fishing boats of Maharastra. Did you find fishing boats complying to these colour codes?
महाराष्ट्रातील मासेमारी बोटींचे कलर कोड खालीलप्रमाणे आहेत. या रंग कोडचे पालन करणाऱ्या मासेमारी नौका तुम्हाला आढळल्या का?

MARKING THE TERRITORY

REGION	COLOUR CODE
Mumbai	Florescent orange
Thane	Fluorescent blue
Raigad	Fluorescent red
Ratnagiri	Fluorescent green
Sindhidurg	Fluorescent yellow

Mark only one oval.

- ◯ 0 %
- ◯ 25% Compliant
- ◯ 50% Compliant सहत्व
- ◯ 75% Compliant सहत्व
- ◯ 100% Compliant सहत्व

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14. 14. Boat crew is required to carry original **chip based Biometric Cards** so that their identity can be proved sea. Did you find boat crew comply to this regulation.
बोट क्रूला मूळ चिप आधारित बायोमेट्रिक कार्डे सोबत ठेवणे आवश्यक आहे जेणेकरून त्यांची ओळख समुद्रात सिद्ध करता येईल. बोट क्रू नियमाचे पालन करत असल्याचे तुम्हाला आढळले का?

Mark only one oval.

- ◯ 0 %
- ◯ 25% Compliant सहत्व
- ◯ 50% Compliant सहत्व
- ◯ 75% Compliant सहत्व
- ◯ 100% Compliant सहत्व

15. 15. How many fishing boats been seized by the coastal security police in your district during last 5 years?
तुमच्या जिल्ह्यात गेल्या ५ वर्षात किनारी सुरक्षा पोलिसांनी किती मासेमारी नौका जप्त केल्या आहेत?

_____

16. 16. How many **Fatalities (deaths)** have been reported in last 5 years?
गेल्या 5 वर्षांत किती मृत्यू (मृत्यू) नोंदवले गेले आहेत?

Mark only one oval per row.

	less than 10	10-50	more than 50
Ratnagiri रत्नागिरी	◯	◯	◯
Sindhudurg सिंधुदुर्ग	◯	◯	◯

17. 17. How many **injuries** have been reported in last 5 years ?
गेल्या ५ वर्षात किती जखमी झाल्याची नोंद झाली आहे?

Mark only one oval per row.

	Less than च्या पेक्षा कमी10	10-50	More than पेक्षा जास्त 50
Ratnagiri रत्नागिरी	◯	◯	◯
Sindhudurg सिंधुदुर्ग	◯	◯	◯

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18. 18. How many boats are reported missing since last 5 years?
गेल्या ५ वर्षांपासून किती बोटी बेपत्ता झाल्याची नोंद आहे?

Mark only one oval per row.

	less than 100	100-200	More than 200
Ratnagiri रत्नागिरी	◯	◯	◯
Sindhudurg सिंधुदुर्ग	◯	◯	◯

19. 19. During your patrol at sea or during boarding operations at sea, did you find boats **overcrowded ?**
समुद्रात तुमच्या गस्तीदरम्यान किंवा समुद्रात बोर्डिंग ऑपरेशन दरम्यान, तुम्हाला बोटींची गर्दी झालेली आढळली का?

Mark only one oval.

- ◯ Never कधीही
- ◯ Rarely क्वचितच
- ◯ Most of the time बहुतांश वेळा
- ◯ Always नेहमी

20. 20. How many boats carry following S**afety Equipment** onboard at sea? *
समुद्रात किती बोटी खालील सुरक्षा उपकरणे घेऊन जातात?

Select option closest to your observations, expressed in %.
तुमच्या निरीक्षणाच्या सर्वात जवळचा पर्याय निवडा, % मध्ये व्यक्त केला आहे.

Mark only one oval per row.

	0 %	25%	50%	75%	100 %
Life Buoys	◯	◯	◯	◯	◯
Life Rafts जीवन तराफा	◯	◯	◯	◯	◯
GPS	◯	◯	◯	◯	◯
SSB Radio Sets एसएसबी रेडिओ	◯	◯	◯	◯	◯
AIS सुरक्षा हातमोजे	◯	◯	◯	◯	◯
Safety Gloves. सुरक्षा हातमोजे	◯	◯	◯	◯	◯
Work Boots/Non-Slip shoes वर्क बूट नॉन स्लिप शूज	◯	◯	◯	◯	◯

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1st Aid Kit प्रथमोपचार किट					
Compass					
Search Light शोध प्रकाश					
Emergency Light					
Emergency Signalling Devices आपत्कालीन सिग्नल					
Emergency Flares आपत्कालीन ज्वाला					
Distress Alert Transmitter (DAT) संकट सूचना ट्रान्समीटर					
VHF set. VHF सेट					
Radar Reflector रडार परावर्तक					
Echo Sounder रडार परावर्तक					
SART					
EPIRB					
Radar रडार					

21. 21. Do you get cases of inter boat rivalry which results in violence at sea ?
तुम्हाला आंतरबोटी शत्रुत्वाची प्रकरणे आढळतात ज्याचा परिणाम समुद्रात हिंसाचारात होतो?

Mark only one oval.

- Yes होय
- No नाही

22. 22. Has there been any deaths as a result of inter boat violence at sea ?
समुद्रात आंतरबोट हिंसाचारामुळे काही मृत्यू झाले आहेत का?

Mark only one oval.

- Yes होय
- No नाही

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23. 23. Any suggestions to improve safety of fishermen ?
मच्छिमारांची सुरक्षा सुधारण्यासाठी काही सूचना आहेत का?

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Annexure - 5
Refers to Para 3.3

QUESTIONNAIRE FOR FISHERMEN/TANDEL, SINDHUDURG

Boat and Fisherman Data

Data Collected from Fishermen / Tandel with details about their boat

1. 1. Boat Name

_____

2. 2. **Responder Name?**

_____

3. 3. Total Crew Onboard ?

Mark only one oval.

- ◯ 1-5
- ◯ 6-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21 and above

4. 4. Boat made of ?

Mark only one oval.

- ◯ Wood
- ◯ Fiber
- ◯ Metal

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5. 5. Boat Registered ?

Mark only one oval.

- ◯ Yes
- ◯ No

6. 6. Type of Fishing Boat ?

Mark only one oval.

- ◯ Traditional
- ◯ Motorised
- ◯ Mechanised

7. 7. Length of Boat

Mark only one oval.

- ◯ less than 10 m
- ◯ 11-20 m
- ◯ 21-30 m

8. 8. Type of Fishing Method

Mark only one oval.

- ◯ Purse Seining
- ◯ Trawling
- ◯ Long Line
- ◯ Other

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9. 9. How far from land you fish ?

Mark only one oval.

- ◯ less than 12 Nm
- ◯ More than 12 Nm

10. 10. Fishing Time ?

Mark only one oval.

- ◯ Day and Night Both
- ◯ Only Day

11. 11. Fishing Duration ?

Mark only one oval.

- ◯ One Day
- ◯ 2-7 Days
- ◯ 8-15 Days

12. 12. What is your duty onboard?

Mark only one oval.

- ◯ Tandel
- ◯ Mechanic
- ◯ Deck Crew

13. 13. Attended Coast Guard CIP ?

Mark only one oval.

- ◯ Yes
- ◯ No

14. 14. do you carry original BIOMETRIC CARD ?

Mark only one oval.

- ◯ Yes
- ◯ No

15. 15. Do you maintain safety equipments ?

Mark only one oval.

- ◯ Yes
- ◯ No

16. 16. Ever handled any emergency situation at sea?

Mark only one oval.

- ◯ Yes
- ◯ No

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17. 17. What type of emergency at sea?

Tick all that apply.

- [ ] Sinking
- [ ] collision
- [ ] flooding
- [ ] man over board
- [ ] engine failure
- [ ] bad weather
- [ ] medical
- [ ] lost way
- [ ] piracy

18. 18. Ever abandoned boat or Been Rescued ?

Mark only one oval.

- ◯ yes
- ◯ no

19. 19. Reason to abandon boat ?

Tick all that apply.

- [ ] sinking
- [ ] flooding
- [ ] collision
- [ ] MOB
- [ ] engine failure
- [ ] Bad weather
- [ ] Medical
- [ ] Lost way
- [ ] Piracy
- [ ] Not Applicable

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20. 20. How do you handle emergency situation at sea ?

Mark only one oval.

- I do myself
- Call Indian Coast Guard/CSP/Other Fishing Boats
- Don't know what to do

21. 21. do you fish in bad weather also ?

Mark only one oval.

- Yes
- No

22. 22. Do you get weather warnings?

Mark only one oval.

- Yes
- No

23. 23. Do you know importance of Radio Channel 16?

Mark only one oval.

- Yes
- No

24. 24. Do you have Navigation Charts ?

Mark only one oval.

- Yes
- No

25. 25. Do you know how to use Navigation Charts ?

Mark only one oval.

- Yes
- No

26. 26. Do you have knowledge of safe fishing areas?

Mark only one oval.

- Yes
- No

27. 27. Do you know that you should not fish in entering /leaving harbour channels ?

Mark only one oval.

- Yes
- No

28. 28. You operate in singles or groups ?

Tick all that apply.

- [ ] Single
- [ ] Group
- [ ] Both Single and Group

29. 29. Do you have live Insurance ?

Mark only one oval.

- ◯ Yes
- ◯ No

30. 30. Do you have liquors at sea when fishing ?

Mark only one oval.

- ◯ yes
- ◯ No

31. 31. How do you cook food at sea?

Mark only one oval.

- ◯ LPG Gas and Stove
- ◯ Hot Plate/Induction Plate

32. 32. Do you change crew at last minute prior going to sea and forget to inform fisheries authorities ?

Mark only one oval.

- Yes
- No
- Sime times

33. 33. Do you place lookout at Night to keep a watch ?

Mark only one oval.

- Yes
- No
- Do not have manpower
- we do not require it