MOTT MACDONALD

Improvement Dredging for Lamma Power Station Navigation Channel

Fisheries Baseline Review Report

October 2018

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香港電燈有限公司
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ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499

ENVIRONMENTAL PERMIT NO. EP-535/2017

IMPROVEMENT DREDGING FOR LAMMA POWER STATION NAVIGATION CHANNEL

Report Title	Fisheries Baseline Review Report (October 2018)
Date	31 October 2018
Certified by	(Mr. Kenneth Fung, Environmental Team Leader)
Verified by	Mr. Y T Tang (AECOM Asia Company Limited, Independent Environmental Checker)

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1 Introduction

An application for Environmental Permit (EP) for the “Improvement Dredging for Lamma Power Station Navigation Channel” (the Project) was submitted on 29 March 2017 (Application No. AEP-535/2017) with the support of an Environmental Impact Assessment Report (EIA). The EIA report was exhibited for public inspection from 9 June 2017 to 8 July 2017 and a consultation with the Advisory Council on the Environment (ACE) was held on 14 August 2017. On 10 October 2017, the Director of Environmental Protection (DEP) approved the EP application with conditions under Section 8(3) of the EIA Ordinance.

According to the approval conditions under Annex 1 (2): “The project proponent shall conduct marine ecological and fisheries baseline review before commencement of each dredging. The marine ecological baseline review shall cover species of conservation interest including but not limit to Green Turtle and Finless Porpoise. In preparing the detailed baseline report, the Director of Agriculture, Fisheries and Conservation Department shall be consulted and the report shall be submitted to the DEP for approval before each dredging, including selected high spot dredging and re-profiling;”

Based on the EP No. EP-535/2017 Clause 2.10 Submission of Fisheries Baseline Review Report: “The Permit Holder shall, no later than 3 months before the commencement of each dredging, including selected high spot dredging and re-profiling, submit 4 hard copies and 1 electronic copy of a Fisheries Baseline Review Report (the Report) to the Director for approval. The Report shall be prepared by a fisheries specialist(s) and shall be certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC).”

In order to fulfil the above EP conditions and as an initiative of The Hongkong Electric Company Limited (HK Electric) in conserving the marine environment, a fisheries baseline survey for collecting updated information was conducted as part of the Review Report. HK Electric has commissioned Mott MacDonald Hong Kong Limited as the environmental consultant for provision of fisheries specialist(s) for the preparation of this Fisheries Baseline Review Report. This Report provides results of the fisheries baseline field survey conducted for this Project prior to the commencement of improvement dredging and the review of updated fisheries baseline information of the Study Area available after the submission of the EIA.

2 Background

2.1 Study Area

2.1.1 Fishing Operation and Fisheries Resources

The proposed dredging site at Lamma Power Station Navigation Channel locates at the western waters of Lamma Island. Based on the Port Survey 2006 (AFCD, 2018), fishing vessels operating within the Study Area included shrimp trawler, hang trawler, gill netter, long liner, hand liner, purse seiner, sampan and miscellaneous crafts, with sampans being the dominant type. Since 31 December 2012, Hong Kong has implemented a trawl ban on its territorial waters and hence shrimp trawler and hang trawler are no longer operating within Hong Kong waters. Level of fishing operations in the Project Area is moderate (100-400 vessels per grid). Fishing operations in the Project Area are mainly vessels less than 15 metres in length (AFCD, 2018).

Shrimps were the major catch at the Project Area. Other catches included croaker (Sciaenidae), squid, scad (Carangidae), crab, rabbitfish (Siganidae), anchovy (Engraulidae), mullet (Mugilidae), seabream (Sparidae) and sardine (Clupeidae) (AFCD, 2018).

The Project Area lies within south Lamma which serves as spawning grounds and nursery areas of commercial fisheries resources (**Figure 1**; ERM, 1998). Most of the commercial fish species recorded in Hong Kong waters were found to spawn from June to September, while most of the crustacean species spawn from April to November (ERM, 2006). Juvenile fishes were recorded all year-round, and reported close to shore as well as south of the Lamma Power Station between March and September (Hyder, 2003). Hyder (2003) also identified Tit Sha Long to Ha Mei Tsui as suitable nursery areas for fish.

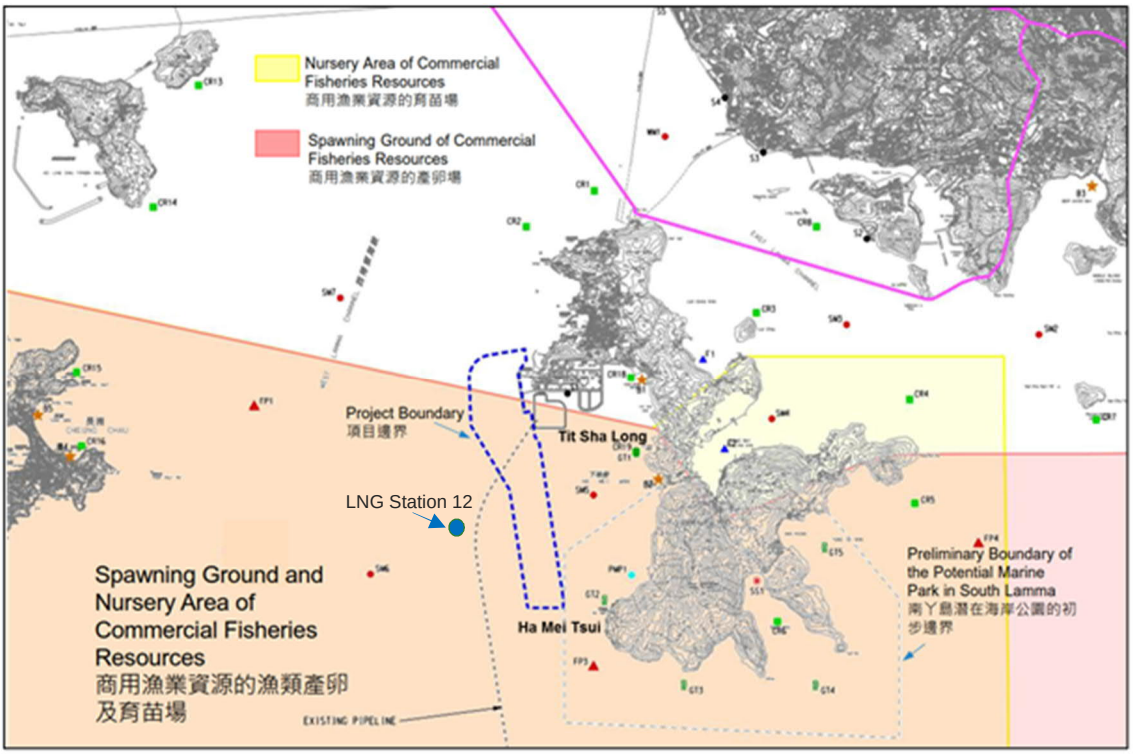
2.1.2 Updated Review

In the recent fisheries surveys conducted for the Hong Kong Offshore LNG Terminal Project (the LNG Project) between October 2016 and July 2017 (ERM, 2018), one of the selected survey stations located just over 1km away from the western side of the Project Area, i.e. Station no. 12 - West Lamma (**Figure 1**). During wet season, a total of 87 individual fishes and crustaceans weighing 5.23kg from 26 species of 19 families were collected at Station 12. In dry season, a total of 53 individual fishes and crustaceans weighing 3.61kg from 13 species of 11 families were caught at Station 12. In both wet and dry seasons, the mean biomass, abundance, species richness, species diversity and species evenness of the fisheries resources at Station 12 were moderate among the twelve survey stations. During wet season, the catches at Station 12 were mostly dominated by the croaker *Johnius belangerii* in terms of both abundance and biomass. In dry season, the threadfin bream *Nemipterus japonicus* which ranked third in terms of abundance and biomass during wet season became the most dominant species. At the same time, the croaker *Johnius belangerii* ranked second and third in terms of abundance and biomass, respectively, in dry season. The two dominant fish species (*J. belangerii* and *N. japonicus*) at Station 12 were both of low commercial values (ERM, 2018).

Vessel surveys were conducted in the LNG Project as well. In wet season, fishing by gill net and hand line using P4/7 vessels (also called sampans) and by hand line using miscellaneous vessel were sighted near Station 12. While in dry season, fishing by hand line and long line using P4/7 vessels were observed around Station 12. Hand-lining using P4/7 vessels represented recreational fishing activities only (ERM, 2018).

In order to obtain the most updated information on fisheries resources of the Study Area, a fisheries baseline survey using the same methodology as that of the LNG Project was conducted in this Study. The results obtained from the fisheries survey together with that of the LNG Project were summarised below.

Figure 1: Spawning Ground and Nursery Area of Commercial Fisheries Resources Around Lamma Waters (ERM, 1998) and Location of Station 12 of the Hong Kong Offshore LNG Terminal Project (ERM, 2018)



2.2 Survey Methodology

Gill net and hand line surveys were conducted once per month from February to May 2018 during daytime, covering both dry (10 February and 3 March 2018) and wet seasons (21 April and 19 May 2018). These two fishing methods are commonly used by local fishermen in Hong Kong.

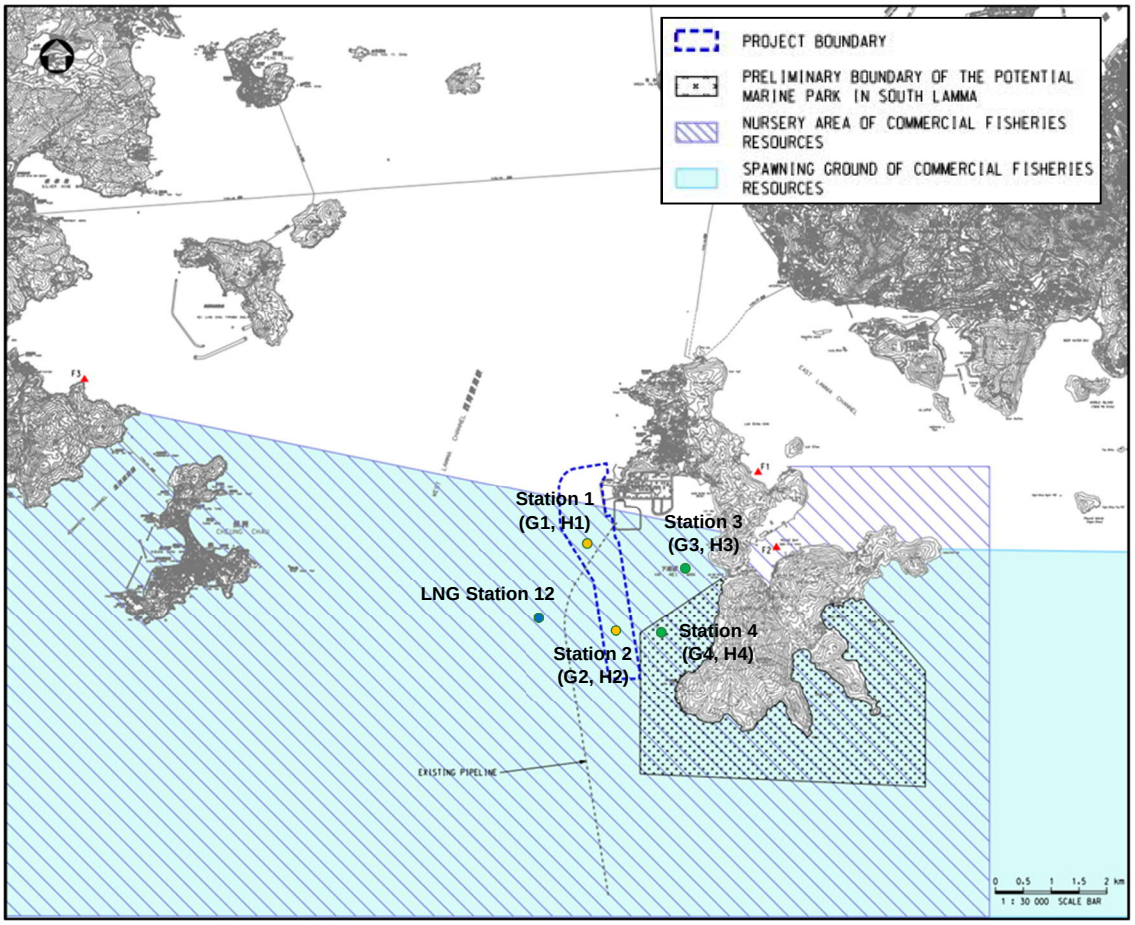
Four monitoring stations were selected, including two monitoring stations in the proposed dredging area (G1 and G2 for gill net survey; H1 and H2 for hand line survey) and two monitoring stations outside the Project Area as reference (G3 and G4 for gill net survey; H3 and H4 for hand line survey) (**Figure 2**). No reference monitoring station was set up at the western side of the Project Area since there is a monitoring station located just over 1km away from the western side of the Project Area (i.e. Station 12) in the LNG Project (**Figure 2**; ERM, 2018). In the LNG Project, gill net and hand line surveys were conducted using the same methodology adopted in this Study.

Gill nets were deployed for one hour at each of the monitoring stations. The nets deployed were about 1m deep, 60m long (consisting of two gill nets each of about 30m long sewn together to form a connected net) and comprised of three layers (trammel net), with two 20cm mesh stretches sandwiching a 5cm mesh stretches.

Hand line surveys were conducted after the deployment of gill nets while waiting for the collection of the gill nets for one hour. Hand lining were done by four surveyors using simple lines and hooks on a sampan for around one hour at each of the four monitoring stations.

The catches from each station were washed and sorted immediately. The catches were identified to species level. Species composition, abundance, size (total length, standard length and fork length as appropriate) and biomass in weight were recorded. For subsequent analyses, catches from the same monitoring station using different fishing methods were pooled together to determine the fisheries production of that station, i.e. catches at G1 and H1 were combined and represented as Station 1, and the same rule applies to Station 2 (which includes G2 and H2), Station 3 (G3 and H3) and Station 4 (H4 and G4) (**Figure 2**). Besides abundance, biomass and size, species richness, Shannon-Weiner diversity (*H*') and Pielou's evenness (*J*') were also calculated and compared between Impact Stations, Reference Stations and the LNG Station 12.

Figure 2: Fisheries Baseline Field Survey Locations



- Impact Stations
- Reference Stations
- LNG Station 12 (Reference Station) (ERM, 2018)

3 Fisheries Survey Findings

3.1 Overview

A total of 174 individual fishes weighing 11.00kg from 20 species of 15 families were collected from February to May 2018 in the four monitoring stations using gill nets and hand lines. Other than fish species, a total of 12 individual crustaceans weighing 0.92kg from 5 species of 3 families were recorded from the surveys. Besides fishes and crustaceans, one individual of cuttlefish *Sepia andreana* weighing 0.95kg was caught throughout the study period. All the species caught in this study are commonly found and widespread across the waters of Hong Kong (Lui *et al.*, 2007; Wong, 2016; Mak, 2017). A full list of species with their respective abundance and biomass collected from the fisheries surveys are shown in **Appendices A and B**.

3.2 Species Composition

In terms of weight and number, the threadfin bream *N. japonicus* which is a fish species of low commercial value is the most dominant catch, comprising nearly half of the total biomass and abundance (45% and 41%, respectively). The croaker *Johnius amblycephalus* which is also of low commercial value ranked second in terms of total biomass and fourth in terms of abundance (**Table 1**).

The cuttlefish *S. andreana* and the snake eel *Pisodonophis boro* were the third and fifth most dominant species in terms of biomass, respectively (**Table 1**). However, there was only one individual caught for each species throughout the surveys. A single individual of *S. andreana* and *P. boro* was caught at Station 1 during dry season and at Station 4 during wet season, respectively. The two species are also of low commercial importance.

The seabream *Evynnis cardinalis* ranked fourth in terms of biomass and second in terms of abundance (**Table 1**). Although this fish species is categorised as medium-valued, only individuals of small sizes were caught in this Study, i.e. average size of 8.6cm total length (TL) and 7.2cm standard length (SL). When comparing with its maximum size of 40cm TL (Froese and Pauly, 2018) and maturity size of 8.8cm SL and 11.7cm SL for male and female, respectively (Law and Sadovy de Mitcheson, 2017), *E. cardinalis* collected in this study are juveniles only and of low commercial importance as they did not reach marketable size yet.

The goby *Myersina filifer* is the third most numerically abundant species, which is also a low-valued fish species (**Table 1**).

The puffer *Lagocephalus gloveri* of no commercial value and the mantis shrimps *Harpiosquilla harpax* and *Oratosquilla oratoria* of high commercial importance ranked fifth in terms of abundance (**Table 1**). Only four individuals were caught for each species throughout the surveys.

Table 1: Top Five Dominant Species Recorded from this Study

Family	Species	Commercial value	Biomass (g)	% of Total Biomass (Rank)	Abundance (No. of individuals)	% of Total Abundance (Rank)
Nemipteridae	*Nemipterus japonicus*	Low	5841	45.4% (1)	76	40.6% (1)
Sciaenidae	*Johnius amblycephalus*	Low	1194	9.3% (2)	11	5.9% (4)
Sepiidae	*Sepia andreana*	Low	950	7.4% (3)	1	0.5% (-)

Family	Species	Commercial value	Biomass (g)	% of Total Biomass (Rank)	Abundance (No. of individuals)	% of Total Abundance (Rank)
Sparidae	*Evynnis cardinalis*	Medium	781	6.1% (4)	40	21.4% (2)
Ophichthidae	*Pisodonophis boro*	Low	710	5.5% (5)	1	0.5% (-)
Gobiidae	*Myersina filifer*	Low	490	3.8% (-)	20	10.7% (3)
Tetraodontidae	*Lagocephalus gloveri*	-	410	3.2% (-)	4	2.1% (5)
Squillidae	*Harpiosquilla harpax*	High	157	1.2% (-)	4	2.1% (5)
Squillidae	*Oratosquilla oratoria*	High	113	0.9% (-)	4	2.1% (5)

Note: Commercial values of the catches were categorised based on the information provided by Fish Marketing Organisation (FMO) and previous fisheries studies including Expansion of Hong Kong International Airport into a Three-Runway System – EIA Study (Mott MacDonald, 2014) and Hong Kong Offshore LNG Terminal – Fisheries Survey Results (ERM, 2018). Commercial value "-" = not commercially important.

3.3 Commercial Value

Among the 26 species recorded in this Study, 25 of them were regarded as commercial species with different values and the only non-commercially important species was the pufferfish *Lagocephalus gloveri* (**Appendices A and B**). Overall, the catches were mostly comprised of low-valued species which accounted for about 79.3% of total biomass and 65.2% of total abundance. Medium- and high-valued species only contributed to around 7.3% and 10.1% of total biomass and 23.5% and 9.1% of total abundance, respectively.

3.4 Spatial and Seasonal Variation

The fisheries resources of the Impact Stations (Station 1 and 2) were generally lower than those of the Reference Stations (Station 3 and 4) and the LNG Station 12. Mean biomass and abundance of the catches in the Impact Stations was lower than that in the Reference Stations and LNG Station 12 in both dry and wet seasons, respectively (**Table 2**). Less number of species was found in the Impact Stations when compared to the Reference Stations and LNG Station 12 in dry and wet seasons, respectively (**Table 2**). When reviewing individual Stations, the mean biomass, abundance and species richness of the Impact Stations 1 and 2 ranged from 0.25 to 1.44, 4.5 to 17.5 and 1.5 to 6, respectively (**Table 3**). These values were lower than those of the Reference Stations 3 and 4 which the mean biomass, abundance and species richness ranged from 0.45 to 1.65, 11.5 to 20 and 2.5 to 6.5, respectively (**Table 3**). Lower mean abundance and species richness were also found in the Impact Stations 1 and 2 when compared to the LNG Station 12 (abundance from 10.6 to 21.8 and species richness from 4 to 8) (**Table 3**).

Mean length of the catches in the Impact Stations in both dry and wet seasons are longer than that in the Reference Stations (**Table 2**), possibly attributed to the locational difference. The two Reference Stations located nearer to the shore when compared to the Impact Stations, and juvenile fishes usually inhabit shallow, near-shore waters as nursery grounds (Beck *et al*., 2001). In terms of species composition, the catches at the Impact Stations were largely dominated by a single species, i.e. the threadfin bream *N. japonicus*, while at least two species co-dominated the Reference Stations. For instances, dominance of the goby *M. filifer* and the pufferfish *L. gloveri* were observed in Station 3 during dry season, the threadfin bream *N. japonicus* and the seabream *E. cardinalis* dominated in Station 3 during wet season, and the threadfin bream *N. japonicus* and the croaker *J. amblycephalus* were dominant in terms of biomass and abundance in wet season of Station 4 (**Appendices A and B**).

Overall, with reference to the LNG Project, the mean species richness and diversity of the Project Area were considered to be low, with some unevenness in species distribution (**Table 3**). The species richness ranged from 1.5 to 6 and diversity index *H'* ranged from 0.28 to 1.46 in this Study (**Table 3**), while the species richness ranged from 3.8 to 13.3 and diversity (*H'*) ranged from 0.13 to 1.38 in the LNG Project and such values of species richness and diversity were regarded as low in the LNG Project (ERM, 2018).

Seasonally, mean biomass and abundance of the catches in wet season were greater than that of dry season. Higher species richness and species diversity (*H'*) were found in wet season when compared to dry season (**Table 2**). Similar seasonal differences in fisheries resources were also documented in Lui *et al.* (2007), Mak (2017) and ERM (2018). When breaking down the results into each station instead of station group for analyses, it was found that the mean biomass in Station 1 during wet season was smaller than that in dry season (**Table 3**), due to collection of a single large individual of cuttlefish *S. andreana* (950g) at Station 1 in dry season. Mean length of the catches in each station was generally smaller in wet season than that in dry season, except in Station 4 (**Table 3**). Smaller sizes of the fisheries catch during wet season might be related to the spawning season of a year. It was found that the reproductive activity of many local fishes was the greatest from March to June which is the period of increasing water temperature (Sadovy, 1998). In Station 4, higher mean length in wet season was caused by the catch of a long snake eel *P. boro* (82cm) (**Appendix C**).

The catches from the fisheries surveys conducted in dry season were mainly dominated by the threadfin bream *N. japonicus* which is of low commercial value. During wet season, some other fish species, such as the seabream *E. cardinalis* and the croaker *J. amblycephalus*, also dominated the catches besides the threadfin bream *N. japonicus*. Relatively more medium- and high-valued species were caught in wet season when compared to dry season (**Appendices A and B**).

Table 2: Fisheries Resources of Each Station Group in Dry and Wet Seasons

Station	Season	Mean Biomass (kg)	Mean Abundance (No. of Individuals)	Mean Species Richness	Mean Species Diversity (Shannon-Weiner *H'*)	Mean Species Evenness (Pielou's *J'*)	Mean Length (cm)
Impact Stations (Stations 1 & 2)	Dry	0.47	4.5	2.25	0.60	0.86	17.08
	Wet	0.95	12.3	4.75	1.26	0.83	14.60
Reference Stations (Stations 3 & 4)	Dry	0.59	11.8	2.75	0.56	0.64	13.79
	Wet	1.22	18.3	6.25	1.40	0.80	13.82
LNG Station 12	Dry	0.72	10.6	4	0.79	0.82	-
	Wet	1.31	21.8	8	1.24	0.74	-

Source: Data of the LNG Station 12 (West Lamma) were obtained from Hong Kong Offshore LNG Terminal – Fisheries Survey Results (ERM, 2018). No length data were available from the LNG project.

Table 3: Fisheries Resources of Each Station in Dry and Wet Seasons

Station	Season	Mean Biomass (kg)	Mean Abundance (No. of Individuals)	Mean Species Richness	Mean Species Diversity (Shannon-Weiner *H'*)	Mean Species Evenness (Pielou's *J'*)	Mean Length (cm)
Station 1	Dry	0.69	4.5	3	0.92	0.92	17.63
	Wet	0.45	7	3.5	1.05	0.85	14.07
Station 2	Dry	0.25	4.5	1.5	0.28	0.81	16.53
	Wet	1.44	17.5	6	1.46	0.82	15.13
Station 3	Dry	0.45	11.5	3	0.78	0.79	12.40
	Wet	0.79	20	6	1.27	0.75	11.16
Station 4	Dry	0.72	12	2.5	0.34	0.50	15.17
	Wet	1.65	16.5	6.5	1.54	0.84	16.48
LNG Station 12	Dry	0.72	10.6	4	0.79	0.82	-
	Wet	1.31	21.8	8	1.24	0.74	-

Source: Data of the LNG Station 12 (West Lamma) were obtained from Hong Kong Offshore LNG Terminal – Fisheries Survey Results (ERM, 2018). No length data were available from the LNG project.

3.5 Summary of Findings

A total of 187 individuals of fishes, crustaceans and cuttlefish weighing 12.87kg from 26 species of 19 families were collected throughout the survey period. All the species caught are common and widespread in Hong Kong waters. The catches were mostly comprised of low-valued species which accounted for about 79.3% of total biomass and 65.2% of total abundance.

Level of fisheries resources at the proposed dredging area (i.e. Impact Stations) was low when compared to the Reference Stations and LNG Station 12. Mean biomass, abundance and number of species of the catches in the Impact Stations were lower than those in the Reference Stations and LNG Station 12. Overall, species richness and diversity of the Project Area were low with some unevenness in species distribution.

Level of fisheries resources in wet season was higher than that in dry season. Mean biomass, abundance, species richness and species diversity (Shannon-Weiner *H'*) in wet season were higher than those in dry season. Abundance and biomass of medium-valued and high-valued species were generally higher in wet season when compared to dry season.

In the EIA report (AEIAR-212/2017), it was identified that shrimp was the major catch at the Project Area, and the other catches included croaker (Sciaenidae), squid, scad (Carangidae), crab, rabbitfish (Siganidae), anchovy (Engraulidae), mullet (Mugilidae), seabream (Sparidae) and sardine (Clupeidae). The catches from the fisheries surveys in this Study were a bit different from those identified in the EIA report. Threadfin bream (Nemipteridae) was the major catch in this Study. Other dominant catches include croaker (Sciaenidae), seabream (Sparidae) and goby (Gobiidae), which the first two families were the same as that identified in the EIA report. In terms of commercial importance, shrimp is regarded as high-valued species, while the dominant fish species collected in this Study are all low-valued species. Under this circumstance, the worst-case scenario of the potential fisheries impacts on fisheries resources including those moderate-valued species of this Project has already been considered in the EIA report, and hence the fisheries impact assessment of the EIA report, which adopted a conservative approach remains valid. No specific mitigation measures for fisheries is considered required with the implementation of measures identified under the water quality impact assessment.

4 Conclusion

The fisheries baseline in and around the proposed dredging area is updated using fisheries survey data and literature review of updated information available after the approval of the EIA. The level of fisheries resources at the proposed dredging area was relatively low. Therefore, the assessment of potential fisheries impacts in the approved EIA report (AEIAR-212/2017) has already taken a conservative approach and remains valid. The overall impacts to fisheries resources/production and nursery and spawning grounds are predicted to be minor due to the temporary, short-term and small-scale nature of the dredging works. No additional mitigation / precautionary measures are required.

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Appendices

A. Survey Data – Mean Biomass (g)

Taxa / Family	Species	Commercial value	Station 1		Station 2		Station 3		Station 4	
			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Fish										
Apogonidae	*Ostorhinchus fasciatus*	Low	0	0	0	0	0	0	0	8
Carangidae	*Decapterus maruadsi*	Low	0	0	0	12	0	0	0	0
Cynoglossidae	*Cynoglossus macrolepidotus*	High	0	31	0	0	0	0	0	0
Gobiidae	*Acentrogobius caninus*	Low	0	0	0	0	14.5	0	18	0
Gobiidae	*Myersina filifer*	Low	14	0	30	0	177	24	0	0
Leiognathidae	*Leiognathus brevirostris*	Medium	0	0	0	13.5	0	0	0	0
Nemipteridae	*Nemipterus japonicus*	Low	123	254	181.5	800	83	315	620	544
Ophichthidae	*Pisodonophis boro*	Low	0	0	0	0	0	0	0	355
Paralichthyidae	*Pseudorhombus levisquamis*	Medium	0	9.5	0	0	0	0	0	0
Platycephalidae	*Inegocia guttata*	Low	28	0	0	67.5	0	0	61	0
Sciaenidae	*Dendrophysa russelii*	Low	0	0	0	0	0	69	0	0
Sciaenidae	*Johnius amblycephalus*	Low	0	0	0	127.5	0	0	0	469.5
Sciaenidae	*Johnius dussumieri*	Low	0	0	0	86	0	0	0	0
Sciaenidae	*Pennahia anea*	Low	0	0	0	0	0	66	0	42
Sciaenidae	*Pennahia argentata*	Medium	20	0	37.5	0	0	0	0	0
Serranidae	*Epinephelus awoara*	High	0	0	0	0	0	0	24	111.5
Sillaginidae	*Sillago sihama*	High	27	0	0	0	0	0	0	0
Sparidae	*Evynnis cardinalis*	Medium	0	58	0	72.5	0	200.5	0	59.5
Synodontidae	*Saurida tumbil*	Low	0	0	0	0	0	42	0	0
Tetraodontidae	*Lagocephalus gloveri*	-	0	8	0	0	173.5	23.5	0	0
Crab										
Portunidae	*Portunus pelagicus*	High	0	92	0	187	0	0	0	0
Portunidae	*Portunus sanguinolentus*	High	0	0	0	0	0	20.5	0	0
Mantis shrimp										
Squillidae	*Harpiosquilla harpax*	High	0	0	0	58.5	0	0	0	20
Squillidae	*Oratosquilla oratoria*	High	0	0	0	15	0	27.5	0	14
Shrimp										
Penaeidae	*Penaeus merguiensis*	High	0	0	0	0	0	0	0	25
Cuttlefish										
Sepiidae	*Sepia andreana*	Low	475	0	0	0	0	0	0	0
		Total	**687**	**452.5**	**249**	**1439.5**	**448**	**788**	**723**	**1648.5**

B. Survey Data – Mean Abundance (No. of Individuals)

Taxa / Family	Species	Commercial value	Station 1		Station 2		Station 3		Station 4	
			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Fish										
Apogonidae	*Ostorhinchus fasciatus*	Low	0	0	0	0	0	0	0	0.5
Carangidae	*Decapterus maruadsi*	Low	0	0	0	0.5	0	0	0	0
Cynoglossidae	*Cynoglossus macrolepidotus*	High	0	0.5	0	0	0	0	0	0
Gobiidae	*Acentrogobius caninus*	Low	0	0	0	0	0.5	0	0.5	0
Gobiidae	*Myersina filifer*	Low	0.5	0	1	0	7.5	1	0	0
Leiognathidae	*Leiognathus brevirostris*	Medium	0	0	0	0.5	0	0	0	0
Nemipteridae	*Nemipterus japonicus*	Low	2	2.5	3	8	2.5	4.5	10.5	5
Ophichthidae	*Pisodonophis boro*	Low	0	0	0	0	0	0	0	0.5
Paralichthyidae	*Pseudorhombus levisquamis*	Medium	0	0.5	0	0	0	0	0	0
Platycephalidae	*Inegocia guttata*	Low	0.5	0	0	0.5	0	0	0.5	0
Sciaenidae	*Dendrophysa russelii*	Low	0	0	0	0	0	0.5	0	0
Sciaenidae	*Johnius amblycephalus*	Low	0	0	0	1	0	0	0	4.5
Sciaenidae	*Johnius dussumieri*	Low	0	0	0	1	0	0	0	0
Sciaenidae	*Pennahia anea*	Low	0	0	0	0	0	0.5	0	0.5
Sciaenidae	*Pennahia argentata*	Medium	0.5	0	0.5	0	0	0	0	0
Serranidae	*Epinephelus awoara*	High	0	0	0	0	0	0	0.5	1
Sillaginidae	*Sillago sihama*	High	0.5	0	0	0	0	0	0	0
Sparidae	*Evynnis cardinalis*	Medium	0	2.5	0	3.5	0	11	0	3
Synodontidae	*Saurida tumbil*	Low	0	0	0	0	0	0.5	0	0
Tetraodontidae	*Lagocephalus gloveri*	-	0	0.5	0	0	1	0.5	0	0
Crab										
Portunidae	*Portunus pelagicus*	High	0	0.5	0	0.5	0	0	0	0
Portunidae	*Portunus sanguinolentus*	High	0	0	0	0	0	0.5	0	0
Mantis shrimp										
Squillidae	*Harpiosquilla harpax*	High	0	0	0	1.5	0	0	0	0.5
Squillidae	*Oratosquilla oratoria*	High	0	0	0	0.5	0	1	0	0.5
Shrimp										
Penaeidae	*Penaeus merguiensis*	High	0	0	0	0	0	0	0	0.5
Cuttlefish										
Sepiidae	*Sepia andreana*	Low	0.5	0	0	0	0	0	0	0
		Total	**4.5**	**7**	**4.5**	**17.5**	**11.5**	**20**	**12**	**16.5**

C. Survey Data – Mean Length (cm)

Taxa / Family	Species	Commercial value	Station 1				Station 2				Station 3				Station 4			
			Dry		Wet		Dry		Wet		Dry		Wet		Dry		Wet	
			A	TL	A	TL	A	TL	A	TL	A	TL	A	TL	A	TL	A	TL
Fish																		
Apogonidae	*Ostorhinchus fasciatus*	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8.00
Carangidae	*Decapterus maruadsi*	Low	0	0	0	0	0	0	1	10.50	0	0	0	0	0	0	0	0
Cynoglossidae	*Cynoglossus macrolepidotus*	High	0	0	1	25.90	0	0	0	0	0	0	0	0	0	0	0	0
Gobiidae	*Acentrogobius caninus*	Low	0	0	0	0	0	0	0	0	1	13.50	0	0	1	13.60	0	0
Gobiidae	*Myersina filifer*	Low	1	13.80	0	0	2	13.10	0	0	15	12.09	2	12.35	0	0	0	0
Leiognathidae	*Leiognathus brevirostris*	Medium	0	0	0	0	0	0	1	9.20	0	0	0	0	0	0	0	0
Nemipteridae	*Nemipterus japonicus*	Low	4	15.30	5	16.30	6	14.37	16	17.02	5	12.66	9	14.74	21	15.23	10	17.15
Ophichthidae	*Pisodonophis boro*	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	82.00
Paralichthyidae	*Pseudorhombus levisquamis*	Medium	0	0	1	11.80	0	0	0	0	0	0	0	0	0	0	0	0
Platycephalidae	*Inegocia guttata*	Low	1	20.60	0	0	0	0	1	23.20	0	0	0	0	1	24.70	0	0
Sciaenidae	*Dendrophysa russelii*	Low	0	0	0	0	0	0	0	0	0	0	1	18.60	0	0	0	0
Sciaenidae	*Johnius amblycephalus*	Low	0	0	0	0	0	0	2	20.05	0	0	0	0	0	0	9	18.04
Sciaenidae	*Johnius dussumieri*	Low	0	0	0	0	0	0	2	18.25	0	0	0	0	0	0	0	0
Sciaenidae	*Pennahia anea*	Low	0	0	0	0	0	0	0	0	0	0	1	18.00	0	0	1	18.50
Sciaenidae	*Pennahia argentata*	Medium	1	16.40	0	0	1	19.00	0	0	0	0	0	0	0	0	0	0
Serranidae	*Epinephelus awoara*	High	0	0	0	0	0	0	0	0	0	0	0	0	1	14.60	2	17.30
Sillaginidae	*Sillago sihama*	High	1	18.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sparidae	*Evynnis cardinalis*	Medium	0	0	5	8.88	0	0	7	8.71	0	0	22	8.60	0	0	6	8.50
Synodontidae	*Saurida tumbil*	Low	0	0	0	0	0	0	0	0	0	0	1	23.00	0	0	0	0
Tetraodontidae	*Lagocephalus gloveri*	-	0	0	1	8.80	0	0	0	0	2	20.40	1	11.00	0	0	0	0
Crab																		
Portunidae	*Portunus pelagicus*	High	0	0	1	11.20	0	0	1	15.20	0	0	0	0	0	0	0	0
Portunidae	*Portunus sanguinolentus*	High	0	0	0	0	0	0	0	0	0	0	1	6.20	0	0	0	0
Mantis shrimp																		
Squillidae	*Harpiosquilla harpax*	High	0	0	0	0	0	0	3	15.67	0	0	0	0	0	0	1	16.70
Squillidae	*Oratosquilla oratoria*	High	0	0	0	0	0	0	1	13.40	0	0	2	12.60	0	0	1	12.20
Shrimp																		
Penaeidae	*Penaeus merguiensis*	High	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4.80
Cuttlefish																		
Sepiidae	*Sepia andreana*	Low	1	21.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: A = total abundance (no. of individuals); TL = mean total length (cm). Standard length instead of total length was used for crab, shrimp and cuttlefish.