Methodology and Results of Fisheries Verification

Appendix 10.1 Surveys

List of Figures

Figure A10.1 Fisheries Sampling Locations

List of Tables

Table A10.1	Summary Table for Fisheries Survey Results (Total)
Table A10.2	Summary Table for Fisheries Survey Results (Commercial Fisheries
	only)
Table A10.3	Summary Table for Gill Net Survey Results (Dry Season)
Table A10.4	Summary table for gill net survey results (wet season)
Table A10.5	Summary table for gill net survey results (total)
Table A10.6	Summary Table for Cage Survey Results (Dry Season)
Table A10.7	Summary Table for Cage Survey Results (Wet Season)
Table A10.8	Summary Table for Cage Survey Results (Total)
Table A10.9	Results of Gonadosomatic Index (GSI)

List of Annexes

Annex 10.1	Species list of the recorded samples
Annex 10.2	Results of fisheries surveys in dry season (abundance)
Annex 10.3	Results of fisheries surveys in dry season (yield in gram)
Annex 10.4	Results of fisheries surveys in wet season (abundance)
Annex 10.5	Results of fisheries surveys in wet season (yield in gram)

Methodology of Fisheries Verification Surveys

- **10.1.1.1** Existing fisheries information is available for establishing fisheries baseline. In addition to Port Survey 2006, the fisheries survey for 3RS EIA study was comprehensive, and covered a large extent of North Lantau waters and included most of the areas of fisheries importance such as important spawning and nursery grounds in North Lantau and areas of high fisheries production in the Brothers and Sha Chau and Lung Kwu Chau, and such the results could sufficiently supplement any information gaps in other literatures and update the general fisheries baseline conditions of the North Lantau waters, which is the basis of the fisheries baseline for the assessment area under the present FIA, including the reclamation areas for the present Project. It is therefore considered no information gap for the FIA assessment area. However, it is beneficial for the Project to have a project-specific field survey, to collect more specific fisheries data to verify the existing information and support the assessment and the development option selection process, and thus fisheries verification surveys were conducted.
- **10.1.1.2** Trawling is used in some fisheries surveys for other projects/studies. However the Port Survey data indicates that the small vessels are the major fisheries operation in Tung Chung area. It is evidenced by the AFCD 2006 Port Survey results which indicated that low number of large fishing vessels (over 15m in length) in the grid cell covering Tung Chung West, and only low number in Tung Chung East. The survey should focus on the dominant fisheries operation in the area (in this case small-vessel fisheries). According to the information available, the waters near Tung Chung East & West are of low to very low fish production and their contribution to Hong Kong fisheries is not high.
- **10.1.1.3** There are also practical constraints for trawling. A large portion of the waters near the Project Area (e.g. Tung Chung Bay) is of very shallow water depth, and thus would not be practicable for some fishing methods such as shrimp trawling. Recently the waters adjacent to the PDA at TCE and Road P1 (Tung Chung Tai Ho Section) have been demarcated as the works areas for the HKBCF project and thus restricted for other vessels, and it is expected that marine traffic of works vessels and other related vessels for trawling would increase in the area. Fishing operations by large vessels might be affected by the marine traffic. It should be noted that other marine surveys such as grab sampling are included under the ecological survey programme of the Project, and thus further information on the marine ecosystems in the area is also available. Given these considerations, available information and the focus of the local fisheries, trawling is not proposed for the present survey.
- **10.1.1.4** Gill netting and cage trapping by small fishing vessels are common fishing methods adopted by local fishermen on small vessels in Tung

Chung area as observed, therefore the fisheries survey adopted gill netting and cage trapping as the survey method.

- **10.1.1.5** The main objective of the fisheries survey is to collect specific information on the small-vessel fisheries in Tung Chung area, to supplement the data from literature reviews.
- 10.1.1.6 The fisheries surveys by gill netting and cage trapping were performed in February 2013 for dry season and August 2013 for wet season, at eight sampling locations (three Impact Sites and five Control Sites). For Impact Sites, surveys were performed in the PDA at TCE and near Road P1 (Tung Chung – Tai Ho Section), at two locations inside the PDA at TCE boundary (i.e. sampling locations E1 & E2 in PDA at TCE, see Figure A10.1) and one location near Road P1 (Tung Chung – Tai Ho Section) (i.e. Location T, see Figure A10.1). There were also five Control Sites (see Figure A10.1), two inside embayment of Airport Channel (i.e. sampling location H in Hau Hok Wan and sampling locations L in Sha Lo Wan), two inside Tung Chung Bay (i.e. sampling locations B1 & B2), and one near the seawalls of Sham Shui Kok of North Lantau (i.e. sampling location S near Sham Shui Kok). At each sampling location, gill netting (30m x 1.2m three-layered gill net, of mesh sizes 6cm) will be deployed for at least 20 minutes before harvesting, and conducted two times during each survey to provide replicates. And for each location at least 5 cages (mesh sizes 2 - 2.5 cm) were deployed for at least 1.5 hr before harvesting, and conducted two times during each survey to provide replicates.
- **10.1.1.7** Results of gill netting and cage trapping provided information on the local small-vessel fisheries (i.e. the most common fishing operation in Tung Chung area) for the study. Data collected included the species composition, sizes (Total Length, i.e. TL) of the fish, and carapace breadth of the crab), abundance and biomass. All species caught in the gill netting and cage trapping were identified to species level as far as possible. Catch value of the collected samples was estimated. Information on fishing activities (e.g. type of fishing operation, number and size of fishing vessels) of nearby vessels during the survey was also recorded.
- **10.1.1.8** As mentioned in previous sections of this report, embayment with mangroves and mudflats including Tung Chung Bay are considered spawning and nursery grounds for marine organisms as well as fisheries species. While the importance of Tung Chung West as fish spawning and nursery grounds are recognised and will be taken into account in the later impact assessment, the present survey also took the opportunities to collect data related to fish spawning. For the adult fish collected from the gill netting and cage trapping survey, their gonadosomatic index was recorded. Gonadosomatic index (GSI) is commonly used to study fish spawning. The index is based on the proportion of the gonadal weight

with the fish's total weight (not including gonadal weight). The higher the GSI value the more mature (i.e. closer to spawning) the fish is. GSI was calculated according to the following formula:

GSI = [Gonad weight (g) / Body Weight (g) (not including gonad)] x 100

Results of fisheries verification surveys

10.1.2 Fisheries Verification Surveys

- **10.1.2.1** The surveys were conducted in February 2013 for dry season, and August 2013 for wet season, to collect data on local fisheries (mainly small vessels) by adopting the most common fishing methods in Tung Chung area, i.e. gill netting and cage trapping. Gonadosomatic index of adult fish collected during the survey were also recorded.
- 10.1.2.2 A total of 257 individual organisms were collected from the surveys (including both commercial and non-commercial species), with 53 in the dry season survey and 204 in the wet season survey (see Table A10.1). Organisms caught represented 40 species, including 30 species of fishes and 10 species of crustaceans, the recorded species is shown in Annex 10.1. In terms of weight, 16.5kg (16,495g) of catch was collected, with 1.3kg (1,340g) from dry season and 15.2kg (15,155.7g) from wet season (see Table A10.1). Detailed results are reported in Annexes 10.2 to 10.5.

Survey Method / Season	Parameter	Dry Season	Wet Season	Total (by Survey Method)
Cilleration	Abundance	23	173	196
Gill netting	Yield (g)	1287	14951.7	16238.7
Caging	Abundance	30	31	61
	Yield (g)	1176.8	1179.1	2355.9
Total (by season)	Abundance	53	204	257
	Yield (g)	1340	15155.7	16495.7

 Table A10.1
 Summary Table for Fisheries Survey Results (Total)

10.1.2.3 For commercial fisheries species (i.e. excluding the non-commercial species, such as Puffer fish, Thalamita crab, Macrophthalmus crab, etc.), a total of 155 individuals was collected, mostly from wet season (142 no.) (see Table A10.2). Organisms caught represented 32 species, including 28 species of fishes and 4 species of crustaceans. The total yield was 13779.8g, with 12892.6g from wet season and 887.2g from dry season (see Table A10.2). As most of the shrimp in Hong Kong are commercial species, a small shrimp (1.3g) collected in present survey, could not be identified, is also regarded as commercial species in present study.

Survey Method / Season	Parameter	Dry Season	Wet Season	Total (by Survey Method)
Cill patting	Abundance	11	127	138
Oni netting	Biomass (g)	848.2	12495.2	13343.4

 Table A10.2
 Summary Table for Fisheries Survey Results (Commercial species only)

Survey Method / Season	Parameter	Dry Season	Wet Season	Total (by Survey Method)
Caging	Abundance	2	15	17
	Biomass (g)	39	397.4	436.4
Total (by season)	Abundance	13	142	155
	Biomass (g)	887.2	12892.6	13779.8

10.1.3 Gill Net Survey

- 10.1.3.1 A total of 138 individual organisms were collected in the gill netting samplings (commercial species only), with 11 from dry season and 127 from wet season (see Tables A10.3 and A10.4). Organisms caught represented 30 species, including 27 species of fishes and 3 species of crustaceans. In dry season, there were 6 fish species but no crustacean of commercial value was recorded, and in wet season, there were 26 fish species & 3 crustaceans (see Annexes 10.2 and 10.4).
- 10.1.3.2 Species recorded are mostly common fisheries species for western/north-western waters. The most abundant species recorded were *Thryssa hamiltonii* (family Engraulidae), *Nematalosa nasus* (family Clupeidae), and *Inegocia japonica* (family Platycephalidae), contributing 22, 19 and 19 of all organisms caught respectively. *Saurida* sp. (family Synodontidae) was also caught in significant numbers (12 individuals) (see Annexes 10.2 and 10.4).
- 10.1.3.3 The total yield from all replicates was 13343.4g (see Table A10.5) (commercial species only). The highest yield came from wet season survey at Sham Shui Kok (S), of 3,157.1g. The total gill netting yield from Sham Shui Kok was also the highest among the eight sampling sites, at 3,290.8g (see Table A10.5). In addition, Sham Shui Kok had the highest numbers of individuals in gill netting catches, while Sham Shui Kok and E1 had the higher numbers of species present of 14 (see Table A10.5). Raw data can refer to Annexes 10.3 and 10.5.
- **10.1.3.4** Statistical information on catches at the 8 sampling locations is summarised in **Tables A10.3**, **A10.4** and **A10.5**. These tables report mean values of each parameter for the replicates taken at each site.
- 10.1.3.5 The pooled results in Table A10.5 suggested that Sham Shui Kok is a more productive fishing ground than other locations including PDA at TCE and Tung Chung Bay (non-commercial species only). Table A10.5 also shows that catches from Sham Shui Kok had a higher yield (3290.8g vs. 2459.2g) and number of individuals (29 vs. 27) than the sampling locations within PDA at TCE and Tung Chung Bay; even though the

number of species in E1 was as high as Sham Shui Kok (14 no. of species) (**Table A10.5**). On the other hand, yield from TCE was higher than Tung Chung Bay (**Table A10.5**). While TCE yielded more than Sha Lo Wan and Hau Hok Wan.

- **10.1.3.6** Major commercial species found in Sham Shui Kok included *Inegocia japonica* and *Saurida* sp.. In TCE, *Inegocia japonica* and *Thryssa hamiltonii* were the major commercial species, while *Saurida* sp. and *Portunus pelagicus* were the major commercial species in TCW. Detailed commercial species found in each surveyed location are shown in the Annexes.
- **10.1.3.7** The yield in Sha Lo Wan is the lowest for both wet and dry seasons, and no commercial species was caught from gill netting.

Location	No. of species*	Abundance	Yield (g)
Sha Lo Wan (L)	0	0	0
Hau Hok Wan (H)	2	3	293.1
Tung Chung West (B1)	1	2	91.7
Tung Chung West (B2)	3	3	182.4
Tung Chung East (E1)	2	2	147.3
Tung Chung East (E2)	0	0	0
Tai Ho (T)	0	0	0
Sham Shui Kok (S)	1	1	133.7
Overall	6	11	848.2

Table A10.3Summary Table for Gill Net Survey Results (Dry Season) (commercialspecies only)

Note:

* Same species have been found in different locations and thus the overall no. of species will not be the sum of

species found in all locations

Table A10.4Summary table for gill net survey results (wet season) (commercialspecies only)

Location	No. of species*	Abundance	Yield (g)
Sha Lo Wan (L)	0	0	0
Hau Hok Wan (H)	4	4	557.9
Tung Chung West (B1)	8	17	840.8
Tung Chung West (B2)	6	7	1624.6
Tung Chung East (E1)	12	25	1915.6
Tung Chung East (E2)	10	25	2459.2
Tai Ho (T)	9	21	1940

Location	No. of species*	Abundance	Yield (g)
Sham Shui Kok (S)	14	28	3157.1
Overall	29	127	12495.2

Note:

* Same species have been found in different locations and thus the overall no. of species will not be the sum of species found in all locations

Summary table for gill net survey results (total of dry and wet seasons)

Location	No. of species*	Abundance	Yield (g)
Sha Lo Wan (L)	0	0	0
Hau Hok Wan (H)	5	7	851
Tung Chung West (B1)	7	19	932.5
Tung Chung West (B2)	8	10	1807
Tung Chung East (E1)	14	27	2062.9
Tung Chung East (E2)	10	25	2459.2
Tai Ho (T)	9	21	1940
Sham Shui Kok (S)	14	29	3290.8
Overall	30	138	13343.4

(commercial species only)

Table A10.5

Note:

* Same species have been found in different locations and thus the overall no. of species will not be the sum of species found in all locations

10.1.4 Cage Survey

- 10.1.4.1 A total of 17 individual organisms were collected in the caging samplings (commercial species only). Organisms caught represented 7 species, including 4 species of fishes and 3 species of crustaceans (see Annexes 10.2 and 10.4). Indeed, the majority of the catches from the caging survey was non-commercial species such as Puffer fish, Charybdis affinis crab, Thalamita crab, Macrophthalmus crab, etc (see Annexes 10.2 and 10.4). Tables A10.6 to A10.8 show the summary for cage survey results in the sampling locations.
- 10.1.4.2 Commercial species recorded are mostly common species for western/north-western waters, including Mangrove mud crab *Scylla* sp.. The most abundant species recorded were *Apogon fasciatus* (commercial fish) and *Squilla* sp. (commercial mantis shrimp), contributing 47% and 18% of all organisms caught respectively.
- 10.1.4.3 The total yield from all replicates was 436.4g (see Table A10.8) (commercial species only). The highest yield came from Tung Chung East (E2), of 221g. In addition, Tung Chung East (E2) also had the highest numbers of individuals in caging catches, and had the highest numbers of species (see Table A10.8). Raw data can refer to Annexes 10.3 and 10.5.

10.1.4.4 Although E2 had the highest yield among the eight sampling locations, it was dominant by low commercial value species *Apogon fasciatus*.

Location	No. of species*	Abundance	Yield (g)
Sha Lo Wan (L)	1	1	37.7
Hau Hok Wan (H)	0	0	0
Tung Chung West (B1)	0	0	0
Tung Chung West (B2)	0	0	0
Tung Chung East (E1)	0	0	0
Tung Chung East (E2)	0	0	0
Tai Ho (T)	1	1	1.3
Sham Shui Kok (S)	0	0	0
Overall	2	2	39

Table A10.6Summary Table for Cage Survey Results (Dry Season) (commercialspecies only)

Note:

* Same species have been found in different locations and thus the overall no. of species will not be the sum of

species found in all locations

Location	No. of species*	Abundance	Yield (g)
Sha Lo Wan (L)	0	0	0
Hau Hok Wan (H)	1	1	13.8
Tung Chung West (B1)	2	2	41.1
Tung Chung West (B2)	0	0	0
Tung Chung East (E1)	1	1	20.2
Tung Chung East (E2)	3	6	221
Tai Ho (T)	0	0	0
Sham Shui Kok (S)	2	5	101.3
Overall	5	15	397.4

Table A10.7Summary Table for Cage Survey Results (Wet Season) (commercialspecies only)

Note:

* Same species have been found in different locations and thus the overall no. of species will not be the sum of species found in all locations

Table A10.8Summary Table for Cage Survey Results (Total of dry and wet seasons)(commercial species only)

Location	No. of species*	Abundance	Yield (g)
Sha Lo Wan (L)	1	1	37.7

Location	No. of species*	Abundance	Yield (g)
1Hau Hok Wan (H)	1	1	13.8
Tung Chung West (B1)	2	2	41.1
Tung Chung West (B2)	0	0	0
Tung Chung East (E1)	1	1	20.2
Tung Chung East (E2)	3	6	221
Tai Ho (T)	1	1	1.3
Sham Shui Kok (S)	2	5	101.3
Overall	7	17	436.4

Note:

* Same species have been found in different locations and thus the overall no. of species will not be the sum of species found in all locations

10.1.5 Other fishing activities

10.1.5.1 During the fish surveys, fishing activities in the vicinity along the sampling locations were observed and recorded. No fishing activities were observed in Sha Lo Wan and Hau Hok Wan, while only 2 sampans were collecting fishes by gill nets in Tung Chung Bay, and 1 sampan deploying cages in Tai Ho. Besides, recreation fishing was also observed on the piers and along the coastlines of Tung Chung area.

10.1.6 Gonadosomatic index (GSI)

- 10.1.6.1 Gonodosomatic index was calculated for a total of 26 individuals of fishes from 10 commercial species (*Inegocia japonica*, *Monacanthus chinensis*, *Monodactylus argenteus*, *Mugil cephalus*, *Mugil cunnesius*, *Mugil sp.*, *Nematalosa nasus*, *Nibea albiflora*, *Sebastiscus marmoratus* and *Thryssa hamiltonii*)(see Table A10.9) while the other fish individuals collected during the present survey were either immature or having no observable gonad inside.
- 10.1.6.2 Gonad was found in 5 species and 8 species of fishes during dry season and wet season, respectively. GSI ranges from 0.16 to 2.18 for dry season, and 0.06 to 1.51 for wet season (see Table A10.9). The GSI of *Sebastiscus marmoratus* and *Thryssa hamiltonii* were the highest during dry season and wet season, respectively (see Table A10.9).
- **10.1.6.3** Given the small number of individuals collected in the present surveys and the low proportion of individuals having observable gonads, it is not sufficient to quantitatively show the changes in GSI or to quantitatively investigate the fish spawning in the Project Area and its vicinity.

No.	Season	Species	Total length (cm)	Biomass (g)	Sex organ (g)	GSI
1	Dry	Monacanthus chinensis	17.5	51.2	0.1	0.20
2	Dry	Mugil cunnesius	24	257.3	0.4	0.16
3	Dry	Nematalosa nasus	16.5	45.9	0.5	1.09
4	Dry	Nematalosa nasus	17.5	58.2	0.6	1.03
5	Dry	Nematalosa nasus	21	90.4	0.6	0.66
6	Dry	Nematalosa nasus	35.1	240.4	0.7	0.29
7	Dry	Nematalosa nasus	34.2	240.4	0.9	0.37
8	Dry	Nematalosa nasus	28.4	236.9	1.5	0.63
9	Dry	Nematalosa nasus	29.2	269.5	1.8	0.67
10	Dry	Nibea albiflora	22.9	83.1	1.8	2.17
11	Dry	Sebastiscus marmoratus	22	156.1	3.4	2.18
12	Wet	Inegocia japonica	30	157.1	0.1	0.06
13	Wet	Inegocia japonica	24	156.5	0.1	0.06
14	Wet	Inegocia japonica	20	86.8	0.1	0.12
15	Wet	Monacanthus chinensis	16	45.8	0.1	0.22
16	Wet	Monodactylus argenteus	13.5	37.4	0.1	0.27
17	Wet	Mugil cephalus	16	37.7	0.3	0.80
18	Wet	Mugil sp.	22.1	120.8	0.4	0.33
19	Wet	Nematalosa nasus	14.5	54	0.5	0.93

Table A10.9Results of Gonadosomatic Index (GSI)

No.	Season	Species	Total length (cm)	Biomass (g)	Sex organ (g)	GSI
20	Wet	Nematalosa nasus	28.5	313	0.7	0.22
21	Wet	Nematalosa nasus	21.5	85.8	0.9	1.05
22	Wet	Nematalosa nasus	20.5	150.1	1.1	0.73
23	Wet	Nematalosa nasus	21.4	138.6	1.2	0.87
24	Wet	Nibea albiflora	21.5	133.7	2	1.50
25	Wet	Nibea albiflora	48	723.8	2.7	0.37
26	Wet	Thryssa hamiltonii	31	311.1	4.7	1.51

Fomily	Spacios nomo	Commercial species	Type of			
rainity	species name		Commercial*			
Fish						
Sparidae	Acanthopagrus latus	Yes	High			
Gobiidae	Acentrogobius caninus	Yes	Low			
Apogonidae	Apogon fasciatus	Yes	Low**			
Ariidae	Arius thunbergi	Yes	Medium**			
Carangidae	<i>Caranx</i> sp.	Yes	N/A			
Haemulidae	Diagramma pictum	Yes	High			
Clupeidae	Elops sp.	Yes	N/A			
Gerreidae	Gerres sp.	Yes	Low**			
Platycephalidae	Inegocia japonica	Yes	Low			
Sciaenidae	Johnius belangerii	Yes	Low			
Sciaenidae	Larimchthys croceus	Yes	High**			
Synodontidae	Leiognathus brevirostris	Yes	Medium			
Synodontidae	Leiognathus equulus	Yes	Low			
Monacanthidae	Monacanthus chinensis	Yes	Medium			
Monodactylidae	Monodactylus argenteus	Yes	N/A			
Mugilidae	Mugil cephalus	Yes	Medium**			
Mugilidae	Mugil cunnesius	Yes	Medium**			
Mugilidae	<i>Mugil</i> sp.	Yes	Medium**			
Nemipteridae	Nemipterus japonicus	Yes	Low			
Clupeidae	Nematalosa nasus	Yes	Low			
Sciaenidae	Nibea albiflora	Yes	High			
Sciaenidae	Pennahia anea	Yes	Low			
Sparidae	Rhabdosargus sarba	Yes	Medium			
Clupeidae	Sardinella sp.	Yes	Low**			
Synodontidae	<i>Saurida</i> sp.	Yes	Low**			
Scorpaenidae	Sebastiscus marmoratus	Yes	High			
Siganidae	Siganus canaliculatus	Yes	Low			
Tetraodontidae	Takifugu alboplumbeus	No	Nil			
Tetraodontidae	Takifugu xanthopterus	No	Nil			
Engraulidae	Thryssa hamiltonii	Yes	Low			
Crustacean						

Annex 10.1 Species list of the recorded samples (including both commercial and non-commercial species)

Fomily	Spacing norma	Commercial species	Type of
ганну	Species name		Commercial*
Portunidae	Scylla serrata	Yes	High
Portunidae	Charybdis affinis	No	Nil
Portunidae	Charybdis hellerii	No	Nil
Portunidae	Charybdis japonica	No	Nil
	Unknown crab	No	Nil
	Unknown shrimp	Yes	N/A
Squillidae	<i>Squilla</i> sp.	Yes	High
Portunidae	Thalamita crenata	No	Nil
Portunidae	Portunus pelagicus	Yes	High
Ocypodidae	Macrophthalmus sp.	No	Nil

The commercial value made reference to 3RS study and Fish Marketing Organization *Commercial Value Category:

High value: > \$45 kg⁻¹

Medium value: $30 - 45 \text{ kg}^{-1}$

Low value: < \$30 kg⁻¹

** Commercial value made reference to similar species of the same genus.

Nil: nil commercial value

N/A: known commercial species without source of price

Annex 10.2 Results of fisheries surveys in dry season (abundance) (including

both commercial and non-commercial spe	ecies)
--	--------

Survey method	Gill 1	net						Cage								
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н
Fish	•	•	•		•				•		•			•		
Acanthopagrus latus	1															
Acentrogobius caninus																
Apogon fasciatus																
Arius thunbergi																
<i>Caranx</i> sp.																
Diagramma pictum																
Elops sp.																
Gerres sp.																
Inegocia japonica																
Johnius belangerii																
Larimchthys croceus																
Leiognathus brevirostris																
Leiognathus equulus																
Monacanthus chinensis	1															
Monodactylus argenteus																
Mugil cephalus																
Mugil cunnesius						1										
<i>Mugil</i> sp.																
Nemipterus japonicus																
Nematalosa nasus				1	2	1		2							1	
Nibea albiflora								1								
Pennahia anea																
Rhabdosargus sarba																
Sardinella sp.																
Saurida sp.																
Sebastiscus marmoratus						1										
Siganus canaliculatus																
Takifugu alboplumbeus													6	5		
Takifugu xanthopterus																
Thryssa hamiltonii																
Crustacean																
Charybdis affinis		2			3	3				3	1		5	2		

Survey method	Gill r	net							Cage								
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н	
Charybdis hellerii	1									2		1					
Charybdis japonica				1													
Macrophthalmus sp.				1							3						
Portunus pelagicus																	
Scylla serrata.																	
<i>Squilla</i> sp.																	
Thalamita crenata																	
Unknown crab	1																
Unknown shrimp											1						
Total	4	2	0	3	5	6	0	3	0	5	5	1	11	7	1	0	

Annex 10.3 Results of fisheries surveys in dry season (yield in gram)

Survey method	Gill	net							Cage							
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н
Fish	•	•		•							•					
Acanthopagrus latus	93.3															
Acentrogobius caninus																
Apogon fasciatus																
Arius thunbergi																
<i>Caranx</i> sp.																
Diagramma pictum																
Elops sp.																
Gerres sp.																
Inegocia japonica																
Johnius belangerii																
Larimchthys croceus																
Leiognathus brevirostris																
Leiognathus equulus																
Monacanthus chinensis	54															
Monodactylus argenteus																
Mugil cephalus																
Mugil cunnesius						86.8										
<i>Mugil</i> sp.																
Nemipterus japonicus																
Nematalosa nasus				134	91.7	58.2		207							37.7	
Nibea albiflora								85.8								
Pennahia anea																
Rhabdosargus sarba																
Sardinella sp.																
Saurida sp.																
Sebastiscus marmoratus						37.4										
Siganus canaliculatus																
Takifugu alboplumbeus													253	223		
Takifugu xanthopterus																
Thryssa hamiltonii																
Crustacean																
Charybdis affinis		51.8			82.3	44.8				81.6	51.9		126	50.6		

(including both commercial and non-commercial species)

Survey method	Gill	net							Cage								
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н	
Charybdis hellerii	130											117					
Charybdis japonica				112						180							
Macrophthalmus sp.				14.9							53.6						
Portunus pelagicus																	
Scylla serrata																	
<i>Squilla</i> sp.																	
Thalamita crenata																	
Unknown crab	3.3																
Unknown shrimp											1.3						
Total	280	51.8	0	261	174	227	0	293	0	262	107	117	380	274	37.7	0	

Annex 10.4 Results of fisheries surveys in wet season (abundance) (including

both commercial and non-commercial specie	s)
---	----

Survey method	Gill net									Cage						
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н
Fish	•	•	•	•				•	•	•		•				
Acanthopagrus latus				3	2	,		1								
Acentrogobius caninus					1											
Apogon fasciatus									1	4		3				
Arius thunbergi		1	4	2	r											
<i>Caranx</i> sp.		1														
Diagramma pictum						1										
<i>Elops</i> sp.						1										
Gerres sp.	2															
Inegocia japonica	4		4	7	3			1								
Johnius belangerii				1												
Larimchthys croceus				1												
Leiognathus brevirostris	3		2													1
Leiognathus equulus				1												
Monacanthus chinensis		1														
Monodactylus argenteus		1														
Mugil cephalus	1			1						1						
Mugil cunnesius					1											
<i>Mugil</i> sp.			1													
Nemipterus japonicus			1													
Nematalosa nasus	3	2	4	1	1	1		1								
Nibea albiflora	1	2		1												
Pennahia anea	1			1												
Rhabdosargus sarba			1			1										
Sardinella sp.			1													
Saurida sp.	3	1		4	4											
Sebastiscus marmoratus																
Siganus canaliculatus	1															
Takifugu alboplumbeus												2	,	6		
Takifugu xanthopterus					1											
Thryssa hamiltonii	2	14	3	2	r	1										
Crustacean																
Charybdis affinis	1	18	2	3						1						

Survey method	Gill net									Cage								
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н		
Charybdis hellerii																		
Charybdis japonica																		
Macrophthalmus sp.																		
Portunus pelagicus		1			4													
Scylla serrata	1	1		1	1	2		1		1			1					
<i>Squilla</i> sp.	3			2								2	1					
Thalamita crenata	6	11		2				2		7								
Unknown crab																		
Unknown shrimp																		
Total	32	54	23	33	18	7	0	6	1	14	0	7	2	6	0	1		

Annex 10.5 Results of fisheries surveys in wet season (yield in gram)

Survey method	Gill net									Cage								
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B1	B2	L	Н		
Fish	1	1					1		1	1								
Acanthopagrus latus				99.5	82.7			257										
Acentrogobius caninus					28.5													
Apogon fasciatus									20.2	84.1		46.7						
Arius thunbergi		178	727	405														
<i>Caranx</i> sp.		276																
Diagramma pictum						313												
Elops sp.						49.5												
Gerres sp.	63.2																	
Inegocia japonica	609		407	1594	215			34.9										
Johnius belangerii				54.7														
Larimchthys croceus				12	,													
Leiognathus brevirostris	81.3		50.8													13.8		
Leiognathus equulus				45.5														
Monacanthus chinensis		157																
Monodactylus argenteus		214																
Mugil cephalus	360			104						40.2								
Mugil cunnesius					59.4													
<i>Mugil</i> sp.			311															
Nemipterus japonicus			14.8															
Nematalosa nasus	218	259	177	140	74.8	150		131										
Nibea albiflora	13.9	506		56.2														
Pennahia anea	19.8			13.8														
Rhabdosargus sarba			44.5			442												
Sardinella sp.			19.9															
<i>Saurida</i> sp.	87.1	30.2		112	132													
Sebastiscus marmoratus																		
Siganus canaliculatus	49.6																	
Takifugu alboplumbeus												91.6		234	ļ			
Takifugu xanthopterus					119													
Thryssa hamiltonii	121	665	188	70.8		50.1												
Crustacean			•	•											-			
Charybdis affinis	40.2	1032	53.7	74.3						89.2								

(including both commercial and non-commercial species)

Survey method	Gill net									Cage							
Species / Location	E1	E2	Т	S	B1	B2	L	Н	E1	E2	Т	S	B 1	B2	L	Н	
Charybdis hellerii																	
Charybdis japonica																	
Macrophthalmus sp.																	
Portunus pelagicus		101			190												
Scylla serrata	210	73		405	58.4	620		135		96.7			12.3				
<i>Squilla</i> sp.	82.7			44.6								54.6	28.8				
Thalamita crenata	399	596		66				78.9		367							
Unknown crab																	
Unknown shrimp																	
Total	2356	4086	1994	3296	959	1624	0	637	20.2	677	0	193	41.1	234	0	13.8	