2

Marine fisheries sector in India-Resource endowments, infrastructure intensities and stakeholder analysis

T.V.Sathianandan
Head-in-Charge and Senior Scientist,
Fisheries Resources Assessment Division
Central Marine Fisheries Research Institute, Kochi
Email: sattvsedpl@hotmail.com

World fish production has increased gradually from below 20 million tonnes in 1950 to more than 160 million tonnes in 2009. In a similar fashion the total fish production from India has grown up to around 8 million tonnes in 2010 from below 1 million tonnes in 1950. Marine fish production from India has increased from mere 50,000 tonnes in 1950 to 3.4 million tonnes in 2010. Aquaculture production has reached around 4 million tonnes in 2010 which was almost nil in 1950**.**

The fisheries sector plays an important role in Indian economy and its contribution to the GDP is about one per cent. Export earnings from marine sector have increased from Rs. 3.92 crores in 1961-62 to Rs. 12,901.47 crores in 2010-11 with 11.8 per cent growth during 2009-10. There are 0.99 million active fishermen employed directly and 0.61 million employed indirectly with the marine fisheries sector. The total fisher folk population in the country is 4.00 million and there are about 1,94,490 fishing crafts operated in the country for harvesting marine fishery resources (CMFRI, 2010). Out of this about 72,500 are mechanized crafts, 71,300 are motorized and the rest are non-mechanized. In mechanized sector there are about 35,200 trawlers. Fishing by all these crafts are concentrated in the depth zone up to 100 m. The traditional crafts and motorized crafts are concentrated more in the east coast (72 per cent and 58 per cent) where as the mechanized vessels are more along the west coast (58 per cent).

India is a tropical country with multi-species fishery in the marine sector. Various types of fishing crafts and gears are used for fishing from the seas. The development of fisheries sector in India can be classified into three phases. Prior to 1965-66 is the first phase when landings were mainly by non-mechanized indigenous crafts and gears and the landings remained below one million tonnes during this phase. The second phase is the period upto 1985-86 and the important features of this phase were increased mechanization, improved gear materials, introduction of motorization of country crafts, expansion of export trade etc. The last phase is the period after 1986. This phase featured intensification of mechanization, motorization of country crafts, multi-day voyage fishing etc. The average contribution from west coast is 67 per cent and that from the east coast is 33 per cent. The overall percentage contribution from the four regions are NE 11.4 per cent, SE 22.0 per cent, SW 35.2 per cent and NW 31.4 per cent. Pelagic fin fishes formed 55 per cent, Demersal 26 per cent, Crustaceans 15 per cent and Molluscs 4 per cent. As per the Silas committee (2000), the potential yield of marine fishery resources in the Indian EEZ is 3.93 million tonnes.

There are about 2000 marine species that are caught from the Indian seas. Over years changes have occurred in the type of fishing, crafts and gears used, time spend in

the sea for harvesting the resources, storage and infrastructural facilities, commercial importance, export demand etc. Fish is one of the costliest items of food in the present days. The gross revenue from the marine fish landings during 2009-10 at the point of first sales (landing centre) was estimated at Rs.19,753 crores (CMFRI, 2011). There are more resources that are exported now and from India marine products are exported to nearly 100 countries. Since marine fishery resources are renewable and not in-exhaustible management and conservation of these resources are very much essential for sustained production from the seas. Thus, monitoring the harvest of different marine fishery resources is of great concern. With this view, Central Marine Fisheries Research Institute (CMFRI) has developed a sampling design for collecting the required information and to estimate marine fish landings along with effort expended. The sampling design adopted is based on stratified multi-stage random sampling technique, with stratification over space and time. The harvest potential of each of the commercially important marine fishery resources have to be periodically revalidated along with the optimum size of different types of fleets operating in the fishery.

Table 2.1 Profile of Indian Marine Fisheries

Component		Profile
Physical Component		
	Length of coastline	8129 km
	Exclusive economic zone	2.02 million km2
	Continental shelf	0.50 million km2
	Inshore area (< 50 m depth)	0.18 million km2
	Fishing villages	3288
Human Component		
	Marine fishers population	4.0 million
	Active fishers population	0.99 million
	Fishermen families	0.86 million
Infrastructure Component		
	Landing centers	1511
	Major fishing harbours	6
	Minor fishing harbours	27
	Mechanised vessels	72559
	Motorised vessels	71313
	Non-motorised vessels	50618

Estimation of Marine fish landings in India

India is one among few countries where a system based on sampling theory is used to collect marine fish catch statistics. The sampling design adopted by the CMFRI to estimate marine fish landings is based on stratified multistage random sampling technique, stratification being done over space and time. CMFRI initiated the process of collection of data on marine fish catch, effort, biological parameters etc. based on scientific principles way back in 1947. In 1959 CMFRI initiated collection of marine fish landings data along the west coast of India through a stratified multistage sampling design. The sampling design became operational in 1961 for both East and West coasts.

Table 2.2 Indian Marine Fisheries Statistics

Gross value at landing centre	Rs. 19,753 crores
At retail points	Rs. 28,511 crores
Export earnings	US$ 3.5 billion
Percentage in total exports	3 per cent
Domestic markets	81 per cent fresh; 5 per cent frozen; 6 per cent dry; 5 per cent fish meal
Per capita fish consumption	2.58 kg (range 0.3 – 39)
Share in GDP	1.1 per cent
Share in agricultural GDP	5.4 per cent
Infrastructure Component	
Landing centers	1511
Major fishing harbours	6
Minor fishing harbours	27
Mechanised vessels	72559
Motorised vessels	71313
Non-motorised vessels	50618

Marine Fish Production

Table 2.3 Top-ten Resources by Value (Landing centre prices)

Rank	Resource/ Stock	Rs. Billion	US$ Million
1	Penaeid shrimps	43.4	964.4
2.	Sardines	10.7	237.8
3.	Cephalopods	9.0	200.0
4.	Seer fishes	6.0	133.4
5.	Pomfrets	5.8	128.9
6.	Croakers	4.6	102.2
7.	Carangids	4.6	102.2
8.	Mackerel	3.9	86.7
9.	Perches	3.9	86.7
10.	Bombay duck	2.5	55.6
11.	Others	15.6	346.7
12.	TOTAL	110.1	2446.7

Table 2.4 Top-ten Resources by Quantity (lakh tonnes)

Name of fish	Average landings (2006-2010)	Per centage
Oil sardine	4.48	14.60
Penaeid prawns	2.16	7.05
Indian mackerel	1.87	6.09
Croakers	1.71	5.57
Ribbon fishes	1.64	5.35
Non-penaeid prawns	1.58	5.14
Threadfin breams	1.18	3.86
Bombayduck	1.11	3.62
Other sardines	0.98	3.21
Catfishes	0.81	2.64
Total	30.67	

Table 2.5 State wise contribution in marine fish landings (lakh tonnes)

State	2010		Average (2006-2010)	
	Landings	Per cent	Landings	Per cent
Kerala	6.08	18.31	5.99	18.44
Gujarat	5.86	17.63	5.83	17.96
Tamil Nadu	5.09	15.32	4.90	15.08
Karnataka	3.86	11.61	3.34	10.28
West Bengal	3.59	10.82	3.39	10.43
Orissa	2.91	8.76	2.54	7.83
Andhra Pradesh	2.41	7.27	2.41	7.43
Maharashtra	2.41	7.26	3.04	9.36
Goa	0.89	2.69	0.90	2.79
Pondicherry	0.11	0.33	0.13	0.39
Total	33.22	100.00	32.46	100.00

Table 2.6 Gear wise contribution in marine fish landings (2006-2010 average)

Gear Name	Landings (lakh tonnes)	per cent	CPUE (Kg/unit)	CPUE (Kg/hour)
Mechanized Trawlnet	16.37	49.52	1242	44
Mechanized Dolnet	2.30	6.96	511	53
Mechanized Gillnet	1.99	6.03	463	17
Mechanized Purseine	1.88	5.69	2331	414
Mechanized Ringseine	1.42	4.31	2584	1157
Mechanized Bagnet	0.40	1.21	364	38
Mechanized Hooks & Lines	0.04	0.13	286	12
Mechanized Driftnet	0.03	0.09	167	15
Other mechanized gears	0.18	0.56	2655	27
Outboard Gillnet	3.34	10.09	82	15
Outboard Ringseine	2.13	6.45	1121	589
Outboard Hooks & Lines	0.56	1.71	77	14
Outboard Bagnet	0.33	1.00	259	50
Outboard Boat seine	0.20	0.61	253	84
Outboard Purseine	0.19	0.56	748	255
Other outboard gears	0.36	1.10	134	28
Non-mechanized gears	1.32	4.00	48	13
Total	33.05	100.00		

What do we exploit from the sea?

Marine fisheries in India is a multi-species fishery. Around 1400 finfish species are harvested from the sea of which 263 are commercially important. Apart from this 36 species of penaeid shrimps and 34 species of cephalopods are also harvested in which 15 species of penaeids and 8 species of cephalopods are commercially important.

How the exploitation is carried out?

The marine fishery resources from the Indian seas are harvested using more than 35 different types of craft gear combinations. The major crafts used are of three different categories namely mechanized, motorized and non-motorized. The mechanized sector include trawlers, gill-netters and inboard vessels. Most of the crafts in the mechanized sector use machines for both propulsion and operation of the gear. The motorized sector exclusively consists of crafts fitted with outboard engines. The non-motorized sector consists of traditional vessels made up of wood, fibre glass, thermo coal etc. and do not use any machine power either for propulsion or for operation of the gear. Major gears used in the marine fisheries sector are trawl nets, gill nets, bag nets, hooks & lines and seines.

Trawl fisheries

It is the major gear accounting for 44 per cent of landings. Number of trawlers and engine horse power increased over time. The Deep sea fishing is done upto 400 m depth from 1999. The medium trawlers undertake multi-day voyages. They carry different trawl nets having different cod-end mesh sizes (15 to 35 mm) to target c high value resources. Penaeid shrimps form the main catch. High opening trawls catch squid, cuttle fish and fishes. Finfishes exploited by trawls belong to 21 major groups.

Seine Fisheries

Ring Seine is the most popular seining method for the pelagics along Kerala coast. Purse seiners operated in Kerala, Karnataka, Goa and Maharashtra. Main species - small pelagics such as oil sardine, lesser sardines, anchovies and mackerel.

Gillnet Fisheries

The gillnet catches increased by more than 4 times in recent years (5.8 lakh t in 2008). Share of mechanized gillnetters increased compared to outboard gillnetters. Small meshed gillnets catch clupeids and croakers. Large meshed gill nets catch sharks, seerfish, mackerels, catfishes, pomfrets, tunas and carangids

Bag net Fisheries

Major gear used by artisanal fishers along NW and NE coasts. Gujarat and Maharashtra, a fixed variety of bag nets (Dolnets). Dolnets operate upto 40 m. 80 per cent of the bag net fisheries come from the mechanized dolnetters. Resources caught are non-penaeid shrimps (Acetesindicus), Bombay duck (Harpadonnehereus), golden anchovy (Coiliadussumeiri) as well as penaeid shrimps and ribbonfishes.

Hooks and Line Fisheries

The hooks and lines fisheries contributes to 2 per cent of the all India marine fish catch. They target large pelagic fishes such as sharks, tunas and barracudas. Development schemes promote hooks and lines fisheries particularly the modern version - long line fishing for tunas.

Artisanal Fisheries

It dwindled with the advent of mechanization from 88 per cent in 1960 to 2 per cent recently. Catamaran and plank built boats have been motorised.

Bivalve fishery

Clams and mussels mainly in inland waters and bays; hand picking and by dredge. Kerala leads in the production of clams - 66,000 tons (t) in 2008-09

Marine Fisheries Management in India

In India, fishery in general is open access fishery which is governed by different acts introduced by the government over years

- Indian Fisheries Act, 1897
- The Wild Life (Protection) Act, 1972
- MFR (regulation) Bill, 1978 formulated after the EEZ declaration
- MFRA of maritime states enacted from 1980 in all maritime states
- Maritime Zones of India Act, 1981
- Environment (Protection) Act, 1986

Regulatory Measures

- Closed season
- Closed fishing areas
- Marine Protected Areas (MPAs)
- Protected Species
- Ban on certain destructive fishing gears and methods
- Minimum mesh size regulation
- Minimum legal size at capture
- Use of Turtle Excluder Device (TED) in trawls in Orissa

Table 2.7 Closed Season for Mechanized Sector

State	Months	Days
Gujarat	June - August	45
Maharashtra	June - August	45
Goa	June - August	45
Karnataka	June - August	45
Kerala	June - August	45
Tamil Nadu	April - May	45
Andhra Pradesh	April - May	45
Orissa	April - May	45
West Bengal	April - May	45

Table 2.8 Spatial closures throughout the coastal states

State	Reserved for traditional vessels	Available to mechanized vessels
Goa	Up to 5 km	Beyond 5 km
Kerala	Up to 10 km	<25 GRT: 10-22 km; >25 GRT: beyond 23 km
Karnataka	Up to 6 km	<15m LOA: 6-20 km; >15m LOA: beyond 20 km
Maharashtra	Up to 5-10 fathom	Beyond 10 fathom depth
Tamil Nadu	Up to 3.4 nautical miles	Beyond to 3.4 nautical miles
Andhra Pradesh	Up to 10 km	<20m LOA: 10-23 km; >20m LOA: beyond 23 km
Orissa	Up to 5 km	<15m LOA: 5-10km; >15m LOA: beyond 20 km

Marine Protected Areas (MPAs)

- Currently, there are 31 MPAs (majority in A&N)
- The current area under MPAs is 6.16 per cent of the area in the coastal biogeographic, which is proposed to be expanded to 7.12 per cent
- Oil wells in Bombay High and Godavari Basin also function as MPAs

Table 2.9 Protected Species(under Indian Wildlife Protection Act, 1972)

Species/ Group	Number
Molluscs	24 species
Elasmobranchs	10 species
Grouper fish	1 species
Sea horses	All species
Sea Cucumber	All species
Sponges and seafans	All species
Corals	All species
Turtles	All 5 species
Whales, dolphins, sea cow	All species

Table 2.10 Minimum Legal Sizes

Species	Weight (g)/ Length (mm)
Panuliruspolyphagus	300 g
P. homarus	200 g
P. ornatus	500 g
Thenusorientalis	150 g
Pampusargenteus	200 g
Loligoduvauceli	80 mm
Sepia pharaonis	115 mm
Octopus membranaceous	45 mm

Ban on Destructive Fishing Methods

- Dynamite fishing
- Cyanide poisoning
- Pair trawling in GoM and Palk Bay
- Thalluvalai (minitrawl) in GoM and Palk Bay

Management and conservation of the resources

- Ecosystem-based fisheries management (EBFM) better than single species management ecosystem evaluation and modeling, can predict changes
- Bycatch reduction- BRDs and semi pelagic trawling
- Capacity reduction- limit entry, buyback
- Understanding climate variability and fisheries-improved information on climate and effects made available
- Implementation of CCRF -overexploitation of stocks, damage to ecosystems, trade issues: ecolabelling
- Natural hazards – disaster management plans
- Mariculture- potential mariculture site identification
- Development of Infrastructure- post harvest loss -15 per cent, public investment, VMS, better domestic marketing
- Diversification of vessels and deep sea fishing- 1.3 lakh t of deep sea resources- tuna longliners and squid jiggers
- Diversification of products -value added products
- Utilization of fish waste to useful products
- Marine Protected Areas (MPAs)-area to expand to 7.12 per cent

Habitat degradation

- Water contamination
- Enforcement of standards for water discharge
- Maintaining the quality of river runoff
- Reducing greenhouse gas emissions

Major items of export

Frozen Shrimp continued to be the major export value item accounting for 49.63 per cent of the total US $ earnings. Shrimp exports during the period increased by 24.86 per cent, 42.97 per cent and 37.99 per cent in quantity, rupee value and US$ value respectively. Fish, has retained its position as the principal export item in quantity terms and the second largest export item in value terms, accounted for a share of about 40.27 per cent in quantity and 19.48 per cent in US$ earnings. Frozen Cuttlefish recorded a growth of 21.92 per cent in rupee value and 15.58 per cent in USD terms. Unit value also increased by 25.06 per cent, however, there is a decline in quantity (7.59 per cent). Export of Frozen Squid showed an increase of 21.53 per cent in rupee value and 17.46 per cent in US$ realization. Unit value also increased by 32.95 per cent. However, there is a decrease of 11.65 per cent in terms of quantity. Live items also showed a growth of 8.76 per cent in terms of rupee value and 3.18 per cent in terms of US$ realization compared to the previous year. Dried items showed a drastic decline in quantity, value and US$ terms by 32.05 per cent. 41.08 per cent, and 44.56 per cent respectively. (Figure2.1)

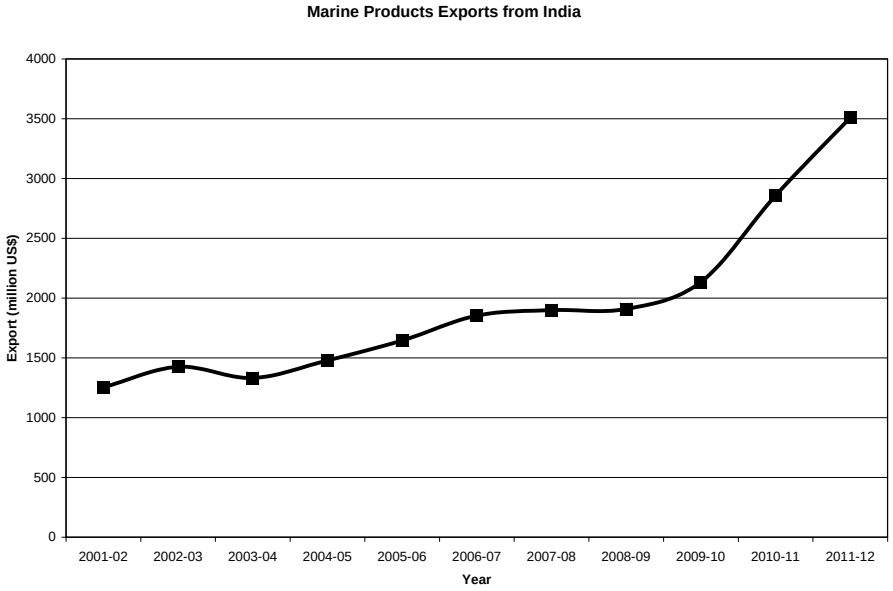

Figure 2.1 Marine Products Exports from India- Total

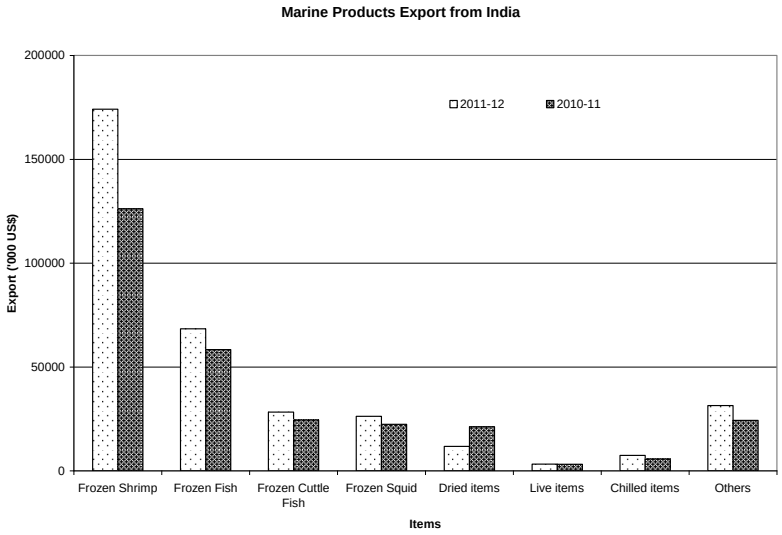

Figure2.2 Marine Products Exports from India –Commodity (Value)

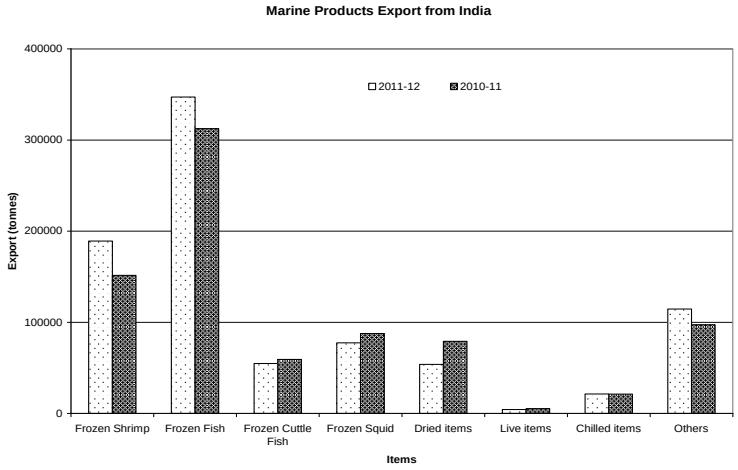

Figure2.3 Marine Products Exports from India –Commodity (Quantity)

Major export markets

As per the current status the largest buyer of Indian marine products is South East Asia with 39.9 per cent share in volume and 25.09 per cent share in value (US$). The next highest buyer is European Union with 22.96 per cent share in volume followed by USA 18.17 per cent, Japan 13.01 per cent, China 7.51 per cent, Middle East 5.33 per cent and 7.5 per cent to other countries. Export to South East Asia recorded a growth of 45.01 per cent in volume and 87.51 per cent in US$ realization. This is mainly due to the increased export of Frozen Shrimp, Frozen Fish and Chilled items. Exports to United States registered a growth of 36.45 per cent in quantity and 45.39 per cent in value (US$ realization) and this is mainly due to increased export of Frozen Shrimp and cephalopods.

Exports of Vannamei shrimp showed a tremendous increase in US market by 212 per cent in quantity and 209 per cent in US $ realization. Export to Japan also registered a positive growth of 21.33 per cent in quantity and 22.35 per cent in US $ terms. Exports of chilled items showed a tremendous increase in Japanese market by 120.12 per cent in quantity and 220.34 per cent in US $ realization. Exports to China showed a drastic decline of 46.89 per cent in quantity and 40.17 per cent in US$ terms. The marine products exports have strengthened India's presence in South East Asia. There is a significant increase in

exports to South East Asian Countries compared to the previous year. Export of Fr. Shrimp to South East Asia has registered a growth of about 222.43 per cent in volume and 356.36 per cent in US$ terms. Export of Fr. Shrimp to USA has also showed a growth of about 47.68 per cent in volume and 47.55 per cent in US$ terms. Export of Vannamei shrimp had also picked up. We have exported about 40787 MT of Vannamei shrimp during this period. Export to Middle East countries showed an increase of 25.98 per cent in US$ realization but declined in quantity by 13.25 per cent. The details are given in the following table.

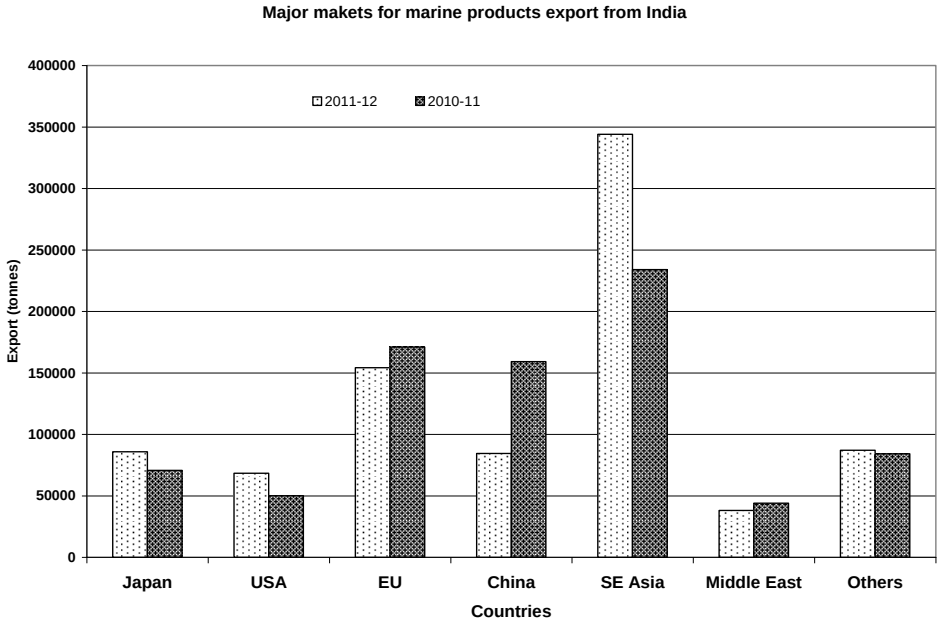

Figure2.4 Major markets for marine products export from in India (Quantity)

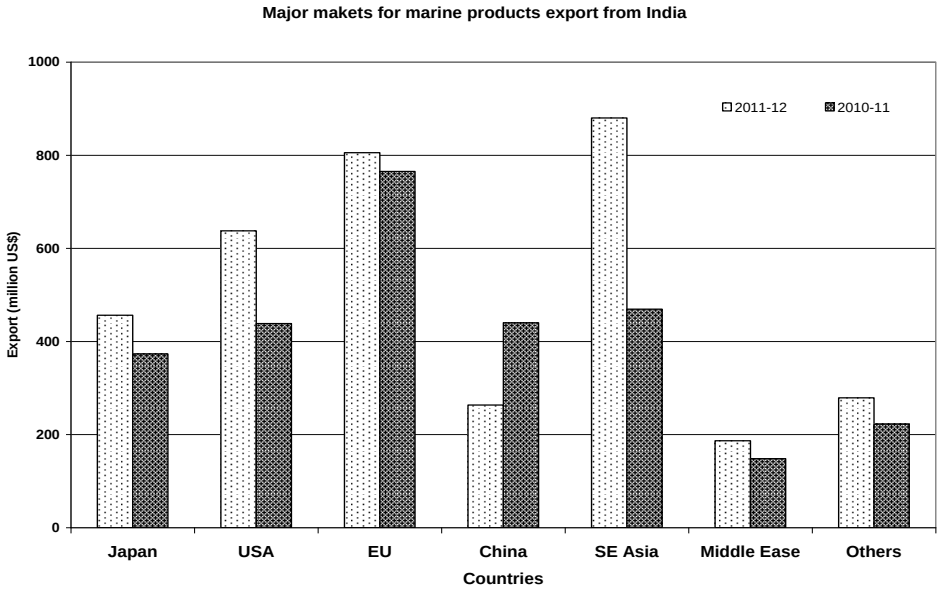

Figure2.5 Major markets for marine products export from in India (Value)

****