Expansion of Hong Kong International Airport into a Three-Runway System Environmental Impact Assessment Report Appendix 14.2 Fisheries Survey Methodology



Appendix 14.2 Fisheries Survey Methodology Appendix 14.2

Fisheries

Survey

1 Fish Trawl Survey

Methodology

Fish trawl surveys have been undertaken to collect baseline information on demersal fisheries within the proposed land formation footprint and adjacent waters. The survey transects covered the proposed land formation area within and outside HKIAAA and the immediately adjacent area (F1A, F1B, F2A, F2B, F3A and F3B), the spawning grounds of commercial fisheries resources in northern Lantau waters identified in previous studies (F5A, F5B, F6A and F6B) and the waters to the west of the existing HKIA (F4A and F4B). The transect routes for the fish trawl surveys are shown in Drawing No. MCL/P132/EIA/14-007.

Active fish trawl surveys have been conducted using shrimp trawl with fishing net dimensions of 5.5 m in length, 2 m in width and 0.3 m in height. The upper mesh size is 5cm and lower mesh size is 2.5cm. Four nets were deployed for each transect. The fish trawl was conducted at a speed of around 3 knots along the transects for about 15 minutes. A total of three daytime and three night time surveys were conducted for both the dry and wet seasons. One daytime and one night time survey were completed for the dry season in between November and December 2012, while another two daytime and two night time surveys were conducted for the wet season between May and August 2013.

The catches from each transect were washed and sorted immediately. The catches were identified to species level as far as practicable and the species composition, abundance, size (total length, standard length and fork length as appropriate) and biomass in weight were measured.

Data obtained were quantified, the average number of species captured, species diversity (H), the evenness (J), the catch per unit effort (CPUE), the yield per unit effort (YPUE) and the proportion of commercial species captured by number and weight in each location (within land formation footprint and the immediately adjacent area, western waters of Chek Lap Kok and northern waters of Chek Lap Kok) were estimated. With reference to EIAO-TM Annex 17, prediction of impacts on fisheries shall take into account ecological impacts.

2 Purse Seine Survey

Purse seine surveys have been conducted at 10 monitoring stations to collect baseline information on pelagic fisheries resources, and included areas where trawling is not permitted (e.g. in Marine Park), or with unsuitable bottom conditions such as rocky substrates (Drawing No. MCL/P132/EIA/14-008). The survey area included the proposed land formation footprint within HKIAAA (P3A and P3B), the spawning grounds of commercial fisheries resources in northern Lantau waters (P5A, P5B), the SCLKCMP where fish trawls have been prohibited since gazettal of the marine park (P2A and P2B), the proposed Brothers Marine Park where the water is relatively shallow (P1A and P1B) and the waters to the west of HKIA (P4A and P4B).

Purse seine surveys have been conducted twice in daytime for the dry season in both March and November 2013, and four times in daytime for the wet season between May and August 2013. Night time purse seine surveys in northwestern waters are not feasible, as this survey has to be conducted with the aid of bright lighting to attract fish, which is prohibited in this area according to relevant shipping laws (Cap.548 Merchant Shipping (Local Vessels) (General) Regulation).

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The dimension for purse seine nets is 120 m in length, 50 m in height with mesh size of 2cm. The duration of purse seine survey was similar to the time required for one full capture operation at daytime i.e. around 20 minutes. As advised by the fishermen, operation time for daytime purse seining is different from night time operation. The duration of 20 minutes include the deployment of net, encircle a school of fish by a sampan with the net, hitting the water with a pole to scare the fish, closing the bottom of the net and collect the net with fish, and is sufficient to reflect a full capture during day time, and longer net deployment time may lead to escape of fish from the nets.

The catches from each station were washed and sorted immediately. The catches were identified to species level as far as practicable and the species composition, abundance, size (total length, standard length and fork length as appropriate) and biomass in weight were measured. The value of the catches were also estimated.

3 Gill Net Survey

Gill net surveys have been conducted at 10 monitoring stations in addition to fish trawl survey and purse seine survey to obtain a more complete inventory of the species composition (Drawing No. MCL/P132/EIA/14-008). The survey stations are similar to the purse seine survey but a bit closer to the coast in order to collect fisheries resources that inhabit in shallower waters.

Gill net surveys were conducted twice in the daytime for the dry season in both March and November 2013, and four times during the daytime for the wet season between May and September 2013. Night surveys for gill netting were not proposed on account of safety as it is not practical to deploy and collect the gill nets during night time, as well as the fact that the duration for gill net deployment cannot be standardised at night time. Gillnet stations P3A, P3B, P5A and P5B were not surveyed on 28 March 2013 due to high current speed, supplementary surveys were conducted in 09 Nov 2013. Ten independent gill nets were deployed for one hour at each of the survey locations. The nets deployed were 1 m deep, 120 m in length (consisting of four gill nets each of approximately 30 m in length sewn together to form a connected net) and comprise 3-layers (trammel net), with two 20cm mesh stretches sandwiching a 5cm mesh stretch. This sampling gear was selected for its ability to capture organisms with a wide range of sizes.

The catches from each station were washed and sorted immediately. The catches were identified to species level as far as practicable and the species composition, abundance, size (total length, standard length and fork length as appropriate) and biomass in weight were measured. The values of the catch were also estimated.

4 Hand Line Survey

Hand lining was used after the deployment of gill nets while waiting for the collection of nets. This is the common practice adopted by those fishermen who use gill nets. Hand line surveys have been conducted at five monitoring stations (H1, H2, H3, H4 and H5) to add to the species inventory obtained from fish trawl surveys, purse seine surveys and gill net surveys (Drawing No. MCL/P132/EIA/14-008). The survey stations were similar to the purse seine surveys but a little closer to the coast to allow data to be collected to reflect those fisheries resources that inhabit shallower waters. The survey area included the proposed land formation footprint within HKIAAA (H3), the spawning grounds of commercial fisheries resources in northern Lantau waters (H5), the SCLKCMP where fish trawls have been prohibited since gazettal of the marine park (H2), the proposed Brothers Marine Park where the water is relatively shallow (H1) and the waters to the west of HKIA (H4). Hand lining surveys were conducted twice during the daytime in both



March and November 2013, and four times during the daytime for the wet season between May and September 2013.

Hand lining was undertaken using simple lines and hooks. The survey was conducted by four surveyors at the same time on a sampan for around one hour at each of the five monitoring stations.

The catches from each station were washed and sorted immediately. The catches were identified to species level as far as practicable and the species composition, abundance, size (total length, standard length and fork length as appropriate) and biomass in weight were measured.

5 Artificial Reef Survey

The baseline conditions at the ARs located within the study area were reviewed using published information from AFCD. Two preliminary dive surveys were conducted on 11 July and 8 November 2013 at the artificial reefs of SCLKCMP to review the status of the ARs as well as the suitability of carrying out further underwater visual count surveys. Initial findings indicated that the waters around the artificial reefs were similar to other parts of the western Hong Kong waters, i.e. turbid and with low visibility of less than 1 m on both days of the site visit. Secchi disc measurements were also made on 5 and 6 November, 2013 to review the underwater visibility and suitability of conducting underwater visual count. The secchi disc measurements indicated that the visibility at SCLKCMP was continuously low with secchi depth below 1 m. As a result it was considered underwater visual count surveys would not be feasible and would not yield meaningful data. In order to review the baseline information of fisheries resources associated with the existing artificial reefs deployed in the SCLKCMP for the evaluation and prediction of potential impacts, preliminary dive surveys and fisheries surveys using purse seine, gill net, hand lining, larvae and post-larvae tow were adopted in the adjacent waters. The locations of the fisheries surveys in the vicinity of the artificial reefs are shown in Drawing No. MCL/P132/EIA/14-008.

Dive surveys within the artificial reefs which are located within the northeast of the Chek Lap Kok waters, i.e. within the existing HKIAAA, were not undertaken as diving conditions were assessed to be unsafe. Safety reasons include the diversions to vessel access routes to and from SkyPier as a result of HKBCF construction works which means vessel routes are extremely close to the AR sites combined with the high turbidity of the area, would pose unacceptable risks to divers. Attempts were made to arrange for dive surveys or other fisheries surveys using suitable fishing vessels, however marine users and stakeholders with knowledge of the waters suggested that locations of the ARs within marine traffic zones pose unacceptable hazards for divers. After discussion with various stakeholders and the Marine Department, the use of remote technique and devices such as Remotely Operated Vehicles (ROVs) was not considered as a suitable alternative underwater survey method because the marine traffic might interfere with the operation of the ROVs, and the ROVs might pose hazard to the vessels due to the close proximity. Combined with the fact that the AR sites near Chek Lap Kok is not considered as a site of fisheries importance since it is heavily influenced by the construction works at HKBCF, it was concluded that dive survey was not required to be conducted as part of this assessment.

6 Ichthyoplankton and Fish Post-larvae Survey

The objective of this survey is to assess the abundance, composition and diversity of ichthyoplankton and fish post-larvae in northern Lantau waters, and also determine if the survey areas are important for commercial fisheries resources. The data may also provide information on the biodiversity of the study area.

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Surveys of ichthyoplankton and fish post-larvae were conducted four times during the spawning season between May and August 2013. According to the findings of ERM (1998), higher number of reproductive fish individuals could be found in the study area (The Brothers, Lung Kwu Chau and Deep Bay) during March, May to August and December to January. Three monitoring stations were located within the land formation footprint (L4, L5 and L6), three stations were located at the proposed Marine Park at The Brothers (L1, L2 and L3), three stations at the waters to the west of the existing HKIA (L13, L14 and L15), three stations in the SCLKCMP (L7, L8 and L9). In total, there were 15 monitoring stations and one pair of bongo nets comprising two nets were deployed at the same time in each station to collect samples for morphological identification, while another sample was preserved for DNA bar coding where morphological identification was infeasible. A replicate tow was conducted at each station on the same day. The survey locations are shown in Drawing No. MCL/P132/EIA/14-009.

7 Ichthyoplankton Sampling

The ichthyoplankton survey is required to determine the abundance and species composition of fish larval assemblages. At this stage, the fish are in their planktonic phase and float freely with the water currents.

One pair of bongo net with a typical 0.5 m mouth diameter and 0.5 mm mesh size was deployed in the survey sites to collect zooplankton and ichthyoplankton. The mouth of one of the nets was fitted with a flowmeter to record the volume of water filtered. The vertical profile of the physical environmental parameters were obtained by a multi-parameter water quality meter.

The nets were deployed in a single oblique tow to a depth of 2 m off seabed, and towed at a speed of around 1 - 2 knots against the flow. During the sampling event, the nets were gradually winched up towards the water surface so that most of the water column was sampled. A replicate tow was conducted at a speed of around 3 - 4 knots with the flow at each station. The tow duration was set at 10 minutes to restrict the amount of zooplankton being collected and to prevent clogging of the nets from accumulated debris, plankton, etc. 10 minutes is a sufficient duration to overcome the spatial patchiness in which plankton (and fish post-larvae) occurs (ERM, 2006).

The plankton material in the bongo net without an attached flowmeter was preserved in a pre-labelled bottle with 5% formalin buffered with seawater immediately after collection onboard. The content was then transferred into 95% ethanol solution for subsequent preservation in the laboratory and morphological identification. The plankton material in the bongo with an attached flowmeter was preserved in a pre-labelled bottle with 95% ethanol solution as back up for DNA bar coding in the laboratory, where morphological identification was found not to be feasible.

The ichthyoplankton samples were sorted in the laboratory, where all fish larvae were identified and counted. Identification of fish larvae was made by morphology and DNA bar coding where morphological identification was not feasible. The samples identified by both morphology and DNA bar coding were combined as pooled samples.

8 Fish Post-larvae Sampling

The fish post – larval survey is intended to determine the abundance and species composition of the fish post settlement. During this stage, the fish have attained a relatively larger size and are capable of swimming against currents, or have adopted to staying above sea bottom most of the time.



One pair of bongo nets with similar design to that for ichthyoplankton sampling but with a coarser mesh size of 1 mm were utilised. With a coarser-mesh net, the chance of catching the fish post-larvae increased. The coarser mesh size also allows small zooplankton to extrude through the net mesh and thus avoid zooplankton from clogging up the net.

The bongo net was deployed in a single oblique tow to a depth of 2 m off the seabed and tow at a speed of 1 - 2 knots against the flow. Subsequently, the nets were gradually winched up towards the water surface so that most of the water column was sampled. A replicate tow was conducted at a speed of around 3 - 4 knots with the flow at each station. The tow was operated five minutes after the deployment of bongo nets for ichthyoplankton survey, the tow duration was set at 10 minutes to restrict the amount of fish post-larvae being collected and to prevent clogging of the nets from accumulated debris, plankton, etc. 10 minutes is sufficient duration to overcome the spatial patchiness in which fish post-larvae occurs.

The fish post-larvae material in the bongo net without the attached flowmeter was preserved in a prelabelled bottle with 5% formalin buffered with seawater immediately after collection on board. The content was then transferred into 95% ethanol solution for subsequent preservation in the laboratory and morphological identification. The plankton material in the bongo net with the attached flowmeter was preserved in a pre-labelled bottle with 95% ethanol solution as back up for DNA bar coding in the laboratory, where morphological identification was not feasible.

The identification of fish specimens was made to the lowest possible taxon, but in the case of larvae the identification may only be to family level. This is a standard procedure as exemplified in other overseas ichthyoplankton studies (Muhling et al., 2013; Ooi and Chong, 2011).

9 Fisheries Interview Survey

In addition to the desktop review of relevant literature on culture and capture fisheries and the programme of field surveys, interviews with fishermen were conducted to supplement all obtained information. Eleven homeports that are likely to have vessels operating in the study area were visited, including Castle Peak Bay, Tung Chung / Sha Lo Wan, Ma Wan / Tsing Lung Tau / Yam O, Tsuen Wan, Tai O, San Pui / Lau Fau Shan and Aberdeen. Five extra homeports outside of the study area, namely, Cheung Chau, Yung Shue Wan / Sok Kwu Wan, Peng Chau and Silver Mine Bay were also visited (Drawing No. MCL/P132/EIA/14-001).

A survey questionnaire was developed for interviewing fishermen, in order to acquire information on fishing vessel types and numbers deployed by fishermen for fishing operation, to help determine locations where capture fisheries occur, fishing time in various locations, major species of adult fish catches, etc. The template for the fisheries survey questionnaire is shown in **Annex A**.

The interviews with fishermen for this project were conducted with reference to the numbers of interviews conducted in the Port Survey 2006. However, the actual number of interviewees was dependent on availability and willingness to be part of the interview process. Fishermen did not have any record of their operation, and the information may be subject to the impression of the fishermen during the interview.

Since the trawl ban effected from 31 December 2012, fishermen using trawlers have moved to outside Hong Kong, while some of the trawlers have transformed their operation to purse seining, gill netting and hand lining. For the survey conducted right after the trawl ban effect in Hong Kong, the survey results may



not directly reflect the impact of the trawl ban to the fishermen. The dominant catches reported by the fishermen were verified with the information collected from fisheries surveys.

10 Aquaculture Interview Survey

Aquaculture activities within the study area include Ma Wan FCZ and Lau Fau Shan oyster production area. Information relating to aquaculture activities was acquired from aquaculture representatives and fish or oyster farmers during the site visits to these culture zones.

11 Reference

ERM, 1998. *Fisheries Resources and Fishing Operations in Hong Kong Waters – Final Report* for Agriculture, Fisheries and Conservation Department.

ERM, 2006. Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities – Environmental Impact Report for Castle Peak Power Company Limited.

Muhling B.A., Smith R.H., Lourdes V.Y., Lamkin J.T., Johns E.M., Carrillo L., Eloy S.C., Malca E., 2013. *Larval fish assemblages and mesoscale oceanographic structure along the Mesoamerican Barrier Reef System.* Fisheries Oceanography 22 (5): 409 – 428.

Ooi AL, Chong VC, 2011. Larval fish assemblages in a tropical mangrove estuary and adjacent costal waters: offshore-inshore flux of marine and estuarine species. Continental Shelf Research 31(15): 1599 – 1610.

Fisheries Questionnaire

Sa	mple Number: Interview Date:	Interview Date:					
Na	me:Contact No:						
Su	rveyor: Vessel Licence:						
Ge	neral Information on vessel						
1.	Home Port:						
	Vessel Type: Pair Trawler Stern Trawler Note Shrimp Trawler Hang Trawler						
	□ Gill Netter □ Long Liner □ Hand Liner □ Purse Seiner						
	□ Sampan □ Miscellaneous Craft						
	Vessel Lengthm/ft Engine Powerhp/kw						
2.	No. of net: Net size: Mesh size: maxmin						
	No. of Hook:Interval between hooks: No. of pot trap:						
	Fishing Gear/Method:						
3.	Daily Operation hour:hour Freq. for gill net deployment:						
	Operation cost for vessel per day Operation cost for labour per month						
	Maintenance cost for vessel per year						
Fis	shing Activity						
4.	Peak months period:to Slack months period:to						
5.	No. of crew: Peak months: HKSAR+ Mainland=						
	Slack months: HKSAR+ Mainland=						
6.	. Please indicate on map provided (see Figure 1), <u>Major</u> area of fishing (map of Western waters).						
7.	No. of fishing days per year in the Major area :						
	Peak Months:(days per month); Slack Months:(days per month)						
8.	3. Reason for selecting the preferred fishing ground:						

To be continued

9.	Your (daily / monthly) avg. income(HK\$) earned in:							
	Peak months: CORE area \$; Slack months: CORE area \$;				;			
10.	10. Size of avg. catch (by daily / monthly) (in hecto-catty / catty / kg) in:							
	Peak months: CORE area; Slack months: CORE area;							
11.	11. Please name 5 commonly caught fish/ species in the different areas:							
	Big-eyes	Bombay Duck	Cardinal Fish	Emperor	Flathead			
	Golden Thead	Grey Mullet	Rabbit Fish	🗖 Sea Perch	Thread Fin			
	C Yellow Croake	er 🗖 Yellow-finned Se	ea Bream	Pomfret	☐ Squid			
	Yellow Belly	🗖 Mugilidae	Others (pleas	e specific):				
12.	Peak season for	fry / spawning fish c	aptured?					
13.	Please mark KE	r spawning / nursery	y area(s) on the pr	ovided map (See	Figure 1)			
Oth	Other Questions							
How often did you see the Chinese White Dolphins/ Porpoises / marine mammals?								
□ Always □ Often □ S		Sometimes	Seldom / Rarely					
Where did you mostly see dolphins / porpoises / marine mammals in Western waters?								
How many dolphins/porpoises/marine mammals did you usually see them in?								
What is your plan when trawling is banned by the end of 2012?								
Re	mark							

捕漁業問卷調査

樣本編號: 訪者姓名:					訪問日期:		
					聯絡號碼:		
調查員:			船牌編號:				
船	 隻資料						
1.	停泊位置:						
	漁船種類:	□雙拖		□單拖	□蝦拖	□摻	繒
		□ 刺網		□延繩釣	□ 手釣	□ 重	網
		□ 舢舨		□ 雜項船			
	船長 (米)			-	引擎馬力:		(匹/千瓦)
2.	漁網數量:		漁網尺	寸:	網眼尺寸::	最大	最小
	落勾數量:		勾的間	距:	籠數量:		
	捕魚工具/方	式:					
3.	每天工作時間	間:小	時		落網次數:		
	每天船隻的營運成本:\$			每月船員的薪酬:\$			
	每年船隻的約	准修費用:\$					
捕	魚活動						
4.	旺季月份:	至		淡季月份:	至		
5.	船員數目:	旺季: 來自	1	(香港) +	(大陸) =	人
		淡季: 來自	1	(香港) +	(大陸) =	人
6.	請在提供的均	也圖上顯示的	「捕魚的主要	₹捕魚水域 位置(見圖一)		
6. 7.	請在提供的 ^比 每年在 主要	也圖上顯示伤 甫魚水域 捕魚	「捕魚的主要」	〔捕魚水域 位置(見圖一)		
6. 7.	請在提供的 ¹ 每年在 主要 旺季:每月_	也圖上顯示的 甫魚水域 捕魚	⊼捕魚的 主要 魚時間 天; 淡季∶	孫捕魚水域 位置 (每月	見圖一) 天		
6. 7. 8.	請在提供的 ¹ 每年在 主要打 旺季:每月_ 選擇優先捕貨	也圖上顯示伤 甫魚水域 捕魚 魚場的原因 _	、捕魚的 主要 魚時間 天; 淡季:	径捕魚水域 位置(每月	見圖一) 天		
6. 7. 8. 9.	請在提供的地 每年在 主要打 旺季:每月_ 選擇優先捕拜 你出海捕魚的	也圖上顯示仍 甫魚水域 捕魚 魚場的原因_ 的漁獲(每日/	(捕魚的 主要) (時間) 天; 淡季: (5) (5) (5) (5) (5) (5) (5) (5) (5) (5)	注捕魚水域 位置(每月 (入:	見圖一) 天		
6. 7. 8. 9.	請在提供的地 每年在 主要打 旺季:每月_ 選擇優先捕算 你出海捕魚的 旺季: 主要	也圖上顯示依 甫魚水域 捕魚 魚場的原因_ 的漁獲(每日/ 捕魚水域 \$_	x捕魚的 主要 魚時間 天; 淡季: 毎月)平均收 四月)平均收	注捕魚水域 位置(每月 (入:	見圖一) _天 淡季: 主要捕魚水 :	 域 \$	
6. 7. 8. 9.	請在提供的 ¹ 每年在 主要打 旺季:每月_ 選擇優先捕算 你出海捕魚的 旺季: 主要	也圖上顯示依 甫魚水域 捕魚 魚場的原因_ 的漁獲(每日/ 捕魚水域 \$_ 勻漁獲量(每日	★ 補魚的主要 ★ 供用 ★ 天; 淡季: ★ 毎月)平均收 ★ 日/每月)(註明	孫捕魚水域 位置(每月 (入: 月 擔/斤/公斤)爲:	見圖一) _天 淡季: 主要捕魚水 :	 域 \$	

11. 請在以下種魚類當中選出5種你最常捕獲到的魚:

□木棉/大眼雞	□ 狗肚	□蔬蘿	□連尖	□牛鳅
□ 紅衫	□ 烏頭	□ 泥鯭	□鱸魚	□ 馬友
□ 黃花	□ 黃腳(魚立)	□ (魚倉)魚	□魷魚	□獅頭/黃皮
□ 鱭魚	□ 其他(請註明)	:		

12. 魚苗 / 產卵的月份 :_____

13. 請在提供的地圖上顯示主要的魚苗 / 產卵水域 (見圖一)

其他問題

你有否在西面水域曾經見過任何海豚 / 江豚 (海豬) / 海洋哺乳動物以及目擊頻率?

□經常 □時常 □有時 □甚少 □從未見過

請問你最常看到海豚/江豚(海豬)/海洋哺乳動物出沒的是西面水域的哪一帶?

請問你平常所看到的一群海豚/江豚 (海豬)/海洋哺乳動物一共有多少條?

於 2012 年尾實施禁止拖網捕魚後, 你有什麼計劃?

其他

-- 問卷完 --



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