

10 FISHERIES IMPACT ASSESSMENT

10.1 Introduction

This Section of the EIA Report presents the results of an assessment of the impact of construction and operation of the drainage system of the Project (Drainage Improvement in Tsuen Wan and Kwai Chung-Tsuen Wan Drainage Tunnel-Investigation), as part of the drainage improvement in Tsuen Wan Kwai Chung & Tsing Yi, on existing fisheries resources, fishing operations and fish culture activities based on the findings of the Water Quality Impact Assessment.

10.2 Fisheries Impact Assessment Methodology

A desktop literature review was conducted in order to establish the fisheries importance of the area surrounding the Outfall O-1. Information from the water quality assessment was used to determine the size of the Study Area as that potentially affected by perturbations to water quality parameters. This area, including Ma Wan Fish Culture Zone, became the Study Area for this fisheries impact assessment (**Figure 10.1**). The importance of fishing resources and fisheries operations identified within the Study Area was assessed using the *EIAO-TM*. The potential impacts due to the construction and operation of the drainage tunnel have been assessed (following the *EIAO-TM Annex 17* guidelines) and the impacts evaluated (based on the criteria in *EIAO-TM Annex 9*).

10.3 Baseline Conditions & Sensitive Receivers

The availability of literature on the fisheries resources of the Study Area comes mainly from the AFCD 1996-1997 ⁽¹⁾ and 2001-2002 Port Survey ⁽²⁾. Other relevant reports from the Study Area have been reviewed.

In Hong Kong, the commercial marine fishing industry is divided into capture and culture fisheries. To assess the capture fishery within the Study Area, the most up-to-date information on the Hong Kong fishery was consulted ⁽³⁾. Information from other relevant studies within the Study Area were also reviewed in order to determine if the areas are important nursery and spawning grounds for commercial fisheries ⁽⁴⁾.

The findings of fisheries surveys, fishermen's interviews and accompanying literature reviews ⁽⁵⁾ conducted for AFCD's *Fisheries Resources and Fishing Operations in Hong Kong Waters Study* have determined that commercial fish species reproduce throughout the year, though spawning for the majority of species appears to be concentrated during the period from June to September. The marine waters within the Study Area were not identified as a primary nursery ground for commercial fisheries (fish fry production density

(1) Agriculture, Fisheries and Conservation Department (1998) *Port Survey 1996/1997*.

(2) Agriculture, Fisheries and Conservation Department (2002a) *Port Survey 2001/2002*, web site www.afcd.gov.hk.

(3) *Ibid.*

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

(5) ERM (1998) *Op cit.*

less than or equal to 50 tails per hectare with reference to the AFCD's Port Survey 2001/2002).

10.3.1 Capture Fisheries

In 2002, the estimated fisheries production in Hong Kong waters from both capture and culture fisheries amounted to 173,198 tonnes, valued at HK\$1,700 million ⁽¹⁾. Capture fisheries accounted for 98 % by weight (94.1 % by value) of the total production while the remaining 2 % (5.9% by value) corresponded to the culture sectors of the industry. Within Hong Kong waters, the highest yields for local fisheries within Hong Kong waters were mainly derived from the eastern and northeastern coasts ⁽²⁾. The five most abundant fish species landed by weight from the capture sector were golden thread (*Nemipterus virgatus* 14%), lizardfish (*Saurida* sp 9%), big-eyes (*Priacanthus* sp 5%), scads (*Decapterus* sp 5%) and yellow belly (*Nemipterus bathybius* 4%).

Based on the latest AFCD Port Survey data ⁽³⁾, the highest range of fisheries production (ie 600 – 1000 kg ha⁻¹) was recorded near Cheung Chau, Penny's Bay, Kau Yi Chau, Po Toi, Ninepin Group and Tap Mun. The top 10 families captured in Hong Kong were rabbitfish (Sigdnidae), sardine (Clupeidae), croaker (Sciaenidae), scad (Carangidae), squid, shrimp, anchovy (Engraulidae), crab, seabream (Sparidae) and threadfin bream (Nemipteridae).

Up-to-date information from AFCD is available for use in this EIA and can be collated to allow an assessment be made of the importance of Fishing Zones in the Study Area to the Hong Kong fishery. The designated Fishing Zones within the Study Area have been identified and the importance of these zones is assessed and discussed below.

The Study Area interfaces with 5 Fishing Areas (including one Fish Culture Zone) as identified in the AFCD Port Survey Report ⁽⁴⁾ (**Figure 10.1**). These Fishing Areas are identified as follows:

- Ma Wan (Fish Culture Zone)
- Tsing Yi
- Tsuen Wan
- Ting Kau
- Shum Tseng

The area and number of vessels operating during 1996-1997 in each of the Fishing Zones is presented in **Table 10.1**.

(1) Agriculture, Fisheries and Conservation Department (2002b). Web site www.afcd.gov.hk.

(2) ERM (1998) Op cit.

(3) Agriculture, Fisheries and Conservation Department (2002a) Op cit.

(4) Agriculture, Fisheries and Conservation Department (1998) Op cit

Table 10.1 Area (ha) and Number of Vessels Operating During 1996 - 1997 in Each AFCD Fishing Zone within the Study Area

Code	Fishery Area	Area (Ha)	Vessels < 15m	Vessels > 15m	All Vessels
0025	Ma Wan	418.82	253.9	0	253.9
0034	Tsing Yi	1326.12	140.1	0	140.1
0035	Tsuen Wan	169.38	116.9	0	116.9
0036	Ting Kau	224.26	121.5	0	121.5
0037	Shum Tseng	85.98	4.6	0	4.6
Total		2,224.56	*	*	*
Total of all Fishing Zones in Hong Kong		181,790.97	2,352.2	266.4	2,618.5
Percentage of Hong Kong Total		1.2 %	*	*	*

*No values can be calculated for these parameters from the information provided, as it cannot be determined whether the vessels reported as operating within one zone are the same vessels that are reported for another zone.

The total number of vessels varies widely from 4.6 in Shum Tseng Fishing Area to 253.9 in Ma Wan Fishing Area. According to the AFCD 1996/ 1997 Port Survey, the total fishing production in those fishing areas is from vessels not exceeding 15m (**Table 10.1**). No vessel exceeding 15m operated in the Fishing Areas (**Table 10.1**).

The number of vessels ranged from 100 to 400 in the Study Area. According to the AFCD 1997 Vessel Count, the most common type of vessel operating within the Study Area is sampan (P4/7) with particularly high numbers (285) recorded in Ma Wan, and (34) recorded in Tsuen Wan. Vessels such as long liner, gill netter, hand liner and miscellaneous craft were reported to operate within the Study Area with relatively low numbers (9) being reported in Ma Wan home port and approximately 31 being reported in Tsuen Wan home port. The information presented indicates that the fisheries production within the Study Area was mainly derived from P4/7 vessels, shrimp and hang trawlers.

The overall fisheries production (adult fish and fish fry) ranged widely from approximately 14 kg ha⁻¹ (Shum Tseng) to >200 kg ha⁻¹ (Tsuen Wan) (**Table 10.2**). These values are not in the high range for production in Hong Kong.

Table 10.2 Fisheries Production Values from each AFCD Fishing Zone within the Study Area (1996 – 1997 Port Survey)

Code	0025	0034	0035	0036	0037
Fishing Areas	Ma Wan	Tsing Yi	Tsuen Wan	Tin Kau	Shum Tseng
Total Production					
Adult Fish (kg)	81,988.08	47,425.64	35,200.56	36,041.55	1,251.06
Fry (Tails)	7,661.29	-	-	-	-
Value (HKD)	4,469,869.80	1,888,784.37	1,362,072.38	1,408,040.13	7,661.29
Production (Ha⁻¹)					
Adult Fish (kg)	195.76	35.76	207.82	160.71	14.55
Fry (Tails)	18.29	-	-	-	-
Value (HKD)	10,672.14	1,424.29	1,424.29	6,278.59	89.11
Rank Production (Ha⁻¹)					
Adult Fish (kg)	48	139	47	63	157

Code	0025	0034	0035	0036	0037
Fishing Areas	Ma Wan	Tsing Yi	Tsuen Wan	Tin Kau	Shum Tseng
Fry (Tails)	68	-	-	-	-

Of the 5 fishing areas identified, three of the fishing zones were ranked as recording high or medium value for adult fish production (Ma Wan 48th, Tsuen Wan 47th and Ting Kau 63rd out of the 179 zones). Ma Wan ranked 68th for fish fry production. Tsing Yi and Shum Tseng recorded low ranked adult fish production (Tsing Yi 139th and Shum Tseng 157th). With the exception of Ma Wan, no fish fry capture operations was recorded in the fishing areas within the Study Area.

According to the AFCD Port Survey data ⁽¹⁾, the top five adult fish species caught in the sector Western Harbour (SE03) included the mixed fish species, *Siganus canaliculatus* (Rabbitfish), *Acetes spp* (Silver shrimp), *Sebasticus marmoratus* (Rockfish) and *Argyrosomus spp* (Croaker). The main fish species reported in catches from the Study Area are of low commercial value (<HK\$10/kg) ⁽²⁾ including mixed species (juveniles of trash fish species such as *Caranx kalla*, *Siganus canaliculatus*, *Sardinella sp.*, *Leiognathus brevirostris*, *Clupanodon punctatus*) (Table 10.33). Silver shrimp, croaker, yellow croaker, sea bream and conger pike eel are regarded as of high commercial value (>HK \$15/kg). Rockfish is regarded as of medium commercial value (HK\$10–15/kg) ⁽²⁾.

Table 10.3 Top Five Adult Fish (by weight) Caught in Each AFCD Fishing Zone within the waters of the Study Area (1996 - 1997 Port Survey)

Code	Fishing Area	Top Five Fish Caught (by weight)	
		Species	Common Name
0025	Ma Wan	<i>Siganus canaliculatus</i>	Rabbitfish
		<i>Sebasticus marmoratus</i>	Rockfish
		Mixed Species	Mixed Species
		<i>Argyrosomus spp</i>	Croaker
		<i>Sparidae species</i>	Sea bream
0034	Tsing Yi	Mixed Species	Mixed Species
		<i>Argyrosomus spp</i>	Croaker
		<i>Siganus canaliculatus</i>	Rockfish
		<i>Acetes spp.</i>	Silver shrimp
		<i>Muraenosox cinereus</i>	Conger pike eel
0035	Tsuen Wan	Mixed Species	Mixed Species
		<i>Acetes spp.</i>	Silver shrimp
		<i>Muraenosox cinereus</i>	Conger pike eel
		<i>Argyrosomus spp</i>	Croaker
		<i>Siganus canaliculatus</i>	Rabbitfish

(1) Agriculture, Fisheries and Conservation Department (1998) Port Survey 1996/1997.

(2) Fish Marketing Organization (2004), Website: www.fmo.org.hk.

Code	Fishing Area	Top Five Fish Caught (by weight)	
		Species	Common Name
0036	Tin Kau	Mixed Species	Mixed Species
		<i>Acetes</i> spp.	Silver shrimp
		<i>Muraenosox cinereus</i>	Conger pike eel
		<i>Argyrosomus</i> spp	Croaker
		<i>Siganus canaliculatus</i>	Rabbitfish
0037	Shum Tseng	Mixed crab species	-
		<i>Sillago sihama</i>	Sand borer
		<i>Siganus canaliculatus</i>	Rabbitfish
		<i>Pseudosciaena crocea</i>	Yellow croaker
		<i>Leiognathus brevirostris</i>	Pony fish

10.3.2 Culture Fisheries

The closest AFCD designated Fish Culture Zone (FCZ) to the Study Area is located at Ma Wan which is approximately 4.4km away from the Outfall O-1 at Yau Kom Tau within the Study Area. As of 31 January 2001, updated information from AFCD indicates that the Ma Wan FCZ consists of 132 licensed rafts with a total licensed area of 14,557m² (total gazetted area=46,300m²)⁽¹⁾. The main species cultured are the spotted grouper (*Epinephelus chlorostigma*), gold-lined seabream (*Rhabdosargus sarba*), mangrove snapper (*Lutjanus argentimaculatus*) and the pompano (*Trachinotus blochii*). There is no figure available for production at this FCZ, although Hong Kong fish production in 1997 totalled 2,960 tonnes valued at approximately \$170 million⁽²⁾.

10.3.3 Fisheries Importance

The importance of the fisheries within the Study Area is addressed based on the baseline information provided above. The Fishing Zones within the Study Area are characterised as mainly of medium to low value. The catches from these zones were composed of juvenile mixed fish species, which are used as fish feed in mariculture. However, Ma Wan Fish Culture Zone was of high value in terms of fisheries.

The EIAO *TM* (Annex 9) states that spawning areas can be regarded as an important habitat type as they are critical to the regeneration and long-term survival of many organisms and their populations. Consequently, Ma Wan, which provides important fisheries habitat and potential fish fry spawning areas along the east Lantau coast, can be considered as important to fisheries⁽³⁾.

10.3.4 Sensitive Receivers

Based on the preceding review of the available information on the capture and culture fisheries of the waters of the Study Area and its immediate vicinity, the sensitive receiver which may be affected by the proposed works associated with the Project has been identified as the Fish Culture Zone at Ma Wan (**Figure 10.1**).

(1) Scott Wilson (2001) *Planning and Engineering Feasibility Study for Sham Tseng Development, EIA Final Report., for Civil Engineering Department.*

(2) Op Cit.

(3) Op Cit.

10.4 Identification of Fisheries Impacts

As discussed in the Water Quality Impact Assessment *Section 5*, the construction works will involve site clearance, site preparation, earthworks, tunnelling by using tunnel boring machine, excavation of production shaft and other general construction activities etc. No dredging, reclamation or filling will be involved. Further to the water quality assessment in *Section 5*, no construction and operational impacts are expected to adversely influence the water quality and hence no unacceptable impacts on the fisheries resources within the Study Area will be expected.

10.5 Assessment of environmental Impacts

From the information presented above, the fisheries impact associated with the Project is considered to be low. An evaluation of the impact in accordance with *Annex 9* of the *EIAO-TM* is presented below.

- *Nature of Impact*: No severe, direct or indirect impacts will occur to fisheries resources within the Study Area as no unacceptable water quality impacts are expected further to the water quality assessment.
- *Size of Affected Area*: The construction of the Project will not result in the direct or temporary loss of fisheries habitats within the Study Area. Further to the water quality assessment, negligible impacts to fisheries will be expected due to the long distance of the Outfall O-1 from the major fishing areas and the small size of the construction works within the Study Area.
- *Size of fisheries resources/production*: Three fishing areas including the fish culture zone Ma Wan within the Study Area are of high to medium ranking for adult fish production in Hong Kong Waters, and another two fishing areas are of low commercial fisheries value. Due to the small size of the affected areas and the construction works restricted to coastal areas, the influence on fisheries resources/production should be negligible and acceptable.
- *Destruction and disturbance of nursery and spawning grounds*: Key fisheries resources consist of rocky substrate around Ma Wan, which provides important fisheries habitats. However, no destruction and disturbance of areas of fisheries importance is expected due to the project works.
- *Impact on fishing activity*: Based on the small size of the affected areas and because the construction works restricted to the foreshore at Yau Kom Tau, the impacts on fisheries resources are expected to be negligible.
- *Impact on aquaculture activity*: The Ma Wan FCZ is predicted not being impacted by perturbation of water quality from the construction works or operation of this Project.

10.6 Mitigation of Adverse Environmental Impacts

In accordance with the guidelines in the *EIAO-TM* on fisheries impact assessment the general policy for mitigating impacts to fisheries, in order of priority are avoidance, minimization and compensation.

Impacts to fisheries resources and fishing operations have largely been avoided during the construction and operation of the drainage tunnel through the avoidance of dredging, reclamation and filling activities. Good construction practice and associated measures were recommended in Water Quality Assessment in *Section 5* to control water quality impacts to within acceptable levels and are also expected to control impacts to fisheries resources. Hence, no fisheries-species mitigation measures are required during construction and operation of the drainage tunnel.

10.7 Residual Fisheries Impacts

No adverse residual impact due to the construction and operation of the drainage tunnel is expected after the implementation of the proposed mitigation measures to control water quality impacts.

10.8 Environmental Monitoring & Audit

The implementation of the water quality mitigation measures stated in the *Section 5* (Water Quality Impact Assessment) should be checked as part of the environmental monitoring and audit procedures during the construction period as presented in the separate Environmental Monitoring and Audit Manual. No other fisheries-specific measures are considered necessary.

10.9 Conclusions

Reviews of existing information on commercial fisheries resources and fishing operations located within the Study Area have been undertaken. Information from a study on fishing operations in Hong Kong and the AFCD Port Surveys indicate that fisheries production values in the vicinity of the Study Area vary but are medium to low.

The construction and operation of the Project will not give rise to impacts to fisheries, as there is no predicted adverse impact to water quality or habitat loss.

No special mitigation measures are required for fisheries resources, mitigation measures recommended to reduce impacts to water quality are also expected to mitigate any impacts to fisheries resources. The availability of literature on the fisheries resources of the Study Area comes mainly from the AFCD 1996-1997(1).