



B1 PHYSICAL DESCRIPTION AND FISHERIES SETTING

B1.1 INTRODUCTION

This *Annex* provides background information on the Hong Kong fishing and aquaculture industry as well as a high-level description of the physical and fisheries characters of western Hong Kong waters, in particular north and west Lantau waters. This review provides the basis for identifying key habitats, species, fisheries resources or fishermen that may warrant focused effort in enhancement and support under the Fisheries Management Plan (FMP). A description on the current planning of the 3RS Project is also presented.

B1.2 PHYSICAL SETTING

The 3RS project area mainly comprises approximately 650 ha of land formation in marine open waters and seawall development of approximately 5.9 km immediately north of the HKIA existing platform in the northern Lantau waters. The resulting loss of seabed comprises of marine sediment and debris formed from natural sedimentation with the influence of flows from the Pearl River Estuary (PRE). The existing seawall is largely constructed of sloping armour rock with the berthing point being constructed of vertical concrete.

The hydrodynamic regime in the western Hong Kong waters is complex and varies with a number of factors including the lunar cycle (spring and neap tides), the season and the rate of flow of the Pearl River. In general, the main ebb tide currents flow south along the Urmston Road, with a subsidiary flow bifurcating northwest of Chek Lap Kok to flow south down the west coast of Lantau, and southeast around the east of Chek Lap Kok Island. Flood tides show the reverse pattern.

The Pearl River, situated in a sub-tropical climate, brings along with heavy loads of suspended sediment and nitrates during summer (wet) season and as a consequence concentrations of these parameters within western waters are variable but generally far higher than in the more oceanic influenced waters to the south and east of Hong Kong. As a result of the influence of the Pearl River, water quality of the western waters is characterized by a relatively higher background level of nitrogenous nutrients (in particular Total Inorganic Nitrogen); the water quality is otherwise acceptable with a fair rate of compliance with the Water Quality Objectives.

During the winter (dry) season the influence of the Pearl River is at its least because of reduced flows, resulting in typically well-mixed coastal waters. In contrast during the summer (wet) season, the flow of the Pearl River increases and the coastal waters become highly stratified as the large influx of brackish water overlies the denser, more saline oceanic waters near the seabed.

There are two main channels in the area. One channel extends from the Ma Wan Channel to the Urmston Road with a deepest depth of 22 m near Tap Shek Kok. The other one which stays south of The Brothers is generally of water depth of 10 m.





Other areas in the North Lantau waters are quite shallow and the average water depth is 5 to 6 m. The water depths of west Lantau range from 0 to 22 m

A number of infrastructure developments are planned or underway in western Hong Kong waters with multiple marine users operating. These include the HKIA, Hong Kong Boundary Crossing Facilities (HKBCF), Tuen Mun – Chek Lap Kok Link (TM-CLKL), Hong Kong Link Road (HKLR), contaminated sediment disposal facilities, shipping fairways and vessel traffic routes, anchorage areas, and submarine utilities such as cables, pipelines, seawater intake and effluent outfalls. Marine traffic level is high with high speed ferries, licensed ferry, tankers, bulk carriers, cargo vessels, container vessels, passenger ships, construction vessels (e.g. pilot, tug and tow, barges), government fast launches, fishing vessels and other small craft commonly seen in these waters.

B1.3 HONG KONG FISHING INDUSTRY & RECENT CHANGES

B1.3.1 Marine Capture Fisheries

Post-war fisheries development efforts allowed vessels to mechanize and be equipped with increasingly powerful engines to extend operational range to the South China Sea and Hong Kong's fishing industry underwent rapid expansion with annual production and production per vessel, especially by trawlers, experiencing an upward trend throughout the 1970s and 1980s. At its peak in 1989, annual production by the Hong Kong capture fisheries industry was 230,000 tonnes per annum.

After this time, annual production and production value of the local fishing fleet levelled off and then saw a downward trend. After 1989, the industry saw a decline in catch per unit effort, reflecting a reduction in fishing efficiency. After 2000, the industry saw a decrease in the number of vessels (mainly among smaller, low power vessels) as well as a continual increase in overall engine power of the fleet. Despite these changes, no corresponding increase in fishing efficiency of the Hong Kong fleet was recorded.

In a recent review, the Government's Committee on Sustainable Fisheries attributed the reduction in annual catch and production value to a declining quality of catch and the continued decrease in fisheries resources in traditional fishing grounds of Hong Kong and the South China Sea due to overfishing and competition from Mainland fishermen from provinces adjoining the South China Sea. The poor status of Hong Kong's fisheries resources was first described in detail in the late 1990s as well as later studies⁽¹⁾⁽²⁾⁽³⁾. In Hong Kong waters, catch composition changed from mainly large, slow-growing, high-value species to small, fast-growing, low-value species. Other factors contributing to the decline included changes in water quality and

(1) ERM 1999. Artificial Reef Deployment Study. Final report for AFD.

(2) ERM 1998. Fisheries Resources and Fishing Operations in Hong Kong Waters. Final report for AFD.

(3) Sumaila, U.R, Cheung, W. and L.Teh 2007. Rebuilding Hong Kong's Marine Fishery. An evaluation of Management Options. WWF-HK commissioned report produced by the Fisheries Centre, University of British Columbia





coastal / marine development projects. In addition, rising operating costs (due to inefficiency associated with fishing technologies not being advanced enough and higher fuels costs), competition from imported fisheries products, the annual summer closure of fishing grounds in the South China Sea (effective since 1999 and extended to two and a half month duration since 2009), the introduction of a permanent trawling ban in Hong Kong waters (effective from 31 December 2012) and introduction of other fisheries management measures has made the operating environment increasingly difficult for Hong Kong fishermen in recent years. Other restrictions on fishing activities in Mainland waters include a total ban on hang trawlers and a ban on bottom trawling in waters less than 40m depth (since 1979).

The business model of operations is also identified as contributing challenges to development of the industry. Capture fisheries operate mainly on a family basis, with crews comprising family members as well as local or Mainland deckhands. The fishing population is ageing with more than half aged over 50 years old and labour shortage and lack of new entrants are acknowledged issues for the industry.

The challenges facing the industry are therefore many and have culminated over many years. Consequently, there has been recognition by government and fishermen and other stakeholders, that the Hong Kong fishing industry must move towards a more sustainable future, allowing fishing communities across Hong Kong to achieve self-reliance, maintain livelihoods and cope with changing business environment. To assist fishers, the government has implemented a number of schemes and financial relief measures over the years whilst at the same time strengthening fisheries management measures in Hong Kong waters including implementation of a fishing licensing system, limiting the entry of new fishing vessels, and implementing measures to enhance fisheries resources. As well as general marine pollution control measures, measures to improve fishing resources have included Artificial Reef deployment programmes, fish restocking programmes, designation of fisheries protection zones, designation of Marine Parks and Marine Reserves (and restrictions on fishing therein) and introduction of the Hong Kong-wide trawling ban. Introduction of fisheries resources enhancement measures started in the mid-1990s when the government's objective for Hong Kong fisheries was to prioritize the sustainable use of fisheries resources rather than pursuing continual increased production. Recently, financial assistance from the government includes a HK\$500 million lump sum Sustainable Fisheries Development Fund to fund projects to facilitate the sustainable development of the Hong Kong fishing industry.

In the latest publically-released data ⁽¹⁾, AFCD reported fishing activities in 2014 by the Hong Kong capture fisheries industry are mainly conducted in the waters of the adjacent continental shelf in the South China Sea. AFCD reported there were about 4,500 fishing vessels in the Hong Kong fleet and estimated the Hong Kong capture fishery annual production was 160,789 tonnes in 2014. AFCD does not publish a more detailed breakdown of data by different home ports across Hong Kong.

(1) AFCD (2015) Capture Fisheries: Latest status
<http://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html>





In 2014, main fishing methods of the Hong Kong fleet include pair trawling, long-lining, gill-netting and purse-seining. Of these methods, pair trawlers have the greatest operational range with traditional fishing grounds for Hong Kong vessels spanning the entire continental shelf of the South China Sea and were responsible for producing the majority of the Hong Kong fishing fleet's annual production. Similarly, fishing grounds for purse-seining also extend to the offshore continental shelf. Vessels conducting long-lining, which targets demersal species has traditionally mainly been conducted around the Pearl River Estuary, reflecting the distribution of target species. Gill-netting is typically employed by local, small scale fishers with effort typically concentrated in Hong Kong waters. Hand-lining involves targeting live catches with traditional frequent fishing grounds including reefs and shoals at Pratas, Paracels, Macclesfield Bank and Spratly Islands.

As mentioned previously, the Hong Kong fleet competes with Mainland fishers in the South China Sea (as well as others such as from Vietnam and Taiwan), though the distribution of fishing effort and degree of overlap of operations cannot be elucidated given there is limited monitoring and publically available information. Based on 2011 data ⁽¹⁾, it can be seen the Hong Kong fleet is small compared to the number of Mainland fishing vessels operating in the South China Sea (Guangdong: 54,300 vessels; Guangxi: 10,300 vessels; Hainan: 26,000 vessels; Fujian: 59,000 vessels). Similarly, based on 2011 data, in comparison annual production by the Hong Kong represents a sizeable fraction of production by fleets in other Mainland provinces bordering the South China Sea (Guangdong: 1,452,000 tonnes per annum; Guangxi: 665,000 tonnes per annum; Hainan: 1,050,000 tonnes per annum; Fujian: 1,916,000 tonnes per annum). Similar to the Hong Kong situation, trawlers are reported to account for most of the production by the Mainland fleet.

B1.3.2

Aquaculture Fisheries

Marine Fish Culture

Hong Kong aquaculture fisheries include marine fish culture and pond culture. Prior to 1980, marine fish culture operations were haphazardly distributed and unregulated. Following enactment of the Marine Fish Culture Ordinance (Cap. 353) in 1980, all fish culture activities were required to operate under licence and in designated fish culture zones. To date, the government has designated 26 fish culture zones (FCZs) located in sheltered coastal areas across Hong Kong, occupying a total sea area of 209 ha (*Figure B1*). The government commissioned a feasibility study to examine the potential for increasing the number and size of fish culture zones as well as the potential for issuing new licences to assist development of the industry. As at 2015, this study is ongoing.

Marine fish culture involves rearing marine fish from fry or fingerlings to marketable size in cages suspended by floating rafts. The species under culture depends on availability of imported fry. Fry are mostly imported from the Mainland, Taiwan,

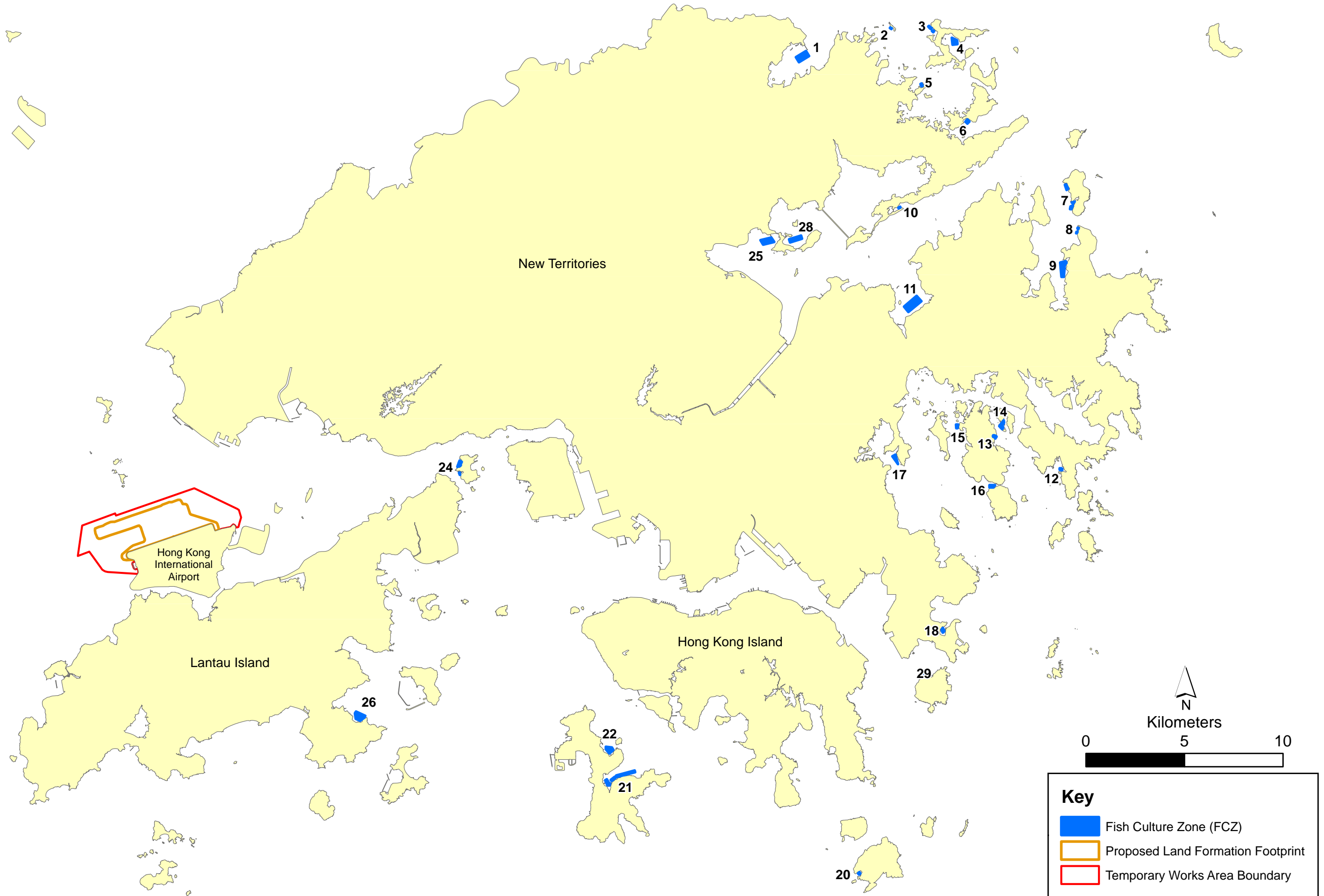
(1) Chinese Academy of Fisheries Science, 2012, The 2011 National Fisheries Statistics (in Chinese)
<http://www.cafs.ac.cn/english/index.html>



Figure B1

Marine Fish Culture Zones in Hong Kong

ID	Fish Culture Zone
1	Sha Tau Kok
2	Ap Chau
3	Kat O
4	O Pui Tong
5	Sai Lau Kong
6	Wong Wan
7	Tap Mun
8	Kau Lau Wan
9	Sham Wan
10	Lo Fu Wat
11	Yung Shue Au
12	Leung Shuen Wan
13	Tiu Cham Wan
14	Tai Tau Chau
15	Kai Lung Wan
16	Kau Sai
17	Ma Nam Wat
18	Po Toi O
20	Po Toi
21	Sok Kwu Wan
22	Lo Tik Wan
24	Ma Wan
25	Yim Tin Tsai
26	Cheung Sha Wan
28	Yim Tin Tsai (East)
29	Tung Lung Chau





Thailand, Philippines or Indonesia. Species being cultured have gradually changed over the recent years. Currently, common species under culture include green grouper, brown-spotted grouper, giant grouper, Russell's snapper, mangrove snapper, goldlined seabream and star snapper.

To manage the effects on water quality of marine fish culture on the marine environment, in 1987, the government introduced a moratorium on the issue of new licences, which is still in effect to the present day. In June 2002, the government allowed marine fish culture licences to be transferable to facilitate competitiveness of operations.

The marine fish culture sector in Hong Kong has seen a decline in annual production since peak levels in the early 1990s. Since that time, production has decreased from nearly 4,000 tonnes per annum to under 1,500 tonnes per annum in the intervening years. The decline may be linked to a number of challenges that the industry faces over the years, such as strong competition from imported aquatic products; inadequate aquaculture technologies; limited choices and supply of fry; uncompetitive production costs; the moratorium on the issue of new marine fish culture licence; and idling marine fish culture rafts⁽¹⁾.

Pond Culture

Pond culture, on the other hand, does not require a licence from the government. Fish pond operations are mainly concentrated in the northwest New Territories. Pond culture involves raising fry or fingerlings to marketable size in ponds. Polyculture of various carp in combination with tilapia or grey mullet is practiced in freshwater inland ponds. Monoculture of carnivorous species such as giant grouper, seabream and spotted scat are practiced in brackish ponds nearer to the coast. Fry are imported from the Mainland and Taiwan and some mullet fry are sourced from local coastal waters. In 2014, there were 1,140 ha of fish ponds in Hong Kong which produced 2,001 tonnes of freshwater fish.

The industry saw a development phase in the post war years to the 1960s and then rapid expansion phase up til the mid 1980's. Improvements in management techniques and mechanization led to reduced operation and maintenance costs and so in the 1970s and 1980s, it had grown to be a highly profitable industry aided by strong demand of a growing population. In the late 1980s, annual production peaked at 6,600 tonnes. Following the late 1980's, the industry saw a decline. Production levels reduced as a result of loss of pond area due to urban development. In the 1990s, the wholesale price of fish decreased in the face of competition from imports. In 2002 the central government removed export quota on freshwater fish to Hong Kong resulting in greater imports and a sharp drop in local prices, affecting incomes. This manifested as a decline in profits and incomes for aquaculturists.

Challenges Facing the Aquaculture Industry

(1) Legislative Council Secretariat (2012) *FACT SHEET: Review of the moratorium on the issue of marine fish culture licence.* FS30/11-12





It has been recognized the aquaculture fisheries sector in Hong Kong faces a number of challenges to its development. In 2006, the Government's Committee on Sustainable Fisheries identified the challenges as including low market share, strong competition from large volume of imported aquaculture products, inadequate aquaculture technologies, limited choices and supply of fry, uncompetitive production costs, moratorium on issue of new licences and idling marine culture fish rafts, unclear land status concerning fishponds and decrease in fish pond area due to urban development. In addition, the aquaculture industry was reported to face problems associated with ageing population (more than half are over 50 years old), labour shortage and inability to attract new entrants to the industry. To assist in addressing the challenges, the government has implemented a number of schemes and relief measures as well as provision of technical support and technical development studies and education on good management practices. The Government's HK\$500 million Sustainable Fisheries Development Fund was set up to fund projects that would facilitate the sustainable development of the Hong Kong fishing industry including aquaculture.

B1.4 FISHERIES PROFILE OF HONG KONG WESTERN WATERS

In order to understand better the fisheries setting of the area where the 3RS Project may have interactions with, a series of fisheries surveys were conducted between 2012 and 2013 as part of the EIA study. This included fish trawl, purse seine, gill net, hand line, artificial reefs, ichthyoplankton and fish post-larvae surveys, as well as fisheries interview survey at the homeports potentially affected by the Project. Survey results were supplemented with data from the literature to provide an update of the status of fisheries resources and fishing activities within and in the vicinity of the 3RS project site.

The findings of the 3RS EIA Study represent the most recent publically available published information on the fisheries resources and operations for Hong Kong western waters. Based on the fisheries interview survey conducted in 2013, it was concluded that information presented in 2006 Port Survey, which is the latest published information on operations and production in Hong Kong waters, was still applicable. However it was noted that since the trawl ban came into effect on 31 December 2012, fishermen using trawlers have moved to outside Hong Kong, while some trawlers have transformed their operation to purse-seining, gill netting and hand-lining.

B1.4.1 Fishing Operations

There are no aquaculture activities within the land formation footprint of the 3RS Project. In western Hong Kong waters, the level of overall fishing operations varied in different places, ranging from very low to moderate (approx. 1-400 vessels) (*Figure B2*). Locations with relatively higher level fishing operations included northern Chek Lap Kok waters, within the SCLKCMP, near The Brothers, Tai O and Fan Lau. The types of fishing vessels operating in the area included stern trawler, shrimp trawler, hang trawler, gill netter, long liner, purse seiner and sampan. It should be noted

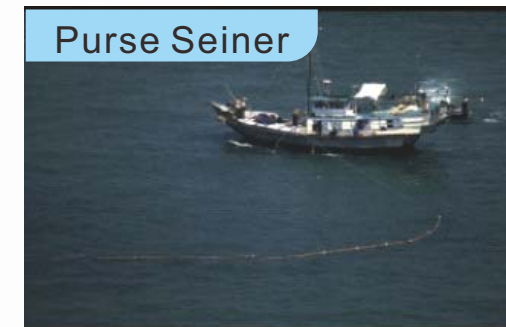
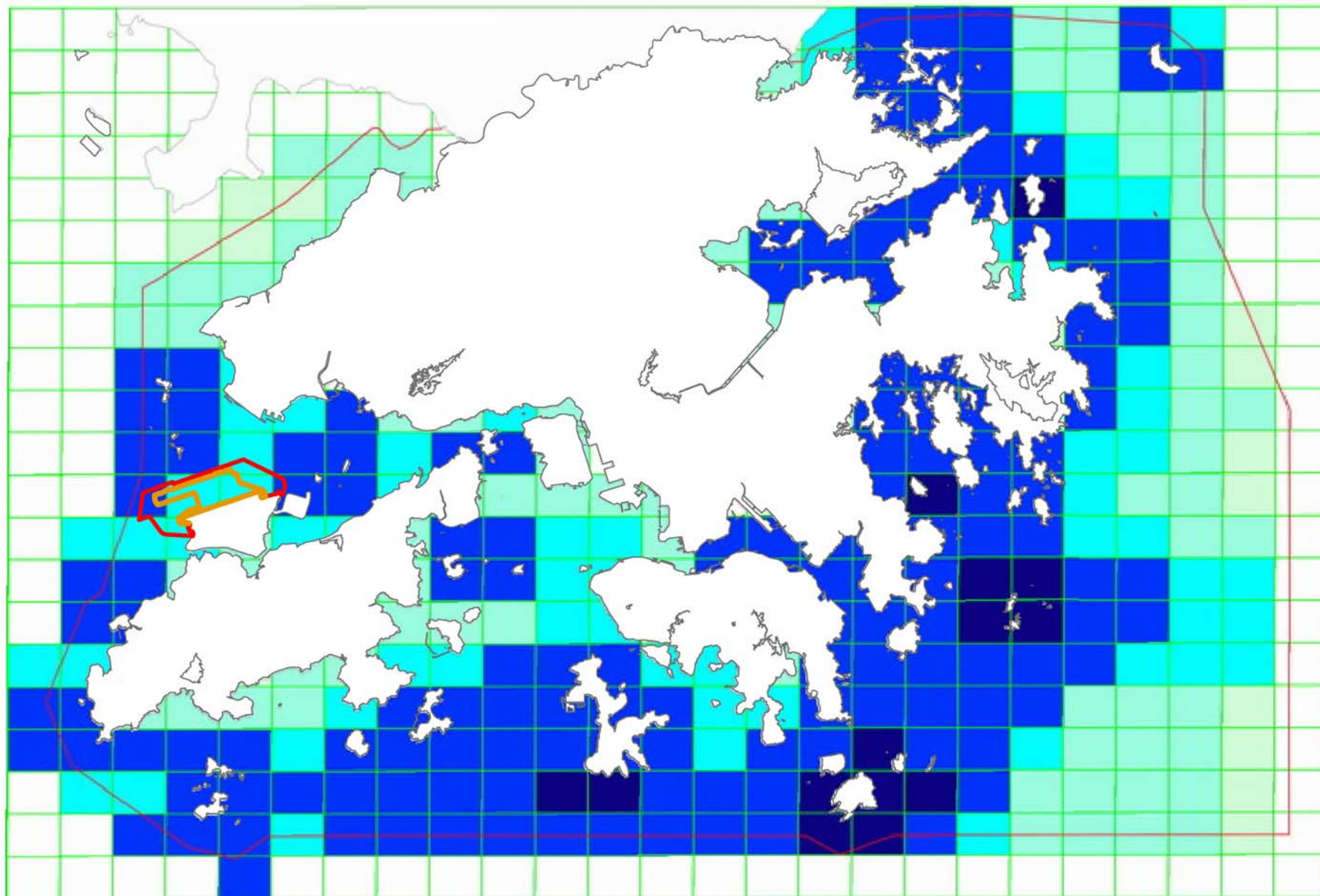


Figure B2 Distribution of Fishing Operations (All Vessels) in Hong Kong Waters as recorded by Agriculture, Fisheries and Conservation Department in Port Survey 2006

Port Survey 2006
Distribution of fishing operations
Overall

捕魚作業及生產訪問調查 2006
捕魚作業分布
總計

捕鱼作业及生产访问调查 2006
捕鱼作业分布
总计

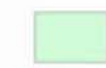







Key

-  Proposed Land Formation Footprint
-  Temporary Works Area Boundary

Number of vessels

漁船數目
漁船數目

-  >0 & ≤ 10
-  10 - 50
-  50 - 100
-  100 - 400
-  400 - 700
-  700 - 1000



that these observations represented data before the territory-wide trawl ban that came into effect on 31 December 2012.

B1.4.2 Fisheries Production

There was no reported fish fry fisheries production, and the Tai O area is the place with reported high adult fish production in terms of weight (400 – 600 kg/ha). In comparison to recent catch levels across Hong Kong waters, moderate to moderate high levels of fisheries productions, in terms of abundance and yield, were recorded in northern Chek Lap Kok waters, western Chek Lap Kok waters, within SCLKCMP, near The Brothers, Tai O and Fan Lau.

B1.4.3 Fisheries Resources

Fisheries surveys of the EIA study recorded moderate yield, in northern and western Chek Lap Kok waters, and high yield in SCLKCMP and The Brothers in comparison to recent catch levels across Hong Kong waters. The most dominant species were generally of low or no commercial value. The ichthyoplankton and fish post-larvae densities and family richness were low.

Northern Lantau waters had been identified as spawning grounds of commercial fisheries resources such as *Leiognathus brevisrostris* (shortnose ponyfish), *Lateolabrax japonicas* (Japanese seabass), *Konosirus punctatus* (dotted gizzard shad), *Solenocera crassicornis* (coastal mud shrimp), *Metapenaeus affinis* (jinga shrimp) and *Oratosquilla oratoria* (mantis shrimp). The highest number of reproductive individuals was observed during May to August, while other months with increased spawning activities included March to April, and December to January.

B1.4.4 Sites of Fisheries Importance

Based on the literature review and latest fisheries survey findings, the sites of fisheries importance were identified and these include spawning grounds of commercial fisheries resources in northern Lantau waters; SCLKCMP; artificial reefs at SCLKCMP and proposed artificial reefs deployment at the planned The Brothers Marine Park (BMP); Ma Wan FCZ; the area of high production of capture fisheries at Tai O; the area around The Brothers which has been proposed to be designated as a marine park arising from the HKBCF project; and the oyster production area at the Deep Bay mudflat (*Figure 3.1*).

Ultimately, the designation of a new 2,400 ha marine park for the 3RS Project, some areas serving as no-take zones, will span a large portion of these waters and will connect to the existing SCLKCMP to the north, the planned BMP to the east and the marine mammals conservation area at the Mainland waters to the west. The designation of the new marine park was proposed to mitigate the moderate impacts associated with loss of 768 ha of fishing ground. The EIA Study indicated expected benefits to fisheries from the new marine park are expected to occur through the net emigration of juvenile and adult fish (termed “spillover effect”), and/or export of pelagic eggs and larvae from the restored spawning stocks fishery.





B1.5

3RS DEVELOPMENT

The 3RS Project will be located on a new land formation immediately north of HKIA in North Lantau. The key project components include:

- Land formation comprising ground improvement, seawall construction and modification (including sea rescue boat points), filling and surcharge activities;
- Construction of new airfield facilities including the third runway, taxiways, aprons, aviation fuel supply network and other airfield infrastructure, aircraft navigational aids, approach lighting system and new Hong Kong International Airport Approach Area (HKIAAA) marker beacons;
- Modification of existing airfield facilities, including the existing North Runway, taxiways and aprons in the Midfield area;
- Construction of new passenger facilities including the Third Runway Concourse (TRC) and expansion of T2, the automated people mover system and associated depot and maintenance / stabling areas, and the baggage handling system;
- Construction of new ancillary facilities to support the operational needs of the expanded airport, including utility buildings, airport support developments, air cargo staging, catering, aircraft maintenance, aircraft engine run-up (engine testing) facilities, ground service equipment area, early bag storage facility, fire station, fire training facility, petrol fuelling station, new air traffic control towers, Hong Kong Observatory facility, mobile phone system antenna towers, stores, security gate houses, etc.;
- Construction of new and expanded infrastructure and utilities, including road networks, seawater cooling and flushing system, stormwater drainage system, greywater system, sewerage network and potable water supply, Towngas supply, 132 kV / 11 kV and other power supply networks, communication networks, etc.; and
- Diversion of existing submarine infrastructure, including the submarine aviation fuel pipelines and submarine 11 kV cables.

Land formation work is planned to commence in 2016. The tentative programme for the Project is for the 3RS to be operational in 2023. Given the scale and complexity of the project, the construction and concurrent runway operational configuration will be implemented in phases. Some components, such as the TRC, may be constructed in phases based on the level of demand. Due to such phasing arrangement, the three-runway airfield system will be in operation before the full completion of all infrastructure associated with the project.

