3-3 Present Status of the Basis for Fishery

3-3-1 Present Status of Basic Facilities for Fishery

3-3-1-1 Present Status of Main Fishery Harbors

In the coastal area within the study area, 6 ports on the Mediterranean coast and 15 ports on the Atlantic coast are well arranged as main fishing ports for the support of coastal and offshore fishery; they are located at intervals of approx. 70 kilometers on the shoreline. Most of these main fishing ports provide at least a depth of 3.5 m in front of the wharf because they are constructed for use by medium- to large-sized boats for coastal and offshore fishery such as trawlers and seiners. Further, although some ports are equipped with berths for transportation ships such as ferries and cargo ships, the areas for fishery and transportation are clearly separated on the layout of each port, so there are no competitions in use. On the Mediterranean coast, these ports are used by sail boats and pleasure boats during the vacation season, so the space for mooring such boats are provided in some fishing ports. The maintenance and management of those main fishing ports are undertaken by the Office des Portes of MTP, and the ODEP (Office d' exploitation des Portes).

As land facilities, production-related facilities including fish markets, ice making facilities, fuel and water supply facilities; support facilities including workshops, warehouses for fishing equipment, and whole saler's offices; and welfare facilities including restaurants, cafes, and various shops are well arranged. Further, around particularly large fishing ports, there are those fishery-related and transport-related industries, such as marine product processing factories, canning factories, ice making facilities, and docks, forming so-called a fishery and port industrial area. Therefore, these large harbors are more advantageous than small fishing villages in the convenience of life and markets for marine products and there are many are artisanal fishermen who moved from rural areas to these main ports and are engaging in fishery.

3-3-1-2 Present Status of Basic Facilities for Fishery in Artisanal Fishing Villages

In most of artisanal fishing villages, anti-wave facilities such as breakwaters and revetment, and unloading facilities such as wharves and slipway are not well arranged. Fishermen usually store their fishing boats by landing them on suitable topological points such as a sandy beach surrounded by reeves. Therefore, there are such problems that shipping boats cannot be pulled out of the beach or safe operations are not assured when the sea is stormy even during a good season for fishing.

On the other hand, because landing beaches with low waves are located distant from highways with few access roads, such places are inconvenient in procurement and storage of tax-free fuels for fishing boats, drinking water, repair parts, and so on. Further, there are few ice making facilities or storage facilities due to poor supply of electric power, and a factors that suppresses the sales prices of fishery products.

Generally, in artisanal fishing villages, there are many cases where middlemen comer to the landing sites and purchase fishery products directly from fishermen. Entry of new middlemen is almost impossible at present because of poor transportation networks. As described above, poor arranged of basic facilities for fishery including port facilities and infrastructure is casting a shadow on the development of artisanal fisheries.

Outlined Fishery Facilities in Main Fishing Ports in the Study Area

3-3-1-3 Formation of Fisheries Areas in Artisinal Fishing Villages

Coasts in Morocco are sandy beaches surrounded by precipitous cliffs or steep rock faces. Many of these sandy beaches have either been formed by the progressive development of river alluvial fans, or by the accumulation of river tractional load on the coast brought about by coastal currents and advancing waves. The large proportion of fisheries areas utilize such sandy beach coastline, and many coastal areas consist of bays surrounded by rock faces or are straight coastline, the length of which ranges from up to a few hundred kilometers to just a few kilometers. The cliffs behind fisheries areas link up with inland hills and are precipitous with heights ranging between 40-8 m in each targeted area. Rivers of all sizes flow down to such beaches, and it is thought that large amounts of sediment are washed down to the coast at flood times. Relatively stable beaches with a width (inward depth) of 50-100 m show signs of depositional coast judging from beach formations, beach gradients and the comments of local inhabitants, etc., and beach lines are advancing roughly 1 m out to sea every year on both the Mediterranean Sea and Atlantic Ocean sides.

Table 3-3-1

Mediterranean coast		Atlantic coast	
Fishing harbor name	Outlined facilities	Fishing harbor name	Outlined facilities
Ras Kebdana	Main breakwater: 495 m, sub breakwater: 520 m, quay with a depth of 5 m: 475 m, land space: 6.5 ha	Tanger	Quay: 595 m, fish market, restaurants, quay for pleasure boats: 180 m
Madpr	Quay with a depth of 5 m: 2,130 m, fish market, ice making machines, synchronous lift: 2, ferry terminal	Asillah	Quay: 100 m, fishery warehouses, etc.
Al Hoceima	Quay with a depth of 5 m: 470 m, fish market	Larache	Quay: 450 m, ice making machine: 67 t/day, fish market, fishery warehouses, berth: 3 ha
Jebha	Breakwater: 270 m, quay with a depth of 4 m: 130 m, refrigerating facilities	Kenitra-Mehdia	Quay, pontoon, warehouses for fishing implements, ice making facilities, fish market, etc.
MÕDiq	Main breakwater: 270 m, quay with a depth of 4 m: 680 m, quay: 480 m, fishery warehouses, quay for pleasure boats: 100 m, berth: 3.5 ha, restaurants, etc.	Sables dÕOr	Breakwater: 470 m, pier: 100 m. ramp: 1, quay with a depth of 6 m, hinterland: 4 ha
Restinga Smir	Quay for pleasure boats maintained and managed by private organs	Mohamedia	Many fuel-related facilities, quay: 178 m, fish market, warehouses for fishing implements: 3,000 m2
		Casablanca	Quay : 1,120 m, fish market, warehouses for fishing implements, brokersÕ offices
		El Jadida	Ramp: 20 m, etc.
		Safi	Strong character of a phosphate rock port, hinterland, etc.
		Essaouira	Quay: 680 m, warehouses for fishing implements, ramps, fishing-boat repairing facilities, etc.
		Agadir	Main breakwater: 375 m, quay: 485 m, fish market, warehouses for fishing implements, ice making machines, etc.
		Sidi Ifni	Breakwater: 945 m, quay: 2,716 m, fish market, warehouses for fishing implements, brokersÕ offices, ice making machines, etc.
			Breakwater, etc/: 1,700 m, quay: 200 m, ice making machines

Source :

3-3-2 Natural Conditions

3-3-2-1 Wind conditions

Wind conditions were analyzed using the data of 1995, which involve the fewest missing data, among from the meteorological observation data at three points of Nador, Tanger, and Safi representing each coastal area. Because these meteorological data represent the maximum wind speed of each day, they present the severest conditions for the analysis of fishery operations on the sea. In either district, no wind exceeding the maximum speed of 25.0 m/sec was observed during that year and over 90% of wind speeds observed both in Nador and Safi were 10.0 m/sec or less. In Tanger, there were many days of strong wind, where the wind speed of 10.0 m/sec or less was 281days, corresponding to less than 80% of the year.
To speak about wind directions, basically the wind from the north is prevailing in the summer period while the wind from the west is prevailing in the winder period. There is a trend of variable wind directions during the period of transition in spring and autumn or when cyclones have occurred. Further, all three points have a common characteristic that sea breezes are prevailing with a little influences of land breezes.

3-3-2-2 Offshore waves

Offshore waves in the Mediterranean Sea
To speak about the "swells" in the sea area on the Mediterranean side, those from the west , which enter into the Gibraltar strait from the Atlantic Ocean, are prevailing mostly in the winter period. Waves that occur in the western area of the Mediterranean Sea also reach the coast of question as "swells" from the ENE direction, but these waves reach this coast not so frequently because they are restricted those in a narrow sea area between the lands on the African and Spanish sides (measured angle: 20°). It is considered that the "swells" that enter through the Gibraltar strait will diffuse and attenuate rapidly because of the open sea area with a width of 180 km on the Mediterranean side after passing the entrance of the strait with a width of 10 km. Therefore, it is considered that the diffracted "swells" will reach to a distance of approx. 120 km, up to a point near the JBHA. Although wind waves from the N and NE directions are prevailing in the area around Nador, those waves with a height of 1.0 m or less account for 90% of the total while those waves with a height of 2.0 to 4.0 m account for only 0.3% (see Table 1). According to the record of wind speeds, however, it is possible that waves with a height of 4.0 m or more occurred more than 10 times during the past 30 years. The level of offshore waves to be used for designing fishery-harbor structures (H1/3 significant waves with a repeatability of 30 years) as calculated from the record of wind speeds during the past 30 years is 6.6 m for Nador and 5.2 m for Al Hoceima (see Tables 3-3-3 and 3-3-4).

Offshore waves in the Atlantic Ocean
"Swells" in the sea area on the Atlantic side are said to have occurred in the North Atlantic Ocean with a range of 1,000 to 3,000 km, which cause those waves with a low frequency (and a large wave length). According to the record of observation at Jorf Lasfar, waves with a frequency of 6 sec or more account for approx. 84% of the total while the waves with a height of 0.6 to 1.5 m account for approx. 48% of the total and occur at intervals of 0.1 min in average with special characteristic that the waves with a height of 0.6 to 1.5 m account for approx. 20% of the total (see Table 3-3-5).
Although wind waves from the N and NE directions are prevailing in the area around Essaouira on the coast of the Atlantic Ocean, those waves with a height of 1.0 m or less account for 89% of the total while those waves with a height of 2.0 to 4.0 m account for only 0.6% (see Table 3-3-6). According to the record

of wind speeds, however, it is possible that waves with a height of 4.0 m or more occurred more than 20 times during the past 30 years. The level of offshore waves to be used for designing fishery-harbor structures (H1/3 significant waves with a repeatability of 30 years) as calculated from the record of wind speeds during the past 30 years is 8.0 m for Jorf Lasfar and 7.0 m for Essaouira (see Tables 3-3-7 and 3-3-8).

3-3-2-3 Drift sand

All fishery sites in Morocco are on a sandy shore, so the countermeasure against drift sand is an important subject. When calculating the "maximum water depth for the movement of drift sand" in the surface layer of sea bottom, it is considered adequate to ignore those offshore waves with a low frequency of occurrence from the viewpoint of economy in constructing facilities. Calculating conditions shall be set as follows with regard to the wind waves that occur normally as well as their frequency:

Assumed wave height (H1/3):	2.0 m
Frequency :	6 sec
Wavelength :	56.2 m
Diameter of sand particles:	0.5 mm (Sidi Hsaine), (Tafedna), (Tifnit)
	1.0 mm (Souira Kedima)
	2.0 mm (Kaa Sras)

The calculated "maximum depth for the movement of drift sand in the surface layer" is as follows (see Table 3-3-9):

Sidi Hsaine :	7.0 m
Saura Kedima :	4.8 m
Kaa Sras :	3.7 m

Therefore, when constructing a basic facility for a fishery harbor such as a breakwater or offshore bank, the port mouth or offshore bank must be placed deeper than the maximum depth for the movement of drift sand in the surface layer.

3-3-2-4 Waves, swells, and abnormal weathers

Both waves and swells clearly show difference in characteristics of each sea area. Although there are observation data over 20 years since the 1960s as to the Atlantic side, because it was impossible to thread the original data, analysis was made on the observation data as to the construction in the Jorf Lasfar port, where wave directions were not recorded. According to these data, waves are relatively calm during the period from spring to summer with those waves with a height of less than 1 m accounting for 70% of the total. During the period from winter to spring, on the other hand, waves with a height of 1.5 m to 2.5 m occur frequently causing a rough surface of the sea. Although no quantitative description on swells can be made due to the absence of the records of wave directions in these data, it is said that most of swells attributable to the waves that occurred in the middle area of the North Atlantic Ocean.

Because the wave data as to the Mediterranean side were not available, analysis was made on the wave data as to the Gibraltar strait tunnel plan at Tanger. This analysis showed that 85% of the waves and swells with a height of 1 m or more concentrated in the winter period with waves from east, north west, and west accounted for 30%, respectively. Because the above mentioned waves and swells from the west and north west do not directly influence on the sea area to the east of Ceuta, it can be said that sea conditions of that area are relatively calm. However, some literatures say that swells reach the coast on the Mediterranean side due to the occurrence of cyclones in the northern area of the Mediterranean Sea.

As to abnormal weather conditions (waves), as a result of analysis of the data of 14 years before 1981, it

is recorded that waves from the south west with H1/3 = 8.2 m and a maximum frequency of T = 17.9 sec attached over 6 hours on Dec. 9, 1978. Further, it is recorded that waves from the west with H1/3 = 7.0 m and a maximum frequency of T = 16.1 sec attached over 17 hours on Jan. 16, 1973.
However, according to the records of abnormal weather (Hurricanes, Cyclones, and Typhoons) in the period of 10 years from 1985 to 1995 of the American Weather Center, there is no abnormal weather that passes through the sea area within 300 m from coast on the Atlantic side of Morocco, so it is considered that these were swells due to the abnormal weather that occurred in the middle or northern area of the Atlantic Ocean.

3-3-2-5 Tide level

The difference in tide level between the first and fifteenth days of the lunar month on the Mediterranean coast is as small as 0.5 m while that on the Atlantic coast is 2.6 m. The difference in tide level at Tanger located on the mouth of the Mediterranean Sea is relatively high as 1.9 m due to the influence of that on the Atlantic coast. The tide level at Casablanca is used as the reference for tidal levels in this country and the times and tidal levels at the ebb and flow in each area as compared with those at Casablanca are shown in the table below. In Morocco, management of lands is performed based on the coast line at high tide. (The definition of the sea area and land area is not clear and accordingly, the border between the water surface and land also is not clear.) Therefore, the land between the sea and the line 6 m above the reference line is under the management of MTP. It is necessary to fully confirm the relations between the tidal reference level (D.L.) and the reference level on the marine chart (C.D.L.) or the reference level on the topological chart prior to the planning of basic facilities for fishery.

Table 3-3-10 Tide Level at Different Sites (Unit of Measure : cm)

Port	Average Tide Level	High Tide	Low Tide	Difference
Al Hoceima	34	56	5	61
Sebta	57	87	5	92
Tanger	127	198	11	209
Casablanca	214	281	13	294
Jorf Lasfar	211	278	13	291
Safi	200	278	13	291
Agadir	119	266	11	277

Source : INRH

3-3-2-6 Geology, tides, and bottom sediment

The Atlas Mountains, which rise in the inland of Morocco, were formed by the organic movements in the Tertiary period accompanying the formation of mountains by the deposit in the ancient Mediterranean Sea that was raised, bent, and crushed. In the coastal area on the Mediterranean Sea, the Rif Mountains consisting of limestone and sand stone (with a height of 2,200 m or more at the peak) are extending close to the shore. To the south of them, the Atlas Mountains (with a height of 3,000 m or more at the peak) rise, which form a water catchment area providing origins of rivers. In the middle Atlas, there are volcanic craters and lava beds on a limestone tableland and canyons are formed by erosion. On the coast line on the Atlantic side, at a location near to Agadir, dikes of mountains such as the middle Atlas protrude producing a complex coast line.
The geological makeup on both the Mediterranean Sea and Atlantic Ocean sides mainly consists of

sedimentary rock typified by tuff breccia, sandstone, mudstone and kieselguhr, and metamorphic rock typified by basalt, limestone and other schist. Much exposed rock has been subjected to extreme erosion, the rock quality is brittle and there is a high risk of collapse. In reflection of the exposed rock quality, soil in coastal areas is brown in color and consists of fine or medium grain sand with a grain size of 0.01-0.5 mm, however, mixing of gravel was observed on some beaches.

In the sea area of the Atlantic Ocean offshore the land of Morocco, the Canary Current is flowing from the northern area of the Atlantic Ocean off Spain to the Canary Islands through all seasons. The flow speed is as slow as 1 knot or less constantly. The water temperature on the surface of the sea is 22°C in August and 16°C in February, showing a difference of 6 degrees between summer and winter.

Most of the bottom sediment on the shore is sand except some reeves. It has been revealed by the survey at this time, that sandy shores are expanding in many fishing villages. Further, it has been confirmed again that main fishery harbors are appropriating much expenses for the maintenance and dredging of the port mouth and sea routes.

3-3-2-7 Current Operating and Fishing Trip Conditions

The maximum wind speed at which small fishing boats can navigatee is generally given as roughly 10.0 m/sec on average, and the maximum operable wave height is a significant wave height (H 1/3) of roughly 1.5 m. In cases of swells where the wave cycle is long (wave length is also long), offshore operation and navigation in waves with a significant height of more than 1.5 m is sometimes possible. In such cases, the offshore wave gradient (wave height/wave length) must be gentler than 0.016.

Waves approaching the coast assume a greater wave height when they reach the breaking water depth and break and, when the post-breaking wave height of short cycle (long wave length) waves reaches 1.3 m or more, fishing boat operation becomes extremely dangerous. Artisinal fishing boats are landed and relieved of their catches on the beaches to the front of the fisheries areas, however, because of the breaking waves near the beach line, the operation of small fishing boats is highly restricted and the number of fishing days is reduced.

Judging from the shape of fishing boats, the allowable limit for fishing is estimated to be a broken wave height of 1.3 m or less near the beach line, and the pre-breaking wave height required for this is calculated as follows judging from the converted offshore wave gradient (H_o/L_o) and converted offshore wave depth ratio (h/H_o'):

Wave cycle of 6 seconds or less :	Converted offshore wave height, 0.9 m or less
Wave cycle of 7 seconds or less :	Converted offshore wave height, 0.8 m or less
Wave cycle of more than 7 seconds :	Converted offshore wave height, 0.7 m or less

3-3-2-8 Number of Possible Operating Days and Possible Fishing Days

When calculating the number of possible operating and possible fishing days based on daily wind and wave data on the Mediterranean Sea side, this works out to be 337 days per year in Nador, meaning that operation and fishing are possible almost throughout the whole year (see Table 3-3-2). There is thought to be some error in this figure because there are no observation data concerning swells on the Mediterranean Sea side, however, the local fishermen say that they conduct fishing on around 220 days per year, so it is considered that operation and fishing can be performed on a fairly high number of days even if swell data are also taken into consideration.

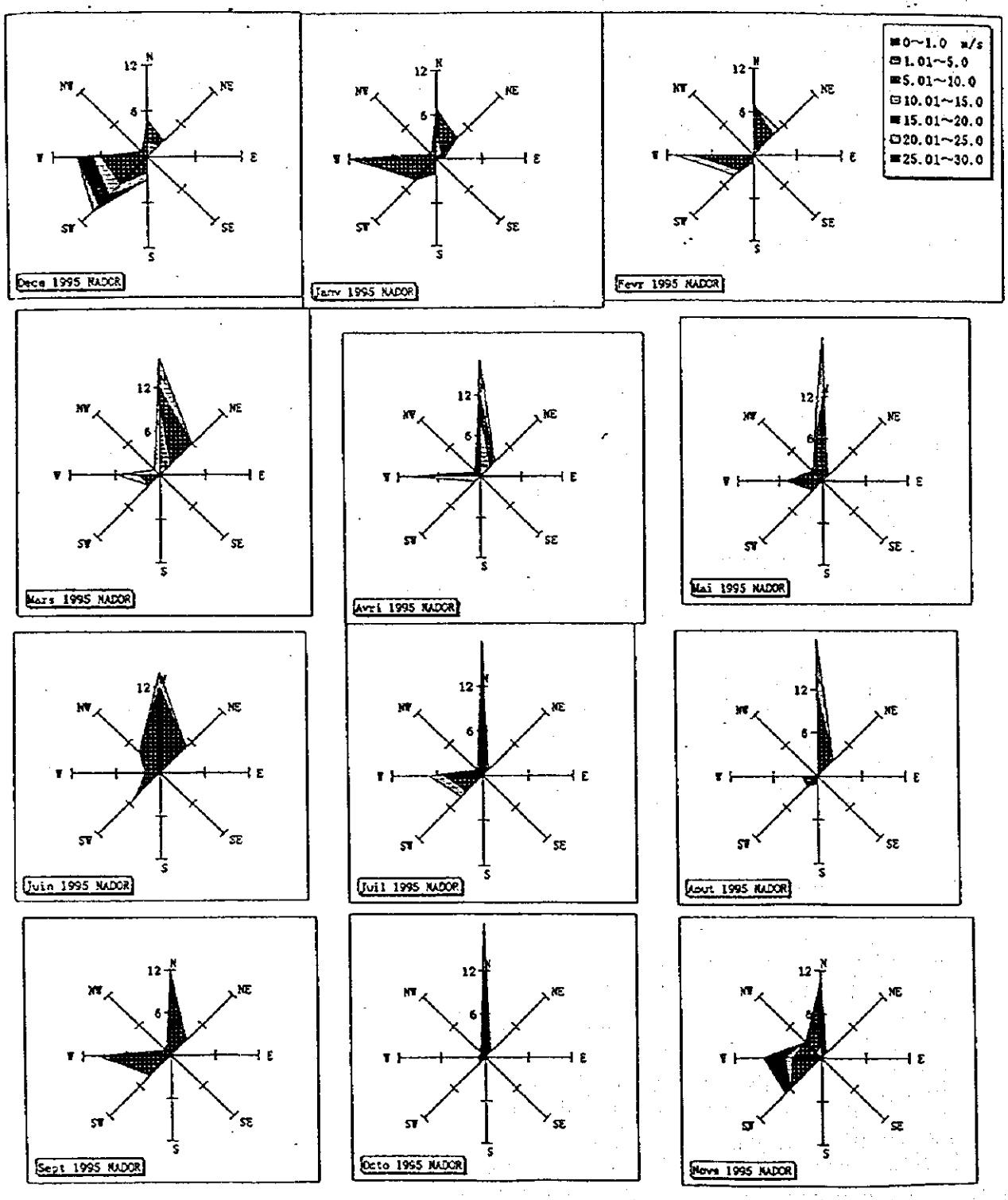
When calculating the number of possible operating days and possible fishing days on the Atlantic Ocean side based on offshore wave observation data at Jolfrasfaal, this was 291 days per year and 143 days per year respectively in 1981 (see Table 3-3-5). In areas where the number of possible fishing days is much less than the number of possible operating days, the construction of fisheries support facilities to raise the number of fishing days is effective.

Wind rose at Nador (Mediterranean sea side)

Daily maximum wind speed (m/s)

NADOR

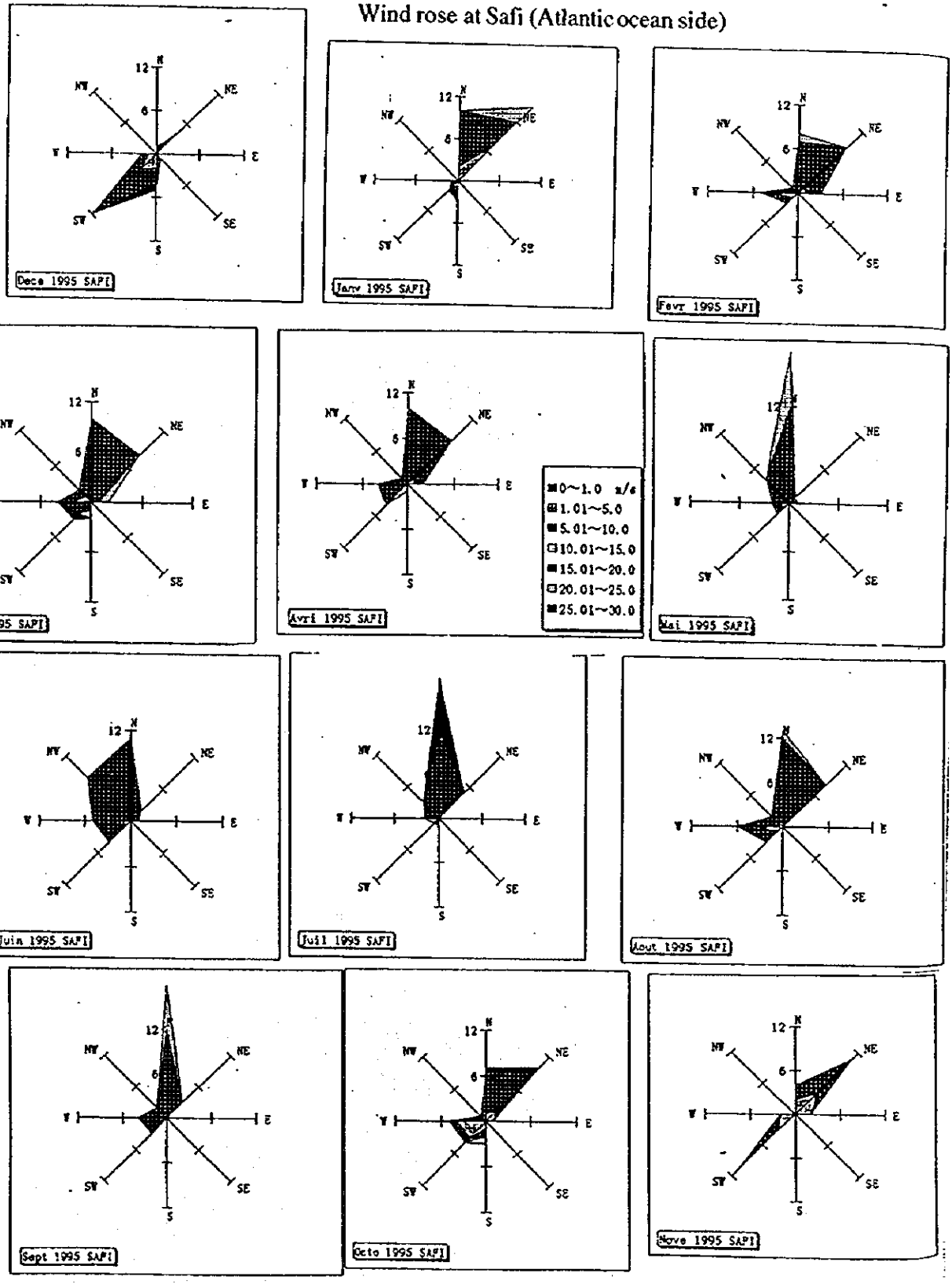
-EN m/sec- Apparition nombre



3-3-1

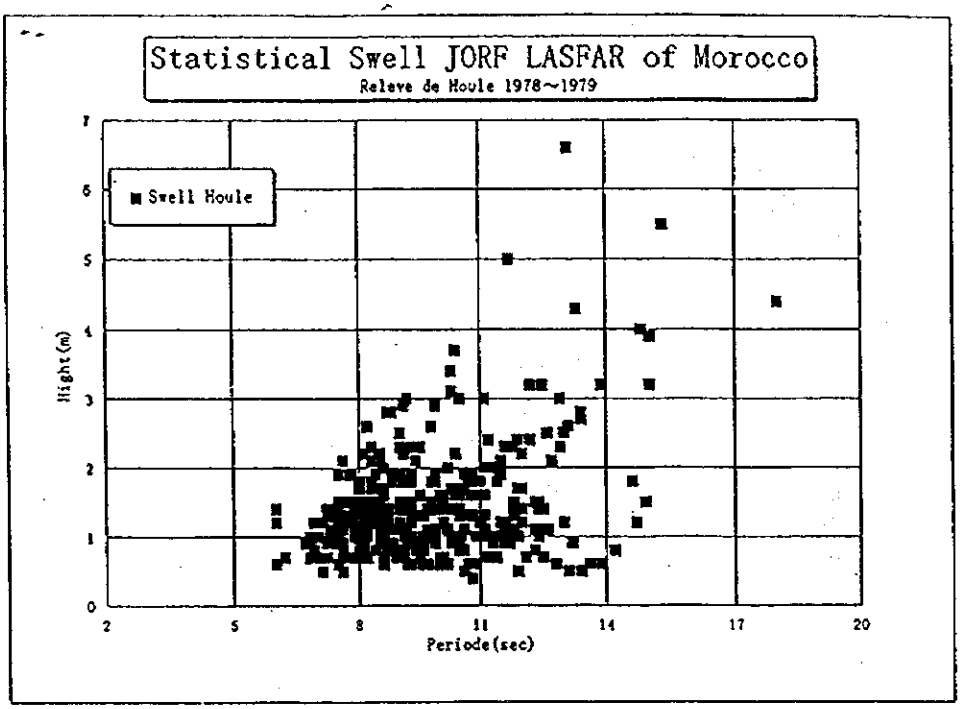
Daily maximum wind speed (m/s) SAFI
-EN m/sec- Apparition nombre

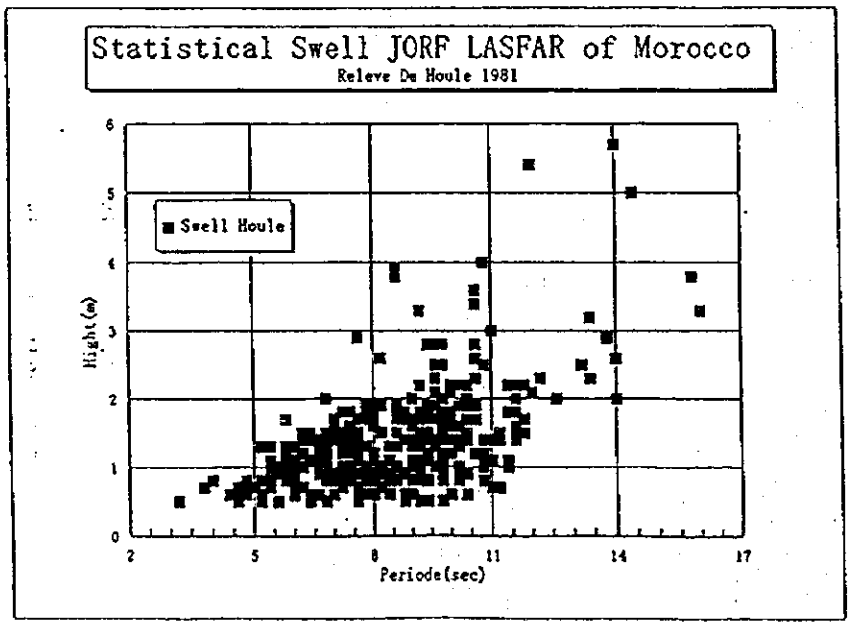
Wind rose at Safi (Atlantic ocean side)



: 3-3-2

Wave height and period at Jorf Lasfar (Atlantic ocean side)





3-3-3

MOROCCO NADOR ' 9 4～9 6　　1994.1.1～1996.12.31　　Select Time12:00

91224
10010S

Deep water wave height (critical operation on sea)　　Deep water wave H1/3

Wave breaking height in shore line (critical sail out from shoreline)　　Peak wave height after breaking below 1.3m

Period, Height	<3.0	3.0< 6.0	6.1< 7.0	7.1< 8.0	8.1< 9.0	9.1< 10.0	10.1< 11.0	11.1< 12.0	12.1< 13.0	13.1< 14.0	14.1< 16.0	Calm	3YEAR appearance	1YEAR conversion	Cumulative appearance	%	Cum. %	Practicable operation day Good	Cum. Good	Cum. %	Total days	Practicable sail out day Good	Cum. Good	Cum. %	Total days
Wave length(m)	<14.04	56.16	76.44	99.84	126.4	156	188.8	224.6	263.6	305.8	399.4														
Calm～0.5	602											49	651	217	217	59.40	59.40	217	217	59.40		217	217	59.40	
0.51～0.6		168											168	56	273	15.33	74.73	56	273	74.73		56	273	74.73	
0.61～0.7													0	0	273	0.00	74.73	0	273	74.73		0	273	74.73	(GOOD)
0.71～0.8		120											120	40	313	10.95	85.68	40	313	85.68		40	313	85.68	337
0.81～0.9		72											72	24	337	6.57	92.24	24	337	92.24		24	337	92.24	
0.91～1.0													0	0	337	0.00	92.24	0	337	92.24			337	92.24	
1.01～1.1		34											34	11	348	3.10	95.35	0	337	92.24			337	92.24	
1.11～1.2													0	0	348	0.00	95.35	0	337	92.24	(GOOD)		337	92.24	
1.21～1.3		24											24	8	356	2.19	97.54	0	337	92.24	337		337	92.24	
1.31～1.4													0	0	356	0.00	97.54	0	337	92.24			337	92.24	
1.41～1.5		8											8	3	359	0.73	98.27	0	337	92.24			337	92.24	
1.51～2.0		13											13	4	363	1.19	99.45		337	92.24	(N,G)		337	92.24	(N,G)
2.01～2.5		3											3	1	364	0.27	99.73		337	92.24	28		337	92.24	28
2.51～3.0			2										2	1	365	0.18	99.91		337	92.24			337	92.24	
3.01～4.0			1										1	0	365	0.09	100.00		337	92.24			337	92.24	
4.01～5.0													0	0	365	0.00	100.00		337	92.24			337	92.24	
5.01～													0	0	365	0.00	100.00		337	92.24			337	92.24	
SUM	602	442	3	0	0	0	0	0	0	0	0	49	1,096	365		100.00	%	337				337			
Practicable operation day	602	360	0	0	0	0	0	0	0	0	0	49	1,011	337		92.24	%								
Practicable sail out day	602	360	0	0	0	0	0	0	0	0	0	49	1,011	337		92.24	%								
Non-practicable operation day	0	82	3	0	0	0	0	0	0	0	0	0	85	28		7.76	%								
Non-practicable sail out day	0	82	3	0	0	0	0	0	0	0	0	0	85	28		7.76	%								

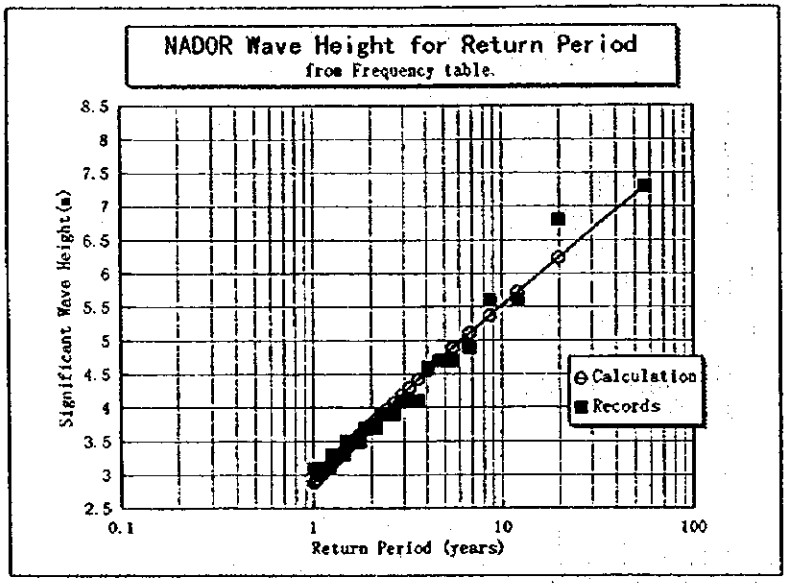
* Practicable operation condition is deep water wave height below 1.0m, or deep water wave height below 1.5m with wave slope below 0.0016

* Practicable sail out condition is peak wave breaking height below 1.3m

Probability (Return period of 30years) of deep water wave at Nador

CALCULATION OF PROBABLE Wave
weibull

β=	0.50	α	0.46
k=	1.10	1/k=	0.91



Wmax (m/s)	frequency	total	m Nos.	Calculation P(x)	y v	Wxcal (m)	Ret. per (years)
7.3	1	1	1	0.983	3.579	7.30	56.45
6.8	1	1	2	0.951	2.730	6.24	19.79
5.6	1	1	3	0.919	2.315	5.72	12.00
5.6	1	1	4	0.888	2.036	5.37	8.61
4.9	1	1	5	0.856	1.824	5.11	6.78
4.7	1	1	6	0.824	1.653	4.89	5.50
4.7	1	1	7	0.792	1.509	4.71	4.66
4.6	1	1	8	0.761	1.384	4.56	4.04
4.1	1	1	9	0.729	1.274	4.42	3.57
4.1	1	1	10	0.697	1.175	4.30	3.20
4.1	1	1	11	0.665	1.086	4.19	2.89
3.9	1	1	12	0.634	1.004	4.08	2.64
3.9	1	1	13	0.602	0.928	3.99	2.43
3.9	1	1	14	0.570	0.857	3.90	2.25
3.7	1	1	15	0.538	0.791	3.82	2.10
3.7	1	1	16	0.507	0.729	3.74	1.96
3.7	1	1	17	0.475	0.670	3.67	1.84
3.5	1	1	18	0.443	0.615	3.60	1.74
3.5	1	1	19	0.411	0.562	3.53	1.64
3.5	1	1	20	0.380	0.511	3.47	1.56
3.5	1	1	21	0.348	0.462	3.41	1.48
3.3	1	1	22	0.316	0.415	3.35	1.42
3.3	1	1	23	0.284	0.370	3.29	1.35
3.3	1	1	24	0.253	0.326	3.24	1.29
3.3	1	1	25	0.221	0.283	3.18	1.24
3.1	1	1	26	0.189	0.242	3.13	1.19
3.1	1	1	27	0.157	0.201	3.08	1.15
3.1	1	1	28	0.126	0.161	3.03	1.11
3.1	1	1	29	0.094	0.122	2.98	1.07
3.1	1	1	30	0.062	0.082	2.93	1.03
3.1	1	1	31	0.030	0.042	2.88	1.00
	31	31		15.707	29.939	125.10	158.94

Return period in 20 years	0.952	2.738	6.251	20.00
Return period in 30 years	0.968	3.070	6.666	30.00
Return period in 40 years	0.976	3.303	6.957	40.00
Return period in 50 years	0.981	3.482	7.181	50.00

Result of regression analysis

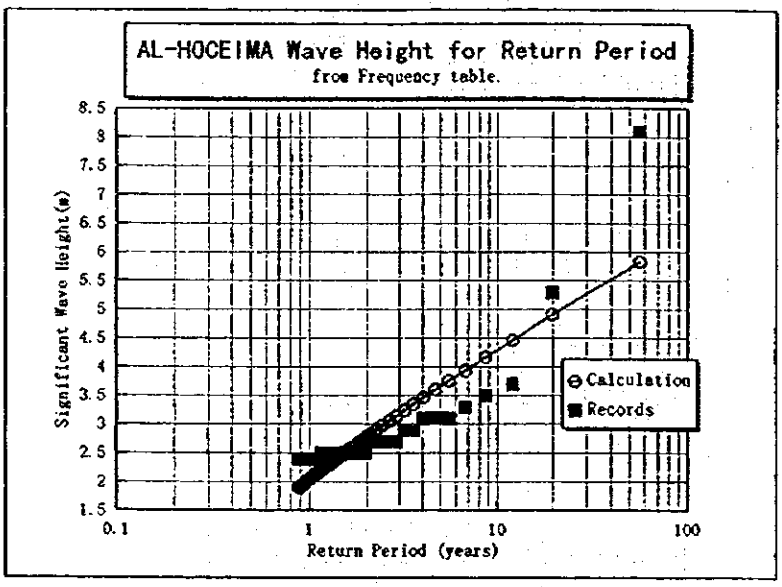
Y value	2.8282
Standard error of Y value	0.1668
R^2	0.9763
No. of sample	31
Degree of freedom	29
X value	1.2501
Standard error of X value	0.00361

(*) $Wx = 1.2501 \times r\,v + 2.8282$

Probability (Return period of 30years) of deep water wave at Al Hoceima

CALCULATION OF PROBABLE Wave
weibull

β =	0.50	α	0.46
k=	1.10	1/k=	0.91



Wmax (m/s)	frequency	total	n Nos.	Calculation P(x)	yv	Wcal (m)	Ret. per (years)
8.1	1	1	1	0.985	3.675	5.83	56.35
5.3	1	1	2	0.957	2.828	4.92	19.76
3.7	1	1	3	0.928	2.415	4.47	11.98
3.5	1	1	4	0.900	2.137	4.17	8.60
3.3	1	1	5	0.872	1.926	3.94	6.70
3.1	1	1	6	0.844	1.756	3.76	5.49
3.1	1	1	7	0.816	1.613	3.60	4.65
3.1	1	1	8	0.788	1.489	3.47	4.04
2.9	1	1	9	0.759	1.380	3.35	3.56
2.9	1	1	10	0.731	1.282	3.25	3.19
2.7	1	1	11	0.703	1.193	3.15	2.89
2.7	1	1	12	0.675	1.112	3.06	2.64
2.7	1	1	13	0.647	1.037	2.98	2.43
2.7	1	1	14	0.619	0.967	2.91	2.25
2.7	1	1	15	0.590	0.902	2.84	2.09
2.5	1	1	16	0.562	0.841	2.77	1.96
2.5	1	1	17	0.534	0.783	2.71	1.84
2.5	1	1	18	0.506	0.728	2.65	1.73
2.5	1	1	19	0.478	0.676	2.59	1.64
2.5	1	1	20	0.450	0.626	2.54	1.56
2.5	1	1	21	0.421	0.578	2.49	1.48
2.5	1	1	22	0.393	0.532	2.44	1.41
2.5	1	1	23	0.365	0.488	2.39	1.35
2.5	1	1	24	0.337	0.445	2.34	1.29
2.5	1	1	25	0.309	0.404	2.30	1.24
2.5	1	1	26	0.281	0.364	2.26	1.19
2.5	1	1	27	0.252	0.325	2.21	1.15
2.4	1	1	28	0.224	0.288	2.17	1.10
2.4	1	1	29	0.196	0.251	2.13	1.07
2.4	1	1	30	0.168	0.214	2.09	1.03
2.4	1	1	31	0.140	0.179	2.06	1.00
2.4	1	1	32	0.112	0.144	2.02	0.96
2.4	1	1	33	0.083	0.109	1.98	0.94
2.4	1	1	34	0.055	0.074	1.94	0.91
2.4	1	1	35	0.027	0.038	1.90	0.88
	35	35		17.707	33.796	101.70	162.34

Return period in 20 years	0.957	2.838	4.927	20.00
Return period in 30 years	0.971	3.168	5.283	30.00
Return period in 40 years	0.979	3.400	5.534	40.00
Return period in 50 years	0.983	3.579	5.727	50.00

Result of regression analysis

Y value	1.8635
Standard error of Y value	0.5467
R^2	0.7418
No. of sample	35
Degree of freedom	33
X value	1.0794
Standard error of X value	0.1108

(*) $Wx = 1.0794 \times yv + 1.8635$

MROCCO JORF LASFAR　　'81　　1981.1.1～12.31　　Select Time12:00

Deep sea water height (critical operation on sea)　　Deep water wave H1/3　　90304

Wave breaking height in shore line (critical sail out from shore line)　　Limit(Wave 0.9m, period 9sec)

period(s) / height(m) / wave length(m)	3.0K 6.0 56.16	6.1K 7.0 76.44	7.1K 8.0 99.84	8.1K 9.0 126.4	9.1K 10.0 156	10.1K 11.0 188.8	11.1K 12.0 224.6	12.1K 13.0 263.6	13.1K 14.0 305.8	14.1K 16.0 399.4	Calm	Appearance	Cumulative appearance	%	Cum.%
Calm											8	8	8	2.19	2.19
0.5～0.6	10	7	4	4	4	1	0	0	0	0		30	38	8.22	10.41
0.61～0.7	7	2	4	2	0	1	1	0	0	0		17	55	4.66	15.07
0.71～0.8	10	3	6	3	3	2	0	0	0	0		27	82	7.40	22.47
0.81～0.9	6	6	8	7	2	2	0	0	0	0		31	113	8.49	30.96
0.91～1.0	6	6	7	5	4	2	1	0	0	0		31	144	8.49	39.45
1.01～1.1	4	5	5	2	3	2	2	0	0	0		23	167	6.30	45.75
1.11～1.2	1	5	7	0	4	2	0	0	0	0		19	186	5.21	50.96
1.21～1.3	4	6	6	3	2	1	0	0	0	0		22	208	6.03	56.99
1.31～1.4	0	13	5	2	7	4	2	0	0	0		33	241	9.04	66.03
1.41～1.5	0	7	4	2	3	1	3	0	0	0		20	261	5.48	71.51
1.51～2.0	1	3	14	11	18	7	5	1	1	0		61	322	16.71	88.22
2.01～2.5	0	0	0	0	7	5	5	1	2	0		20	342	5.48	93.70
2.51～3.0	0	0	1	1	3	3	0	0	2	0		10	352	2.74	96.44
3.01～4.0	0	0	0	2	1	4	0	0	1	2		10	362	2.74	99.18
4.01～5.0	0	0	0	0	0	0	0	0	0	1		1	363	0.27	99.45
5.01～	0	0	0	0	0	0	1	0	1	0		2	365	0.55	100
SUM	49	63	71	44	61	37	20	2	7	3	8	365		100	%
Practicable operation day	39	34	56	41	57	30	19	2	5	0	8	291		79.73	%
Practicable sail out day	39	24	29	21	13	8	1	0	0	0	8	143		39.18	%
Non-practicable operation day	10	29	15	3	4	7	1	0	2	3	0	74		20.27	%
Non-practicable sail out day	10	39	42	23	48	29	19	2	7	3	0	222		60.82	%

Practicable operation day					Practicable sail out day			
Good	Cum. Good	Cum. %	Total days	Good	Cum. Good	Cum.%	Total days
8	8	2.19		8	8	2.19	
30	38	10.41		30	38	10.41	
17	55	15.07		17	55	15.07	
27	82	22.47		27	82	22.47	
31	113	30.96		31	113	30.96	
31	144	39.45		30	143	39.18	
19	163	44.66			143	39.18	
18	181	49.59	(GOOD)		143	39.18	(GOOD)
12	193	52.88	291		143	39.18	143
20	213	58.36			143	39.18	
13	226	61.92			143	39.18	
43	269	73.70	(N, G)		143	39.18	(N, G)
20	289	79.18	74		143	39.18	148
2	291	79.73			143	39.18	
	291	79.73			143	39.18	
	291	79.73			143	39.18	
	291	79.73			143	39.18	
291		79.08		143		39.18	

* Practicable operation condition is deep wave height below 1.0m, or deep water wave below1.5m with wave slope below 0.0016
* Practicable sail out condition is peak wave breaking height below 1.3m

MOROCCO ESSAOUIRA ' 94～96 1994.1.1～1996.12.31 Select Time12:00

91224
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Deep wave height (critical operation on sea) Deep water wave H1/3

Wave breaking height in shore line (critical sail out from shoreline) Peak wave height after breaking below 1.3m

Period (s) Height (m)	<3.0	3.0< 6.0	6.1< 7.0	7.1< 8.0	8.1< 9.0	9.1< 10.0	10.1< 11.0	11.1< 12.0	12.1< 13.0	13.1< 14.0	14.1< 16.0	Calm	3YEAR appearance	1YEAR conversion	Cumulative appearance	%	Cum. %	Practicable operation day: Good	Cum. Good	Cum. %	Total days	Practicable sail out day: Good	Cum. Good	Cum. %	Total days
Wave length(m)	<14.04	56.16	76.44	99.84	126.4	156	188.8	224.6	263.6	305.8	399.4														
Calm～0.5	505											37	542	181	181	49.45	49.45	181	181	49.54		181	181	49.54	
0.51～0.6		133											133	44	225	12.14	61.59	44	225	61.59		44	225	61.59	
0.61～0.7													0	0	225	0.00	61.59	0	225	61.59		0	225	61.59	(GOOD)
0.71～0.8		167											167	56	281	15.24	76.82	56	281	76.92		56	281	76.92	324
0.81～0.9		130											130	43	324	11.86	88.69	43	324	88.69		43	324	88.69	
0.91～1.0													0	0	324	0.00	88.69	0	324	88.69			324	88.69	
1.01～1.1		56											56	19	343	5.11	93.80	0	324	88.69			324	88.69	
1.11～1.2													0	0	343	0.00	93.80	0	324	88.69	(GOOD)		324	88.69	
1.21～1.3		36											36	12	355	3.28	97.08	0	324	88.69	324		324	88.69	
1.31～1.4													0	0	355	0.00	97.08	0	324	88.69			324	88.69	
1.41～1.5		9											9	3	358	0.82	97.90	0	324	88.69			324	88.69	
1.51～2.0		16											16	5	363	1.46	99.36		324	88.69	(N,G)		324	88.69	(N,G)
2.01～2.5		5											5	2	365	0.46	99.82		324	88.69	41		324	88.69	41
2.51～3.0			1										1	0	365	0.09	99.91		324	88.69			324	88.69	
3.01～4.0													0	0	365	0.00	99.91		324	88.69			324	88.69	
4.01～5.0													0	0	365	0.00	99.91		324	88.69			324	88.69	
5.01～					1								1	0	365	0.09	100.00		324	88.69			324	88.69	
SUM	505	552	1	0	1	0	0	0	0	0	0	37	1,096	365		99.91	%	324				324			
Practicable operation day	505	430	0	0	0	0	0	0	0	0	0	37	972	324		88.69	%								
Practicable sail-out day	505	430	0	0	0	0	0	0	0	0	0	37	972	324		88.69	%								
Non-practicable operation day	0	122	1	0	1	0	0	0	0	0	0	0	124	41		11.31	%								
Non-practicable sail out day	0	122	1	0	1	0	0	0	0	0	0	0	124	41		11.31	%								

* Practicable operation condition is deep water wave height below 1.0m, or deep water wave height below 1.5m with wave slope below 0.0016

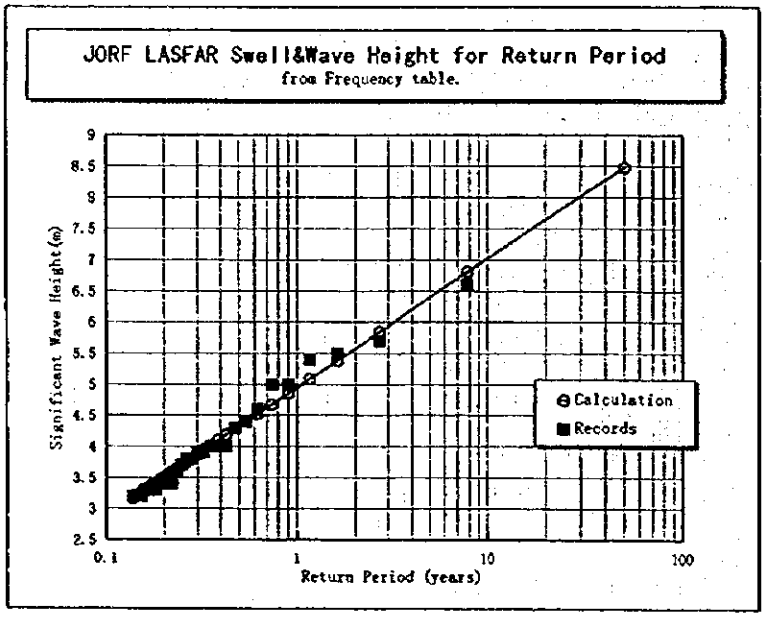
* Practicable sail out condition is peak wave breaking height below 1.3m

Probability (Return period of 30years) of deep water wave at Jorf Lasfar

CALCULATION OF PROBABLE Wave

weibull	β=	0.53	α	0.48
	k=	1.00	1/k=	1

Case 3



			Calculation				
Hmax (m/s)	frequency	total	m Nos.	P(x)	yv	Hcal (m)	Ret. per. (years)
						8.48	50
5.6	1	1	1	0.985	4.224	6.81	7.81
5.7	1	1	2	0.957	3.152	5.84	2.67
5.5	1	1	3	0.929	2.646	5.39	1.61
5.4	1	1	4	0.901	2.312	5.08	1.15
5.0	1	1	5	0.873	2.062	4.86	0.90
5.0	1	1	6	0.845	1.862	4.68	0.74
4.6	1	1	7	0.816	1.696	4.53	0.62
4.4	1	1	8	0.788	1.553	4.40	0.54
4.3	1	1	9	0.760	1.428	4.29	0.48
4.0	1	1	10	0.732	1.317	4.19	0.43
4.0	1	1	11	0.704	1.217	4.10	0.39
4.0	1	1	12	0.676	1.126	4.01	0.35
3.9	1	1	13	0.648	1.043	3.94	0.32
3.9	1	1	14	0.619	0.966	3.87	0.30
3.8	1	1	15	0.591	0.895	3.81	0.28
3.8	1	1	16	0.563	0.828	3.75	0.26
3.7	1	1	17	0.535	0.766	3.69	0.25
3.6	1	1	18	0.507	0.707	3.64	0.23
3.4	1	1	19	0.479	0.652	3.59	0.22
3.4	1	1	20	0.451	0.599	3.54	0.21
3.4	1	1	21	0.422	0.549	3.49	0.20
3.4	1	1	22	0.394	0.501	3.45	0.19
3.3	1	1	23	0.366	0.456	3.41	0.18
3.3	1	1	24	0.338	0.413	3.37	0.17
3.3	1	1	25	0.310	0.371	3.33	0.17
3.3	1	1	26	0.282	0.331	3.30	0.16
3.2	1	1	27	0.254	0.292	3.26	0.15
3.2	1	1	28	0.225	0.255	3.23	0.15
3.2	1	1	29	0.197	0.220	3.20	0.14
3.2	1	1	30	0.169	0.185	3.17	0.14
3.2	1	1	31	0.141	0.152	3.14	0.13
3.2	1	1	32	0.113	0.120	3.11	0.13
3.2	1	1	33	0.085	0.089	3.08	0.12
3.1	1	1	34	0.057	0.058	3.05	0.12
3.1	1	1	35	0.028	0.029	3.02	0.12
total	35	35		17.741	35.071	136.6	22.025

Return period in 20 years	0.994	5.165	7.66	20.00
Return period in 30 years	0.996	5.570	8.02	30.00
Return period in 40 years	0.997	5.858	8.28	40.00
Return period in 50 years	0.998	6.081	8.48	50.00

(e) $Hx = 0.902 \times yv + 2.999$

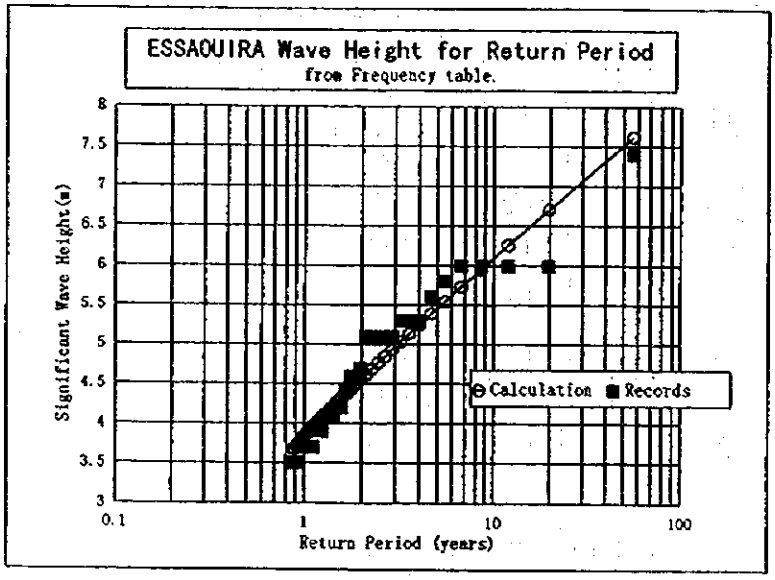
Result of regression analysis

Y value	2.999
Standard error of Y value	0.1209
R^2	0.9815
No. of sample	35
Degree of freedom	33
X value	0.902
Standard error of X value	0.0216

Probability (Return period of 30years) of deep water wave at Essaouira

CALCULATION OF PROBABLE Wave
Weibull

β =	0.50	α	0.46
k=	1.10	1/k=	0.91



Wave max (m)	frequency	total	n Nos.	Calculation P(x)	yv	Hxcal (m)	Ret. per (years)
7.4	1	1	1	0.985	3.675	7.62	56.35
6.0	1	1	2	0.957	2.828	6.71	19.76
6.0	1	1	3	0.928	2.415	6.26	11.98
6.0	1	1	4	0.900	2.137	5.96	8.60
6.0	1	1	5	0.872	1.926	5.73	6.70
5.8	1	1	6	0.844	1.756	5.54	5.49
5.6	1	1	7	0.816	1.613	5.39	4.65
5.3	1	1	8	0.788	1.489	5.26	4.04
5.3	1	1	9	0.759	1.380	5.14	3.56
5.3	1	1	10	0.731	1.282	5.03	3.19
5.1	1	1	11	0.703	1.193	4.93	2.89
5.1	1	1	12	0.675	1.112	4.85	2.64
5.1	1	1	13	0.647	1.037	4.77	2.43
5.1	1	1	14	0.619	0.967	4.69	2.25
5.1	1	1	15	0.590	0.902	4.62	2.09
4.7	1	1	16	0.562	0.841	4.55	1.96
4.6	1	1	17	0.534	0.783	4.49	1.84
4.6	1	1	18	0.506	0.728	4.43	1.73
4.4	1	1	19	0.478	0.676	4.37	1.64
4.2	1	1	20	0.450	0.626	4.32	1.56
4.2	1	1	21	0.421	0.578	4.27	1.48
4.1	1	1	22	0.393	0.532	4.22	1.41
4.1	1	1	23	0.365	0.488	4.17	1.35
4.1	1	1	24	0.337	0.445	4.13	1.29
3.9	1	1	25	0.309	0.404	4.08	1.24
3.9	1	1	26	0.281	0.364	4.04	1.19
3.9	1	1	27	0.252	0.325	4.00	1.15
3.7	1	1	28	0.224	0.288	3.95	1.10
3.7	1	1	29	0.196	0.251	3.91	1.07
3.7	1	1	30	0.168	0.214	3.88	1.03
3.7	1	1	31	0.140	0.179	3.84	1.00
3.7	1	1	32	0.112	0.144	3.80	0.96
3.7	1	1	33	0.083	0.109	3.76	0.94
3.5	1	1	34	0.055	0.074	3.72	0.91
3.5	1	1	35	0.027	0.038	3.68	0.88
	35	35		17.707	33.796	164.10	162.34

Return period in 20 years	0.957	2.838	6.716	20.00
Return period in 30 years	0.971	3.168	7.073	30.00
Return period in 40 years	0.979	3.400	7.325	40.00
Return period in 50 years	0.983	3.579	7.519	50.00

Result of regression analysis

Y value	3.6431
Standard error of Y value	0.2413
R^2	0.9369
No. of sample	35
Degree of freedom	33
X value	1.0828
Standard error of X value	0.0489

(*) $Hx = 1.0828 \times rv + 3.6431$

Limit depth of littoral drift movement (surface movement)

by Standard design method of fishing port structure

100130

	H_o'	H_o	L_o	d	H_o'/L_o	hi/L_o	hi	REMARK
KAA ASRAS	1.9	2.0	126	2.0	0.01540	0.0380	4.79	
SOUILA KEDIMA	1.9	2.0	126	1.0	0.01540	0.0500	6.30	
SID HOSSIN	1.9	2.0	126	0.5	0.01540	0.0650	8.19	(TAFEDNA,TEFNIT)
KAA ASRAS	1.9	2.0	56.2	2.0	0.03452	0.0650	3.65	
SOUILA KEDIMA	1.9	2.0	56.2	1.0	0.03452	0.0850	4.78	
SID HOSSIN	1.9	2.0	56.2	0.5	0.03452	0.1250	7.03	(TAFEDNA,TEFNIT)

H_o : Deep water wave height(m)　　L_o : Wave length of deep water wave(m)= 126m 56.2m

H : Wave height at depth hi(m)　　T : period　　9sec 6sec

hi : Limit depth of movement(m)　　d : Particle diameter of sand(mm)

3-4 Community of fishing villages

3-4-1 Current status of fishing villages

1) Colonial configuration and the occupation of inhabitants

Colonial configurations of villages in the Atlantic and Mediterranean coasts, and those in the southern part of Marrakesh for comparison, are shown in the table below. According to this table, there is no difference in average size of households. However, commune rurales with a large number of households can be seen on the coast of Atlantic Ocean. According to the on-site survey, these are of scattered village form and it is expected that the range of a commune rurale is very large.

When looking into the number of members of each household of fishermen, although there are some areas featured by very large households in part of the coast on the Mediterranean Sea, the average number of members of each household over the whole coastal areas of Morocco is approximate 6 to 7. Although there are some exceptions, usually houses are traditional one-story buildings with which walls consisting of plastering with a form where a central courtyard is surrounded by three rooms in three directions.

Table 3-4-1 Colonial Configuration

	Province	Commune	Moroccans	Foreigners	Number of Households	Average Size of Houshold
Atlantic Coast	Agadir	Tifnit (and peripheral colony)	39,221	68	8,254	4.75
		Imesouane	8,645	0	1,347	6.42
	Essaouira	Tafedna	5,097	0	808	6.31
	Safi	Souira Kedima (actually seems to be larger than this)	52,688	1	8,657	6.09
Mediterranean coast	Tanger	Ksar Sghir	8,818	0	1,701	5.18
	Nador	Sidi Hsaine	6,972	0	1,080	6.46
	Tetouan	Oued R'mel (and peripheral colony)	6,610		1,268	5.21
	Nador	Kalet	11,724	1	2,059	5.69
Inland (around Marrakesh)		Tahannaout	7,263	0	1,180	6.16
		Asni	5,609	0	911	6.16
		Amizmiz	27,385	0	4,405	6.22
		Ait Ourir	9,048	0	1,464	6.18

Source : Population Legale du Maroc, 1994, Direction de la Statisique
Preliminary survey report for the survey of the distributed electrification plan in the Houze District, Morroc, 1996.

Although the occupation of inhabitants may vary from one place to another, it can be considered as combined agriculture and fishery basically with a large weight on fishery. With the average area of the cultivated land per household is 1 to 2 ha, as a result of the comparison of the incomes from agriculture and fishery, the income from fishery accounts for 90% of the total income.

However, agricultural products are important from the viewpoint of self supply of the principal food. Widely cultivated are wheat, barley, and corn. In addition, beans such as grams and lentils, green and yellow vegetables, tomatoes, potatoes, vegetables such as lettuce, olive, apples, oranges, and so on are cultivated by households of fishermen for self supply depending on areas. Further, though there are few fishermen's households which have a large herd of cattle, there are some fishermen's households which obtain approximately 30% of the annual income from the sales of sheep and cows and they cannot be ignored.

Further, there are some villages engaging in beekeeping on the Atlantic coast. Generally speaking, villages on the Atlantic side seem to maintain a considerable portion of their livelihood by relaying on fishery. Villages on the Mediterranean coast, on the other hand, can be said to be quite diversified on a wide range from exclusive fishery to nearly exclusive agriculture.

2) Maintenance of the livelihood of fishermen

(1) Number crew members per ship and distribution of catches

Three types of fishing of bottom long liner, angling, and netting are performed on five villages though their combination may vary from one to another. Roles for operation of a fishing boat include apprentice fishermen (Mousses), who engage in maintenance and cleaning of the boat on the shore and providing meals for crew on the shore, as well as the ship owner, chief fisherman, and crew.

The number of fishermen working on an artisanal fishing boat is about 3 to 5. The minimum unit for an artisanal fishing boat consists of three members: two fishermen to go to fishing and an assistant to push the boat off the beach. The maximum unit consists of five members: three fishermen to go to fishing and two assistants. When a person possesses more than one boat, the assistants work for all of the boats. In most cases, one of the crew members was a son of the boats owner. When a person possesses more than one boat, a son of the boat owner was on one of the boats. Social relationships between other employed fishermen and the boat owner are not yet clarified. However, fishing is not always performed by a team of fishermen under close relationships by blood and marriage, but often by members consisting of friends and neighbors and those young crew members who came from other areas.

A common method of catch distribution on the Mediterranean coast is that the catch less the cost of fuel is defied as the profit and it is equally divided into the shares of maintenance cost, boat owner, and crew. In reality, the share of the boat owner consisting of the maintenance cost and his own share is twice as large as that of the crew.

As to the method for distribution, the same pattern can also be seen in Souira Kedima on the Atlantic coast, where although the profit is equally divided between the boat owner and crew, the share of each crew member is lower partially because the number of crew members is usually larger by one in this area.

(2) Purchase and possession of boats

Forms of possessing boats included both individual possession and joint possession. It is difficult to generalize because the obtained data is very limited, but the ratio of these two forms were roughly equal to each other. Joint possession begins with a joint investment, where although joint investments with a son (or father) are rarely seen, those with other partners such as a son-in-law (or father-in-law) and friends can be seen frequently. Joint investments between brothers are rarely seen either, so it seems that there is a trend that joint investments are performed between partners under relatively remote relationships by blood and marriage. Contributions between partners are half and half.

When the boat owner is not included in the crew, one of the crew members becomes the chief fisherman. It seems that the relationship between the chief fisherman and the boat owner varies from one area to another. An example in Souira Kedima is introduced here.

Suppose that a boat owner has purchased a boat at 20,000 DH. Then the boat owner employs a chief fisherman and crew. In this case, the chief fisherman can become a joint owner when the total catch has reached a half the price of the boat, i.e. 10,000 DH. It is said that the share of the chief fisherman will become larger than that of a non-owner chief fisherman.

As for the purchase of boats, because CNCA (Caisse Nationale du Credit Agricole) does not give loans regardless whether it is an individual or joint purchase, it is performed by own fund. No loan is available for purchase of nets, either. Although individual ownership of boats is preferred, there are such joint investments in the form of an aid such as those from a son-in-law. Basically, it seemed that joint

investment is performed to mutually supplement the shortage of funds with no more significance. In the case of individual ownership, most persons purchase a boat with money made by working on coastal fishing boats during a period of 8 to 10 years. On the other hand, because loans are available for purchase of outboard motors, many fishermen are utilizing the loans. It is said that such loans are provided at an interest rate of 6% and at a term of 5 years and are to be repaid by annual installments. According to the fishermen, an allowance for delay of 2 months can be given for repayment.

(3) Sources of fish for self consumption and the frequency of eating fish

As a result of investigations as to what frequency fishermen eat fish during the summer and winter periods and how much fish boat owners and crew members purchase fish for their own consumption during the summer and winter periods, it has been found that both boat owners and crew members in every shore eat their own catch alone during the summer period but most of them purchase fish more or less for their own consumption during the winder period.

3) Education in the community of fishermen

National average of adult literacy rate is 50%, rate of attending to elementary school is 68%, and rate of attending to junior high school is 36%, which is below the averages of developing countries and those of middle-east and north-African countries. When looking into these figures of men and women separately, the rate of literacy among men is 61%, that among women is 38%, rate of attending to elementary school as of 1986 to 91 is 81% among men, that of women is 55%, and the net rate of attending to school is further lower as 66% of men and 45% of women. Number of public schools and students in Morocco as well as the rate of women are shown in Table 3-4-2.

Table 3-4-2 Number of Public Schools and Students in Morocco

Stage of Education	Number of Facilities	Number of Students	(Women Incl.)	Rate of Women Among Students (%)
Education before attending to school				
(1) Koran school	28,082	599,134	(150,095)	25.0%
(2) Kindergarten and nursery	3,847	179,909	(79,599)	44.2%
Basic education (9 years)				
(1) Elementary school	1,966	2,627,628	(1,058,834)	40.2%
(2) Secondary school	715	821,347	(338,897)	41.2%
Secondary education (3 years)		347,998	(145,767)	41.8%
Higher education				
(1) College	11	254,873	(95,548)	37.4%
(2) Higher research institutes	25	8,847	(*)	*
(3) Teachers colleges				
Teachers for elementary education	*	10,339	(2,290)	22.1%
course	12	4,558	(1,578)	34.6%
Teachers for secondary education course	8	2,490	(538)	21.6%
Teachers for higher education course	*	*	(*)	*
(4) International educational institutes				
Professional training		70,002	(23,931)	34.1%
(1) Specialized course				
Agriculture, architecture, craftwork	183	16,281	(8,351)	51.2%
(2) Job qualification course	214	27,546	(6,911)	25.0%
(3) Engineer course	136	26,175	(8,969)	34.2%

In the process of the survey, it has been found that many of fishermen are not graduated from elementary school and they are necessary to acquire the ability to read and write in the preliminary stage of establishing a cooperative, etc. Further, at present, there are many cases among women where those who were graduated from elementary school with an excellent record were not permitted to go to secondary school due to financial reasons.

Although this table does not show the rate of women going to school among all ages suitable for going to school, it still shows that the rate of women in the higher educational institutes is low. The highest rate of women was shown in specialized courses of professional training, particularly in the specialty of secretary in the commercial course.

For most people in villages, the basic education (9 years) is the highest educational career. Because it is necessary to go to a nearby larger village or city to receive secondary education, it hinders them from receiving secondary education. Although this circumstance applies to women and men equally, women are not allowed to go to school by lodging outside their villages.

4) Economic activities of women in villages

According to our observation, the possibility of women to participate in formal economic activities is very small. Although the circumstances disadvantageous to women are decreasing, the number of those women who have received sufficient education is still not so large. Even in cities, only one fifth of women who want employment can find their job and a statistics (as of 1980) shows, that among the women of the ages suitable for employment, only 10.9% are in the formal public labor market.

Table 3-4-3 Labor Markets on Villages of Morocco (data as of 1995)

		Ratio in Each Generation of Population			Ratio in the Labor Market	
		Employed	People Seeking Employment	People not Seeking Employment	Employed	People Seeking Employment
Male	Ages less than 15	9.10%	0.00%	90.90%	100.00%	0.00%
	Ages 15 to 24	68.69%	12.69%	18.62%	84.40%	15.60%
	Ages 25 to 44	88.36%	8.23%	3.41%	91.48%	8.52%
	Ages 45 to 59	90.04%	3.10%	6.87%	96.67%	3.33%
	Ages 60 and over	53.92%	2.08%	44.01%	96.29%	3.71%
Female	Ages less than 15	10.54%	0.00%	89.46%	100.00%	0.00%
	Ages 15 to 24	39.40%	2.72%	57.87%	93.54%	6.46%
	Ages 25 to 44	38.84%	3.25%	57.91%	92.29%	7.71%
	Ages 45 to 59	38.03%	1.86%	60.11%	95.34%	
	Ages 60 and over	20.93%	0.87%	78.20%	96.01%	3.99%

Source : Annuaire Statistiquedu Moroc 1996, Direction de la Statistique

Table 3-4-3 shows the data concerning the differences between the sexes in the labor market in all villages of Morocco. Although the degree of improvement is remarkable at present, the ratio of those women of ages 15 to 59 put to the labor market (employed and people seeking employment) is about 40%. However, this table shows that the ratio women put to the labor market is less than half that of men and the ratio of employment of in the labor market women is superior to that of men. This ratio is considerably higher than the result obtained by the study team through the interviews in each village.

Data from on-site survey suggest that the advancement of women to the formal jobs in villages are hindered by the objection from men based on the doctrine of Islam as well as by the small size of labor market. On a village on the Mediterranean coast, Kaa Sras, a survey in the form of separate interviews to women and men by female and male interviewers, respectively. In those interviews, men were questioned about the formal labor of women, and women were questioned their opinions about performing formal activities for obtaining cash income.

Opinions of most of the men interviewed were that "There is no time for women to work outside. Women are already busy with their housework." Some of them said "The age is changing, so it is inevitable to allow women to work outside for cash income." According to opinions of women, on the other hand, many of them admit that housework is a lot for women. However, the great majority of them strongly agreed to the opinion that cash income is necessary for women and most of them said that they themselves want to work if there is a suitable job or let their daughters do so.

However, when those women were asked whether they will permit their daughters to work outside the village, all of them strongly objected to do so. The reasons told were that the advancement of women to outside the village is dangerous and further, there is no merit of braving such danger because their income is smaller than that of men." Although there are not enough to make a conclusion, at least in villages, it can be said that there is a trend that formal work of women for cash income is objected by most of men and women seek for the means to obtain cash income within their own village.

3-4-2 Organization of fishermen

1) Organization of fishermen

Although it is a common case in each shore that the eldest person becomes the representative of fishermen and works as the contact point with the DRAM or the head of commune for negotiation, the organization of fishermen as a formal institution is not clearly established. In other words, it can be said that there is

a representative but there is no substantial organization under him.
The most clearly established relationship among fishermen is that between the boat owners and the crew. This relationship is mainly consisting of the relationship between the father and sons and is reinforced by the relationship between relatives and friends. Further, no special trend that boats are managed among those under strong relationships by blood and marriage is shown in the results of the study, as will be described later on, there are many cases where young fishermen from a remote place are employed. Moreover, the fact that boats are rarely treated as the object of inheritance will be another reason for that the boat does not work specially as an attractive point among relatives. Life of a small fishing boat is 6 or 7 to 10 years and even that for a long-lining fishing boat with a small outboard motor is limited to 20 years, so the cases where ships are inherited as an asset are rare.

2) Movement and settlement of fishermen

A fisherman usually begins to work on board in his late teens in his native sea mainly as an assistance to his father or engage in auxiliary work on the beach. The form of work seems to vary from one shore to another. If he does not have problems such as severe sea sickness, or if he can overcome such problems, permitted to begin working on board boat as a crew member within a few months to few years. And after 1 to 2 years of work on board in his native sea, he will move to a ship in another village. Not always he moves from a small fishing boat to another small fishing boat, there are many fishermen who move to coastal fishing boats. And it is a common case that he will return to his native village after 3 to 5 years to work as a fisherman and settle there. According to the interviews, this move of young fishermen is a tradition and young fishermen will be trained by moving to ships of others and further ships in other places. Therefore, although it is true that fishermen move very frequently, most of them consist of young fishermen in their teens or twenties.
A common period of movement seems to be 5 to 10 years. When looking into the destinations of movement, in the case of fishermen on the Mediterranean side, they are scattered over the whole area along the Mediterranean sea as well as Larache. Although there are those fishermen who go to Casablanca and further south to Tantan, they are exceptional. Several examples of the history of movement of fishermen are shown below based on the data obtained from several villages on the coast of the Mediterranean Sea.

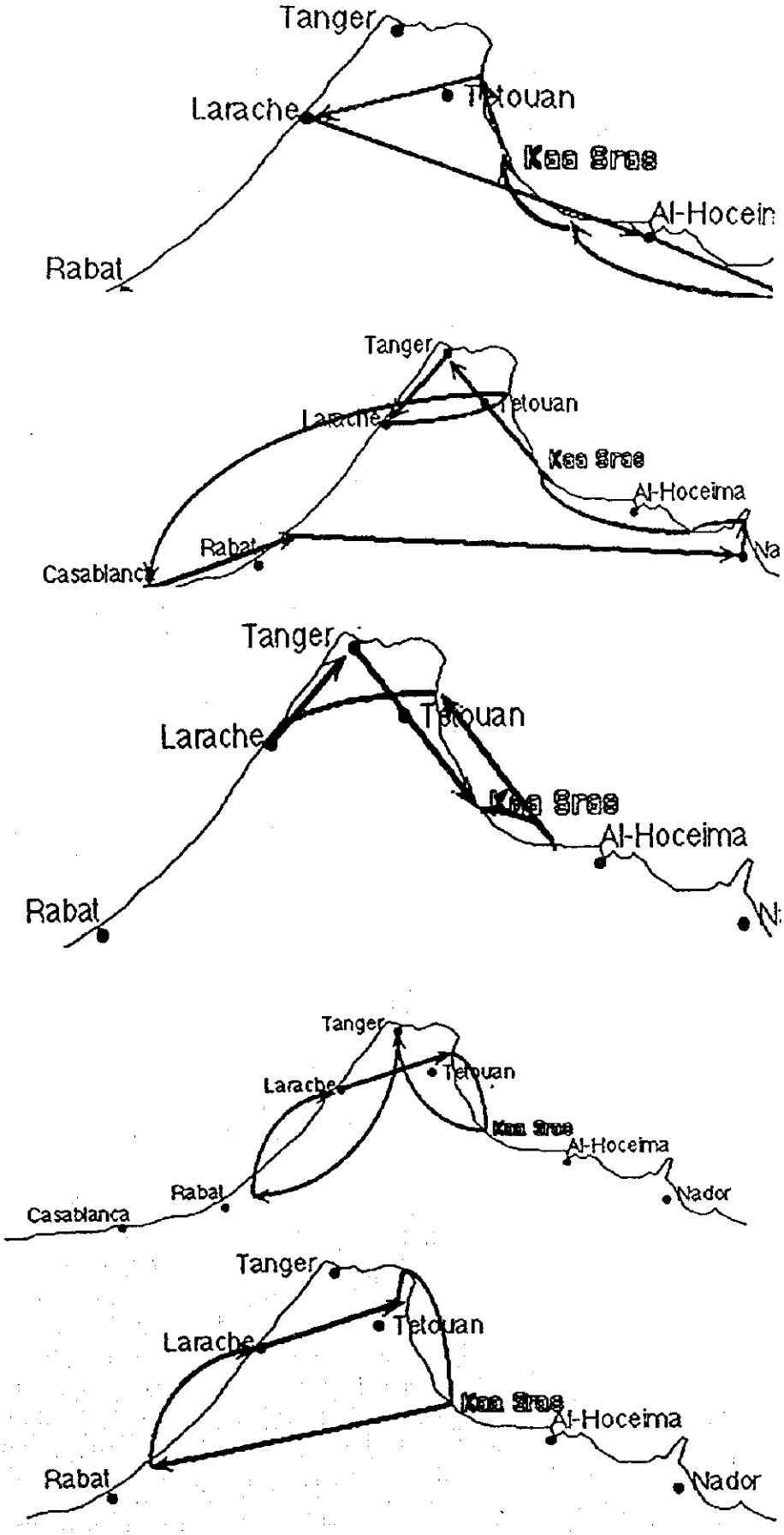


Figure 3-4-1 Movement of Mediterranean Coast Fishermen in their Early Years

History of movement during young ages of fishermen on the coast of the Mediterranean Sea
In the case of fishermen on the Atlantic coast, they have changed the boats 3 or 4 times, where the number of experiences of changing the boats of the owner class is smaller than that of the crew class and the owner class has a longer period of working in one place. Further, the range of movement is not so diversified as that on the Mediterranean side; it is limited to the region south of Sidi Ifni or nearby large fishing ports at the largest extent.
However, boat owners understand the reasons why young fishermen move frequently. When a boat owner in the Mediterranean side who has two small fishing boats and employing nine fishermen is cited as an example. He deems thee to four of those employed are not long-term crew members but will be to other boats within a short period. And he says that he always pays attention whether there are any young fishermen who want to work, even when he is employing a sufficient number of crew members to operate the boat.

3-4-3 Daily Schedule of Fishing Household Members

In regard to fishing households in Morocco, men at work can be observed on the beaches and can be approached for interview. Few women, however, rarely go beyond the village boundary and it is rather difficult for a male interviewer to interview them, particularly in the case of married women as the permission of their husbands must be obtained. Under these circumstances, a survey was conducted to quantitatively establish the daily activities of not only women but also all household members of fishing households in Souira Kedima and Sidi Hssaine. This survey lasted approximately one and a half months from October to November, 1997.

Figure 1 summarises the daily activities of five members (father, mother, son, daughter and grandmother in this case) of a household based on three categories, i.e. "housekeeping", "production" and "religious activities, education and leisure". Here, the hours of activities exclude the duration of sleeping at night with each member spending approximately 16 hours on various activities.

The most prominent facts are the key hours of "housekeeping" and the short hours of "production" for married women (mothers). Of the 16 active hours a day, they spend some 12 hours on "housekeeping" and less than one hour on "production." The daily activity pattern of married men (fathers) is in stark contrast to that of their wives with some five hours and six hours being spent on "housekeeping" and "production" respectively. These findings illustrate the housebound activities of married women. In the case of old women (grandmothers), the total hours of "housekeeping" are less than half those of married women and the time free from "housekeeping" is used for religion, education and leisure.

Figure 2 compares only the time spent on "housekeeping." As described above, the corresponding time of married women (mothers) is overwhelmingly long. While married men (fathers) and their sons spend time siilarly on "housekeeping", detailed analysis reveals that these activities consist only of "meal" and "washing clothes." In the case of married women, the "cooking / preparating," "others" and "disciplining children" take two hours each in addition to "meal" and "washing clothes." The time spent on "housekeeping" by daughters and sons shows that daughters spend long hours on "fetching water / firewood, suggesting that these jobs are mainly conducted by daughters. As far as the category of "housekeeping" is concerned, a similar pattern is observed for married men (fathers) and their sons. It is, therefore, clear that men are not encouraged to be involved in "housekeeping" from childhood.

Figure 3 compares the time allocations within the category of "production". Here, married men (fathers) spend six and a half hours a day on these activities while married women spend less than one hour. On average, men spend three hours a day on "fishing" and slightly less than two hours a day fon "farming."

The next persons involved in "production" are daughters who spend slightly less than two hours a day on "herding livestock." In many of the visited areas, young women were frequently observed tending flocks of sheep, illustrating the reliability of this data. Daughters also spend longer hours on "farming" than married women (mothers).
Sons appear to spend an average of approximately one hour a day on "fishing." This is because of the inclusion of some young boys in the samples who actually join adult men in fishing. Many boys, however, are not yet engaged in fishing.

Although Figure 4 is entitled "Time allocation of Fshery Household for Religious Activities, Education and Leisure", it includes all activities other than "housekeeping" and "production". The most hours of activity for all household members in this category are spent on "nothing special" which includes resting, such as naps. Compared to the other two activity categories, many activities in this category are associated with resting or leisure. Sons spend the most hours among all family members in activities in this category. While married men (fathers) spend approximately one hour a day on "staying at cafe," sons also spend slightly more than one hour a day on "staying at cafe" near the fishing port, indicating that sons play around the port from childhood. Sons also spend slightly less than three hours a day on "schooling" while daughters spend only approximately one hour a day on "schooling." The statistics in 3-4-1 show that some 40% of pupils receiving basic education (nine years) are girls. In the studied villages, however, there is still a distinctive gap between boys and girls in terms of the school attendance rate at the basic education stage. Married women (mothers) spend most time on "prayer" and "nothing special" in the category of "religious activities, education and leisure". Given their heavy involvement in "housekeeping," it is clear that married women (mothers) spend most of the day at home. Once they become grandmothers, they have more time outside the home to chat with friends or to do other things as indicated by some three hours of "visiting neighbourhood" in the data of grandmothers.

Fig.3-4-2 Time Allocation of Fishery Household (one day)

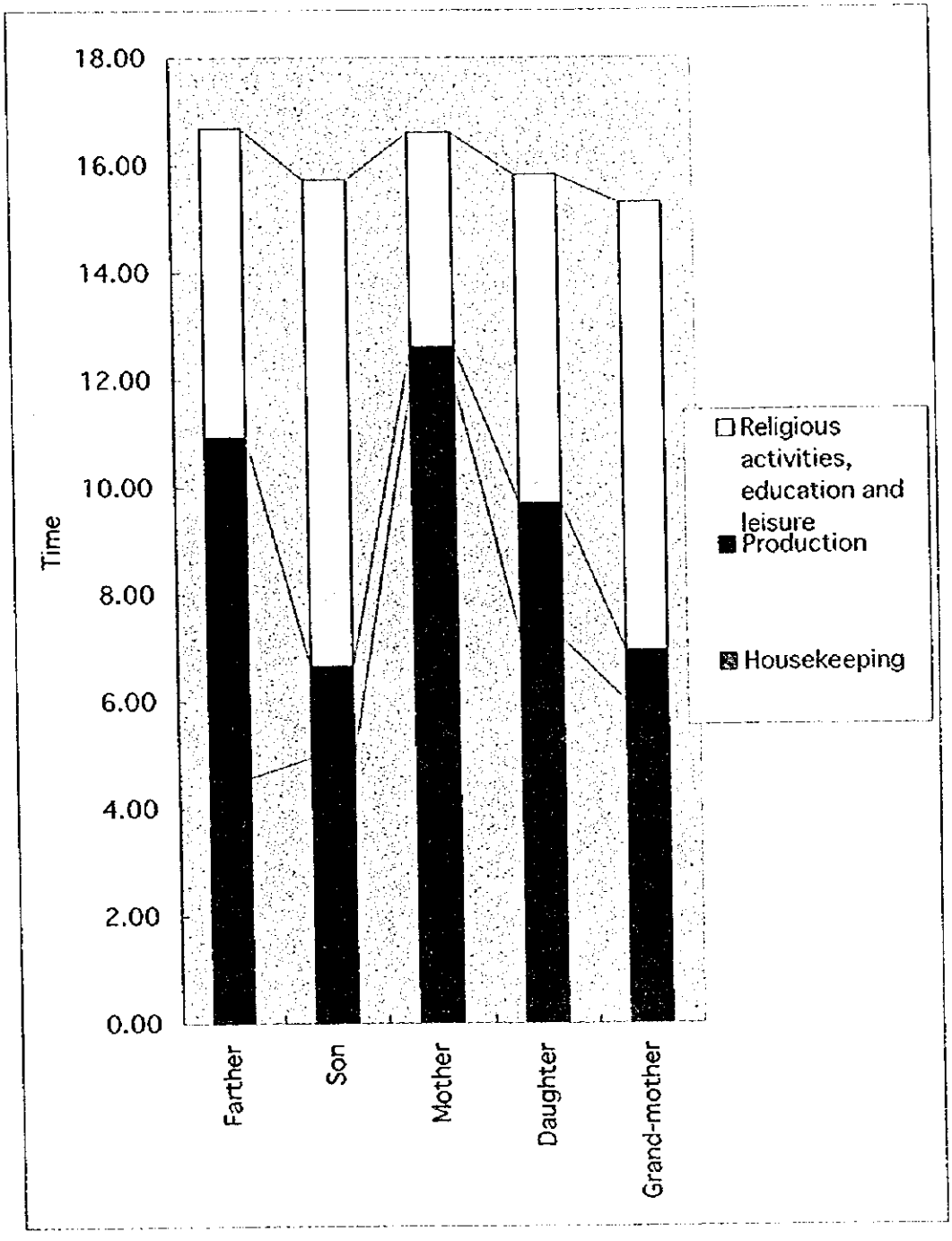


Fig. 3-4-3 Time allocation of Fishery Household for Housekeeping

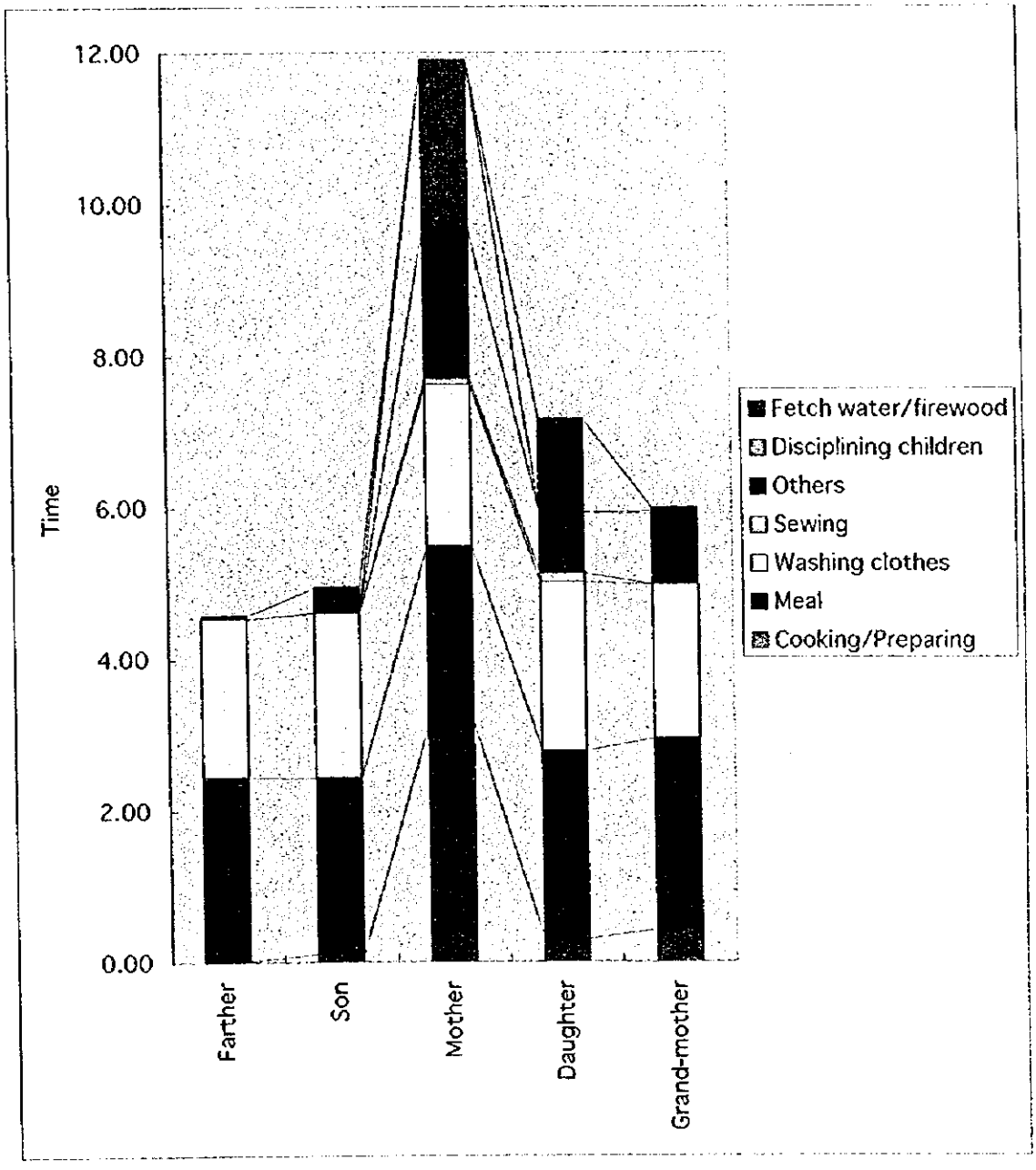


Fig. 3-4-4 Time Allocation of Fishery Household for Production

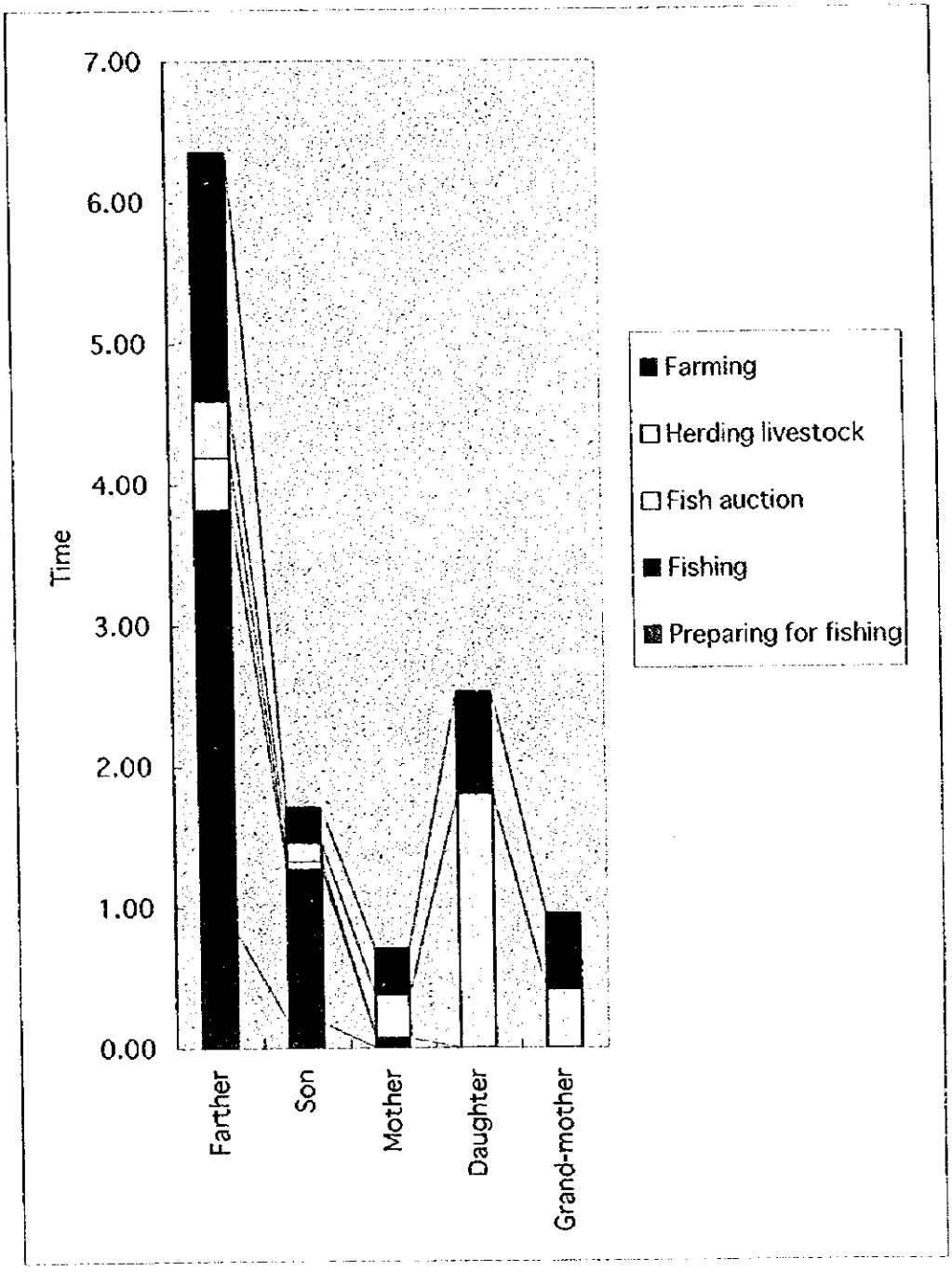
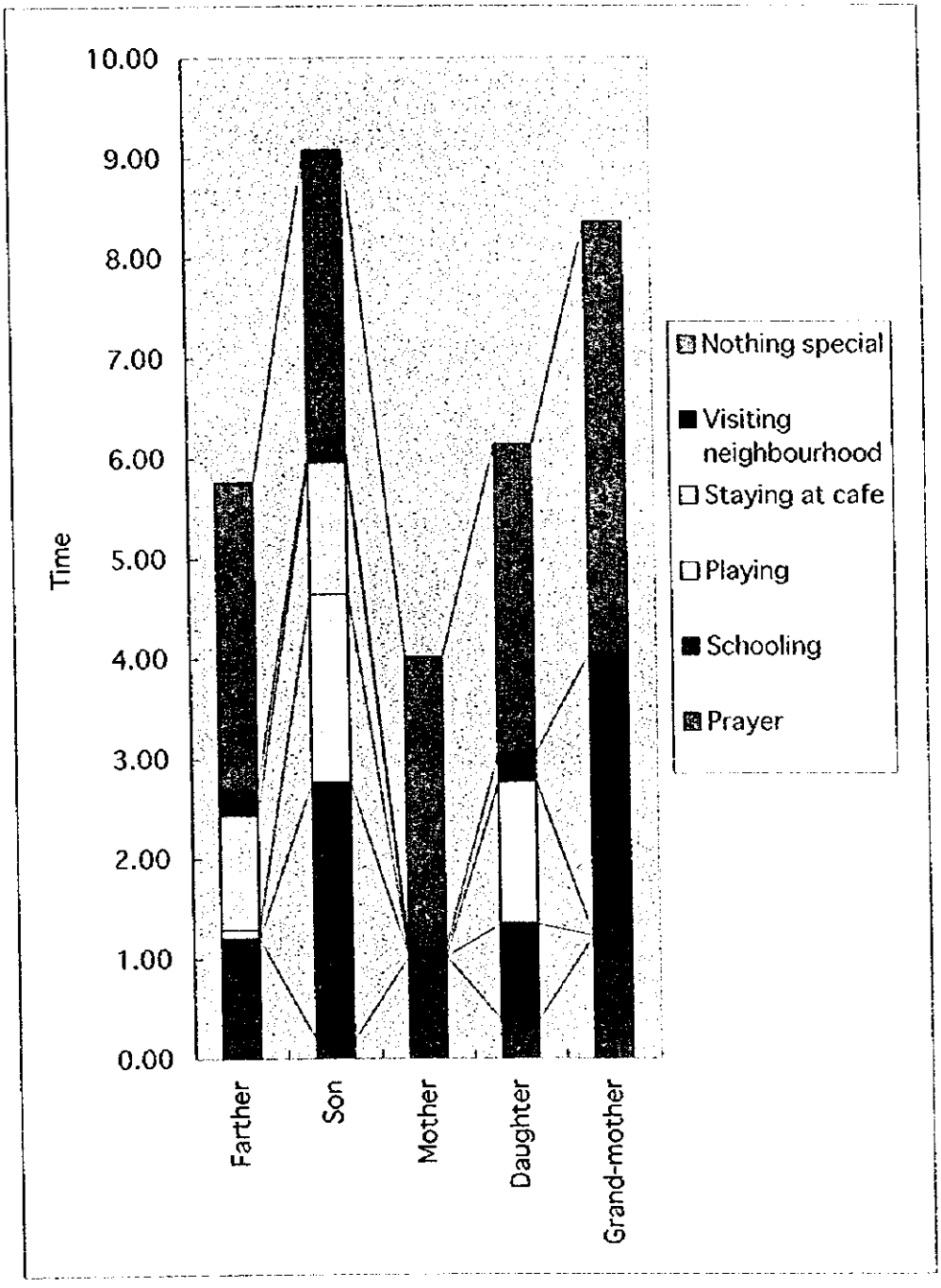


Fig. 3-4-5 Time Allocation of Fishery Household for Religious Activities, Education and Leisure



3-5 Infrastructure for fishing villages

3-5-1 Present status of infrastructure for fishing villages

1) Roads

Main truck roads connecting main cities both in inland and coastal areas have 2 or 4 lanes, are well paved, and arranged on a high level in general. Further, the slope of lanes is relatively gentle excluding that of roads on a ridge or in a peninsula, enable smooth passage of vehicles in most portions of a road. However, in steeply aslant areas on the Mediterranean side, roads are constructed by cutting a cliff, where there were many dangerous points from the viewpoint of disaster prevention.

Arrangement of expressway network is in progress steadily, where expressways connecting Casablanca, Rabat, and Larache on the northern coat on the Atlantic side are opened and construction for extending to Tanger is underway. After the expressway has been opened Tanger and Rabat will be connected by a travel of approximately 3 hours or so accompanied by improved convenience of transportation from Europe by ferries. Further, construction of the expressway network from Rabat, to main inland cities is also started from the southern area of Meknes.

As for access roads from the trunk road to fishing villages, the conditions vary largely depending on the topological relations between the shore and its hinterland. One case is that there is a large gap in height between the shore and its hinterland, where although hinterland is directly accessible by vehicles from the trunk road and access road, the route from the hinterland to the shore must be covered by walking. This situation can be seen in many locations where base rock and dike are exposed both on the Mediterranean and Atlantic sides.

Shores that are located at the end of an alluvial fan or a delta have no problem as they allow direct access from the trunk road to the sand beach in most cases. As special cases, in the case of those fishing villages that are located in a remote area or in peninsula and are isolated from transportation networks, the access road from the trunk road is not paved and sometime will be destroyed by flooding. Management of roads is undertaken by MTP as well as communes and in the case of communes, there are many cases where maintenance and management are not sufficiently done due to financial problems.

2) Electricity

In Morocco, power distribution networks are well arranged all over the county and, using such network, electricity is supplied to mainly cities by ONE (Office National d'Electricité) or regional electric power corporations. In local areas, local electrification through the extension of the existing power transportation network is gradually in progress on the basis of PNER (Programme Nationale d'Eléctrification Rurale) since the beginning of the 1980s. Through this process, electrification of 70,000 households in 900 villages has been completed. By the way, the electric charge is uniform all over the country without any gap between different regions.

In 1996, PERG (Programme dEléctrification Rurale Globale) was established by COSPER (Comité de Suivi des Programme d'Eléctrification Rurale so that local electrification is implemented by ONE and CDER (Centre de Développement des Energies Renouvables) according to this plan, 1,500,000 households (9 million people) will be electrified by 1996 to 2010. A difference from PNER is that distributed electrification methods mainly based on natural energy are incorporated in this plan in addition to the extension of the existing power grid network so that the project is profitable. As are the cases of other villages, some fishing villages will not receive power supply depending on the site conditions of individual villages. Sidi Hsaine and Tafedna, where electrification is not completed at present, are not included in the list of plans to be implemented.

3) Water supply

As for water supply, development of water supply facilities is done by water ONEP (Office National de l'Eau Potable) by giving first priority to mainly those areas of dense population including cities. In local areas, on the other hand, the coverage rate of water supply at the end of 1980 was only 14% and, therefore, a project for the construction of wells and water supply networks has been implemented since 1991 based on PACER (Programme d'Approvisionnemt Groupéen Eau Potable ds Population Rurale). In this plan, water supply to 31,000 locations (11 million people) within 10 years is targeted. The shares of bearing the budget are 26% of the state, 15% of the commune rurale, 15% of FDR, and 45% of loans and aids. Although the coverage rate of water supply was raised up to 32% by the end of 1996, the expansion is beginning to slow since the last year due to the exhaustion of budget and delays in returning loans.

Further, as special examples, there are those cases where MTP and the Ministry of Agriculture jointly implement small wells development for irrigation as a link of countermeasure against draughts, and part of water from them are used for drinking in some villages. Water changes may vary slightly from one area to another.

In those villages where no water supply network is installed, water is obtained from wells in most cases and transportation of water is a substantial burden for them. Further, in most landing sites branch of water supply network is not installed.

4) Sewage

In main urban areas, there are many cases where public sewage networks are well established and residential waste water is processed at a public treatment plant or discharged to the sea. In rural areas including fishing villages, on the other hand, because no public sewage network is installed, waste water is mostly processed by simple discharge, natural percolation or septic tanks, or seepage to the underground. In this case miscellaneous waste water is directly discharge to rivers and a large volume of miscellaneous waste water will be discharged to public water during the vacation season in summer. Although the legislation has been revised so that each commune can decide the way of waste water treatment, this provision is not applicable to existing facilities. Some marine product processing factories on the Mediterranean Sea were discharging processing water directly to the sea.

5) Land use along the sea

The land between the altitude of 6 m to the high tide line is owned by the state and is under the management of MTP. The same conditions also apply to rivers. Further, most of erosion control and windbreak forests and steeply aslant lands are under the management of the Ministry of Agriculture. Private lands used for farm lands, housing lands, etc. are defined as rural areas in terms of taxation and landholding tax, fixed property tax, etc. are exempted with regard to them.

6) Problems of solid wastes

In the areas of large cities, solid waste is collected by garbage wagons and collectively disposed at specified incineration plants. In rural areas including fishing village, on the other hand, solid waste is collected and disposed by the commune rurale. However, as the problem of moral of fishermen, they have few senses of disposing wastes to a specified place or clear up garbage, so many cases where the shore is dirty.

3-6 Environment on the Coast / Seashore Area

3-6-1 the Mediterranean Coast

3-6-1-1 Natural Condition

(1) Geographical features

The coastal line of Morocco on the Mediterranean sea is about 600 km long, Er Rif almost runs side by side with it. In accordance with the location made by this Er Rif and the seashore, the natural condition of the Mediterranean coast area can be divided into 4 :1) the north end of Er Rif / the Strait of Gibraltar (from Cap Spartal to Sebta); 2) the northwest part of Er Rif (The mountain range goes inland and fairly away from the coastal line, comparatively broad coast is formed from Cap Spartal to Sebta); 3) the Er Rif area (The mountain range directly goes down into the sea. from Maritil to Nador); 4) the east of Er Rif (Basically makes flat ground and has formed broad sandy beaches. from Nador to Saidia).

On the Er Rif area numbered 3), that has the longest coastal line, in some places alluvial fans have grown along the rivers and at the mouth the sandy beaches are formed, on the coastal line that corresponds to the valley the beaches like a sandy drift are formed and these beaches are used for the landing sites or of the artisanal fishing boats, but in many cases accessing the seashore is difficult. Almost all the rivers on the Mediterranean coast have water only in the rainy season. The hinterland is mainty steep slopes, its soil is easy to become colloidal and the surface soil flows out easily. Even the steep slopes are already used as farmland, and the vegetation is lost in a broad area. Thus the agricultural productivity is not high, and silt and sand on the land flow into the sea intensively during winter which is also the rainy season.

(2) Marine ecosystem

The average water temperature of the Mediterranean sea is 25°C in summer, the salinity is about 38.5g/l, both are higher than those of the Atlantic. Also the evaporation rate is higher, and by these factors the surface sea water runs from the Atlantic to the Mediterranean sea. One branch of that flow to the Mediterranean is flowing along the coastal line of Morocco, gives much influence to the ecosystem on the coast of the Mediterranean sea. There are no big rivers except the Moulouya on the Mediterranean side, and the vegetation of the hinterland is poor in many spots, it could be thought that the inflow of nutrient salt from the land is limited. Though researches on the ecosystem in the coast of the Mediterranean sea are limited, the ecosystem there could be said to be basically based on the primary production by phytoplankton. Around the Strait of Gibraltar is an exception, where here the exchange of the sea water occurs very often with the Atlantic area, the productivity is thought to be higher than that in the west of there.

3-6-1-2 Important Ecosystem and Important Species

AEFCS (Administration des Eaux et Forêt et des Energies Renouvables) of the Ministry of Agriculture designates 3 "top priority" sites and 3 "second priority" sites as the biologically and ecologically important places on the Mediterranean coastal area (Table 3-6-1). Though any of these areas is not designated as a reserve at present, as for Al Hoceima the designation for a national park officially is now examined.

<u>Al Hoceima proposed site for a national park</u>

In Al Hoceima proposed site for a national park, once Monk seals population, (*Monachusmonachus*) was confirmed, the reconstruction of the Mediterranean group of Monk seals is the biggest purpose of establishing the national park. And this site is the biggest habitat of ospray (*Pandion haliaetus*) in the southern coast of the Mediterranean sea. Moreover, located outside of the park, in the south of Al Hoceima port, there is a spawning ground for fishes.

8 staff are working on preparation of the park, however, the main work now is management of the forest, protection of ospray, and construction of the relation with the local residents. The population within this area is about 14,000. Along the coastline, 500m zone from the coast is to be set aside as a natural reserve and prohibit fishing, and 3 miles from the shore will be a resources control area to restrict human activities for the purpose of the consistence of use and protection of the resources.
In the area around this proposed site, agricultural productivity is low and the accessibility to fishery resources is limited, so the way to earn the income is extremely limited. AEFCS realizes, under these circumstances, that it is difficult to restrict human activities giving priority to the nature protection. They are aiming at residents' participation for the management of the protected area and at the alternative income generation including tourism development.

Lagoon Bou Areg (Nador)
The only one large salt lake in the Mediterranean coastal area. The mouth for the sea was blocked by accumulated sand, the incision work was done in 1995. Wetland area around the lake is an important wintering site for birds, and the nesting site for avocet (avocette in French, *Recurvirostra avosetta*). In addition, extensive mats of sea weed (*Zostera marina, Posidonia caulinii*) are distributed, which make the lake a rearing place for fishes or crustacean, and the biological productivity is high. However, because the effluent of agricultural irrigation, residential areas, and factories, at least partially, salinity change and eutrophication are thought to be going on. And by spread of the housing development around the lake, salt marsh becomes diminished.
Other than the above sites, Emb Moulouya and Jubel Moussa are listed for the proposed site with top priority.

3-6-1-3 Social Environment

(1) The cultural heritage
On the Mediterranean side, especially from the Strait of Gibraltar to Tetouan, there disperse lots of historical monuments. Ksar Sghir in Tanger province is the only one designated as "Cultural Asset". And around Tetouan there are Sidi Abdeslam Del Behar (between Martil and Tanger), Ghar El Kehal, Kaf That El Ghar (the Stone Age), Beliunech (along the Cebta beach, Islamic relic), Tiguisat-bades (Al Hoceima, Islamic relic), Cubylla, Parientina, and so on. Besides, the manufacturing method of salted anchovies has 1,000 year history in the area from Tanger to Tetouan, some see it as having value of an intangible cultural legacy.
As the matters on observing those cultural assets, in addition of spontaneous breakdown or low consciousness of the nation, the points noticed are, stealing and illicit sale on the relics, destruction when stealing, deterioration of the cultural monuments with scraping the stone off by the inhabitants around.

(2) The development of tourism and other human activities
Because of the topographical limitation of the Mediterranean coastal area as mentioned above, the economic activities including tourism are concentrating on the middle and large-scale cities or the limited areas with broad sandy beach.
For the future tourism in development in Morocco, the Ministry of Tourism is regarding the seaside area as the biggest touristic resources, in particular the Mediterranean coast is pointed as the important area (Kara Iris, the area between Saidia and Ras el Ma, Martiga Lagoon are the leading sites, and el Jobha, Oued Laou, Kaa Asras, Azla, Karte-arkman are noticed as high potential areas). Moreover as a strategy of the tourism development, touristic sites should be dispersed into many middle and small-scale sites making good use of the unique characteristics of the sites. From this standpoint, fishing villages and

fishing ports are regarded as hopeful tourism resources, the list of the potential sites for tourism development includes many artisanal fishing villages or beaches (Table 3-6-2) .
Besides, on the Mediterranean side as sandy beaches are naturally limited, and almost all the sandy beaches over some scale are already utilized for tourism, the sand for building materials is short of supply. Now the sand taken on the Atlantic coast is transported by land, but there is much expectation for taking the sand from the bottom of the Mediterranean sea.

3-6-2 Atlantic Coast

3-6-2-1 Natural Condition

(1) Geographical features

The coastline on the Atlantic side is totally about 2500 km long. The feature of the study area can be divided into 6 :1) the flat plain north of Kenitra; 2) the hills between Kenitra and Mohamedia; 3) the plain from Mohamedia to Essaouira, 4) the west end of High Atlas between Essaouira and Agadir; 5) the plain between Agadir and Tiznit; 6) the west end of Anti Atlas south of Tiznit.
The plain north of Kenitra, which is numbered 1), lies between Oued Lukkos and Oued Ouerra, lake Merja Zerga is located in the middle, and broad sandy beach is formed on the seashore. In the area between Mohamedia and Essaouira, called 3), coastal dunes grow in large area along the coastline. In Sidi Moussa and Oualidia, salt lakes and back marshes grow along the coastline behind the coastal dunes. From Essaouira to Agadir, called 4), the west end of High Atlas goes down into the sea, there is the highest seaside cliff in Morocco. And around Agadir, there is a 820,000 ha natural forest of algan trees. The area from Agadir to Tiznit , called 5), is a plain lying between High Atlas and Anti Atlas, and there are Oued Souss and Oued Massa, with wetlands at their mouths. South of Tiznit, called 6), is the west end of Anti Atlas, there the feature of mountain chain is sunken in the sea.
Almost all the seashore is made of sedimentary rock, along with the supply of sand from the rivers, the supply of sand by the erosion on the seashore is thought to be substantial. Coastal dunes are formed with sand brought by the wind toward the west. The sand on the Atlantic coast is generally finer than that on the Atlantic, and the sand hill is likely to move toward the inland by the wind. Thus in the area 1), 3), 5) of the above, desertification is going on inland from the coastline. Afforestation for soil fixation is operated by AEFCS of the Ministry of Agriculture. The amount of littoral drift in the sea would be considerable, but the information on this problem is limited. There is an estimation that it accumulated about 20,000 tons of sukd per year in port of El Jadida.

(2) Marine ecosystem

There are 2 factors giving much influences to the marine ecosystem on the Atlantic coast. One is 2 ocean currents streaming north and south. The Canaries Current originating from the north of the Atlantic Qcean runs toward the south along the Moroccan coast. The surface water temperature of this current is 15 to 23°C, and the salinity is 35.9 to 36.5 g/l, which is relatively high, but lower than that of the Mediterranean. On the other hand the current coming up at north from Senegal is higher both in the temperature and in the salinity, and these 2 currents meet in the offshore of Cap Blanc. The other factor is the upwelling. Upwellings are observed through the year in south of Agadir, especially occur more frequently in summer.
They are not observed through the year in the north of Agadir, and also reported the scale is smaller. By the upwellings, the bottom water containing organic matter is lifted, and plankton is stirred, thus this area has high productivity. And in the area, change of the water temperature through the year is less, which also forms a peculiar biological habitat. Moreover, the Atlantic coast has more inflow rivers than

on the Mediterranean coast, the inflow of nutrient salt is thought to be comparatively larger.

(3) Pollution

The major pollution on the Atlantic coast induces effluent from the phosphate factories in Port de Jorf Lasfar and Safi. There is no detailed information about this problem, according to the information from INRH, the majority of the effluent moves toward the south and the range influenced directly by these draining is supposed to be only about 3 to 6 km from the shore. The direct influence to the coastal resources of sardines are thought to be none. However mainly in Safi a possibility of influence to benthos including demersal fish is pointed out. However, the areas around the effluent points are likely to have extreme eutrophication, and the possibility that the marine ecosystems around these areas are already altered is high. This area should be limited to around the effluent points and expansion of this invluenced area is unlikely. In addition to this, effluent with high concentration of phosphate can cause only eutrophication, and possibility of toxic impact should be negligible.

3-6-2-2 Important Ecosystems and Species

In the report by AEFCS of the Ministry of Agriculture already mentioned , on the Atlantic coast there are 23 biologically and ecologically important places (12 "top priority" sites and 11 "second priority" sites). The number is far more than on the Mediterranean. In the study area, there are 16 important places including 8 sites each for top and second priority. This is especially because the length of the coastline, and the fact that the Atlantic coast has more flat ground which can form biologically rich area such as marshes and wetlands, and the peculiarity of the bio-geographic characteristic of the Atlantic coast that, the south area of the Atlantic coast makes the confluence point of organisms, that are partly Mediterranean and partly tropic and partly Sahara origin.

Souss-Massa National Park

This National Park (33,800 ha) is surrounded by the Atlas Mountains and has peculiar bio-geographical environment. It was designated as a national park in 1991, and the only national park in the stndy area. A management plan including various regulations in the park is under drawing up, the Water and Forest Bureau experts this law be established in September, 1997.

This park includes 2 important sites, wetlands at the mouths of the Souss and the Massa, and the steppe or traditional agricultural zones. The steppe or traditional agricultural zone is confirmed as the habitat of Bold ibis (*Geronticus eremita*), and there is a plan of re-introduction of ostriches and antelopes. Even in the park the desertification is going on from the seashore, along with the growth of farm land, the vegetation is changing apparently. As a result of this, the environment inhabitable for Bold ibis is diminished, so along with this change of the vegetation, the change of the fauna is worried. Other than that, in recent years environmental problems caused by tourism activities are increasing, the dumping by the tourists and approach to the Bold ibis nest during their breeding season are thought to be most serious.

In AEFCS, 16 staff operates the administration. The park is divided into 3 sections, the north area, the middle area, and the south area. Each area has the administrating station. This national park endeavors continuously, with support by GTZ to form an administration system participated by the residents. In case that the workshop is held, as a condition, the residents must organize an association representing them. Till now the workshops of PCM type were held in the middle and south area, the subjects on administration of the park etc. were examined including the views from the residents' side. In the future also in the north area, the administration participated by the residents is planned to be operated with the

same method.

Merja-Zerga Biological Reserve
Since 1978 this area has been designated for a reserve. Also since 1980, it has been the registered wetland of the Ramsar Convention. This is an extremely important place as a transit and wintering spot of migrant birds from Europe. Annual average number of the bird is confirmed to be over 160,000 including wild geese and wild ducks, waders, and flamingos. Moreover, Slender-billed curlew (*Numenius tenuirostris*), that is rarely confirmed its life cycle, was observed, this area includes its wintering spot. Around Merja Zerga there are 11 villages, and 7 of them have the population over 10,000. By collecting shellfishes and cogongrasses (probably Juncs) and by fishery in the lagoons, the biota is thought to be much influenced, but the range of human activities and the area for protection largely overlap, and the protection activity is not well organized. On the other hand eco-tourism such as bird watching has prospered gradually.

Other than that on the Atlantic coast, Loukkos/Larache with the wetland ecosystem at the mouth of the rivers, Sidi Bou Ghabay which plays a role to give the environmental education, Sidi Moussa-Oualidia, in which 2 back-marshes continuously exist side by side along the coastline plays an important role as a transit and wintering spot for migrant birds, have high priority. In addition, Alose (*Alosa alosa, Alosa fallax*), that is confirmed in Loukkos, Sebou, Bouregreg, Oum Rbea, Souss, etc., is sharply decreasing by recent construction of dams and over-fishing.

3-6-2-3 Social Environment

(1) The cultural heritage
On the Atlantic side, there are some places with value for cultural assets like Lukos or Asilah south of Gibraltar, but overall, important cultural assets are fewer than on the Mediterranean side. However, there is a possibility of a sunken boat with cultural value existing between Larache and Tanger, and a possibility of a submarine relic offshore Essaouira.

(2) The development of tourism and other human activities
On the Atlantic coast there are the cities of middle-scale or more such as Rabat, Casablanca, and Agadir. And in the largest plain in Morocco spreading south from Casablanca, agriculture is flourishing. Moreover there is the tourisn development or the collection of sand for construction materials as mentioned below, the rate of utilization of the seaside area is higher than on the Mediterranean side.

Tourism development plan in Tifnit
SONABA (Societe National d'Amenagement de la Baie d'Agadir, an autonomic public corporation to promote the tourism development investment around Agadir established in 1973) is promoting tourism development plans in 5 places (Founty-Palm bay, Tamraght-Taghazout, Tama Ounza, Aghroud, Tifnit). SONOBA possesses the estate of 196 ha including the beach of Tifnit in Souss-Massa national park, and tourism development is planned in that place. Concretely saying, constructing a hotel of 8,000 beds scale and other lodging facilities, high lank residence of 2,000 beds, and a golf course of 60 ha is in the plan. The budget for the development is estimated to be 40 million dollars.

The Sand Collection for Construction materials
The sandy beach or the coastal dunews on the Atlantic coast is the biggest source of sand for construction materials. On the Atlantic coast, sand is taken in large scale especially in the area between Kenitra and

Skirat (an estimation says about 3,000 m^3 per day), and around Oualidia. Some say the total annual amount of the collection is about 500,000 tons.

3-6-3 Present Condition of the Environmental Administration of Morocco

3-6-3-1 The legislation related to environment

(1) The Environment Fundamental Law

The bill for "the Low regarding Protection and Improvement of Environment", which is the first Environment Fundamental Law in Morocco, includes descriptions about "Preservation of the Historical Heritages and Cultural Assets" in article 15, "Control over Dangerous Facilities and Equipment" in article 18, "Conservation of Fauna and Flora" in article 35, "Preservation of Marine Resources" in article 54, "Administration of the Protected Area", in article 62, "Environmental Impact Assessment" in article 81. To enact the Environment Law, committee is supposed to be held 10 times from 1983. As of March in 1997, the committee was held 4 times.

(2) Other legislation related to environmental issues

In addition to the above, many bills concerning environmental administration including the Law on the Protection of Marine Environment and the Law on Environmental Assessment are called "Project (Projet de loi sur ---)" and discussed parallel with each other. The method of discussion about these bills was prescribed as, Secretar General de Government (SGG) first discusses about the original bill which was drawn up by the ministry in charge after coordination with related organizations, then the bill gone through another coordination among all the ministries is introduced into the Diet as a government bill. Thus considerable time is required to establish a law.

As for the Law on the Protection of Marine Environment (Loi sur la Protection de l'Environnement Marin), now the bill is examined, in the National Commission of Law for Protection and Preservation of Marine Environment consisting of the MPM, other related governmental organizations, and experts. The latest draft of this bill was presented in 1990, the contents are mainly about the prevention and countermeasures of marine pollution caused by an accident at sea ,etc. Now it is at the stage of being under discussion in SGG, and it seems to take some more time until the law is enacted.

3-6-3-2 Environmental Assessment

This law has been prepared to enact since the Division of Observation and Study of the Coordination, Study and Observation Bureau (Division de l'observation et des etudes, Direction de l'observation des etudes et de la coordination) of the Ministry of Environment introduced the first bill for environmental impact study into the International Legislative Commission (Commission juriduqe et relations internationles) of the National Environment Council (Conseil National de l'Environnnement) in June of 1995 (Projet de Loi et de Decret sur les Etudes d'Impact sur l'Environnement). The latest draft was presented in October of 1996, the outline is as follows.

1) Preparation up of TOR for environmental impact study should be conducted under the responsibility of the competent authorities of the development plan concerned, in cooperation with the entrepreneur, and with advice of other related organizations

2) For each project, led by the Ministry of Environment, the Examination Committee consisting of the related ministries and agencies, related research institutes, representatives of the residents, etc. is

organized. Roles of this Committee are approval of the Study TOR, judgment over the propriety of the project from the aspect of environmental administration, and giving proposals for improvement of project contents.

3) Though the entrepreneur is responsible for operating the study, as for supervision on the operation (watching if it's operated according to TOR), the competent authorities operates this.

4) The research report contains the following: a) Conclusion; b) Detailed explanation about the contents of the project activities and the development plan; c) Framework of the project operation; d) Present environmental condition on the project site (biological, physical, and social environment); e) Estimation of foreseeable environmental influences, direct and indirect, positive and negative; f) Examination about the method to avoid, modify, and compensate for the environmental influence; g) Monitoring and inspecting program about whether proposals in the conclusion of the impact study was carried out; h) List of the organizations and groups concerning the project.

5) The Ministry of Environment inspects about whether the prescription for the consideration to environment, that is proposed in the conclusion of the study, is properly carried out.

6) To the offender against this law, Government can order a stop of the planned project. It can also order a restoration of the site or a compensation for irreversible damage. However regarding the subject that had been under examination for approval before this law comes into effect, this provision is inapplicable.

7) The sorts of development plans with obligation of environmental impact study, concerning fishing village development, includes "Construction of commercial port", "Sight-seeing development on the coastal area", "Sight-seeing development in farm village or remote village", "Canning factory", "Food processing factory with use of fish flour or fish oil", and other than that "Plan with considerable anxiety rising from the residents in the future", and "Already realized as an environmental matter".

Generally, the preservation of marine environment including the seashore is under the jurisdiction of the MPM. However the port development is under the jurisdiction of MTP, and the maritime security is of the Marine Police belonging to the Ministry of Defense. As for environmental assessment, there is a section in INRH taking charge of environmental assessment, but they have just started their operations. For staff development in recent years the MTP operates the environmental impact studies. But regarding the construction of fishing port, the demarkation is not clear among governmental related organizations, like between the MPMand the MTP. Environmental impact study about the food processing factories seems to be operated.

3-6-3-3 Water Quality Monitoring

INRH is promoting a plan to construct the monitoring centers in 12 spots (5 on the Mediterranean coast, 7 on the Atlantic coast) all over the country.
As for now the Station of Surveillance on Sanitary of Water (Station de surveyrance de solubuite du littoral), that is the predecessor of the above center, is conducting monitoring mainly on bacteriological examinations from the viewpoint of sanitation. About the items of water quality measurement including density of heavy metals, if necessary, they send the sample to the INRH head office for inspection.
On the other hand the Service of Oceanography (Service d'Oceanographie,) of INRH has been carrying out

studies about the scientific researches on possibilities of aquaculture at estuarine areas., and the upwellings on the Atlantic coast.

3-6-3-4 Protected Area Management

Protection of wild life in Morocco is under the jurisdiction of the Division of Hunting, Fishing, Natural Protection (Division de la eliasse, pêche et protection de la nature) of the AEFCS (Administration des eaux et forets) of the Ministry of Agriculture. They put together all the protection policies of important ecosystems all over the country into a shape of "Plan Directuer des Aires Protegees" in 1995. In this document they selected 154 recommended sites for protected status including 5 national parks, 85 reserves with top or second priority, and 61 reserves with third priority.

The AEFCS has a Délégation Regionale des Eaux et Forêt (DREF) in each province, but the protected areas which remain legally in force are still few, the main role of these offices now is afforestation for preservation of the forests and soil.

3-6-3-5 Cultural Assets Management

About 1,500 buildings and spots with some cultural value are confirmed all over the country, of which about 350 is authorized as "Cultural Assets". The cultural assets are classified into 3 types, "Historical Cultural Assets", "Natural Cultural Assets" and "Archeological Cultural Assets". In the coastal area, the relic of Ksar Sghir is the only authorized cultural assets.
The Cultural Assets Bureau (Direction du patrimoine cultural) of the Ministry of Cultural Affairs makes plans and policies for the preservation of cultural assets. Regarding actual preservation activities, the Inspectors of Regional Cultural Assets Conservation (Inspections regionales des monuments historiques et des sites & conservations des sites) are in charge. In each region there is the regional committee with a caidat acting as chairman, and a subcommittee about preservation of the regional cultural assets is held if necessary. In addition, of the most important cultural assets, rangers are stationed to clean and patrol, but mainly because of small budget etc. this is not adequately done.

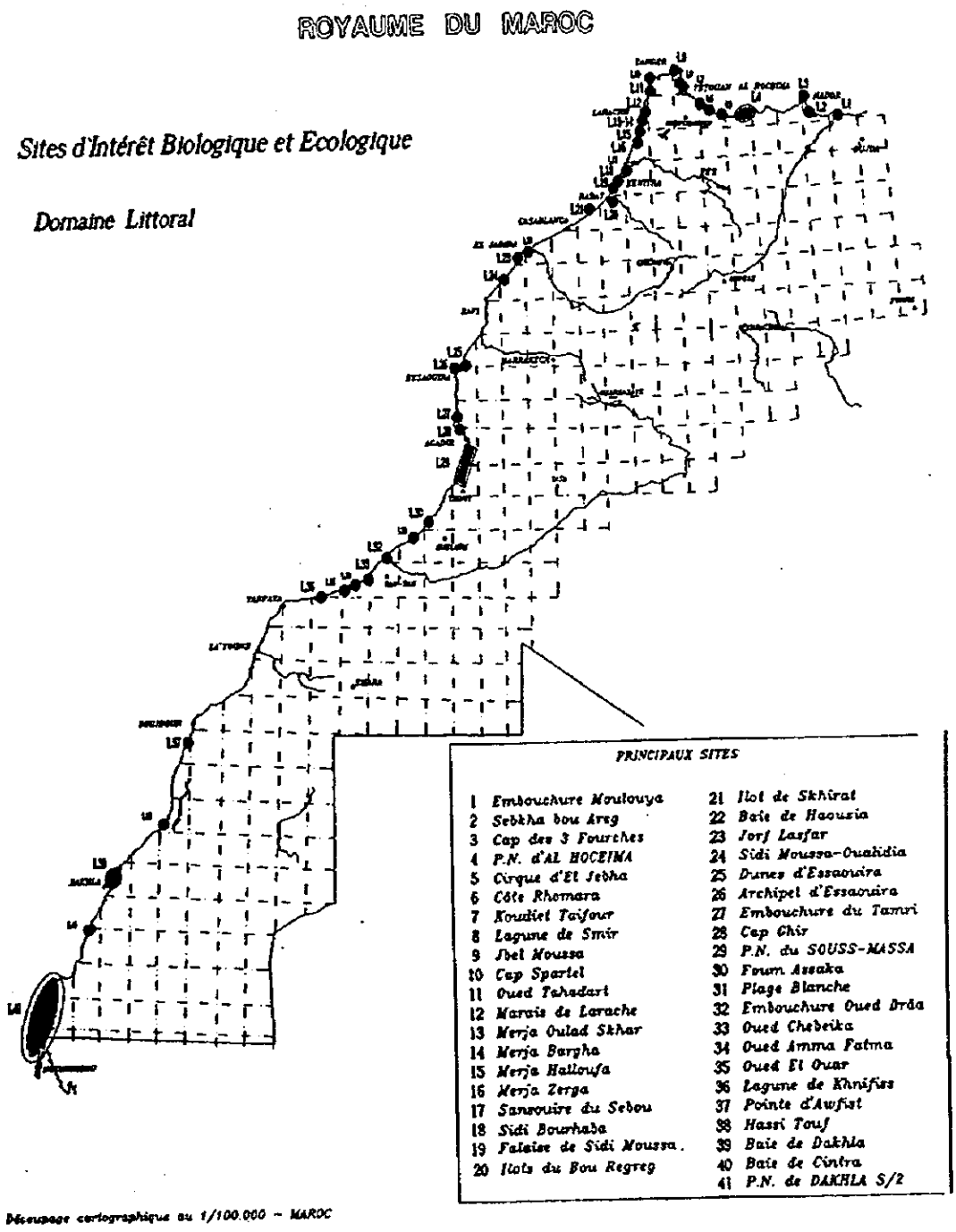
3-6-3-6 Tourism Development

Government of Morocco considers the seaside area as an important sight-seeing resource. Especially on the Mediterranean coast, the development strategy is to disperse into many small-scale touristic sites rather than focusing on a few large-scale sites, and development with making good use of the local characteristics is oriented. Fishing villages and fishing ports are also regarded as "tourism resources" (cf. table 3-6-2). Tifnit is thought to be an example of the above. And the importance of the tourism sector as an alternative way to earn income for fishermen is also realized.

3-6-3-7 Environmental NGO in Morocco

Now domestic NGOs are said to be about 17,000. But of those, NGOs dealing with environmental matters only about 50. Moreover only 2 were confirmed which engage in activity related to marine environment, and these did not appear to act very powerfully.

Figure 3-6-1 Biologically / Ecologically Important Areas in Littoral Zone of Morocco



Soucrce: Plan Directure des Aires Protegees, Vol.3: Les Sites d'Interet Biologique et Ecologique du Domaine Littoral

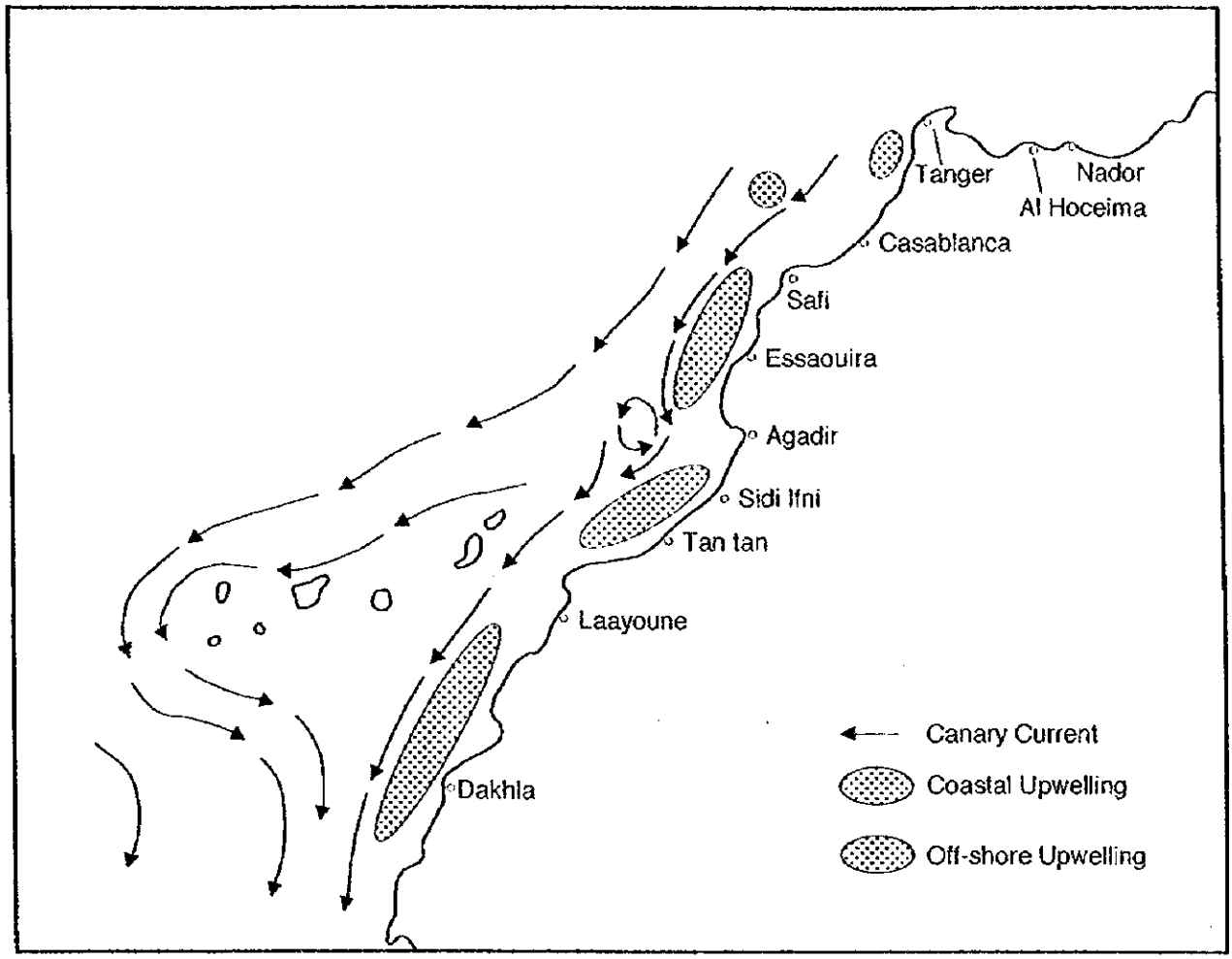


Fig. 3-6-2 Current and Upwelling in the Atlantic Ocean

Table 3.6.1 Biologically / Ecologically Important Areas in Littoral Zone of Morroco

No.	Priority	Title	Region
L 1	1	Embouchure Moulouya	Saydia
L 2	2	Sebkha bou Areg	Nador
L 3	2	Cap des 3 fourches	Nador
L 4	1	**P.N. Al Hoceima**	**Al Hoceima**
L 9	1	Jbel Moussa	Tetouan
L 11	2	Oued Tahadart	Tanger
L 12	1	Marais de Larache	Larache
L 13	2	Merja Oulad Skhar	Larache
L 14	2	Merja Barrha	Larache
L 15	2	Merja Halloufa	Souk el Arba du Gharb
L 16	1	**Merja Zerga**	**Souk el Arba du Gharb**
L 18	1	Sidi Bourhaba	Rabat
L 19	2	Falaise de Sidi Moussa	Rabat
L 20	2	Ilots de Bou Regreg	RAbat
L 21	2	Ilots de Skhirrat	Mohammedia
L 23	2	Jorf Lasfar	El Jadida
L 24	1	Sidi Moussa-Oualidia	El Jadida/Sidi Smaine Oualidia
L 25	1	Dunes d'Essaouira	Essaouira
L 26	1	Archipel d'Essaouira	Essaouira
L 27	1	Embouchure du Tamri	Taghazout
L 28	2	Cap Ghir	Taghazout
L 29	1	**P.N. Souss-Massa**	**Agadir**
L 30	1	Foum Assaka	Sidi Ifni
L 32	2	Embouchure Oued Draa	Cap Draa/Tan tan
L 33	2	Oued Chebeika	Wad Wa'ar/Tan tan
L 36	1	Lagune de Khnifiss	Foum Agoutir/Tarfaya
L 37	2	Pointe d'Awifist	Awfist
L 39	1	Baie de Dakhla	AD-Dakhla
L 41	1	P.N. Dakhla S/2	Sebkha Lahdartwil

Note:
L1-L11: Mediterranean side
L12-L41: Atlantic side, in which L12-L29 are included in the study area

Table 3.6.2 High Potential Areas for Tourism in the Coastal Area of Morocco

Province	Areas
Meditteranean	
Tanger	Ksar Sghir, Oued Ledian, Plage Tandafel, Malabata, Cap Spartel, Sidi Kankouch, Asilah
Tetouan	Oued Laou, Plage Martil, Cabo Negro, Mdiq, Plage Restinga Smir, Beni Younech, Cires, Plage Ras-Rmel
Chefchaouen	Crique Abdelkarim El Khatabi, Plage Jebha, Stihat, Plage Kaa Asras, Source Ras El Ma, Plage Bourgada Targa
Nador	Kariat Arkmane, Miami Plage, Cordon Laguaire, Sebkha Bou Areg, Cap des Trois Fourches, Plage Tizighine, Embouchure Oued Moulaya, Ras El Ma (Cap de l'Eau), Plage Point Negri
Oujda	Plage de Saidia
Atlantic	
Casabranca	Plage Zenata, Plage dar Bouazza, Plage Oulad Abou, Plage Tamaris, Foret de Bouskoura, Foret Sidi Maarouf
El Jadida	Plage Haouzia, Plage Sidi Bouzid, Plage Moulay Abdellah, Oualidia, Azemmour
Safi	Plage Ras Beddouza, Plage Lalla Fatna, Plage Jorf Lihoudi, **Plage Souira Kedima**
Essaouira	Plage Sidi Abdeljalil, Plage Sidi Kaouki, **Tafedna**, Plage Timzghida
Agadir	Aghroud, Tamraht, Taghazout, Tama ou Anza, **Tifnite**, Oued Massa
Tiznit	Plage Mirleft Aglou, Plage Sidi Mohamed Ben Abdellah, Village Fortifie Agdir N'Targant

Main Scarce Species Living on the Coast of Morocco (Species Verging on Extermination)

Slender-billed curlew (*Numenius tenuirostris*)

A species seen comparatively generally in 19th century Europe, in recent years they are said to be breeding in Russia but that is not confirmed accurately. The population is estimated probably 50 to 70. They are known to come south to Morocco for wintering, but confirmed only in Merja-Zerga now. However that number is decreasing year by year, only one population was confirmed last year. To conserve this bird there is an international memorandum (Memorandum of Understanding Concerning Conservation Measures for the Slender-billed Curlew, Numenius tenuirostris, 1994), Morocco also participates in this. In this memorandum a domestic concrete action plan is specified, which suggests their habitats like Merja Zerga should be preserved or so, but in fact, short of talent and money the activity is stagnant.

Bold ibis (*Geronticus eremita*)

At the beginning of this century, even in Morocco, their living was confirmed in 40 spots, but now they are only seen in Souss-Massa national park and Tamri. Now a population of about 250 is confirmed, about 2 thirds of that are in Souss-Massa. Their main prey is a small insect, the steppe vegetation and the traditional farm in this area is their main preying place. Their breeding season is from February to June, they nest on the seaside cliff north of Sidi Moussa. Their nesting was watched in more larger area before, now only 3 spots was confirmed as their nesting place. From the research conducted by AEFCSand Bird Life International, for these a few years in spite of reproduction being done, their population hasn't increased at all. In Turkey, artificial reproduction is promoted, but there is no record yet that the one reproduced artificially goes back to nature and reproduces again. Influences on their breeding season from tourists and fishermen are thought to affects their progress of reproduction a lot. Other than that, influence of agricultural chemicals, capture by hunting, etc. are thought to be causes for stopped increase in their population. Their preying place are broaden to Tifnit.

Alose (*Alosa alosa; Alosa fallax*)

Between 2 sorts of Alose, *Alosa alosa* (grand alose) grows 80 cm in maximum length, about 3 to 4 kg in weight. *A. fallax* (petit alose) is 50 cm in length, 1.5 to 2.0 kg in weight approximately. They go up the river for reproduction, which is confirmed in Moulouya, Loukkos, Sebou, Bouregreg, Oum Rbea, and Souss. 3 or 4-year-old matured ones go up, in the case of Grand alose they start in November and continue till June. Petit aloses usually live near the bank, start going up later, in February. April and May is their peak of going up. Males are earlier in start, and matured one is earlier than young one. The catch is much in Casablanca, and Essaouia, but annual yield is peaked at 216 tons in 1981, decreased since then. It was 11 tons in 1991, and only 7 tons in '92. Since 1994 2-year closed season was enforced, and this was extended for 2 years in 1996. Freshwater zone is also enforced as closed area by the Ministry of Agriculture.

CHAPTER 4

CHAPTER 4 MASTER PLAN

4-1 Approach

4-1-1 Introduction

1) Present Condition of Artisanal Fisheries Development

As mentioned, Morocco's artisanal fishery is one sub-sector of the fishery sector. It operates from landing sites at about 120 locations nationwide and is very artisanal in terms of boats and fishing gear. Among the landing sites, very few sites have a basic fishing port infrastructure in place. Notwithstanding the small scale of its operations and lack of an infrastructure, however, it never has fewer than 6,900 fishing vessels in operation, and its socio-economic impact is not exceeded by the offshore and coastal fishing sectors.

Assuming that there are 4 fishermen who make their livings aboard each of the 6,900 small fishing vessels, which comes to a total of about 28,000 persons. Among non-seafaring members of the trade, most of whom are youths and elderly people, are: dock helpers, ship maintenance crews, janitorial workers and transport workers, the total number of which is presumed to be about the same as that of the seafaring members. Moreover, counting such tradesmen as brokers, tackle and bait dealers, ship's carpenters, the employees of restaurants that cater to fishermen and those residing in fishing communities, the total easily exceeds 100,000 persons. Thus, the number of persons from such groups accounts for more than 1/3 of that number. Including families, it may be seen that somewhere between 300,000 to 400,000 persons depend on the fishing industry as a means of earning their livelihood.

The importance of the artisanal fishing industry may also be seen from its production level. Estimated figures of monetary production presented earlier in 3-1-1 show its total production rivals that of the coastal fishing sector excluding production from pelagic fish such as sardines. The catch of the artisanal fishery includes such regular items as spiny lobsters, high value bottom fish, octopus and squid, a high percentage of which is exported to markets overseas. While the average volume of the catch may be low in absolute terms, the total sale is relatively high, which accounts for the importance of this industry.

Just as in many other countries, the balanced industrial development in the whole country is a most important element of the national development. At present the agricultural sector, Morocco's strongest financial pillar, is experiencing instability due to droughts and other reasons. This, added to the fact that Morocco is behind in developing its rural areas, bringing the artisanal fishing industry to center stage as a prospective source of income and employment.

However, it would be an exaggeration to say that the Moroccan government has given adequate consideration to the artisanal fishing industry. Since the 1970's, the Moroccan government has lent strong support to the development of modern port facilities, full-scale development of the off-shore fishing sector by use of large-scale fishing vessels, and the training of Moroccan shipboard personnel. This joint effort of the government and the private sector, which focused on the offshore fishing sector, bore fruit and gradually raised production levels. The fact remains, however, that the traditional artisanal fishing industry, which relied on small wooden boats, was not an area of official concern and was thus excluded from development efforts. Of course, popularization of outboard engines and overseas shipments brought advances to the artisanal fishing industry form within, but this was not the result of any planned development effort by the central government.

In recent years, the government has shown a great interest in the artisanal fishing industry. This interest developed as a result of the widening economic gap between cities, towns and rural villages; with its attendant serious problems, such as population shifts from rural to urban areas and widespread unemployment among Morocco's youth. Bringing increased income opportunities to a broad segment of the rural population by agricultural development would not be an easy task --- especially in a marginal area dependent on rain water. Thus, despite its backward "traditional" aspects, the artisanal fishing industry, which was part of the agricultural sector and could yield substantial income with low investment, had suddenly become the center of attention.

2) Master Plan for Development of the Artisanal Fishing Industry

Despite such conditions, a "Master Plan" for development of Morocco's artisanal fishing industry, i.e., a futuristic vision and realistic process for its development, was not well discussed. Why is this the case?. In other words, multiple points of view are needed to provide a sense of direction for the artisanal fishery development.

Moreover, development of the artisanal fishing industry is easier said than done. There are wide regional differences to be considered and all villages cannot be treated in the same way, making this a complex problem. While government research is now in progress to determine current conditions in the artisanal fishing industry, a program for development has not been fully and clearly outlined. It must also be noted that the government's objectives, and the extent to which they may be achieved, have not been clearly stated.

The purpose of this chapter is to present a Master Plan for development of the artisanal fishing industry. As the major premise of the plan, research on current conditions surrounding the industry, the potential for its development, and any restrictions is needed. There is no guarantee that development of the artisanal fishing industry will go smoothly as prospected. In fact, it is anticipated that various problems and risks will be involved. In this regard, problems with no ready solutions and problems beyond the scope of this study will also be addressed in the Master Plan. A realistic planning process must be based on a clear grasp of the problems involved. This will be the point of departure for the formation of a Master Plan and for this chapter, as well.

Focusing on a variety of fields, this study brought the following problem areas in sharp relief.

(1) Depletion of off shore resources (in the Mediterranean and Atlantic)
(2) Inefficient fishing technology
(3) Necessity of sustainable development
(4) Lack of infrastructure for the fishing industry as a whole
(5) Lack of distribution networks
(6) Lack of fishermen's groups
(7) Fragility of the fishing village's economic base
(8) Difficulty of enforcement of the law

The areas listed above represent problems that must be solved urgently for the development of a artisanal fishing village. These areas are intertwined in a complex manner. After presentation of the Master Plan in this chapter, the above areas are addressed and the reform strategy was designated. In addition; to coordinate reform plans, the PCM method was used as an approach to formulate the Master Plan.

3) The Artisanal Fishing Industry: Goals for Development

Based on current socio-economic conditions in Morocco, official goals for development of the artisanal fishing industry might be framed in the following areas:

(1) Poverty Alleviation Programs: Reduction of poverty in rural villages by increasing the income level of fishermen and developing new employment opportunities in fishing villages

(2) Regional Development: Use of sustainable development programs of the artisanal fishing villages, as a catalyst for continuous development of the region.

(3) Measures to combat social problems: to solve such social problems as illegal trade, it will be necessary to reduce the alleged involvement of artisanal fishermen.

(4) Creating a Fishing Village Culture: Creating the elements of a fishing village sub-culture will enrich Morocco's cultural diversity in many ways, and the economic benefits resulting from it are not to be ignored

The first two areas are the most important and are part of Morocco's national plan for development. The third is urgent in nature, but is restricted to applicable regions of the country. The fourth area represents a long-term development goal.

Regardless of the goal, just to fight poverty or develop rural areas, increasing the income level, not just for the artisanal fishing industry as a whole, but for the fishermen themselves; and expanding employment possibilities for residents of the rural villages are the fundamental steps that must be taken. In this regard, the important point to be noted is that a policy to increase the actual number of fishermen relying on limited coastal marine resources should not be implemented; but, rather, by developing policies to increase the income level of those already in the fishing industry, services will be generated to areas beyond the conventional fishing industry in the area, which will inevitably lead to the creation of new jobs. Improvement of fishing technology that requires training of fishermen can have a similar economic impact. The section to follow examines the possibilities and implications of policies designed to increase marine production in Morocco's artisanal villages, one by one.

While an increase of marine production is one way of increasing the income of fishermen and the level of employment in fishing villages, the most effective way is the simultaneous achievement of such a production increase with an increase of fish prices and reduction of the production cost. The development of fishing port infrastructure and the introduction of larger fishing vessels will constitute concrete measures to improve the fishing productivity as they will lengthen the period of operation together with expansion of the geographical scope of fishing.

Also considered are measures to increase the fishermen's income that go beyond a mere increase in marine production capacity, such as raising prices by increasing demand, and improving the distribution system. Even lowering the cost of production will have the effect of increasing the fishermen's income. These topics are to be examined in Section 3.

In one sense, promoting development of the artisanal fishing industry does not just concern the industry itself, but concerns improving the socio-economic environment in which that industry exists. Thus, creation of favorable conditions is another approach that may be taken. Programs to generate alternative income for fishermen, to develop allied industries, to install a social services infrastructure for the villages, provide systematic financial support and to create fishermen's groups are examples of ways to improve

socio-economic conditions. Section 4-1-4 will examine this approach in detail.

4) The Development of Morocco's Artisanal Fishing Industry and Regional Development

The development of Morocco's artisanal fishing industry should not merely focus on increasing production, but should relate to the village as one "link in the chain" of regional development. In many remote areas, there is no industry other than that represented by the local fishing village. In many instances in areas with no irrigation facilities, the agricultural production capacity is generally quite low, and the artisanal fishing industry represents the only means of producing a cash income. Quite naturally, those who live is such regions have high hopes regarding development of the artisanal fishing industry.

The advantage of developing the artisanal fishing industry will go far beyond the scope of the industry itself. For example, it will be entirely possible for coastal fishing vessels to use facilities designed as artisanal fishing ports as refugee ports or as alternate ports for landing. The facilities will have a positive impact on the economic activities of allied industries, such as tourism, and may create a supplemental source of income for women, as well. Moreover, development of an infrastructure for the artisanal fishing industry will entail the concurrent development of such things as roads, power facilities, water supply, schools and public health facilities, making a substantial contribution to the development of programs designed to meet basic human needs. As one example, additional components of the Imessouane Project, supported by Japanese grant aid, are digging wells and developing water supply facilities.

The Mediterranean coast of Morocco is said to be an area of illegal trade with Europe. Though the Moroccan government has made substantial effort to solve this problem, this is not a problem that can easily be solved. The keynote of our proposed measures is that, as fishing villages become economically independent, the number of fishermen said to be participating in the Marijuana trafficking is expected to decrease.

This is one example of how development of the artisanal fishing industry is a link in the chain of regional development.

Although Morocco is surrounded by the sea and rich in marine resources, historically speaking, a traditional "fishing village" culture has rarely been seen. The level of seafood consumption in the country is quite low and variety of marine food processing is small. Communities on the Atlantic coast are quite noticeably atypical of an actual "fishing village", in marked contrast to the traditional fishing villages on the Mediterranean side. For example, while there were few people living in the fishing village of Tafedna 5 years ago, a village infrastructure has recently sprung up and Tafedna is coming to be known as a center of the greater Tafedna area. From a long range point of view, it is felt that, if such settled communities spring up around the country, a new "fishing village culture" will enhance the diversity of Moroccan culture. Popularization of seafood in Morocco should have a close link with such a fishing village culture.

4-1-2 Increasing Fishing Production

1) Requirements for Increasing Catch

In general, such things as expanding the area of fishing grounds, increasing hours of operation for fishing vessels, improving fishing technology and achieving effective resource management are required to increase fishery production.

As far as expanding the fishing area is concerned, this study has shown there are hardly any available fishing grounds that are not already being fished by Morocco's artisanal fishing boats, and it has been concluded there is little room for expansion. As opposed to this, approaches considered most effective are

increasing hours of operation and improving fishing technology, thereby increasing the effectiveness of fishing operations. It is through development of a fishing port infrastructure that these methods will come into play. In this section, these issues are discussed in detail.

2) Infrastructure Development

The development of fishing port infrastructure will speed up fishing preparation and fish landing activities, resulting in not only an increase of the daily hours of operation but also an increase of the annual days of operation as safe anchorage during the stormy winter season and fishing activities immediately before and after stormy days will become possible.

How should we proceed in developing artisanal fishing port infrastructures for Morocco. Firstly, a National Fishing Port Committee, chaired by the Secretary of MPM and also represented by such organizations as MTP, the Department of Transportation, and ONP, should be created immediately. As a sounding board for the Master Plan proposed by this report, the Committee shall develop a plan for a nationwide fishing port infrastructure, which shall include plans for nationwide fishing port infrastructure. All points to be considered in developing policies with reference to both infrastructures have been included in Section 4-1-6, under the heading "Activity Plans".

3) Improving Fishing Technology

Improved fishing technology can be a contributing factor in increasing marine production. Introduction of technology such as fish finders and GPS can improve efficiency of the fishing operation. In fact, artisanal fishermen have a keen interest in the equipment needed to implement these techniques and methods, rather than upscaling their vessels. Since depth must be ascertained in using bottom long line fishing, fishermen are especially aware of the usefulness of fish finders in locating schools of fish. We believe that introduction of fish finders and GPS can bring several percentage of increase in fishing production. Moreover, in areas which do not have a rich tradition of artisanal fishing, such as those areas along the Atlantic coast, the installation of advanced equipment, reformed fishing systems and maximal use of varied fishing methods will be special assets in increasing fishing production.

4) Proper Resource Management

Finally, let us consider the impact of proper resource management on increased fish production. By and large, artisanal fishermen have not reported a depletion of resources in the coastal waters they fish. For the women harvesting shellfish in the lagoon of Moulay Bousellham, there is a common feeling that resources are starting to be depleted. However, such feeling among Morocco's artisanal fishermen is still unpopular.

Nonetheless, the idea of developing the artisanal fishing industry with no regard for the status of natural resources is unfeasible. The reason for caution is, as mentioned earlier; even if the number of artisanal fishermen is stabilized, creation of an infrastructure and introduction of advanced equipment will inevitably increase the fishing effort. In fact, reports of decreasing resources are already being heard among small-scale coastal fishermen with long lines. Along the Mediterranean coast, moreover, the volume of catches appears to have peaked, suggesting that the fishing is at around the MSY level, making proper resource management all the more important.

We also feel that the total number of artisanal fishing vessels should be strictly regulated on a countrywide basis, and care must be taken to avoid overinvestment in this sector. Moreover, as a specific fish production reform measure, the artisanal fishing industry should be subjected to a government

resource management program based on a workable basic resource management system.

5) Risks and Merits of Increased Fishery Production

Even if the aforementioned policies are implemented, the expected increases in income and employment could be precluded, due to complications resulting from outside factors. An especially thorny problem would result if the is done mainly for infrastructure only. This would result in the imposition of restrictions on development, due to uncertainty concerning resources and problems arising in the areas of finance, distribution and institutional management.

As another example, even if plans for an infrastructure proceed as expected, if financial resources are not available to artisanal fishermen, the capital expected for facilities development will not be forthcoming; and, if fishermen's organizations do not arise spontaneously, it is possible that maintenance of facilities or sanitation can be problems. Moreover, it is also quite possible that the infrastructure will not only increase the fishing effort of the existing fishermen who rely on it, but will have an after-effect of attracting new entities resulting in depletion of natural marine resources.

Another point to be considered is that fishing has always been a "seasonal" occupation. As a result, many fishermen relying on it as sole source of income have found it hard having steady income to meet their cost of living. This situation may continue to exist, even if the income level of fishermen is raised. This issue is closely related to the difference of fishery income and household income.

What are fishermen doing to reduce the instability of income? This varies from one region to the other. In Tiglet, for example, the fishermen fish from April to October. For the rest of the year, they are engaged in wheat farming and the tending of livestock. Fishermen in Souira Kedima seek waged labour in Safi or Casablanca during the off-season. If they are unsuccessful in finding temporary work, they rely solely on income earned from fishing during the summer. Many fishermen in Tafedna are engaged in small-scale farming and the domestic production of Algan oil throughout the year, accounting for some 10% of the annual fishing household income, while being actively involved in fishing during the peak fishing season from May to October. In any event, to secure a stable family income, it is necessary to create opportunity for women to get income and/or promote "cottage industry" type enterprises, such as marine food processing.

In conclusion, infrastructural development has limited impact on the general need for the development. Thus, a comprehensive approach must be taken, which includes consideration for socio-economic and institutional needs.

4-1-3 Raising Prices and Lowering Production Costs

1) Raising the Price of Fish

Efforts to meet consumer needs are required to boost the consumer demand for fish with a view to achieving an increase of fish prices. The preservation of freshness is the first item on the agenda for such efforts. At present, a large part of the catch of artisanal fisheries is exported to Europe and the fish is packed in ice by middlemen as soon as it is sold by fishermen to middlemen. As a result, freshness appears to be reasonably preserved. The simple refrigeration facilities owned by middlemen, however, are of rather crude construction with a poor thermal insulation performance and do not appear to be particularly hygienic. Moreover, it may not be possible for ordinary fishermen to use these facilities for the temporary storage of fish before its sale. As refrigeration facilities can benefit many fishermen with small capital investment, such facilities should be urgently constructed nationwide together with the improvement of auction halls. Given the eagerness of the private sector to invest in ice-making facilities

and refrigeration facilities, it is necessary to carefully examine whether the government or the private sector should be vested with the priority role of constructing these facilities.

Increasing the volume of exports is generally a goal of exporters in Agadir and Casablanca. While there are no problems anticipated in leaving exports to the private sector, government support is sought in such areas as the observance of international sanitation standards. The government has long shown interest in developing the domestic market by means of encouraging the public to eat more seafood which is the second item on the agenda to achieve an increase of fish prices. In the area of domestic consumption, there are two points that are apt to be overlooked, as follows: Firstly, when it comes to increasing seafood production, the significance of the fact that true "fishing village" communities are rare in Morocco is scarcely understood. This point will be dealt with separately in a later section. Secondly, it should be understood that the seafood consumption of vacationers during the summer season (not just foreign visitors, but including many Moroccans) is a substantial source of income for the fishing villages they visit; and, thus, through joint development of the artisanal fishing industry, great economic benefits can be expected. A joint infrastructure for the artisanal fishing and tourist industries is an essential theme for development.

Some argue that in order to raise the prices of fish to an appropriate level, the socio-economic system that subordinates fishermen to middlemen will need to be reformed. Even many fishermen are of the strong opinion that the buying prices offered by middlemen are distorted by their conferences and are thus unfairly low. However, the middlemen say this is not the case and flatly reject the idea, suggesting that the prices are set by competition between middlemen.

As the production scale and historical background vary from one village to another, it is difficult to apply uniform measures for all villages. For example, at the village-owned fish market in Souira Kedima, the auction is entrusted to the private sector and some 10 middlemen are invited to participate in the auction. The successful bid prices continuously fluctuate at this market, suggesting the working of competitive bidding. In Tafedna, however, there is no auction and seven middlemen buy fish at the same prices. Fishermen in Tafedna believe that the opening of a fish market for competitive auction is the most important measure to achieve an increase of fish prices.

2) Decreasing Production Costs

Management costs for the artisanal fishing industry may be divided into labor, materiel, and capital, and risk. Since there is an abundant influx of labor from local agricultural villages cost should be considered as negligible.

The relatively high prices of such things as fuel, fishing gear, supplies and bait, which is due to the logistical problems of fishing villages, has been the source of many complaints. For the fisherman of Tafedna, poor access roads have been a great hindrance, not only in the purchase of supplies, but also with respect to the sale of fish. The problem regarding fuel is that while all coastal fishing vessels can purchase fuel tax-free, only a small number of vessels engaged in artisanal fisheries can enjoy this advantage. The fuel cost gap between different types of fishing vessels has adverse impacts on fish prices and the income of fishermen. Apart from the problem of fuel, the material cost does not constitute a serious problem for the production cost.

The capital cost is yet another problem area. As will be explained later; since any credit system does not normally cover the artisanal fishing industry, capital cost is extremely high for this sector. Even if they want to invest in such things as shipbuilding and fish search equipment, they do not have the means to prepare the money. They either have to receive loans from middlemen at substantial interest rates, or give

up altogether. If systems such as fishermen's credit targeting fishermen's groups or micro-credit systems for women residing in fishing villages were developed, it should be possible to reduce this cost.

For the artisanal industry, unexpected damage of a serious nature include accidents at sea and fishing gear damage caused by large-scale fishing boats. Even if a financial cash flow is normally sound, one accident of this nature can mean the loss of everything. Surprisingly, such accidents are common in every fishing village. Especially disastrous are sea accidents involving loss of life, bringing unimaginable hardship to the fisherman's surviving family members. Our study has suggested that occupational risks of this nature account for a major portion of their cost. (Moreover, whether the government can regulate the increase of artisanal fishing boats is a mid-long term risk to the industry.

To reduce the risk of accidents, it is felt that setting up navigation signs, small beacons and marine radio facilities is the most effective way of making operations safe. Moreover, damage to fishing gear resulting from the illegal operations of coastal trollers are being reported in various regions; and, the economic impact of solution to this problem can be great.

4-1-4 The artisanal Fishing Industry: Reforming the Socio-economic Foundations

The development strategies recommended up to now have not had the artisanal fishing industry as their central object. There is another approach that reforming the socio-economic foundations, or environment, of the industry will create positive conditions for development.

1) Securing an Alternative Income for the Fisherman's Family

For the families of artisanal fishermen, increasing the amount of their non-fishery income (income from employment outside fishery) is not just a matter of increasing household income, but also a very important matter of supplementing their seasonal, unstable fishing income. A group of fishermen's wives in Tafedna, who are engaged in the production of Algan oil, was introduced in Section 4-9. In addition, there is a women's association in the Targha area of Kaa Srass, which is sponsored by the Canadian NGO. Some of its members are engaged in a weaving project. Most of these women are widows of fishermen's wives. In four days of time, they are able to earn 100 DH, which comprises a substantial portion of the family budget. Potential of contribution to family budgets from cash incomes produced by women in small industries (such as tourism and cottage industry type seafood processing) is worth a serious consideration.

2) Reinforcement of Related Industries

The artisanal fishing industry can also be directly promoted by the reinforcement of the related industries comprising its base, such as shipbuilding, fishing gear manufacturing, marine products processing and marine products distribution. The basic premise on which this concept is based is that a balance must be struck between those industries comprising the "non-port" infrastructure, such as highways, water supply, electrical power facilities and telecommunications. In this regard, the subject of how private investment capital can be raised is another problem that must be considered, in view of the various systems available.

3) Developing a Social Services Infrastructure

A policy of developing a social service infrastructure including such things as roads, water supply facilities, electrical power facilities, schools and public health facilities for fishing villages can be well justified solely in terms of the many residents to be served thereby; not to mention the tremendous economic boost it can give to the artisanal fishing industry.

In this connection, a solution to the housing problem of fishermen is an especially important topic when it comes to the subject of development. As mentioned, ports on the Atlantic coast were not initially residential areas for fishermen. In recent years, however; with the rapid development of the artisanal fishing industry, the number of fishermen wanting to relocate to the port areas has significantly increased. Even at the PCM of Souira Kedima, fishermen have shown a clear intent to become permanent residents. There is a large number of fishermen willing to pay as much as 25% down payment on a 2 bedroom private home in the 100,000 DH price range. This is just one example, to be sure. However, it seems the development of Morocco's artisanal fishing industry up to the present time has, in fact, been directly linked to fishing port development. Thus, if the focus of fishing village development were not similarly linked to development of the artisanal fishing industry, such development would be out of step with the times.

4) Provision of Financial Services

Plans must be made at once for the reinforcement of financial services designed to meet the needs of artisanal fishermen. As mentioned earlier, artisanal fishermen have an extreme need for investment capital. Notwithstanding the fact that they are enjoying a steady cash flow; not only investment services; but, also, savings account services have been ignored to point where the situation has gotten out of control.

We found only 30 cases of financing being currently available for the purchase of artisanal fishing boats via the bank we investigated, which was the Essaouira branch of CNCA (Caisse Nationale du Credit Agricole), an agricultural trust bank. If a fisherman has an surplus capital; there is a tendency that as a "farmer", he'll probably invest in livestock; and, as a fisherman, he'll probably invest in fishing gear. While it is true that fishermen are not well acquainted with financial institutions, it cannot be denied that the institutions themselves have not made enough effort to receive their business. Services must be sought out that meet the needs of the artisanal fishing industry, such as "micro-credit" and mobile banking.

5) Systems Support

There are no financial support programs for the development of artisanal fishing villages, such as programs designed to include artisanal fishermen in the social-insurance program, grants and tax counseling. Even within the fishing industry, one finds that coastal fishermen are included in the social-insurance program. However, artisanal fishermen are not considered to be covered by this insurance, and have thus concentrated their hopes on this program. While there are indications that there would be technical problems in including artisanal fishermen, this is not felt to be an unsolvable problem. On the contrary, it seems the major cause of the problem is a lack of clear political directives. The registration of artisanal fishermen and the issue of including them in the social-insurance system, problems which developed in the wake of restrictions on the total number of artisanal fishing vessels, are important areas of consideration which makes the current research all the more valuable.

6) Fostering the Growth of Fishermen's Organizations

Since there is no history of cooperation between fishing villages, and educational standards are noticeably low, it is difficult to develop fishermen's associations. In particular; since many villages on the Atlantic coast do not function as "communities", regional consciousness is also low and it will take time to develop a "self-governing" social system. Nevertheless, we feel that "haste makes waste" and we should proceed with caution. Actually, FAO and ONP began moving toward the development of fishermen's cooperatives in the 1980's; but, since there was little chance of success at the time, the programs were shelved. In addition, with German support, fishing cooperatives have been created. Through these "co-ops", 9 fishermen are exercising joint control over 4 fishing vessels. In reality, this situation does not appear to be much different from a case in which a private shipowner creates a "dummy" association in order to gain access to free grant money. However, there is another side to the story, as when young

fishermen in Kaa Srass (on the Mediterranean side) were forming mutual self-help fishermen's groups to deal with maritime disasters. It is thus felt that the so-called "dummy" co-ops may be the first step toward a future generation of genuine fishermen.

Moreover; via the PCM, it has become clear that the fishermen of Sidi Hsaine have a strong sense of solidarity --- something fishermen's associations are generally lacking. This exposes the view that Morocco's fishermen cannot be organized as a false concept. However, while some fishing villages have reached the point in their historical development wherein associations might be feasible, others have not yet reached that stage in their social evolution.

Basic social training programs offered continuously over the next 2 to 3 years in such areas as literacy education, daily operations, personal finance, community cleaning and leadership training will produce responsible local leadership. We should be patient in waiting for this result. If Morocco quickly moves toward the creation of fishermen's cooperatives while in a state of social unpreparedness, it is feared that the cooperatives will either be disbanded or become the objects of private gain. Even from the perspective of managing facilities and capital resource development, excessive expectations are a dangerous thing. In so far as possible, the fishing sector should reach a stage of being independently managed by the fishermen themselves. Some villages will produce outstanding leaders through their social training programs, develop a sense of solidarity and quickly mature to the point of being able to support substantial operations. On the other hand, it must be expected that other villages will never be able to achieve such results.

4-1-5 Problems of Government Policy

This section will discuss a variety of subjects which must be carefully analyzed for the successful development of the artisanal fishing industry in Morocco. Incomplete knowledge of these subjects could throw the development process off course.

1) Whose income is to be increased?

The first question to be examined when referring to "an increase of income in fishing villages through the development of artisanal fisheries" is whose income should be increased. Should it be the income of existing fishermen or should it be the total income of a fishing village, including that of villagers other than fishermen? While it should ideally be an increase of the income of both groups, things are not so simple.

We believe that, if the number of artisanal fishing vessels is increased beyond its current level, there will be a strain on marine resources. There will also be excessive "macro-investment" and the net profit produced by the artisanal fishing industry can only be decreased. On the contrary, it would be far better to let the artisanal fishing industry remain at its current level as an industry of growing profits; and to let it distribute the profits earned at that level, through dynamic production and service industries, to the poor of Morocco's agricultural sector. To indemnify artisanal fishermen for losses incurred due to restrictions on the number of vessels, a tax might be levied in the form of a fee for commercial fishing licenses and the revenues raised thereby might be redistributed to artisanal fishermen.

Of course, even employment opportunities would not be limited to the fishing population, but increased opportunities would be made available to all those working within the fishing industry. According to the timetable of the Moroccan government, the number of persons employed in the fishing industry in land-based occupations is to be increased from its current level of 300,000 to 400,000 by the year 2000. Even

if the total number of artisanal fishing vessels is made subject to restriction in the near future; supposing that the number of fishing vessels will have increased by nearly 10,000 by the time sanctions are imposed, almost 50,000 new jobs will be created for crew members, land support personnel, middlemen, etc. Thus, nearly half the government's target will have been met by new workers in the artisanal fishing industry alone. If sectors producing strong supplementary revenues, such as the restaurant and tourist industries, continue to exhibit a strong performance, an even greater percentage of the target should be met by the artisanal fishing industry.

2) Who are the artisanal fishermen?

As explained earlier, artisanal fishermen are not merely those fishermen who work in the vicinity of artisanal fishing villages. Artisanal fishermen may also be active in areas with large-scale fishing ports. However, these two groups of artisanal fishermen not of a completely separate existence. For example; when the fishing season arrives, many of the fishermen of Essaouira disperse themselves among local villages and conduct fishing operations in the vicinity of those villages. In fact, it is said that as many as 150 of the 300 fishing vessels usually moored at the Port of Essaouira are essentially "transient" vessels.

Morocco's artisanal fishermen, whether they are based at large fishing ports or at fishing villages, are extremely transient. They have a tendency to freely change their base of operations, based on resources and conditions of the fishing port infrastructure. As a result; if a new fishing port is built in Imessouene, it is felt that fishermen would migrate from Essaouira Province. Thus, a plan based on the current stable distribution of fishermen might result in a wide margin of error. Moreover, artisanal fishermen are known to be a substantial component of the crews on coastal fishing vessels, which is further evidence of their basic mobility. On the other hand; on the Mediterranean side of Morocco, fishermen lack mobility. This is due to different historical developments and the government's anti-smuggling sanctions.

3) Will successful development of the artisanal fishing industry depend on an upscaling of its fishing vessels?

Among the owners of artisanal fishing vessels there are those who own coastal fishing vessels, as well. In general, however, such owners have no desire to invest in large-scale vessels, which have much higher fixed costs. One explanation for this lack of investment interest would be there is great among fishermen in enlarging their existing small fishing vessels, enabling them to accommodate powerful engines. As a part of our study, we investigated some coastal long lines in the village of Safi. These were 80 HP vessels in operation offshore for 2 to 4 days at a time. In Safi, it was felt that, for reasons of dwindling resources and the larger vessel's lack of cost-effectiveness, artisanal vessels are preferable to large ones. These fishermen were in a position to compare the production capacities of small and large-scale fishing vessels, and felt that even a slight upgrade would be desirable a common view among fishermen.

Rather than large-scale vessels, artisanal fishermen are more inclined to be concerned with such things as fish finder, the GPS, and maritime radio communications, which can help them increase the efficiency of their operations. As they must know, the successful development of the artisanal fishing industry is not necessarily a matter of increasing the size of their vessels.

4) What level of government support is permissible?

There is always the fear that government policies which interfere with private economic interests will have negative side effects. A call for caution in implementing such policies is thus to be expected. Below are some policies for the fishery sector of present-day Morocco that should be re-examined in terms of whether or not government support in these areas is appropriate. Of course, it is felt that there are merits to these policies, which is why they are now in effect. However, there are related problems, which are

shown in parentheses. The reader is asked to evaluate their relative strengths and weaknesses.

1) Tax exemption on the purchase of fuel oil for large-scale fishing vessels and some artisanal fishing vessels (a burden for the taxpayer; the black market "moral hazard"; the problem of "fairness")
2) An increase in the number of officials promoting reform measures for marine production (an increase in the number of government officials; the lack of real incentives)

5) What are the unique features of Morocco's fishing port development?

One unique feature of Morocco's fishing port development is the great impact it is having on the larger economy. Far more than its benefit to the artisanal fishing industry itself, is its potential impact on the larger economy. Land acquisitions and subdivisions for bungalows now being erected by developers in Souira Kedima and Tmmesouane are evidence of the anticipated fishing port development. Even now, the economic impact of the 25,000 vacationers visiting Souira Kedima each year during the summer season is being strongly felt. It is clear that development of a fishing port/social services infrastructure will have an even more far reaching effect on the larger economy.

Another unique feature of Morocco's artisanal fishing industry is that, since Morocco accepts the catches of foreign fishing vessels at her ports, it is easy to receive foreign assistance for the development of the artisanal fishing industry. However; while it is advantageous to have an abundance of economic resources for investment in the artisanal fishing industry, there are also certain disadvantages that should be paid attention to. In the case of foreign aid, it is all too easy to over-allocate such resources for development of the fishing industry, not leaving sufficient resources for the development of other industries. To avoid unbalanced investment, resources should not just be used for the development of socio-economic infrastructures (such as the fishing industry), but for the development of roads, electrical power facilities, water supply facilities and other important social service sectors. Moreover; although capital investment by the government can help to eliminate an imbalance, the question to be asked is: Should the cost to the government merely be another "taxpayers burden", or should it be passed on to the ultimate consumer -- the one who benefits from the services provided.

4-1-6 Activity Plan

1) Nationwide Fishing Port Infrastructure

In planning for a nationwide fishing port infrastructure and a artisanal fishing village infrastructure, the following points must be born in mind:

(1) Small-scale fishermen do not merely reside in small fishing villages. As many as 1/3 reside in cities and utilize large-scale harbor facilities. Thus, plans for developing a nationwide infrastructure for artisanal fishing villages should be subordinate to nationwide plans for fishing port development (which include plans for large-scale harbors).

(2) Once development activities are commenced, fishing ports are to be divided into five categories, nationwide, depending on the importance of the various marine industries, which are based at fishing ports, and the functions of the fishing ports themselves.

There will be two special categories, as follows: Special Category 1 - Large-scale fishing ports such as those at Agadir and Al Hoseima, which also accommodate off-shore fishing activities, and Special Category 2 - Relatively small fishing ports that are principally used by offshore fishing vessels. Category A, B and C fishing ports are bases for artisanal fisheries with the number of fishing vessels using these ports of

more than 100 for Category A ports, not less than 50 but less than 100 for Category B ports and less than 50 for Category C ports.

(3) Small-scale fishing villages are those with a Category A, B or C fishing port and are classified into the categories of A, B or C (see the Fisheries Production Improvement Plan for details of the development programme for these villages).

(4) The fishing ports for Category A villages will be so located that they are accessible to artisanal fishermen in any coastal region, and neither fishermen or port workers will need to travel more than 30 km to reach one another --- whether they are ports of Special Category 1 or Special Category 2.

(5) The priority of infrastructure development for Category A fishing ports should be periodically reviewed. For example, if the chart shows completion of a new fishing port in Tmmesouane, one might predict a lower priority for a fishing port development in or around the adjoining village of Tafedna. Relocations of artisanal fishing villages ore changing patterns of the artisanal fishing population are other points to be constantly looked for.

(6) Regardless of Category A, B or C ports, measures designed to improve the safety of fishing boats entering and leaving the port, etc. which will have significant development effects with small investment should be conducted as soon as possible but the status (role-sharing) of fishing villages based on their respective categories must be clearly established.

(7) An infrastructure development plan which does not provide for private investment in facilities is futile. There are many fishing villages where the private sector is requesting to invest in ice-making and refrigeration facilities provided that it can secure the necessary land. The disclosure of information on development plans and the introduction of tax and other incentives should be conducted with a view to exploiting the investment potential of the private sector.

(8) In the same way, through mass publication of plans for both ice production plants and cold storage facilities, the government can insure more effective investments and fair investment programs that are free of political interference. Moreover, by the advance allocation of land for such facilities, the investors will not be faced with unfair real estate prices based on land speculation.

2) Feasibility Study for the Development of artisanal Fishing Villages

Once plans have been set for the development of infrastructures for nationwide fishing ports and artisanal fishing villages, feasibility studies will need to be made on the various artisanal fishing villages that will be embraced by those plans. However, MPM and MTP have, in fact, already completed feasibility studies on important artisanal fishing villages. The results reported in government studies on such villages as Souira Kedima, Sidi Hsaine and Tafedna have been incorporated in this report. Beyond feasibility studies on the villages themselves, however, studies on potential projects for the development of nationwide safety operations facilities, artisanal avocation halls and cold storage facilities should be completed as soon as possible.

Of the three major fishing villages dealt with here, Souira Kedima has the greatest potential for development. It is a "model" village in every respect, even in terms of its social system, and should show potential for broad-based economic development. Based on experience gained in the development of Tafedna, the nationwide development of artisanal fishing villages should be soon to follow.

3) Monitoring and the Evaluation of Enterprises

To monitor the progress and effectiveness of the individual development projects which result from the feasibility studies, a monitoring team will be placed with MPM. Findings will be viewed from "hard" (technological) and "soft" (social) points of view. To acquire a grasp of the "broad picture" concerning the development of Morocco's artisanal fishing villages, the team will compile results on a nationwide basis.

Moreover, once the technical components of the project have been completed and inspected, a Completion Evaluation will be done. Two to three years later, when the impact of the project can be clearly seen, and Ex-post Evaluation will be done. As many concerned agencies as possible will be involved in the evaluation process. The evaluations will consider not only the "hard" (technical) aspects of development, but will also entail a broad analysis of the fishing industry, based on socio-economic factors. The project will be evaluated in terms of it effectiveness, impact, efficiency, relevance and sustainability.

4-2 Ocean Fishery Production Reform Plan

4-2-1 Basic Concept

As we have seen, Morocco's artisanal fishermen are faced with extreme conditions; socially, economically, and in terms of the environment. Even from results of the PCM, it may be seen that fishermen are so caught up in the struggle for daily necessities that they are unable to improve their lot in life. The social system and long-held traditions are factors restricting their socio-economic mobility. However, through the development of infrastructures for commercial fishing and social services, appropriate technical guidance, vocational counseling and the reinforcement of fishermen's associations, increased income and social status for fishermen are goals well within the realm of possibility.

Up till now, Morocco has actively promoted the off-shore and coastal fishing industries as "national" enterprises. For this reason, a considerable number of harbor facilities have been designed and built to accommodate large and mid-sized fishing vessels. On the average, there is presently one port designed to accommodate a heavy volume of large to mid-sized fishing vessels for every 70 km of coastline.

Since the main fishing area of the artisanal fishing industry is a narrow region within a few miles of the continental shelf and only artisanal wooden fishing boats are used, it may be said that the area fished is extremely limited. There are almost no dock and anchorage facilities. Thus, when a fishing vessel is being rowed out to sea from the beach, even slight turbulence prevents it from going out. Moreover, there are almost no infrastructures that support commercial fishing operations.

A considerable number of artisanal fishing villages have development potential, both in terms of resources and geographical location; and there are great prospects for the growth of commercial fishing. Villages on the Mediterranean side, for example, have a fishing tradition that dates back to the Phoenician era, have been influenced by advanced fishing countries as Spain, have high utilization rates for their natural resources, host a great number of tourists from Europe each year and have close access to a promising European market. On the other hand, villages on the Atlantic side have much leeway to increase the size of their fishing grounds, and have resources that are not being utilized. Their commercial fishing facilities are inadequate; but, if such things as their fishing techniques and fishing boat equipment are improved and expanded upon, it is felt their production rates will rise.

From such a perspective, we framed a revised national marine production plan aimed at wharves and artisanal fishermen, which will raise the volume of marine production, based on the following: completion of a commercial fishing infrastructure for the wharves; a survey of existing marine resources; and the expansion of commercial fishing technology, both in terms of equipment and know-how.