Annex H

Fisheries Impact Assessment

1.1 BASELINE CONDITIONS

This Annex describes the baseline conditions of capture and culture fisheries resources within the Assessment Area. This area was defined in the Study Brief as all sensitive receivers within the North Western, Western Buffer and Southern Water Control Zones (WCZs). On the basis of preliminary information from the water quality assessment, perturbations to water quality are unlikely to extend outside the area presented in *Annex G - Figure 1.1a*. Consequently, this assessment of impacts has focussed on the fisheries resources of this area. Baseline conditions are evaluated based on information from the literature and specific field studies conducted for the purposes of this EIA.

1.1.1 Literature Review

The availability of literature on the fisheries resources of the Assessment Area comes mainly from the AFCD 1996-97 Port Survey. The list of relevant reports in the Study Brief has been reviewed along with relevant information pertaining to the fisheries characteristics of the Penny's Bay and East Lantau area.

1.1.2 Focussed Field Surveys

Due to the limited literature available for some components of the marine ecosystem, field surveys were considered necessary to fill the information gaps identified and enable a complete and robust assessment of impacts to fisheries to be performed. The findings of the field surveys are presented below as well as an outline of information on fisheries resources based on information gathered through desk-top reviews of available literature.

In Hong Kong, the commercial marine fishing industry is divided into capture and culture fisheries. To assess the capture fishery within the Assessment Area, the most up-to-date information on the Hong Kong fishery was consulted ⁽¹⁾. Information from other relevant studies within the Assessment Area were also reviewed in order to determine if the areas are important nursery and spawning grounds for commercial fisheries ⁽²⁾. Updated mariculture information was obtained from the AFCD.

2.1 CAPTURE FISHERIES

In 1997, the estimated fisheries production in Hong Kong waters from both capture and culture fisheries amounted to 186,000 tonnes, valued at HK\$ 2,459 million ⁽³⁾. Capture fisheries accounted for 96 % by weight of the total production while the remaining 4 % corresponded to the culture sectors of the industry. Within Hong Kong waters, the highest yields for local fisheries were mainly derived from the eastern and north-eastern coasts ⁽⁴⁾. 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%).

2.1.1 Fishing Operations

In 1989-91 AFCD devised a system whereby the waters of Hong Kong were divided up into Fishing Zones ⁽⁵⁾. Data was gathered at that time on the catches of the Hong Kong fleet derived from these Fishing Zones. Since this first Hong Kong wide survey, AFCD have updated the information which now indicates that the number of Fishing Zones equates to 189 of which 179 are actively fished by vessels in the Hong Kong fleet ⁽¹⁾.

The 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 (*Figure 2.1a*). The designated Fishing Zones within the Assessment Area have been identified and the importance of these zones will be assessed and discussed below.

The Assessment Area within which potential impacts arising from the construction and operation of the proposed Theme Park EIA and associated developments may occur, consists of thirteen Fishing Zones. These zones are found in northern and (eastern Lantau Island *Figure 2.1a* and *Table 2.1a*). Of

⁽⁴⁾ Agriculture, Fisheries and Conservation Department (1998) Port Survey 1996 - 1997.

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

^(*) Agriculture, Fisheries and Conservation Department (1998), Annual Departmental Report 1997-1998

⁽¹) ERM (1998) Op cit.

Agriculture, Fisheries and Conservation Department (1991) Port Survey 1989 - 1991.

these 13 fishing zones only three fall in some part under the footprint of the two reclamations for the Theme Park (0023 - Yam O, 0002 - Pa Tau Kwu and 0003 - Penny's Bay.

In comparison with other parts of Hong Kong these fishing zones show a low ranking for fisheries production (120 - 189th). Out of the 189 fishing zones in Hong Kong that reported catches Pa Tau Kwu 149 and Penny's Bay 133. The main fishing operations in these areas are by small scale vessels operating gill nets, hand lines and long lines. These vessels originate from three of the home ports of Silvermine Bay, Ma Wan, and Peng Chau. The Pa Tau Kwu and Penny's Bay fishery zones are also ranked as low (the lower third of all fishing zones) for Hong Kong in terms of catch value (*Table 2.1b*). The fishing zone at Yam O ranks as medium (82 out of 189) when compared to other zones in Hong Kong for both catch weight and value. Neither of these three zones recorded any fry capture activities.

Of the other fishing zones in the Assessment Area the more important ones that rank as of high fisheries production (top third of all fishing zones) are Tsing Chau Tsai East, Ma Wan, Peng Chau and Tsing Lung Tau. Fish fry capture activities were reported from Tsing Chau Tsai, Ma Wan, Kau Yi Chau and Tsing Lung Tau. However, none of these four zones can be regarded as important areas for fry production.

The main fish species reported in catches from the Theme Park footprint are of low commercial value including, mantis shrimp, mixed species (juveniles of trash fish species such as pony fish, scad, rabbitfish and sardine), croaker, crabs and sole (*Table 2.1c*). Only one species of medium value are reported from the area those being the sea breams.

Table 2.1a Area (Ha) and Number of Vessels Operating During 1996 - 1997 in Each AFCD Fishing Zone within the Assessment Area

Code	Fishery Area	Area (Ha)	Vessels < 15 m	Vessels > 15 m	All Vessels
0001	Fa Peng	297	45	3	48
0002	Pa Tau Kwu	815	63	4	29
0003	Penny's Bay	278	62	1	63
0004	Discovery Bay	354	99		69
2000	Tai Shui Hang	202	37	က	40
0022	Sham Shui Kok	532	136	15	151
0023	Yam O	530	116	8	124
0024	Tsing Chau Tsai	170	160	0	160
0025	Ma Wan	419	254	0	254
0027	Peng Chau	542	198	16	213
0028	Kau Yi Chau	1,621	279	16	295
0038	Tsing Lung Tau	219	130	0	130
0039	Tai Lam Chung	370	20	2	23
Total		6,349	*	*	*
Total of all Fishing Zones in Hong Kong	•	181,791	2,352	266	2,618
Percentage of Hong Kong Total		3.49%	*	*	*
* No sections and the section of the					

* 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.

Table 2.1b

Code	Fishing Area	Total Production	duction	Production (Ha-1)	n (Ha-1)	Rank Production (Ha-1)	tion (Ha-1)
		Adult Fish (kg)	Fry (tails)	Adult Fish (kg)	Fry (tails)	Adult Fish	Fry
10001	Fa Peng	12,384	•	42		131/189	
0002	Pa Tau Kwu	16,327	1	, ₂₀	1	149/189	ı
2000	Penny's Bay	11,447	•	41	i	133/189	•
0004	Discovery Bay	14,068	1	40	1	134/189	1
2000	Tai Shui Hang	6,870	ı	34	•	140/189	ı
0022	Sham Shui Kok	56,329	•	106		89/189	,
0023	Yam O	63,009	•	119	1	82/189	1
0024	Tsing Chau Tsai	38,943	7,661	229	44.98	39/189	46/89
0025	Ma Wan	81,988	7,661	196	18.29	48/189	68/89
0027	Peng Chau	239,029	•	441	•	17/189	
0028	Kau Yi Chau	246,437	22,984	152	14.18	64/189	72/89
9500	Tsing Lung Tau	. 35,180	7,661	161	35.02	62/189	58/89
0039	Tai Lam Chung	2,908	,	21	,	148/189	. •

ENVIRONMENTAL RESOURCES MANAGEMENT

of the Assessment Area
g Zone within the waters o
ght in Each AFCD Fishin
Adult Fish (by weight) Cau
Table 2.1c Top Five Adı

Fabrente Species 10p Fave Fan Cangen (19) Weight Species Gommon Name Fa Peng Mixed Species Gommon Name Sebaticus marmoratus Rockfish Platycephalus indicus Flattish Oratosquilla spp Mixed Species Plattish Argyrosomus spp Croaker Chonglessus spp Sole Oratosquilla spp Mixed Species Portuguilla spp Mixed Species Platycephalus publicus spp Croaker Chonglessus spp Sole Oratosquilla spp Mixed Species Argyrosomus spp Croaker Portuguilla spp Mixed Species Portuguilla spp Mixed Species Discovery Bay Mixed Species Butte crab Argyrosomus spp Croaker Leioguidhus brevirostris Pony fish Clarybdis cruciata Red crab Clarybdis cruciata Red crab Clarybdis cruciata Sham Shui Kok Mixed Species Spotsicus Mixed Species Sebasticus marmoratus Rockfish Caronxie Mixed Species Sebasticus marmoratus Rockfish Caronxie Argyrosomus spp Croaker Trichturns haumela Haittail Mixed Species Sebasticus marmoratus Rockfish Caronxie Chroaker Trichturns haumela Haittail Mixed Species Chocker Discontinus marmoratus Pony fish Caroker Trichturns haumela Haittail Mixed Species Chocker Discontinus marmoratus Pony Each Croaker Croaker Trichturns haumela Haittail Mixed Species Chocker Discontinus marmoratus Pony Each Croaker Croaker Discontinus marmoratus Pony Each Croaker Croaker Character Discontinus marmoratus Pony Each Croaker Discontinus Mixed Species Pony Each Croaker Discontinus Mixed Species Pony Each Croaker Discontinus Mixed Species Pony Each Croaker Discontinus Discontinus Mixed Species Pony Each Croaker Discontinu	6467	Die Lies Auge			* * * * * * * * * * * * * * * * * * * *
Species Common Name Fa Peng Muramorans Conger Pile Eel Muramoranis Rockfish Pa Tau Kwu Muked Species Sebasticus marmoranis Rockfish Oratosquilla spp Muked Species Platycephalus indicus Hattish Argyrosomus spp Croaker Cymoglossus spp Soile Oratosquilla spp Marie Shrimp Mixed Species Argyrosomus spp Croaker Portunus Pelagicus Mixed Species Argyrosomus spp Croaker Portunus pelagicus Blue crab Lerogradius brevirostris Pony fish Olarybdis cruciata Claryddis cruciata Charybdis cruciata Red crab Argyrosomus spp Croaker Pony fish Charybdis cruciata Charybdis cruciata Charybdis cruciata Charybdis cruciata Charybdis cruciata Rockfish Charybdis cruciata Rockfish Charybdis cruciata Rockfish Croaker Pontuns sanguinolentus Sebasticus marmoratus Mixed Species Sebasticus marmoratus Mixed Species Croaker Pontuna Shuir Kok Sebasticus marmoratus Mixed Species Argyrosomus spp Croaker Pontuna Shuirup Sham On Mixed Species Charybdis cruciata Mixed Species Sebasticus marmoratus Mixed Species Charybdis cruciata Charybdis cruciata Mixed Species Sebasticus marmoratus Mixed Species Charybdis cruciata Mixed Species Mixed Species Charybdis cruciata Discovery Mixed Species Mixed Species Charybdis cruciata Discovery Mixed Species Discovery Di	Code	risimig vied		Caught (by weight)	Commercial Value
Fa Peng Muraenosox cinereus Conger Pike Eel Mixed Species Mixed Species Sebaciticus marmoratus Pa Tau Kwu Mixed Species Platycephalus indicus Oratosquilla spp Mantis Strimp Mixed Species Platycephalus indicus Oratosquilla spp Mantis Strimp Oratosquilla spp Sole Oratosquilla spp Mantis Shrimp Mixed Species Mixed Species Argyrosomus spp Sole Oratosquilla spp Mixed Species Portnuns pelagicus Portnuns pelagicus Blue crab Lacognalius brevirostris Pony ish Sparida spp Croaker Portnuns pelagicus Mixed Species Portnuns pelagicus Sparida spp Croaker Argyrosomus spp Croaker Croaker Charybdis cruciata Pony ish Mixed Species Mathemenan splinis Pinga shrimp Mathemenan splinis Pinga shrimp Mathemenan splinis Pinga shrimp Croaker Argyrosomus spp Croaker Croaker Portnuns dalla Shrimp sad Argyrosomus spp Croaker Mathemenan Shui Kok Mixed Species Sebasticus marmoratus Mathemenan Hairtail Mixed Species Mixed Species Dony ish Croaker Croaker Argyrosomus spp Croaker Dony ish Chirura hamela Hairtail Mixed Species			Species	Common Name	: : : : : : : : : : : : : : : : : : : :
Sebasticus marmoratus Rocklish Platycephulus indicus Flatish Platycephulus indicus Flatish Oratosquilla sepe Mantis Stutinp Mixed Species Mixed Species Platish Argyrosomus sepe Sole Oratosquilla sepe Mantis Strimp Mixed Species Mixed Species Argyrosomus sepe Sole Portuny's Bay Mixed Species Mixed Species Argyrosomus sepe Sea breams Discovery Bay Mixed Species Mixed Species Portunus pelagicus Bue crab Leografius brevirostris Pony fish Sparidae sep Sea breams Discovery Bay Mixed Species Mixed Species Portunus sepp Croaker Charydis cruciata Charydis cruciata Charydis cruciata Charydis cruciata Portunus suguinolentus Sham Shui Kok Mixed Species Mixed Species Mixed Species Argyrosomus spp Croaker Charydis cruciata Charydis cruciata Red crab Portunus suguinolentus Sebasticus mamoratus Mixed Species Argyrosomus spp Croaker Charydis cruciata Red crab Portunius sanguinolentus Sebasticus mamoratus Rocklish Camark Allinius sanguinolentus Argyrosomus spp Croaker	0001	Fa Peng	Muraenosox cinereus	Conger Pike Eel	Medium
Pa Tau Kwu Plutycephalus indicus Flatfish Ordresquilla spp Manis Shrimp Mixed Species Plutycephalus indicus Flatfish Argyresomus spp Croaker Cynoglosius spp Sole Ordrosquilla spp Manis Shrimp Mixed Species Plutycephalus indicus Flatfish Argyresomus spp Croaker Cynoglosius spp Sole Manis Shrimp Mixed Species Argyresomus spp Croaker Portunus pelagicus Blue crab Leogradhus brevirostris Pony fish Spridae spp Croaker Portunus pelagicus Blue crab Argyresomus spp Croaker Portunus pelagicus Blue crab Argyresomus spp Croaker Leogradhus brevirostris Pony fish Charydais cruciata Red crab Argyresomus affinis Jinga shrimp Sham Shui Kok Mixed Species Sebasticus mannoratus Rockfish Caranx kalla Argyresomus spp Croaker Prichiturus daumela Hairtail Yam O Mixed Species Croaker Prichiturus haumela Hairtail			Mixed Species	Mixed Species	Low
Pa Tau Kwu Mixed Species Martis Strimp Pa Tau Kwu Mixed Species Phttycephalta indicus Flatish Argyrosomus spp Sole Ordrosquilla spp Martis Shrimp Mixed Species Ordrosquilla spp Martis Shrimp Mixed Species Argyrosomus spp Sole Ordrosquilla spp Mixed Species Argyrosomus spp Croaker Leiografilus brevirostris Pony fish Sparidae spp Sea breams Discovery Bay Mixed Species Blue crab Leiografilus brevirostris Pony fish Argyrosomus spp Croaker Leiografilus brevirostris Red crab Argyrosomus spp Croaker Leiografilus brevirostris Pony fish Charpfals cruciata Red crab Mixed Species Mixed Species Mixed Species Mixed Species Sebasticus marmoratus Mixed Species Sebasticus marmoratus Mixed Species Argyrosomus spp Croaker Croaker Charpfalla Shrimp scad Argyrosomus spp Croaker Argyrosomus spp Croaker Croaker Croaker Charpfalla Shrimp scad Argyrosomus spp Croaker Argyrosomus spp Croak			Sebasticus marmoratus	Rockfish	Low
Pa Tau Kwu Mixed Species Mixed Species Platycephalus indicas Flathish Argycephalus indicas Flathish Argycephalus indicas Flathish Argycephalus indicas Polecies Cynoglossus spp Croaker Cynoglossus spp Mantis Shrimp Mixed Species Mixed Species Argycosomus spp Croaker Portunus pelagicus Blue crab Leiognathus breviostris Pony fish Sparidae spp Mixed Species Portunus pelagicus Blue crab Argycosomus spp Croaker Leiognathus breviostris Pony fish Charybdis cruciata Red crab Leiognathus breviostris Pony fish Charybdis cruciata Red crab Charybdis cruciata Geara Sham Shui Kok Mixed Species Sham Shui Kok Mixed Species Seasiticus ammonatus Red crab Matapenaeus affinis Jinga shrimp Mixed Species Seasiticus ammonatus Rockfish Garant Kalla Mixed Species Seasiticus ammonatus Rockfish Carant Kalla Mixed Species Seasiticus ammonatus Rockfish Carant Kalla Mixed Species Seasiticus ammonatus Rockfish Carant Kalla Mixed Species Seasiticus ammonatus Matapia Mixed Species Seasiticus ammonatus Mixed Species			Platycephalus indicus	Flatfish	Low
Pa Tau Kwu Mixed Species Mixed Species Pathyephalus radicus Flatfish Argyrosomus spp Goaker Cynoglossus spp Sole Oratosquilla spp Mants Shrimp Mixed Species Argyrosomus spp Groaker Portunus pelagicus Blue crab Lerograthus brevirostris Pory fish Sparidae spp Mixed Species Mixed Species Mixed Species Mixed Species Portunus pelagicus Mixed Species Portunus pelagicus Mixed Species Mixed Species Mixed Species Mixed Species Argyrosomus spp Groaker Lerograthus brevirostris Pory fish Clarybdis cruciata Red crab Clarybdis cruciata Clarybdis cruciata Red crab Clarybdis cruciata Clarybdis cruciata Red crab Muxed Species Sham Shui Kok Mixed Species Sham Shui Kok Mixed Species Sebasticus mornoratus Red crab Clarybdis cruciata Red crab Clarybdis cruciata Red crab Mutapenaeus affinis Jinga shrimp Mutapenaeus affinis Argyrosomus spp Croaker Croaker Clarybdis cruciata Red crab Clarybdis cruciata Red crab Clarybdis cruciata Red crab Clarybdis cruciata Red crab Charybdis cra			Oratosquilla spp	Mantis Shrimp	Low
Platycephalus indicas Flatfish Argyrosomus spp Groaker Cymoglossus spp Sole Ordnoguilla spp Martis Strimp Mixed Species Argyrosomus spp Croaker Portunus pelagicus Blue crab Leiognalius brevirostris Blue crab Argyrosomus spp Groaker Portunus pelagicus Blue crab Argyrosomus spp Groaker Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognatius brevirostris Pony fish Charybdis cruciata Red crab Clapanodon punctatus Gizzard shad Portunus sanguinolentus Gizzard shad Portunus sanguinolentus Jinga shrimp Mathermens affinis Jinga shrimp Mathermens affinis Jinga shrimp Mathermens affinis Sham Shui Kok Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species Croaker Portunus sanguinolentus Britan Britail Man O Mixed Species Croaker Portunus Sanguinolentus Britan Britail Man O Mixed Species Croaker Portunus Sanguinolentus Britan Britail Man O Mixed Species Croaker Portunus Sanguinolentus Britan Britail Man O Mixed Species Croaker Discovery Bay Mixed Species Croaker Mixed Species	0002	Pa Tau Kwu	Mixed Species	Mixed Species	Low
Argyrosomus spp Croaker Cymoglossus spp Sole Oratosquilla spp Mantis Shrimp Mixed Species Argyrosomus spp Croaker Portunus pelagicus Blue crab Leiognathus brevirostris Discovery Bay Mixed Species Mixed Species Mixed Species Mixed Species Mixed Species Mixed Species Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charyddis cruciata Red crab Leiognathus brevirostris Pony fish Charyddis cruciata Red crab Charyddis cruciata Red crab Mixed Species Mixed Species Mixed Species Sebasticus marmoratus Sham Shui Kok Mixed Species Sebasticus marmoratus Rockfish Caraux kalla Argyrosomus spp Croaker Prichiturus haumela Hairtail Manc Species Choaricus Mixed Species Choaricus Caraux And Mixed Caraux And Mi			Platycephalus indicus	Flatfish	Low
Cynoglossus spp Sole Oratosquilla spp Mantis Shrimp Mixed Species Argyrosomus spp Croaker Portunus pelagicus Bue crab Leiognathus brevirostris Pony fish Sparidae spp See breams Mixed Species Mixed Species Portunus pelagicus Bue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Clupanodon punctatus Gizzard shad Portunus sanginionelnius 3-Spot crab Mixed Species Sebasticus mamoratus Rockfish Caranx kalla Argyrosomus spp Croaker Inchiturus haumela Hairtail Vam O Mixed Species Choorien Character Choorien Species Choorien Character Character Character Character Character Character Character Character Character Choorien Character			Argyrosomus spp	Croaker	Low
Penny's Bay Mixed Species Mixed Species Argyrosomus spp Croaker Portunus pelagicus Blue crab Leiognathus brevirostris Pony fish Sparidae spp Mixed Species Portunus pelagicus Blue crab Mixed Species Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Charybdis cruciata Argyrosomus spp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiturus haumela Hairtail Yam O Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Argyrosomus spp Croaker Trichiturus haumela Hairtail		,	Cynoglossus spp	Sole	Low
Penny's Bay Mixed Species Argyrosomus spp Croaker Porturus pelagicus Biue crab Leiogradhus brevirostris Discovery Bay Mixed Species Porturus pelagicus Mixed Species Porturus sepp Croaker Leiogradhus brevirostris Discovery Bay Mixed Species Porturus sepp Croaker Leiogradhus brevirostris Clarybdis cruciata Croaker Clarybdis cruciata Clarybdis cruciata Clarybdis cruciata Clarybdis cruciata Croaker Clarybdis cruciata Croaker Clarybdis cruciata Clarybdis cruciata Clary			Oratosquilla spp	Mantis Shrimp	Low
Argyrosomus spp Croaker Portunus pelagicus Blue crab Leiognathus brevirostris Pony fish Sparidae spp Mixed Species Mixed Species Mixed Species Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Charybdis cruciata Mixed Species Sebasticus marmoratus Sham Shui Kok Mixed Species Sebasticus marmoratus Croaker Trichiurus haumela Hairtail Mixed Species Character Charked Species Mixed Species Mixed Species Character Character Mixed Species Mixed Species Mixed Species Character Chara	0003	Penny's Bay	Mixed Species	Mixed Species	Low
Portunus pelagicus Blue crab Leiognathus brevirostris Pony fish Sparidae spp Mixed Species Mixed Species Mixed Species Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Charybdis sanguinolentus Gizzard shad Portunus sanguinolentus Gizzard shad Portunus sanguinolentus 3-Spot crab Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Mixed Species Charit sanguinolen Bairtail Mixed Species Charit sanguinolen Mixed Species Charat sanguinolen Mixed Species Charat sanguinolen Mixed Species Charat sanguinolen Mixed Species			Argyrosomus spp	Croaker	Low
Leiognathus brevirostris Pony fish Sparidae spp Biscovery Bay Mixed Species Mixed Species Mixed Species Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Charybdis cruciata Red crab Mixed Species Spot crab Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Argyrosomus spp Croaker Trichiurus haumela Mixed Species Schorts haumela Mixed Species Schorts haumela Mixed Species Croaker Trichiurus haumela Mixed Species Charter and Mixed Spec			Portunus pelagicus	Blue crab	Low
Sparidae spp Sea breams Discovery Bay Mixed Species Mixed Species Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Metapenaeus affinis Janga shrimp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Argyrosomus spp Croaker Trichiurus haumela Hairtail Sham O Mixed Species Chartian caranzatus Colonia supportunia support			Letognathus brevirostris	Pony fish	Low
Discovery Bay Mixed Species Portunus pelagicus Argyrosomus spp Croaker Leiognathus brevirostris Charybdis cruciata Charybdis			Sparidae spp	Sea breams	Medium
Portunus pelagicus Blue crab Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Clarybdis cruciata Red crab Clarybdis cruciata Red crab Charybdis cruciata Red crab Metapenaeus affinis Jinga shrimp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichturus haumela Hairtail Yam O Mixed Species Schoot and Species Croaker Trichturus haumela Hairtail	0004	Discovery Bay	Mixed Species	Mixed Species	Low
Argyrosomus spp Croaker Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Clapanodon punctatus Red crab Clupanodon punctatus Gizzard shad Portunus sanguinolentus 3-Spot crab Metapenaeus affinis Jinga shrimp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species Chard Species Godes			Portunus pelagicus	Blue crab	Low
Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Tai Shui Hang Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Charybdis cruciata Red crab Charybdis cruciata Red crab Charybdis cruciata Red crab Metapenaeus affinis 3-Spot crab Metapenaeus affinis Jinga shrimp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species Cohocicus marmoratus Chartail			Argyrosomus spp	Croaker	Low
Charybdis cruciata Red crab Tai Shui Hang Leiognathus brevirostris Pony fish Charybdis cruciata Red crab Clupanodon punctatus Gizzard shad Portunus sanguinolentus 3-Spot crab Metapenaeus affinis Jinga shrimp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Argyrosomus spp Croaker Trichiurus haumela Mixed Species Cohoticus marmoratus Mixed Species Cohoticus marmoratus Mixed Species Cohoticus marmoratus Cohoticus marmoratus Croaker Trichiurus haumela Mixed Species Cohoticus marmoratus Mixed Species			Leiognathus brevirostris	Pony fish	Low
Tai Shui Hang Leiognathus brevirostris Charybdis cruciata Clupanodon punctatus Clupanodon punctatus Clupanodon punctatus Porturus sanguinolentus Metapenaeus affinis Jinga shrimp Mixed Species Sebasticus marmoratus Caranx kalla Argyrosomus spp Croaker Trichiurus haumela Mixed Species Charticus mammoratus Mixed Species Charticus mammoratus Charticus mammoratus Mixed Species Cobacticus mammoratus Cobacticus mammor			Charybdis cruciata	Red crab	Low
Charybdis cruciata Red crab Chapanodon punctatus Gizzard shad Porturius sanguinolentus 3-Spot crab Metapenaeus affinis Jinga shrimp Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiturus haumela Hairtail Yam O Mixed Species	0005	Tai Shui Hang	Leiognathus brevirostris	Pony fish	Low
Clupanodon punctatus Gizzard shad Portunus sanguinolentus 3-Spot crab Metapenaeus affinis Jinga shrimp Mixed Species Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species			Charybdis cruciata	Red crab	Low
Portunus sanguinolentus 3-Spot crab Metapenaeus affinis Jinga shrimp Mixed Species Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species Schatticus marmoratus Dealest			Clupanodon punctatus	Gizzard shad	Low
Sham Shui Kok Mixed Species Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species			Portunus sanguinolentus	3-Spot crab	Low
Sham Shui Kok Mixed Species Mixed Species Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species School School School School Species			Metapenaeus affinis	Jinga shrimp	High
Sebasticus marmoratus Rockfish Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species Schatticus marmoratus Double L	0022	Sham Shui Kok	Mixed Species	Mixed Species	Low
Caranx kalla Shrimp scad Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species School School School School			Sebasticus marmoratus	Rockfish	Low
Argyrosomus spp Croaker Trichiurus haumela Hairtail Yam O Mixed Species Mixed Species			Caranx kalla	Shrimp scad	Medium
Trichiurus haumela Hairtail Yam O Mixed Species School and an amount of the Control of the Con			Argyrosomus spp	Croaker	Low
Yam O Mixed Species Mixed Species			Trichiurus haumela	Hairtail	Medium
Deal.6.1	0023	Yam O	Mixed Species	Mixed Species	Low
ROCKEISI			Sebasticus marmoratus	Rockfish	Low

Codo	Linking And	71	ale Constant and a second	1 1 1 1
Code	risting Area		TOP FIVE FISH Caught (by weight)	Commercial Value
		Species	Common Name	
		Clupanodon punctatus	Gizzard shad	Low
		Mugil affinis	Mullet	Low .
		Sparidae spp	Sea breams	Medium
0024	Tsing Chau Tsai	Mixed Species	Mixed Species	Low
		Sebasticus marmoratus	Rockfish	Low
		Argyrosomus spp	Croaker	Low
		Muraenosox cinereus	Conger Pike Eel	Medium
		Sparidae spp	Sea breams	Medium
0025	Ma Wan	Siganus oramin	Rabbit fish	Low
		Sebasticus marmoratus	Rockfish	Low
		Mixed Species	Mixed Species	Low
	٠.	Argyrosomus spp	Croaker	Low
		Sparidae spp	Sea breams	Medium
0027	Peng Chau	Mixed Species	Mixed Species	Low
		Acetes spp	Silver shrimp	High
		Siganus oramin	Rabbit fish	Low
		Charybdis cruciata	Red crab	Low
		Johnius belengeri	Croaker	Low
0028	Kau Yi Chau	Mixed Species	Mixed Species	Low
		. Acetes spp	Silver shrimp	High
		Siganus oramin	Rabbit fish	Low
		Argyrosomus spp	Croaker	Low
		Sardinella jussieu	Sardine	Low
0038	Tsing Lung Tau	Mixed Species	Mixed Species	Low
		Sebasticus marmoratus	Rockfish	Low
		Argyrosomus spp	Croaker	Low
		Siganus oramin	Rabbit fish	Low
		Acetes spp	Silver shrimp	High
0039	Tai Lam Chung	Acetes spp	Silver shrimp	High
		Muraenosox cinereus	Conger Pike Eel	Medium
		Mixed Species	Mixed Species	Low
		Sebasticus marmoratus	Rockfish	Low
		Argyrosomus spp	Croaker	Low
Note: Mixed Species consists	s of juveniles of Carnax k	Note: Mixed Species consists of juveniles of Carnax kalla, Siganus oramin, Sardinella spp, Leiognathus brevirostris and Clupanodon punctatus.	iognathus brevirostris and Clup	anodon punctatus.

2.2 Culture Fisheries

The closest AFCD designated Fish Culture Zone (FCZ) to the Assessment Area is located at Ma Wan. Information from the AFCD indicates that, as at 31 Jan 2000, the Ma Wan FCZ consists of 132 licensed rafts from 82 licenses issued, with a total licensed area of 14,557 m² (total gazetted area = 46,300 m²). There are no figures available for individual production at this FCZ, although the annual production of fish reared in Hong Kong has dropped from 2,960 tonnes in 1997 to 1,200 tonnes in 1998 as a result of a red tide outbreak. In March and April 1998, widespread red tide algal blooms caused fish kills at many of the FCZs in Hong Kong. However, the Ma Wan FCZ, due to the fast currents in the vicinity, was the least affected of the FCZs and only minimal fish kills occurred (AFCD pers comm). The main species cultured in Hong Kong were the spotted grouper (Epinephelus chlorostigma), gold-lined seabream (Rhabdosargus sarba), mangrove snapper (Lutjanus argentimaculatus) and the pompano (Trachinotus blochii).

2.3 OTHER STUDIES

Recent construction works for the Airport Core Programme projects, such as the North Lantau Development and North Lantau Highway, are likely to have caused disturbance to previously existing fisheries habitat in the area. These disturbances may have led to a reduction in the importance of the North Lantau coastline as a nursery area. The main commercial fisheries in the vicinity of North Lantau are shrimp trawling and purse seining for migratory croaker (6). Fish species can move away from the temporarily affected areas, while the shrimp are very prolific, having remained in the area despite disturbance from recent marine construction works in the area. In addition, as the water quality is generally poor due to the influence of the waters of the western harbour area and SSDS Stage I outfall discharges (7), fisheries resources in the waters of eastern Lantau may have been adversely impacted.

All fish and macro-invertebrate species recorded in a trawl survey undertaken in the South Tsing Yi area as part of the EIA for Backfilling of South Tsing Yi and North Lantau (8) were commonly found in the coastal waters of Hong Kong. Their numbers and abundances were low.

Results of a 12-month fishery survey initiated in August 1995 around Penny's Bay⁽¹⁾ revealed that the fisheries resources in the area are generally in a poor state as indicated by the low numbers collected per unit of fishing effort, the extremely low encounter rate for large schools of the dominant pelagic fish, and the undersized nature of the catch. The cause of this poor state of the resource was attributed by the authors to a combination of overfishing and

⁽⁶⁾ ERM-Hong Kong Ltd (1995) op cit.

^(*) Mouchel Asia Limited (1998) Strategic Sewage Disposal Scheme Stage 1 Baseline Monitoring and Performance Verification. First Annual Report for Environmental Protection Department, July 1998.

^(°) Ibid

CES (Asia) Ltd (1997a) Lantau Port Development Stage 1 Fisheries Resources Survey. Final Report submitted to Civil Engineering Department, June 1997.

habitat degradation from pollution and disturbance (dredging and dumping).

In 1995 survey, the waters at Fa Peng, Penny's Bay, Discovery Bay and Peng Chau were considered to be important nursery areas for fish fry that are important to the local fry fishery⁽¹⁾. Five taxa, collected in the survey, including four species of sparid and one taxon of salangid, were important to the local fry fishery.

However, the most recent and up to date data from the AFCD Fisheries Study (11) identified the most important fisheries spawning and nursery areas in Hong Kong waters (*Figure 9.2b* and *9.2c*). As can be seen from the figures the Penny's Bay area was not regarded as an important spawning or nursery area.

ENVIRONMENTAL RESOURCES MANAGEMENT

⁽¹⁶⁾ CES (Asia) Ltd (1997b) Lantau Port Development: Stage 1 Fish Fry Survey. Final Report submitted to Civil Engineering Department, February 1997.
(11) ERM (1998) Op cit.

3.1 ICHTHYOPLANKTON SURVEYS

3.1.1 Methodology

As little is known about the commercial fishery spawning and nursery status of North Lantau waters, ichthyoplankton (fish eggs and larvae) sampling was included in the Study to assess the value of the North Lantau area as a nursery and spawning ground for commercial fisheries. Due to the seasonal nature of juveniles of commercial fish species, the trawling was conducted once in the wet season (September 1998) and once in the dry season (February 1999) for stations T1 - T6 to ensure that no species of importance were overlooked.

Ichthyoplankton trawls, using a Rigosha conical plankton mesh net (mesh size 80 μm, length 60 cm, mouth diameter 12 cm) were conducted in the Assessment Areas (for NSLDFS and the Theme Park and associated developments) to quantitatively assess the abundance of juveniles, eggs and larvae of commercial fisheries species. Four replicate 10 minute surface tows were conducted at each of the ten sites (T1 - T6 for NSLDFS EIA Study, T7 - T10 for Theme Park EIA Study) shown on *Figure 3.1a*. The ichthyoplankton samples were preserved in formalin for subsequent identification and enumeration⁽¹⁾.

To supplement the dry season ichthyoplankton information obtained for North Lantau, ichthyoplankton trawl surveys were also conducted in Penny's Bay in December 1999. Due to the seasonality in these resources, only the dry seasons survey results of the North Lantau ichthyoplankton trawls are compared with the findings of the Penny's Bay trawls. The results of both of these surveys are presented below.

3.1.2 Results

NSLDFS Trawl Stations (T1 - T6)

During the dry season surveys (conducted on 5 February 1999), ichthyoplankton samples were largely comprised of eggs of sardine *Sardinella nymphaea* and larvae of sea bream *Sparus latus* (*Table 3.1a*). Ichthyoplankton abundances were found to be higher in the trawl samples collected from stations T5 and T6.

Taxonomic identification of samples was conducted by Prof ZR Chen of the South China Sea Institute of Oceanology, The Chinese Academy of Sciences, China.

Table 3.1a Composition of the Ichthyoplankton Trawls around Norhteast Lantau during the Dry Season (February 1999)

Transect	Family	Species	Mean Abundance/10 min trawl
T1	Clupeidae	Sardinella nymphaea	2.0 eggs
T2	Clupeidae	Sardinella nymphaea	2.0 eggs
Т3	Sparidae	Sparus latus	0.3 larva
T4	Clupeidae	Sardinella nymphaea	1.5 eggs
	Sparidae	Sparus latus	0.8 larva
T5	Clupeidae	Sardinella nymphaea	3.8 eggs
T6	Clupeidae	Sardinella nymphaea	3.8 eggs

The results of the NSLDFS survey indicated that the marine areas around the northeast Lantau area support low abundance of eggs and larvae of mainly low value commercial pelagic species.

Penny's Bay Trawl Stations (T7 - T10)

In the December (dry season) trawl surveys at Penny's Bay, eggs, prelarvae and larvae of a total of 8 species were identified (*Table 3.1b*). They include sardines *Sardinella nymphaea* and *S. jussieu*, rockfish *Sebasticus marmoratus*, sea bream *Sparus latus*, dragonnet *Callionymus richardsoni*, red pargo *Pagrosomus major*, mullet *Mugil cephalus* and *Harengula ovalis*.

The composition of the ichthyoplankton tows comprised mainly eggs of Sardinella nymphaea, S. jussieu and Sparus latus (Table 3.1b). Prelarvae of Sardinella nymphaea, Sparus latus and Mugil cephalus, and larvae of Sebasticus marmoratus were also identified in the samples. Two of the species identified, ie Sparus latus and Pagrosomas major, are of higher commercial value than the other species identified for the Penny's Bay samples.

Species were more diverse at trawl stations located in outer bay area (ie T9 and T10) where eggs of *Sardinella nymphaea*, *S. jussieu*, and *Sparus latus* were more abundant when compared to the samples collected from the inner bay stations (ie T7 and T8). In general, sampling stations located at outer Penny's Bay (T9 and T10) showed a higher species diversity (in terms of species number) and abundance of ichthyoplankton than those located in inner bay region.

Table 3.1b Composition of the Ichthyoplankton Trawls around Penny's Bay during the Dry Season (December 1999)

Transect	Family	Species	Mean Abundance/10 min trawl
T7	Clupeidae	Sardinella nymphaea	0.3 egg; 0.5 prelarva
	Scorpaenide	Sebastiscus marmoratus	1.0 larva
	Sparidae	Sparus latus	0.3 egg; 0.3 prelarva
T8	Clupeidae	Sardinella nymphaea	1.0 egg
	Sparidae	Sparus latus	0.8 egg; 0.8 prelarva
T9	Clupeidae	Sardinella nymphaea	3.8 eggs; 0.8 prelarva
		Harengula ovalis	0.3 egg
	Scorpaenide	Sebastiscus marmoratus	0.5 larva
	Sparidae	Sparus latus	2.0 eggs; 1.5 prelarva
	Mugilidae	Mugil cephalus	0.3 prelarva
	Callionymidae	Callionymus richardsoni ¹	0.3 egg
T10	Clupeidae	Sardinella nymphaea	2.8 eggs; 0.5 prelarva
		Sardinella jussieu	5.8 eggs; 2.3 prelarva
	Scorpaenide	Sebastiscus marmoratus	1.0 larva
	Sparidae	Sparus latus	5.0 eggs; 1.8 prelarva
	•	Pagrosomas major	0.3 egg
	Mugilidae	Mugil cephalus	0.5 prelarva
	Callionymidae	Callionymus richardsoni	0.5 prelarva

The dry season ichthyoplankton trawl results obtained from Penny's Bay in December 1999 were compared to the data recorded in February 1999 for North Lantau and in March 1998 for Little Green Island, Green Island and Hong Kong Island (*Table 3.1c*). The plankton tows from Penny's Bay contained the highest mean abundance of eggs, prelarvae and larvae than the other four sites. The number of species recorded was also highest at Penny's Bay. However, it should be noted that none of the areas listed below in *Table 3.1c* support commercial fish fry operations and were not identified in the Fisheries Resources and Fishing Operations in Hong Kong Waters Study as being important fish fry or spawning grounds. Although fish fry can be found in Penny's Bay and the other locations presented in *Table 3.1c* the abundance is low and insufficient to support the commercial operation of fry fisheries.

Table 3.1c Mean Abundance (10 minute trawl-1) of eggs, prelarvae and larvae of the Ichthyoplankton Trawls Obtained during the Dry Season around North Lantau, Penny's Bay, Little Green Island, Green Island and Hong Kong Island

Site	No of	•	Mean Abundance/10 mir	ı trawl	
	Species	Eggs	Prelarva	Larva	
North Lantau	2	2.1	0.0	_ 0.2	·
Penny's Bay	8	5.8	2.3	0.6	
Little Green Island*	7	3.3	0.1	0.4	

Site	No of		Mean Abundance/10 min	trawl	
	Species	Eggs	Prelarva	Larva	
Green Island*	3	1.1	0.8	0.1	
Hong Kong Island*	3	0.9	0.0	0.0	

^{*:} Ichthyoplankton data from the ongoing Green Island Development - Studies on EWQIA and MITA for TDD of the HKSAR.

3.2 SUMMARY

While Penny's Bay showed the highest abundance of ichthyoplankton when compared to the results obtained for Little Green Island, Green Island and Hong Kong Island, the majority of the species identified are of low commercial value. It should be noted that none of the areas listed above support commercial fish fry operations and were not identified in the Fisheries Resources and Fishing Operations in Hong Kong Waters Study as being important fish fry or spawning grounds. Although fish fry can be found in Penny's Bay and the other locations detailed above, the abundance is low and insufficient to support the commercial operation of fry fisheries. Based on the results obtained from surveys and a review of relevant literature, the waters of Penny's Bay do not appear to be an important nursery and spawning ground for commercial fisheries resources.

