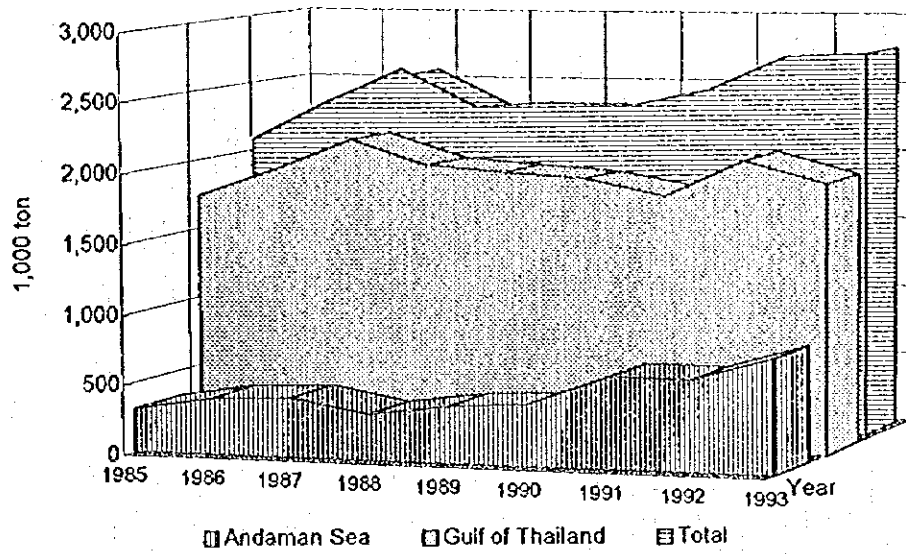
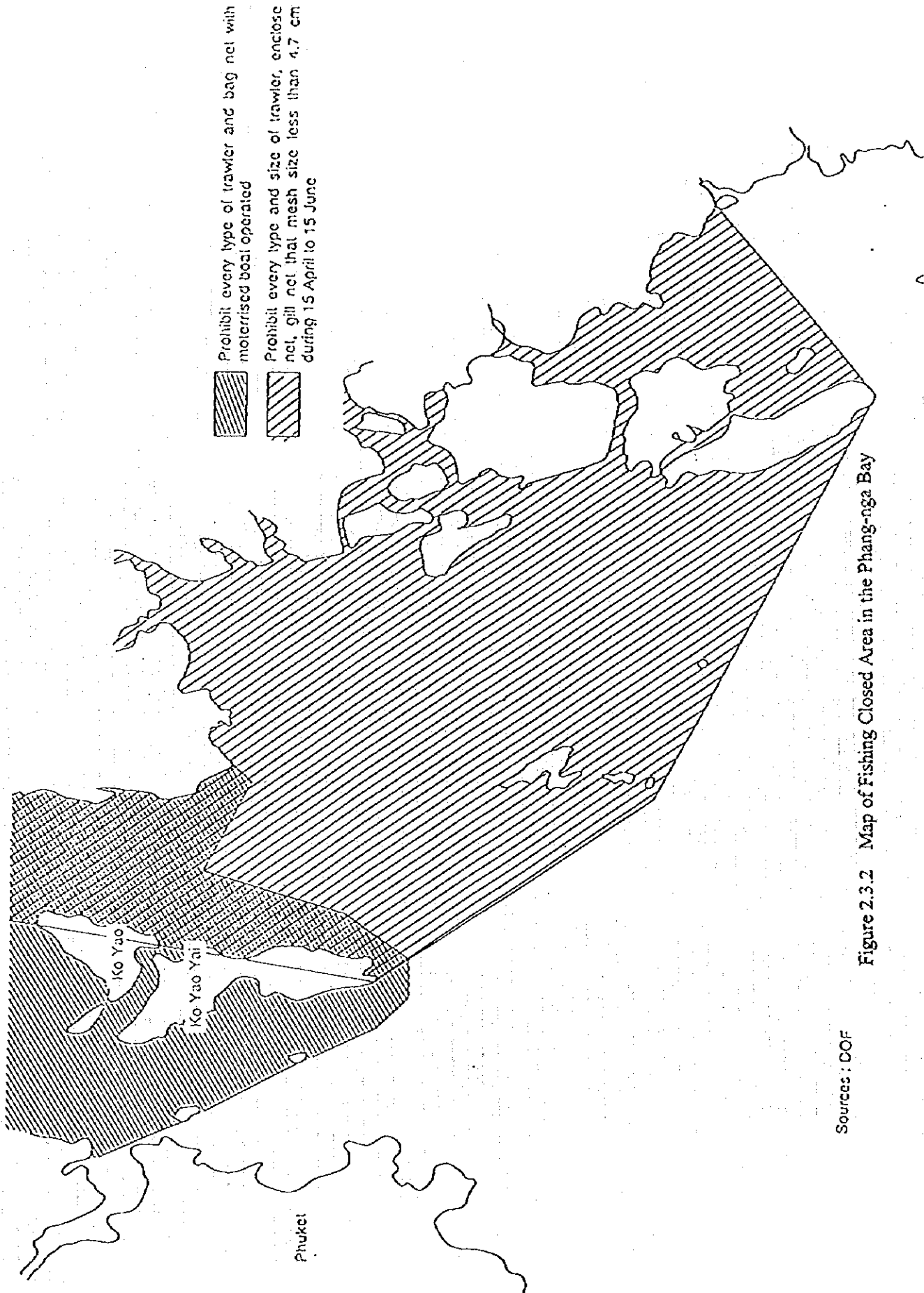


Figure 2.3.1 Trend of Marine Fisheries Capture by Area



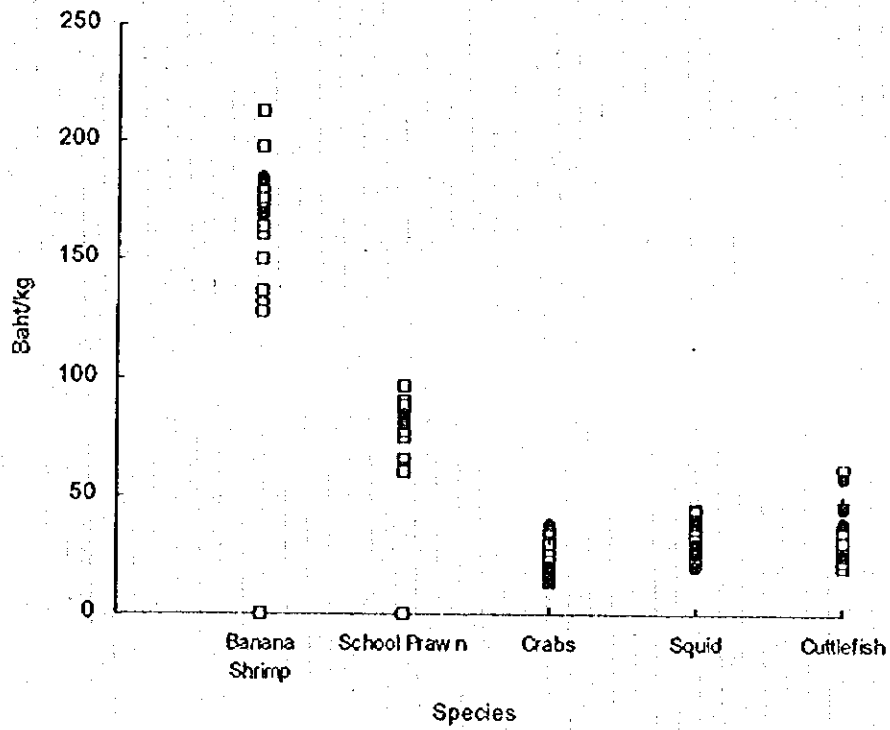
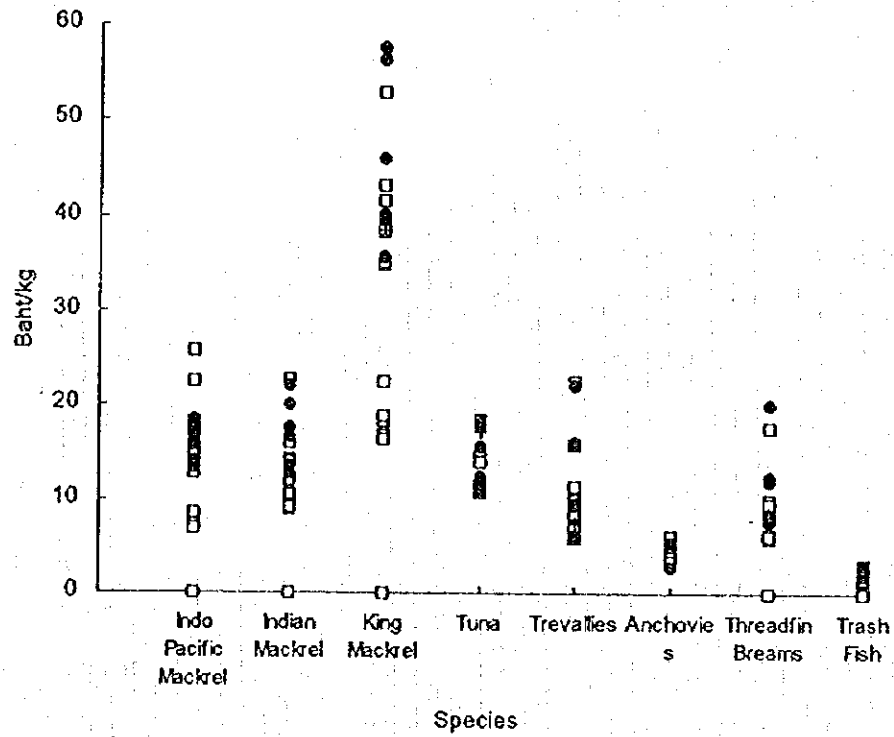
Sources: Fisheries Record of Thailand



Sources : DOF

Figure 2.3.2 Map of Fishing Closed Area in the Phang-nga Bay

Figure 2.3.3 Average Price of Marine Fish Landed at Major Landing Place by Species and Area in 1993



Sources : Fishery Statistics of Thailand, 1993, DOF

Table 2.2.1 Gross Domestic Product by Sector (Current Price, B billion), 1990-1994

| | 1990 | 1991 | 1992 | 1993 | 1994 | Annual Growth | Share(1994) |
|-----------------------------|---------|---------|---------|---------|---------|---------------|-------------|
| Agriculture | 274.6 | 316.7 | 347.9 | 322.6 | 369.0 | 6.1% | 10.2% |
| Crops | 160.4 | 183.2 | 198.8 | 170.7 | 203.3 | 4.9% | 5.6% |
| Livestock | 32.9 | 37.4 | 34.9 | 32.3 | 37.1 | 2.4% | 1.0% |
| Fisheries | 32.2 | 43.1 | 55.6 | 58.8 | 60.8 | 13.6% | 1.7% |
| Forestry | 6.8 | 6.0 | 5.7 | 5.1 | 4.6 | -7.5% | 0.1% |
| Agricultural Services | 10.8 | 10.9 | 11.3 | 10.9 | 11.8 | 1.8% | 0.3% |
| Simple Agri-Processing | 31.5 | 36.1 | 41.6 | 44.8 | 51.4 | 10.3% | 1.4% |
| Mining and Quarrying | 34.8 | 39.4 | 42.3 | 47.1 | 48.6 | 6.9% | 1.3% |
| Manufacturing | 594.0 | 707.9 | 779.2 | 893.4 | 1,014.9 | 11.3% | 28.2% |
| Construction | 136.2 | 168.3 | 190.5 | 222.4 | 268.0 | 14.5% | 7.4% |
| Electricity/Water Supply | 47.7 | 53.4 | 65.5 | 75.8 | 84.0 | 12.0% | 2.3% |
| Transportation/Communic'n | 156.8 | 176.9 | 204.9 | 238.1 | 268.0 | 11.3% | 7.4% |
| Wholesale/Retail Sale | 387.0 | 427.7 | 473.2 | 526.9 | 592.0 | 8.9% | 16.4% |
| Banking/Insurance/Real Ests | 120.5 | 134.3 | 182.8 | 231.7 | 285.9 | 18.9% | 7.9% |
| Ownership of Dwellings | 66.0 | 70.9 | 75.4 | 81.4 | 88.8 | 6.1% | 2.5% |
| Public Administr'n/Defense | 76.6 | 86.9 | 105.4 | 117.6 | 127.4 | 10.7% | 3.5% |
| Services | 291.8 | 324.6 | 360.0 | 406.9 | 454.3 | 9.3% | 12.6% |
| Aggregate GDP | 2,186.0 | 2,507.0 | 2,827.1 | 3,163.9 | 3,600.9 | 10.5% | |

Source: National Economic and Social Development Board (NESDB), June 1996

Table 2.2.2 Minimum Wage Rates by Province, 1996

| | | Min. wage | |
|--------------|-------------------------|-----------|----------|
| Bangkok | Bangkok | B145/day | |
| | Samut Prakan | B145/day | |
| | Pathum Thani | B145/day | |
| | Samut Sakhon | B145/day | |
| | Nakhon Pathom | B145/day | |
| | Nonthaburi | B145/day | |
| Northeastern | NakhonRatchasima | B126/day | |
| | All others except above | | B118/day |
| Northern | Chiang Mai | B126/day | |
| | All others except above | | B118/day |
| Southern | Phuket | B145/day | |
| | Phang-nga | B126/day | |
| | Ranon | B126/day | |
| | All others except above | | B118/day |
| Eastern | Chon Buri | B126/day | |
| | All others except above | | B118/day |
| Western | All provinces | | B118/day |
| Central | Saraburi | B126/day | |
| | All others except above | | B118/day |

Source: Ministry of Labor and Social Welfare, Employment Service Office,
Ministerial Decree No.4, 1996

Table 2.2.3 Head Count Ratio of Poverty by Region and Type of Community

| Region | Community Type | Baht per Month | | | Diminish- g Rate |
|-----------------|----------------|----------------|------|------|------------------------|
| | | 1988 | 1990 | 1992 | |
| Greater Bangkok | | 9.4 | 5.2 | 3.0 | 24.8% |
| Central | | 13.6 | 8.3 | 6.0 | 18.5% |
| | Municipal | 11.1 | 6.1 | 2.1 | 34.0% |
| | Sanitary Dist | 14.3 | 15.3 | 7.9 | 13.8% |
| | Village | 13.8 | 7.3 | 6.1 | 18.5% |
| Northern | | 23.2 | 18.2 | 15.3 | 9.9% |
| | Municipal | 17.8 | 14.5 | 6.8 | 21.4% |
| | Sanitary Dist | 38.9 | 24.7 | 19.5 | 15.9% |
| | Village | 21.0 | 17.8 | 15.9 | 6.7% |
| Northeastern | | 29.5 | 21.4 | 19.5 | 9.8% |
| | Municipal | 17.4 | 15.9 | 10.3 | 12.3% |
| | Sanitary Dist | 35.2 | 32.0 | 28.2 | 5.4% |
| | Village | 29.7 | 20.8 | 19.2 | 10.3% |
| Southern | | 23.1 | 16.9 | 11.6 | 15.8% |
| | Municipal | 14.3 | 13.6 | 7.9 | 13.8% |
| | Sanitary Dist | 25.4 | 25.0 | 13.2 | 15.1% |
| | Village | 24.3 | 16.7 | 12.0 | 16.2% |
| Whole Kingdom | | 22.2 | 15.8 | 13.0 | 12.5% |
| | Municipal | 10.5 | 7.8 | 3.7 | 23.0% |
| | Sanitary Dist | 27.3 | 22.0 | 16.4 | 12.0% |
| | Village | 24.0 | 16.9 | 14.7 | 11.5% |

Source: ADB, Strengthening Poverty Reduction and Income Distribution, 1996

Table 2.2.4 Gross Regional Product of Southern Province by Sector (Current Price)

| | (unit: million baht) | | | |
|------------------------|-----------------------|-----------------|-----------------|-----------------|
| | Current Market Prices | | 1988 Prices | |
| | 1989 | 1993 | 1989 | 1993 |
| Agriculture | 279,947 | 314,974 | 275,569 | 288,761 |
| Crops | 175,234 | 175,623 | 175,031 | 174,817 |
| Livestock | 29,876 | 32,921 | 28,432 | 32,124 |
| Fisheries | 27,461 | 46,831 | 27,936 | 36,197 |
| Forestry | 8,518 | 4,664 | 8,487 | 3,974 |
| Agri. Services | 10,678 | 10,768 | 9,957 | 8,817 |
| Agri. Process. | 28,180 | 44,167 | 26,726 | 32,832 |
| Mining | 31,884 | 46,538 | 28,227 | 40,589 |
| Manufacturing | 496,714 | 899,435 | 467,632 | 755,489 |
| Construction | 102,123 | 217,159 | 95,554 | 156,735 |
| Electricity & Water | 42,466 | 77,294 | 42,259 | 62,973 |
| Transport. & | 138,084 | 236,272 | 128,754 | 187,240 |
| Trade | 309,816 | 525,726 | 296,919 | 403,953 |
| Bank, Real Estate | 84,668 | 231,623 | 80,426 | 182,449 |
| Ownership of Dwellings | 60,457 | 81,961 | 58,213 | 67,660 |
| Public | 64,621 | 120,402 | 57,277 | 69,688 |
| Services | 246,211 | 409,990 | 218,122 | 262,761 |
| TOTAL | 1,856,99 | 3,161,37 | 1,749,95 | 2,477,29 |

Source: Central Statistic Office

Table 2.2.5 Value Added in Fisheries Sector by Region, 1989 and 1993

| | (unit: million baht) | | | |
|-----------------|-----------------------|--------|-------------|--------|
| | Current Market Prices | | 1988 Prices | |
| | 1989 | 1993 | 1989 | 1993 |
| National Total | 27,461 | 46,831 | 27,936 | 36,197 |
| Northeastern | 962 | 1,169 | 932 | 997 |
| Northern | 462 | 738 | 445 | 646 |
| Southern | 13,455 | 29,368 | 13,856 | 22,429 |
| Eastern | 5,637 | 6,694 | 5,722 | 5,158 |
| Western | 1,454 | 2,387 | 1,462 | 1,870 |
| Central | 253 | 345 | 240 | 299 |
| Greater Bangkok | 5,238 | 6,130 | 5,278 | 4,798 |

Source: Central Statistic Office

Table 2.2.6 Value of Import and Export in Thailand, 1990-1994

| Year | (unit: million baht) | | |
|------|----------------------|-----------|------------------|
| | Import | Export | Balance of Trade |
| 1990 | 852,836 | 589,776 | -263,060 |
| 1991 | 959,408 | 725,449 | -233,959 |
| 1992 | 1,033,246 | 834,839 | -198,407 |
| 1993 | 1,170,848 | 951,360 | -219,488 |
| 1994 | 1,370,635 | 1,152,011 | -218,624 |

Source: Key Statistics of Thailand 1995, National Statistical Office

Table 2.2.7 Balance of Import and Export of Fishery Products in Thailand

| Year | Import | | Export | | Balance of Value (million) |
|------|----------------|-----------------|----------------|-----------------|----------------------------|
| | Quantity (ton) | Value (million) | Quantity (ton) | Value (million) | |
| 1989 | 455,755 | 19,067 | 875,293 | 53,705 | 34,638 |
| 1990 | 507,737 | 20,653 | 904,973 | 61,070 | 40,417 |
| 1991 | 724,668 | 27,353 | 1,087,395 | 78,463 | 51,110 |
| 1992 | 714,012 | 24,569 | 1,106,141 | 82,469 | 57,900 |
| 1993 | 760,919 | 21,629 | 1,115,078 | 91,018 | 69,389 |

Source: Marine Fisheries Production Statistics 1993, Department of Fisheries

Table 2.2.8 Major Countries in World Trade of Fishery Products, 1993

| Import | | | Export | | | Export | | |
|---------|----------|-----------|---------|-----------|-----------|---------|-----------|-----------|
| Country | (1,000) | | Country | (1,000) | | Country | (1,000) | |
| 1 | Japan | 14,187,14 | 1 | Thailand | 3,404,268 | 1 | Thailand | 2,573,788 |
| 2 | USA | 6,290,233 | 2 | USA | 3,179,474 | 2 | Norway | 1,991,994 |
| 3 | Spain | 2,629,799 | 3 | Taiwan | 2,369,422 | 3 | Taiwan | 1,825,179 |
| 4 | France | 2,556,151 | 4 | Norway | 2,302,346 | 4 | Russian | 1,452,372 |
| 5 | Italy | 2,131,181 | 5 | Denmark | 2,150,665 | 5 | Indonesia | 1,319,672 |
| 6 | Germany | 1,883,684 | 6 | Canada | 2,055,438 | 6 | Canada | 1,234,034 |
| 7 | UK | 1,628,852 | 7 | China | 1,542,426 | 7 | Iceland | 1,114,264 |
| 8 | Hong | 1,376,856 | 8 | Russian | 1,471,446 | 8 | Chile | 1,106,174 |
| 9 | Denmark | 1,094,253 | 9 | Indonesia | 1,419,492 | 9 | Denmark | 1,056,412 |
| 1 | Thailand | 830,480 | 1 | Korea | 1,335,419 | 1 | China | 966,496 |

Source: FAO Yearbook, Fishery Statistics Commodities, 1993

Table 2.2.9 Value of Fishery Products Export of Thailand

(unit: thousand baht)

| | 1988 | | 1993 | | Annual Increase |
|----------------------------|------------|---------|------------|---------|-----------------|
| | Value | Share | Value | Share | |
| Total | 44,437,407 | 100.00% | 91,018,326 | 100.00% | 15.4% |
| Live | 141,435 | 0.32% | 367,127 | 0.40% | 21.0% |
| Fish | — | — | 293,746 | 0.32% | — |
| Others | — | — | 73,381 | 0.08% | — |
| Fresh/Frozen | 16,828,768 | 37.87% | 52,010,464 | 57.14% | 25.3% |
| Fish | 3,180,657 | 7.16% | 8,196,282 | 9.01% | 20.8% |
| Shrimps | 9,697,987 | 21.82% | 37,841,652 | 41.58% | 31.3% |
| Crabs | 59,413 | 0.13% | 110,756 | 0.12% | 13.3% |
| Squids | 3,890,711 | 8.76% | 5,861,774 | 6.44% | 8.5% |
| Salted/Dried/Smoked | 2,586,539 | 5.82% | 2,603,868 | 2.86% | 0.1% |
| Fish | 431,900 | 0.97% | 921,391 | 1.01% | 16.4% |
| Shrimps | 561,823 | 1.26% | 778,188 | 0.85% | 6.7% |
| Crabs | 23,438 | 0.05% | 25,433 | 0.03% | 1.6% |
| Squids | 1,569,378 | 3.53% | 878,856 | 0.97% | -10.9% |
| Fresh/Frozen/Salted | 434,138 | 0.98% | 720,321 | 0.79% | 10.7% |
| Molluscs | 125,738 | 0.28% | 67,672 | 0.07% | -11.7% |
| Others | 308,400 | 0.69% | 652,649 | 0.72% | 16.2% |
| In Airtight Containers | 19,753,777 | 44.45% | 27,469,624 | 30.18% | 6.8% |
| Sardine | 403,063 | 0.91% | 1,021,784 | 1.12% | 20.4% |
| Tuna | 12,964,237 | 29.17% | 13,062,774 | 14.35% | 0.2% |
| Other Fish | 1,673,914 | 3.77% | 2,570,774 | 2.82% | 9.0% |
| Shrimps | 2,334,608 | 5.25% | 9,378,306 | 10.30% | 32.1% |
| Crabs | 1,485,024 | 3.34% | 1,150,814 | 1.26% | -5.0% |
| Squids | 275,786 | 0.62% | 77,698 | 0.09% | -22.4% |
| Asari | 617,145 | 1.39% | 207,474 | 0.23% | -19.6% |
| Not in Airtight Containers | 855,621 | 1.93% | 2,395,068 | 2.63% | 22.9% |
| Sardine | 9,450 | 0.02% | 30,948 | 0.03% | 26.8% |
| Tuna | 1,461 | 0.00% | 1,865,588 | 2.05% | 318.1% |
| Squids | 751,495 | 1.69% | 461,703 | 0.51% | -9.3% |
| Asari | 93,215 | 0.21% | 36,829 | 0.04% | -16.9% |
| Prepared/Preserved | 334,421 | 0.75% | 623,348 | 0.68% | 13.3% |
| Lobster | 713 | 0.00% | 693 | 0.00% | -0.6% |
| Awabi | 2,482 | 0.01% | 6,026 | 0.01% | 19.4% |
| Others | 331,226 | 0.75% | 616,629 | 0.68% | 13.2% |
| Fish Meal | 784,119 | 1.76% | 23,052 | 0.03% | -50.6% |
| Fish Sauce | 202,902 | 0.46% | 342,944 | 0.38% | 11.1% |
| Seaweed and Agar-agar | 30,128 | 0.07% | 34,893 | 0.04% | 3.0% |
| Others | 2,485,559 | 5.59% | 4,427,617 | 4.86% | 12.2% |

Source: of Marine Fisheries Production Statistics 1994, and Fisheries Statistics of Thailand, Department of Fisheries

Table 2.2.10 Major Countries of Canned Tuna Export

| | (unit: ton) | | | | | |
|--------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| TOTAL | 391,781 | 442,877 | 442,840 | 549,988 | 468,146 | 502,429 |
| Thailand | 207,756 | 225,123 | 232,972 | 272,800 | 243,588 | 229,904 |
| Philippine | 37,137 | 47,499 | 44,696 | 46,121 | 47,043 | 55,488 |
| Cote | 31,564 | 38,294 | 41,382 | 47,248 | 41,378 | 49,942 |
| Spain | 11,250 | 9,499 | 6,874 | 12,477 | 10,404 | 13,861 |
| Senegal | 17,690 | 20,634 | 20,693 | 34,358 | 15,043 | 19,065 |
| Indonesia | 8,504 | 20,621 | 18,651 | 41,059 | 19,015 | 23,069 |
| Ecuador | 6,185 | 3,970 | 5,560 | 5,132 | 9,986 | 11,155 |
| Portugal | 2,291 | 3,865 | 3,888 | 6,039 | 5,167 | 6,774 |
| Italy | 2,275 | 5,186 | 4,431 | 4,262 | 3,732 | 5,338 |
| France | 7,892 | 3,870 | 2,154 | 1,669 | 4,054 | 7,936 |

Source: FAO Yearbook, Fishery Statistics Commodities, 1993

Table 2.2.11 Major Countries of Frozen Tuna Import

| | (unit: ton) | | | | | |
|--------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| TOTAL | 1,038,548 | 1,099,307 | 1,248,789 | 1,390,561 | 1,209,436 | 1,231,089 |
| Thailand | 256,291 | 323,411 | 369,488 | 493,658 | 420,496 | 402,267 |
| Japan | 211,216 | 193,641 | 241,050 | 245,461 | 252,476 | 298,310 |
| USA | 171,655 | 173,508 | 132,983 | 141,384 | 112,470 | 122,067 |
| Spain | 124,196 | 110,961 | 167,225 | 150,746 | 65,842 | 94,428 |
| Italy | 84,080 | 109,638 | 122,268 | 114,059 | 99,214 | 87,375 |
| Cote | 46,785 | 51,849 | 56,235 | 69,971 | 64,377 | 73,176 |
| Singapore | 40,541 | 41,084 | 40,436 | 48,036 | 51,278 | 40,658 |
| Philippine | 18,552 | 6,438 | 21,672 | 41,296 | 56,072 | 37,440 |
| Portugal | 10,694 | 11,040 | 20,345 | 22,430 | 15,704 | 14,211 |
| Fiji | 11,537 | 7,130 | 10,429 | 13,684 | 8,273 | 12,203 |

Source: FAO Yearbook, Fishery Statistics Commodities, 1993

Table 2.2.12 Per Capita Fish Consumption in Thailand

| | Total | For | | | Total | Per Capita Fish Consumption (kg/person) | |
|------|-------------------------------|--|---------------------------|---------------------------|---------------------------|---|-------------------------------|
| | Production (1,000 tons) | Fish Meal & Trash Fish (1,000 tons) | Import (1,000 tons) | Export (1,000 tons) | Supply (1,000 tons) | | Population (million p.) |
| 1984 | 2,135 | 843 | 166 | 547 | 911 | 50.46 | 18.05 |
| 1985 | 2,225 | 844 | 207 | 639 | 949 | 51.48 | 18.43 |
| 1986 | 2,536 | 1,030 | 362 | 847 | 1,021 | 52.54 | 19.43 |
| 1987 | 2,779 | 1,162 | 323 | 946 | 994 | 53.54 | 18.57 |
| 1988 | 2,630 | 1,011 | 484 | 1,110 | 993 | 54.59 | 18.19 |
| 1989 | 2,740 | 1,038 | 606 | 1,232 | 1,076 | 55.21 | 19.49 |
| 1990 | 2,786 | 1,043 | 662 | 1,322 | 1,083 | 56.08 | 19.31 |
| 1991 | 2,968 | 1,055 | 911 | 1,538 | 1,286 | 56.92 | 22.59 |
| 1992 | 3,240 | 1,095 | 875 | 1,554 | 1,466 | 57.60 | 25.45 |
| 1993 | 3,358 | 1,096 | 839 | 1,618 | 1,483 | 58.54 | 25.33 |
| 1994 | 3,491 | 1,096 | 911 | 1,750 | 1,556 | 59.10 | 26.33 |

Source: Department of Fisheries

Table 2.2.13 Gross Regional Product of Southern Province by Sector
(Current Price, B million), 1990-1994

| | 1990 | 1991 | 1992 | 1993 | 1994 | Annual Growth | Share (1994) |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|---------------|--------------|
| Agriculture | 65,319.1 | 76,948.5 | 88,733.9 | 90,944.3 | 110,939.8 | 14.2% | 38.0% |
| Crops | 32,031.7 | 33,170.7 | 39,261.0 | 38,282.5 | 52,531.9 | 13.2% | 18.0% |
| Livestock | 2,508.6 | 3,732.9 | 3,895.6 | 2,994.9 | 4,457.9 | 15.5% | 1.5% |
| Fisheries | 18,170.4 | 26,670.0 | 30,987.7 | 34,442.3 | 36,032.6 | 18.7% | 12.3% |
| Forestry | 4,458.3 | 4,256.3 | 4,019.0 | 3,900.5 | 3,727.1 | -4.4% | 1.3% |
| Agricultural Services | 367.9 | 399.6 | 384.1 | 401.6 | 418.8 | 3.3% | 0.1% |
| Simple Agri-Processing | 7,781.9 | 8,718.7 | 10,186.3 | 10,922.3 | 13,771.2 | 15.3% | 4.7% |
| Mining and Quarrying | 2,296.3 | 2,040.9 | 2,213.5 | 2,116.7 | 2,588.4 | 3.0% | 0.9% |
| Manufacturing | 10,580.6 | 11,922.5 | 12,684.5 | 14,504.8 | 15,773.1 | 10.5% | 5.4% |
| Construction | 13,173.8 | 15,486.0 | 16,763.8 | 16,941.5 | 22,443.8 | 14.2% | 7.7% |
| Electricity/Water Supply | 3,640.4 | 3,834.6 | 4,611.9 | 5,303.6 | 6,020.6 | 13.4% | 2.1% |
| Transportation/Communication | 11,190.7 | 12,192.2 | 13,144.5 | 15,742.5 | 17,031.5 | 11.1% | 5.8% |
| Whole Sale/Retail Sale | 30,302.5 | 33,505.4 | 36,961.6 | 40,702.8 | 45,890.2 | 10.9% | 15.7% |
| Banking/Insurance/Real Ests | 6,564.3 | 7,648.2 | 9,233.2 | 10,550.9 | 15,547.6 | 24.1% | 5.3% |
| Ownership of Dwellings | 7,259.6 | 8,295.3 | 8,533.9 | 9,289.6 | 10,252.4 | 9.0% | 3.5% |
| Public Administration/Defense | 9,198.4 | 10,497.6 | 12,775.0 | 14,628.2 | 15,730.5 | 14.4% | 5.4% |
| Services | 28,003.5 | 32,501.8 | 37,496.6 | 40,915.1 | 45,866.2 | 13.1% | 15.7% |
| Aggregate GDP | 176,948.6 | 202,950.5 | 230,467.9 | 247,135.2 | 292,311.0 | 13.4% | |

Source: National Economic and Social Development Board (NESDB), June 1996, p.4

Table 2.2.14 Gross Regional Product by Region at Current Market Price, 1993

| | GRP (1,000 baht) | Population (1,000 persons) | Per Capita (Baht) |
|--------------|---------------------|-------------------------------|----------------------|
| Total | 3,161,373,931 | 58,584 | 53,963 |
| Greater | 1,781,641,195 | 9,520 | 187,147 |
| Central | 115,487,643 | 2,840 | 40,665 |
| Eastern | 263,549,821 | 3,693 | 71,365 |
| Western | 123,019,139 | 3,362 | 36,591 |
| Northern | 285,220,100 | 11,146 | 25,589 |
| Northeastern | 333,472,534 | 20,052 | 16,630 |
| Southern | 258,983,499 | 7,972 | 32,487 |
| (Andaman) | 74,857,646 | 1,748 | 42,825 |
| Ranong | 9,617,836 | 142 | 67,731 |
| Phangnga | 9,812,805 | 234 | 41,935 |
| Phuket | 19,152,905 | 206 | 92,975 |
| Krabi | 12,105,015 | 335 | 36,134 |
| Trang | 16,926,115 | 581 | 29,133 |
| Satun | 7,242,969 | 250 | 28,972 |
| (Thai Gulf) | 184,125,853 | 6,224 | 29,583 |

Source: National Statistical Office

Table 2.2.15 Gross Provincial Product by Industrial Origin in Andaman Area at Current Market Price, 1993

| | (unit: million baht) | | | | | |
|------------------------|----------------------|--------------|---------------|---------------|---------------|--------------|
| | Ranong | Phangng | Phuket | Krabi | Trang | Satun |
| Agriculture | 5,524 | 4,436 | 2,889 | 5,704 | 7,032 | 3,258 |
| Crops | 417 | 2,223 | 417 | 4,271 | 3,682 | 1,187 |
| Livestock | 138 | 131 | 113 | 107 | 229 | 136 |
| Fisheries | 3,774 | 756 | 2,090 | 171 | 1,510 | 1,524 |
| Forestry | 797 | 1,091 | 6 | 783 | 431 | 76 |
| Agri. Services | 3 | 4 | 1 | 9 | 16 | 16 |
| Agri. Process. | 395 | 230 | 262 | 364 | 1,162 | 319 |
| Mining | 16 | 88 | 19 | 116 | 71 | 1 |
| Manufacturing | 207 | 408 | 1,116 | 744 | 702 | 210 |
| Construction | 306 | 287 | 2,362 | 570 | 845 | 331 |
| Electricity & Water | 240 | 100 | 599 | 209 | 292 | 96 |
| Transport. & | 293 | 303 | 3,491 | 372 | 787 | 287 |
| Trade | 1045 | 1,152 | 2,291 | 1,522 | 2,741 | 1,305 |
| Bank, Real Estate | 249 | 262 | 1,308 | 335 | 590 | 149 |
| Ownership of Dwellings | 201 | 294 | 333 | 362 | 645 | 278 |
| Public | 319 | 720 | 440 | 919 | 845 | 455 |
| Services | 1,228 | 1,728 | 4,378 | 1,248 | 2,366 | 880 |
| TOTAL | 9,628 | 9,779 | 19,227 | 12,102 | 16,915 | 7,251 |

Source: Central Statistic Office

Table 2.2.16 Labour Force Situation by Region, 1993

| | Total | Bangko | Central | Norther | N.East' | Southe |
|------------------|---------|---------|---------|---------|---------|---------|
| Total Population | 59,401 | 6,919 | 13,261 | 11,122 | 20,245 | 7,854 |
| Population 13 | 45,195 | 5,613 | 10,335 | 8,726 | 14,799 | 5,722 |
| Labour Force | 34,231 | 3,827 | 7,628 | 6,678 | 11,850 | 4,248 |
| Employed | 33,178 | 3,759 | 7,497 | 6,471 | 11,263 | 4,188 |
| Unemployed | 1,053 | 68 | 131 | 207 | 587 | 60 |
| (Ratio) | (3.08%) | (1.78%) | (1.72%) | (3.10%) | (4.95%) | (1.41%) |
| Seasonally | 736 | 0.5 | 102 | 165 | 435 | 33 |
| (Ratio) | (2.22%) | (0.01%) | (1.36%) | (2.55%) | (3.86%) | (0.79%) |

Source: Estimated Labour Force and Employment 1995, Department Labour Protection and welfare

Table 2.3.1 Trend of Fisheries Production by Sector

| | Unit: 1,000ton | | | | | | | | |
|---------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| Marine capture | 1,997.2 | 2309.5 | 2540 | 2337.2 | 2,370.5 | 2,362.2 | 2,478.6 | 2,736.4 | 2,752.5 |
| Inland capture | 92.2 | 98.4 | 87.4 | 81.5 | 109.1 | 127.2 | 136.0 | 132.0 | 175.4 |
| Coastal aquaculture | 60.6 | 39.1 | 61.9 | 108.9 | 168.7 | 193.2 | 230.4 | 229.3 | 295.6 |
| Freshwater culture | 75.2 | 89.3 | 89.8 | 102.1 | 91.7 | 103.8 | 122.7 | 142.1 | 161.6 |
| Total | 2,225.2 | 2,536.3 | 2,779.1 | 2,629.7 | 2,740.0 | 2,786.4 | 2,967.7 | 3,239.8 | 3,385.1 |

Source: Fisheries Statistics of Thailand 1993, DOF

Table 2.3.2 Catch of Marine Fish by Species (1/2)

| | Unit : ton | | | | | | | | |
|---------------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| Ground Total | 2,057,751 | 2,348,572 | 2,601,929 | 2,337,215 | 2,370,548 | 2,362,218 | 2,478,607 | 2,736,352 | 2,752,486 |
| Sub-Total Fish | 1,570,439 | 1,798,930 | 2,017,397 | 1,865,845 | 1,930,297 | 1,946,167 | 2,018,152 | 2,226,859 | 2,349,824 |
| Sub-Total Pelagic Fish | 588,104 | 570,081 | 629,589 | 637,823 | 703,471 | 719,138 | 726,130 | 841,040 | 855,459 |
| Indo-pacific mackerel | 121,107 | 113,497 | 119,182 | 111,657 | 121,041 | 103,537 | 102,977 | 129,551 | 143,982 |
| Indian mackerel | 36,970 | 41,891 | 39,876 | 25,808 | 35,127 | 32,293 | 32,558 | 40,124 | 49,729 |
| King mackerel | 11,724 | 14,770 | 15,502 | 15,258 | 12,898 | 12,962 | 10,397 | 12,326 | 14,582 |
| Wolf herrings | 2,674 | 3,149 | 4,503 | 4,927 | 5,312 | 7,867 | 8,908 | 7,764 | 9,140 |
| Longtail tuna | 48,000 | 48,299 | 65,911 | 92,925 | 82,125 | 102,436 | 84,847 | 74,445 | 60,407 |
| Eastern little tuna | 38,881 | 45,473 | 36,708 | 53,450 | 47,525 | 60,759 | 67,399 | 94,627 | 87,175 |
| Scads | 33,692 | 26,411 | 56,140 | 31,763 | 39,593 | 33,235 | 46,729 | 50,959 | 55,170 |
| Hardtail-scads | 8,902 | 19,130 | 22,248 | 24,879 | 28,177 | 22,683 | 23,361 | 22,584 | 23,297 |
| Trevallies | 52,111 | 42,204 | 43,197 | 48,918 | 53,765 | 51,954 | 43,478 | 45,728 | 56,528 |
| Big eye scads | 18,418 | 19,609 | 25,960 | 18,882 | 21,408 | 31,586 | 22,308 | 25,541 | 22,448 |
| Blackbanded kingfish | 2,617 | 2,957 | 3,794 | 3,224 | 2,645 | 3,104 | 3,865 | 2,585 | 3,430 |
| Threadfins | 1,794 | 1,729 | 1,288 | 2,073 | 2,275 | 2,196 | 2,299 | 1,873 | 3,153 |
| Sardinellas | 97,742 | 121,242 | 127,208 | 123,739 | 145,038 | 120,546 | 140,912 | 163,527 | 152,300 |
| Anchovies | 104,196 | 58,987 | 57,769 | 69,378 | 97,080 | 123,958 | 127,089 | 159,884 | 165,335 |
| Mullet | 5,176 | 5,440 | 4,894 | 4,649 | 4,921 | 4,655 | 4,675 | 4,615 | 4,050 |
| Black pomfret | 3,047 | 4,512 | 4,713 | 5,235 | 3,847 | 4,437 | 3,174 | 3,254 | 3,076 |
| Silver pomfret | 1,053 | 781 | 696 | 1,058 | 694 | 930 | 1,134 | 1,653 | 1,657 |
| Sub-Total Demersal Fish | 97,478 | 131,545 | 152,726 | 139,834 | 142,560 | 140,192 | 180,309 | 219,814 | 286,649 |
| False travally | 10 | 8 | 6 | 0 | 26 | 0 | 0 | 0 | 0 |
| Barracudas | 4,084 | 5,081 | 5,492 | 5,234 | 5,234 | 6,182 | 8,753 | 7,930 | 7,912 |
| Crocker | 12,073 | 14,831 | 13,392 | 13,723 | 15,551 | 14,874 | 20,701 | 18,537 | 20,533 |
| Treadfin breams | 17,096 | 26,801 | 34,134 | 29,559 | 33,674 | 31,139 | 47,030 | 65,377 | 75,327 |
| Monocle breams | 511 | 662 | 1,358 | 945 | 628 | 619 | 379 | 78 | 73 |
| Lizard fish | 10,074 | 14,929 | 17,563 | 17,319 | 18,941 | 16,454 | 23,677 | 38,312 | 53,554 |
| Hairtails | 4,599 | 5,132 | 5,913 | 5,869 | 5,611 | 6,302 | 5,040 | 2,984 | 5,305 |
| Snappers | 3,074 | 4,133 | 4,934 | 4,653 | 3,680 | 4,648 | 5,754 | 6,937 | 16,567 |
| Giant Seaperch | 905 | 1,319 | 1,710 | 295 | 247 | 128 | 147 | 122 | 47 |
| Sweetlips | 1 | 0 | 21 | 9 | 0 | 0 | 0 | 0 | 0 |
| Big eyes | 12,705 | 18,190 | 24,999 | 22,571 | 22,398 | 23,049 | 33,914 | 44,620 | 59,839 |
| Sand whithings | 3,947 | 4,129 | 4,219 | 4,726 | 4,210 | 3,559 | 3,779 | 3,244 | 3,400 |
| Barbel eel | 1,480 | 1,174 | 919 | 1,284 | 823 | 909 | 775 | 797 | 7,830 |
| Marine catfishes | 4,358 | 5,133 | 6,482 | 6,321 | 4,319 | 5,016 | 4,090 | 6,233 | 8,858 |
| Rays | 5,980 | 9,190 | 9,762 | 7,594 | 7,942 | 7,947 | 7,287 | 5,366 | 5,801 |
| Sharks | 3,246 | 4,332 | 4,597 | 3,844 | 3,269 | 2,997 | 3,769 | 2,210 | 2,511 |
| Flatfishes | 6,528 | 7,456 | 7,257 | 7,248 | 7,872 | 8,093 | 7,556 | 7,715 | 7,934 |
| Indian Halibut | 2,830 | 3,888 | 3,952 | 3,365 | 3,245 | 3,333 | 1,644 | 1,333 | 1,882 |
| Conger eels | 1,963 | 2,765 | 2,802 | 2,385 | 1,928 | 2,182 | 2,236 | 2,551 | 3,189 |
| Grouper | 2,014 | 2,392 | 3,214 | 2,892 | 2,962 | 2,761 | 3,778 | 5,468 | 6,037 |
| Sub-Total other food fish | 108,436 | 121,068 | 129,428 | 132,075 | 103,922 | 108,524 | 129,873 | 164,615 | 181,164 |
| Sub-Total Trash fish | 776,421 | 976,236 | 1,105,654 | 956,113 | 980,344 | 978,313 | 981,840 | 1,001,390 | 1,026,552 |

Note: Turtle eggs is not included from 1985 to 1989.

Aquaculture production is included from 1985 to 1987.

Sources: Fisheries Statistics of Thailand, 1985-1992

Table 2.3.2 Catch of Marine Fish by Species (2/2)

| | Unit : ton | | | | | | | | |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| Sub-Total Crustaceans | 154,47 2 | 176,78 0 | 192,03 7 | 152,08 8 | 153,10 9 | 149,03 0 | 174,31 4 | 161,15 3 | 166,03 3 |
| Sub-Total Shrimp & prawn | 127,64 3 | 141,17 4 | 151,63 6 | 110,24 0 | 110,78 7 | 107,46 5 | 129,12 8 | 116,74 6 | 119,01 4 |
| Banana shrimp | 19,132 | 19,722 | 19,050 | 9,735 | 10,803 | 11,359 | 10,952 | 11,203 | 12,608 |
| Jumbo Tiger prawn | 463 | 1,179 | 10,839 | 393 | 394 | 349 | 378 | 396 | 536 |
| Tiger shrimp | 1,293 | 1,175 | 1,079 | 1,123 | 1,048 | 779 | 980 | 766 | 996 |
| King prawn | 1,375 | 1,694 | 1,763 | 1,576 | 1,724 | 1,546 | 1,629 | 1,981 | 2,138 |
| School prawn | 13,985 | 13,465 | 14,145 | 9,295 | 8,609 | 7,937 | 9,734 | 8,089 | 8,595 |
| Other shrimp | 71,224 | 82,878 | 82,783 | 63,678 | 62,327 | 61,019 | 82,406 | 69,202 | 70,640 |
| Sergestid shrimp | 18,818 | 19,359 | 20,055 | 23,019 | 24,431 | 23,123 | 21,753 | 23,983 | 22,008 |
| Flathead Lobster | 1,014 | 958 | 1,337 | 732 | 692 | 1,021 | 880 | 878 | 1,233 |
| Mantis shrimps | 339 | 444 | 487 | 619 | 460 | 309 | 391 | 187 | 202 |
| Macrobracium | 0 | 300 | 108 | 70 | 99 | 23 | 25 | 61 | 58 |
| Sub-Total crabs | 26,829 | 35,606 | 40,401 | 41,848 | 42,322 | 41,565 | 45,186 | 44,407 | 47,019 |
| Swimming crab | 22,233 | 30,432 | 34,707 | 37,102 | 35,461 | 34,768 | 36,068 | 36,254 | 39,759 |
| Mud crab | 4,484 | 4,611 | 4,964 | 4,437 | 4,975 | 4,203 | 4,956 | 4,730 | 3,005 |
| Other crab | 112 | 563 | 730 | 309 | 1,886 | 2,594 | 4,162 | 3,423 | 4,255 |
| Sub-Total Cephalopod | 299,55 8 | 295,60 6 | 350,32 3 | 300,08 1 | 270,55 8 | 253,02 6 | 230,68 4 | 245,14 9 | 220,99 4 |
| Sub-Total Squids & Cuttlefishes | 116,03 5 | 134,91 5 | 132,53 8 | 124,24 3 | 142,92 3 | 135,07 2 | 154,40 2 | 150,31 5 | 153,23 7 |
| Squid | 63,996 | 71,344 | 75,420 | 67,176 | 69,640 | 64,370 | 69,367 | 64,774 | 72,162 |
| Cuttlefish | 42,814 | 51,625 | 45,695 | 45,308 | 57,033 | 52,170 | 65,029 | 64,996 | 60,367 |
| Octopus | 9,225 | 11,946 | 11,423 | 11,759 | 16,050 | 18,532 | 20,006 | 20,545 | 20,708 |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sub-Total Molluscs | 183,52 3 | 160,69 1 | 217,78 5 | 175,83 8 | 127,63 5 | 117,95 4 | 76,282 | 94,834 | 67,757 |
| Bloody cockle | 19,927 | 13,595 | 11,779 | 2,548 | 2,450 | 2,717 | 0 | 0 | 0 |
| Green mussel | 61,019 | 28,110 | 46,783 | 22,597 | 18,071 | 18,054 | 16,314 | 24,007 | 24,650 |
| Oyster | 5,241 | 1,439 | 2,532 | 659 | 1,399 | 432 | 0 | 0 | 0 |
| Horse mussel | 7,945 | 8,406 | 15,695 | 30,074 | 12,205 | 6,117 | 0 | 0 | 0 |
| Shortneck clam | 83,726 | 101,23 2 | 131,23 0 | 115,39 1 | 89,158 | 85,712 | 59,720 | 70,575 | 42,572 |
| Scallop | 0 | 244 | 351 | 331 | 319 | 202 | 238 | 252 | 335 |
| Other shellfish | 5,665 | 7,665 | 9,415 | 4,238 | 4,033 | 4,720 | 10 | 0 | 0 |
| Sub-Total Others | 33,282 | 77,256 | 42,172 | 19,201 | 16,584 | 13,995 | 55,457 | 103,19 1 | 15,635 |
| Jellyfish | 29,018 | 76,090 | 40,476 | 18,352 | 15,955 | 13,995 | 55,457 | 103,19 1 | 15,635 |
| Sea cucumber | 31 | 11 | 26 | 26 | 23 | 0 | 0 | 0 | 0 |
| Others | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sub-Total Seaweeds | 4,233 | 1,155 | 1,667 | 823 | 606 | 0 | 0 | 0 | 0 |

Note : Turtle eggs is not included from 1985 to 1989.

Sources: Fisheries Statistics of Thailand, 1985-1992

Table 2.3.3 Catch of Marine Fisheries by Fishing Gear and Fishing Ground

| | Unit : ton | | | | | |
|---------------------|------------|----------|----------|----------|----------|----------|
| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| Thailand | 2,337,21 | 2,370,54 | 2,362,20 | 2,478,60 | 2,736,35 | 2,752,48 |
| | 5 | 8 | 0 | 7 | 2 | 6 |
| Trawl | 1,256,80 | 1,308,35 | 1,268,31 | 1,398,55 | 1,487,11 | 1,604,90 |
| | 1 | 2 | 9 | 4 | 5 | 8 |
| Otter board trawl | 1,027,70 | 1,100,12 | 1,092,39 | 1,204,91 | 1,256,72 | 1,352,03 |
| | 6 | 9 | 4 | 3 | 4 | 3 |
| Pair trawl | 228,841 | 207,884 | 175,683 | 193,294 | 230,166 | 252,552 |
| Beam Trawl | 254 | 339 | 242 | 347 | 225 | 323 |
| Purse seine | 632,468 | 674,053 | 757,512 | 737,811 | 836,806 | 854,480 |
| Purse seine | 571,728 | 568,440 | 611,831 | 617,303 | 675,262 | 701,630 |
| Anchovy purse seine | 60,740 | 105,613 | 145,681 | 120,508 | 161,544 | 152,850 |
| Gill net | 146,655 | 134,484 | 106,144 | 103,702 | 109,736 | 106,255 |
| Mobilnet | 32,519 | 33,039 | 30,588 | 40,445 | 40,222 | 39,815 |
| Squid light luring | 24,092 | 25,283 | 25,845 | 25,730 | 24,040 | 26,114 |
| Hook | 7,724 | 7,059 | 6,884 | 6,630 | 6,249 | 5,549 |
| Stationary gear | 42,248 | 44,378 | 35,161 | 35,569 | 34,411 | 32,308 |
| Collection | 194,708 | 143,900 | 131,747 | 130,166 | 197,773 | 83,057 |
| Gulf of Thailand | 2,001,64 | 1,963,65 | 1,923,14 | 1,820,68 | 2,081,52 | 1,929,67 |
| | 5 | 7 | 5 | 7 | 8 | 2 |
| Trawl | 1,064,16 | 1,061,09 | 1,004,17 | 939,860 | 1,010,77 | 1,067,59 |
| | 6 | 3 | 7 | | 6 | 9 |
| Otter board trawl | 852,684 | 869,618 | 843,042 | 806,919 | 852,400 | 902,558 |
| Pair trawl | 211,228 | 191,157 | 160,893 | 132,594 | 158,161 | 164,718 |
| Beam Trawl | 254 | 318 | 242 | 347 | 215 | 323 |
| Purse seine | 535,720 | 554,607 | 616,347 | 572,742 | 696,522 | 608,150 |
| Purse seine | 475,203 | 449,270 | 471,298 | 464,083 | 571,654 | 496,099 |
| Anchovy purse seine | 60,517 | 105,337 | 145,049 | 108,659 | 124,868 | 112,051 |
| Gill net | 134,803 | 122,426 | 93,950 | 86,381 | 93,010 | 91,270 |
| Mobilnet | 27,267 | 27,464 | 25,895 | 32,746 | 32,666 | 31,736 |
| Squid light luring | 23,878 | 25,088 | 25,608 | 25,325 | 23,521 | 25,444 |
| Hook | 5,771 | 5,270 | 4,591 | 4,191 | 3,991 | 3,784 |
| Stationary gear | 35,233 | 37,359 | 28,891 | 29,456 | 28,417 | 27,148 |
| Collection | 174,807 | 130,350 | 123,686 | 129,986 | 192,625 | 74,541 |
| Andaman Sea | 335,570 | 406,891 | 439,055 | 657,920 | 654,824 | 822,814 |
| Trawl | 192,635 | 247,259 | 264,142 | 458,694 | 476,339 | 537,309 |
| Otter board trawl | 175,022 | 230,511 | 249,352 | 397,994 | 404,324 | 449,475 |
| Pair trawl | 17,613 | 16,727 | 14,790 | 60,700 | 72,005 | 87,834 |
| Beam Trawl | | 21 | | | 10 | |
| Purse seine | 96,748 | 119,446 | 141,165 | 165,069 | 140,284 | 246,330 |
| Purse seine | 96,525 | 119,170 | 140,533 | 153,220 | 103,608 | 205,531 |
| Anchovy purse seine | 223 | 276 | 632 | 11,849 | 36,676 | 40,799 |
| Gill net | 11,852 | 12,058 | 12,194 | 17,321 | 16,726 | 14,985 |
| Mobilnet | 5,252 | 5,575 | 4,693 | 7,699 | 7,556 | 8,079 |
| Squid light luring | 214 | 195 | 237 | 405 | 519 | 670 |
| Hook | 1,953 | 1,789 | 2,293 | 2,439 | 2,258 | 1,765 |
| Stationary gear | 7,015 | 7,019 | 6,270 | 6,113 | 5,994 | 5,160 |
| Collection | 19,901 | 13,550 | 8,061 | 180 | 5,148 | 8,516 |

Sources: Fisheries Statistics of Thailand, 1988 - 1993, DOF

Table 2.3.4 Trend of Catch Per Unit Effort (kg/hour) by Fishing Ground

| | 198 1 | 198 2 | 198 3 | 198 4 | 198 5 | 198 6 | 198 7 | 198 8 | 198 9 | 199 0 |
|------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Otter Board Trawl | | | | | | | | | | |
| Gulf of Thailand | 64.0 8 | 60.9 2 | 56.8 9 | 54.7 6 | 50.6 1 | 49.3 9 | 56.3 8 | 53.3 5 | 56.9 0 | 53.6 5 |
| Andaman Sea | 72.8 2 | 70.0 2 | 73.6 6 | 75.2 2 | 82.5 3 | 65.3 1 | 67.1 1 | 58.4 7 | 69.9 2 | 49.5 9 |
| Purse Seine | | | | | | | | | | |
| Gulf of Thailand | 448. 25 | 268. 10 | 288. 31 | 299. 94 | 418. 88 | 327. 47 | 353. 18 | 330. 01 | 372. 92 | 240. 48 |
| Andaman Sea | 208. 38 | 455. 55 | 734. 01 | 493. 51 | 490. 82 | 418. 84 | 577. 78 | 483. 77 | 617. 48 | 461. 43 |

Sources : DOF

Table 2.3.5 Conditions of Fisheries Agreement with Neighboring Countries

| | Situation | Problems |
|-----------|---|--|
| Indonesia | <ul style="list-style-type: none"> Indonesia is most important fishing area for Thai fishing boats. A great number of Thai companies operate joint fisheries business with Indonesian companies. There are about 600 to 700 Thai fishing boats operate fishing in Indonesian territorial waters, in South China Sea, off Sumatra Island to the north and in Irian Jaya. Thailand and Indonesia have commitments under the Thai - Indonesia - Malaysian Economic Triangular Project. | <ul style="list-style-type: none"> There still are boats trespassing an Indonesian territorial waters. Some licensed boats use illegal fishing gear and operate outside the area permitted on the licence. Catches to be brought to Thailand are required to be declared at the Indonesian port, causing delay and extra expenses to Thai fishing boats. Indonesia government impose legal control on the fishing gears. Indonesia has a tendency to raise tax on aquatic animal export to encourage domestic processing business. |
| Myanmar | <ul style="list-style-type: none"> Myanmar government granted concession to 7 Thai fishing companies with a number of 246 boats in 1993 - 1994 fishing season. Fish processing factories in Ranong, such as cold storage, fish meal factory, surimi factory, depend on raw materials from the Andaman Sea in great quantity. Myanmar authorities gave concession to two Thai fishing companies. However, Thai companies were required to invest in fisheries industries such as cold storage, ice making factory, fish meal factory, canning factory and lobster farm. | <ul style="list-style-type: none"> Thai fishing boats carried out illegal operation such as fishing outside of concession area, misus of fishing gear, excessive number of Myanmar crews, avoidance of check in and out, disguised fishing boats in trespass. Myanmar authorities threatened to take violent measures in searching and seizing Thai fishing boats trespassing Myanmar waters. There were about 64 Thai fishing boats that were sunk or set on fire in the period from December 1993 to April 1994. Myanmar authorities amended the penalty for breaking rules and regulations of Myanmar by foreign boat to a 10 - 47 years' imprisonment depending on the offence. Problems with minority tribes such as payment for protection made to several groups in an amount about 100,000 Baht per boat a year. |
| Vietnam | <ul style="list-style-type: none"> Vietnam permitted six Thai companies to operate fishery in Vietnam waters. However, Vietnam ordered foreign companies to suspend their fishing operation in order to reconsider interest receivable. The central government of Vietnam permit a Thai fishery company to fish for technological demonstration in central part to northern part of the country. However, the operation was interrupted due to order of the Vietnamese government. However, Vietnamese authorities have not granted any concession to Thailand. | <ul style="list-style-type: none"> Vietnam lacks unity of international control that central government can not control fishery administration of coastal provincial governors. Vietnam lacks capital to make joint investment with Thailand. Prerequisite for fishery are inconsistent with economic principle that cost consuming check-in and out far a part of fishing area Work coordination between work units of Vietnam is inefficient. Fishing boat passing through other provincial area was often arrested and it took time to clear the boat. |
| Malaysia | <ul style="list-style-type: none"> Malaysia granted a Thai company with 40 fishing boats the right to fish in Malaysian waters. Thai companies and The Thai sector have proposed to Malaysian authorities to send Thai fishing boats to Malaysian waters, pending Malaysia's decision. Some areas butting on Malaysian border, such as Narathivat and Satun provinces, operate joint fisheries with Malaysia under two national flags. | <ul style="list-style-type: none"> Malaysian government makes no consideration as to expansion of cooperation in number of fishing boats and fishing area. Fishery law of Malaysia is inconsistent with the principle of international law in that requests foreign fishing boats to make prior application for permission to pass through Malaysian waters and failing to do so, such fishing boats would be deemed to trespass on Malaysian waters. Problems in connection with court proceeding, defending, boat seizure, crew arrest, fine imposition, imprisonment, release, etc.. |
| Cambodia | <ul style="list-style-type: none"> Cambodia granted to two to five Thai companies with a number of 200 to 300 fishing boats the right to fishing in Cambodian waters | <ul style="list-style-type: none"> The person (military officer) who gave the concession to Thai fishing boats is not directly responsible for fisheries. The National Supreme Council of Cambodia has no definite policy to grant fishing concession to foreign fishing boats. |
| India | <ul style="list-style-type: none"> India grants two Thai companies with five fishing boats the right to fish in the Indian Ocean. | <ul style="list-style-type: none"> There still are fishing boats sneaking in to fish. Indian government fixes the rate of royalty at 2 % of aquatic animal produce before deducting any expenses. The fishing area in which foreign fishing boats are permitted to fish are not sufficiently productive. However, there is the rich area from Wisakha Pattanam to the border line between India and Bangladesh. |
| Banglade | <ul style="list-style-type: none"> Bangladesh grants one Thai company with 10 fishing boats the right to fish in Bangladesh waters. There are some fishing boats trespassing on Bangladesh waters. | <ul style="list-style-type: none"> Bangladesh government has no policy to permit Thai fishing boats to expand fishing area. |

Source : DOF

Table 2.3.6 Surface Area of the Indian Ocean

| | Unit : 1,000 km ² | |
|-----------|------------------------------|----------------------|
| | Western Indian Ocean | Eastern Indian Ocean |
| High seas | 19,820 | 24,710 |
| EEZ | 13,900 | 7,810 |
| Total | 33,720 | 32,520 |

Sources: Indian Ocean Tuna News No.6-June 1995

Table 2.3.7 Tuna Landings in the Indian Ocean

| | Unit : tons | |
|----------------------|-------------|---------|
| | 1992 | 1993 |
| Western Indian Ocean | 694,595 | 785,683 |
| Eastern Indian Ocean | 204,958 | 205,654 |
| Total | 899,553 | 991,337 |

Sources: Indian Ocean Tuna News No.6-June 1995

Table 2.3.8 Status of the Stocks of Tuna and Tuna-like Fishes in the Indian Ocean by ITPT

| Species | Annual Catch 1989 ~ 1993 (10 ³ ton) | Status |
|---------------------------------------|--|--|
| Yellowfin <i>Thunnus albacares</i> | 168 ~ 315 W: 136 ~ 285 E: 31 ~ 30 | The stock status was considered to be largely unknown, with the fishing pressure in the western Indian Ocean likely to range from moderate to above the sustainable level. |
| Bigeye <i>Thunnus obesus</i> | 42 ~ 45 W: 33 ~ 36 E: 10 ~ 9 | The information regarding this stock is not enough to arrive to any conclusions regarding its status. |
| Skipjack <i>Katsuwonus pelamis</i> | 238 ~ 266 W: 219 ~ 249 E: 19 ~ 17 | The biological characteristics of the species suggest that it is unlikely to be over-exploited. |
| Albacore <i>Thunnus alalunga</i> | 19 ~ 11 W: 6 ~ 5 E: 13 ~ 5 | The existing analyses contained uncertainties about the stock structure. |
| Swordfish | - | Given the low to moderate catches of this species, the status of the stock was considered to be good and further development of the fishery can be envisaged. |
| Other billfish species | - | No information was presented regarding the condition of the several stocks in this broad category. |

Sources: Indian Ocean Tuna News No.8, December 1995

Table 2.3.9 Number of Taiwanese Fishing Boats in the Indian Ocean

| | Unit : boat | | | | | | | |
|----------|-------------|------|------|------|------|------|------|------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| Longline | 127 | 153 | 160 | 187 | 263 | 272 | 253 | 296 |
| Gillnet | 58 | 76 | 82 | 139 | 124 | 121 | 109 | 16 |
| Total | 185 | 229 | 242 | 326 | 387 | 393 | 362 | 312 |

Source: Proceeding of the 5th Expert Consultation on Indian Ocean Tunas, ITPT 1994

Table 2.3.10 Tuna Landing Volume by Japanese Purse Seines on Phuket Commercial Port (1/2)

| Name of boat | 1994 | | | | | | | | | | | |
|----------------------------|----------|----------|----------|----------|----------|----------|----------|--------|----------|----------|----------|----------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| NIPPON MARU | 1,247.86 | | | | | | | | | 801.12 | 800.84 | |
| FUKUJICHI MARU 83 | | 472.68 | | 389.98 | | | | | | 677.55 | 582.28 | 592.90 |
| GENPUKU MARU 86 | | | 475.40 | | 512.89 | 356.45 | 458.60 | 133.06 | 555.88 | 564.62 | | 479.06 |
| KOYO MARU 75 | | 551.51 | | 511.57 | | 880.00 | 543.35 | | | 616.44 | 586.37 | 344.08 |
| KOYO MARU 88 | | 549.86 | | 573.08 | 663.90 | | | | | 677.29 | | 588.15 |
| SHOYU MARU | 692.74 | | | 676.74 | | | | | | | | |
| SHOYU MARU 38 | | | 614.70 | | 660.92 | 707.34 | | 517.33 | 491.69 | 681.63 | | 700.27 |
| TOKIWA MARU | 460.42 | | | | | | | | | | | |
| AVG of landing volume/Boat | 576.58 | 524.68 | 545.05 | 537.84 | 612.57 | 647.93 | 500.98 | 325.20 | 523.79 | 643.51 | 584.33 | 540.89 |
| Total | 2,401.02 | 1,574.05 | 1,090.10 | 2,151.37 | 1,837.71 | 1,943.79 | 1,001.95 | 650.39 | 1,047.57 | 4,018.65 | 1,969.49 | 2,704.46 |

Source : Phuket Commercial Port

Table 2.3.10 Tuna Landing Volume by Japanese Purse Seines on Phuket Commercial Port (2/2)

| Name of boat | 1995 | | | | | | | | | | | |
|----------------------------|----------|----------|----------|--------|----------|--------|----------|-----|-----|-----|-----|-----|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| NIPPON MARU | 768.98 | | 876.87 | | 297.83 | | | | | | | |
| FUKUJICHI MARU 83 | 693.85 | 705.15 | | | | 446.44 | | | | | | |
| GENPUKU MARU 86 | 570.56 | 593.83 | | | 484.55 | | 495.04 | | | | | |
| SHOYU MARU 75 | 577.29 | | | | | | | | | | | |
| KOYO MARU 88 | | | | | | | 157.95 | | | | | |
| SHOYU MARU 38 | 678.31 | | | | 296.66 | | 611.59 | | | | | |
| AVG of landing volume/Boat | 630.00 | 649.49 | 517.46 | 681.42 | 390.61 | 446.44 | 421.53 | | | | | |
| Total | 3,288.99 | 1,298.98 | 1,394.33 | 681.42 | 1,079.04 | 446.44 | 1,264.58 | | | | | |

Source : Phuket Commercial Port

Table 2.3.11 Average Price of Marine Fish Landed at Major Landing Place by Species, by Province 1993

| | Indo Pacific mackerel | Indian mackerel | King mackerel | Tuna | Trevallies | Anchovies | Threadfin Breams | Trash Fish | Banana Shrimp | School Prawn | Crabs | Squid | Cuttlefish |
|----------------------|-----------------------|-----------------|---------------|-------|------------|-----------|------------------|------------|---------------|--------------|-------|-------|------------|
| Coastal Zone 1 | | | | | | | | | | | | | |
| Trat | 7.28 | | 34.83 | 11.92 | 6.71 | 3.56 | 5.97 | 2.01 | 160.63 | 65.01 | 26.19 | 22.00 | 30.17 |
| Chantaburi | 8.57 | 8.86 | 18.19 | | 8.02 | | 8.88 | 2.36 | 170.15 | 61.76 | 15.80 | 28.58 | 25.23 |
| Rayong | 12.85 | 10.51 | 43.14 | 11.59 | 6.20 | 4.28 | 9.99 | 2.28 | 175.12 | 76.25 | | 41.12 | 23.66 |
| Coastal Zone 2 | | | | | | | | | | | | | |
| Chon Buri | 18.33 | | 16.80 | 18.37 | 9.96 | 3.51 | 7.83 | 1.96 | 173.89 | 84.66 | 24.63 | 34.01 | 22.56 |
| Chachoeng sao | | | | | | | | 2.57 | 121.50 | 73.82 | 17.46 | 21.00 | 20.42 |
| Samut Prakan | 15.03 | 11.96 | | 15.04 | 9.98 | | 9.00 | 2.98 | 131.07 | 90.00 | 25.02 | 25.00 | 34.57 |
| Samut Sakhon | 17.15 | 16.00 | 38.35 | | 11.28 | | 9.17 | 2.97 | 127.78 | 88.20 | 29.96 | 31.56 | 37.08 |
| Samut Songkhram | 22.60 | | 16.36 | | 5.82 | 4.97 | | 2.17 | 174.43 | 75.09 | 22.40 | 43.78 | 33.17 |
| Phetchaburi | | | | | | | 6.30 | 1.40 | 176.11 | 74.85 | 32.79 | 21.99 | 35.00 |
| Coastal Zone 3 | | | | | | | | | | | | | |
| Prachuab Khiri Khan | 15.21 | 14.23 | 18.92 | 13.89 | 2.52 | | 6.02 | 1.62 | 212.72 | 81.54 | 30.01 | 40.40 | 28.22 |
| Chumphon | 13.97 | 9.12 | 22.49 | 18.11 | 7.07 | | 6.12 | 2.57 | 164.06 | 61.24 | 13.69 | 25.02 | 30.48 |
| Surat Thani | 17.24 | | 35.00 | | 10.00 | 6.00 | 9.50 | 2.68 | 136.95 | 77.01 | 15.76 | 22.28 | 19.95 |
| Coastal Zone 4 | | | | | | | | | | | | | |
| Nakhon Sri Thammarat | 6.99 | | 38.53 | 10.70 | 15.75 | | 8.04 | 2.12 | 150.12 | 60.54 | 14.97 | 22.46 | 22.66 |
| Songkhla | 15.01 | | 38.49 | 17.28 | 7.55 | | 8.80 | 2.40 | | | 32.07 | 39.23 | 47.04 |
| Patani | 14.63 | 13.98 | 41.63 | 18.00 | 9.59 | | 8.29 | 2.14 | 198.00 | 96.83 | 35.52 | 39.76 | 60.85 |
| Narathiwat | 25.72 | 22.75 | 52.93 | 18.00 | 22.55 | | 17.65 | 1.95 | 180.00 | 80.98 | | 43.92 | 35.45 |
| Coastal Zone 5 | | | | | | | | | | | | | |
| Ranong | 14.00 | 17.62 | 40.18 | 15.58 | 15.99 | | 12.00 | 2.80 | 185.00 | 80.01 | 20.00 | 30.00 | 45.00 |
| Phang-nga | 16.02 | 16.61 | 56.26 | 11.61 | 5.97 | 2.90 | 8.29 | 2.75 | | | | 19.76 | |
| Phuket | 18.02 | 20.00 | 46.00 | 18.00 | 22.00 | 5.44 | 20.00 | 2.90 | 185.00 | 84.00 | 37.68 | 39.00 | 58.00 |
| Krabi | 17.31 | 22.01 | 39.57 | 12.28 | 6.00 | | | 2.62 | | | | 27.45 | 45.11 |
| Trang | 13.46 | 13.55 | 35.63 | 18.53 | 9.29 | 5.21 | 7.64 | 2.49 | 183.21 | 84.03 | 18.39 | 28.49 | 38.44 |
| Satun | 18.54 | 12.84 | 57.50 | 10.83 | | | 12.40 | 2.02 | 168.63 | | 14.17 | 26.10 | 24.55 |

Sources : Fishery Statistics of Thailand, 1993, DOF

Table 2.3.12 Average Income for Fishermen in the Andaman Sea Coast

| Position | No. of person | Income by Fishery |
|--------------------|---------------|---|
| Trawl | | |
| Captain | 1 | 1,500B/month and 10% of net profit to 10% of wholesale price |
| Deputy captain | 1 | 5,000 - 8,000B/month and 2 - 3 % of net profit |
| Fishing master | 1 | 5,000 - 8,000B/month and 2 - 3 % of net profit |
| Engineer | 1 - 2 | 5,000 - 8,000B/month and 2 - 3 % of net profit |
| Crew | 7 - 17 | 3,000B/month and 1 % of net profit to 4,500B |
| Purse seine | | |
| Captain | 1 | 10,000B/month and 10% of net profit to 10% of wholesale price |
| Deputy captain | 1 | 5,000B/month and 1% of net profit to 5,000B/month and 3% of Wholesale price |
| Fishing master | 1 | 3,000B/month and 10% of net profit to 8% of wholesale price |
| Engineer | 1 | 5,000B/month and 1% of net profit to 5,000B/month and 2% of wholesale price |
| Crew | 20 - 36 | 3,000B/month to 1,500B/month and 1% of net profit |

Sources : JICA study team Phase 1 survey

Table 2.3.13 Fish Landing Volume at Major Landing Site along the Andaman Sea Coast

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Munag, Ranong Province | 49,689 | 94,566 | 106,719 | 126,876 | 160,330 | 169,406 | 158,096 | 153,631 |
| Takuapa, Phang-nga Province | 3,495 | 2,799 | 1,376 | 1,928 | 1,689 | | | |
| Kurabui, Phang-nga Province | 17,312 | 19,513 | 19,129 | 21,670 | 25,845 | 13,971 | 29,739 | 23,312 |
| Taimuang, Phang-nga Province | 9,724 | 11,450 | 8,972 | 11,631 | 17,234 | 17,868 | 19,948 | 18,208 |
| Muang, Phuket Province | 37,686 | 68,131 | 81,379 | 76,515 | 68,541 | 91,244 | 69,121 | 63,832 |
| Muang, Krabi Province | 10,411 | 11,167 | 8,180 | 9,042 | 8,955 | 5,902 | 6,058 | 9,569 |
| Kantang, Trang Province | 56,601 | 76,169 | 78,900 | 66,005 | 69,844 | 65,081 | 34,180 | 33,772 |
| Muang, Satun Province | 86,394 | 62,611 | 49,073 | 56,620 | 67,851 | 44,076 | 63,750 | 64,989 |
| La-ngu, Stun Province | | | 1,336 | 1,704 | 2,246 | 13,917 | 15,826 | 15,657 |
| Total | 271,312 | 346,396 | 355,064 | 371,991 | 422,535 | 421,465 | 396,718 | 382,970 |

Sources : The Landing Place Survey, 1990 - 1993, DOF

Table 2.3.14 Number of Registered Fishing Boats in Thailand 1981-1993

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|-------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Total | 15,968 | 15,916 | 16,054 | 15,550 | 20,979 | 21,547 | 18,170 | 16,820 | 18,146 |
| Gulf of Thailand | 13,701 | 13,628 | 13,875 | 13,265 | 16,709 | 17,581 | 15,323 | 13,989 | 15,141 |
| Andaman Sea | 2,267 | 2,288 | 2,179 | 2,285 | 4,270 | 3,966 | 2,847 | 2,831 | 3,005 |
| Ranong | 146 | 160 | 223 | 315 | 669 | 674 | 389 | 455 | 350 |
| Phangnga | 540 | 560 | 313 | 297 | 833 | 564 | 478 | 282 | 468 |
| Phuket | 261 | 238 | 269 | 259 | 484 | 440 | 383 | 393 | 507 |
| Krabi | 352 | 280 | 269 | 259 | 258 | 238 | 93 | 231 | 185 |
| Trang | 586 | 608 | 581 | 603 | 793 | 761 | 698 | 657 | 694 |
| Satun | 382 | 442 | 524 | 552 | 1,233 | 1,289 | 806 | 813 | 801 |

Sources : Fishing Vessels Statistics, 1985-1993, DOF

Table 2.3.15 Number of Registered Fishing Boats by Capacity in the Andaman Sea

| | Unit : Boat | | | | | | | |
|------------------|-------------|------|------|------|-------------|------|------|------|
| | Trawl | | | | Purse seine | | | |
| | 1990 | 1991 | 1992 | 1993 | 1990 | 1991 | 1992 | 1993 |
| Ranong | | | | | | | | |
| < 14 m | 102 | 7 | 7 | 7 | 15 | 8 | 6 | 1 |
| 14 - 18 m | 103 | 114 | 103 | 86 | 7 | 13 | 11 | 15 |
| 18 - 25 m | 92 | 34 | 74 | 74 | 33 | 39 | 44 | 41 |
| > 25 m | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 1 |
| Total | 298 | 156 | 186 | 168 | 55 | 60 | 61 | 58 |
| Phang-nga | | | | | | | | |
| < 14 m | 17 | 5 | 6 | 1 | 0 | 3 | 0 | 3 |
| 14 - 18 m | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 2 |
| 18 - 25 m | 1 | 0 | 1 | 0 | 3 | 0 | 1 | 6 |
| > 25 m | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 20 | 5 | 7 | 1 | 4 | 3 | 2 | 11 |
| Phuket | | | | | | | | |
| < 14 m | 27 | 9 | 18 | 15 | 3 | 8 | 0 | 1 |
| 14 - 18 m | 126 | 104 | 125 | 120 | 7 | 1 | 0 | 10 |
| 18 - 25 m | 88 | 76 | 128 | 102 | 42 | 33 | 0 | 45 |
| > 25 m | 2 | 1 | 2 | 2 | 2 | 1 | 0 | 0 |
| Total | 243 | 190 | 273 | 239 | 54 | 43 | 0 | 56 |
| Krabi | | | | | | | | |
| < 14 m | 58 | 16 | 11 | 10 | 0 | 0 | 1 | 2 |
| 14 - 18 m | 0 | 7 | 0 | 0 | 0 | 0 | 7 | 7 |
| 18 - 25 m | 0 | 11 | 1 | 1 | 1 | 0 | 6 | 7 |
| > 25 m | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Total | 58 | 34 | 13 | 11 | 1 | 0 | 14 | 16 |
| Trang | | | | | | | | |
| < 14 m | 99 | 92 | 75 | 57 | 0 | 0 | 0 | 0 |
| 14 - 18 m | 205 | 182 | 175 | 141 | 5 | 7 | 3 | 1 |
| 18 - 25 m | 321 | 316 | 325 | 301 | 16 | 22 | 20 | 20 |
| > 25 m | 8 | 8 | 7 | 7 | 0 | 0 | 1 | 0 |
| Total | 633 | 598 | 582 | 506 | 21 | 29 | 24 | 21 |
| Satun | | | | | | | | |
| < 14 m | 320 | 204 | 188 | 170 | 2 | 2 | 1 | 2 |
| 14 - 18 m | 131 | 94 | 87 | 78 | 14 | 8 | 15 | 18 |
| 18 - 25 m | 126 | 74 | 79 | 78 | 48 | 32 | 61 | 65 |
| > 25 m | 5 | 3 | 3 | 2 | 1 | 1 | 0 | 1 |
| Total | 582 | 375 | 357 | 328 | 65 | 43 | 77 | 86 |

Sources : Thai Fishing Vessels Statistics 1990 - 1993, DOF

Table 2.3.16 Fisheries Conditions of Each Province on the Andaman Sea Coast (1/2)

| | Ranong province | Phang-nga province | Phuket province |
|------------------------------|--|--|--|
| Main landing site | Commercial fishing is carried on only in Muang district. There are two landing site, FMO Fishing Port and private landing site in Muang. | Commercial fishing is carried on in Kuraburi district and Taimuang district. There are only private landing sites in Phang-nga. | Commercial fishing is carried on in Muang and Thalang districts. There are FMO Fishing Port and private landing sites in Muang, and only private landing sites in Thalang. |
| Main fishing ground | Myanmar | Main fishing grounds of Kuraburi covers from Myanmar boundary to Similan Islands. Fishing ground of Taimuang covers from Surin Island off coast of Kuraburi to Phuket. | Off coast from Phuket to Ranong (boundary of Myanmar), Myanmar, Indian Ocean, and Malaka strait, etc. |
| No. of fishermen | 1,872 fishery establishment and employee's house holds in Muang, and 1,258 in the other areas. | 6,003 fishery establishment and fishery employee's house hold in Phang-nga, and 923 is in Kuraburi, 464 is in Taimuang respectively. | 1,968 fishery establishment and fishery employees' house holds that of 1,142 is in Muang and 725 is in Thalang. |
| No. of fishing boats | 433 of inboard engine boats were in Ranong, and 395 were in Muang in 1995. Most of commercial fishing boats were trawler in Muang. | 238 of inboard engine boats in Phang-nga, and 104 were in Kohyao. However, there were only 18 in Kuraburi, and 45 in Taimuang, where were main landing sites in Phang-nga. Most of fishing boats were shrimp gill netter that length is under 14m. | 355 inboard engine boats were in Phuket that consists of 322 in Muang and 30 in Thalang in 1995. Capacity of boat in Phuket is bigger than other provinces. |
| Landing volume in 1993 (ton) | 153,631 tons | 23,312 tons at Kuraburi 18,208 tons at Taimuang | 68,632 tons |
| Others | Because of their main fishing ground is in Myanmar, landing volume at Ranong is influenced by political conditions between Thailand and Myanmar. | Main fishing gear is purse seine in Kuraburi, and some trawlers come from Ranong. In addition, purse seiners from the Gulf of Thailand operate and load in the Northern east monsoon season. | Taiwanese tuna long liners operates in the Indian Ocean have unloaded their catch since August 1995. Japanese tuna purse seiners also have unloaded their catch at Phuket commercial port. |

Source : Result of Field Survey by JICA Study Team

Table 2.3.16 Fisheries Conditions of Each Province on the Andaman Sea Coast (2/2)

| | Krabi province | Trang province | Satun Province |
|------------------------------|---|--|---|
| Main landing site | Commercial fishing is carried on in Muang, Kloungkom and Naukloung district. However, there are only private landing sites in Krabi, and Muang is largest landing site in Krabi. | Commercial fishing is carried on in Kantang, Sikao and Hadsumran. There are only private landing sites, and main landing site is in Kantang. Most of them are located along the Kantang river. | Commercial fishing is carried on in two districts, Muang and La-ngu. There are two landing sites in Muang. One is Tamalang FMO Fishing Port, and the other is Che-biang private landing site. There is only private landing site in La-ngu. |
| Main fishing ground | Fishing ground is in neighbouring water areas that is northern part from the line between South tip end of Phuket and Libong Island. | Malaka straits including Malaysian and Indonesian water. | Around Tartao Island, Adang Island and Rawi Island. Some of trawlers operate around Phuket depend on the catch. Some fishing boats operate around Lankawi Island and Penan Island in Malaysia. |
| No. of fishermen | 5,497 fishery establishment and fishery employees' house holds in Krabi, and 1,059 in Muang, 1,323 in Kloungkom, 1,082 in Naukloung respectively. | 5,703 fishery establishment and fishery employees' house holds in Trang, and 3,113 is in Kantang, 731 is in Sikao, 844 is in Hadsumran respectively. | 6,327 fishery establishment and fishery employees' house holds in Satun, and 2,574 is in Muang, 2,243 is in La-ngu respectively. |
| No. of fishing boats | 92 of inboard engine boats were in Krabi, and 71 was in Muang in 1995. However, most of them are shrimp gill netter and squid cast netter that length is less than 14 m. Purse seine is main fishing gear at Muang, and trawl is main in the other two districts. | 518 of inboard engine boats were in Trang, and 476 was in Kantang in 1995. There main fishing gear is otter board trawl, and capacity of fishing boat is larger than other provinces. | 910 of inboard engine boats were in Satun, and 717 was in Muang, 178 was in La-Ngu. Because of using Malaysian fishing boats, capacity of these boats were smaller than other provinces. |
| Landing volume in 1993 (ton) | 9,569 tons | 33,772 tons | 64,989 tons at Muang 15,657 tons at La-Ngu |
| Others | There were not much fishing boats come to fish at Krabi from other provinces such as the Gulf of Thailand, even some of them based Krabi. The reason is that only less than 18 m boats are able to access to landing site, because of shallow depth of channel. | There are many fishing boats move in Trang from other provinces include the Gulf of Thailand. Especially, many large scale fishing boats transfer, and operate in Trang province during closed season in the Gulf of Thailand. | Squid fishing was operated around Tartau Island during October to February. |

Source : Result of Field Survey by JICA Study Team

Table 2.4.1 Fish Landing and Marketing Volume in FMO Fishing Port and Market in 1993, 1994, 1995

Unit: tons/year

| Fish Markets and Fishing Ports | 1993 | 1994 | 1995 |
|--------------------------------|----------------|----------------|----------------|
| Ranong | 56,776 | 35,403 | 59,913 |
| Hua Hin | 14,348 | 16,217 | 18,110 |
| Surat Thani | 3,082 | 2,719 | 1,579 |
| Pattani | 159,529 | 205,942 | 211,315 |
| Satun | 6,588 | 6,944 | 12,525 |
| Phuket | 29,811 | 25,350 | 24,558 |
| Chumphon | 32,837 | 32,540 | 31,403 |
| Nakorn Sri Thammarat | 11,495 | 34,476 | 34,580 |
| Fishing Port Total | 314,466 | 359,591 | 393,983 |
| Samut Prakarn Fish Market | 138,747 | 176,391 | 162,852 |
| Samut Sakhon Fish Market | 219,106 | 225,092 | 226,474 |
| Bangkok Fish Market | 140,074 | 150,440 | 147,509 |
| Fish Market Total | 497,927 | 551,923 | 536,835 |

Source: Statistics of Fish Markets and Fishing Port, FMO

Table 2.4.2 Share of Fresh Fish Volume Transported to Bangkok Fish Market on Land from 1991 to 1995

Unit: %

| Provinces | 1991 | 1992 | 1993 | 1994 | 1995 |
|----------------------|---------------|---------------|---------------|---------------|---------------|
| Trad | 13.92 | 13.75 | 11.54 | 13.70 | 12.37 |
| Chanthaburi | 8.58 | 7.70 | 6.71 | 5.74 | 4.90 |
| Chonburi | 2.10 | 2.49 | 2.84 | 2.55 | 2.17 |
| Rayong | 3.13 | 2.07 | 2.16 | 1.96 | 1.04 |
| Sub Total | 27.73 | 26.01 | 23.25 | 23.95 | 20.48 |
| Samut Prakan | 5.59 | 5.32 | 5.12 | 5.03 | 5.13 |
| Samut Sakhon | 5.39 | 7.31 | 8.48 | 7.77 | 9.21 |
| Samut Songkram | 4.55 | 5.03 | 5.98 | 7.00 | 12.53 |
| Sub Total | 15.53 | 17.66 | 19.58 | 19.80 | 26.87 |
| Phetchaburi | 1.58 | 1.83 | 2.38 | 2.31 | 1.78 |
| Prachuab Khirikhan | 11.19 | 8.95 | 13.57 | 12.36 | 9.41 |
| Chumphon | 16.30 | 17.22 | 13.50 | 13.26 | 11.08 |
| Surat Thani | 2.24 | 2.16 | 3.50 | 3.93 | 3.12 |
| Nakorn Sri Thammarat | 2.11 | 2.02 | 1.65 | 1.73 | 1.59 |
| Songkhla | 2.98 | 1.28 | 1.48 | 2.02 | 2.13 |
| Pattani | 0.80 | 0.36 | 0.26 | 0.33 | 0.29 |
| Sub Total | 37.2 | 33.82 | 36.34 | 35.94 | 29.40 |
| Satun | 1.13 | 2.36 | 1.26 | 1.86 | 2.69 |
| Krabi | 0.07 | 0.04 | 0.00 | 0.00 | 0.07 |
| Phuket | 1.02 | 1.05 | 1.36 | 2.47 | 1.68 |
| Trang | 3.51 | 4.17 | 4.70 | 5.03 | 5.69 |
| Ranong | 13.77 | 14.65 | 12.15 | 9.52 | 11.48 |
| Sub Total | 19.50 | 22.27 | 19.47 | 18.88 | 21.16 |
| Other Provinces | 0.04 | 0.24 | 1.36 | 1.43 | 1.64 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

Source: Statistics of Fish Markets and Fishing Port, FMO

Table 2.4.3 Fish Landing Facilities on Andaman Sea Board, 1996

| Province District | Ranong | | Phang-nga | | Phuket | | Krabi | | Trang | | Satun | |
|----------------------|--------|--|-----------|-----------|--------|--|-------|--|---------|--|-------|-------|
| | Muang | | Kuraburi | Thaimuang | Muang | | Muang | | Kantang | | Muang | Langu |
| FMO Fishing Port | 1 | | 0 | 0 | 1 | | 0 | | 0 | | 0 | 0 |
| Private jetty | 48* | | 10 | 3 | 8 | | 8 | | 16 | | 12 | 4 |

Note: * Ten private jetties out of 48 exist within FMO site.

Source: JICA Study Team

Table 2.4.4 Destination and Share of Fish from Landing Sites on Andaman Sea Board, 1994

| Province District | Ranong | | Phang-nga | | Phuket | | Krabi | | Trang | | Satun | |
|----------------------|--------|--|-----------|------------|--------|--|-------|--|---------|--|-------|-------|
| | Muang | | Kuraburi | Thai Muang | Muang | | Muang | | Kantang | | Muang | Langu |
| Local | 55 | | 10 | | 16 | | 40 | | 50 | | 70 | |
| Soungkhla, Hat Yai | 15 | | 75 | | 19 | | 35 | | 25 | | 20 | |
| Samut-Sakhon, BKK | 20 | | - | | 53 | | 20 | | 25* | | - | |
| Others | 10 | | 15 | | 12 | | 5 | | 5 | | 10 | |

Note: * Share of destination of fresh fish are estimated based upon the results of interview survey for PFO, MFO, Fish Agents

Source: JICA Study Team

3. INITIAL ENVIRONMENTAL EXAMINATION (IEE) AND SITE SCREENING

3.1. Introduction

This section presents the initial environmental evaluation and screening of the project, with the main objective being to identify the preferred site for the Fisheries Complex, based on biophysical and socio-economic environmental criteria and to set out, in broad terms, the scope of the EIA. The preferred site, selected on the basis of engineering, fisheries demand, financial, economic as well as environmental criteria, would then be subject to a full-scale environmental assessment and the production of a complete environmental impacts statement.

Given that the Thai government has indicated, under Notification No. 2 (B.E. 2535) Aug. 24, 1993, that ports projects with a capacity for ships >500 tonnes, which would include this project, must complete an EIA, the IEE by definition is not required. However, the study team has completed an IEE which goes beyond its normal definition in that the study includes a screening exercise to select a preferred site, knowing that the EIA will be required. This work is, therefore, termed IEE and Site Screening.

3.2. Description of the Proposed Project

In its 8th National Development Plan, the Government of Thailand (GOT) has indicated the urgent need to establish industrial and economic centres in southern Thailand. They have focused on the tourism and fisheries sectors. The plan identifies the need for a modern fishing port, located on the Andaman Sea coast, able to attract Thai and foreign fishing vessels by providing superior fish processing facilities, ship servicing, land and air transportation links as well as a Rest and Recuperation facility for crews.

This project, to plan, design and construct a 'Fisheries Complex' (FC), was conceived to meet that objective.

In terms of maximum capacity, it will have to handle the full volume of both the Thai nearshore fleet and foreign (Taiwanese, Korean, Chinese and Japanese) deep sea fishing fleets wanting to process their Andaman Sea and Indian Ocean catches.

Some key operating features of the FC which could have significant impacts on the environment would be:

- fish processing facility for cleaning, freezing and shipping
- shrimp processing (cooking)
- fish processing waste treatment
- ship waste (including bilge and sewage) collection
- ship refuelling
- ship servicing
- access road construction and operation

3.3. Proposed Port Sites and Existing Environmental Conditions

In 1995, the Government of Thailand identified five possible sites for a fisheries complex on the Andaman Sea coast. Brief description of each site follows; focusing on the biophysical and social environmental settings.

(1) Ban Bang Raet (Palian River), Trang Province (Site No.1)

The Palian River site is located at the mouth of the Palian River as it empties into the highly productive Trang-Palian River estuary, some 12km south of the Kantang Port in Trang province. The site is situated in a mangrove forest, within a mangrove 'conservation¹' area. The nearest village to the site is Palian, with a road coming to within 1km of the site. Most of the area between the end of the road and the proposed complex's location is covered in mangrove forest.

The bio-physical environment has a good biodiversity including a very productive, estuarine area, as well as a healthy mangrove forest with a full complement of wildlife, primarily birds, herptiles and invertebrates.

Water quality in the estuary and near the site is excellent, with very minimal anthropogenic impact. From the sea the mangrove forest appears to have been minimally exploited since the cutting of the second growth was restricted some years ago. In fact this area has one of the largest continuous mangrove stands in Thailand

The estuary is extremely shallow, extending for many kilometres into the Andaman Sea, and as such has rich seagrass beds, dugong colonies as well as dolphins. Natural shrimp and clam production is very good, albeit heavily exploited by artisanal fishers. Fish traps and nets were observed in many locations throughout the estuary. Overall, this estuary is a highly productive nursery area for many of the fishes important to the regional Thai inshore fishery.

Kantang Town about 14 km. to the north and on the Trang River, is a seaport and as such a channel for small to medium sized vessels is maintained along the West shoreline of the Trang River Channel as it winds its way to the open Andaman Sea. This channel is maintained through continuous dredging operations.

Power, water and sewage treatment facilities for this site would have to be developed. Power is available from Kantang. A major road construction would have to take place to permit an efficient and fast land-link to the international gateways at Trang and Hat Yai airport.

The livelihood of the local population revolves around the sea and some land-based agriculture, plus the service industry to the fishing and freight fleet docking at Kantang. The nearest village of Ban Bang Raet is an artisanal fishing village fully dependent on the coastal resources for its livelihood. The people do practice some subsistence agriculture primarily for home and village consumption.

¹ Thailand classifies its mangrove forest into three categories: conservation zone = completely protected; Zone A = forestry operations only permitted; Zone B = economic development permitted.

(2) Ban Klua Tai, Trang Province (Site No. 2)

This site is located in the small village of Ban Klua Tai, on the West shore of the Trang river about 4km downstream of Kantang Town. The area has rural agriculture land use, with small scale rice production all around the village. The community is connected by gravel road to Kantang, where a new bridge, over the Trang River, has just been constructed. Even so the travel time to Trang is > 1 hour. There are other small settlements both to the north and south of Ban Klua Tai. Upstream of this proposed site are both rubber processing, charcoal manufacturing and fishmeal production plants, with no pollution control or waste treatment facilities. There is also an active river aggregate dredging operation ongoing upstream of the village. Various commercial and industrial operations, such as charcoal, rubber and fishmeal production are located from 1.5 - 2.0 km upstream of the village.

Generally, the land-side bio-physical environment is highly disturbed with only a few remnants of the natural ecosystem remaining; consisting of small nipa palm stands and tropical rain forest, as well as small mangrove stands. The river, at that location is somewhat contaminated, with sewage and processing waste, with the major constituents being bacterial and possible other pathogenic organisms. Since the waters in this area are brackish, the natural antiseptic quality of sea water is greatly diminished. The exact distance that the salt water extends into the Trang River has not been established. However the recent study completed by Chulonkhorn Univ. (1993) provides some useful basic ecology of the estuary in general, and statistics on the mariculture operations in the area.

The economic and employment base of the area is more diverse than the others in Trang in that earnings come from not only fishing and fishing related activities, but from labour in the various local industries and tourism operations.

If the complex is located at this site, involuntary resettlement will be necessary causing major changes in traditional lifestyle which may completely reshape this small village's economy and social fabric.

Services, other than electrical power (at low voltage) are several kilometres away. In that respect, the provision of potable water and sewage treatment to the community, as a means of compensation for having to relocate some of the homes, may be of benefit to the citizens.

(3) Pak Meng, Trang Province (Site No.3)

This site is located some 45 km NW of Trang City in a newly designated national park, which encompasses a considerable amount of the coastal zone of Trang Province. Although not precisely established, the complex would be located at the northern end of the 5 km long Pak Meng beach. Pak Meng village is surrounded to the North and East by second growth mangrove forest and to the South by cleared agricultural lands, including shrimp ponds and rice. This site, as with Krabi, has a rich bio-diversity, including seagrass beds located South of the village with its centre at Longitude $99^{\circ} 21'E$ and Latitude $7^{\circ} 23'N$. Total area where seagrass may exist would include a large area extending from Long. $99^{\circ} 25'E$ to $99^{\circ} 20'E$ to the South along the Pak Meng coastal area. In a general survey of 25 known seagrass beds (Chansang and Poovachiranon, 1994), on the Andaman Sea coast, this area was the largest (6.4 km^2) but had a coverage of only 54 %. Given the good water transparency, this seagrass bed is healthy and vigorous. Although not confirmed, it is highly likely that dugong colonies exist in the area associated with the seagrass. Coral reefs are located along the islands, such as Koa Muk which are located about 5 km south of Pak Meng beach, several kilometres from shore.

Around Pak Meng village, the presence of seagrass and dugon is not clearly understood, nor is the function of Pak Meng Bay, located just Northwest of the village centre. The area, in generally, can be considered an important habitat for shrimp and fish production and recently has been identified as good dugong habitat.

Water quality in the area, including Pak Meng village appears to be very good, with very little contamination or garbage deposition observed. Water transparency, about 3.8m (based on measurements taken by the Phuket Marine Biological Center) is good and indicates an optimal environment for seagrass production and general marine fertility. Aside from the mangrove forest, most natural vegetation and wildlife in the area has been significantly disturbed. For example the coastline along Pak Meng beach has been colonised by casurina pine, a tree species native to Australia and the area to the South of Pak Meng village has been cleared of mangroves for shrimp farming.

Other than the 1994 general carrying capacity study (OEPP, 1994) no thorough ecological survey of this site has ever been completed (at least nothing we were able to find during the Feb. 1996 field visit), yet a great deal of accumulated local knowledge exists, but has never been documented.

Waters in this area are very shallow with maximum 4m depth available only some 500m offshore. Ocean going fishing vessels will need a minimum 7m draft, requiring either a very long causeway/pier or extensive dredging both to construct the channel and to maintain it. Furthermore, since the site is at the upper end of a large sand beach, nearshore drift must remain undisturbed as natural coastal sediment deposition and removal patterns must be maintained in order to avoid the loss or filling in of the beach.

The proposed site is located in a subsistence agricultural and small-scale tourism land use area, with no industrial or commercial enterprises in the vicinity.

Pak Meng, the village closest to the proposed site, is a small artisanal fishing community, participating in the local resource management empowerment program being implemented by Yatfon, a provincial NGO. Since the Yatfon program began, the artisanal fishery has thrived under a program which encourages the local community to manage their natural resources, helping to re-establish traditional means of earning a living through the provision of information and resource management methodology.

A small pier acting as a tourist jumping-off point for a number of offshore islands, brings additional revenues to this small community, during the tourist season from December through March.

The site has a number of small access roads linking it to the paved secondary road No. 4162, leading to the larger regional road No. 4046, the direct connection to Trang City. Beyond Pak Meng village, no other settlements exist. Si Kao, located about 4 km inland and north of Pak Meng is the nearest larger village at the junction of Roads No. 4046 (now under reconstruction) and No. 4162..

Infrastructure at this site is minimal in that power (of a capacity needed by the fishing complex), water and waste management services do not exist. The construction of various tourist facilities along Pak Meng Beach, now under way may bring these services to within a few hundred meters of the possible location of the complex access point.

(4) Ban Khao Thong Tai, Krabi Province (Site No. 4)

About 30 km NW of Krabi Town, the site is located directly on Phang Nga Bay, a sparsely populated shallow bay. The relatively new paved two-lane local road passes directly along the shore of the site and acts as a kind of seawall. The land use in the area is essential agriculture and fishing with about 10 semi-permanent trap nets being operated just off shore by several local families living in Ban Khao Thong Tai, 1.5 km inland.

The bio-physical environment, aside from the intrusion by the fishing operations, is pristine, with a small stand of first growth mangrove trees, some reaching heights of over 30m, scattered along the coastal mudflats. Visually this area is spectacular, with the skyline being broken up only by the limestone karst islands scattered around the offshore area.

The waters in the area are very shallow reaching a depth of only a few meters even 500m from shore. Seagrass beds are reported to be scattered throughout the area. The Krabi DOF official reported confirmed sightings of dugong in the area.

To reach deep water one has to extend more than one km into the bay and then the route to the open waters, in the often hazy waters with many small islands and reef formations, is complicated and potentially dangerous.

Broadly, this area has a rich coastal bio-diversity, ranging from unspoiled coastal tidal flats, to seagrass beds and coral formations in the deeper waters. The soft limestone clay geology of the area, makes the waters naturally somewhat cloudy, giving them a faded blue-green hue. Artisanal fishing in the past used to be intensive and destructive, causing long term, and in some cases, irreparable damage to the coral habitat. However in recent times, due to the efforts of local organisations, resource exploitation based on sustainable harvesting, is become the norm, with great concern, on the part of the artisanal fishers, for the maintenance of habitats.

Ban Tha Len located about 2 km from the site, subsists on artisanal fishing as well as farming, rubber plantation labour and work in the growing number of tourist establishments. There are quite a number of similar small villages scattered around the area, all making a living as described earlier.

The proposed site has no services, (aside from a low voltage power line that passes by along the road) or an adequate road system to a transportation gateway.

While the immediate site around Ban Khao Thong Tai is not tourist(yet), the general area is a highly valuable tourism zone. Krabi's tourism industry, focused almost exclusively on Phang Nga Bay, generated about 2,000 million baht in 1992 (Chulalongkorn Univ., 1995). In contrast, the fishing industry, during the same period, generated only 723 million baht. These situations would suggest that any effort to compromise the tourism industry with other commercial operations in the Krabi coastal area needs very careful economic analysis.

(5) Phuket Fishing Port (Site No. 5)

This site is located immediately adjoining the existing Phuket commercial fishing pier in an industrial land use area. The actual site for the facility has been cleared of buildings and vegetation, thus is ready for construction. The cleared land plus the surrounding second growth mangrove stand, is under the control of the Fish Market Organisation (personal communication Pramuan Rungjai, Mgr. Phuket Fishing Port, 02, 1996). The site is in fact on a small island (Si Rae) along the waterway separating Phuket Island from Si Rae Island.

A few meters East from the edge of the cleared property a large commercial and residential complex exists, providing services and housing to the local labour force as well as to a number of the fishers.

On the West side of the channel are a large number of actively used private fishing jetties. Combined with the government pier's operations, the activity in much of this 'harbour area' is related to fishing.

Such high density of fishing activity, and a total lack of waste management facilities, has lead to a high level of water pollution in the harbour and out into the nearshore area of Phuket Bay. Contaminants are mainly sewage and fish processing wastes plus garbage. Occasionally oils and other petroleum products are spilled into this harbour as well. Although flushed by a relatively strong tidal current the sea floor is probabaly quite degraded, with only pollutant resistant organisms surviving.

A number of significant biophysical features exist in the study area. First is a mangrove stand which fringes the East and South sides of the site and the commercial complex, extending southward as the eastern shoreline for the port's access route to open water. This second growth 250 Rai mangrove stand consists chiefly of common and healthy, *Avicennia* sp. and *Rhizophora* sp., with the two tree species being distributed according to the general ground salinity levels and the soil types. This mangrove stand may also host a small egret rookery.

Secondly, the channel required for port operations, passes by a number of seagrass beds, with the closest being at Ban Laemphappa (Chansang and Poovachiranon, 1994). Although estimated to be relatively small (900 m²) this area could act as a 'seed bank' for re-establishment of the seagrass in the other locations where these beds existed historically.

The channel also passes by a number of small islands in Phuket Bay (e.g., Phao Noi and Ta Phao Yai) which may have remnant fringing coral reefs, along their eastern coast, away from the direct monsoon weather (Phongsuwan and Chansang, 1992). This means that these reefs could be directly exposed to increases in water turbidity due to propeller wash from ocean going fishing vessels plying the waters or from dredging operations in the channel.

The existing channel leading out into Phuket Bay is only 3 m deep, designed for shallow draft vessels.

In terms of the social and human environment, the only sensitive feature is the sea gypsy village on Cape Tukkae, at the entrance to the proposed site for the complex. The existing housing and services complex beside the proposed new facility will remain although some uses may have to change, e.g., from residential to commercial, with new residential units being constructed further away from the noise of a large port complex. The labour force in the area is all fishing and fishery service sector oriented thus permitting an easy upgrade in the extent and depth of the labour force needed to operate the facility.

Given that the site already has heavy truck traffic and must have good power supplies, the infrastructure, in relation to other areas, is quite advanced. The present roadway easily accepts small traffic but not the large container units, nor is there a direct connection to the Phuket bypass road or to Highway 402, the road link to the airport. As well the site presently has no water, sewer or garbage services. In fact potable water supply and its management are critical since supplies are dwindling and the tourism sector is given priority to the available supply.

3.4. Probable Environmental Effects

Based on a principally qualitative field survey, the impact of the proposed facility² on 37 environmental factors was assessed and a probable impact profile of each site was prepared. The environmental factors were grouped as being either natural environment or social environment related. These two broad groups were further subdivided into the following areas:

² At the time of this BEE, the exact location or the capacity and complete range of functions of the complex was not defined. As such the full range and extent of probable impacts could not be determined.

Natural Environment -

- ecosystems degradation
- soil and erosion
- hydrology and water quality
- air, noise and odor

Social Environment -

- socio-economics
- institutional and local customs
- culture and landscape

In the following sub-section we elaborate on this assessment.

3.4.1. General Impacts

Three potential impacts could affect the proposed site no matter where the complex is located.

Over-exploitation

Whenever new technology or facilities are introduced into a fishery and they can provide quicker and larger profits, in this case coming from higher quality products, more rapid transport to market and therefore quicker payment, there is a tendency to increase catch through further capitalisation. Concomitant with this issue could be the growth of the fleet, albeit illegal, through fishers entering on hearing that better profits are to be made. Such activities lead to added pressure (often excessive) on the fish stocks. These factors must be carefully considered and may well require a new enforcement policy and strict controls.

Destabilisation of local economy and community cohesion

The second impact, and to some extent related to the first is the induced changes to any local artisanal fishery and community if such a facility is built nearby. The employment, income and community stability could change drastically and careful analysis and planning of such an eventuality will have to be at any of the proposed locations.

Water Contamination

The FC will generate at least four waste streams; each requiring specialised handling, and treatment (fish processing waste, bilge , sewage and solid waste) . Treatment facilities will have to be constructed and then maintained on a continuous basis. In any event the risk of water pollution is very high.

3.4.2. Probable Impacts on Specific Sites

(1) Ban Bang Raet (Palian River), Trang Province (Site No.1)

a. Ecosystem Impacts

This site is located in a mangrove 'conservation' area near the mouth of the Palian River. The development of this site would require the clearing of many rai of mangrove forest, and with it important coastal mangrove habitat. If a fishing complex were located at this site, it could mean the end of the continuous coastal mangrove forest in this area, and surely severely reduce the mangrove stand in the construction area for both the facility and its land-link to an international gateway. The action of clearing the large area of mangroves could effect the local ecological balance and reduce the productivity of the area.

The need for extensive construction and maintenance dredging for three to four kilometres seaward, could have serious consequences for the seagrass beds and the dugong and their habitat.

b. Hydrology and Water Quality

The Palian river site is far enough downstream from Kantang port and far enough away from Plain town that the water quality is good, thus any changes would be felt immediately locally. Chronic contamination of the waters by untreated wastes could have serious consequences for the tidal flats and in turn destabilise the estuarine biomass production cycle.

The hydrological processes in relation to dredging and water-based structures and the operations of the facility as it related to waste management must be carefully assessed and mitigation measures set in place.

c. Air, Noise and Odor

Air Quality

Local air quality would be affected by greatly increased vessel traffic. The fact that large numbers of vessels move through the Trang River channel, and would reduce the visual impact of the project

Noise

As with the air pollution, the local noise environment, with levels significantly below the internationally acceptable 55 dBA³ annoyance level (for urban outdoor living area), would degrade significantly but this would probably be ameliorated by the already 'noisy' conditions in the Trang River channel, with the large fishing and transport fleet moving in and out of Kantang. A more important impact would be on the land side, with the new roadway and transport traffic generating noise levels far above background conditions.

³ Generally noise levels above 55 dBA are considered undesirable, particularly in previously quiet area. It is estimated that background noise levels in this area are 35- 40 dBA. The introduction of new and chronic noise in such area can lead to very significant quality of life changes thus needing careful analysis.

Odor

Odor is not expected to be a problem in the immediate area of the site as the fish processing wastes would likely be trucked to the existing fishmeal plant in Kantang; where the present odor problem is at a critical level.

d. Socio-Economic Impacts

If this site is chosen, the socio-economic impacts will have to be investigated very carefully. In-migration of workers may put pressure on the minimal services in the village of Ban Bang Raet. The new employment opportunity will tend to draw people away from the less well paying traditional work. The complex with its long dredged channel and greatly increased large vessel traffic, may reduce the traditional fishing ground and force a change in the base of the economic activity.

Without treatment and enforcement of standards, untreated waste discharges could result in a significant rise in sewage related health and sanitary issues for the local community and potentially affect the marketability of the local artisanal fish catches if tainting occurs.

e. Institutional and local customs impacts

As with the Krabi and Pak Meng sites, there is a concern at this location that the new complex may force a reassessment of the existing resource management approach which encourages local people to manage their resources, and return to the more centralised approach which, while more easily managed, has a high risk of allowing the cycle of resource degradation and economic losses to return.

f. Cultural and landscape related impacts

The aesthetic value and visual intrusion by the complex will be significant. The clearing of large stands of mangroves, coupled with a massive dredge spoils disposal and finally the complex itself will, for every, change the quality of life in Palien as well as along the new roadway linking the complex to the international gateway in Trang. Sensitive planning of the construction and operation of the facility will be key to avoiding chronic problems.

(2) Ban Klua Tai, Trang Province (Site No. 2)

a. Ecosystem Impacts

In terms of sensitive ecosystems affected, this site presents minimal problems, as it is in a village area, consisting of a large cleared areas where small scale rice and crop farming is practiced. There are no mangroves to speak of and offshore the sea and river have been extensively disturbed given that the waters are the main shipping channel to Kantang harbour.

b. Hydrology and Water Quality Impacts

This site is on the main shipping channel, therefore the hydrology and water quality have already been affected. Nevertheless waste treatment will have to be vigorously implemented since the downstream fishery will no doubt suffer from a large increase in organic nutrients and other wastes. The discharge of untreated 'service wastes' such as bilge, waste oils and sewage from the large vessels into the estuary could lead to a significant degradation to the for the natural ecosystem

c. Air, Noise and Odor Impacts

Air Quality and Noise

Air quality and noise levels are already elevated given that the site is on the Kantang harbour shipping channel. The vessel traffic associated with the new complex will degrade the existing conditions by several orders of magnitude, thus requiring some assessment of and possible adjustment to the operating procedures of the complex.

Odor

As with the Palian site the issue of odor will be minimal since the fish meal production (utilising the fish processing wastes) will be done at the existing plant(s) in Kantang.

d. Socio-economic Impacts

The location of the site at Ban Klua Tai, could have serious socio-economic consequences for the village residents. Given that the village area is already cleared, the logical location for the complex would in the area now used for rice production. In essence the complex could obliterate Ban Klua Tai, as it would require an involuntary resettlement, severely destabilising the community cohesion, the local artisanal economy. The project would also introduce a new and highly volatile economic base and pit those who will stand to gain from the facility being located in this village against those who will lose their land, homes and the security of living an area they have probably been in for generations. The village life as experienced by this community for generations would be permanently altered and replaced by single industry town system, which has a long history (around the world) of fostering economic and social instability.

e. Institutional and Local Customs Impacts

There is no question but that a complex at this location could easily lead to a loss of control by the local people, over their resources and a generally reduced feeling of empowerment. In other words the Ban Klua Tai will no longer be able to chart their own destiny but could be totally dependent on outside forces to dictate their fate. Such a scenario has been shown to generate many social problems and must be avoided.

Local customs and traditional ways could be rapidly obliterated as the village is caught up in dealing with the massive pressures of relocation and finding a new existence. Enticed by money , village leaders could make ill-advised decisions on behalf of the community further eroding their sense of community and sense of who they are.

f. Cultural and Landscape Impacts

Once a community is forced to relocate, its cultural identity is severely affected, both in terms of the relationship to the local lands and coastal area and in terms of the ancestral significance of the physical location of the village. The cultural erosion can be enormous and rapid.

The visual intrusion on the area will be such that the village will be replaced by the complex and the roadway linking to Trang. Therefore once, constructed and with the village relocated, the visual impact of the complex will not matter. If however the village is simply pushed to one side or the other of the complex or the complex is built immediately beside the village centre, the visual intrusion and aesthetic impacts and in fact the full range of socio-economic effects will be massive and such a scenario should be prevented under any circumstance.

(3) Pak Meng, Trang Province (Site No.3)

a. Ecosystem Impacts

The requirement for a long deep water access channel or conversely a long causeway could significantly alter the littoral drift as well as the tidal flat water and sediment movement patterns. Consequences of this could lead to the loss of the seagrass beds, part of Pak Meng Beach, as well as a reduction in the fish production of these coastal waters.

To the north and East of Pak Meng village is a large mangrove forest, which must be protected. Thus the alignment for any access roads must not encroach on these land or degrade the natural tidal and freshwater cycles permitting this ecosystem to remain healthy.

The seagrass beds, one of the largest and productive on the Andaman Sea coast, may have to be protected from excessive construction and maintenance dredging turbidity plumes, since these will cause their die-off and fuel a cycle of reduced productivity.

Seagrass beds are scarcely found in the waters fronting the Pak Meng beach and there remains few confirmed dugong habitat in the waters. Actual reported sightings have only been recorded in the waters offshore the southern Chang Lang beach. However, Pak Meng has recently been identified as a dugong habitat (DOF, personal communication). Furthermore, the Ratchapat fisheries Collage, located in Si Kao has embarked on a seagrass replanting project in the proposed project area.

b. Hydrological and Water Quality Impacts

Hydrology

If the access channel/ causeway is not constructed with great care and planning, nearshore hydrology and coastal topography will be affected, therefore a thorough simulation exercise will be needed to address this potentially large scale and chronic impact.

Water Quality

As with the Krabi site, Pak Meng is relatively un-polluted, thus potential contamination from untreated fish processing wastes, sewage and vessel servicing wastes, could have disastrous long term consequences for the ecology and tourism value of the area.

c. Air, Noise and Odor

Lacking careful controls and planning, air and odor pollution from vessel exhausts, plus fish processing facilities, could permanently affect the tourism value of the area and also degrade the quality of life for local residents.

Noise from the operation of the complex must also be addressed

d. Socio-economic Impacts

Pak Meng is a small fishing village dependent on an artisanal fishery for the majority of their livelihood, thus a fisheries complex could have an enormous impact on the village, not only disrupting the artisanal fishery, but also infringing the traditional community cohesion and quality of life. Higher wages at the fisheries complex may be the major influence in attracting people away from the traditional work. Secondly, there may very well be an in-migration of more skilled labour, taking the positions which locals were expecting in return for the intrusion into their area by the new facility.

e. Institutions and local customs

There is a genuine fear among the local coastal communities in the area, that a large fishery complex will attract other fishers, further increasing the pressure on the dwindling resources. What is worse is that the small coastal communities in Trang Province have been working very hard (and with considerable success, based on data from Yatfon) to increase the coastal productivity and to broaden their economic base to as many coastal zone related products as possible, and these gains may be quickly lost by a loss of local controls and local institutional organisation for natural resources management and enforcement of the regulations.

Resettlement will not be a significant issue for this site.

f. Cultural and Landscape Impacts

Depending on the design and its exact location, the FC could be highly visually intrusive, interfering with the present natural setting and secondly , reducing the interest in Pak Meng beach by tourist, who do not want to pay to be confronted with a large industrial port facility in the basically nature oriented tourism zone.

(4) Ban Khao Thong Tai, Krabi Province (Site No. 4)

a. Ecological Impacts

Given that this site is located in an area of Phang Nga Bay that has minimal human intrusion, impact on key ecosystems would be likely. Tidal flats, seagrass beds which function as the area's fish biomass production zone, could be seriously degraded since the site would need extensive causeway construction as well as dredging to provide access to the ocean-going vessels.

Dugong habitat and their travel routes may be seriously affected by the dramatic increase in vessel traffic of all types.

Since the complex will also be a fueling and servicing centre for the incoming vessels, fuel spills and falling of waters with oil slicks is inevitable. In this area, which has essentially artisanal fishing activity such pollution could degrade the coastal fishery and would be highly visible and could depress the growing and economically important tourism value of the entire bay.

b. Hydrological and Water Quality Impacts

Due to the need for extensive causeway or dredging operations, serious coastal hydrological process impacts are likely. Littoral drift may be permanently altered, changing the local fishery and possibly significantly degrading it. Waste from the complex could have very serious consequences for the Bay, the seagrass beds, the coral reefs as well as the aesthetic appeal of the entire area.

c. Air, Noise and Odor

Air, noise and odor impacts will be very significant since this site is in a nearly completely natural rural setting. Odor from the operation of FC and the inevitable fish waste processing (fishmeal) facility could seriously degrade the area for many km downwind of the operation. Air pollution will be less of a problem, but will be very visible particularly from the large vessel traffic and from the large increases in truck traffic carrying the processed fish products to the international transportation gateway.

Noise will also be very significant as the complex will be in 7-days a week thus machinery, vessels, trucks, etc. will be creating noise continuously. At present the area has no mechanical noise intrusion other than from the 7-8 low horsepower canoes used to service the trap nets in the area, plus the small charcoal production business located in a small mangrove stand some 1.5 km north of the site.

d. Socio-economic Impacts

Generally socio-economic effects from this project at this site could be major, in that in-migration of workers, visual intrusion and degradation of the tourism industry as well as major visual and aesthetic intrusion could destabilise the local economy as well as attack the traditional way of life for villages like Si Kao, Ban Tha Len and Ban Khao Tong.

Any water quality degradation and/or the pollution of the surface waters with oil films would degrade the quality of the local fish products, and seriously affect the small fishers.

(5) Phuket Fishing Port (Site No. 5)

a. Ecosystem Impacts

The only ecosystem impact of any significance at this site will be the removal of the mangrove stands (zoned as category B mangrove, i.e., economic development area) plus the further degradation of the small seagrass beds in the area.

b. Hydrology and Water Quality Impacts

Hydrological issues will also be important as the complex will need a large water supply, and Phuket is experiencing a water shortage. Water quality could be further degraded by the large volume fish processing facility if proper waste management procedures are not put in place.

c. Air, Noise and Odor Impacts

Since the facility will include fish processing, odor will be produced and will affect the local area, beyond the existing localised odor zone. Given that the complex would be designed to attract the international deep sea fleet, truck and sea traffic would be continuous, significantly affecting the area's noise and air environment, particularly along the trucking route.

d. Socio-Economic Impacts

The complex may force the resettlement of people along the alignment of a new road which will be needed to service the complex and link it to the existing Phuket ring road.

In terms of socio-economic impacts this location would not pose serious problem for the local labour force as it would in small remote villages where shifts away from a self reliant artisanal economy, to a corporate employer, could have very serious long term impacts. Although the labour force is large, the skills necessary to operate such a complex would not be readily available locally and thus the project would need to import skills such as STP operation and management or provide training to local staff.

Overall, this site is located in an industrial-commercial area and the complex would not have a major impact on the area. In other words, it would blend in to the existing land use, provided that good services and conscientious management were provided.

3.5. Tabulation of the IEE/ Site Screening Process

Given that Thai regulations state that a project of this scale must have a full EIA, the IEE focused on the analysis and tabulation of results focusing exclusively on the selection of a preferred site, rather than the determination of the need for an EIA.

Table 3.5.1 and Figures from 3.5.1 to 3.5.5 present both a tabular and graphical summary of the assessment of the 37 environmental criteria used in the selection of a preferred site for the fisheries complex on environmental grounds.

(1) Ban Bang Raet (Palian River), Trang Province (Site No.1)

This site was ranked as in 5th place as a fishery complex site. This ranking a candidate site for the following environmental reasons:

- This site is located in a coastal mangrove forest classified as a 'conservation' area, and as such the site is deemed to be very significant and totally protected. This is specified in the Mangrove Policy of Thailand's Forest Protection Act.
- The need to dredge a 3km+ access channel from the Andaman Sea to the Palian river mouth would lead to serious and potentially chronic environmental losses, including fish habitat, overall fish production and water pollution.
- the need to construct a new access road from the site to Palian village and upgrade the road to Trang, the international gateway, would require involuntary resettlement of people and would inflict permanent changes to the local villages in terms of very significantly increased traffic, noise and air pollution.

(2) Ban Klua Tai, Trang Province (Site No. 2)

From an ecological perspective, this site presents few obstacles in that the land was, some years ago, cleared of all native vegetation and converted to rice fields and other agricultural lands. The sea-side is now the main shipping access channel to Kantang and as such receives regular maintenance dredging.

By contrast, the socio-economic consequences of a fishing complex at this location are potentially very serious and minimally mitigateable. Therefore, this site was ranked 3rd as a candidate site for the fishery complex. This ranking was based on the following key environmental reasons.

- Even though a small village, Ban Klua Tai would be eliminated by such a large development. Its 300-400 citizens would have to be resettled and in the process losing the community social structure and their historical identity in Trang Province.
- A major and costly road construction project (more than 10 km long) would have to be undertaken to upgrade and construct the road link between this village and Kantang and onward to Trang. As well as high costs, this work would require taking of agricultural lands and the likely displacement of people.

(3) Pak Meng, Trang Province (Site No.3)

This site was ranked 2nd as a fishery complex site. This ranking was based on the following key environmental reasons:

- This site is in a national park and as such, park policies do not allow development other than that designed to improve the park's function.
- Very shallow waters would require the construction and maintenance of a long and deep access channel an/or causeway, permanently changing coastal nearshore currents and sediment movements, which could have drastic effects on nearshore fish (the target of the many artisanal fishers) distribution and production.
- Pak Meng beach area would be in real danger of being fouled by accidental spills.. from a fishery complex port located at its "upstream" end. Spills are bound to occur at a port of the scale being considered and where many potentially polluting activities will have to take place on an almost continuous bases.
- The access channel and/or causeway would cut across seagrass beds as well as known dugong travel routes, interfering with these two nationally protected environmental features.
- Pak Meng is a small artisanal fishing village, which has rekindled the traditional coastal village way of life and, by all accounts, is economically better off than before, has improved the yield from the resources they harvest, through local management (empowerment), and would be in serious jeopardy of being completely destabilized by the influence of this large fishing complex.

(4) Ban Khao Thong Tai, Krabi Province (Site No. 4)

This site was ranked in 5th place as a fishery complex site. This ranking was based on the following key environmental reasons.

- The massive dredging and/or causeway construction needed to obtain the necessary 7m depth for ocean going fishing vessels, coupled with the required long term maintenance dredging, would irreparably degrade this area
- Both seagrass bed and dugong are present in this area and any permanent disturbance, such as from a fishing port, would most certainly extirpate the dugong.
- With the quite extensive large vessel traffic moving in and out of Phang Nga Bay, known for its dangerous reefs and shallow waters, accidents are bound to happen and thus the risk of severe degradation of the exceptionally clean natural ecosystem and the economically robust, and growing, tourism industry from oil spills, bilge discharges and sewage/garbage dumping is too great to permit industrial development at this site in the heart of Phang Nga Bay.
- In 1992 the tourism industry in Krabi Province equalled about 20% of the total provincial income or 2,000 million baht. The "ripple effect" through housing and commercial developments has added a further 50% to the province's tourism related income. These numbers are too large to risk when compared with the provincial fishing industry, which, in 1992 generated about 732 million baht in revenues or < 1/3 of that of the tourism industry.

(5) Phuket Fishing Port (Site No. 5)

Phuket is considered the best location for the fishery complex for both bio-physical and socio-economic reasons.

- Ecologically and from a water quality, air, noise and odor perspective, the area has been extensively disturbed and dredged. The development of a fishery complex would only help to clean up the area, providing waste treatment and proper handling of catch, reducing the spoilage rate and increasing profits to the fishermen.
- The West and South sides of the area where construction would take place are presently covered by a category B mangrove forest. This forest is under the control of the Phuket fishing Port and is such, clearing of this area is not restricted. In fact, it is our understanding that the provincial forestry department has given approval for this clearing to take place.
- There appear to be no significant negative socio-economic impacts other than from the access road construction which will require some property taking along the alignment linking it to the Phuket Ring-Road as well as possible economic losses for those people who presently derive income from the local mangrove forest.

3.6. Conclusions

Based on the evaluation of 37 environmental criteria at five possible sites for the fishery complex, Phuket is clearly the first choice on environmental grounds. A distant second choice would be Pak Meng, Trang Province, followed by Ban Klua Tai, Bab Bang Raet and finally the Ban Khao Thong Tai in Krabi Province.

Under the existing Environmental Quality Act Sections 46 and 51, the Notification of the Ministry of Science Technology and Environmental, Aug. 24th, 2535, this project must have a full EIA completed.

Table 3.5.1 Evaluation scores for 38 environmental factors used in assessing relative probable impact of sighting of fisheries complex at 5 alternative locations on the Andaman Sea coastline of Southern Thailand.

| Environmental Factors | Trang - Palien River | Trang -Trang R.; Ban Klua Tai | Trang -Pak Meng | Krabi - Ban Tha Len | Phuket Fishing Pier |
|--|----------------------|-------------------------------|-----------------|---------------------|---------------------|
| Degradation of landbased-vegetation community | 4 | 2 | 2 | 3 | 3 |
| Introduction of exotic flora and/or fauna | 5 | 2 | 3 | 3 | 2 |
| Degradation of biological diversity | 8 | 1 | 6 | 2 | 2 |
| Fish stock degradation | 3 | 1 | 3 | 5 | 4 |
| Degradation of tidal flats | 7 | 3 | 6 | 8 | 2 |
| Degradation of seagrass beds | 8 | 5 | 6 | 7 | 4 |
| Clearing of mangrove forests | 10 | 2 | 3 | 3 | 5 |
| Degradation of coral reef system | 4 | 1 | 4 | 5 | 1 |
| Degradation of nearshore seabed (benthic production area) | 6 | 3 | 6 | 8 | 2 |
| Soil erosion | 3 | 3 | 1 | 1 | 1 |
| Encroachment on sensitive habitat, e.g., dugong | 6 | 5 | 1 | 6 | 1 |
| Changes in groundwater hydrology (needed water) | 2 | 2 | 2 | 2 | 5 |
| Hydrological changes due to modification of coastal topography | 2 | 2 | 4 | 7 | 1 |
| Modification of wave trains and sediment movement | 5 | 5 | 5 | 8 | 3 |
| Water contamination by sewage, fish processing, bilge waste, etc.. | 9 | 9 | 7 | 7 | 5 |
| Eutrophication | 6 | 5 | 6 | 6 | 4 |
| Offensive odor pollution | 3 | 8 | 8 | 8 | 6 |
| Noise and vibration | 5 | 5 | 5 | 5 | 5 |
| Visible air pollution due to large tanker traffic | 5 | 7 | 7 | 9 | 4 |
| Planned resettlement | 1 | 5 | 2 | 7 | 2 |
| Involuntary resettlement | 1 | 5 | 2 | 3 | 5 |
| Substantial changes in way of life | 1 | 8 | 5 | 2 | 1 |
| Conflict between beneficiaries and non-beneficiaries of project | 2 | 8 | 5 | 6 | 1 |
| Increases in land transportation (access roads) | 7 | 7 | 6 | 6 | 3 |
| In-migration | 7 | 4 | 7 | 7 | 2 |
| Change in population composition relative to labour force | 7 | 7 | 7 | 5 | 2 |
| Changes in base of economic activity | 4 | 7 | 4 | 3 | 1 |
| Involuntary occupational change | 3 | 6 | 6 | 4 | 2 |
| Increases in income disparity | 1 | 3 | 1 | 1 | 1 |
| Changes in social and institutional structure | 4 | 4 | 4 | 3 | 3 |
| Waste and excrement related health degradation | 7 | 7 | 8 | 8 | 4 |
| Infringement on and/or reduced resource mgt. empowerment | 6 | 8 | 6 | 5 | 2 |
| Changes in historical customs and fishing rights | 4 | 5 | 4 | 3 | 2 |
| Impairment and/or demolition of historic remains and cultural assets | 2 | 6 | 4 | 4 | 4 |
| Impairment to aesthetic value of area | 9 | 7 | 6 | 8 | 3 |
| Visual intrusion | 9 | 9 | 8 | 9 | 3 |

Note: Scores are based on qualitative observations made during an 8-day field visit to all sites in Feb. 1996.

Figure 3.5.1 Results of the environmental field evaluation of a fisheries complex site on the Palian River estuary, Trang Province .

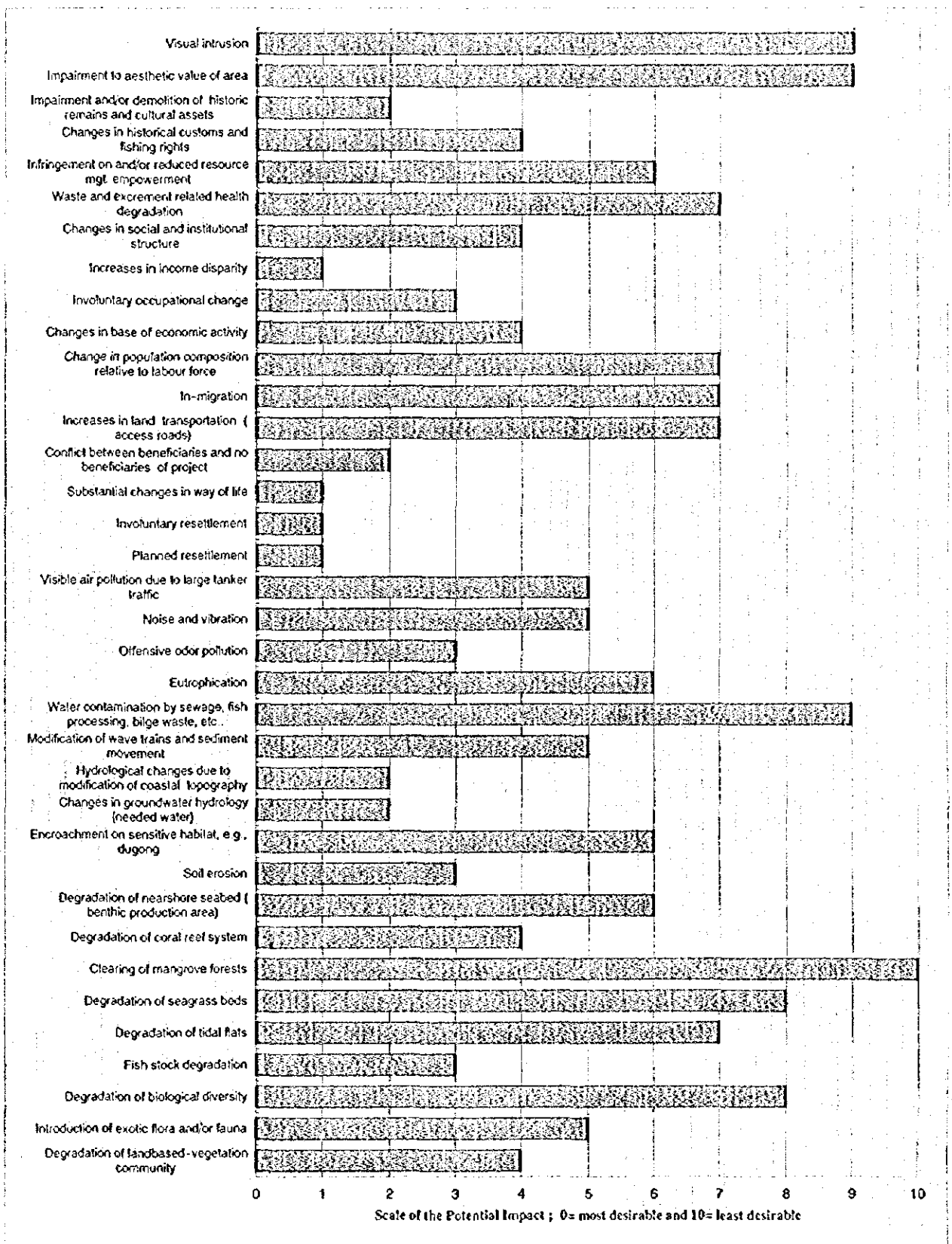


Figure 3.5.2 Results of environmental field evaluation of a fisheries complex site at Ban Klua Tai in Trang province

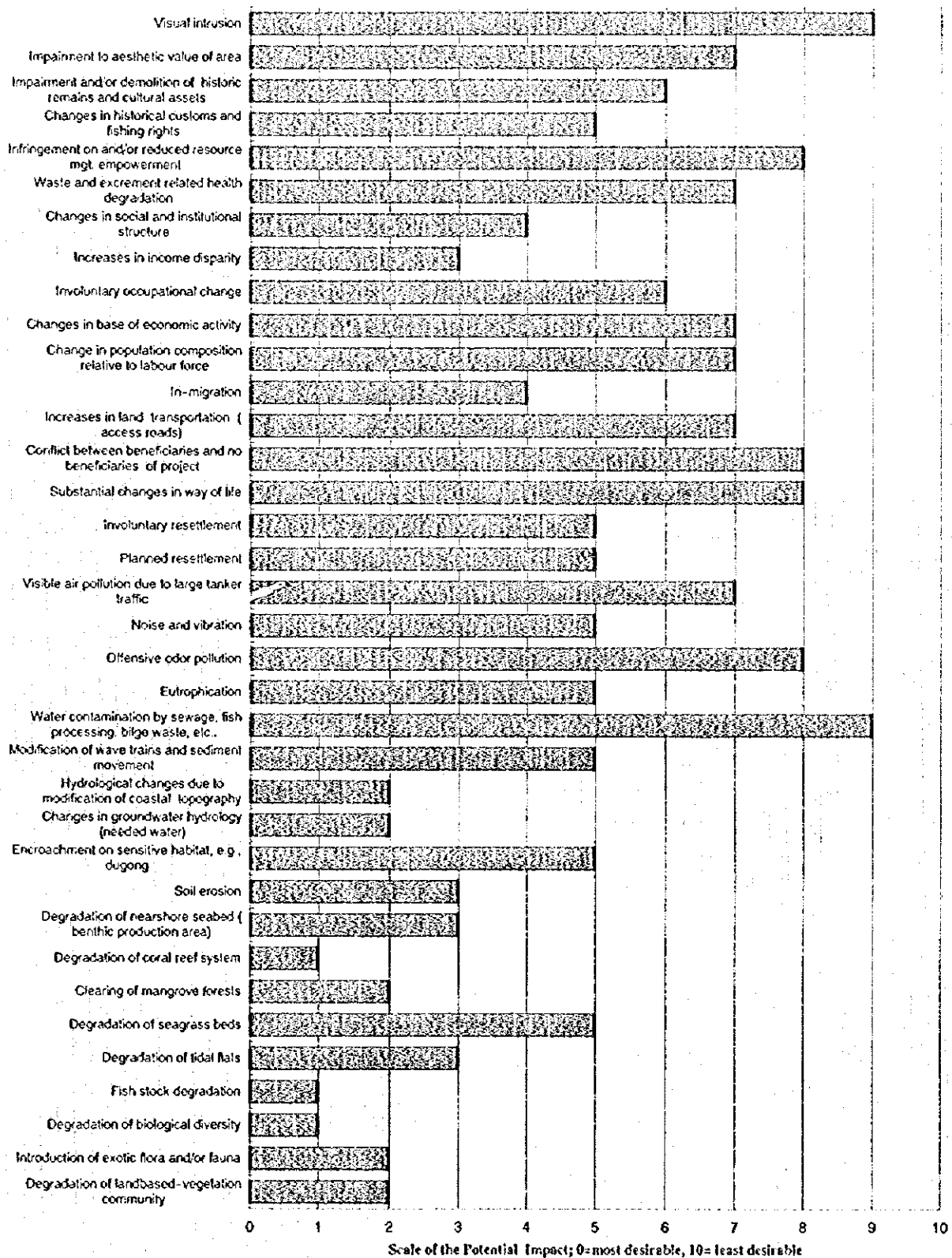


Figure 3.5.3 Result of the environmental field evaluation of Pak Meng site in Trang province

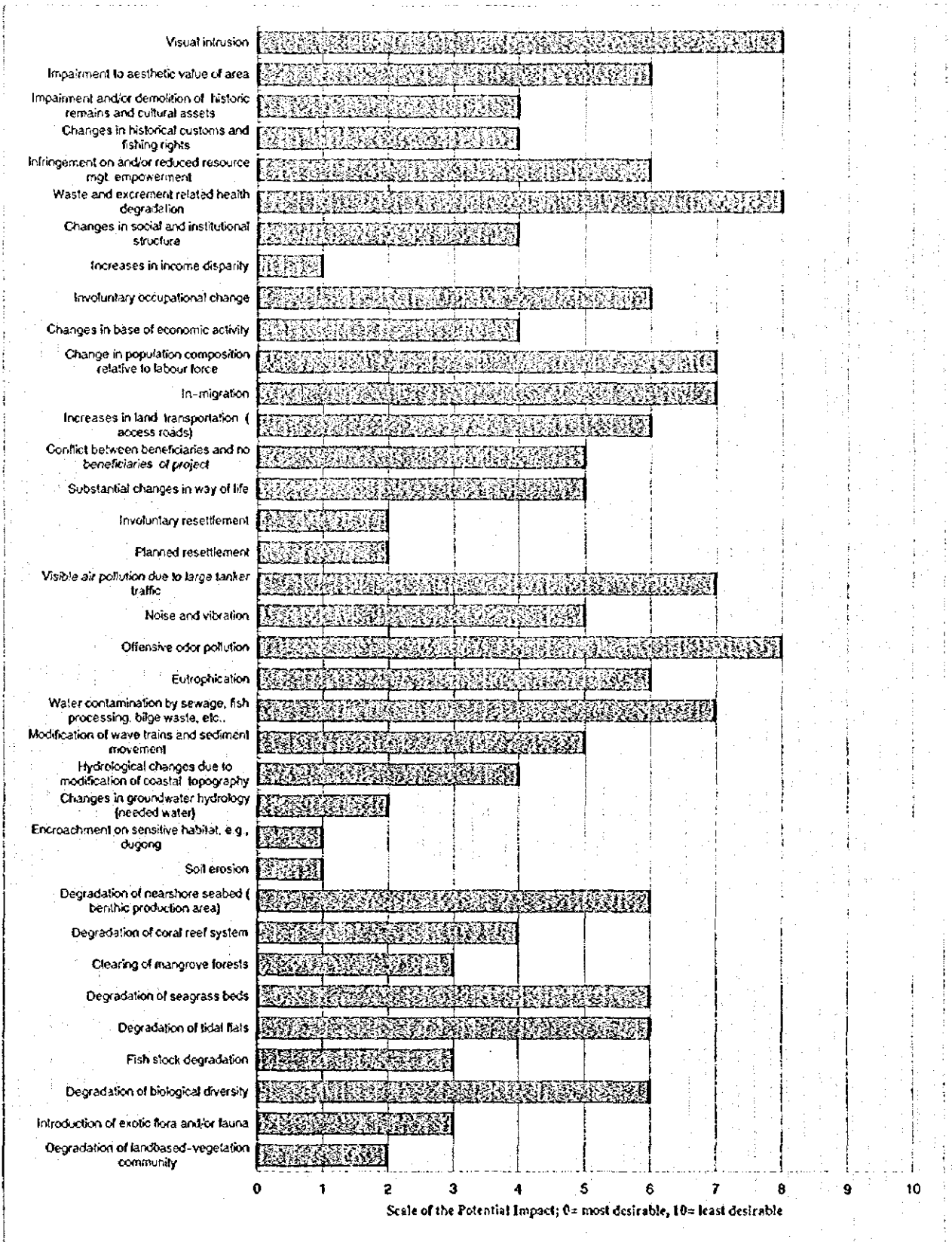


Figure 3.5.4 Results of environmental field evaluation of the Ban Tha Len site in Krabi province

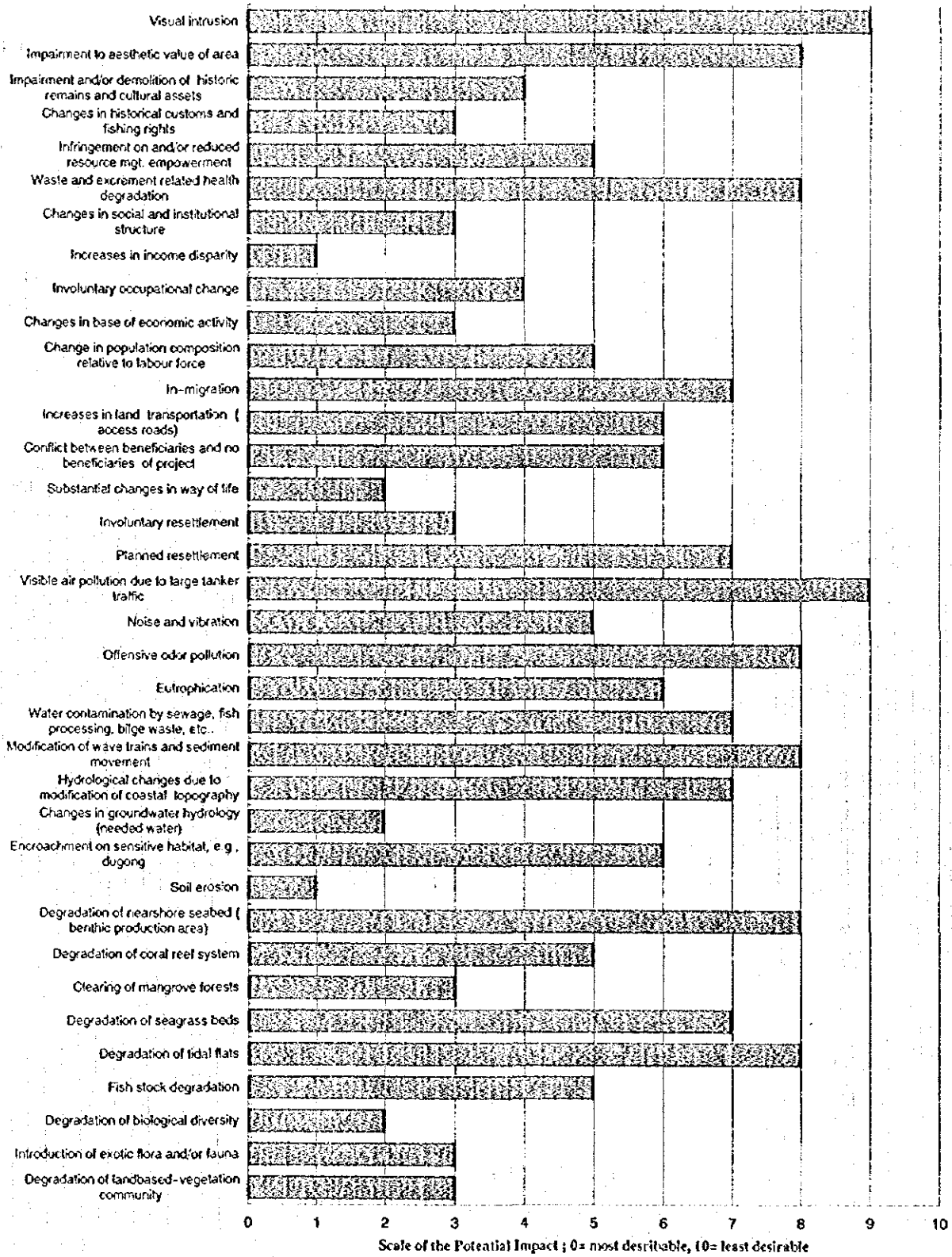


Figure 3.5.5 Results of the environmental field evaluation of the Phuket site for a Fisheries complex .





4. SELECTION OF PROJECT SITE

4.1. Proposed Project Site

The Terms of Reference (TOR) for the Project are prepared by JICA on the basis of Scope of Work on August 10th, 1995. In the present stage TOR calls for identification of the project site through establishment of selection criteria, review of proposed sites, etc.

As stated in the Preliminary Study Report (in Japanese), five locations in three provinces are proposed by DOF as follows:

- (1) Right bank of Palian River (Ban Don Khiam) in Trang
- (2) Right bank of Mae Nam Trang (Ban Na Klua Tai) in Trang
- (3) Pak Meng in Trang
- (4) Ban Khao Thong in Krabi
- (5) Fishing Port in Phuket

The proposed location in Krabi Province at the beginning of the study is changed to the Ban Khao Thong from Laem Hang Nak for being kept away from the Royal Cottage area.

In addition to the proposed locations, seven locations as listed below were recommended for the team's understanding on the fishery activities on the Andaman Sea coast.

- (6) Ranong
- (7) Kuraburi
- (8) Takua Pa
- (9) Tapu Lamu
- (10) Thai Muang
- (11) Langu
- (12) Satun

The Team made reconnaissance of the twelve locations as above and reviewed the situation at each location from viewpoints of fishery, social economy, and engineering.

Through discussion with DOF on the basis of results of the reconnaissance, it is confirmed that DOF is desirous of establishing new fishery complex in a province of Phuket, Krabi and Trang and of excluding provinces of Ranong, Phangnga and Satun for the project site because of the government policies.

The study, therefore, focuses on the five locations from (1) to (5) for selection of the project site and will clarify the characteristics at each location for identification of the project site.

4.2. Criteria for Its Selection

The most desirable project site will be identified from the proposed five locations, as discussed in the previous section.

For selecting the project site the study in this stage aims at finding facts for fishery sector, collecting information for fishing port planning and examining the environmental conditions at the proposed locations. As stated in the sub-section 2.2.2 "Fisheries Development Plan", DOF sets the target to develop fishing grounds in the Andaman Sea and Indian Ocean. It is understood that the Fishery Complex Project will be formulated to meet the objective. The fundamental concept of the fishery complex is conceived to be promotion of the fishing activities by:

- Thai nearshore boats in the Andaman Sea, and
- Deep-sea fishing vessels from Thailand to be newly purchased plus foreign countries in the Andaman Sea and Indian Ocean.

The concept is expected to cover the ideal scale of facilities for fisheries industry such as fish processing and annexed facilities.

In examining the locations on the basis of criteria, the project concept mentioned as above will be employed.

The criteria for selecting the project site are proposed on the basis of the aspects from planning and engineering, and the aspects from fishery and environment at each location. The followings are description on the outlines of the each criterion for the said purpose.

(1) Planning Aspects

1) Area for flexible layout of necessary facilities

In planning a new fishery complex, wide area and its extension will be required to accommodate a large number of fishing vessels and to provide cold storage facilities, processing plants, etc. The master plan is subject to change with corresponding future economic and fisheries changes, and the site will require flexibility against modification of the established plan, even in any cases of expansion or reduction. It is important that development area be secured with minimizing any restrictions, to meet the social and economical demands to the development. The proposed locations are to be evaluated from the above viewpoint for the goal.

2) Safe Manoeuvring of Fishing Vessels

For preventing shipwreck, a fishing port should equip a sufficient width and depth of access channels and basins with a navigation system. The standards for design of fishing port facilities and the guideline for planning of fishing ports in Japan emphasize the safe manoeuvring and specify the required dimensions for the purpose. The guideline presents that width of a channel for double carriage requires five or six times of design ship's width. Area of a basin for self-turning requires a circle area of three times of ship's LOA. Area of the latter facility can be reduced to two times of the LOA with towing by tug boats.

As mentioned in the head of this sub-section, the fishery complex will accommodate deep-sea fishing vessels. Purse seiners will be employed for the fishing and the ships are likely to be a max. size as about 70 m in LOA, 12 m in width and 7 m in full draft.

If the fishing vessels are accommodated, efficient width of a channel will require 60 m and efficient diameter of turning basin will need 210 m and 140 m for self-turning and towed-turning respectively.

3) Functional layout of the facilities

This aspect is to evaluate the proposed locations from a viewpoint of possibility to layout facilities for the fishery complex with well functioning. Wharves and basins will be located, considering required functions as landing system, flow of landed fish, etc. Facilities as cold rooms, ice-making plants, processing plants, etc. will be provided to meet flow of landed fish and other requirements. The plane configuration of given land at each proposed location will be evaluated from this criterion.

4) Utilities (Electricity, Water Supply, Sewerage)

a. Easy to Supplying Water for Processing and Cleaning Fish Landing place.

Large volume of the fresh water will be required for fish landing wharf, handling place, auction place and processing plants. The average of water required by the fishing port is estimated between 5 and 10 times of the volume of the fish landing. Larger volume of water for handling small fish is needed than big size fish. In particularly, Surimi processing plants are required high quality water of about 15 to 20 times of the volume of raw material fishes.

For cleaning places of landing and handling fish, filtered sea water can be used but processing factories always require fresh clean water.

b. Completed or Available to Supply of Electricity.

It can be estimated that the fishing port facilities shall consume large volume of electricity by refrigeration machinery and illumination for landing fish at the night time.

(2) Engineering Aspects

1) Land reclamation

Reclamation to create land for facilities of the complex will be basically required more or less at any proposed locations. As no information underground soil is available, characteristic surface soil at other locations will be referred for ranking the proposed locations. Minimum information will be given on difference of soil characteristics between mangrove forest area and sand beach or rigid river banks. Soil in the mangrove forest area, for example, is very loose, which will cause serious settlement when reclaimed.

Bathymetric feature on water depth and seabed gradient will influence reclamation volume. Scales of fishing port facilities at the locations facing the rivers should be minimised not to interrupt river flows.

2) Marine conditions (Waves)

An ideal basin of a fishing port is to be sheltered from wave action and almost fishing ports on the coast of Andaman Sea are located in the rivers where they are free from waves. But approach channels of some fishing ports are exposed and are maintained with annual dredging. When new fishing complex is extended to offshore, provision of breakwaters will be required to shelter the basin and channel. The proposed locations are ranked by this criterion.

3) Maintenance of channels and mooring basin (Siltation)

As described in section 3.4, channels of all the existing fishing ports are dredged to maintain the necessary depth and volume of 200,000 or 300,000 m³ is annually dredged. The new fishery complex will provide a deeper channel and basin for deep-sea fishing fleet and larger volume of seabed material will be dredged. The volume will vary with natural conditions at the proposed locations and will be ranked referring to the dredging records. This criterion is for evaluation of maintenance works.

(3) Fishery Aspects

1) Number of existing fishing boats and fish agents

As mentioned in "2.3.6.(1)", it is expected that a new fishing port will accommodate a part of fishing fleet in a province where a new fishing port will be located and some number of fishing boats from the Gulf of Thailand being operated in Andaman Sea. Therefore, a province that many fishing boats exist in is desirable for the project site.

It seems that landed fish catch will be mainly transacted with fish agents. They will unlikely move only their fishery business activities to the outside of their own provinces because fishery business is a part of their conglomerate activities. A province that fish agents exist in is desirable for the project site.

2) Distance to fishing grounds

One of the purposes of new fishing complex is to develop deep sea fishing in the Indian ocean. Therefore, shorter distance from the fishing ground in the Indian Ocean is desirable. The proposed locations are evaluated with the criterion.

3) Conditions of transportation.

Tuna fishing has great potential to develop deep sea fishing in the Indian Ocean. As mentioned in "2.3.4(3)", about 60 % of landed tuna by long liner vessels are exported by air from Phuket international airport to the market, of which major target is fresh tuna (*sashimi*) market in Japan due to the highest price. International air port is required to export tuna caught by long line vessels for earning hard currency. The other species caught in the Indian Ocean are raw materials for fish processing industries, such as canning, surimi, etc. Those are transported by land to existing factories located along the Thai Gulf and Greater Bangkok area. To transport them with certain quality, road conditions should be considered for selecting the project site.

4) Available Human Resources for Processing Plants and Related Facilities.

Handling fish and processing fisheries products are one of the most labour intensive industry, particularly, selection of size and quality of the fish are required experienced skill labourers. Sound management of these plants requires labour force to meet their production.

Following the above, the availability of human resources is conceived to be a criterion for successful establishment of fishery complex.

(4) Environmental Aspects

1) Ecosystem degradation

Ecosystem degradation refers to the interference from the proposed development with the normal functioning of a natural environment system such as seagrass beds or mangrove forests or estuarine areas. The degradation can also result from accidental introductions of exotic competitor species or the reduction of habitat. 9 factors are identified under this category.

2) Hydrology and Water Quality

Coastal port facility development often requires the construction of reclaimed land areas, piers, navigation channels, causeways and maintenance dredging, modifying the coastal hydrology, including erosion and deposition cycles. These changes can have a severe effect on coastal biomass productivity, shifting fish distributions patterns and generally changing the ecology of the area.

Secondly, such facilities generate large quantities of liquid and solid waste which must be treated and properly disposed of. Requiring specialised infrastructure and human resources.

Therefore the evaluation of these two factors is very important in establishing potential impact. 4 factors are identified under this category.

3) Air, Noise and Odor

The introduction of intensive large vessel traffic, the significant increase in local land transportation, the establishing of fish processing facilities, all generate air pollution. The extent to which these changes affect the surrounding natural and human environment is an important component to establishing project impact.

Noise from a fishing port-complex, particularly in an area previously rural agricultural, can be very annoying for local citizens and can permanently change the area's quality of life. Therefore the inclusion of noise as a measure of impact is required.

Thirdly, odor from fishery port complex is well known and if associated with a fish waste processing facility can be far reaching with a large 'down-wind' impact plume. Good examples of such conditions are found in Kantang, Trang Province. Odors from such operations are extremely strong and can seriously affect all other outdoor landuses, significant residential discomfort and could also lead to land value degradation. The extent to which odor can be managed is an important measure of total project impact.

4 factors are identified under this category.

4) Socio-economic Destabilization

Ranging from the most severe socio-economic impact, namely involuntary resettlement to in-migration, forced occupational changes and community destabilization, these factors measure key impacts of such a project on the human environment. 12 factors are identified under this category.

5) Changes to Institutional and Local Customs

Project of this scale bring with them new roles, controls and often forced compliance by local people to destructive, restrictive and minimally applicable regulations, which throw the community economy and historical rights into chaos. Such changes can have serious chronic economic and social consequences, and therefore most be evaluated. 2 factors are identified under this category.

6) Changes to Culture and Landscape

The degradation of a community's cultural assets and any historical (archeological) features coupled with a change in people's visual landscape around them, can have serious impacts. 3 factors are identified under this category.

4.3. Evaluation of Proposed Locations

For identification of the project site, characteristics of the proposed locations are shown as from Table 4.3.1 to Table 4.3.5 respectively, in terms of the criteria mentioned in section 4.2. They are described with consideration of the concept of the fishery complex, referring to the existing fishing port facilities in Thailand.

In addition to the above, the proposed locations in the three provinces are evaluated on the assumption of landing fish catch as 100,000 ton. A result of evaluation is shown in Table 4.3.6.

The five proposed locations are ranked in the two tables with giving marks of three grades of 1, 2 and 3 which presents "most desirable", "desirable" and "least desirable" respectively. They are evaluated relatively on each criterion among the said locations.

Examining the results from two tables, the locations of No.1, No.2 and No.4 are ranked low. Pak Meng and Phuket mark same scores. Pak Meng and Phuket has the further advantage over the above 3 locations. As an evaluation result, it is understood that Pak Meng leads Phuket in planning and engineering aspects and Phuket has an advantage in environmental aspects.

Implementation of the project in proposed site in Pak Meng, which is located in the national park, will require permission from the governmental authority.

Thourh discussions with DOF, it is emphasized that conservation of natural resources and enviornment are the most important issues, which should be considered regionally and internationally with top priority. It is also noted that detailed study will be required to minimise environmental impacts with implementing countermeasures for mitigation.

In Pak Meng there remain mangrove forest and a small groupe of dugon around the islands near the river mouth of Klong Trang. Mangrove and dugong are said to be symbles of environment protection and it is understood that minimization of impacts is very important.

Considering the Thai environment conservation policy and movement, it is understood that a key criterion with a first priority should not be planning aspects but minimization of environmental impacts. Restriction in planning was relieved with a proposal by DOF to utilize the water area outside of the canal in Phuket Fishing Port.

The above comprehensive consideration leads the conclusion that Phuket Fishing Port is identified as the project site.

Table 4.3.1 Site Characteristics at Ban Don Khiam (No. 1)

| Criteria | Description |
|---|---|
| (1) Planning Aspects | |
| 1) Area for flexible layout of facilities | (1) Sufficient land area will be available if mangrove forest is cleared with permission from authority. (2) Water area is limited as the site is located along the river bank. |
| 2) Safe manoeuvring | (1) Existing river width is abt 600 m. (2) A channel & basin will be provided in the river. Self-manoevring is difficult due to river flow. (3) Approach channel to -7 m will require 15 km dredging. |
| 3) Functional layout of facilities | (1) The above situation will disperse facilities along the river stream. |
| 4) Utilities | (1) No utilities. |
| (2) Engineering Aspects | |
| 1) Land reclamation | (1) Very loose soil around mangrove forest area. (2) Flat area will be acquired in the mangrove area. |
| 2) Marine conditions | (1) No wave action. (2) River flow should be considered for designing water facilities. |
| 3) Maintenance of channels and basins | (1) Almost same volume of sedimentation in Mae Nam Trang is expected as not less than 300,000 m ³ for deep sea fishing fleet. |
| (3) Fishery Aspects | |
| 1) Existing number of fishing boats and fish agents | (1) 657 fishing boats including 357 boats more than 18 m are registered, and many large-scale boats come from other provinces including the Gulf of Thailand. (2) 39 fish agents and another 19 related fish dealers are in Trang Province. |
| 2) Distance to fishing grounds | It is the farthest site from deep sea fishing ground in Andaman Sea, being 160 km away from southern Phuket, the nearest site. (2) Distance from Great Channel is 520 km to steam for deep sea fishing in Indian Ocean. |
| 3) Conditions of transportation | (1) No access road to the site. (2) Road distance from the site is 880 km to Bangkok and 190 km to Hat Yai. (3) Domestic airport is in Trang Province. |
| 4) Availability of human resources | (1) Seasonal transfer of labour to rubber industry occur annually. (2) Shortage of labour force is not expected seriously. |
| (4) Environmental Aspects | |
| 1) Ecosystem | There exists mangrove forest to be conserved around the mouth of Klong Palian. |
| 2) Hydrology and Water Quality | Sufficient river flow with good quality |
| 3) Air, Noise and Odor | No contamination. |
| 4) Socio-Economics | No social activity. |
| 5) Institutional and Local Customs | No social activity. |
| 6) Culture and Landscape | Covered with natural mangrove forest |

Table 4.3.2 Site Characteristics at Ban Na Klua Tai (No.2)

| Criteria | Description |
|---|--|
| (1) Planning Aspects | |
| 1) Area for flexible layout of facilities | (1) Sufficient area will be available if trees except mangroves is cleared (2) Water area is limited as the site is located along the river bank. |
| 2) Safe manoeuvring | (1) Existing river width is abt 600 m. (2) A channel & basin will be provided in the river. Manoeuvring will require tug's assistance due to rive flow. |
| 3) Functional layout of facilities | (1) The above situation will disperse facilities along the river stream. |
| 4) Utilities | (1) No utilities. |
| (2) Engineering Aspects | |
| 1) Land reclamation | (1) Reclamation will be minimized for facilities with utilizing the existing open land. |
| 2) Marine conditions | (1) No wave action. |
| 3) Maintenance of channels and basins | (1) Not less than 300,000 m ³ will be required to maintain the channel for deep sea fishing fleet. |
| (3) Fishery Aspects | |
| 1) Existing number of fishing boats and fish agents | (1) 657 fishing boats including 357 boats more than 18 m are registered, and many large-scale boats come from other provinces including the Gulf of Thailand. (2) 39 fish agents and another 19 related fish dealers in Trang province. |
| 2) Distance to fishing grounds | It is the farthest site from deep sea fishing ground in Andaman Sea , being 160 km away from southern Phuket, the nearest site. (2) Distance from Great Channel is 520 km to steam for deep sea fishing in Indian Ocean. |
| 3) Conditions of transportation | (1) Existing access road is not paved. (2) Road distance from the site is 890 km to Bangkok and 200 km to Hat Yai. (3) Domestic airport is in Trang Province. |
| 4) Availability of human resources | (1) Seasonal transfer of labour to rubber industry occur annually. (2) Shortage of labour force is not expected seriously. |
| (4) Environmental Aspects | |
| 1) Ecosystem | (1) There is few significant ecosystem. (2) No mangrove forest. |
| 2) Hydrology and Water Quality | (1) Hydrology and water quality have been affected. |
| 3) Air, Noise and Odor | (1) Air quality and noise levels are elevated. (2) Odor level is very high. |
| 4) Socio-Economics | (1) A small community held by agriculture and fishery might be resettled in implementing the project. |
| 5) Institutional and Local Customs | Traditional custom in the village might be changed. |
| 6) Culture and Landscape | No issue. |

Table 4.3.3 Site Characteristics at Pak Meng (No.3)

| Criteria | Description |
|---|--|
| (1) Planning Aspects | |
| 1) Area for flexible layout of facilities | (1) Free layout in the sea. (2) Required land area will be created with land reclamation at the shallow waters. |
| 2) Safe manoeuvring | (1) Layout of water facilities is ideally proposed. (2) Distance between 0 m deep to 7 m deep is about 3 km. |
| 3) Functional layout of facilities | (1) Functional layout will be proposed in the reclaimed land. |
| 5) Utilities | (1) Electricity available (2) Large quantity of water should be acquired from deep wells. |
| (2) Engineering Aspects | |
| 1) Land reclamation | (1) Sandy beach where less settlement is expected than mangrove area. (2) 1/400 of Seabed gradient: Flat seabed |
| 2) Marine conditions | (1) Some wave action is expected around the channel mouth in SW monsoon season. |
| 3) Maintenance of channels and basins | (1) Littoral drift is expected a little. |
| (3) Fishery Aspects | |
| 1) Existing number of fishing boats and fish agents | (1) 657 fishing boats including 357 boats more than 18 m are registered, and many large-scale boats come from other provinces including the Gulf of Thailand. (2) 39 fish agents and another 19 related fish dealers are in Trang province. |
| 2) Distance to fishing grounds | It is the third nearest site from deep sea fishing ground in andaman Sea being 130 km away from southern Phuket. (2) Distance from the Great Channel entering Indian Ocean is 500 km to steam for deep sea fishing in Indian Ocean. |
| 3) Conditions of transportation | (1) Existing access road is available. (2) Road distance from the location is 880 km to Bangkok and 190 km to Hat Yai. (3) Domestic air port to Bangkok is available. |
| 4) Availability of human resources | (1) Seasonal transfer of labour to rubber industry occur annually. (2) Shortage of labour force is not expected seriously. |
| (4) Environmental Aspects | |
| 1) Ecosystem | (1) To the North and East of the village is a large mangrove forest. (2) Seagrass beds is not found around the beach. There are seagrass beds around the island located southwest offshore. (3) Reported sightings were recorded. |
| 2) Hydrology and Water Quality | Good quality water without contamination |
| 3) Air, Noise and Odor | No. |
| 4) Socio-Economics | Artisanal fishing is carried out in the offshore. |
| 5) Institutional and Local Customs | Natural resources management for increasing fish production |
| 6) Culture and Landscape | Famous for its good scenery. |

Table 4.3.4 Site Characteristics at Ban Khao Thong Tai (NO.4)

| Criteria | Description |
|---|---|
| (1) Planning Aspects | |
| 1) Area for flexible layout of facilities | (1) Sufficient area will be available if mangrove forest is cleared with permission from authority. (3) A channel is expected to be less than 2km. |
| 2) Safe manoeuvring | (1) Layout of water facilities is ideally proposed. (2) Distance between 0 m deep to 7 m deep is about 2 km. |
| 3) Functional layout of facilities | (1) Free and functional layout in the reclaimed land. |
| 4) Utilities | (1) No utilities |
| (2) Engineering Aspects | |
| 1) Land reclamation | (1) Very loose soil around mangrove forest area. (2) Flat area will be acquired in the mangrove area. |
| 2) Marine conditions | (1) Relatively sheltered area. |
| 3) Maintenance of channels and basins | (1) Easy maintenance of a channel is expected. |
| (3) Fishery Aspects | |
| 1) Existing number of fishing boats and fish agents | (1) 231 fishing boats including 9 boats more than 18 m are registered. 76 fish agents and another 43 related fish dealers are in Krabi Province. |
| 2) Distance to fishing grounds | (1) It is the farthest site from deep sea fishing ground in Andaman Sea, being 100 km away from southern Phuket, the nearest site. (2) Distance from Great Channel is 460 km to steam for deep sea fishing in Indian Ocean. |
| 3) Conditions of transportation | (1) Existing access road is not paved. No airport in Krabi Province. (2) Road distance from the site is 890 km to Bangkok and 200 km to Hat Yai. |
| 4) Availability of human resources | (1) Seasonal transfer of labour to rubber industry occur annually. (2) Shortage of labour force is not expected seriously. |
| (4) Environmental Aspects | |
| 1) Ecosystem | (1) Seagrass beds remain. (2) Dugong travels are reported. |
| 2) Hydrology and Water Quality | (1) Good quality water. |
| 3) Air, Noise and Odor | (1) No industrial activities. |
| 4) Socio-Economics | There is a small village for fishermen operating fishing in the pro |
| 5) Institutional and Local Customs | Traditional custom in the village might be changed. |
| 6) Culture and Landscape | Beautiful scenery. |

Table 4.3.5 Site Characteristics at Phuket Fishing Port (No.5)

| Criteria | Description |
|---|---|
| (1) Planning Aspects | |
| 1) Area for flexible layout of facilities | (1) Land area is 80 ha in the fishery development zone & water area is limited. (2) The area will not accommodate a full scale of facilities to meet future demands. |
| 2) Safe manoeuvring | (1) Existing river width is abt 200 m. (2) Additional dredging for deep-sea boats will be 5 km. (3) Manoeuvring will require assistance of tug boats. |
| 3) Functional layout of facilities | (1) Berths and land facilities will not be located with relating functions due to limited area and its configuration. |
| 4) Utilities | (1) Electricity available. (2) Water supply is insufficient for processing plants. |
| (2) Engineering Aspects | |
| 1) Land reclamation | (1) Very loose soil around mangrove forest area. (2) Flat area will be acquired in the mangrove area. |
| 2) Marine conditions | (1) The existing approach channel is affected by waves in NE monsoon season. |
| 3) Maintenance of channels and basins | (1) Present dredging volume is abt 200,000 m ³ . (2) Maintaining a deeper channel will require dredging volume not less than 300,000 m ³ . |
| (3) Fishery Aspects | |
| 1) Existing number of fishing boats and fish agents | (1) 393 fishing boats including 141 boats more than 18 m are registered, and many large-scale boats come from other provinces including the Gulf of Thailand. (2) 6 fish agents and another 20 retailers use FMO facilities. |
| 2) Distance to fishing grounds | Phuket is the nearest site from deep sea fishing ground in Andaman Sea among the five, being 40 km away. (2) Distance from Great Channel is 400 km to steam for deep sea fishing in Indian Ocean. |
| 3) Conditions of transportation | (1) Road distance from the site is 880 km to Bangkok and 470 km to Hat Yai. (2) Access road available. (3) International airport is in northern part of Phuket Province. |
| 4) Availability of human resources | (1) Wage rates for labourers are higher than the other provinces. (2) Necessary labourers are easily employed. |
| (4) Environmental Aspects | |
| 1) Ecosystem | (1) Permission to cut off the mangrove forest has been obtained. (2) A small seagrass beds remain. |
| 2) Hydrology and Water Quality | (1) Shortage of water. (2) Existing channels are contaminated. |
| 3) Air, Noise and Odor | (1) Odor from fish meal factories and contaminated water. |
| 4) Socio-Economics | (1) Large labour force might migrate from other provinces. (2) Proposed location is in the fishery development zone. |
| 5) Institutional and Local Customs | Significant changes will not be expected. |
| 6) Culture and Landscape | Significant changes will not be expected. |

Table 4.3.6 Evaluation of Proposed Locations (in Landing Fish of 100,000 ton)

| Criteria | Ban Don Khiam No.1 | Ban Na Khua Tai No.2 | Pak Meng No.3 | Ban Khao Thong No.4 | Phuket Fishing Port No.5 |
|---|-----------------------|-------------------------|------------------|------------------------|-----------------------------|
| (1) Planning Aspects | | | | | |
| 1) Area for flexible layout of facilities | 3 | 1 | 1 | 3 | 1 |
| 2) Safe manoeuvring | 3 | 3 | 1 | 1 | 3 |
| 3) Functional layout of facilities | 3 | 2 | 1 | 3 | 2 |
| 4) Utilities | 3 | 3 | 1 | 3 | 2 |
| (2) Engineering Aspects | | | | | |
| 1) Land reclamation | 3 | 2 | 1 | 3 | 3 |
| 2) Marine conditions | 1 | 1 | 3 | 2 | 3 |
| 3) Maintenance of channels and basins | 3 | 3 | 1 | 2 | 3 |
| (3) Fishery Aspects | | | | | |
| 1) Possibility of transfer of fish agents | 2 | 2 | 2 | 3 | 1 |
| 2) Distance to fishing grounds | 3 | 3 | 2 | 3 | 1 |
| 3) Conditions of transportation | 3 | 3 | 2 | 3 | 1 |
| 4) Availability of human resources | 1 | 1 | 1 | 1 | 2 |
| Sub-total | 28 | 24 | 16 | 27 | 22 |
| (4) Environmental Aspects | | | | | |
| 1) Ecosystem | 3 | 2 | 2 | 3 | 1 |
| 2) Hydrology and Water Quality | 3 | 2 | 2 | 3 | 1 |
| 3) Air, Noise and Odor | 3 | 2 | 2 | 3 | 1 |
| 4) Socio-Economics | 2 | 3 | 3 | 3 | 1 |
| 5) Changes to Institutional and Local Customs | 3 | 3 | 2 | 2 | 1 |
| 6) Changes to the Culture and Landscape | 3 | 3 | 2 | 3 | 1 |
| Sub-total | 17 | 15 | 13 | 17 | 6 |
| G. Total | 45 | 39 | 29 | 44 | 28 |