

VI ECOST Meeting (Bangkok; 21-25 April 2008)

Presentation:

DATA PROCESSING OF FISHERY HOUSEHOLD SAMPLE SURVEY TO COMPARE THE SOCIETAL COST AND BENEFIT OF FISHING ACTIVITIES IN MARINE PROTECTED AREAS AND IN UNPROTECTED ZONES: PRELIMINARY RESULTS FROM CHUMPHON SURVEY (Gulf of Thailand)

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1. OBJECTIVE AND CONTENT OF THE SAMPLE SURVEY

- **Objective**

To put up the conditions of a scientific way to collect the statistical data which induces a representative sample (among other conditions) to assess and compare the societal costs of fishing activities in or around MPAs versus in unprotected zones

- **Content**

general considerations, multi-activity and household occupational structure, household income distribution by source (breakdown by household members), monetary costs and fishery profitability (breakdown by fishing units and type of *métier*), estimated fisheries management costs and level of subsidies, market prices, number and nature of markets for aquatic living resources, perceptions of non-market and non-use value, perceptions of marine resource harvest and seafood availability, existence and effectiveness of decision making and management bodies, existence and adequacy of the legislation, activity level of community organisations and degree of interaction between managers and stakeholders

- Localization of the case study

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2 SAMPLING STRATEGY, SURVEY METHOD, CARRYING OUT



Fig 1: Map of Thailand



Fig 2: Mu Ko Chumphon National Park (Marine Protected Area)

- **The sampling strategy**

- The sampling unit is the fishery household which forms one or several fishing units defined by a *métier* (fleet/fishing gear/target species) throughout the year. In the case of Chumpon Province fishery household survey, 126 fishery household forming 225 fishing units were drawn.
- The data source was a 2006 census from the Department of Fisheries of Chumpon Province (Gulf of Thailand)
- Two types of stratification were considered:
 - a geographical stratification : on one hand the communes (*tambon*) inside or adjacent to the MPA (Mu Ko Chumphon National Park: MKCNP), on the other hand the remote communes from the MPA
 - a stratification by the main *métier* defined by an association of a fleet, a fishing gear and target species : otter board trawler, anchovy purse seiner, anchovy falling netter, squid falling netter.
- The sampling rate was 15% and the breakdown of the sample of Chumpon Province fishery household survey was as follows (table 1):

Table 1: Breakdown of the sample of Chumpon Province fishery household survey

<i>Métier</i>	IN and AROUND MPA (MKCNP)		Remote from MPA		Total	
	<i>Census</i>	<i>Sample</i>	<i>Census</i>	<i>Sample</i>	<i>Census</i>	<i>Sample</i>
Trawler/Otter board trawl/Trashfish	139	22	48	7	187	29
Seiner/Anchovy purse seine/Anchovy	12	2	11	1	23	3
Netter/Anchovy falling net/Anchovy	60	9	71	11	131	20
Netter/Squid falling net/Squid	283	42	209	32	492	74
TOTAL	494	75	339	51	833	126

- **The survey method and the carrying out of the sample survey**

- The drawing of the sample was as follows: for each stratum one must have a list of fishery household, for each list one applies a systematic random procedure: the first fishery household was selected at random in the list, then one fishery household of the sample is drawn every five fishery household.

- The carrying out of the sample survey relating to the year 2007 fishery activities required:
 - a preliminary inquiry (February 2007) to delimit the area of influence of Mu Ko Chumphon National Park (marine protected area) by interviews with fishermen leaders at the level of each commune (*tambon*), to draw up the sample, to explain about the content of the survey with fishery households
 - a survey of every selected fishery household (126 fishery households) twice a year: on July 2007 (rainy season) and on February 2008 (dry season)

2. DATA PROCESSING METHODOLOGY AND PRELIMINARY RESULTS

- Development of an excel file to enter and store the data of the survey

Table 2: Excerpt of the excel file relating to the Chumphon Province fishery household survey

IDENTIFICATION OF THE FISHING HOUSEHOLD	1	2	2bis
IDENTIFICATION OF THE FISHING UNIT	1	2	3
	IN and AROUND MPA	IN and AROUND MPA	IN and AROUND MPA
Type of métier	Otter board trawl	Otter board trawl	King mackerel drift gill net
FIXED COSTS (thai bath)	87500	78750	85000
Depreciation cost	45000	47500	52500
Interest debt	20000	7500	7500
Lease of equipment	0	0	0
Opportunity cost of capital	22500	23750	25000
Present fishing unit assets value	450000	475000	500000
VARIABLE COSTS (thai bath)	939960	1082400	562460
CATCHES (ton)	46560	57432	11400
Fishing days	352	350	80
fishing hours	5280	5250	560
Boat size	17	17	17
Horse power	275	180	180
Number of crew	4	7	10
Crew remuneration	192000	321600	132000
Fuel	640000	480000	12000
Oil	24960	115200	12900
Ice	32000	124800	23400
Handling cost	10000	3000	3000
Repair and maintenance	18000	4800	4800
Licence fees	1000	1000	1000
Taxes	2000	2000	2000
Other variable costs	20000	30000	356000
Opportunity cost of labour	67584	67200	15360
MANAGEMENT COSTS (thai bath)	140	172	96
Administration	28	34	7
Research	42	52	10
Rehabilitation	28	34	68
Enforcement	42	52	10
TOTAL COSTS (thai bath)	1027600	1161322	647556
euro	22836	25807	14390
FISHERY REVENUE (thai bath)	1691976	1568616	808800
PROFIT (thai bath)	664376	407294	161244

First of all, one can give a general description of the two categories (“inside or around MPAs” or “remote from MPAs”) of the MPA variable with the most influential quantitative variables in the following table (table 3). The quantitative (or continuous) variables have been ranked by decreasing order of Test-values (significant at the 5% level) for both positive and negative statistics (resp. greater and lower than average values).

Table 3 : Characterization of the categories of variable “MPA” by quantitative variables

AROUND MPA (Number of observations = 57)						
Distinctive variables	Mean in the category	Overall mean	Standard deviation in the category	Overall standard deviation	Test-Value	Probability
<i>HIGHER THAN AVERAGE</i>						
Boat size	14,161	12,574	3,478	3,978	4,64	0,000
Taxes	1560,530	1196,170	1221,870	1118,730	3,78	0,000
Horse power	190,842	168,449	90,267	95,660	2,72	0,003
PROFIT	277511,000	239603,000	195106,000	167480,000	2,63	0,004
value for species 4	41165,100	25443,600	88270,900	70334,800	2,60	0,005
Share of wages in VC	0,251	0,226	0,102	0,116	2,47	0,007
FISHERY INCOME	830071,000	710361,000	585998,000	573477,000	2,42	0,008
fishing hours	2055,440	1773,620	1554,310	1416,050	2,31	0,010
Opportunity cost of labour	38231,600	35184,500	15333,200	15775,500	2,24	0,012
Depreciation cost	32849,300	28410,200	23497,800	23781,900	2,17	0,015
value for species 3	61643,500	41798,800	125737,000	108376,000	2,13	0,017
FIXED COSTS	66917,100	56097,500	62362,400	59623,000	2,11	0,018
Number of crew	5,351	4,806	2,737	3,012	2,10	0,018
TOTAL COSTS	552559,000	470757,000	444887,000	462504,000	2,05	0,020
euro	12279,100	10461,300	9886,380	10277,900	2,05	0,020
Oil	13402,900	10695,000	18678,400	15387,300	2,04	0,020
Rehabilitation	34,421	27,757	46,254	38,902	1,99	0,023
Fuel	233344,000	192189,000	233936,000	241155,000	1,98	0,024
VARIABLE COSTS	485474,000	414524,000	414062,000	430710,000	1,91	0,028
MANAGEMENT COSTS	167,784	136,270	230,352	193,454	1,89	0,029
Handling cost	6180,700	5446,940	5299,900	4520,030	1,89	0,030
Administration	33,341	27,128	46,166	38,737	1,86	0,031
Enforcement	50,011	40,693	69,249	58,105	1,86	0,031
Research	50,011	40,693	69,249	58,105	1,86	0,031
Fishing days	199,123	185,459	79,861	85,712	1,85	0,032
Wage rate	22410,100	19512,900	15242,900	18461,700	1,82	0,034
<i>LOWER THAN AVERAGE</i>						
Average landing price for species 6	27,000	34,294	26,098	26,537	-1,98	0,024
Profit over crew wages	3,572	5,911	2,979	10,894	-2,49	0,006
Profit rate	0,355	0,392	0,128	0,155	-2,74	0,003
REMOTE FROM MPA (Number of observations= 41)						
Distinctive variables	Mean in the category	Overall mean	Standard deviation in the category	Overall standard deviation	Value-Test	Probability
<i>HIGHER THAN AVERAGE</i>						
Profit rate	0,443	0,392	0,174	0,155	2,74	0,003
Profit over crew wages	9,164	5,911	15,910	10,894	2,49	0,006

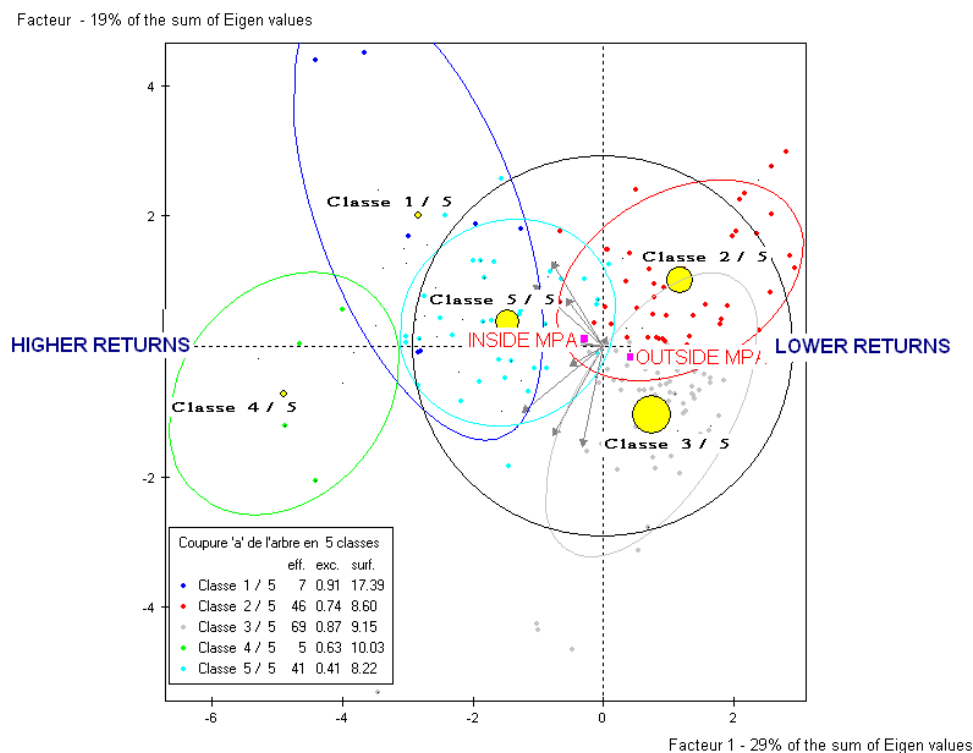
Average landing price for species 6	58,000	34,294	6,671	26,537	1,98	0,024
Wage rate	15485,200	19512,900	21535,400	18461,700	-1,82	0,034
Fishing days	166,463	185,459	89,849	85,712	-1,85	0,032
Administration	18,491	27,128	22,257	38,737	-1,86	0,031
Enforcement	27,737	40,693	33,385	58,105	-1,86	0,031
Research	27,737	40,693	33,385	58,105	-1,86	0,031
Handling cost	4426,830	5446,940	2827,480	4520,030	-1,89	0,030
MANAGEMENT COSTS	92,457	136,270	111,285	193,454	-1,89	0,029
VARIABLE COSTS	315884,000	414524,000	433977,000	430710,000	-1,91	0,028
Fuel	134973,000	192189,000	239365,000	241155,000	-1,98	0,024
Rehabilitation	18,491	27,757	22,257	38,902	-1,99	0,023
Oil	6930,370	10695,000	7518,980	15387,300	-2,04	0,020
TOTAL COSTS	357033,000	470757,000	462491,000	462504,000	-2,05	0,020
euro	7934,060	10461,300	10277,600	10277,900	-2,05	0,020
<i>LOWER THAN AVERAGE</i>						
Number of crew	4,049	4,806	3,208	3,012	-2,10	0,018
FIXED COSTS	41055,800	56097,500	51974,200	59623,000	-2,11	0,018
value for species 3	14209,800	41798,800	69181,400	108376,000	-2,13	0,017
Depreciation cost	22238,700	28410,200	22776,400	23781,900	-2,17	0,015
Opportunity cost of labour	30948,300	35184,500	15399,400	15775,500	-2,24	0,012
fishing hours	1381,830	1773,620	1081,810	1416,050	-2,31	0,010
FISHERY REVENUE	543934,000	710361,000	510952,000	573477,000	-2,42	0,008
Share of wages in VC	0,192	0,226	0,125	0,116	-2,47	0,007
value for species 4	3586,830	25443,600	13065,500	70334,800	-2,60	0,005
PROFIT	186902,000	239603,000	96686,600	167480,000	-2,63	0,004
Horse power	137,317	168,449	94,227	95,660	-2,72	0,003
Taxes	689,634	1196,170	689,051	1118,730	-3,78	0,000
Boat size	10,366	12,574	3,553	3,978	-4,64	0,000

At first glance, there is no clear evidence showing higher returns and profits from the Insiders against the Outsiders. Indeed, the “remote from MPA” fishing units report even higher profit rates in average than the “in and around MPA” units, although these results are shaded by a very high standard deviation. On the other hand, in absolute terms, the “inside and around MPA” category includes bigger fishing units (horse power, size, profits, income) than the “remote from MPA” category.

- **Principal Component Analysis (PCA) and clustering with characterization of the categories of the variable MPA (“in and around MPA” and “remote from MPA”) by continuous and nominal variables**

A first multivariate (principal component) analysis was carried out on the basis of ten relative variables (average landing price for species 1, average landing price for species 2, average landing price for species 3, profit per fishing day, profit rate, wage rate, catch per fishing day, catch per fishing hour, share of wages in variable costs, profit over crew wages). It gives optimally (Ward criterion) five clusters that present several determining features (Fig.3).

Fig 3: Multivariate analysis on the basis of ten variables



Legend: the pixel spots represent the observations (fishing units), the empty squares the qualitative (nominal) variables (including the MPA variable), the grey arrows denote the active continuous variables (all linked negatively with the first component) and the yellow full circles the centres of gravity of each class (with the specified number of observations in the framed legend).

The characterization of the clusters by the quantitative variables is displayed in annex 1. The MPA variable (“around MPA” or “remote from MPA”) appears to be linked with two of the clusters at the 5% level of significance: the proportion of “around MPA” fishing units is higher in the high wage rate cluster (class 1; 7 obs.) and positively for the “remote from MPA” with the low profit rate cluster (class 2; 46 obs.). In other words, there is a higher proportion of fishing units harvesting outside the area of influence of the MPA which face negative profit rates (profit/revenue). On the other hand, at the overall level of the PCA, the “around MPA” variable is once again not significant in the three other classes and therefore not fully related with the two first factorial components associated with catch per unit of effort and profit levels. This is confirmed by the position of the MPA categories (inside vs outside): although situated on the left-hand side of the horizontal axis where all the returns and profits variables are linked together (thus the units having the highest returns are rather on this left-hand side of the factorial map), the “INSIDE MPA” category remains close to the centre of the map, hence to the average values of the ten variables. The OUTSIDE MPA category is located on the right-hand side of the map (where the individuals having lower returns are) but it is also quite close to the centre of gravity (average values).

- **Performance of Chi-square tests to test the relationship between profit per fishing day (PPFD) variable and MPA variable (“in and around MPA” and “remote from MPA”)**

Two Chi-square tests have been performed to test for the relationship between a ”profit per fishing day” (PPFD) variable divided into two categories (positive and negative PPFD).

At second glance, a test significant at the 5% level (table 4), shows that the low profit population is twice more important “remote from MPA” than “around MPA”; or in other words, at the 95% of significance we found a significant relationship between the profit per fishing day level and the MPA variable (“in and around MPA” or “remote from MPA”):

Table 4: Profit per fishing day in two categories around MPA and remote from MPA

	Negative PPFD			Positive PPFD			TOTAL		
	% row	Size	%column	% row	Size	%column	% row	Size	%column
AROUND MPA	12,5%	16	41,0%	87,5%	112	60,2%	100,0%	128	56,9%
REMOTE FROM MPA	23,7%	23	59,0%	76,3%	74	39,8%	100,0%	97	43,1%
TOTAL	17,3%	39	100,0%	82,7%	186	100,0%	100,0%	225	100,0%

$KHI2 = 4.09 / 1 \text{ DEGREES OF FREEDOM} / \text{PROBA} (KHI2 > 4.09) = 0.043 / \text{TEST-VALUE} = 1.72$

At third glance, from table 4, higher profit fishing units are relatively more represented inside or around MPA than outside although the difference of proportions between the two categories (inside and outside) is not so straightforward. However, another interesting insight is given by splitting up the positive PPFD category into two categories: positive earnings less than 4000 and earnings of 4000 or more, The new test shows greater homogeneity of returns “inside or around” than “remote from MPAs”: four fishing units out of five make up the mid-profit category for the “in and around MPA” population against only two thirds as far as the “remote from MPA” population is concerned (table 5). In other words, the MPAs are likely to result in fewer units facing negative profits and lower variability.

Table 5: Profit per fishing day in three categories around MPA and remote from MPA

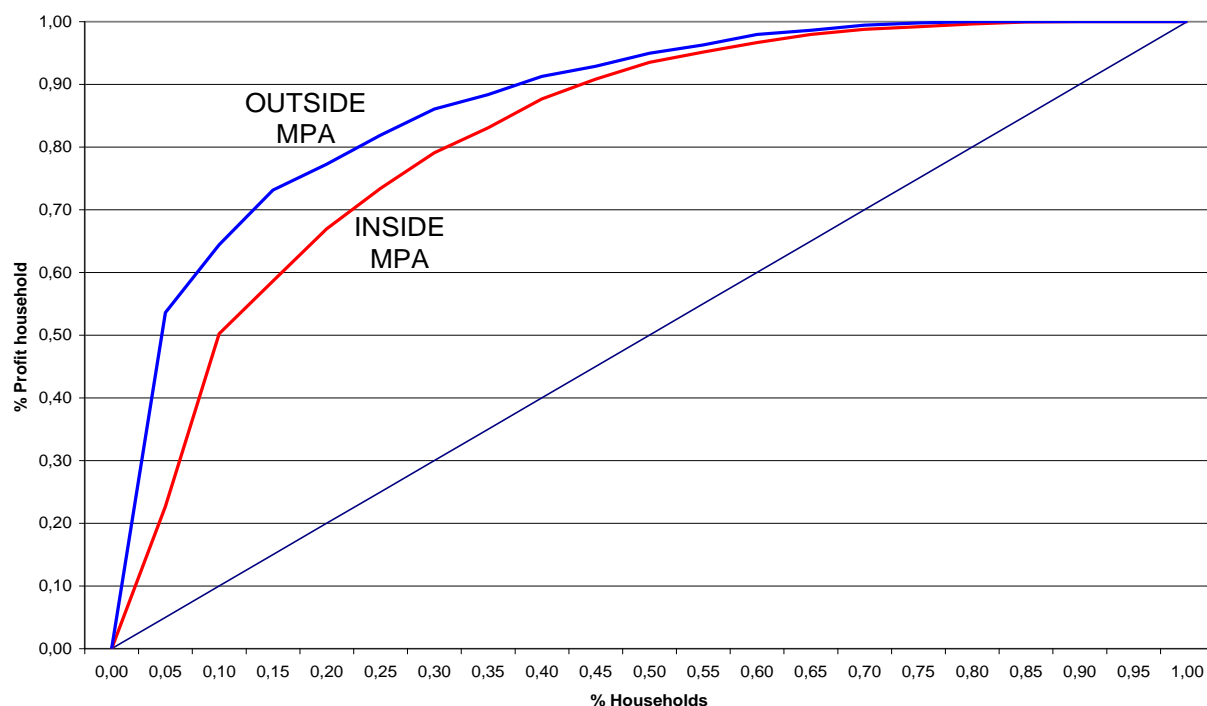
	Negative PPF			Medium PPF			High PPF			TOTAL		
	% row	Size	%column	% row	Size	%column	% row	Size	%column	% row	Size	%column
IN and AROUND MPA		16			104			8			128	
	12,5%		41,0%	81,3%		61,5%	6,3%		47,1%	100,0%		56,9%
REMOTE FROM MPA		23			65			9			97	
	23,7%		59,0%	67,0%		38,5%	9,3%		52,9%	100,0%		43,1%
TOTAL		39			169			17			225	
	17,3%		100,0%	75,1%		100,0%	7,6%		100,0%	100,0%		100,0%

$KHI2 = 6.16 / 2$ DEGREES OF FREEDOM PROBA ($KHI2 > 6.16$) = **0.046** / V.TEST = 1.69

● **La mesure de la concentration du résultat net d'exploitation**

➤ **La courbe de Lorenz**

La variance des résultats nets d'exploitation par ménage est plus élevée en dehors de l'AMP qu'à l'intérieur de l'AMP, ce qui traduit une distribution plus inégalitaire. Le coefficient de variation (le rapport entre écart-type et moyenne) est de 1,14 dans l'AMP et de 1,72 au dehors.



- **L'indicateur dérivé du Herfindahl** confirme cette plus grande dispersion en présentant un double avantage : rendre comparable des niveaux de concentration entre échantillons de taille différente et borner l'indicateur entre 0 et 1. En calculant cet indicateur sur les revenus des ménages, nous obtenons une valeur 1,72% pour les *insiders* et de 5,81% pour les *outsiders*; sur les résultats nets d'exploitation des ménages, la structure inégalitaire des *outsiders* est encore plus patente puisqu'elle est de 14,5% contre 3,45% pour les *insiders*.

ANNEX 1

Characterization by quantitative variables of the five clusters

Class 1 / 5 (Number of observations = 7.00)

Distinctive variables	Mean in the cluster	Overall mean	Standard deviation in the class	Overall standard deviation	Value-Test	Probability
Average landing price for species 2	120,000	31,311	32,950	39,313	6,32	0,000
Wage rate	38009,500	14523,500	21311,200	12851,800	4,92	0,000
VARIABLE COSTS	700083,000	253453,000	492326,000	246963,000	4,87	0,000
Catch per fishing day	169,768	78,172	55,362	70,572	3,50	0,000
MANAGEMENT COSTS	108,771	39,900	69,424	55,042	3,37	0,000
CATCHES	36257,100	14375,100	23141,200	19306,600	3,05	0,001
fishing hours	2880,000	1492,750	1571,170	1275,840	2,93	0,002
Share of wages in VC	0,354	0,212	0,215	0,134	2,86	0,002
Average landing price for species 3	130,200	59,143	85,375	65,006	2,65	0,004
Number of crew	5,857	3,685	3,090	2,612	2,24	0,013

Class 2 / 5 (Number of observations = 46.00)

Distinctive variables	Mean in the cluster	Overall mean	Standard deviation in the class	Overall standard deviation	Value-Test	Probability
Share of wages in VC	0,268	0,212	0,127	0,134	3,30	0,000
VARIABLE COSTS	186163,000	253453,000	107926,000	246963,000	-2,16	0,015
PROFIT	-7751,060	183624,000	112058,000	410898,000	-3,70	0,000
Profit over crew wages	-1,106	5,291	2,686	13,655	-3,72	0,000
CATCHES	4643,940	14375,100	4587,000	19306,600	-4,00	0,000
MANAGEMENT COSTS	11,545	39,900	11,449	55,042	-4,09	0,000
Catch per fishing hour	4,519	9,340	3,511	7,631	-5,01	0,000
Catch per fishing day	32,247	78,172	24,861	70,572	-5,16	0,000
Profit per fishing day	-228,245	995,538	716,754	1815,300	-5,35	0,000
Profit rate	-0,403	0,161	0,755	0,564	-7,95	0,000

Class 3 / 5 (Number of observations Weight = 69.00)

Distinctive variables	Mean in the cluster	Overall mean	Standard deviation in the class	Overall standard deviation	Value-Test	Probability
Profit rate	0,424	0,161	0,205	0,564	5,03	0,000
Profit over crew wages	11,084	5,291	19,332	13,655	4,58	0,000
Average landing price for species 2	12,090	31,311	16,899	39,313	-2,59	0,005
fishing hours	1115,290	1492,750	585,465	1275,840	-3,19	0,001
FIXED COSTS	18976,200	41022,200	14549,400	55439,800	-4,29	0,000
Horse power	89,436	126,156	75,877	91,850	-4,31	0,000
Catch per fishing hour	6,021	9,340	3,872	7,631	-4,69	0,000
CATCHES	5910,300	14375,100	3771,980	19306,600	-4,73	0,000
MANAGEMENT COSTS	15,740	39,900	11,242	55,042	-4,74	0,000
Opportunity cost of capital	4345,290	8477,830	3723,670	8369,460	-5,33	0,000
Boat size	9,590	11,444	2,820	3,752	-5,33	0,000
VARIABLE COSTS	126335,000	253453,000	75252,400	246963,000	-5,55	0,000

Catch per fishing day	41,794	78,172	27,584	70,572	-5,56	0,000
Wage rate	7408,030	14523,500	4880,130	12851,800	-5,97	0,000
Number of crew	1,986	3,685	1,537	2,612	-7,02	0,000
Share of wages in VC	0,116	0,212	0,074	0,134	-7,66	0,000

Classe 4 / 5 (Number of observations= 5)

Distinctive variables	Mean in the cluster	Overall mean	Standard deviation in the class	Overall standard deviation	Value-Test	Probability
PROFIT	1927850,000	183624,000	1125230,000	410898,000	9,61	0,000
Average landing price for species 1	188,000	56,256	72,498	35,680	8,36	0,000
Profit per fishing day	7663,400	995,538	3357,730	1815,300	8,31	0,000
Wage rate	44770,000	14523,500	19182,700	12851,800	5,33	0,000
MANAGEMENT COSTS	162,534	39,900	43,523	55,042	5,04	0,000
VARIABLE COSTS	779680,000	253453,000	256642,000	246963,000	4,82	0,000
CATCHES	55130,000	14375,100	30745,900	19306,600	4,78	0,000
Catch per fishing day	203,480	78,172	62,427	70,572	4,02	0,000
fishing hours	3712,000	1492,750	1568,790	1275,840	3,94	0,000
Opportunity cost of capital	22050,000	8477,830	9965,440	8369,460	3,67	0,000
Number of crew	7,800	3,685	1,720	2,612	3,57	0,000
Share of wages in VC	0,404	0,212	0,070	0,134	3,24	0,001
Boat size	16,200	11,444	0,980	3,752	2,87	0,002
Fishing days	261,800	171,354	90,303	90,043	2,27	0,011
Catch per fishing hour	16,691	9,340	6,745	7,631	2,18	0,015
Horse power	214,000	126,156	68,220	91,850	2,16	0,015

Class 5 / 5 (Number of observations = 41.00)

Distinctive variables	Mean in the cluster	Overall mean	Standard deviation in the class	Overall standard deviation	Value-Test	Probability
Catch per fishing hour	18,773	9,340	6,946	7,631	9,08	0,000
Catch per fishing day	159,999	78,172	52,901	70,572	8,51	0,000
CATCHES	30832,600	14375,100	22160,800	19306,600	6,26	0,000
MANAGEMENT COSTS	85,661	39,900	66,167	55,042	6,10	0,000
Opportunity cost of capital	15350,600	8477,830	10102,200	8369,460	6,03	0,000
FIXED COSTS	81405,500	41022,200	85161,800	55439,800	5,35	0,000
Horse power	191,820	126,156	94,710	91,850	5,25	0,000
Boat size	14,046	11,444	3,818	3,752	5,09	0,000
Number of crew	5,488	3,685	2,539	2,612	5,07	0,000
VARIABLE COSTS	402453,000	253453,000	235790,000	246963,000	4,43	0,000
Wage rate	20143,700	14523,500	11933,900	12851,800	3,21	0,001
Share of wages in VC	0,262	0,212	0,093	0,134	2,74	0,003
fishing hours	1957,380	1492,750	1717,690	1275,840	2,67	0,004
Profit per fishing day	1527,340	995,538	1341,780	1815,300	2,15	0,016
Average landing price for species 3	33,929	59,143	24,391	65,006	-2,02	0,022
Average landing price for species 1	41,122	56,256	34,579	35,680	-3,11	0,001

Characterization by the nominal variables of the five clusters

Breakdown 'a' of the tree in 5 classes

Class: Class 1 / 5 (Number of observations Size: 7 - Percentage: 4.17)

Variables	Distinctive categories	% of the category in the class	% of the category in the sample	% of the class in the category	Value-Test	Probability	Number of observations
Species 1	Metapenaeus	71,43	2,98	100,00	5,49	0,000	5
Type of métier	Otter board trawl	100,00	14,29	29,17	4,88	0,000	24
species 4	Cuttlefish	57,14	2,38	100,00	4,74	0,000	4
species 3	Swimming crab	57,14	2,98	80,00	4,40	0,000	5
species 2	Other shrimps	57,14	3,57	66,67	4,16	0,000	6
MPA	AROUND MPA	100,00	58,93	7,07	2,00	0,023	99
MPA	REMOTE FROM MPA	0,00	41,07	0,00	-2,00	0,023	69
species 3	*unanswered*	28,57	83,33	1,43	-2,96	0,002	140
Type of métier	Squid falling net	0,00	62,50	0,00	-3,14	0,001	105
Species 1	Squid	0,00	64,29	0,00	-3,25	0,001	108
species 2	*unanswered*	0,00	65,48	0,00	-3,32	0,000	110
species 4	*unanswered*	28,57	87,50	1,36	-3,40	0,000	147

Class: Class 2 / 5 (Number of observations: 46 - Percentage: 27.38)

Variables	Distinctive categories	% of the category in the class	% of the category in the sample	% of the class in the category	Value-Test	Probability	Number of observations
species 4	*unanswered*	100,00	87,50	31,29	3,19	0,001	147
species 2	*unanswered*	84,78	65,48	35,45	3,17	0,001	110
species 3	*unanswered*	95,65	83,33	31,43	2,59	0,005	140
Species 1	Squid	80,43	64,29	34,26	2,57	0,005	108
Type of métier	Squid falling net	73,91	62,50	32,38	1,72	0,043	105
MPA	REMOTE FROM MPA	52,17	41,07	34,78	1,61	0,053	69
Species 1	Mackerel	4,35	2,98	40,00	0,21	0,418	5
Type of métier	Mackerel gill net	4,35	3,57	33,33	0,06	0,476	6
Species 1	King mackerel	2,17	3,57	16,67	-0,06	0,476	6
species 3	Other food fish	2,17	2,98	20,00	-0,21	0,418	5
Species 1	Threadfin bream	2,17	2,98	20,00	-0,21	0,418	5
species 2	Other food fish	4,35	4,76	25,00	-0,30	0,381	8
Type of métier	Other fish gill net	2,17	2,38	25,00	-0,52	0,302	4
Type of métier	Crab gill net	0,00	2,38	0,00	-0,60	0,274	4
species 3	Cynoglossus	0,00	2,38	0,00	-0,60	0,274	4
Species 1	Penaeus merguensis	0,00	2,38	0,00	-0,60	0,274	4
species 4	Cuttlefish	0,00	2,38	0,00	-0,60	0,274	4
species 2	Cynoglossus	0,00	2,38	0,00	-0,60	0,274	4
Type of métier	Anchovy falling net	2,17	5,36	11,11	-0,71	0,239	9
Species 1	Anchovy	2,17	5,36	11,11	-0,71	0,239	9
species 2	Trash fish	6,52	10,71	16,67	-0,78	0,216	18
species 3	Swimming crab	0,00	2,98	0,00	-0,85	0,197	5
Species 1	Metapenaeus	0,00	2,98	0,00	-0,85	0,197	5

species 2	Other shrimps	0,00	3,57	0,00	-1,07	0,142	6
MPA	AROUND MPA	47,83	58,93	22,22	-1,61	0,053	99
Type of métier	Otter board trawl	2,17	14,29	4,17	-2,77	0,003	24

Class: Class 3 / 5 (Number of observations: 69 - Percentage: 41.07)

Variables	Distinctive categories	% of the category in the class	% of the category in the sample	% of the class in the category	Value-Test	Probability	Number of observations
species 4	*unanswered*	100,00	87,50	46,94	4,39	0,000	147
Type of métier	Squid falling net	81,16	62,50	53,33	4,10	0,000	105
Species 1	Squid	82,61	64,29	52,78	4,07	0,000	108
species 3	*unanswered*	95,65	83,33	47,14	3,57	0,000	140
species 2	Trash fish	20,29	10,71	77,78	3,09	0,001	18
Type of métier	Crab gill net	5,80	2,38	100,00	1,93	0,027	4
species 2	Other shrimps	0,00	3,57	0,00	-1,76	0,039	6
Species 1	Anchovy	0,00	5,36	0,00	-2,44	0,007	9
Type of métier	Anchovy falling net	0,00	5,36	0,00	-2,44	0,007	9
Type of métier	Otter board trawl	0,00	14,29	0,00	-4,79	0,000	24

Class: Class 4 / 5 (Number of observations: 5 - Percentage: 2.98)

Variables	Distinctive categories	% of the category in the class	% of the category in the sample	% of the class in the category	Value-Test	Probability	Number of observations
species 2	Other food fish	60,00	4,76	37,50	3,20	0,001	8
Type of métier	Otter board trawl	80,00	14,29	16,67	2,97	0,001	24
Species 1	Penaeus merguensis	40,00	2,38	50,00	2,64	0,004	4
Type of métier	Squid falling net	0,00	62,50	0,00	-2,47	0,007	105
Species 1	Squid	0,00	64,29	0,00	-2,56	0,005	108
species 2	*unanswered*	0,00	65,48	0,00	-2,62	0,004	110
species 3	*unanswered*	20,00	83,33	0,71	-2,77	0,003	140
species 4	*unanswered*	20,00	87,50	0,68	-3,14	0,001	147

Class: Class 5 / 5 (Number of observations: 41 , Percentage: 24.40)

Variables	Distinctive categories	% of the category in the class	% of the category in the sample	% of the class in the category	Value-Test	Probability	Number of observations
Type of métier	Anchovy falling net	19,51	5,36	88,89	3,88	0,000	9
Species 1	Anchovy	19,51	5,36	88,89	3,88	0,000	9
Type of métier	Otter board trawl	29,27	14,29	50,00	2,75	0,003	24
species 2	Cynoglossus	9,76	2,38	100,00	2,73	0,003	4
Species 1	Threadfin bream	9,76	2,98	80,00	2,23	0,013	5
species 3	Cynoglossus	7,32	2,38	75,00	1,69	0,045	4
species 2	Trash fish	2,44	10,71	5,56	-1,79	0,036	18
species 3	*unanswered*	65,85	83,33	19,29	-3,06	0,001	140
species 4	*unanswered*	70,73	87,50	19,73	-3,25	0,001	147
Type of métier	Squid falling net	36,59	62,50	14,29	-3,71	0,000	105
Species 1	Squid	34,15	64,29	12,96	-4,38	0,000	108