MONITORING OF MARINE MAMMALS IN HONG KONG WATERS (2020-21)

FINAL REPORT
(1 April 2020 to 31 March 2021)

Submitted by

Hong Kong Cetacean Research Project

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

A longitudinal study on Chinese White Dolphins and Indo-Pacific finless porpoises has been conducted in Hong Kong since 1995. The present monitoring study represents a continuation of this long-term research study with the funding support from the Agriculture, Fisheries and Conservation Department of the Hong Kong SAR Government, covering the period of April 2020 to March 2021.

During the one-year study period, 175 line-transect vessel surveys with 6,018.0 km of survey effort were conducted among ten survey areas in Hong Kong. A total of 174 groups of 520 Chinese White Dolphins and 85 groups of 226 finless porpoises were sighted during vessel and helicopter surveys. The dolphins were sighted frequently along the west coast of Lantau Island as well as the northern portion of the SWL survey area, but only a handful of sightings were made at the western end of the North Lantau region. For the porpoises, they mainly clustered at the inshore waters around Shui Hau Peninsula and offshore waters to the south and east of Tai A Chau.

In 2020, the most important dolphin habitats were concentrated along the stretch of waters from Tai O Peninsula toward Fan Lau Peninsula. In the past decade, dolphin occurrence in the North Lantau region has greatly diminished and is largely confined to the western end of this region in recent years with no apparent signs of recovery. Notable decline in dolphin usage was also observed within the two marine parks in the North Lantau region, while the usage has remained high and fairly steady within the Southwest Lantau Marine Park.

For finless porpoises, their most heavily utilized habitats in 2020 were confined to the south of Tai A Chau as well as the offshore waters at the juncture of SEL and SWL survey areas. Temporal change in porpoise habitat use is notable in the offshore waters between Shek Kwu Chau and the Soko Islands with the higher usage in 2015-17 becoming lower in 2018-20, especially around Shek Kwu Chau where the reclamation works for the Integrated Waste Management Facilities occurred.

In 2020, the combined estimate of dolphin abundance in Hong Kong waters in the four main survey areas of dolphin occurrences (i.e. SWL, WL, NWL and NEL) was 37 (the combined estimates for the last five years, i.e. 2015 to 2019, were 65, 47, 47, 32, and 52, respectively). Significant declines in dolphin abundances were detected in each of the three survey areas in NEL, NWL and WL over the past two decades, as well as the combined abundance from the four main areas of dolphin occurrences in the past

decade.

During the 2020-21 monitoring period, 112 individual dolphins were identified with 352 re-sightings, and about two-thirds of all re-sightings were made in WL waters. A total of six new individuals have been added to the photo-ID catalogue, while notable deaths of two well-known individuals (i.e. NL120 and WL124) were documented in 2020. There was a record high of 18 individuals that were frequently sighted in Hong Kong waters in the past but have disappeared in 2020. Continuous decline in dolphin movements between NWL and WL survey areas was evident in recent years, and similar decline also occurred in dolphin movements between SWL and WL survey areas in 2020-21.

In light of the dramatic decline in calf occurrence especially in recent years, the survival of calves over the past two decades was examined based on long-term photo-identification data. In this period, it was estimated that at least 85 of the 186 calves sighted in Hong Kong did not survive beyond the first two years, which included 49 calves that likely died shortly after birth, and another 31 calves that were observed only once with their mothers but disappeared in subsequent sightings. Furthermore, 85 calves were determined to have successfully survived into the older juvenile stage and became somewhat independent from their mothers. However, after reaching the highest level in 2010 (with 14 individuals), the number of surviving newborns has quickly decreased to a much lower level since 2014, with only a handful of newborns being able to survive in the past five years. The low survival rate of newborns, coupled with the worrisome declining trend in abundance over the past decade, is of great concern for the continuous survival of dolphins in Hong Kong waters.

行政摘要 (中文翻譯)

自 1995 年開始，一項有關本地中華白海豚及印度太平洋江豚的長期研究經已展開。此項為期一年 (由 2020 年 4 月至 2021 年 3 月)、獲香港特別行政區政府漁農自然護理署資助的研究工作，正是這長期監察的延伸。

在十二個月研究期間，研究員共進行了 175 次樣條線船上調查，在全港十個調查區航行了 6,018.0 公里，並觀察到共 174 群中華白海豚 (總數達 520 隻) 及 85 群江豚 (總數達 226 隻)。在 2020-21 年間，中華白海豚經常在大嶼山西面水域一帶及西南面水域的北部出沒，在大嶼山以北水域卻只有接近西端的零星出沒紀錄。另一方面，江豚的目擊記錄主要集中於水口半島附近的近岸水域、及大鴉洲以東及以南的離岸水域。

中華白海豚在 2020 年的重要棲身地，主要集中在大澳半島與分流半島之間的近岸水域。在過去十年，海豚在北大嶼山水域的使用率大幅下降，並於近年只集中出沒於此水域的西端，未有回復較高使用量的跡象。海豚在北大嶼山水域的兩個海岸公園內的使用量均明顯地減少，反而在西南大嶼山海岸公園錄得穩定而持續高企的使用量。

此外，江豚在 2020 年錄得最高使用量的棲身地，位處於大鴉洲以南水域，及大嶼山東南、西南調查區交界的離岸海域。在 2015-17 年間，於石鼓洲及索罟群島之間水域曾錄得較高的江豚使用量，但卻在 2018-20 年間相對減少，這變化尤其在毗鄰「綜合廢物管理設施」填海工程的石鼓洲水域更為明顯。

在 2020 年，中華白海豚在大嶼山西南、西、西北及東北四個調查區域的整體數目估計為 37 隻 (過去五年的年度整體數目分別為 65、47、47、32 及 52 隻)。大嶼山東北、西北及西面的調查區域在過去廿年的海豚數量，均各自錄得明顯下降趨勢；而四個調查區域合共的整體海豚數目在過去十年亦錄得明顯下降趨勢。

於 2020-21 監察年度期間，研究員辨認出 112 隻個別海豚、共 352 次的目擊紀錄，其中約三分之二均出現在大嶼山西面水域。2020 年內共有六隻新的個別海豚被加入相片辨認名錄，但亦有兩隻曾經常出現於香港水域的個別海豚 (NL120 及 WL124) 相繼死亡。過去一些經常出沒於香港水域的海豚個體，共有 18 隻於 2020 年間不見所蹤，亦為近年的最高數字。於大嶼山西北面及西面調查區之間移動的個別海豚，其數量於近數年持續明顯下降；而於大嶼山西面及西南面調查區之間移動的個別海豚數量，亦同樣在 2020-21 年間下降。

中華白海豚幼豚於近年在香港水域的出沒錄得大幅度下降，有見及此，研究

員利用長期相片辨認的數據進行幼豚存活狀況的分析，發現在過去二十年、共 186 條個別初生幼豚的紀錄中，估計至少有 85 條未能生存超過兩年，當中包括 49 條在剛出生後於短時間內死亡，另外有 31 條幼豚與母豚只曾出現過一次，隨後再遇上母豚時幼豚已不見所蹤。此外，共有 85 條幼豚於出生後能成功存活，並進入少年期及大致上不再需要倚賴母豚；這些成功存活的幼豚，曾在 2010 年錄得最高的數字 (共 14 條)，但該數字卻於 2014 年開始持續下降，在過去五年亦只有零星的幼豚存活紀錄。偏低的幼豚存活率，再加上過去十年海豚數字不斷下降，均為本地海豚的存活前景帶來警號，情況令人憂慮。

1. INTRODUCTION

Since 1995, the Hong Kong Cetacean Research Project (HKCRP) has been conducting a longitudinal study on Chinese White Dolphins (also known as the Indo-Pacific humpback dolphin, *Sousa chinensis*) and Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) in Hong Kong and the Pearl River Delta region. This multi-disciplinary research programme has been primarily funded by the Agriculture, Fisheries and Conservation Department (AFCD) as well as various government departments and NGOs, aiming to provide critical scientific information to the Hong Kong SAR Government for formulation of sound management and conservation strategies for the local populations of dolphins and porpoises. In addition, HKCRP has been extensively involved in numerous environmental consultancy studies to assess potential impacts of marine construction works on cetaceans in Hong Kong waters and the Pearl River Estuary, and to provide suggestions and guidance on mitigation measures to lessen the pressures of the development projects on dolphins and porpoises. Results from these integrated studies have been used to establish several systematic databases, which can be used to estimate population size, to monitor trends in abundance, distribution, habitat use and behaviour over time, and to keep track of levels and changes in mortality rates of local cetaceans (e.g. Hung 2008, 2019, 2020; Jefferson et al. 2002, 2009, 2012; Wang and Hung 2018, 2019, 2020).

The present monitoring study represents a continuation and extension of this research programme, with funding support from AFCD of HKSAR Government. The main goal of this one-year monitoring study is to collect systematic data for assessment of the distribution and abundance of Chinese White Dolphins and Indo-Pacific finless porpoises in Hong Kong, to take photographic records of individual dolphins, and to analyze the marine mammal monitoring data for better understanding of the various aspects of local dolphin and porpoise populations. The one-year project covers the period from 1 April 2020 to 31 March 2021. This revised draft final report is submitted to AFCD as a summary of this monitoring project, covering the entire 12-month study period from April 2020 to March 2021.

2. OBJECTIVES OF PRESENT STUDY

The main goal of this one-year monitoring study was to collect systematic monitoring data for an in-depth analysis and assessment of distribution, abundance and habitat use of Chinese White Dolphins and Indo-Pacific finless porpoises in Hong

Kong, to take photographic records of individual dolphins, and to analyze the monitoring data for better understanding of various aspects of local dolphins and porpoises. To achieve this main goal, several specific objectives were set for the present study. The first objective was to assess the spatial and temporal patterns of distribution, abundance and habitat use of Chinese White Dolphins and Indo-Pacific finless porpoises in Hong Kong in detail. This objective was achieved through data collection on dolphins and porpoises by conducting regular systematic line-transect vessel surveys and helicopter surveys.

The second objective was to identify individual Chinese White Dolphins by their natural markings using photo-identification technique. This objective was achieved by obtaining high-quality photographs of Chinese White Dolphins for photo-identification analysis. Photographs of re-sighted and newly identified individuals were compiled and added to the current photo-identification catalogue, with associated descriptions for each newly identified individual. Photographic records of finless porpoises were also taken during vessel and helicopter surveys for educational purposes.

The third objective was to analyze the monitoring data for better understanding of the various aspects of local dolphin and porpoise populations. This objective was achieved by conducting various data analyses, including line-transect analysis, encounter rate analysis, distribution analysis, behavioural analysis and quantitative grid analysis to assess the spatial and temporal patterns of abundance, distribution and habitat use and trends of occurrence of Chinese White Dolphins and finless porpoises using vessel survey data. The fourth objective was to conduct ranging pattern analysis and residency pattern analysis to study individual core area, ranging pattern, habitat use and movement pattern of Chinese White Dolphins based on the data obtained from both the line-transect vessel surveys and the associated photo-identification works.

The final objective was to educate the members of the public on local dolphins and porpoises, by disseminating the study findings from the long-term monitoring research programme. This objective was achieved by providing public seminars to local primary and secondary school students through the arrangement of AFCD.

3. RESEARCH TASKS

During the study period, several tasks were completed to satisfy the objectives set for the present marine mammal monitoring study. These tasks were:

- to collect monitoring data for assessment on spatial and temporal patterns of distribution, abundance and habitat use of local dolphins and porpoises through systematic line-transect vessel surveys and helicopter surveys;

- to analyze line-transect survey data for assessment on spatial and temporal patterns of distribution, abundance, habitat use and trends of occurrence of dolphins and porpoises in Hong Kong;

- to take photographic records of Chinese White Dolphins for photo-identification analysis and update the photo-identification catalogue;

- to analyze photo-identification data of individual Chinese White Dolphins to assess their ranging patterns, core area use and movement patterns;

- to take photographic records of finless porpoises; and

- to assist AFCD in arousing public awareness on local dolphins and porpoises through school seminars.

4. METHODOLOGY

4.1. Vessel Survey

The survey team used standard line-transect methods (Buckland et al. 2001) to conduct regular vessel surveys, and followed the same technique of data collection that has been adopted in the past two decades of marine mammal monitoring surveys in Hong Kong developed by HKCRP (Hung 2005, 2019, 2020; Jefferson 2000a, b; Jefferson et al. 2002). The territorial waters of Hong Kong Special Administrative Region are divided into twelve different survey areas, and line-transect surveys were conducted among ten survey areas (i.e. Northwest (NWL), Northeast (NEL), West (WL), Southwest (SWL) and Southeast Lantau (SEL), Deep Bay (DB), Lamma (LM), Po Toi (PT), Ninepins (NP) and Sai Kung (SK)) (Figure 1).

For each vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously using 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^o and 90^o (in relation to the bow, which is defined as 0^o). One to two additional experienced observers were available on board to work in shifts (i.e. rotating every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species and had participated in rigorous at-sea training program provided by the principal investigator.

During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (e.g. *Garmin eTrex*). When dolphins or porpoises were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin/porpoise group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin/porpoise group to the transect line was later calculated from the initial sighting distance and angle.

The line-transect data collected during the present study were compatible with the long-term databases maintained by HKCRP in a way that it can be analyzed by established computer programmes (e.g. all recent versions of DISTANCE programme including version 6.0, ArcView© GIS programme) for examination of population status including trends in abundance, distribution and habitat use of Chinese White Dolphins and finless porpoises in Hong Kong waters.

4.2. Helicopter Survey

Only one helicopter survey arranged by the Government Flying Service (GFS) through AFCD was conducted during the 2020-21 monitoring period to survey mainly the remote areas that were relatively inaccessible by boat (e.g. Sai Kung, Mirs Bay) (Figure 2). The survey coverage of each helicopter survey largely depended on weather conditions such as visibility, sea state, cloud cover and wind direction, and the planned flight route could be changed with some flexibility according to the final decision by the GFS pilot.

The helicopter survey usually lasted 1.5 hours, flying at an altitude of about 150 metres and a speed of 150-200 km/hr. Two to three observers were on board to search for dolphins and porpoises on both sides of the helicopter. Data on sighting position, environmental conditions, group size and behaviour of the dolphins or porpoises were recorded when they were sighted. The off-effort helicopter surveys were mainly used to collect data for distribution of Chinese White Dolphins and finless porpoises, but individual dolphins with very distinct identifying features were occasionally identified from pictures taken from the helicopter.

4.3. Photo-identification Work

When a group of Chinese White Dolphins were sighted during the line-transect vessel survey, the survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph each dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides differ. One or two professional digital cameras (e.g. *Canon* EOS 7D Mark II model), each equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater details, and were carefully compared to all identified dolphins in the PRE Chinese White Dolphin photo-identification catalogue compiled and curated by HKCRP. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000a; Jefferson and Leatherwood 1997). All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a database. Any individuals not in the current catalogue were given a new identification number and added to the catalogue along with their data and text descriptions including age class, gender, any nickname or unique markings. The updated photo-identification catalogue incorporated all new photographs of individual dolphins taken during the present study.

4.4. Data Analyses

4.4.1. Distribution pattern analysis

The line-transect survey data were integrated with a Geographic Information System (GIS) to visualize and interpret different spatial and temporal patterns of dolphin and porpoise distribution using their sighting positions collected from vessel and helicopter surveys. Location data of dolphin and porpoise groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView© 3.1) to examine their distribution patterns in detail. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, fishing boat associations, young calves and behavioural activities. Data from the long-term sighting databases were used to compare past distribution patterns of dolphins and porpoises in recent years to data from the present study period.

4.4.2. Encounter rate analysis

Since the line-transect survey effort was uneven among different survey areas and across different years, the encounter rates of Chinese White Dolphins and finless porpoises (number of on-effort sightings per 100 km of survey effort) were calculated separately for each survey area to correct for the uneven survey effort. As such, encounter rates could be useful indicators of the relative importance of different regions within the study area to the dolphins and porpoises.

4.4.3. Line-transect analysis

Density and abundance of Chinese White Dolphins were estimated by line-transect analysis using systematic line-transect vessel survey data collected during the present study. For the analysis, survey effort in each single survey day was used as the sample. Estimates were calculated only from dolphin sightings and effort data that were collected during conditions of Beaufort 0-3 (see Jefferson 2000a) and using standard line-transect methods (Buckland et al. 2001). The estimates were made using the computer program DISTANCE Version 6.0, Release 2 (Thomas et al. 2009). The following formulae were used to estimate density, abundance, and their associated coefficient of variation:

$$\hat{D} = \frac{n\ \hat{f}(0)\ \hat{E}(s)}{2\ L\ \hat{g}(0)}$$

$$\hat{N} = \frac{n\ \hat{f}(0)\ \hat{E}(s)\ A}{2\ L\ \hat{g}(0)}$$

$$C\hat{V} = \sqrt{\frac{\hat{\text{var}}(n)}{n^2} + \frac{\hat{\text{var}}[\hat{f}(0)]}{[\hat{f}(0)]^2} + \frac{\hat{\text{var}}[\hat{E}(s)]}{[\hat{E}(s)]^2} + \frac{\hat{\text{var}}[\hat{g}(0)]}{[\hat{g}(0)]^2}}$$

where D = density (of individuals),
n = number of on-effort sightings,
f(0) = trackline probability density at zero distance,
E(s) = unbiased estimate of average group size,
L = length of transect lines surveyed on effort,
g(0) = trackline detection probability,
N = abundance,
A = size of the survey area,
CV = coefficient of variation, and
var = variance.

A strategy of selective pooling and stratification was used in order to minimize bias and maximize precision in making the estimates of density and abundance (see Buckland et al. 2001). Distant sightings were truncated to remove outliers and accommodate modeling, and size-bias corrected estimate of group size was calculated by regressing $\log_e$ of group size against distance. Three models (uniform, half-normal and hazard rate) were fitted to the data of perpendicular distances to estimate f(0) and the resulting dolphin density and abundance (Buckland et al. 2001). The best model (and thus its associated values for these parameters) was determined by the lowest Akaike's Information Criterion (AIC) value.

Besides estimating dolphin abundance for the four main areas of dolphin occurrences (i.e. NEL, NWL, WL and SWL) in 2020, annual abundance estimates were also generated for every year since 2001 in NWL and NEL survey areas and since 2003 in WL survey areas, to investigate any significant temporal trend using linear regression model. To perform such trend analysis, the linear regression model is considered in the four areas as follow:

$$x_t = a + bt + u_t \qquad \text{for } t = 1, 2, \ldots, n$$

where x_t denotes the abundance data of dolphin at time t, n is the number of observations, and u_t is an error term which follows normal distribution with mean zero and variance σ^2.

4.4.4. Quantitative grid analysis on habitat use

To conduct quantitative grid analysis of habitat use (Hung 2008), positions of on-effort sightings of Chinese White Dolphins and finless porpoises were retrieved from their long-term sighting databases, and then plotted onto 1-km^2 grids among the nine survey areas on GIS. Sighting densities (number of on-effort sightings per km^2)

and dolphin/porpoise densities (total number of dolphins/porpoises from on-effort sightings per km^2) were then calculated for each 1 km by 1 km grid with the aid of GIS. Sighting density grids and dolphin/porpoise density grids were further normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent in each grid was calculated by examining the survey coverage on each line-transect survey to determine how many times the grid was surveyed during the study period. For example, when the survey boat traversed through a specific grid 50 times, 50 units of survey effort were counted for that grid. With the amount of survey effort calculated for each grid, the sighting density and dolphin/porpoise density of each grid were then normalized (i.e. divided by the unit of survey effort).

The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort **s**ightings **p**er 100 units of **s**urvey **e**ffort. In addition, the derived unit for actual dolphin/porpoise density was termed DPSE, representing the number of **d**olphins/porpoises **p**er 100 units of **s**urvey **e**ffort. Among the 1-km^2 grids that were partially covered by land, the percentage of sea area was calculated using GIS tools, and their SPSE and DPSE values were adjusted accordingly. The following formulae were used to estimate SPSE and DPSE in each 1-km^2 grid within the study area:

$$SPSE = ((S / E) \times 100) / SA\%$$

$$DPSE = ((D / E) \times 100) / SA\%$$

where S = total number of on-effort sightings
D = total number of dolphins/porpoises from on-effort sightings
E = total number of units of survey effort
SA% = percentage of sea area

Both SPSE and DPSE values are useful for examining relative dolphin/porpoise usage within a one square kilometre area. For the present monitoring study, both SPSE and DPSE values were calculated in each 1-km^2 grid among all survey areas for the entire one-year period in 2020 for both dolphins and porpoises, and in the past five years of monitoring (i.e. 2016-20) for finless porpoises. In addition, to examine the temporal changes in the habitat use patterns in relation to calf occurrence and feeding / socializing activities, the subset of dolphin sightings with calf occurrence or engaged in these activities were used to calculate SPSE and DPSE values across four five-year periods (i.e. 2001-05, 2006-10, 2011-15, 2016-20) among grids around Lantau Island.

Furthermore, for the impact investigation of the stoppage of high-speed ferry (HSF) traffic since February 2020 due to the Covid-19 pandemic, the grid analysis was also utilized to examine the temporal changes in dolphin and porpoise habitat use within and to the south and north of the South Lantau Vessel Fairway (SLVF)[1] encompassing a suite of grids, with the number of on-effort sightings and units of survey effort being pooled together from these grids to calculate sighting and dolphin densities as a whole for that suite of grids (see Hung 2008, 2012). Dolphin and porpoise usage before and after the HSF stoppage among these selected grids could then be compared by stratifying the sightings and survey effort into specific time frames.

4.4.5. Behavioural analysis

When dolphins were sighted during vessel surveys, their behaviours were observed. Different behaviours were categorized (i.e. feeding, milling/resting, traveling, socializing) and recorded. These data were then input into a separate database with sighting information, which was used to determine the distribution of behavioural data using a desktop GIS. Distribution of sightings of dolphins engaged in different activities and behaviours would then be plotted on GIS and carefully examined to identify important areas for different activities, and compared with past distribution patterns of such activities. The behavioural data was also used in the quantitative analysis on habitat use to identify important dolphin habitats for feeding and socializing activities and examine trends in habitat use over the past two decades.

4.4.6. Ranging pattern analysis

For the examination of individual ranging patterns, location data of identified dolphins with 10 or more re-sightings and sighted during the present study period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home range for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, created by the Alaska Biological Science Centre, USGS (Hooge and Eichenlaub 1997), was loaded as an extension of ArcView© 3.1 along with another extension Spatial Analyst 2.0. Using the fixed kernel method, the program calculated kernel density estimates based on all sighting positions, and provided an active interface to display kernel density plots. The kernel estimator then calculated and displayed the overall ranging area at 95% UD (utilization distribution) level. The core areas of individuals at two different levels (50% and 25% UD) were also examined to investigate their range use in greater detail.

4.4.7. Residency pattern analysis

To examine the monthly and annual occurrence patterns of individual dolphins,

[1] The South Lantau Vessel Fairway (SLVF) in this report refers to the portion of water at the south of Lantau Island between Fan Lau and the Chi Ma Wan Peninsula. The concerned area is part of the traffic separation schemes between south of Kau Yi Chau and Fan Lau recommended by Marine Department.

their residency patterns in Hong Kong were carefully evaluated. “Residents” were defined as individuals that were regularly sighted in Hong Kong for at least eight years in the past 12 years (i.e. 2009-2020), or five years in a row within the same period. Other individuals that were intermittently sighted during the past years were defined as “Visitors”. In addition, monthly matrix of occurrence was also examined to differentiate individuals that occurred year-round (i.e. individuals that occur in every month of the year) or seasonally (i.e. individuals that occur only in certain months of the year). Using both yearly and monthly matrices of occurrence, “year-round residents” were the individual dolphins that were regularly sighted in Hong Kong throughout the year, while “seasonal visitors” were the ones that were sighted sporadically in Hong Kong and only during certain months of the year within the study period.

5. RESULTS AND DISCUSSIONS

5.1. Summary of Data Collection

5.1.1. Survey effort

During the entire 2020-21 monitoring period, a total of 175 line-transect vessel surveys were conducted among ten survey areas in Hong Kong waters from April 2020 to March 2021. These included 14 surveys in DB, 15 surveys in NEL, 13 surveys in NWL, 32 surveys in WL, 41 surveys in SWL, 30 surveys in SEL, 12 surveys in LM, ten surveys in PT, six surveys in NP and two surveys in SK. The details of these survey effort data collected are presented in Appendix I.

More survey effort was allocated to survey areas outside of North and West Lantau waters during the 2020-21 monitoring period, as additional surveys have already been conducted in NWL, NEL and WL survey areas concurrently under the Hong Kong Link Road (HKLR) regular line-transect monitoring surveys as part of the EM&A works for the Hong Kong-Zhuhai-Macau Bridge (HZMB) construction. These additional HZMB-related marine mammal monitoring surveys employed the same HKCRP personnel, survey methodology and research vessels to ensure consistency and full compatibility with the AFCD long-term marine mammal monitoring programme. In order to increase the overall sample size for the present monitoring study, such EM&A data were combined with the AFCD monitoring data for various data analyses presented throughout this report, which can provide valuable supplementary information on dolphin and porpoise occurrences.

Furthermore, only one helicopter survey was conducted with the Government Flying Services through the arrangement of AFCD on July 17th of 2020, which covered the eastern and southern waters of Hong Kong. Such off-effort data on local dolphins and porpoises collected from the helicopter survey were also included in the distribution analysis and group size analysis.

From April 2020 to March 2021, 672.0 hours were spent collecting 6,018.0 km of survey effort during the AFCD vessel line-transect surveys among the ten survey areas. About two-third of the total survey effort was conducted among six areas where dolphins occurred regularly, which included 12.8% in NEL/NWL, 13.5% in WL, 36.7% in SWL/SEL and 4.0% in DB. On the other hand, 69.7% of total survey effort was allocated to survey areas in southern and eastern waters of Hong Kong (i.e. SWL, SEL, LM, PT, NP and SK) where porpoises regularly occurred. It should be mentioned that 98.8% of all survey effort was conducted under favourable sea conditions (Beaufort 3 or below, with good visibility). Such high percentage of survey effort conducted in favourable conditions is crucial to the success of the marine mammal data collection programme in Hong Kong, as only such data can be used in various analyses to examine the encounter rates and habitat use of both dolphins and porpoises, as well as to estimate the density and abundance of dolphins.

During the same 12-month monitoring period in 2020-21, a total of 3,549.4 km of survey effort was also conducted in NEL, NWL and WL under the HZMB-related EM&A dolphin monitoring surveys. This brings the total survey effort to 5,131.2 km for the combined dataset from AFCD and HZMB-related surveys among these three survey areas. Over 95% of the survey effort of HZMB-related EM&A surveys was also conducted under favourable sea conditions, which can be combined with the AFCD monitoring data for various analyses.

Since 1996, the long-term marine mammal monitoring programme coordinated by HKCRP has collected a total of 253,520.5 km of line-transect survey effort in Hong Kong and Guangdong waters of the Pearl River Estuary under different government-sponsored monitoring projects, consultancy studies and private studies, with 46.7% of the total effort funded by AFCD. The survey effort in 2020 alone comprised 4.0% of the total survey effort collected since 1996.

5.1.2. Marine mammal sightings

Chinese White Dolphins - From the AFCD monitoring surveys alone, 174 groups of 520 Chinese White Dolphins were sighted during the 2020-21 monitoring period (see

Appendix II). Combined with the additional sightings (69 groups of 238 dolphins) contributed from various HZMB-related EM&A surveys, a total of 243 groups of 758 dolphins were sighted altogether during the same 12-month period. Among them, 211 groups of 648 dolphins were sighted during on-effort line-transect vessel surveys.

During the 2020-21 monitoring period, dolphin sightings were mostly made in the WL (152 sightings), SWL (63) and NWL (27) survey areas while one sighting of a lone dolphin was made in SEL survey area. However, no sighting was made in the NEL or DB survey areas, despite a considerable amount of effort surveying these areas. As in previous monitoring periods, no dolphin was sighted in LM, PT or NP survey areas, where porpoises primarily occur on a regular basis.

Similar to the survey results from recent years of AFCD monitoring work, no dolphin was sighted in NEL for the entire year of 2020 as well as the first three months of 2021. However, the passive acoustic monitoring (PAM) conducted concurrently by HKCRP with the funding support of AFCD revealed that dolphins have not completely abandoned this area (especially around the Brothers Islands where the C-POD units were deployed) in recent years. For example, there were a total of 40 days in the past 3.5 years (including 12 days in the second half of 2017, 19 days in 2018, eight days in 2019 and one day in 2020) where at least 10 DPMs (a **D**etection **P**ositive **M**inute is any one minute period where at least one click train was detected) were recorded per day at Siu Ho Wan. In addition, a C-POD deployed at Tai Mo To also recorded at least 10 DPMs per day during another ten days in the past 3.5 years (including two days in the second half of 2017, six days in 2018, one day each in 2019 and 2020). Notably, in the past PAM monitoring periods, a strong diel pattern with significantly more dolphin detections at night than during the day was found among all sites within the Brothers Marine Park (Wang and Hung 2018, 2019, 2020). Even though the dolphin detections were still very low and declining around the Brothers Islands in NEL, the continuing night-time usage by dolphins of this once-important habitat should not be overlooked, and the on-going PAM studies would be critical to fill important data gaps in monitoring dolphin occurrences 24 hours a day within this marine park as well as for the NEL survey area.

<u>Finless Porpoises</u> – A total of 85 groups of 226 finless porpoises were sighted from vessel surveys and the helicopter survey during the 2020-21 monitoring period (see Appendix III). Among these porpoise sightings, 68 of them were made during on-effort search, which can be used in the encounter rate analysis and habitat use analysis. The porpoises were mainly sighted in the SEL and SWL survey areas with

24 and 34 groups, respectively, during the 12-month monitoring period. They also occurred occasionally in LM and PT survey areas with ten and nine sightings in these two areas respectively, but seldom occurred in NP and SK survey areas with seven sightings in total from these two areas. Notably, a lone porpoise was sighted within WL survey area for the first time in the past two decades, which was located to the west of Fan Lau Peninsula (see below for further discussion). As in previous monitoring periods, the porpoises were absent from the NWL, NEL and DB survey areas, where dolphins primarily occur throughout the past two decades.

For the most part, no porpoise was sighted in survey areas where dolphins regularly occurred in the past (except for the exceptionally rare sighting of a lone porpoise made near Fan Lau), but it should be mentioned that there have been some unexpected findings from the recent PAM studies, which revealed the possible presence of porpoises in WL waters. For example, there were some limited detections of porpoises at Fan Lau and Peaked Hill in 2019 and 2020 (Wang and Hung 2019, 2020). Notably, finless porpoises have never been sighted to the north of Fan Lau in more than two decades of visual surveys conducted by HKCRP, until the very recent sighting made in March 2021. It is possible that the source of these clicks that were automatically classified as finless porpoises were not produced by porpoises, but instead, the source could be from some Chinese White Dolphins, which may periodically produce click trains with characteristics that resemble those of porpoises. Even if these detections were finless porpoises, such rare events may have little biological significance (which also applies to the recent visual sighting made near Fan Lau). Nevertheless, data from continued PAM monitoring are needed before conclusions can be made about the occurrence of porpoises in the West and North Lantau regions, which have long been considered areas not utilized by porpoises.

5.1.3. Photo-identification of individual dolphins

During the 2020-21 monitoring period, approximately 16,500 digital photographs of Chinese White Dolphins were taken during AFCD monitoring surveys for the photo-identification of individual dolphins. All photographs taken in the field were compared with existing individuals from the photo-identification catalogue compiled and curated by HKCRP since 1995. All new photographs identified as existing or new individuals during the study period, as well as any updated information on gender and age class of individual dolphins, were incorporated into the photo-identification catalogue. A significant amount of photo-identification data was also contributed from the HZMB-related surveys during the same 12-month period.

Up to January 2021, a cumulative total of 1,125 individual Chinese White Dolphins (including 16 that were confirmed to be dead) have been identified by HKCRP researchers in Hong Kong waters and the rest of the Pearl River Estuary. The current catalogue contained 575 individuals being first identified within Hong Kong's territorial waters and another 550 individuals being first identified in Guangdong waters of the Pearl River Estuary. In 2020, six newly identified individuals from Hong Kong waters were added to the catalogue, while two notable deaths of well-known individuals, NL120 and WL124, with long sighting histories in Hong Kong were documented.

The catalogue summary revealed that 257 individuals have been seen 15 times or more; 162 individuals have been seen 30 times or more; and 107 individuals have been seen 50 times or more. In contrast, 39.7% of the identified individuals have only been seen once or twice, with most of these being first identified in Guangdong waters (328 out of 447 individuals). Temporal trends in the total number of identified individuals, the total number of re-sightings made, and the number of individuals within several categories of number of re-sightings showed good advancement in the photo-identification works during the 2020-21 monitoring period (Figure 3).

Between April 2020 and March 2021, a total of 112 individual dolphins, sighted 352 times altogether, were identified during AFCD regular vessel surveys (Appendix IV). With the addition of the HZMB-related monitoring survey data collected in the NWL and WL survey areas, there was a combined total of 134 individual dolphins being identified 523 times during the 12-month period. About two-thirds of the re-sightings made during the AFCD/HZMB surveys were in the WL survey area, while they were also made regularly in the SWL (25.6%). Only 47 re-sightings were made in NWL, and the only individual sighted in SEL was identified to be NL306. However, no dolphins were sighted at all in the NEL or DB survey areas during the 2020-21 monitoring period.

Among the 134 identified individuals from the AFCD/HZMB combined dataset, most of them were re-sighted only a few times, while some were repeatedly re-sighted, indicating their strong reliance of Hong Kong's waters as an important part of their home range. For example, 36 individuals were re-sighted five times or more, while 12 individuals (CH38, SL40, SL44, SL60, WL42, WL123, WL131, WL152, WL168, WL180, WL220 and WL250) were re-sighted ten times or more in the combined dataset during the relatively short 12-month study period. Notably, these frequently-sighted individuals are all considered year-round residents from their pattern of occurrences (see Section 5.7.1).

In 2020-21, 19 individuals were re-sighted with their calves. Some of their calves were already in their juvenile stage and were identified individuals in the photo-ID catalogue (e.g. the mother and calf pairs of WL21-WL256, WL28-WL288, WL129-WL311). The mothers that were re-sighted with young calves (i.e. unspotted calf or unspotted juvenile) will be closely monitored, as their survival is critical for the long-term viability of the dolphin population, especially in light of the dramatic decline in calf occurrence in recent years (see Section 5.4.2). The critical issue of calf survival is also further examined in Section 5.8.3 through the comprehensive photo-identification data collected in the past two decades.

Since 2015, a total of 79 frequently-occurring individuals (with 15 or more re-sightings during the period of 2012-21) have disappeared from Hong Kong's territorial waters. The total number of missing individuals from Hong Kong's waters reached the highest level in 2020, with a total of 18 individuals missing (the number for 2015 to 2019 were 13, 8, 14, 16 and 10 missing individuals, respectively). Some notable missing individuals included CH34 and NL272, which were re-sighted 119 and 79 times during the eight-year period of 2012-19 (including 21 and 15 re-sightings, respectively, in the previous two years). However, neither individual was observed in 2020 or during the first three months of 2021. It is also notable that among the 79 disappeared individuals, only eight of them have been sighted across the border since their absence in Hong Kong's waters. This also highlights the importance of conducting monitoring surveys and associated photo-ID works across the border in the entire Pearl River Estuary, as this would not only provide information on cross-boundary movements of individual dolphins, but could also confirm if individuals that have disappeared from Hong Kong's waters may still be alive across the border.

5.2. Distribution

5.2.1 Distribution of Chinese White Dolphins

During the 2020-21 monitoring period, Chinese White Dolphins were sighted frequently along the west coast of Lantau Island and at the northern portion of the SWL survey area (Figure 4). In contrast, only a handful of sightings were made throughout the North Lantau region and in the SEL survey area, while no dolphins were sighted at all in Deep Bay (Figure 4).

In 2020 alone, from the combined effort of the AFCD and HZMB-related surveys, dolphin occurrence was the highest along the west coast of Lantau, while they also occurred frequently at the northern portion of SWL waters. Furthermore, they mostly occurred in the northwestern (i.e. mainly near Lung Kwu Chau) and southwestern (i.e. west of the airport) ends of the North Lantau region (Figure 5). A closer look at dolphin distribution in North Lantau waters (including Deep Bay) revealed that the majority of dolphin sightings were found near Lung Kwu Chau. Outside of the Sha Chau and Lung Kwu Chau Marine Park, only a handful of dolphin groups were sighted near Black Point, to the west of the airport and adjacent to the HKLR alignment (Figure 6). However, they were completely absent from the central and eastern portions of the North Lantau region, including most of the peripheral area of the 3RS work zone as well as the footprints of the Hong Kong-Zhuhai-Macau bridge.

Dolphins occurred much more frequently throughout the WL survey area in 2020 (Figure 7), with higher concentrations near Tai O Peninsula, Kai Kung Shan and Peaked Hill, and all around the Fan Lau Peninsula. As in recent years, they appeared to occur more frequently along the inshore waters of WL, but less frequently further offshore along the western territorial border, especially in the southern portion of WL survey area. Notably, dolphins seldom occurred at the northern end of the WL survey area, especially near the HKLR alignment (Figure 7). In the South Lantau region, dolphins occurred regularly in the SWL survey area in 2020, particularly around Fan Lau Peninsula and in the inshore waters between Fan Lau and Shui Hau Peninsula. Only a few sightings were made in the proximity to the Soko Islands, while the dolphins were mostly absent from the southern part of SWL survey area (Figure 7). No dolphin was sighted at all in SEL survey area for the entire year of 2020, despite a considerable amount of survey effort.

5.2.2. Distribution of finless porpoises

From April 2020 to March 2021, two main clusters of porpoise occurrences were found in inshore waters around Shui Hau Peninsula and offshore waters to the south and east of Tai A Chau (Figure 8). Besides these two areas, porpoise sightings were sporadically scattered to the west of Shek Kwu Chau as well as in the offshore waters of the eastern survey areas. Notably, the porpoises were rarely sighted during the 12-month monitoring period in areas where they have occurred regularly and frequently in the past (e.g. around Shek Kwu Chau, Cheung Chau, Lamma Island, Po Toi Islands). As mentioned above, one exceptionally rare porpoise sighting was made to the west of Fan Lau Peninsula in March 2021.

Examination of temporal changes in porpoise distributions in the past four years (2017-20) revealed that the waters between the Soko Islands and Shek Kwu Chau have been consistently and frequently used by porpoises in recent years (Figure 9). Moreover, there appears to be more porpoise groups sighted around the Shui Hau Peninsula in 2020 than in previous years, and this could be related to the halt in high-speed ferry traffic due to the Covid-19 pandemic. This issue will be further examined in Section 5.9. Notably, despite the high usage of the waters between Shek Kwu Chau and the Soko Islands by the porpoises in 2020, the nearshore waters around Shek Kwu Chau are still being avoided by them, which was consistent with the findings in 2018 and 2019 (Figure 9). In the eastern survey areas, porpoise usage fluctuated greatly across different years, and porpoises rarely occurred around the Po Toi Islands in 2020, which was not the case in 2017 and 2019 (Figure 9).

5.3. Habitat Use

5.3.1. Habitat use patterns of Chinese White Dolphins

Habitat use patterns of Chinese White Dolphins were examined using the quantitative grid analysis, to calculate the SPSE and DPSE values (i.e. sighting densities and dolphin densities, respectively) in all grids among the six survey areas where they occurred regularly in 2020. These patterns were also compared to the annual patterns observed in recent years.

In 2020, all grids with high dolphin densities were concentrated along the coast of WL and the western portion of SWL, mainly extending from Tai O Peninsula toward Fan Lau Peninsula (Figure 10). This general habitat use pattern has also been consistently recorded in recent years. In contrast, with the exception of a handful of grids recorded low dolphin densities around Lung Kwu Chau, Sha Chau and Black Point, the rest of the North Lantau region (including Deep Bay) had no records of dolphin occurrence in 2020. Furthermore, the central portion of South Lantau waters only recorded low to medium dolphin usage, while they appeared to have avoided the eastern portion altogether for the entire year (Figure 10).

Temporal changes in dolphin habitat use patterns

A comparison was made among the habitat use patterns over the past decade to examine the temporal changes in dolphin densities in the western waters of Hong Kong. In WL, more intense habitat use was recorded with high densities in most grids during the period of 2013-15 (Figure 11). Since then, dolphin densities diminished progressively in most parts of the area in 2016 and 2017, before a slight rebound occurred in 2018 and 2019. In 2020, it appeared that dolphins once again diminished their usage of WL (Figure 11). Notably, dolphin usage in the northern portion of the WL survey area, which overlapped with the HKLR alignment, was fairly low in the period of 2015-17 as well as in 2019-20, when compared to the earlier years before and during the initial phase of HKLR construction (Figure 11). Dolphin usage should be continuously monitored in their priority habitats in WL waters, especially for the examination of the long-term impact of the bridge alignment on north-south movement of individual dolphins between the North and West Lantau regions.

In SWL waters, after a resurgence of dolphin habitat use in 2014-15, such use has continued to diminish in recent years. In the past three years, dolphins mostly utilized their priority habitats near Fan Lau Peninsula, but their usage elsewhere in SWL waters have been low to moderately low, and quite scattered mostly in the northern portion of the survey area (Figure 11).

In the North Lantau region, a dramatic decline in dolphin habitat use pattern has been well documented in recent years, with greatly diminished dolphin occurrences since 2013 (see Hung 2019, 2020). Such trend continued in 2020, with dolphin occurrence declining to the lowest point ever in this region (Figure 12). In recent years, dolphin usage has been largely confined to the western end of the North Lantau region, and in the past two years they mostly utilized the Sha Chau and Lung Kwu Chau Marine Park and with very low densities being recorded (Figure 12). The continuous absence of dolphins in the central and eastern portions of the region since 2015 is of great concern, as there have been no signs of recovery in dolphin habitat use, even after the marine works associated with the HZMB construction was completed in 2016, and the majority of the massive reclamation works associated with the third runway expansion was near completion in 2020.

<u>Temporal changes in dolphin habitat use patterns among six key habitats</u>

The temporal trends in dolphin usage at six key habitats were examined for the 17-year period between 2004-20, which included the three existing marine parks around Sha Chau and Lung Kwu Chau, the Brothers Islands as well as the southwestern corner of Lantau, one planned marine park around the Soko Islands, and two other “dolphin hot spots” at Tai O and Black Point where they regularly occurred in the past (Figure 13). To examine dolphin usage over these six key habitats that encompass a suite of grids, the number of on-effort sightings and amount of survey effort were pooled together from those grids, to calculate dolphin densities (DPSE) as a whole for each year during the 2004-20 period to track any changes over the years.

Within the Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP, with 17 grids), there has been a continuous decline in dolphin usage since 2013, and such usage fell even further to the lowest level in 2020 (Figure 14). Such an alarming decline raises serious concerns because this area has long been considered important dolphin habitat in Hong Kong (Hung 2008). Even at the historically lowest level of dolphin occurrence in 2020, the waters around Lung Kwu Chau remain the only habitat in the North Lantau region that is still being consistently utilized by dolphins. Furthermore, after a dramatic decline in dolphin usage since 2011, the Brothers Marine Park (BMP, with 15 grids) recorded zero dolphin density in six consecutive years in 2015-20. Although dolphin usage was expected to recover after the completion of most marine works associated with HZMB construction and the establishment of the BMP in December 2016, their occurrence around the Brothers Islands remains extremely rare during the past six years. Even though passive acoustic monitoring revealed that a very low level of dolphin detections was recorded within this marine park in recent years, most of these detections were made during night-time. With the near-absence of dolphins in this once-important dolphin habitat for quite a long time now, continuous acoustic monitoring of this area would become even more critical for detecting any signs of recovery in dolphin usage even at very low levels.

Notably, the recent PAM monitoring studies have also revealed clear declines in dolphin usage within SCLKCMP and BMP since 2017 (and even just between single monitoring periods). At both PAM sites that have been monitored acoustically for multiple years within each of the SCLKCMP and BMP, there are clear decreases in dolphin detections. At Lung Kwu Chau N, the proportion of logged days with at least one detection (DPD % of logged days) decreased from 98.65% in 2017-18 to 96.56% in 2018-19 and then to 88.92% in 2019-20. Similar consistent declines were also seen in this metric at BMP sites (Siu Ho Wan - 24.73 to 17.71 to 3.20%; and Tai Mo To - 21.17 to 12.05 to 3.91%) while at Sha Chau SE (SCLKCMP), there was a slightly increase from 2017-18 (35.64%) to 2018-19 (39.95%) before declining much further to the lowest level in 2019-20 (27.79%). The exact same patterns were observed at these sites in the mean detection positive minute per day (DPM/day) metric and clearly indicated decreasing occurrence of dolphins in the two marine parks to becoming very rare events at the BMP (Wang and Hung 2018, 2019 and 2020).

Continuing declines in dolphin acoustic detections over just a one-year period is concerning, as this suggests that the continuing construction activities in waters adjacent to the marine parks (e.g. the 3RS project and the Tung Chung New Town Development reclamation project) are having noticeable impacts on dolphin occurrence within the protected waters of SCLKCMP and BMP even over a fairly short period of time. As such, the protection afforded by the marine parks is clearly ineffective at mitigating such threats that originate outside the marine parks (Wang and Hung 2019). Continuous monitoring of these two marine parks with visual surveys and passive acoustic methods concurrently would be essential in the coming years to provide a more comprehensive understanding of the anthropogenic impacts on the dolphins' usage of and the effectiveness of the protection provided by marine parks in the North Lantau region.

Besides a noticeable increase in dolphin usage in 2014 and 2015 within the recently established Southwest Lantau Marine Park (SWLMP, with 15 grids), such usage has remained fairly steady and high in the past decade (Figure 14). It should be noted that this marine park has consistently recorded the highest levels of dolphin usage among all key dolphin habitats in western Hong Kong during the past 17 years, and this last remaining stronghold of the top priority dolphin habitats should be closely monitored to examine any sign of temporal changes in their future usage (Figure 14). Comparing data from the PAM monitoring periods of 2018-19 and 2019-20 revealed little and inconsistent changes in dolphin acoustic detections between these two periods in SWLMP (i.e. the DPD % logged days increased slightly in 2019-20 while mean DPMs/day decreased slightly). However, comparing the data from during these two periods with data available from some initial monitoring at Fan Lau in 2013 (and during the same 108-day period from February 4 to May 31), showed a dramatic decline in mean DPM/day from 2013 (240.45) to 2019 (62.81) and then again to 2020 (33.69). There was little change in DPD % of logged days between 2013 (99.07%) and 2019 (100%) but a more noticeable decline in 2020 (94.44%).

After a dramatic decline in dolphin densities was detected in the planned South Lantau Marine Park (SLMP, with 30 grids) in 2018, dolphin usage there rebounded to a slightly higher level in 2019 and 2020 (Figure 14). This increase could be linked to a 20% drop in high-speed ferry volume in the South Lantau Vessel Fairway between 2018 and 2019, as such decline in marine traffic may have provided a safer and less noisy passage for dolphins to reach the South Lantau Marine Park from SWLMP and the southern coast of Lantau. However, the complete halt for the high-speed ferry service since February 2020 due to the Covid-19 pandemic did not result in even higher dolphin usage in SLMP in 2020 as expected. The impact of the complete halt of high-speed ferry traffic on dolphin usage in the South Lantau region will be further examined in Section 5.9. Furthermore, comparing data from the PAM monitoring periods of 2018-19 and 2019-20 obtained from the Tai A Chau S site within SLMP showed no signs of a rebound in dolphin acoustic detections but instead a dramatic decline in mean DPM/day and DPD % of logged days between these two periods (i.e.

1.57 to 0.06 DPMs/day and 30.33 to 2.09% of logged days having at least one detection). Comparing data from these two periods with data available from some initial PAM monitoring at this site in 2016-17 (and during the same 147-day period from October 8^{th} to June 12^{th}) showed a dramatic decline in mean DPM/day from 2016-17 (1.56) to 2018-19 (0.49) and then again to 2019-20 (0.03). There was little change in DPD % of logged days between 2016-17 (20.41%) and 2018-19 (21.09%) but a sharp decline occurred in 2019-20 (2.04%).

Once identified as a critical dolphin habitat in the western waters of Hong Kong, the waters around Tai O Peninsula (with four grids) also recorded a steady decline in dolphin densities from the highest in 2009 to the lowest in 2017, 2018 and 2020 (even though a slight rebound was recorded in 2019) (Figure 14). The dolphin usage at Black Point (with four grids) fluctuated greatly in earlier years with no apparent trend. After a near complete absence from this area between 2014 and 2018, dolphin usage has climbed back to a slightly higher level in 2019 before falling to a very low level in 2020 (Figure 14). As this area is situated at the border of a proposed large-scale reclamation site at Lung Kwu Tan and only a few kilometres away from the Sha Chau and Lung Kwu Chau Marine Park, special attention on dolphin habitat use in this area in the near future is needed.

5.3.2. Habitat use patterns of finless porpoises

The spatial pattern of porpoise habitat use in 2020 revealed that the more heavily utilized habitats were mostly confined to the south of Tai A Chau as well as the offshore waters at the juncture of SEL and SWL survey areas (Figure 15). In addition, a number of grids in LM and PT survey areas also recorded very high porpoise densities in 2020, but these results should be treated with caution because the relatively low amount of survey effort conducted during the one-year period could have heavily biased the results.

In order to increase the sample size, the survey effort and porpoise data collected from 2016-20 were pooled and analyzed for a longer period in order to obtain sufficient survey data to provide a better representation of porpoise habitat use pattern in the southern and eastern waters of Hong Kong in recent years. Since finless porpoises in Hong Kong exhibit pronounced seasonal patterns of distribution, with rare occurrence in each survey area during certain periods of the year (Hung 2005, 2008; Jefferson et al. 2002), the five-year dataset was further stratified into winter/spring (December through May) and summer/autumn (June through November) periods to deduce habitat use patterns of porpoises for the respective dry and wet seasons.

For the examination of porpoise habitat use patterns during the dry season (winter and spring months) in 2016-20, in which almost all survey effort was allocated to the SWL, SEL and LM survey areas, the grids with high porpoise densities mainly clustered in the offshore waters between Shek Kwu Chau and the Soko Islands, as well as a few places near Cheung Chau and Shek Kwu Chau (Figure 16). However, it should be noted that there has been a dramatic decline in porpoise densities near Shek Kwu Chau since the construction of the IWMF commenced in 2018 (see below on temporal changes in porpoise habitat use patterns). Furthermore, during the dry season in 2016-20, porpoises seldom utilized the inshore waters and western portion of the South Lantau region, the offshore waters to the south of Cheung Chau, and the southwestern, eastern and northern portions of the LM survey area (Figure 16).

In the eastern survey areas, more survey effort was allocated there during the wet season (summer and autumn months) of 2016-20, while the survey effort remained relatively consistent in the SWL and SEL waters year-round, but with much lower survey efforts in LM waters. For the five-year period, porpoise densities were moderate around the Po Toi Islands, in the offshore waters in the PT survey area, as well as at the juncture of the PT and NP survey areas (Figure 17). Although some grids in NP and SK recorded very high porpoise densities, these results could still be biased as the survey effort accumulated over the five-year period in these survey areas was relatively low (less than 10 units of survey effort in total for most grids). Furthermore, even though porpoises occurred mostly in the offshore waters of South Lantau and Lamma Island during the wet season in 2016-20, densities in these areas were much lower than during the dry season (Figure 17).

Temporal changes in porpoise habitat use patterns

To examine the recent temporal changes in porpoise densities at various important habitats in southern waters of Hong Kong, comparisons were made on porpoise habitat use patterns across the past six years in 2015-20. During the three-year period of 2015-17, porpoise usage at the offshore waters between Shek Kwu Chau and the Soko Islands as well as to the south of Cheung Chau was consistently at a high level. However, such usage has evidently changed in the past three years of 2018-20, with noticeable declines at the abovementioned important porpoise habitats, especially around Shek Kwu Chau, which is possibly linked to the recent IWMF construction (Figure 18). In contrast, porpoise usage of the waters to the west of Lamma Island fluctuated greatly during the six-year period, with more extensive and intense usage in 2016 and 2017 but more sporadic occurrences in 2019 and 2020 (Figure 18).

Three key porpoise habitats in South Lantau (including the planned SLMP, Shek Kwu Chau and Pui O Wan) were examined for temporal trends in their usage across a 16-year period between 2004 and 2020 (Figure 13). Similar to the Chinese White Dolphins, to examine temporal trends in porpoise usage of these key habitats that encompass a suite of grids, the number of on-effort porpoise sightings and unit of survey effort were pooled together from those grids, to calculate porpoise densities (DPSE) as a whole for each year from 2004 to 2020.

Porpoise usage fluctuated greatly at the planned SLMP (with 30 grids) in the past 17 years, starting with very low levels between 2004-09 (albeit a strong surge occurred in 2007) (Figure 19). Since 2010, there was a steady increase in porpoise usage of this area to the highest level in 2014. In contrast, porpoise usage within this planned marine park in the past six years has become more unstable, with notable drops in 2016 and 2019 (Figure 19). Comparing data from the PAM monitoring periods of 2018-19 and 2019-20 obtained from the Tai A Chau S site within SLMP also revealed a clear decline in mean DPM/day and DPD % of logged days between these two periods (i.e. 45.44 to 31.18 DPMs/day and 94.43 to 81.25% of logged days having at least one detection). Comparing data from these two monitoring periods with data available from some initial PAM monitoring at this site in 2016-17 and during the same 147-day period (from October 8th to June 12th), also showed a dramatic decline in mean DPM/day from 2016-17 (215.94) to 2018-19 (42.44) and then again to 2019-20 (28.06), and in DPD % of logged days from 99.32% (2016-17) to 97.28% (2018-19) and then further to 86.39% (2019-20).

The inshore waters of Pui O Wan (with nine grids) were consistently used by porpoises in the earlier years and such usage maintained at a higher level until 2010, when the porpoises began to use these waters infrequently between 2010 and 2013 (Figure 19). Since then, porpoise usage rebounded to a higher level in the subsequent years, with the exception of a noticeable drop on 2018 and 2020, which coincided with the dramatic decline in porpoise usage at nearby Shek Kwu Chau in recent years.

Since 2007, the surrounding waters of Shek Kwu Chau (with eight grids) were consistently utilized by the porpoises as a priority habitat. In recent years, there was a steady increase from 2013 to a much higher level in 2016 (Figure 19). However, there was a sharp decline in porpoise usage to the lowest levels in 2018-20. The dramatic decline in porpoise usage of this habitat in the past three consecutive years may be linked to the construction activities near Shek Kwu Chau in association with the reclamation works for IWMF, as the preparation works began in March 2018, while the reclamation works commenced in June 2018. Such a sharp decline at this once-critical porpoise habitat should raise serious concerns about the impacts of the IWMF project and whether the waters around Shek Kwu Chau could still serve important functions for porpoises that regularly occur in Hong Kong waters. Temporal trends in their habitat use near Shek Kwu Chau as well as for the entire southern waters of Hong Kong should be closely monitored as the IWMF construction works continue over the next few years.

5.4. Group Size, Calf Occurrence and Activities

5.4.1. Group sizes of dolphins and porpoises

During the 2020-21 monitoring period, the group sizes of Chinese White Dolphins varied from singletons to 19 animals, with an overall mean of 3.1 ± 2.53 (n = 243). Among the four areas where dolphins occurred in 2020-21, the mean group sizes were the lowest in SEL (1.0 with only one lone individual sighted) and highest in WL (3.3) (Table 1a). Mean group sizes were similar across the four seasons, which were slightly higher in both summer and winter (3.3 for both seasons) and slightly lower in spring (2.7) and autumn (3.0). As in past monitoring periods, the majority of dolphin groups sighted in 2020-21 were small, with 56.0% of the groups composed of 1-2 animals, and 75.3% of the groups with fewer than five animals. Only five out of the 243 dolphin groups consisted of more than ten animals (Figure 20).

The examination of long-term trend in annual mean dolphin group sizes since 2002 revealed that the mean group sizes in recent years have stabilized with remarkably similar levels (i.e. 3.23-3.28) in five consecutive years of 2016-20 (Figure 21). However, it should be noted that among different survey areas, the mean group size in NWL was at the lowest level in three consecutive years of 2018-20, while mean group size in SWL remained higher in both 2019 and 2020 when compared to previous years. Temporal changes in mean dolphin group sizes should be continuously monitored, as this could be indicative of changes in their foraging strategies in response to increased disturbance from various sources or changes in prey distribution and overall prey resources in the western waters of Hong Kong.

Distribution of dolphins in different group size categories in 2020 is shown in Figure 22. Larger dolphin groups occurred predominantly along the WL coastline, with the very large groups (10+ dolphins per group) mostly occurred between Kai Kung Shan and Fan Lau Peninsula (Figure 22). Elsewhere, only a few larger groups occurred in the North Lantau region (only around Lung Kwu Chau) as well as the northern portion of SWL survey area (mainly between Siu A Chau and Shui Hau Peninsula). In contrast, the smaller dolphin groups were evenly distributed throughout the main distribution of dolphins around Lantau waters in 2020 (Figure 22). As in previous years, the groups that occurred at the periphery of the distribution were usually smaller.

Group sizes of finless porpoises during the 2020-21 monitoring period varied from singletons to 13 animals, with an overall mean of 2.7 ± 2.36 (n=85). The majority of the groups were very small, with 63.5% being composed of 1-2 animals, and all except ten groups (or 88.2% of all groups) had fewer than five animals (Figure 23). The mean group sizes in the NP (3.5), SEL (3.2) and SWL (2.8) were all above the overall mean, while the ones in LM (2.1) and PT (1.8) were below (Table 1b). Notably, all three groups sighted in SK were singletons.

For the first time, temporal trend in annual mean porpoise group sizes were examined between 2007 and 2020 (Figure 24). Over the 14-year period, mean porpoise group sizes have fluctuated greatly, but there appeared to be a steady increase from the lowest in 2009 to the second highest recorded in 2016 (albeit a large spike in 2012). Since then, such figures have fallen to a lower level in three of the past four years (except another spike in 2019). It would be beneficial to continue monitoring such trend, to determine whether there are any changes in the porpoises' foraging strategies in response to anthropogenic impacts such as increased vessel traffic disturbance or any changes in prey distribution and resources.

Distribution of porpoises in different group sizes in 2020 showed that the larger porpoise groups mainly clustered to the south of Tai A Chau as well as between the Shui Hau Peninsula and Shek Kwu Chau (Figure 25). In contrast, porpoise groups sighted in the eastern survey areas of PT, NP and SK as well as in LM waters and around Cheung Chau were generally small. The important porpoise habitat identified in 2020 in the offshore waters between Shek Kwu Chau and the Soko Islands were also dominated by smaller groups of porpoises (Figure 25).

5.4.2. Occurrence of dolphin calves

Of the 654 dolphins sighted altogether in 2020, 74.1% of them were categorized into six age classes. Among them, the spotted adults (26.0%) and spotted juveniles (20.0%) comprised the largest proportion of dolphins being identified with their age classes, which is similar to the past several years. Three unspotted calves (UC, or newborn calves) and 14 unspotted juveniles (UJ, or older calves) were sighted in 2020, with these combined comprising only 2.2% of the total. Notably, the three newborn calves belonged to three identified females respectively (i.e. WL145 sighted on January 2020, CH108 sighted on July 2020 and CH38 sighted on November 2020). However, the newborn calves of CH38 have disappeared from her during subsequent sightings, while the newborn calves of CH108 and WL145 still accompanied their respective mothers in their last re-sightings made in December 2020 and February 2021, respectively.

After a steady decline in the past six years in young calf occurrence in Hong Kong's waters, falling from the annual percentage of 5.8% in 2013 to the lowest of 1.5% in 2018, there appears to be a small rebound in 2019 (2.5%) and 2020 (2.2%) (Table 2; Figure 26). However, calf occurrence in the past two years still remains at a very low level when compared to earlier years. The declining occurrence of dolphin calves in recent years is of great concern because such low levels of recruitment cast a very worrisome future for the local dolphin population. As mother-calf pairs are more susceptible to anthropogenic disturbances, the exceptionally low percentages of young calves in recent years certainly raises some concerns about the suitability of Hong Kong's waters for reproduction and the rearing of calves, with the presence of the increasing adverse impacts of various coastal development projects and high level of vessel activities within their habitats around Lantau Island. A follow-up examination on several life history parameters deduced from the long-term photo-identification data is conducted in this report (see Section 5.8) to examine the critical issue of calf survival over the past two decades of dolphin monitoring.

Distribution of young calves in 2020 is shown in Figure 27. With the exception of two UJs sighted to the south of Kau Ling Chung, almost all young calves were located between Tai O Peninsula and Fan Lau Peninsula in WL waters, with the three UCs occurring near Kai Kung Shan and Fan Lau. In contrast, no young calves were found in the North Lantau region in 2020. In fact, January 2014 was the last time that an UC was sighted in North Lantau region, and there were only 14 UJs sighted there in the past five years.

Temporal changes in habitat use patterns of UCs (newborn calves) and UJs (older calves) in the past two decades are examined in details using the quantitative grid analysis. Among the four five-year periods (i.e. 2001-05, 2006-10, 2011-15 and 2016-20), a progressive decline in the occurrence of newborn calves around Lantau Island is evident. In 2001-05, such occurrence was wide-spread in the North Lantau region and along the WL coastal waters, with moderate densities around Lung Kwu

Chau and the Brothers Islands, and high to very high densities near Tai O Peninsula, Peaked Hill and Fan Lau (Figure 28). In the subsequent period of 2006-10, the occurrence of newborn calves appeared to be more confined to the Sha Chau and Lung Kwu Chau Marine Park with higher densities. In 2011-15, calf occurrence became more widespread once again, with grids near Lung Kwu Tan and around the Brothers Islands also recording moderate densities in the North Lantau region, while many grids in WL waters and a few in SWL waters recorded moderately high densities (Figure 28). However, a dramatic change in occurrence of newborn calves was evident in the recent years of 2016-20: they were completely absent from the North and South Lantau regions, while the grids that recorded their presence in WL waters were mostly in low densities (Figure 28).

Similar decline in the occurrence of older calves around Lantau Island is also observed in the past decades (Figure 29). In the earlier years of 2001-05 and 2006-10, occurrence of older calves was widespread in North, West and Southwest Lantau waters, with high densities found in grids near Lung Kwu Chau, around the Brothers Islands, and throughout WL waters spreading from Shum Wat to Fan Lau Peninsula (Figure 29). However, even though such occurrence was still widespread in North and West Lantau waters in 2011-15, the densities of older calves were mostly low to moderate, with the exception of the grids near Peaked Hill and Fan Lau. In the most recent period of 2016-20, their presence was only confined to several grids at the western end of the North Lantau region as well as the northern portion of SWL waters, while their densities were generally low among all grids in WL waters (Figure 29).

5.4.3. Activities of dolphins

In 2020, 23 (or 9.4%) and eight (or 3.3%) groups of all dolphin sightings were observed to be engaged in feeding and socializing activities, respectively. None of the groups was observed to be engaged in traveling or milling/resting activity in 2020. Annual percentages of both feeding and socializing activities remained at similarly low levels over the past five years (Figure 30) and the diminished occurrence of both of these activities in recent years is alarming, because they serve important functions in the daily lives of dolphins. This would also reflect the overall deterioration of habitat quality in western Hong Kong’s waters for Chinese White Dolphins, as the anthropogenic disturbances continue to affect their different usage of Hong Kong waters.

Distribution of dolphins engaged in different activities in 2020 is shown in Figure 31. Besides two groups scattered near Lung Kwu Chau and at the southwest corner of the 3RS work zone in NWL, the majority of dolphin groups associated with feeding activities were found along the stretch of coastlines, ranging from Tai O Peninsula to Fan Lau in WL as well as from Fan Lau to Shui Hau Peninsula in SWL (Figure 31). On the other hand, with the exception of two groups sighted near Lung Kwu Chau and at the tip of Fan Lau Peninsula, the rest of the sightings associated with socializing activities were found in the coastal waters between Tai O Peninsula and Peaked Hill (Figure 31).

Temporal changes in habitat use patterns of dolphins engaged in feeding and socializing activities in the past two decades are examined in detail using the quantitative grid analysis. During the first three five-year periods (i.e. 2001-05, 2006-10 and 2011-15), densities of dolphin groups engaged in feeding activities were consistently higher along the coastal waters of WL survey area, but such occurrences have diminished over the years in the North Lantau region, especially around the Sha Chau and Lung Kwu Chau Marine Park and the Brothers Islands (Figure 32). In contrast, the occurrence of dolphin groups engaged in feeding activities became more intense and widespread in SWL waters in 2011-15 than the previous two five-year periods. However, such occurrence has diminished noticeably across the North, West and South Lantau regions in the most recent five-year period of 2016-20, with most grids recording only low to moderately low densities, as well as a complete absence in the NEL waters (Figure 32).

A similar trend was also observed in the occurrence of dolphins engaged in socializing activities (Figure 33). Although densities progressively diminished around Lantau waters across the first three five-year periods of 2001-05, 2006-10 and 2011-15, such occurrences were still widespread. However, in the most recent years of 2016-20, occurrence of dolphins engaged in socializing was largely restricted to the western end of the North Lantau region and northern end of SWL waters and in very low densities. Moreover, even though most grids recorded occurrence of dolphins engaged in socializing activities in WL waters in 2016-20, such densities dropped to a very low level throughout the area (Figure 33).

5.4.4. Dolphin associations with fishing boats

Among the 243 groups of dolphins sighted during the 2020-21 monitoring period, only eight (or 3.3% of all groups) were associated with operating fishing boats. Six of these groups were associated with purse-seiners, while the other two groups were associated with gill-netters.

After reaching the lowest level (1.8%) in 2018, the overall annual percentage of dolphin sightings associated with fishing boats in 2019 (2.4%) and 2020 (2.0%) still remained at low levels. The five dolphin groups associated with operating fishing boats (all were with purse-seiners) in 2020 were distributed along the coastline in the SWL survey area, ranging from Fan Lau Peninsula to the eastern end of the Shui Hau Peninsula (Figure 34).

5.5. Encounter Rate

5.5.1. Encounter rates of Chinese White Dolphins

To calculate the encounter rates of Chinese White Dolphins, only survey data collected in Beaufort 0-3 conditions was included in the analysis as in past monitoring periods. From April 2020 to March 2021, the combined encounter rates of dolphins from the four survey areas of NEL, NWL, WL and SWL was 3.3, which was the second lowest among all monitoring periods since 2002-03 (with the previous low of 3.0 recorded in 2018-19; Figure 35a & Table 3). After a steady decline of dolphin encounter rates in the past eight monitoring periods in 2011-19 and followed by a slight rebound in 2019-20, the rate in 2020-21 dropped slightly to a lower level. Among different survey areas, the encounter rates in NWL during the past two monitoring periods in 2019-20 and 2020-21 were at the historical lowest level, while the 2020-21 encounter rate in the WL survey area also fell to the lowest level among all monitoring periods (Figure 35b).

As consistently recorded in all past monitoring periods, WL continued to have the highest encounter rate (11.6) among the three survey areas with dolphin occurrence, and was considerably higher than the rates in SWL (3.1) and NWL (1.1) (Table 3). The encounter rate in NEL was once again zero, as no on-effort dolphin sighting was made during 1,449.0 km of survey effort. Similar to the previous seven monitoring periods, dolphin encounter rate in 2020-21 was once again higher in SWL than in NWL, which is the opposite of observations made in earlier years (Table 3).

<u>Temporal trend in annual encounter rate</u>

Temporal trends in annual dolphin encounter rates since 2002 were examined for the overall combined areas (i.e. NEL, NWL, WL and SWL), as well as the North Lantau and West/Southwest Lantau regions. The overall encounter rate of the combined areas in 2020 was the second lowest since 2002 (the lowest being recorded in 2018) (Figure 36a). After a steep decline in the past four years between 2015 and 2018, the combined rate in 2019 appears to have rebounded slightly, before another small drop once again in 2020 (Figure 36a). Notably, the dolphin encounter rate in the entire North Lantau region (NEL and NWL survey areas combined) in 2020 remained at the lowest level as was also observed in 2019, while the rate for the West/Southwest Lantau regions dropped to the second lowest in 2020 after a slight rebound in 2019 (Figure 36b).

5.5.2. Encounter rates of finless porpoises

Encounter rates of finless porpoises were calculated using data collected in Beaufort 0-2 conditions, since the porpoise encounter rate was once again much lower in Beaufort 3 or more conditions (0.9 porpoises per 100 km of survey effort) than in Beaufort 0-2 conditions (1.8) in 2020-21 and this difference remains consistent with that documented in past monitoring periods.

From April 2020 to March 2021, the combined porpoise encounter rate of SWL, SEL, LM and PT survey areas was 1.9 sightings per 100 km of survey effort (Table 4). This rate was the lowest among the past 14 monitoring periods, with the second and third lowest rates being recorded in the 2018-19 and 2007-08 monitoring periods, respectively (Figure 37). Among the six survey areas with porpoise occurrences during the 2020-21 monitoring period, the encounter rates were highest in SK (3.3) and SWL (2.8), while the rate in SEL (2.3) was slightly higher than the overall encounter rate. In contrast, the encounter rates for NP (0.4), PT (1.5) and LM (1.4) were all lower than the overall rate.

Annual porpoise encounter rates from the combined areas of SWL, SEL, LM and PT indicates that the overall porpoise usage of Hong Kong’s waters have fluctuated annually since 2002. However, there appeared to be a consistent decline from 2013 to the lowest levels in the past three years of 2018-20 (Figure 38a). To account for potential frequent movements across the SEL, SWL and LM survey areas in winter and spring months (i.e. their peak season of occurrence), data from these three areas were pooled to calculate the annual porpoise encounter rates in the southern waters of Hong Kong collectively for another examination of temporal trends over the past decade. After dropping to the lowest level in 2019 since 2007, there was a moderate rebound in the porpoise encounter rate in 2020 (Figure 38b).

Among the four survey areas, the variability in annual porpoise encounter rates was evident, with no apparent long-term trend in any of these four areas (Figure 39). However, the SEL survey area apparently experienced a noticeable drop in porpoise annual encounter rates in the past three consecutive years, while there was a large rebound observed in the SWL survey area in 2020. Moreover, the annual encounter rate remained very low in LM for four consecutive years in 2017-20, and the one in PT has fluctuated across years without any consistent trend (Figure 39).

5.6. Density and Abundance

5.6.1. Estimates of dolphin density and abundance in 2020

Densities and abundance of Chinese White Dolphins were estimated for the NEL, NWL, WL and SWL survey areas using the line-transect analysis method, following similar approach as in previous years of dolphin monitoring in Hong Kong (see Hung 2019, 2020). The annual estimates deduced from the 2020 monitoring data can be used to assess the long-term temporal trend in dolphin occurrence in Hong Kong. Only effort and sighting data collected from the four areas during Beaufort 0-3 conditions were used in the analysis and this included 6,597.1 km of survey effort and 188 dolphin groups from the four areas for density and abundance estimations in 2020 (Table 5a).

Among the four survey areas, WL recorded the highest dolphin density, with 68.79 individuals/100 km^2, which was three and 21 times higher than the densities in SWL and NWL, respectively (Table 5a). Notably, the WL figure in 2020 was the fourth lowest in the past decade after a strong rebound recorded in 2019. Dolphin density in SWL in 2020 fell slightly from the previous year to a moderate level after a noticeable increase from 2018 to 2019. In contrast, the density estimate for NWL in 2020 (3.21 individuals/100 km^2) was the lowest among all years since 2001, with the second and third lowest being recorded in 2019 and 2018. Furthermore, as in the previous four years, dolphin density and abundance could not be estimated for NEL in 2020 because no dolphin was sighted in this area for the entire year.

In 2020, the abundance estimates of Chinese White Dolphins were 19, 15 and 3 dolphins in the WL, SWL and NWL survey areas, respectively, while no dolphins were observed in the NEL survey area. This estimate for the four areas combined was 37 dolphins (Table 5b). The coefficient of variations (CVs) remained low to moderate for the 2020 estimates in WL (16%), SWL (37%) and NWL (43%) and therefore the abundance estimates for the year should be reliable (Table 5a). After a steady decline in combined abundance estimates from 188 dolphins in 2003 to the lowest of 32 dolphins in 2018, a noticeable rebound was observed in 2019 (52 dolphins), followed by the noticeable drop in the most recent estimate of 2020 (Figure 40; Table 5b).

5.6.2. Temporal trends in dolphin abundance

Temporal trends of annual dolphin abundance in NWL/NEL (2001-20), SWL

(2002-20) as well as WL (2003-20) were further examined, where consistent amount of survey effort (at least 500 km of annual survey effort) has been conducted in these four areas of major dolphin occurrence. In SWL, temporal trend of annual estimates was only examined for the past decade (2010-20) but not for a longer period, as consistent survey effort (at least 500 km of survey effort per year) was not collected annually prior to 2010. Alternatively, biennial estimates were deduced in SWL for 2002-03, 2004-05, 2006-07 and 2008-09 to examine the overall temporal trend in dolphin abundance over a longer period.

Firstly, the temporal trend in SWL showed fluctuations across the years, with a marked decline from the highest in 2002-03 (30 dolphins) to the lowest in 2006-07 (six dolphins) (Figure 41). Since then, the annual abundance estimates have remained at a lower level in subsequent periods, before a noticeable rebound in 2014 and 2015. Thereafter, abundance estimates dropped again and to much lower levels in the three subsequent years of 2016-18, before another rebound occurred in 2019 and 2020 (Figure 41; Table 5b). Notably, the associated CVs of the annual abundance estimates in SWL remained moderate and within the range of 20-40% (except for the biennial estimates in 2002-03 (45%) as well as the annual estimates in 2010 (67%) and 2012 (54%)), so the estimates should be reliable for most years.

In WL, dolphin abundance steadily decreased from 54 dolphins in 2007 to only 17 dolphins in 2012 (Figure 42; Table 5b). After a rebound in 2013 and 2014 (with 23 and 36 dolphins, respectively), there was another steady decline in the following years of 2015-20, with the exception of a noticeable spike in 2019. In contrast, dolphin abundance in the North Lantau region showed a dramatic decline in the past two decades. In NEL, the decline was appalling, dropping from the highest in 2001 (20 dolphins) to one dolphin in 2014 and then to zero for six consecutive years (2015-20) (Figure 42). Dolphin abundance in NWL also dropped steadily and steeply from the highest in 2003 (84 dolphins) to the lowest in 2020 (three dolphins), which is a 96.4% decline since 2003, or a 92.5% drop since 2012 (Figure 42).

Using linear regression models, the test statistics for hypotheses $H_0\!:b=0$ vs. $H_1\!:b<0$ in the respective four areas were found to be as follow:

- <u>NEL (2001-20)</u>: the test statistic for the hypotheses was -8.9969 ($p \ll 0.0000$). Therefore, the hypothesis H_0 was rejected at the 5% level of significance, so the decline in dolphin abundance in NEL was statistically significant.

- <u>NWL (2001-20)</u>: the test statistic for the hypotheses was -15.9334 ($p \ll 0.0000$). Therefore, the hypothesis H_0 was rejected at the 5% level of significance, so the decline in dolphin abundance in NWL was statistically significant.

- <u>WL (2003-20)</u>: the test statistic for the hypotheses was -6.3000 ($p \ll 0.0000$). Therefore, the hypothesis H_0 was rejected at the 5% level of significance, so the decline in dolphin abundance in WL was statistically significant.
- <u>SWL (2010-20)</u>: the test statistic for the hypotheses was -0.0140 ($p = 0.4945$). Therefore, the hypothesis H_0 was not rejected at the 5% level of significance, so there was no statistically significant decline.

- <u>Combined estimates from NEL, NWL, WL and SWL (2010-20)</u>: the test statistic for the hypotheses was -6.1618 ($p = 0.0004$). Therefore, the hypothesis H_0 was rejected at the 5% level of significance, so the decline in the combined dolphin abundance was statistically significant.

In summary, clearly significant declines in annual dolphin abundance were detected in each of the three survey areas in NEL, NWL and WL in the past two decades. When the abundance estimates of SWL were considered together with the other three areas collectively, there was also a significant downward trend in overall annual dolphin abundance over the past decade.

5.7. Range Use, Residency and Movement Patterns of Individual Dolphins

5.7.1. Individual range use, residency pattern and core area use

<u>Individual Range Use</u>

In order to examine the range use of individual Chinese White Dolphins, the 95% UD kernel ranges of 111 individuals that occurred in Hong Kong's survey areas in 2020 (as identified through photo-identification works) were deduced using the fixed kernel method, and their ranging patterns are shown in Appendix V. In addition, 103 of these individual dolphins that occurred in 2020 and also had a history of being sighted ≥15 times were further examined for their range use and residency patterns (Table 6).

Among these 103 individuals, all except one (NL286) had occurred in WL in the past, while the majority of them had also occurred in NWL (68.9%) and SWL (83.5%), and to a lesser extent in NEL (18.4%) and DB (10.7%) (Table 6). In contrast, only four and two individuals had been re-sighted in the SEL or EL survey areas, respectively, as part of their historical range. Furthermore, 85 of these 103 individuals (or 82.5%) occupied ranges that spanned the waters of Hong Kong and the Mainland

(Table 6), indicating cross-boundary movements by many individual dolphins that occur regularly in Hong Kong's waters. However, many of these individuals occurred just to the west of the territorial boundary without venturing much further into Lingding Bay (see Appendix V).

Residency Pattern

The residency patterns of 98 individuals were further assessed by examining their annual and monthly occurrences in Hong Kong, as five other individuals (i.e. NL331, WL283, WL286, WL291 and WL294) were only recently identified and re-sighted in the past several years, and therefore their annual occurrence could not be reliably assessed. Overall, 67 and 29 individuals were identified as year-round and seasonal residents respectively, while two individuals were identified as seasonal visitors (Table 6). Therefore, 98% of the assessed individuals were considered residents in Hong Kong, as they have been sighted consistently in the past 12 years (i.e. 2009-20), or in at least five consecutive years. However, the proportion of visitors (2%) that utilized Hong Kong's waters could be seriously underestimated, as these visitors would have infrequently utilized Hong Kong waters, and it will be harder for them to reach the minimum threshold on the number of re-sightings required for this analysis. Moreover, based on the monthly occurrences of these 98 individuals, 32% of them only occurred in Hong Kong during certain months of the year, while the rest occurred here year-round (Table 6).

In addition to their residency patterns, attempts were made to classify the 98 individuals into the two social clusters that occurred regularly in Hong Kong (see Dungan et al. 2012), based on their overall range use at 95% UD level as well as core area use at 50% UD and 25% UD levels. Results indicated that 14 individuals (14%) and 78 individuals (80%) belonged to the northern and southern social clusters, respectively (Table 6). In addition, there were also 11 individuals that spanned their range use more or less evenly across North and West Lantau waters with frequent occurrences in both waters and the majority of them (e.g. NL120, NL226, NL261) shifting their range use from North Lantau waters to WL and SWL waters in recent years (see Appendix V).

Core Area Use

The analysis on individual core area use revealed that four major core areas of dolphin activities are located around Lung Kwu Chau, the Brothers Islands, in SWL waters, and along the coast of West Lantau, with the latter further subdivided into Tai O, Peaked Hill and Fan Lau. Among the 103 individuals, 24 and 17 individuals occupied

Lung Kwu Chau as their 50% and 25% UD core areas, respectively, while only eight and six individuals occupied the Brothers Islands as their 50% and 25% UD core areas, respectively (Table 6). More than half of these individuals that utilized Lung Kwu Chau and the Brothers Islands as their core areas belonged to the northern social cluster.

In contrast, 87 and 85 individuals utilized the waters along the west coast of Lantau as their 50% UD and 25% UD core areas, respectively, with the majority of them belonging to the southern social cluster (Table 6). As there has been a surge of individuals expanding or shifting their range use into SWL waters in recent years, there were also 18 and seven individuals that have utilized South Lantau waters as their 50% and 25% UD core areas, respectively (Table 6).

5.7.2. Individual movement pattern

By combining all photo-identification data collected through the present monitoring study and other studies, movement patterns of individual dolphins within Hong Kong territorial waters in 2020-21 were broadly examined. From April 2020 to March 2021, 135 individuals were re-sighted a total of 590 times, with 96 individuals being re-sighted more than once (i.e. occurred at more than one location).

The examination of individual movement patterns between re-sightings revealed that 73 individuals moved across different survey areas around Lantau in 2020-21. That included 25 individuals that occurred across NWL and WL survey areas, and 61 individuals that were re-sighted in both SWL and WL survey areas (Table 7). Moreover, 13 individuals occurred in all three areas of NWL, WL and SWL, covering extensive ranges during the 12-month study period. As in recent monitoring periods, no sighting was made in NEL during the 2020-21 monitoring period so there was no movement of individuals into this once-important habitat.

With an extensive amount of photo-identification data being collected from different surveys during 2020-21, there were still a significant portion of individual dolphins sighted repeatedly within just a single survey area and did not range into neighbouring areas. These included 21 individuals that occurred exclusively in the WL survey area, and two individuals that were only re-sighted in the SWL waters. Their restricted movements within Hong Kong’s waters could be a concern, as this could be related to potential obstructions to movements across different survey areas as a result of human activities (e.g. high-speed ferry traffic) or infrastructure projects (e.g. reclamation).

The temporal trend in individual movement patterns across different survey areas was examined for the past 11 monitoring periods, in order to provide insights into temporal changes in their intensity of movements as a result of various anthropogenic factors. Besides the dramatic decline in dolphin movements between NEL and NWL survey areas due to the absence of dolphin occurrence in NEL in recent years, there were other notable changes. For example, there was a continuous decline in dolphin movements across the NWL and WL survey areas during the past four monitoring periods, and the level in 2020-21 was the second lowest among all monitoring periods in the past decade (Figure 43; Table 7). Furthermore, there was a continuous decline in dolphin movements across SWL and WL in recent years, except a slight rebound occurred in 2019-20 monitoring period before falling to a lower level in 2020-21 (Figure 43; Table 7).

5.8. Update on Life History Parameters of Individual Dolphins

In the past, important information on several life history parameters of Chinese White Dolphins based on long-term photo-identification data yielded invaluable information to gain in-depth insights on issues such as their life span, female-calf association and calf survival (Hung 2010, 2015, 2018; Jefferson et al. 2012). In light of the dramatic decline in calf occurrence of dolphins in recent years as discussed in Section 5.4.2, another re-examination on these life history parameters is conducted for this report, with such analysis being further supplemented by a wealth of photo-identification data collected in recent years.

5.8.1. Individual life span

Sighting history of 366 individuals from the photo-ID catalogue were examined for the analysis on estimated life span, and these individuals either have long sighting histories (more than five years) or were frequently sighted (10+ re-sightings) in Hong Kong waters since 1995. The ages of 32 individual dolphins were directly deduced from their sighting histories without the need of estimation, as they have been observed with their mothers since birth for the past two decades. On the other hand, the ages of the other 334 individuals were estimated from their sighting histories and by making some assumptions about their ages when they were first seen (see Hung 2010, 2015). The assumed minimum age of each age class is as follow: SJ (at least three years old), SS (at least eight years old), SA (at least 10 years old), and UA (at least 15 years old). These assumed minimum ages in relation to their colour pattern were based on available information on their growth curve (age/length relationship) (see Jefferson et al. 2012) and hypothesis of their colour pattern development established by Hung (2010). The estimated age of an identified individual was then calculated by summing up the time span of its sighting history (number of years between the first and last sightings of the individual) and the minimum age of the individual based on its age class when it was first seen.

Among these 366 individuals, 18 individuals were estimated to be over 30 years old (with the oldest individual EL01 estimated to be nearly 40 years old), while another 18 individuals were estimated to be 25-30 years old. Nearly 70% of all examined individuals were estimated to be at least 12 years old, which represents sexually mature adults (see Jefferson 2000; Jefferson et al. 2012). As in previous analyses, the mean estimated age of known females (19.3, n=132) was very similar to that of known males (18.4, n=8).

It is interesting to note that 28 of the 120 spotted juveniles are presumably sexually mature adults based on their estimated age. In fact, many of them have long sighting history in Hong Kong waters, with 16 individuals sighted more than 12 years in Hong Kong in the past two decades. In one notable case, the individual NL259 was first sighted as a newborn calf following its mother in March 2000, and it was last sighted in January 2021 as a SJ at the age of 21 years old. Clearly, these spotted juveniles are not "juveniles" as their age class category suggest. Moreover, a few of these "juveniles" have given births to young calves in the past (e.g. WL129, WL131, WL291), and many of them have only transitioned to the spotted subadult (or speckled) stage after a long period of time. Similar observations are also made for spotted subadults (SS), many of which are presumably well into their adulthood based on their estimated age. Therefore, the age class categorization as first suggested in Jefferson (2000a) should be viewed as arbitrary, and most often does not reflect the actual life stage of the individual dolphin.

Overall, it should be noted that many individual dolphins in the photo-ID catalogue are sexually mature (i.e. more than 12 years old) with a good proportion of them having survived well into their twenties or thirties. These sexually mature adults are vital to the sustainability of a healthy population, and their continued survival with a relatively long life span would give the population a fighting chance against various threats faced in their habitats as described throughout the present report.

5.8.2. Female-calf association

A total of 247 individual dolphins from the photo-ID catalogue were examined for females that may have given birth to calves in the past two decades. Among them, 102 were identified as females through confirmation from their calving histories (with repeated calf associations) and/or through molecular sexing of skin biopsy samples (14 individuals in total). Another 24 individuals were categorized as probable females, as they were only seen with their young calves (and for some cases only supporting a dead calf) in a single incident, but those calves disappeared shortly after, which were presumably dead. Of the 102 confirmed females, 97 had calving histories, with 52 of them seen with one calf in their histories, 27 with two calves and 18 with three calves. Most of these mothers are considered residents of Hong Kong with regular occurrence and relatively long sighting histories. Notably, the other five known females with long sightings histories in Hong Kong but with no calving history were NL49, NL120, NL136, WL68 and WL76.

A total of 160 calves with 97 females were sighted repeatedly, and the minimum periods of these female-calf associations were estimated between their first and last re-sightings. It should be cautioned that the estimated periods of female-calf associations were likely underestimates, as some calves were already unspotted juveniles (i.e. older calves) or even spotted juveniles when first seen. They might also still be associated with their mothers for a period of time after their last re-sightings. Such minimum periods of female-calf associations ranged from 4-167 months, with an average of 42.3 ± 31.16 months (median = 39 months). Fifteen calves are still associated with their mother in their last re-sightings in recent months of 2020-21.

About 36% of the calves were associated with their mothers for fewer than 24 months, while there were also 37 calves associated with their mothers for at least four years or more. A few notable cases with very long-term female-calf associations were documented. For example, NL80 was first sighted with her calf NL301 in May 2007, and the calf was associated with her until June 2019 for more than 12 years. Moreover, NL202 was first sighted with her newborn in October 2006; since then, the mother-calf pair has been frequently sighted together around the Lung Kwu Chau area. Such association of this mother-calf pair still persists at present (i.e. with nearly 14 years of association), and the calf has been identified as NL286, although their association has become less stable in recent years. Another long-term association was observed from the mother-calf pair of WL21 and WL256, with the calf first sighted in December 2010 and is still associated with its mother up to July 2020 for nearly ten years. Such long periods of mother-calf associations were rather unusual for small cetaceans, and it is possibly related to the low fecundity of Hong Kong dolphins, as all three mothers mentioned above has not had another newborn calf during the long-term associations. In fact, calf production over the course of the long-term monitoring has been fairly low, with most female year-round residents consistently sighted in Hong

Kong only successfully produced 1-2 offspring during the past two decades (and many of these offspring did not survive in their first year or two; see below).

5.8.3. Calf survival

In the past two decades, it was estimated that at least 85 of the 186 calves sighted in Hong Kong did not survive beyond the first year or two. These included 49 calves that were probably dead shortly after birth as they disappeared quickly in subsequent sightings of their mothers within a few weeks. There were another five dead calves that were supported by their mothers at the time of discovery (a type of epimeletic behaviour as described in details in Hung 2014). Furthermore, 31 calves were observed only once with their mothers, and it is likely that they also died shortly after the brief encounter as they were absent during subsequent re-sightings of their mothers. The observed low survival rate of calves was further supported by the stranding data in the past, with a high proportion of stranded animals being dead calves (Hung 2006; AFCD unpublished data).

For the rest of the calves, it was determined that 85 of them have successfully survived into the older juvenile stage (mostly SJs) to become somewhat independent from their mothers, while some of them have associations with their mothers for extended periods of time (see previous section). On the other hand, the survival of another 16 calves cannot be determined with confidence, as they either have likely survived as they have been with their mothers for a relatively long period but have disappeared from Hong Kong waters with their mothers, or have only been sighted recently within the past 12 months and therefore their survival cannot be reliably assessed yet.

Temporal changes in the number of dead and survived calves are also examined since 2006, when the occurrence of calves with their mothers has been more consistently documented in the photo-identification catalogue. During the 15-year span from 2006-20, 79 calves were confirmed to have survived into the older juvenile stage, while another 75 calves were confirmed to have died. A steady increase in the total number of calves being born was observed from 2006-11, with the highest total recorded in 2011 with 22 births (Figure 44). Since 2015, the number has dropped noticeably to below ten births, and there were only four births in the past two years in 2019 and 2020 (three and one births, respectively).

For surviving newborns, the temporal trend indicated that their number reached the highest in 2010 with 14 individuals, but this has quickly decreased to a much lower level after 2014, with only a handful of calves being able to survive beyond their first year or two in the past five years (Figure 44). On the other hand, the number of calves that did not survive to their first year or two quickly rose to the highest level in 2011, which had more calves that did not survive (13) than those that survived (nine) (Figure 44). In fact, the total number of calves that did not survive (51) has surpassed the number of those that survived (40) in the past decade.

Even though most dolphins in Hong Kong enjoy a relatively long lifespan, the low survival rate of newborns and the low fecundity of reproductive females raise serious concerns for the continuous survival of dolphins in Hong Kong waters, in light of the worrisome declining trend in their abundance in the past decade, as well as the dramatic decline in calf occurrence. It has long been speculated that mortality of young calves can be linked to the negative impacts of water pollution, as heavy load of pollutants (e.g. DDT, PCBs) have been found among some stranded dolphin calves in Hong Kong (Jefferson et al. 2006). Continuous habitat loss and degradation, as well as increasing acoustic disturbances from marine construction works and high-speed ferry traffic, may further compound the problem. Special attention should be made to alleviate these negative impacts, as the survival of calves appears to be driving the decline in abundance in the past decade and thus, the continuing long-term survival of the dolphins in Hong Kong's waters.

5.9. Potential Impacts on dolphins and porpoises from HSF Stoppage

Due to the Covid-19 pandemic outbreak in Hong Kong, some unprecedented measures were taken by the government to stop all HSF services between Hong Kong, Macau and Mainland cities in the Pearl River Delta region in February 2020. Coupled with the on-going long-term marine mammal monitoring works in Hong Kong, these events provided a rare opportunity to determine whether such a large, nearly-immediate halt in a specific large-scale human activity (that is a long time threat to dolphins and porpoises) would coincide with any changes in the occurrence of local dolphins and porpoises.

To ascertain the timing and extent of the HSF stoppage, a recent analysis on automatic identification system (AIS) data recently completed by AFCD is reviewed. In addition, to determine whether there have been any changes in dolphin and porpoise habitat use since the HSF traffic stopped, grid analysis was conducted to deduce DPSE values among grids within and to the north and south of the South Lantau Vessel Fairway (SLVF) before and after the HSF stoppage. Moreover, qualitative examinations on the distribution of dolphins and porpoises in relation to their different group sizes, associated activities and calf occurrence in South Lantau waters were also conducted before and after the HSF stoppage.

AIS data analysis on vessel traffic

For the AIS analysis conducted by AFCD, the AIS records obtained from the Marine Department of Hong Kong were utilized, which can provide information about the ship to other ships or coastal authority automatically, and the vessels fitted with AIS transceivers can then be tracked by AIS base stations. The Marine Department has several base stations that integrate the AIS signals into their vessel system, and such records provided to AFCD can be used to investigate the possible interaction between the distribution of local Chinese White Dolphins and finless porpoises with marine traffic, especially those vessels traveling at high speed that would have greater potentials to inflict injuries and cause acoustic disturbance to marine mammals. The analysis of vessel information utilized AIS records taken from January 2019 to June 2020, with the study area focused on waters south of Lantau where a busy route known as the South Lantau Vessel Fairway (SLVF) exists for high-speed cross-boundary ferry services to serve the ports between Hong Kong, Macau and others major cities in the Pearl River Delta region.

During the 18-month study period, the majority of the AIS records were composed of fishing vessels, HSF, cargo vessels, passenger vessels and tankers. Coincided with the suspension of HSF services between Hong Kong and Macau/Mainland cities in February 2020, there was a drastic drop of more than 90% in daily AIS records. Notably, before this drop in early 2020, there was already a slight decreasing trend in mean daily AIS records of HSF in 2019, which is also shown in the Port Statistics by the Marine Department (Hung 2020). The analysis of vessel tracks also showed a great drop in vessel track lengths in February 2020, once again coinciding with the suspension of the cross-boundary HSF services.

Another parameter derived from AIS records is the track density pattern, which showed that the SLVF was clearly the area with the heaviest overall marine traffic in South Lantau waters before HSF suspension. Evidently, the suspension in February 2020 resulted in a very different track density pattern, with the SLVF no longer having the highest track density. This drastic change in overall track density pattern before and after the HSF stoppage suggested that this ship type had been the dominating factor in shaping the marine traffic pattern in South Lantau waters.

Analysis of vessel information utilized AIS records undertaken by AFCD validates the usefulness of AIS records in understanding the temporal trends of HSF, and confirms the dramatic drop in marine traffic in SLVF upon the HSF stoppage in February 2020. The temporal changes detected by analyzing AIS records of HSF were also in very good agreement with those deduced from the Port Statistics (the sole information on marine traffic utilized in the past to examine impacts on local dolphins; see Hung 2012), but the AIS records added another important layer of information with vessel tracks for visualization of track density patterns, which enable an in-depth understanding of the spatial distribution of the vessels over time.

<u>Analyses of visual monitoring data</u>

To determine whether dolphin and porpoise habitat use changed since the HSF stoppage happened in February 2020, the quantitative grid analysis was conducted to deduce DPSE values among grids within and around the SLVF (see Figure 45) one year after the stoppage (i.e. February 2020 to January 2021) to compare with the ones deduced from the previous four annual periods of February-January in 2016-17 2017-18, 2018-19 and 2019-20 before the stoppage.

For Chinese White Dolphins, the mean DPSE values among the 32 grids along the SLVF were similar in the first three annual periods of 2016-17, 2017-18 and 2018-19 before HSF stoppage (Figure 46a). However, dolphin usage within the SLVF increased noticeably in 2019-20, the year before the HSF stoppage but also when the HSF traffic in SLVF started to decline (see above and also Hung 2020). In 2020-21, the annual period after the HSF stoppage, dolphin usage within SLVF remained high, but has dropped to a lower level when compared to the usage in 2019-20 (Figure 46a).

Dolphin usage among the grids to the north and south of SLVF (18 grids and 85 grids, respectively) were also examined to determined whether there has been any increase in crossings through the SLVF from coastal waters (i.e. north of SLVF) to the more offshore waters (i.e. south of SLVF), including the important marine mammal habitat at the Soko Islands, as the intense HSF traffic was thought to be a major impediment for such movements across the busy vessel fairway. The mean DPSE values to the north and south of SLVF showed that the proportion of dolphin usage to the north of SLVF was much higher than the one to the south of SLVF in the first two annual periods of 2016-17 and 2017-18, but such proportion has been reversed in the past two annual periods of 2019-20 and 2020-21 (more usage to the south than to the north of SLVF), coincided with the increased usage of dolphins with SLVF in these two periods (Figure 46a). It appeared that when dolphins occurred in South Lantau waters in the past two annual periods, they spent more time within SLVF and also crossing over the vessel fairway to the offshore waters. However, such increase actually happened the year before the HSF stoppage in February 2020, and therefore it may not be directly related to the dramatic reduction of HSF traffic within SLVF.

For finless porpoises, their usage within the SLVF has remained consistently low before and after the HSF stoppage, while their main occurrences were to the south of SLVF (i.e. offshore waters in the South Lantau region). Even though there was a small increase in porpoise usage within SLVF from 2019-20 (pre-stoppage) to 2020-21 (post-stoppage), the mean DPSE value in 2020-21 was still lower than the highest level recorded in 2018-19 (Figure 46b), and therefore conclusion cannot be made whether the HSF stoppage has encouraged the porpoises spending more time within the SLVF. Notably, porpoises ventured into the coastal waters to the north of SLVF more frequently in 2017-18 and 2018-19 before the HSF stoppage, but such movement has dropped to the lowest level (nearly non-existent) in 2020-21 after the HSF stoppage (Figure 46b). It is evident that the HSF stoppage has not resulted in more crossings of SLVF by the porpoises from offshore to inshore waters, which was the expectation with the suspension of HSF within SLVF.

Furthermore, the distribution patterns of dolphins and porpoises in South Lantau waters in relation to their larger groups, calf occurrences as well as associated activities were also examined to determine whether there have been any changes before and after the HSF stoppage. For the Chinese White Dolphins, there appears to be more larger groups occurring at the western end of SLVF (especially near Fan Lau Peninsula) in 2019-20 and 2020-21 when compared to previous years (Figure 47). However, only a few larger groups were sighted to the south of SLVF in each of the five annual periods before or after HSF stoppage. Furthermore, there was an apparent increase in the number of mother-calf pairs sighted at the western end of SLVF (especially near Fan Lau Peninsula) after the HSF stoppage in 2020-21 than in previous years before the HSF stoppage (Figure 48). On the contrary, even though there were slightly more dolphin groups engaged in feeding activities along the southern coast of Lantau in 2020-21 when compared to 2018-19 and 2019-20, but such more wide-spread distribution was also observed in 2016-17 and 2017-18 before the HSF stoppage (Figure 49), and therefore it is too early to determine whether the HSF stoppage has actually encouraged more dolphins to use the coastal waters of South Lantau region for feeding activities. In addition, dolphin groups engaged in socializing activities have been consistently rare near SLVF before or after the HSF stoppage (Figure 49). For the finless porpoises, it is evident that the HSF stoppage has not caused any changes in distribution of larger groups before and after the HSF stoppage (Figure 50). In fact, most of the larger porpoise groups were actually further away from SLVF in 2020-21 when compared to previous years (Figure 50).

Besides the quantitative grid analysis and distribution analysis on dolphin usage near the SLVF, it should also be mentioned that the examination of temporal trends in dolphin abundance in SWL survey area (see Section 5.6.2) did not reveal an increase in 2020 after the HSF stoppage as expected. Before the HSF stoppage, there was an increase from seven dolphins in 2018 to 19 dolphins in 2019, which was thought to be attributed to the 20% drop in HSF traffic in 2019 (see Hung 2020). But with the complete halt of HSF traffic in the second month of 2020, dolphin number actually fell slightly to 15 dolphins in 2020 (Table 5b).

<u>Complementary information from passive acoustic monitoring study</u>

As the visual monitoring data only reflect the dolphin and porpoise usage in South Lantau waters during daylight hours before and after the HSF stoppage, and both species exhibited distinct diel pattern with more nighttime detection than daytime detection (Wang and Hung 2020), another complementary study utilizing acoustic monitoring data collected for AFCD (which provides information on 24-hour activities of dolphins and porpoises) is examined as another reference of potential changes in marine mammal occurrence in light of the HSF stoppage in February 2020. The comparison utilized PAM data collected from August 2019 to January 2020 as pre-HSF stoppage period, to be compared with the period of February-July 2020 as post-HSF stoppage period, at three PAM sites that are closest to the SLVF (i.e. Fan Lau, Kau Ling Chung and Siu A Chau).

The acoustic data at Siu A Chau revealed that there were significantly more dolphin detections after HSF-stoppage than before, but the opposite result was found at the Kau Ling Chung site (Wang and Hung 2020). Furthermore, there were also more dolphin detections before the HSF-stoppage at Fan Lau, but such difference was not significant (Wang and Hung 2020). Even though dolphin detections have increased at Siu A Chau after the HSF stoppage, it is still uncertain whether such increase is related to other reasons beyond the HSF stoppage, especially since another nearby site at Kau Ling Chung showed the opposite trend after the HSF stoppage. There is also the possibility of a lag in dolphin response after the HSF stoppage in some areas, so more data from acoustic monitoring would be needed for a better understanding.

On the other hand, there were significantly higher porpoise detections at Kau Ling Chung and Siu A Chau after the HSF stoppage (Wang and Hung 2020). Similarly, it is concluded that much more data are needed to understand confounding factors such as seasonal occurrences to better determine how much of the increase observed may have been due to changes in HSF service. At least a full year of acoustic data would be needed for further assessment to reduce confounding factors such as seasonal variation in dolphin and porpoise occurrences.

6. SCHOOL SEMINARS AND PUBLIC AWARENESS

Due to the Covid-19 pandemic, HKCRP researchers were only able to deliver two online education seminars at local primary and secondary schools on behalf of AFCD to increase public awareness on the conservation of local cetaceans during the 2020-21 monitoring period. PowerPoint presentations were also prepared for the school talks with up-to-date information on both dolphins and porpoises gained from the present long-term monitoring programme. The talk materials included content such as the threats faced by local cetaceans, and conservation measures that AFCD has implemented to protect them in Hong Kong. Through this integrated approach of the long-term monitoring programme and publicity/education programme, the Hong Kong public can gain first-hand information from our HKCRP researchers, and their support will be vital to the long-term success in conservation of local cetaceans.

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Table 1a. Mean group size of Chinese White Dolphins among different survey areas in recent monitoring periods
(* denote the mean group size calculated from a sample size of one group)

Monitoring Period	Overall	Deep Bay	NE Lantau	NW Lantau	W Lantau	SW Lantau	SE Lantau
2013-14	3.4	4.0	3.2	3.5	3.4	3.2	N/A
2014-15	4.1	5.1	2.7	3.5	4.4	4.0	1.0
2015-16	3.8	2.0	1.0*	4.1	3.8	3.7	2.5
2016-17	3.3	N/A	1.0*	3.8	3.5	2.4	1.4
2017-18	3.0	3.7	5.0*	3.3	3.0	2.8	1.5
2018-19	3.1	2.3	N/A	2.4	3.6	2.7	1.0
2019-20	3.2	2.0	N/A	2.7	3.2	3.6	1.0
2020-21	3.1	N/A	N/A	2.4	3.3	3.1	1.0*

Table 1b. Mean group size of finless porpoises among different survey areas in recent monitoring periods
(* denote the mean group size calculated from a sample size of one group)

Monitoring Period	Overall	SW Lantau	SE Lantau	Lamma	Po Toi	Ninepins	Sai Kung
2013-14	2.3	2.8	1.9	2.6	N/A	1.3	N/A
2014-15	2.7	3.5	2.6	3.1	1.9	2.6	1.3
2015-16	3.1	3.1	2.9	4.4	2.5	1.7	1.3
2016-17	2.7	2.4	2.7	3.3	3.3	2.2	1.7
2017-18	2.5	2.8	2.5	1.9	2.7	1.5	1.2
2018-19	2.7	2.1	3.1	2.3	2.0	3.0*	2.0
2019-20	2.6	2.7	2.2	2.4	3.4	3.5	N/A
2020-21	2.7	2.8	3.2	2.1	1.8	3.5	1.0

Table 2. Occurrences of unspotted calves (UC) and unspotted juveniles (UJ) in Hong Kong, including the their annual total number and percentage of the total

Year	No. of UC	UC% of total	No. of UJ	UJ% of total
2002	13	1.0%	74	5.5%
2003	22	1.0%	153	6.9%
2004	18	1.1%	75	4.7%
2005	29	1.4%	123	5.9%
2006	24	1.1%	97	4.4%
2007	11	0.8%	56	4.1%
2008	12	1.0%	58	4.7%
2009	6	0.5%	87	6.9%
2010	4	0.3%	91	7.2%
2011	26	1.2%	80	3.7%
2012	27	1.5%	59	3.2%
2013	21	1.0%	102	4.8%
2014	15	0.7%	64	2.9%
2015	12	0.6%	32	1.6%
2016	1	0.1%	20	1.7%
2017	1	0.1%	20	1.7%
2018	2	0.2%	14	1.3%
2019	3	0.3%	23	2.2%
2020	3	0.4%	14	1.8%

Table 3. Encounter rates (no. of on-effort sightings per 100 km^2) of Chinese White Dolphins among different survey areas in the past 19 monitoring periods

Monitoring Period	Overall	NE Lantau	NW Lantau	W Lantau	SW Lantau
2002-03	8.6	4.6	10.8	22.6	2.4
2003-04	10.8	5.0	11.3	25.9	2.5
2004-05	8.2	2.9	8.3	21.4	2.6
2005-06	7.8	2.7	8.7	20.2	1.6
2006-07	6.9	2.3	5.7	20.6	1.0
2007-08	9.9	4.7	10.5	26.1	3.7
2008-09	7.2	2.2	7.2	17.9	2.4
2009-10	6.3	1.7	4.9	18.0	2.2
2010-11	6.8	2.6	7.5	13.4	2.4
2011-12	7.7	5.0	8.7	15.3	2.6
2012-13	7.3	1.6	7.8	19.2	3.5
2013-14	7.2	0.7	6.3	19.6	6.8
2014-15	5.5	0.1	3.6	18.4	5.6
2015-16	4.7	0.1	2.2	15.5	5.5
2016-17	4.0	0.0	1.9	14.9	3.2
2017-18	3.4	0.0	2.4	11.8	4.1
2018-19	3.0	0.0	1.7	13.0	2.0
2019-20	3.5	0.0	0.7	13.3	3.8
2020-21	3.3	0.0	1.1	11.6	3.1

Table 4. Encounter rates (no. of on-effort sightings per 100 km^2) of finless porpoises among different survey areas in the past 14 monitoring periods

Monitoring Period	Overall	SW Lantau	SE Lantau	Lamma	Po Toi
2007-08	3.0	2.7	5.1	1.9	1.9
2008-09	3.3	2.8	1.4	7.8	2.9
2009-10	3.5	1.9	6.1	1.0	5.5
2010-11	3.3	2.7	5.4	3.0	3.4
2011-12	4.9	3.0	5.8	9.6	3.4
2012-13	4.7	5.9	8.4	4.6	2.2
2013-14	6.4	7.4	12.5	7.6	0.0
2014-15	4.2	2.6	8.7	2.9	2.2
2015-16	3.8	2.3	5.3	6.4	5.2
2016-17	3.7	2.8	8.1	2.5	1.8
2017-18	3.3	3.9	6.2	1.5	2.7
2018-19	2.9	2.9	5.1	1.9	1.2
2019-20	3.3	3.9	5.6	1.9	2.2
2020-21	1.9	2.8	2.3	1.4	1.5

Table 5a. Line transects parameters and estimates of density and abundance for Chinese White Dolphins in western waters of Hong Kong in 2020

([1]unit for encounter rate: number of on-effort sightings per 100 km of survey effort; [2]unit for individual density: number of dolphins per 100 km^2)

	NE Lantau	NW Lantau	W Lantau	SW Lantau
Effort	1518.3	2409.4	1290.5	1378.9
Number of Sightings	N/A	14	133	41
Average Group Size	N/A	2.50	3.15	3.71
Encounter Rate[1]	N/A	0.58	10.31	2.95
Individual Density[2]	N/A	3.21	68.79	22.74
Abundance	N/A	3	19	15
95% C.I. (Abundance)	N/A	1-6	14-26	7-30
%CV	N/A	43	16	37

Table 5b. Annual abundance estimates of Chinese White Dolphins from each survey area in western waters of Hong Kong in 2003-20

(figures in red derived from biennial estimates; figures in blue indicate no or only one on-effort sighting made in that area for that year)

Year	*Combined*	NE Lantau	NW Lantau	W Lantau	SW Lantau
2003	*188*	18	84	56	30
2004	*143*	9	62	51	21
2005	*128*	7	58	42	21
2006	*113*	9	54	44	6
2007	*130*	10	60	54	6
2008	*108*	11	42	43	12
2009	*100*	5	40	43	12
2010	*86*	7	35	33	11
2011	*88*	11	39	28	10
2012	*80*	4	40	17	19
2013	*73*	3	36	23	11
2014	*87*	1	24	36	26
2015	*65*	0	10	31	24
2016	*47*	0	11	27	9
2017	*47*	0	21	16	10
2018	*32*	0	6	19	7
2019	*52*	0	4	29	19
2020	*37*	0	3	19	15

Table 6. Range use (50%/25% UD core areas and sighting coverage) and residency patterns of 103 individuals with 15+ sightings and appeared in 2020

(abbreviations: SR=Seasonal Resident; YR=Year-round Resident; SV=Seasonal Visitor; UD= Utilization Distribution; LKC = Lung Kwu Chau Marine Park; CLK= northeast corner of airport; BR= Brothers Islands; TO= Tai O; PH= Peaked Hill; FL= Fan Lau; SL= South Lantau; WL= West Lantau; DB= Deep Bay; EL= East Lantau; NEL= Notheast Lantau; NWL= Northwest Lantau; SWL= Southwest Lantau; SEL= Southeast Lantau; CH=Chinese waters; * denotes individuals that have their gender determined by biopsy sampling)

				Primary	Occurrence in Survey Areas								50% UD Core Area						25% UD Core Area					
ID#	# STG	Gender	Residency	Range	DB	EL	NEL	NWL	WL	SWL	SEL	CH	LKC	BR	TO	PH	FL	SL	LKC	BR	TO	PH	FL	SL
CH12	102	F?	YR	WL					√	√		√				√	√					√	√	
CH38	117	?	YR	WL					√	√		√				√	√					√	√	
CH84	16	F	SR	NL	√			√	√			√	√						√					
CH108	141	F	YR	WL				√	√	√		√				√	√						√	
CH112	21	?	SR	WL				√	√	√		√			√	√	√					√	√	
CH113	61	F	SR	WL				√	√	√		√			√	√					√	√		
CH141	49	F	YR	WL					√	√		√				√	√					√	√	
CH206	21	?	SR	WL					√	√		√				√	√					√	√	
EL01	130	M*	SR	NL		√	√	√	√	√		√		√						√				
NL33	160	F*	YR	NL			√	√	√	√			√	√						√				
NL37	79	?	SR	NL		√	√	√	√	√		√	√		√				√					
NL49	69	F*	SR	NL			√	√	√	√			√		√	√			√			√		
NL98	182	F*	YR	NL			√	√	√	√		√	√	√					√	√				
NL120	152	F*	YR	NL/WL	√		√	√	√	√		√	√	√						√				
NL123	191	F	YR	NL/WL	√		√	√	√	√		√	√	√						√				
NL136	166	F*	YR	NL	√		√	√	√				√						√					
NL156	64	?	SR	NL/WL				√	√	√		√	√		√	√	√				√	√		
NL182	136	F	YR	NL	√		√	√	√				√						√					
NL202	154	F	YR	NL	√		√	√	√			√	√						√					
NL206	77	F*	YR	WL				√	√	√		√				√	√					√	√	
NL226	97	?	YR	NL/WL	√		√	√	√	√		√	√	√	√	√	√	√		√	√		√	
NL242	100	F*	YR	NL			√	√	√	√		√	√	√					√					
NL259	98	?	YR	NL/WL			√	√	√				√		√				√		√			
NL261	116	M?	YR	NL/WL	√		√	√	√	√		√	√	√					√					
NL269	68	?	YR	WL				√	√	√		√			√	√	√					√		
NL281	16	?	SR	NL				√	√			√	√						√					
NL286	113	?	YR	NL	√		√	√				√	√						√					
NL293	46	?	SR	WL				√	√			√			√						√			
NL306	40	?	YR	WL				√	√	√	√					√	√	√				√	√	√
NL311	34	?	YR	WL				√	√	√		√			√	√	√				√	√	√	
NL313	16	?	SR	WL				√	√	√		√				√						√		
NL321	37	?	YR	NL	√			√	√	√		√	√						√					
NL322	37	?	YR	NL/WL				√	√	√			√		√	√	√	√	√			√	√	√
NL328	16	?	SR	NL				√	√			√	√						√					
NL331	15	?	N.D.	WL				√	√	√		√					√	√						√
SL40	107	F	YR	WL					√	√		√				√	√						√	
SL42	21	?	SR	WL	√			√	√	√			√		√	√					√	√		
SL44	62	?	YR	WL					√	√		√			√	√	√					√	√	
SL59	34	?	YR	WL				√	√	√		√			√	√	√				√	√	√	
SL60	67	?	YR	WL					√	√		√					√						√	
WL05	114	F?	YR	NL/WL			√	√	√	√		√	√		√				√		√			
WL11	73	F*	YR	NL/WL			√	√	√			√	√		√				√					
WL15	122	M*	YR	WL			√	√	√	√					√	√	√	√					√	
WL21	82	F	SR	WL				√	√	√		√			√	√	√				√	√		
WL28	41	F	YR	WL				√	√	√		√			√						√			
WL29	54	F	SR	WL					√	√		√				√						√		
WL42	155	?	YR	WL				√	√	√		√				√	√					√	√	
WL46	95	?	YR	WL			√	√	√	√		√			√	√					√			
WL61	124	?	YR	WL				√	√	√		√				√	√						√	
WL66	27	F	SR	WL					√			√			√	√					√			
WL68	83	F*	YR	WL					√	√		√				√	√					√		

Table 6. (cont'd)

ID#	# STG	Gender	Residency	Primary Range	Occurrence in Survey Areas								50% UD Core Area						25% UD Core Area					
					DB	EL	NEL	NWL	WL	SWL	SEL	CH	LKC	BR	TO	PH	FL	SL	LKC	BR	TO	PH	FL	SL
WL72	142	F	YR	WL				√	√	√		√				√	√					√	√	
WL79	105	?	SR	WL				√	√			√			√	√					√			
WL91	113	?	YR	WL					√	√	√	√				√	√						√	
WL92	50	?	YR	WL					√	√		√					√						√	
WL94	89	F	YR	WL					√	√		√					√						√	
WL98	56	F	YR	WL				√	√	√		√			√	√	√				√	√		
WL100	21	F	SR	WL				√	√	√		√				√	√					√	√	
WL109	122	F	YR	WL				√	√	√		√			√	√	√					√	√	
WL114	91	F?	YR	WL				√	√	√		√				√	√					√	√	
WL118	85	F	YR	WL					√	√		√				√	√					√		
WL123	160	F?	YR	WL				√	√	√		√				√	√						√	
WL129	38	F	YR	WL					√	√		√				√	√					√	√	
WL130	111	F?	YR	WL				√	√	√							√						√	
WL131	163	F?	YR	WL				√	√	√		√				√	√					√		
WL142	91	?	YR	WL					√	√		√					√						√	
WL145	55	F	YR	WL				√	√	√		√			√						√			
WL152	132	F?	YR	WL				√	√	√						√	√						√	
WL166	31	?	SR	WL					√	√						√	√					√		
WL167	20	F	SR	NL/WL				√	√			√			√						√			
WL168	58	?	YR	WL					√	√		√			√	√	√					√	√	
WL169	18	F	SR	WL					√	√		√				√	√					√		
WL171	38	F	SR	WL					√	√						√	√					√	√	
WL179	53	F	YR	NL/WL				√	√	√		√	√		√	√	√					√	√	
WL180	118	F?	YR	WL					√	√		√					√						√	
WL190	17	?	SR	WL					√	√					√	√		√			√	√		
WL200	21	F	SR	WL				√	√	√		√			√	√	√	√			√	√	√	
WL208	49	F	YR	WL				√	√	√					√	√	√					√	√	
WL210	36	F?	SR	WL					√	√		√			√	√	√					√	√	
WL213	19	F	SR	WL				√	√						√	√					√	√		
WL214	33	F	YR	WL				√	√			√			√	√					√	√		
WL216	46	?	SR	WL				√	√	√		√			√	√						√		
WL218	25	?	SV	WL				√	√	√		√			√	√	√				√	√		
WL220	76	?	YR	WL					√	√		√				√	√					√	√	
WL221	74	?	YR	WL				√	√	√		√			√	√	√	√			√		√	
WL229	33	?	YR	WL					√	√		√			√	√	√				√	√	√	
WL232	58	?	YR	WL				√	√	√		√			√		√	√			√		√	√
WL233	29	?	SV	WL				√	√	√		√			√	√	√	√			√	√	√	
WL243	56	?	YR	WL				√	√	√	√				√			√			√			√
WL250	46	F	YR	WL					√	√	√	√					√	√					√	√
WL251	15	?	SR	WL				√	√			√										√		
WL254	29	F	YR	WL					√	√		√				√	√	√				√	√	
WL256	23	?	SR	WL					√	√		√				√	√					√		
WL260	32	?	YR	WL					√	√		√				√	√	√				√	√	
WL268	34	?	YR	WL				√	√	√		√			√						√			
WL269	30	?	YR	WL					√	√		√				√	√					√		
WL272	15	?	YR	WL					√	√					√	√	√					√		
WL273	33	F?	YR	WL				√	√	√		√				√	√	√				√	√	
WL281	23	?	YR	WL				√	√	√		√			√	√	√	√				√	√	
WL283	19	?	N.D.	WL				√	√			√			√	√					√			
WL286	21	?	N.D.	WL					√	√		√			√	√	√	√				√		√
WL291	20	F	N.D.	WL				√	√	√		√			√	√					√	√		
WL294	21	?	N.D.	WL				√	√	√		√			√	√	√	√				√	√	

Table 7. Number of individual dolphins involved in movements across different survey areas around Lantau in recent mointoring periods

Monitoring Period	Total No. of Ind.	NEL-NWL	NWL-WL	WL-SWL	NEL-NWL-WL	NWL-WL-SWL	NEL-NWL-WL-SWL
2010-11	169	29	23	14	9	1	0
2011-12	217	50	66	40	16	8	1
2012-13	200	39	50	34	18	3	1
2013-14	199	19	52	52	12	9	2
2014-15	227	6	62	72	5	14	0
2015-16	210	1	35	87	1	9	0
2016-17	208	0	50	81	0	20	0
2017-18	185	5	48	65	2	17	1
2018-19	172	0	37	52	0	9	0
2019-20	168	0	19	69	0	8	0
2020-21	135	0	25	61	0	13	0

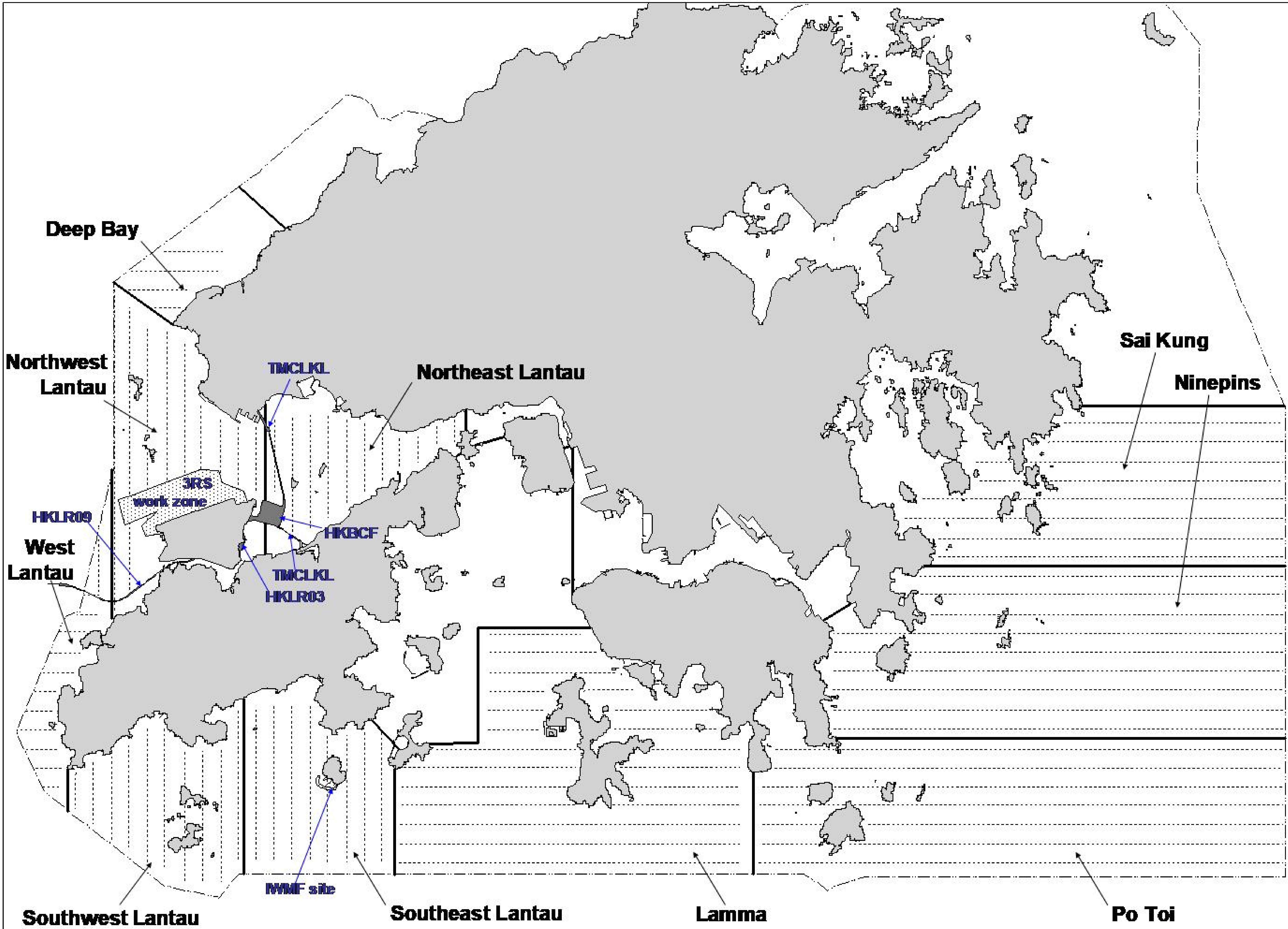


Figure 1. Ten Line-Transect Survey Areas within the Study Area for the 2020-21 Monitoring Study

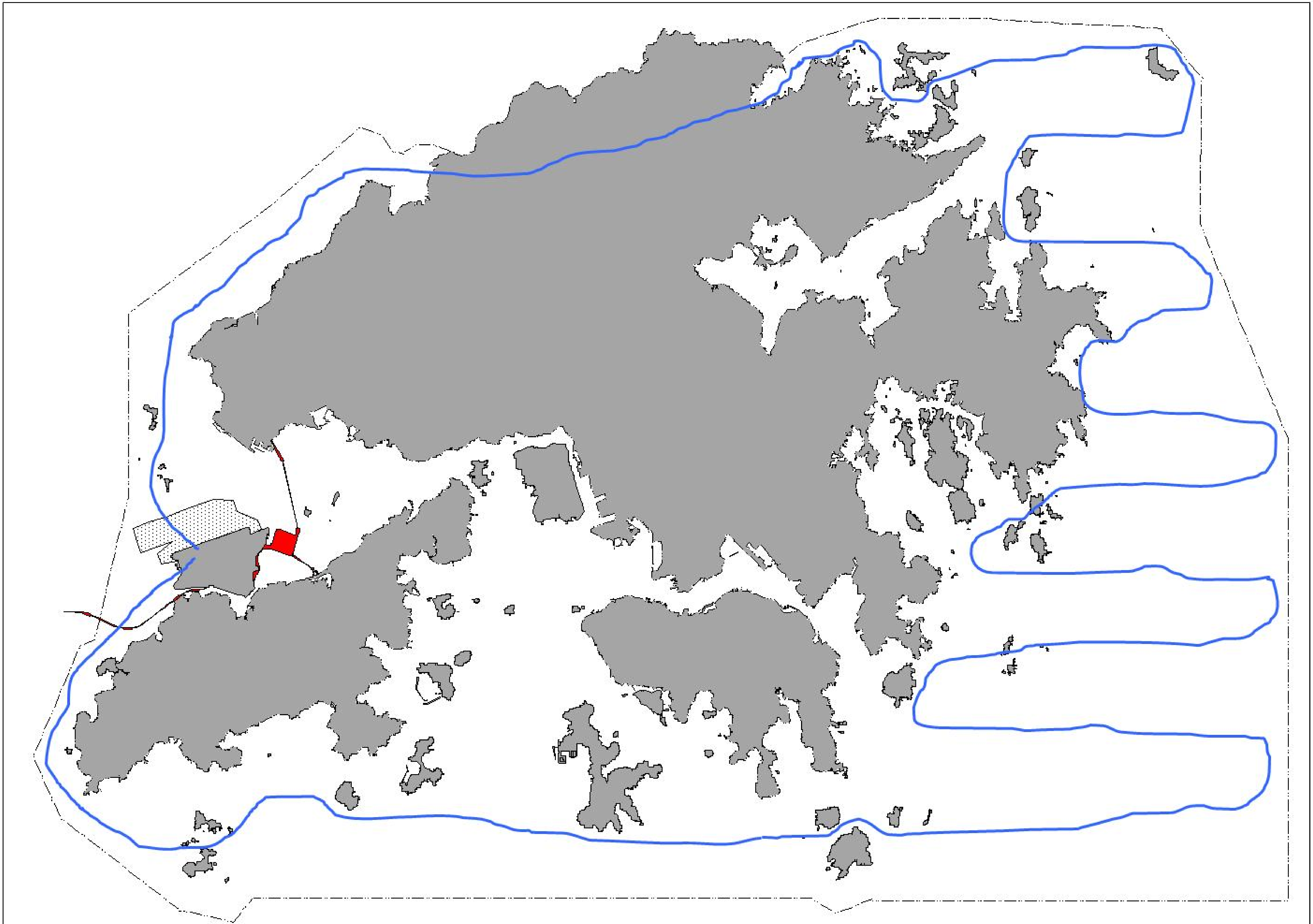


Figure 2. Indicative Survey Route for Helicopter Surveys in Eastern and Southern Waters of Hong Kong

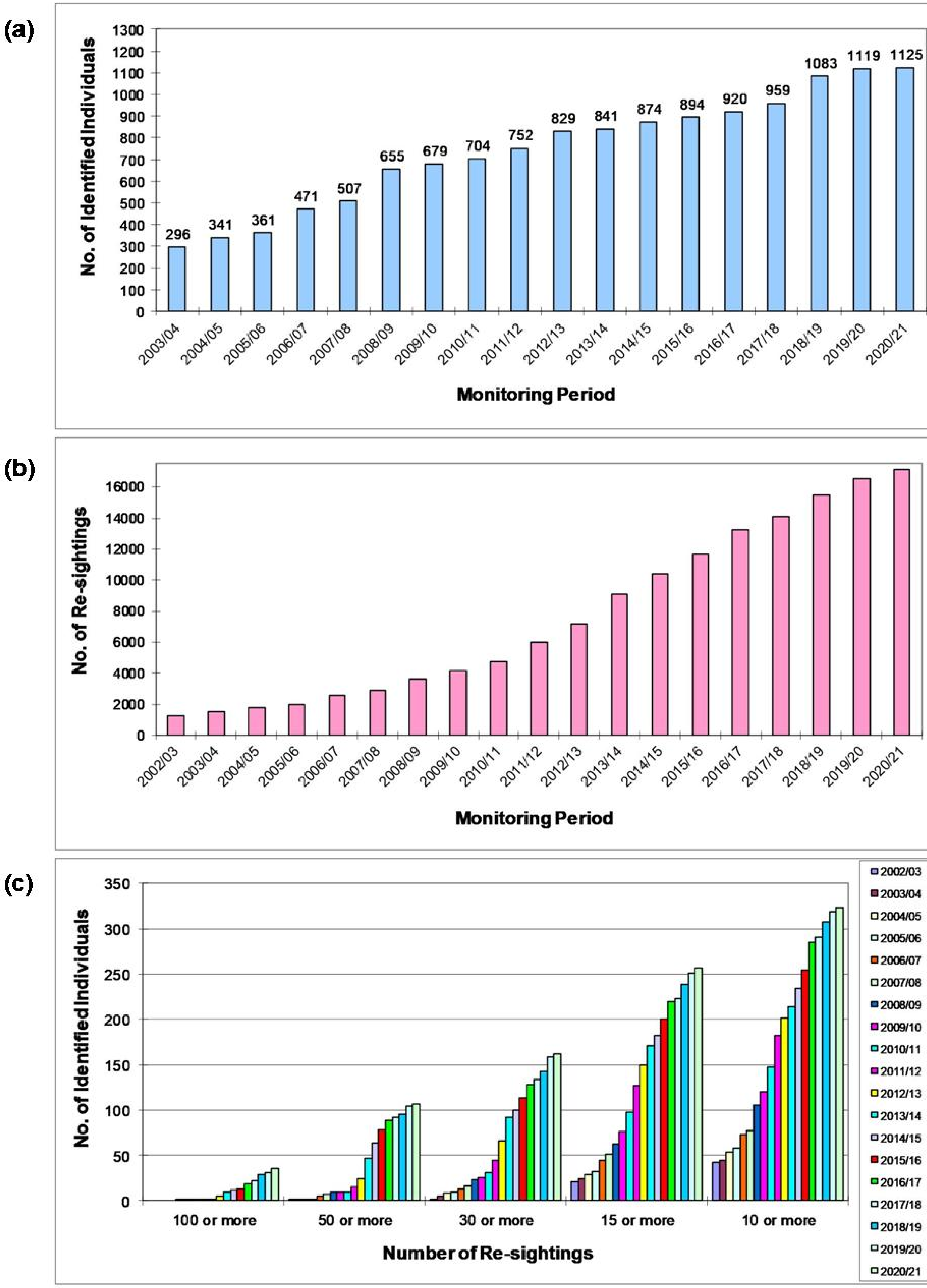


Figure 3. Temporal trends of (a) cumulative number of identified individuals; (b) total number of re-sightings made; and (c) number of identified individuals within several categories of number of re-sightings in the past 19 monitoring periods since 2002

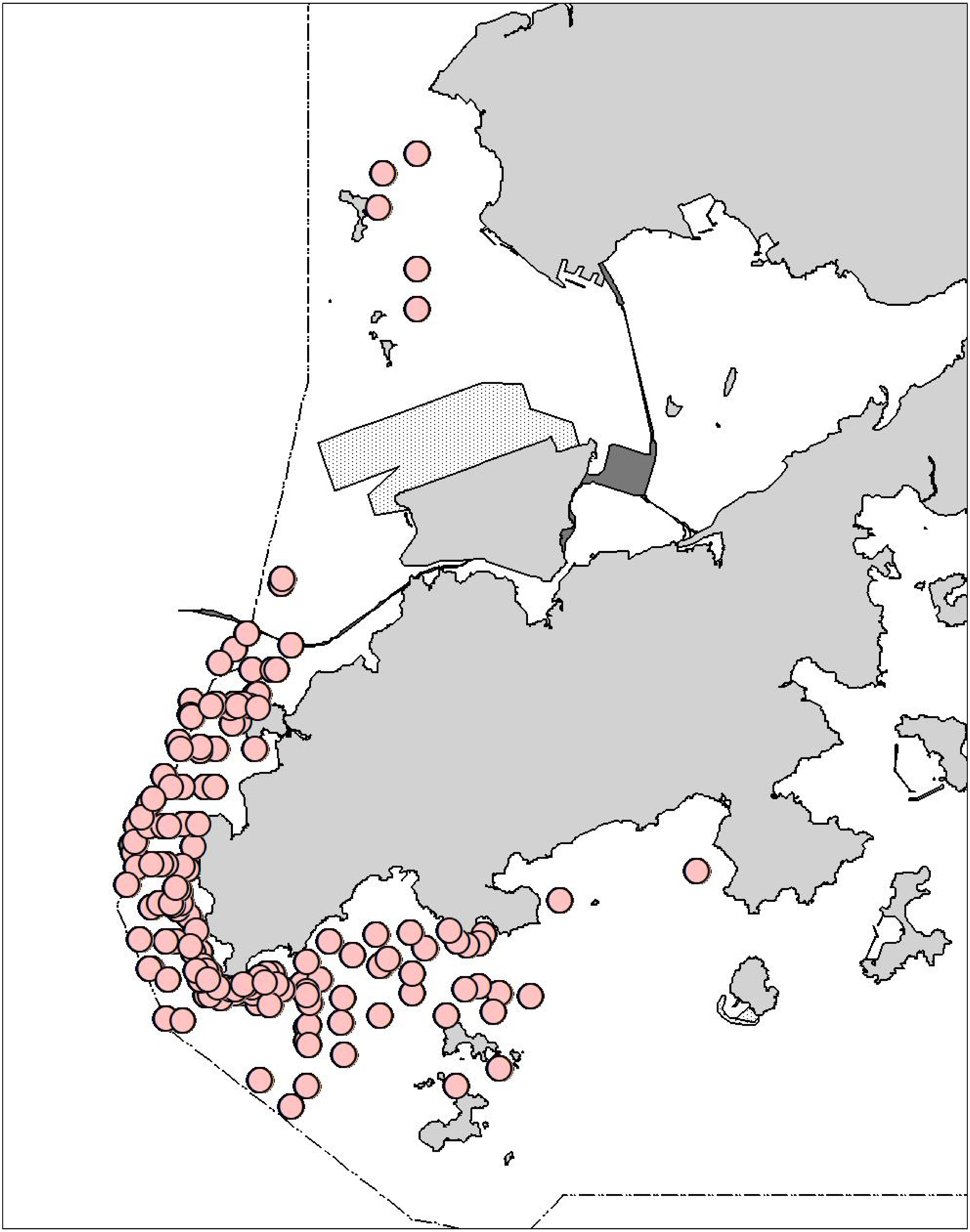


Figure 4. Distribution of CWD sightings in Hong Kong waters during AFCD monitoring surveys (April 2020 – March 2021)

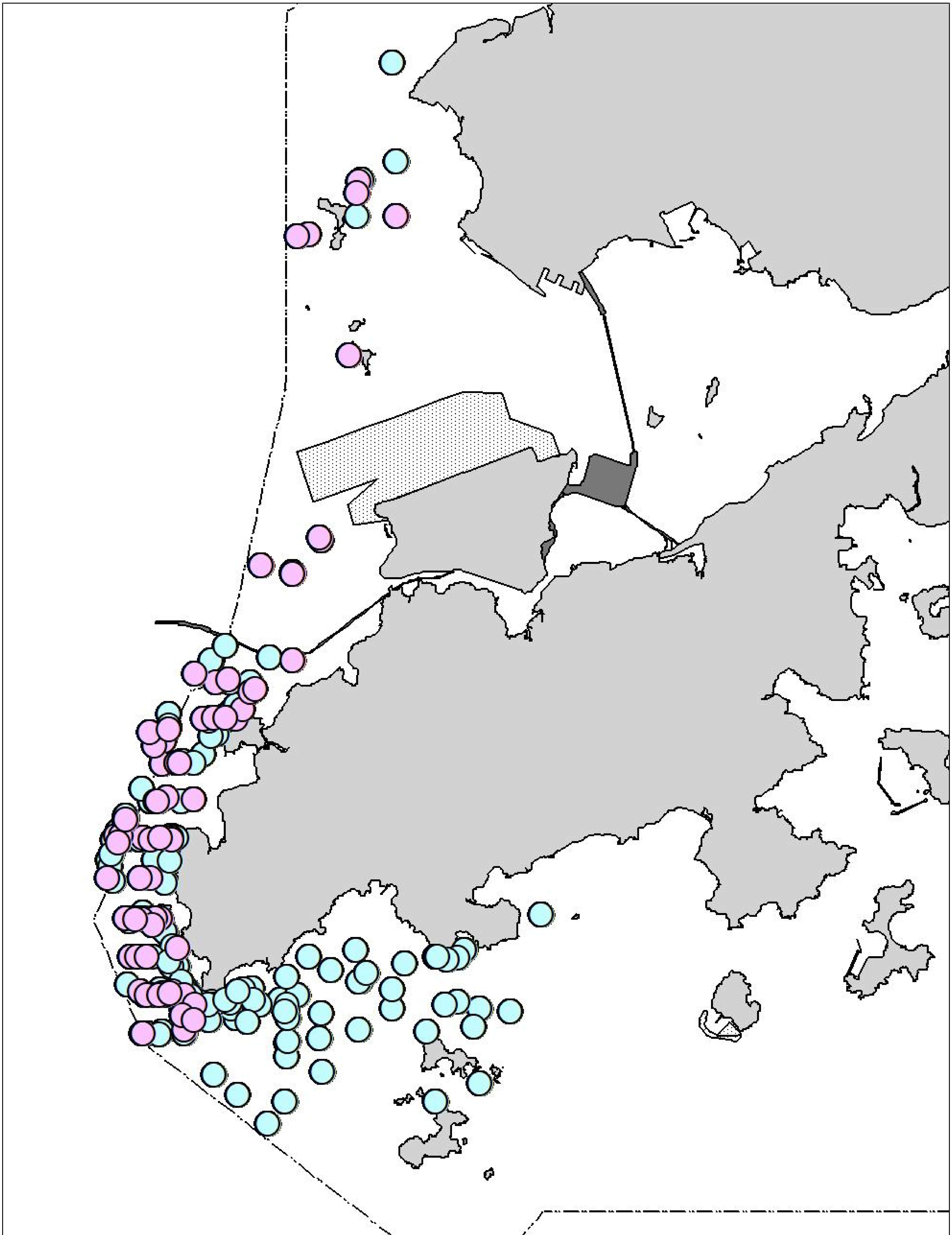


Figure 5. Distribution of all CWD sightings in Hong Kong waters in 2020
(blue dots: AFCD survey sightings; purple dots: HZMB survey sightings)

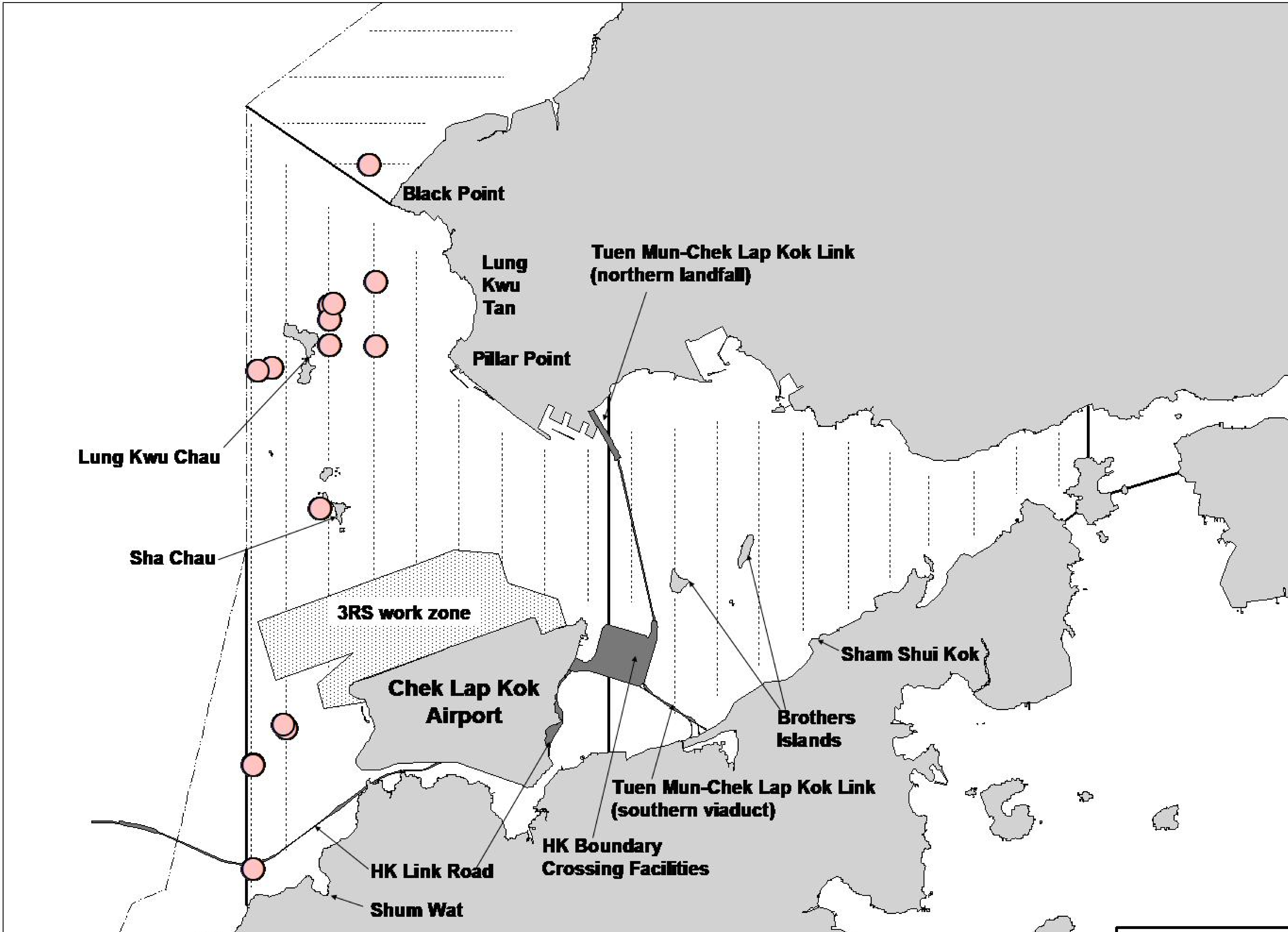


Figure 6. Distribution of Chinese White Dolphin sightings in North Lantau (2020)

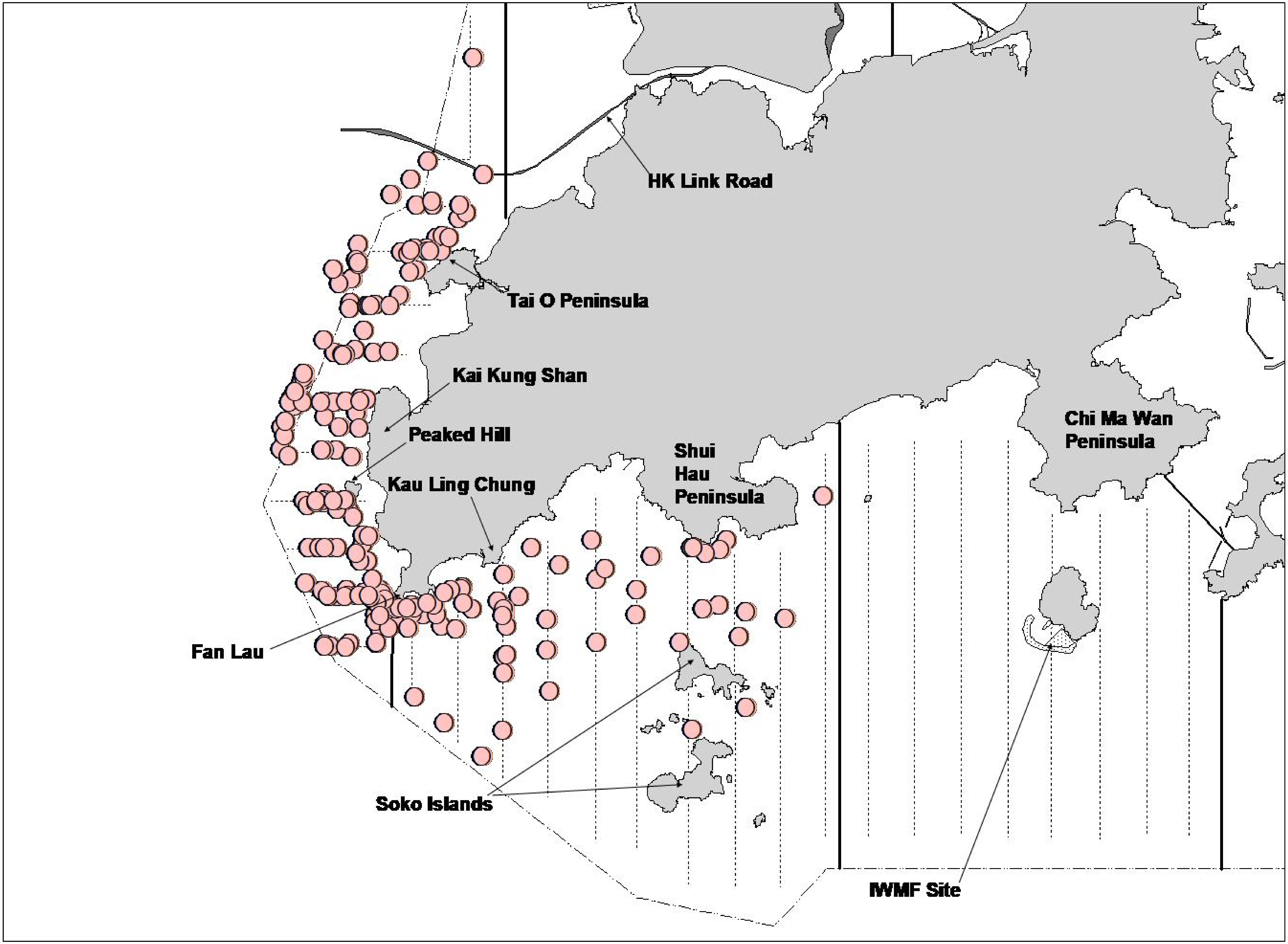


Figure 7. Distribution of Chinese White Dolphin sightings in West and South Lantau waters (2020)

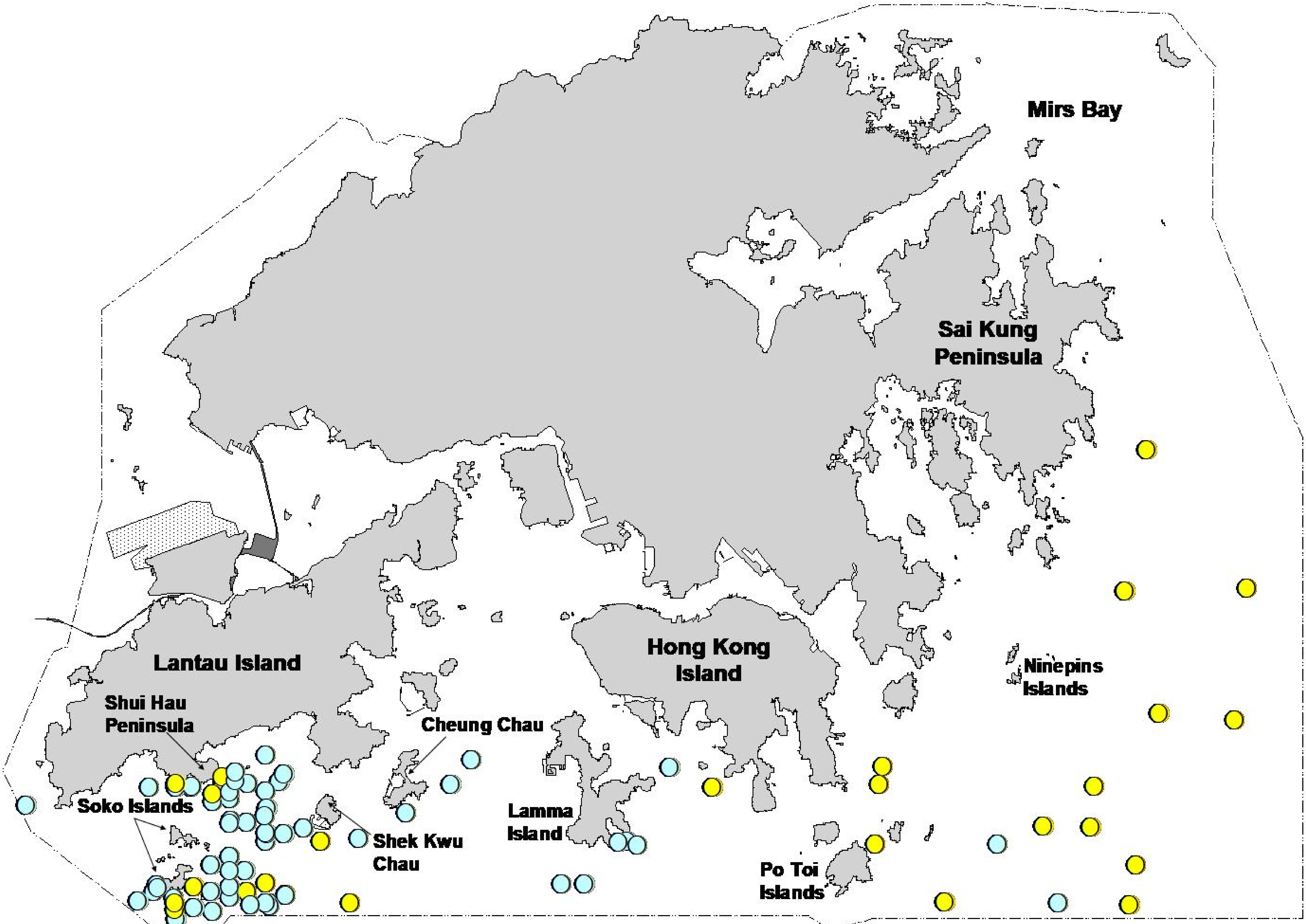


Figure 8. Distribution of finless porpoise sightings made during AFCD surveys (April 2020 – March 2021)
(blue dots: sightings made during winter/spring months; yellow dots: sightings made during summer/autumn months)

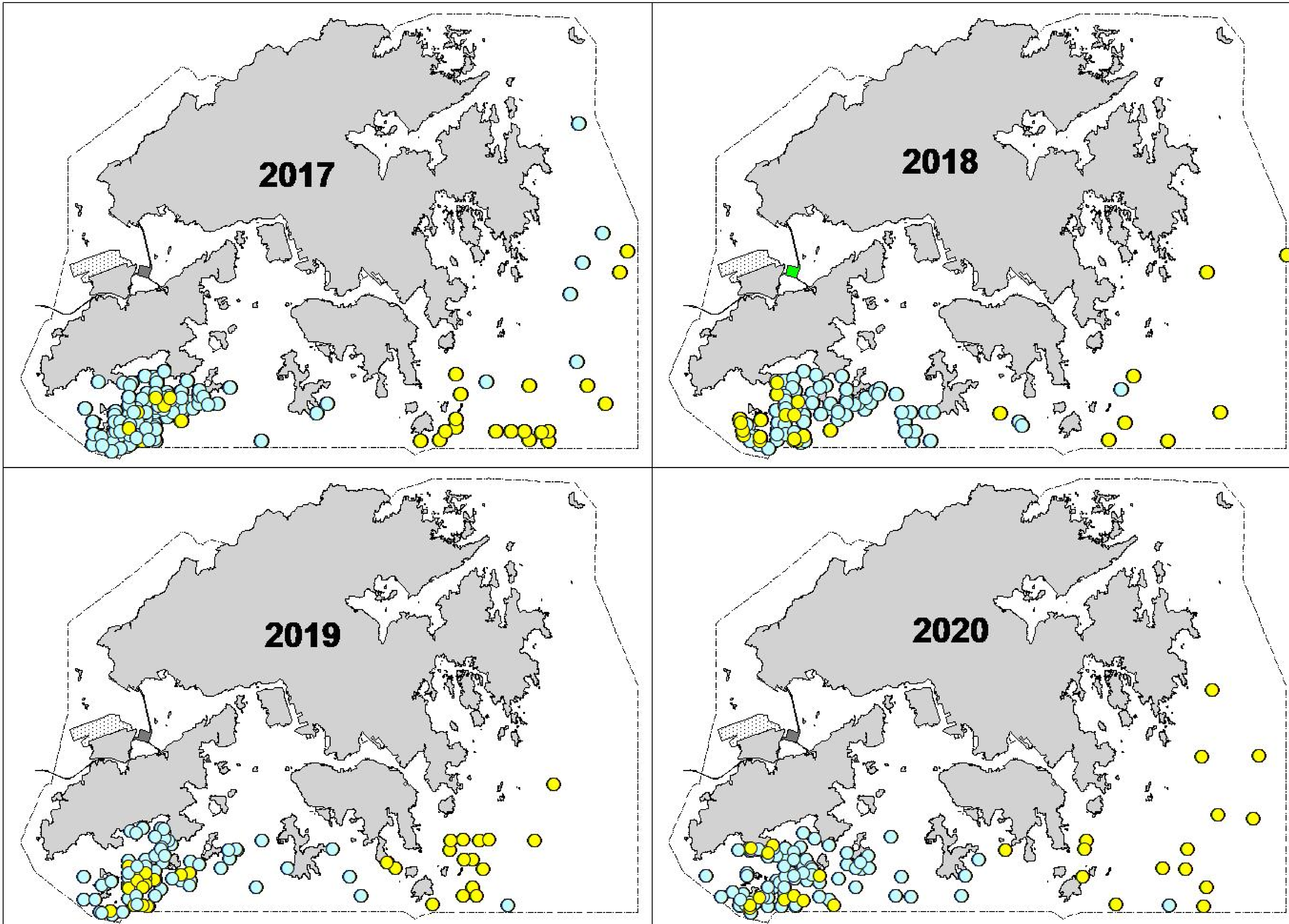


Figure 9. Comparison of annual porpoise distribution patterns from 2017-20
(blue dots: sightings made during winter/spring months; yellow dots: sightings made during summer/autumn months)

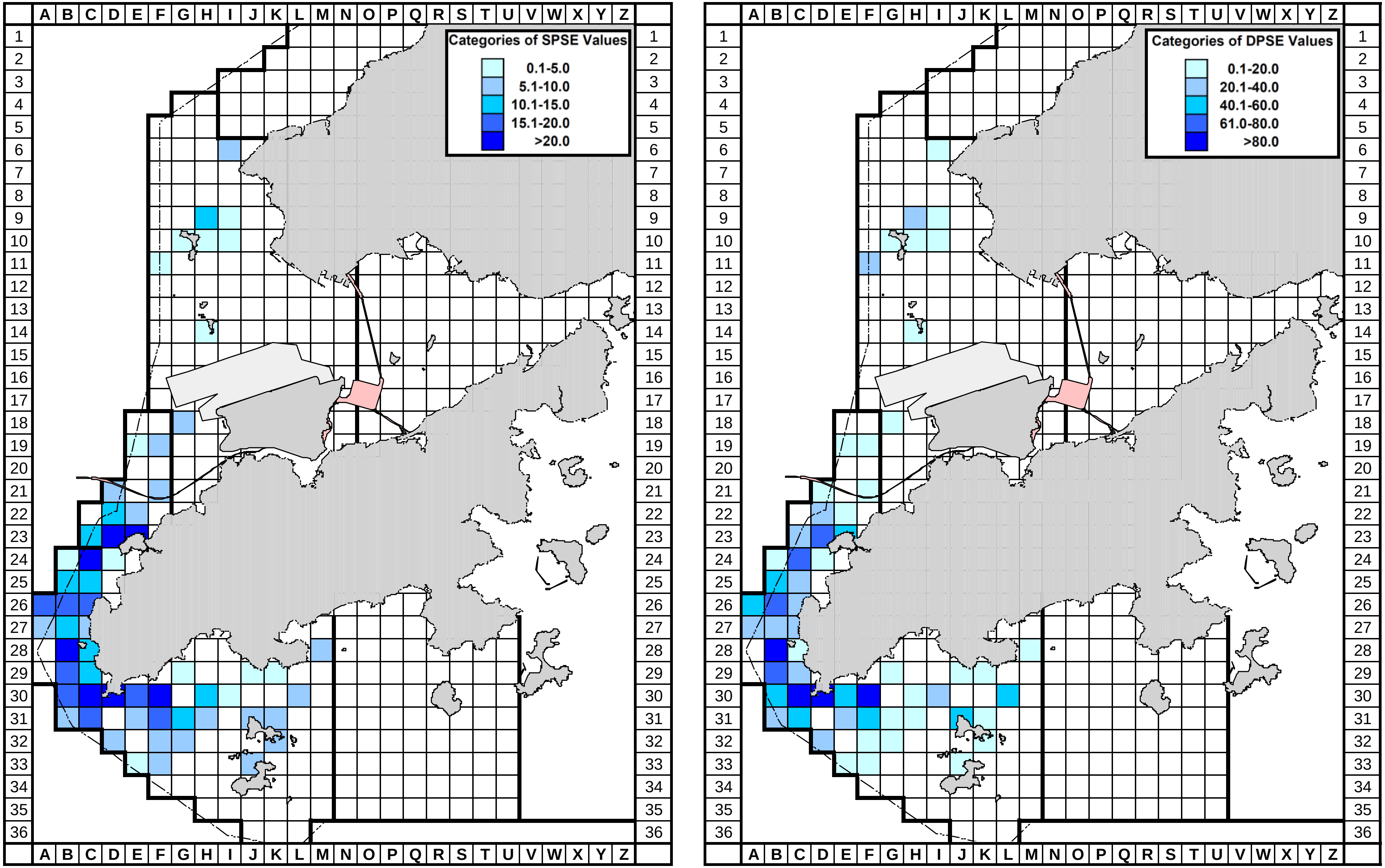


Figure 10. (left) Sighting density of Chinese white dolphins with corrected survey effort per km^2 in waters around Lantau Island (number within grids represent "SPSE" no. of on-effort dolphin sightings per 100 units of survey effort) (using data from January - December 2020)

(right) Density of Chinese white dolphins with corrected survey effort per km^2 in waters around Lantau Island (number within grids represent "DPSE" = no. o dolphins per 100 units of survey effort) (using data from January - December 2020)

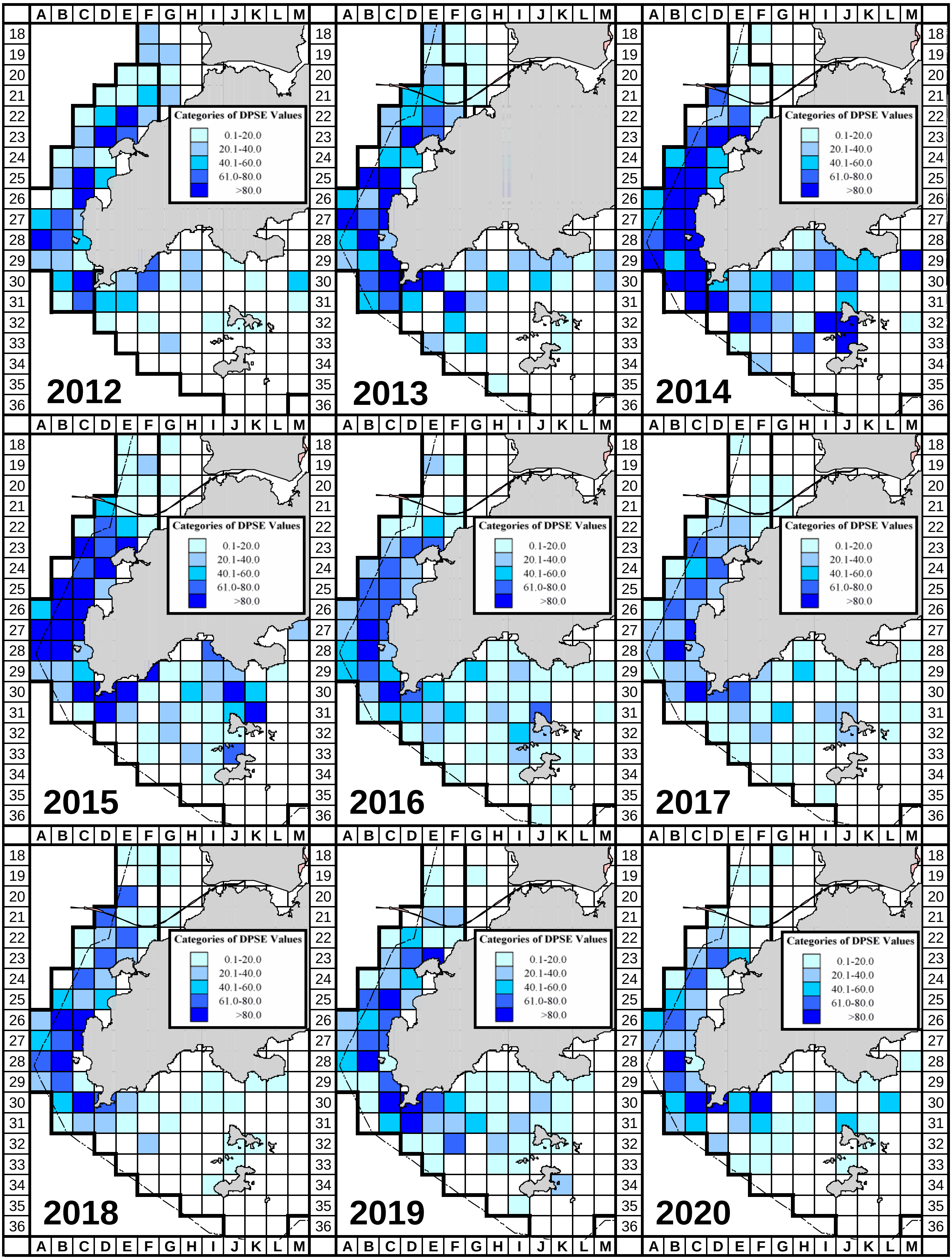


Figure 11. Comparison of Chinese White Dolphin densities with corrected survey effort per km^2 in West and Southwest Lantau Waters in 2012-20 (number within grids represent "DPSE" = no. of dolphins per 100 units of survey effort)

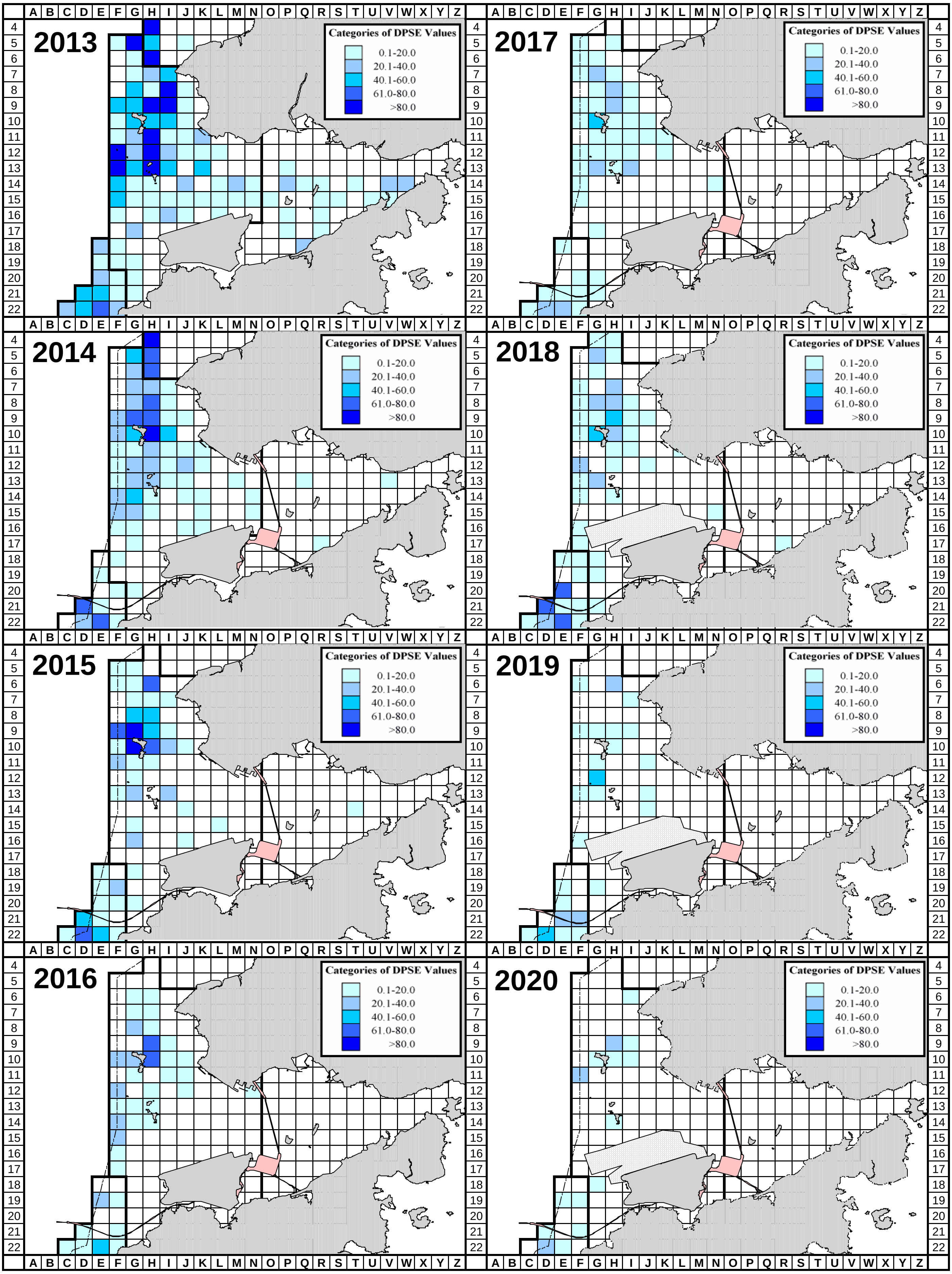


Figure 12. Comparison of dolphin densities with corrected survey effort per km^2 in North Lantau waters in 2013-20 (number within grids represent "DPSE" = no. of dolphins per 100 units of survey effort)

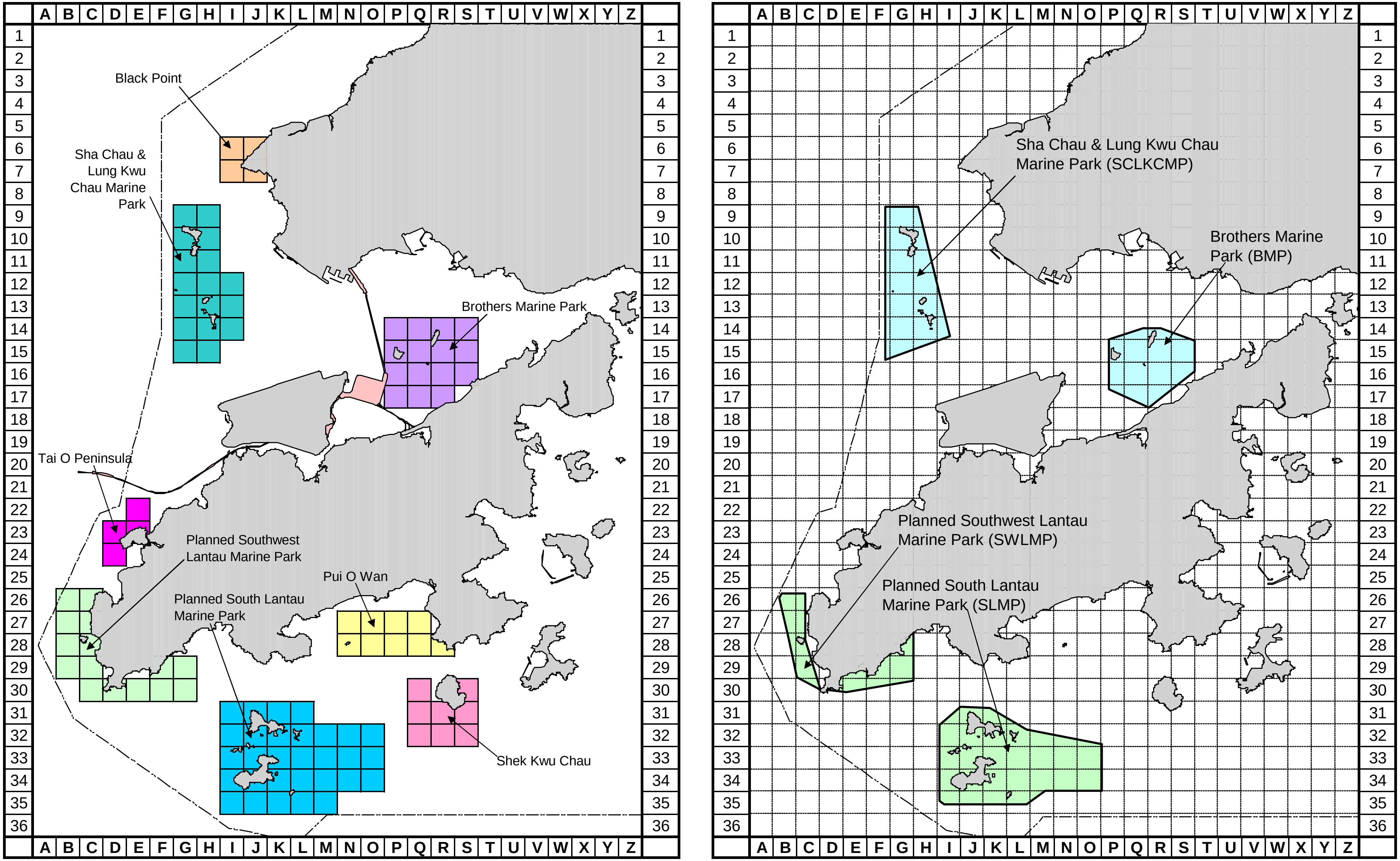


Figure 13. Grids of key marine mammal habitats in western HK waters that were examined for temporal trend in dolphin and porpoise densities

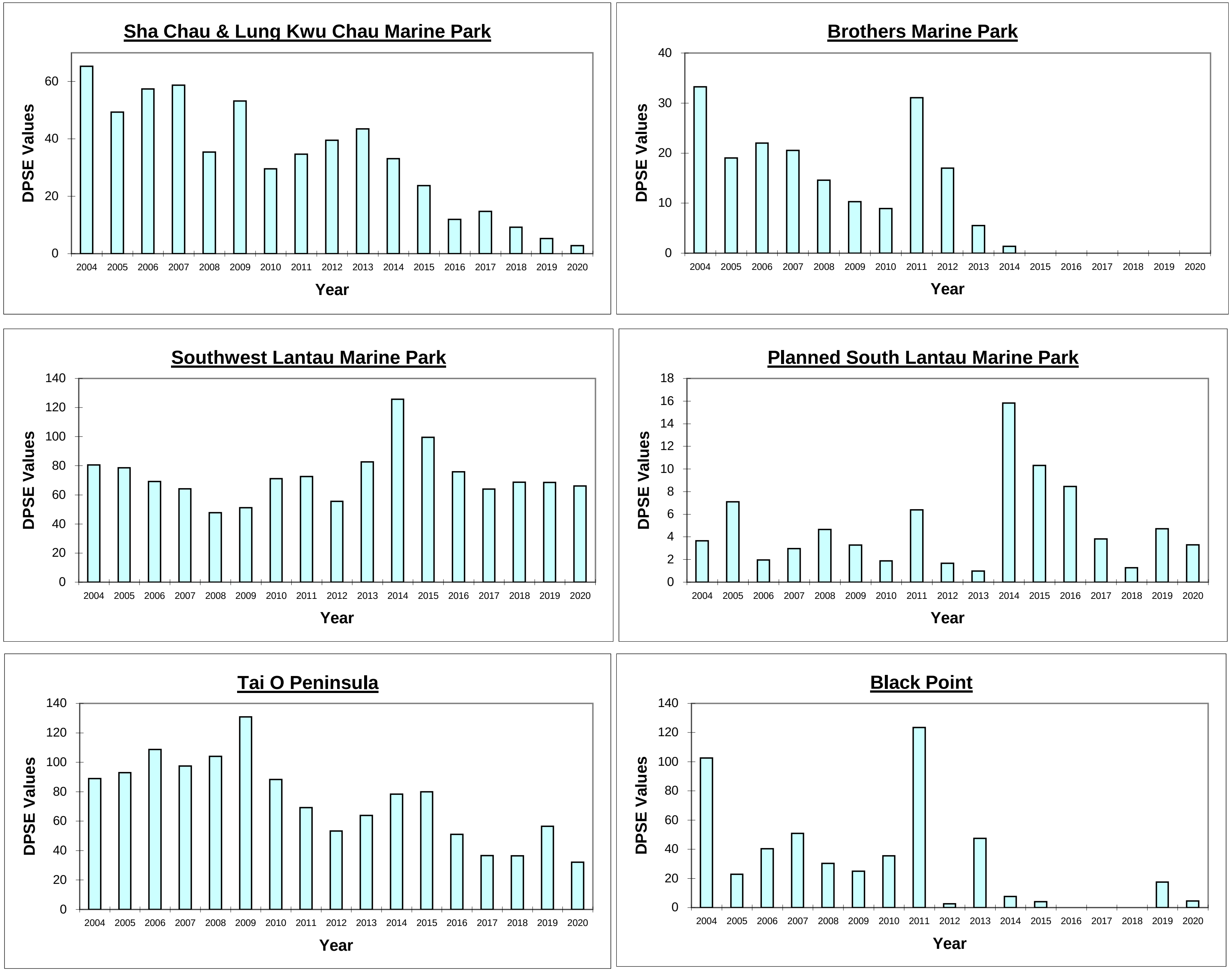


Figure 14. Temporal trend of dolphin densities (DPSE Values) at six key dolphin habitats in Lantau waters

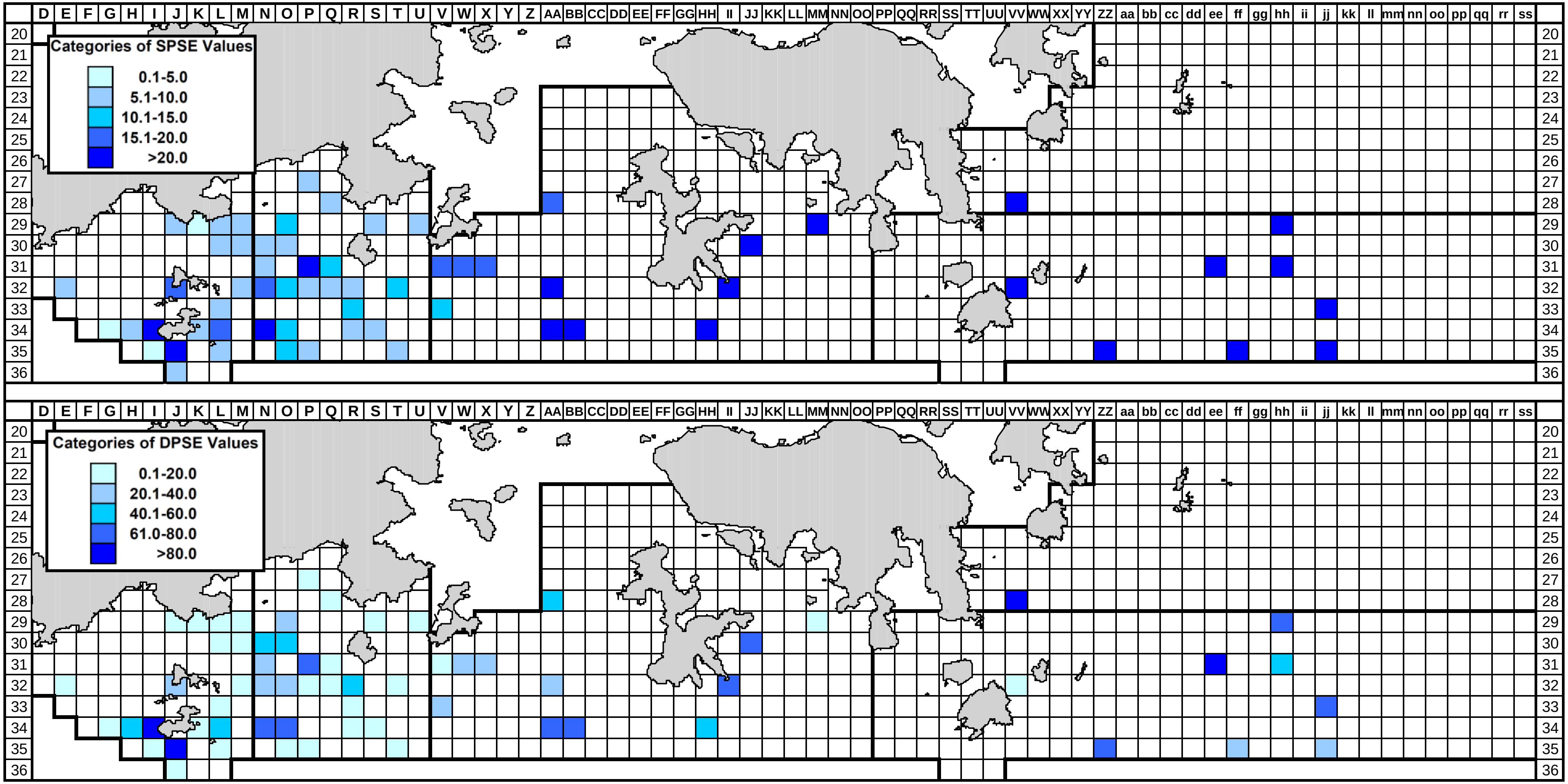


Figure 15. (top) Sighting density of finless porpoises with corrected survey effort per km^2 in southern waters of Hong Kong (number within grids represent "SPSE" = no. of on-effort porpoise sightings per 100 units of survey effort) (using data from January - December 2020)

(bottom) Density of finless porpoises with corrected survey effort per km^2 in southern waters of Hong Kong (number within grids represents "DPSE" = no. of porpoises per 100 units of survey effort) (using data from January - December 2020)

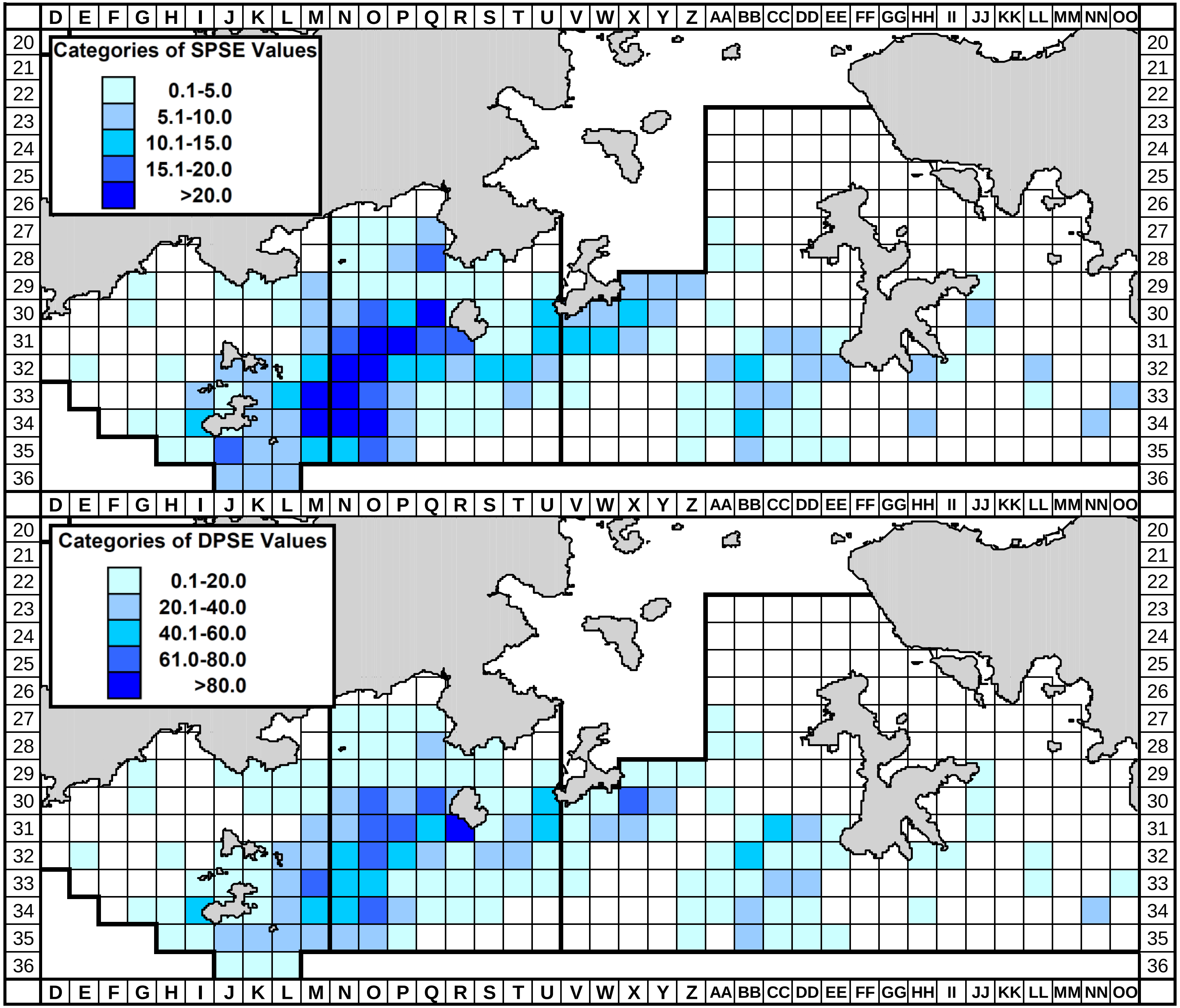


Figure 16. Density of finless porpoises with corrected survey effort per km^2 in southern waters of Hong Kong during dry season (December to May), using data collected during 2016-20 (SPSE = no. of on-effort porpoise sightings per 100 units of survey effort; DPSE = no. of porpoises per 100 units of survey effort)

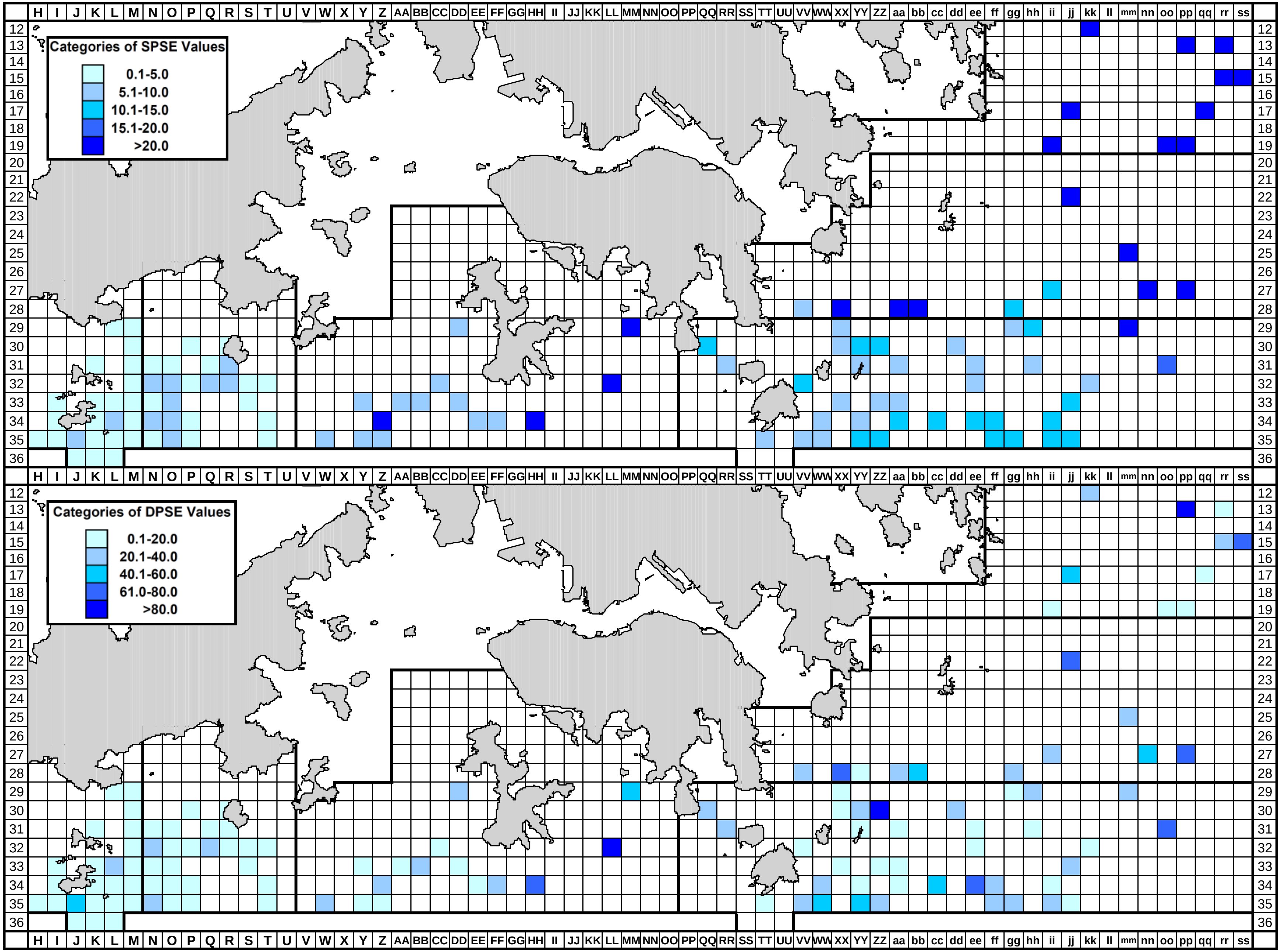


Figure 17. Density of finless porpoises with corrected survey effort per km^2 in southern and eastern waters of Hong Kong during wet season (June to November), using data collected during 2016-20 (SPSE = no. of on-effort porpoise sightings per 100 units of survey effort; DPSE = no. of porpoises per 100 units of survey effort

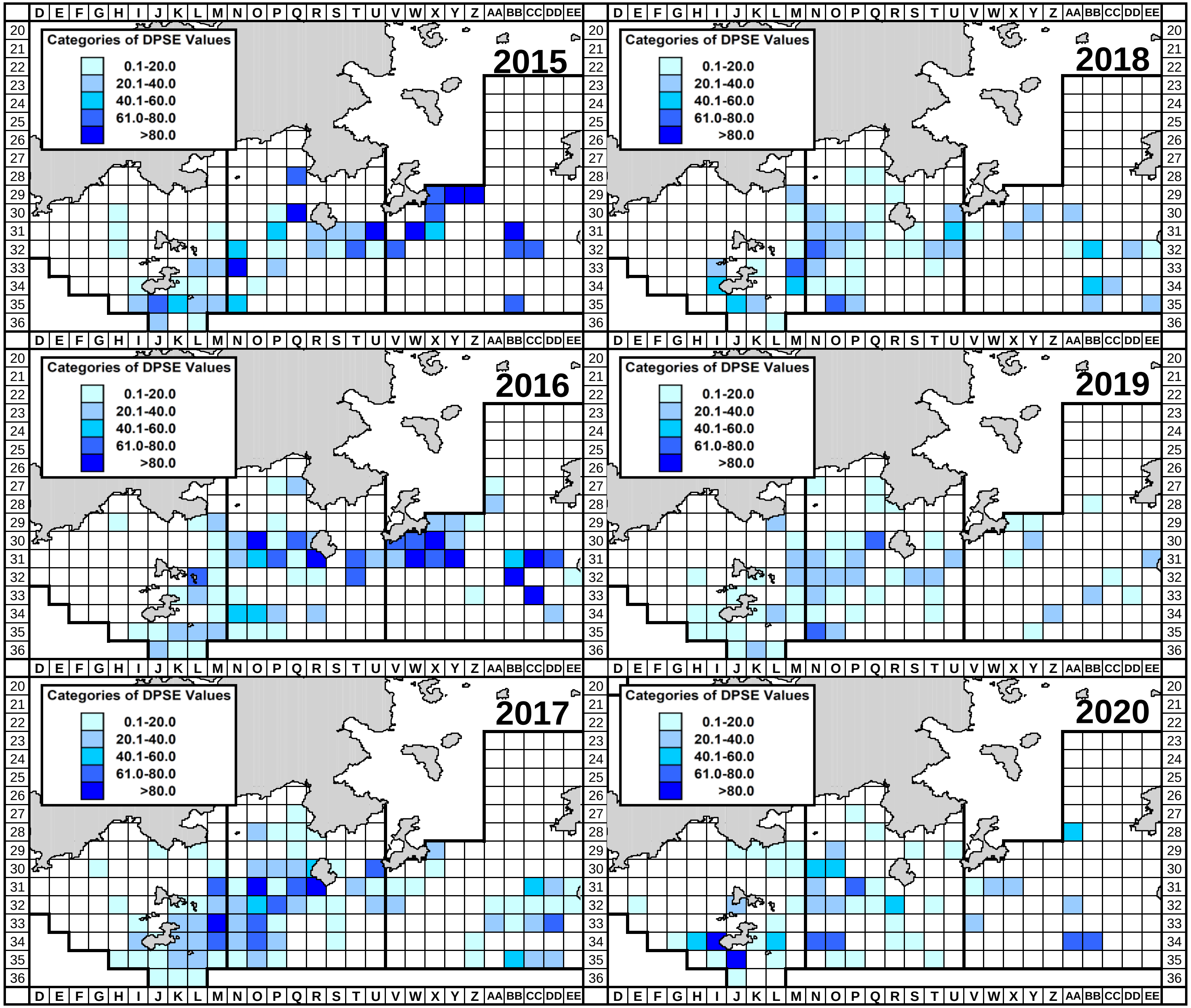


Figure 18. Comparison of porpoise densities with corrected survey effort per km^2 in South Lantau and Western Lamma waters in 2015-20 (number within grids represent "DPSE" = no. of porpoises per 100 units of survey effort)

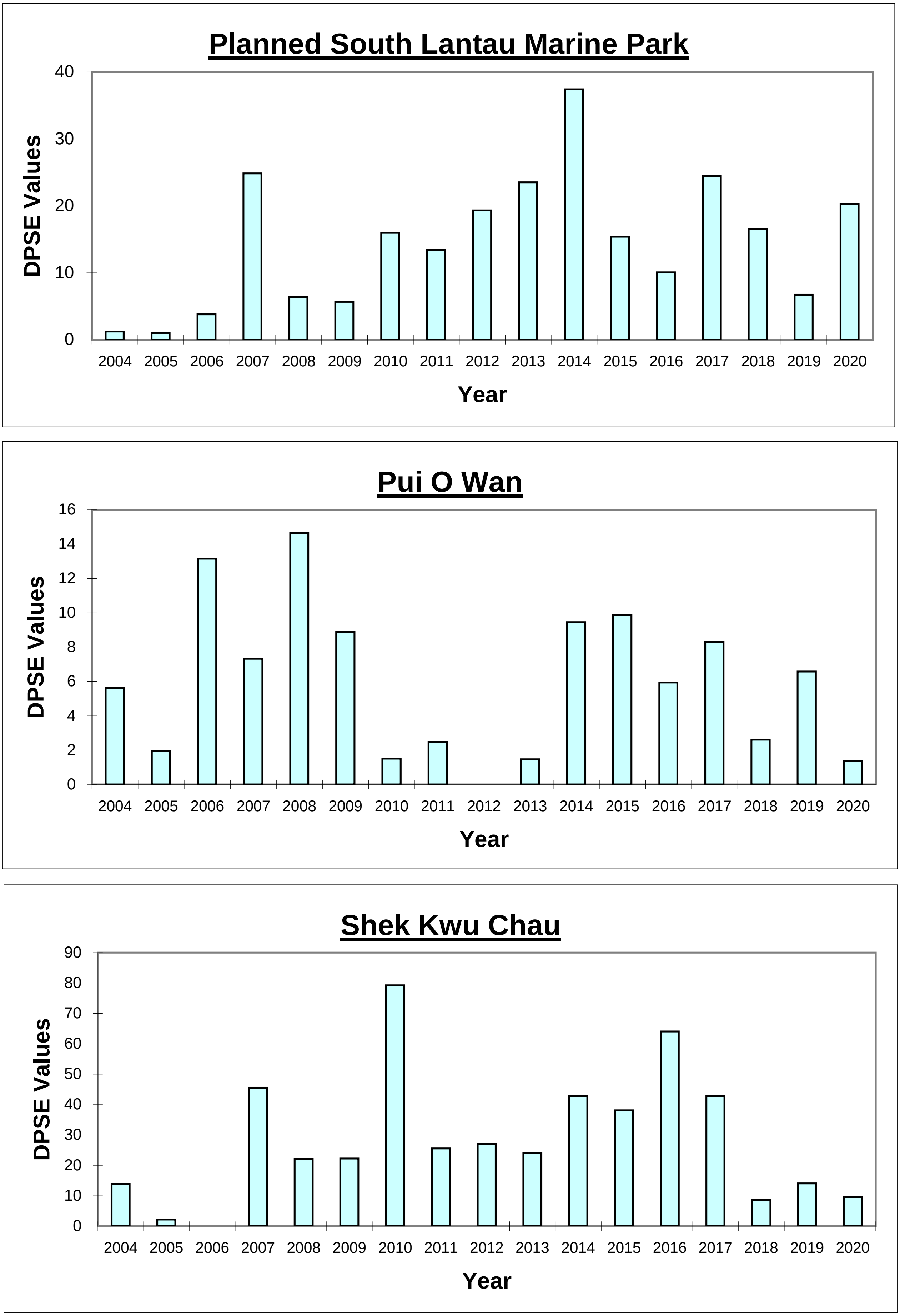


Figure 19. Temporal trend of porpoise densities (DPSE Values) at three key porpoise habitats in South Lantau waters

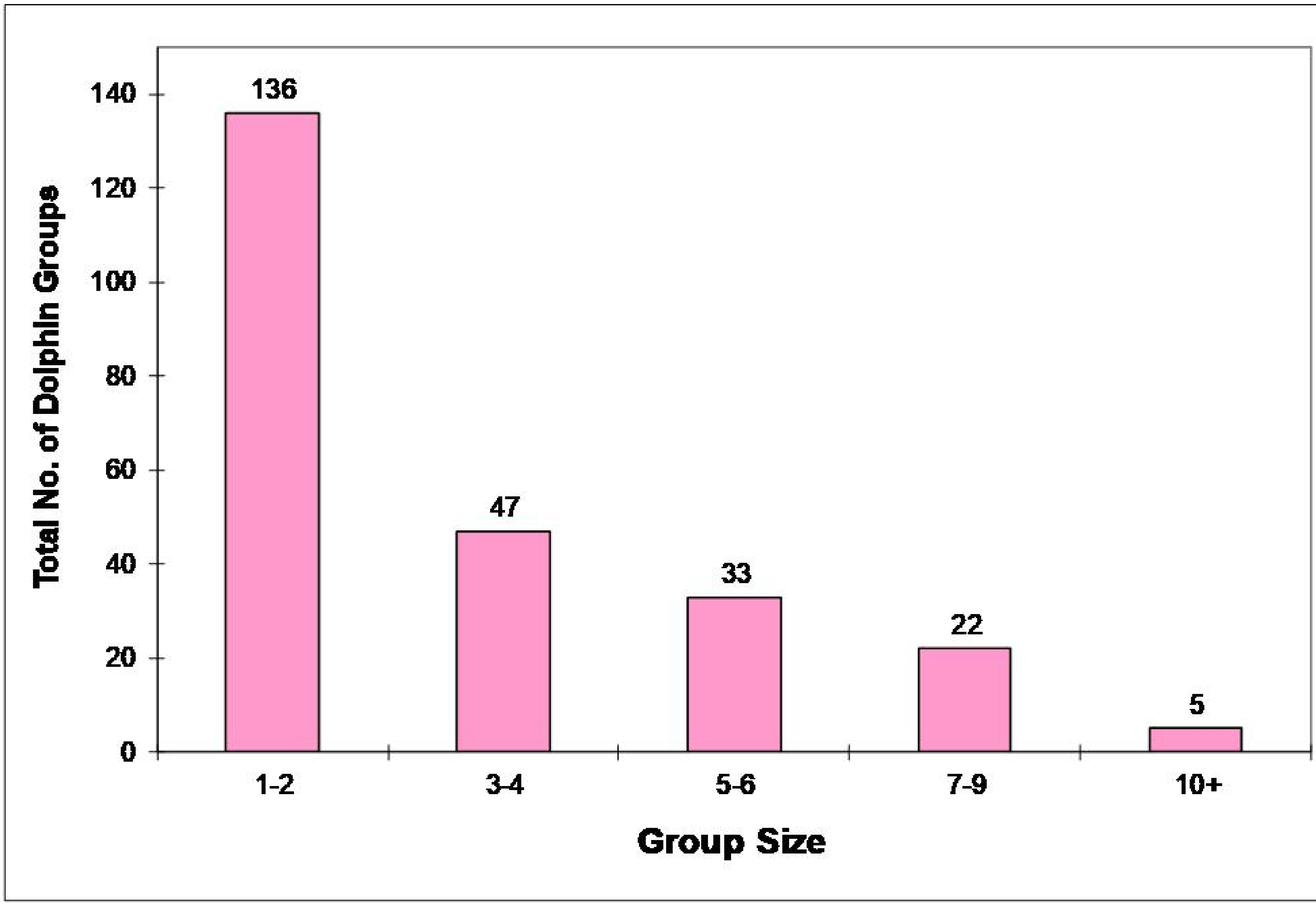


Figure 20. Total number of dolphin groups with different group sizes during April 2020 to March 2021

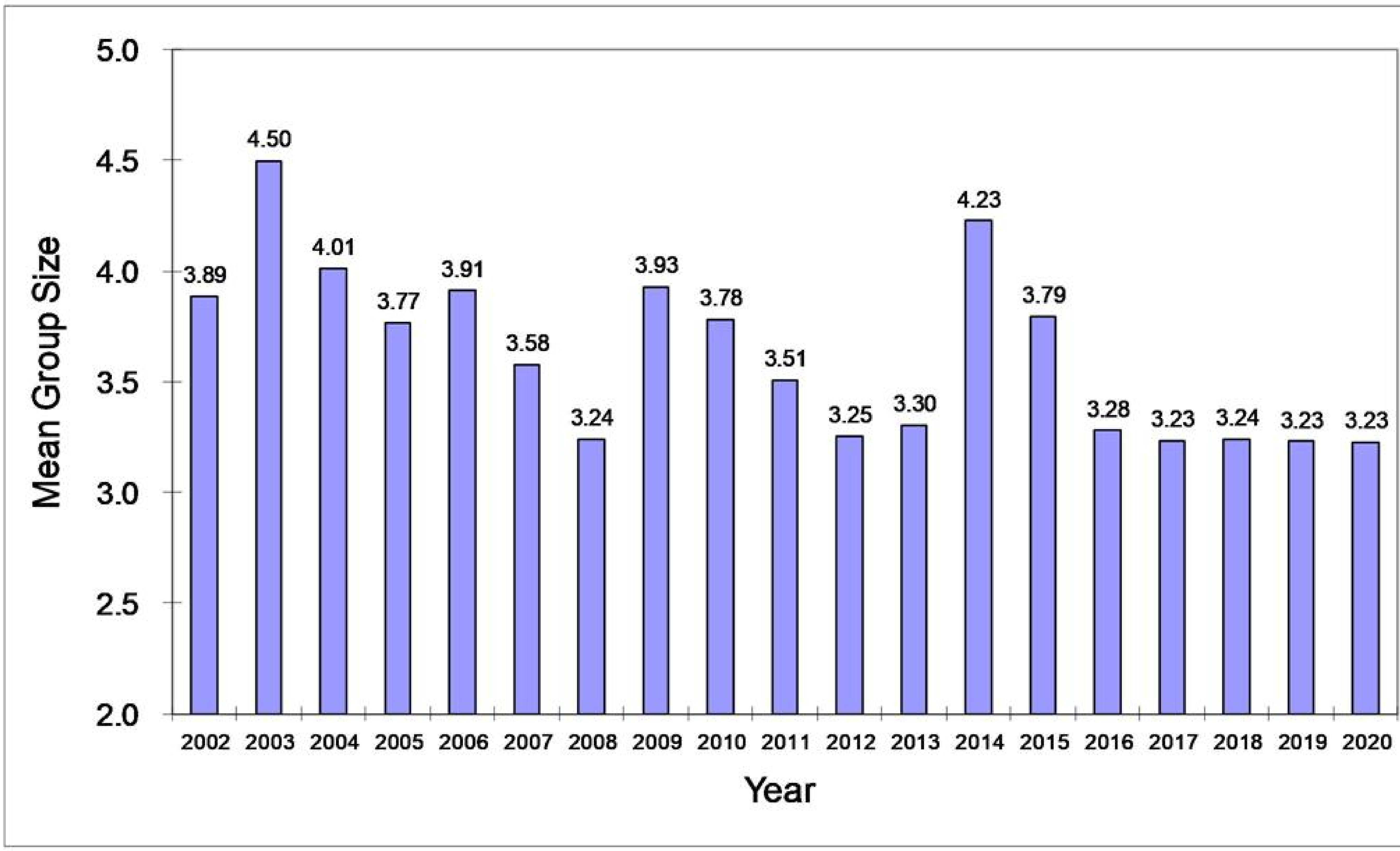


Figure 21. Temporal trend of mean dolphin group size in 2002-20

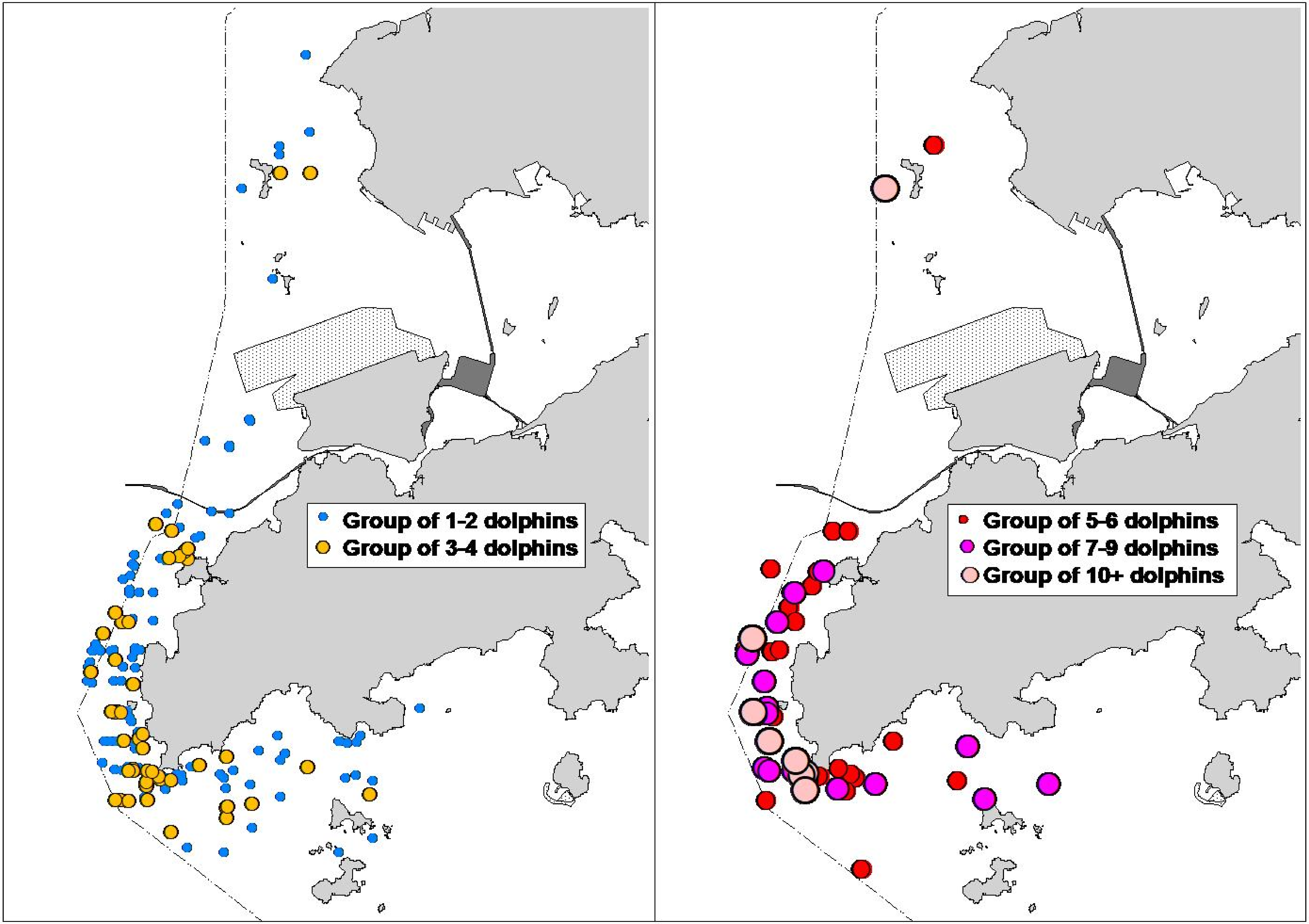


Figure 22. Distribution of Chinese White Dolphins with different group sizes in 2020

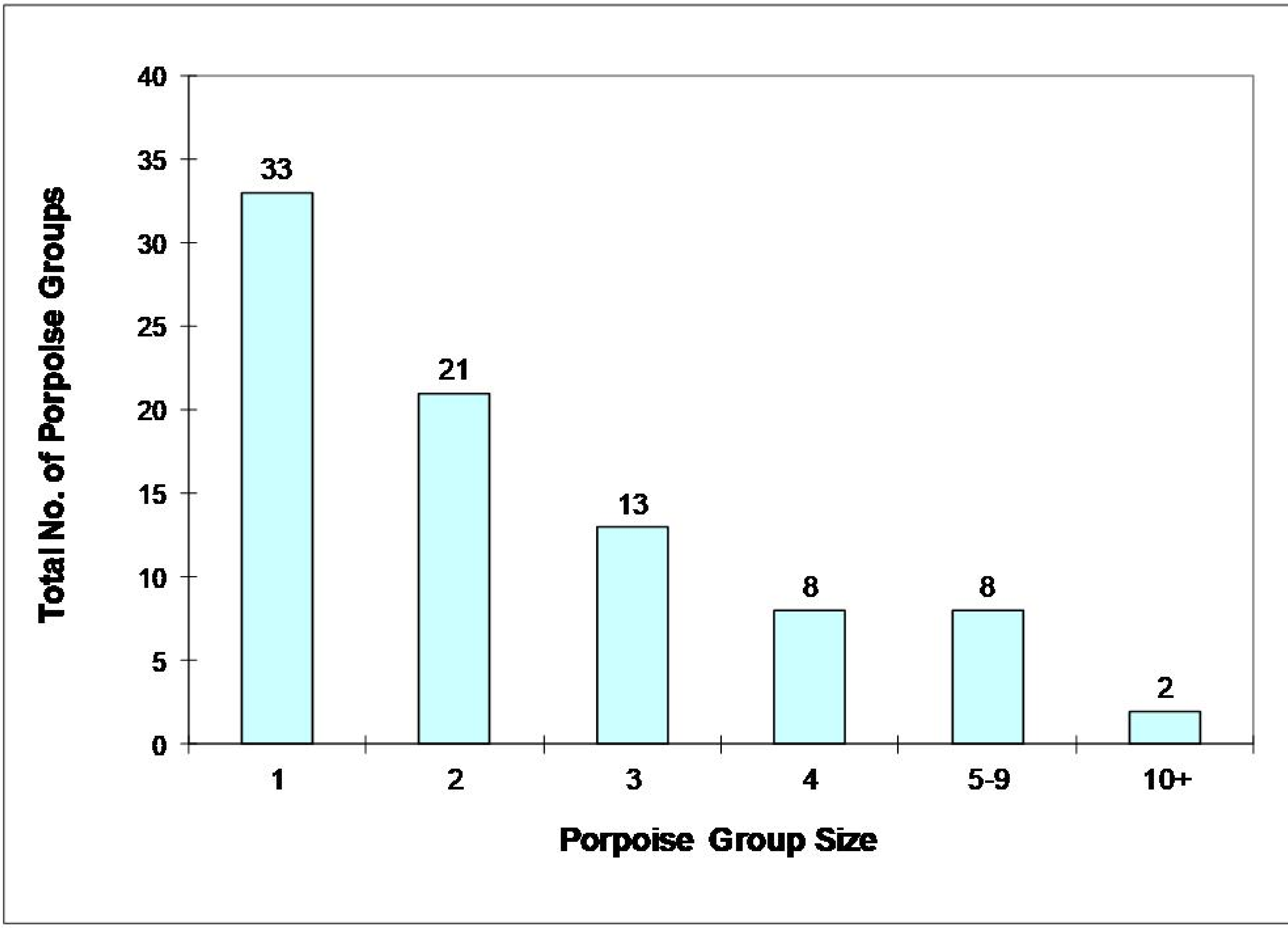


Figure 23. Total number of porpoise groups with different group sizes during April 2020 to March 2021

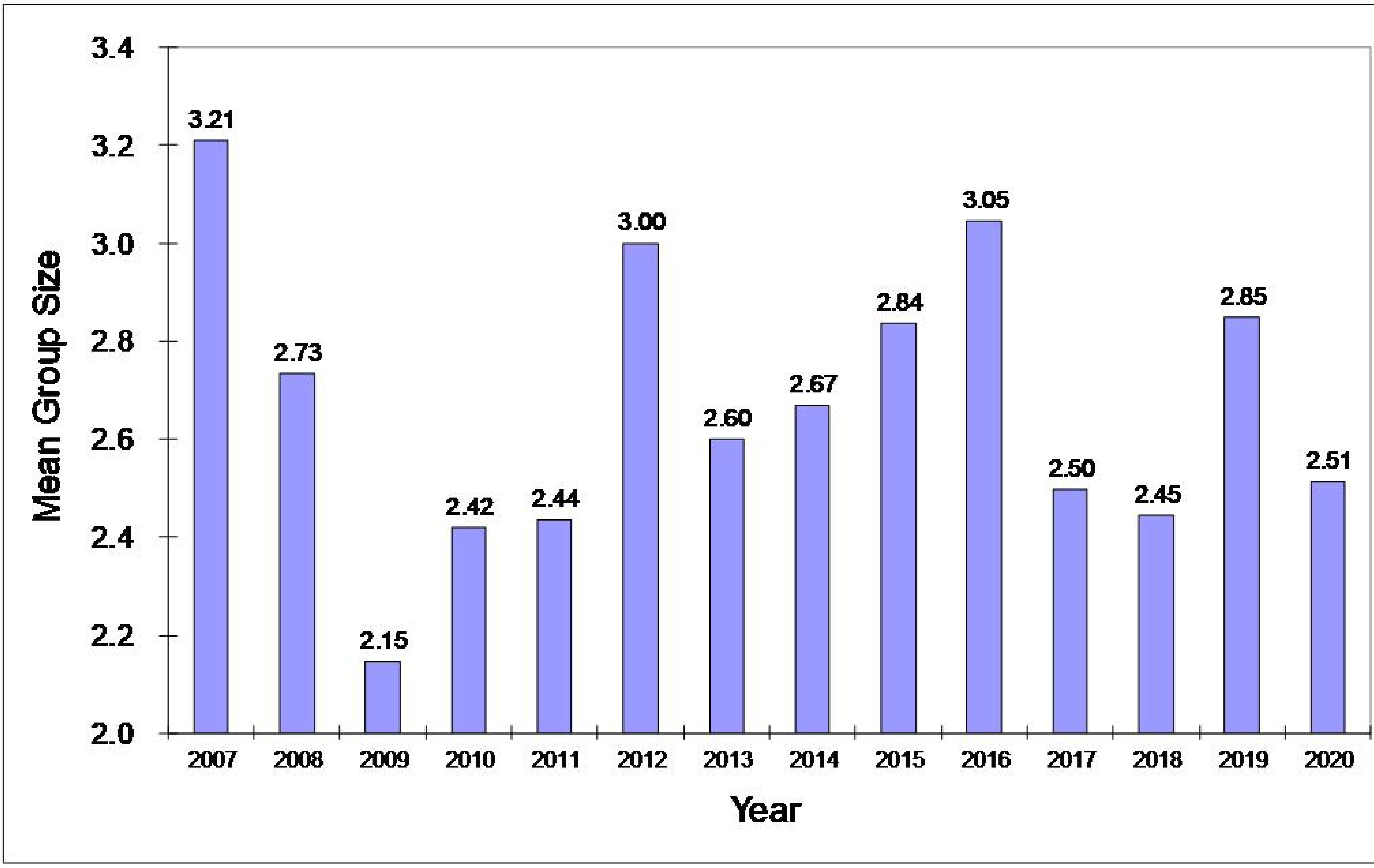


Figure 24. Temporal trend of mean porpoise group size in 2007-20

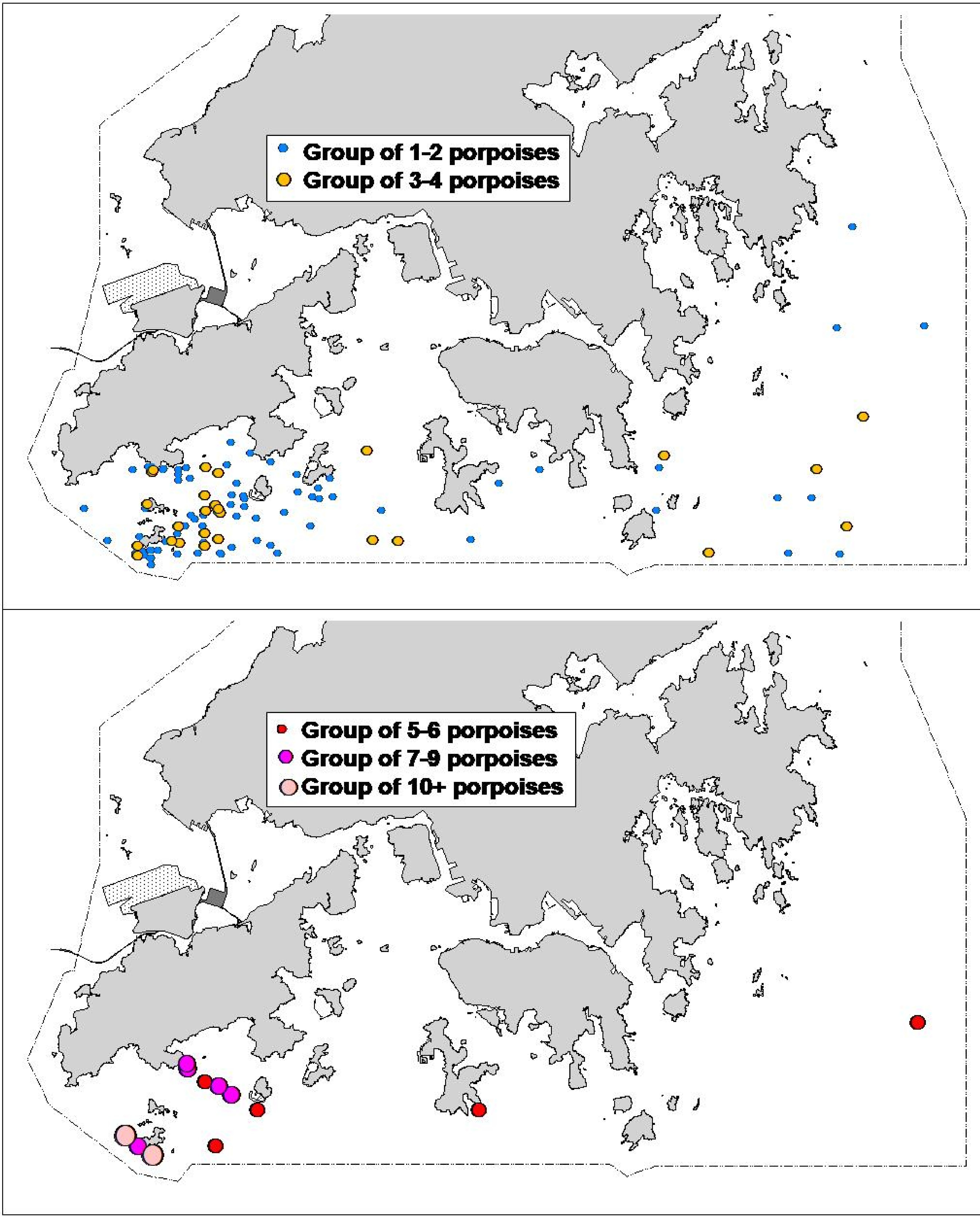


Figure 25. Distribution of finless porpoises with different group sizes in 2020

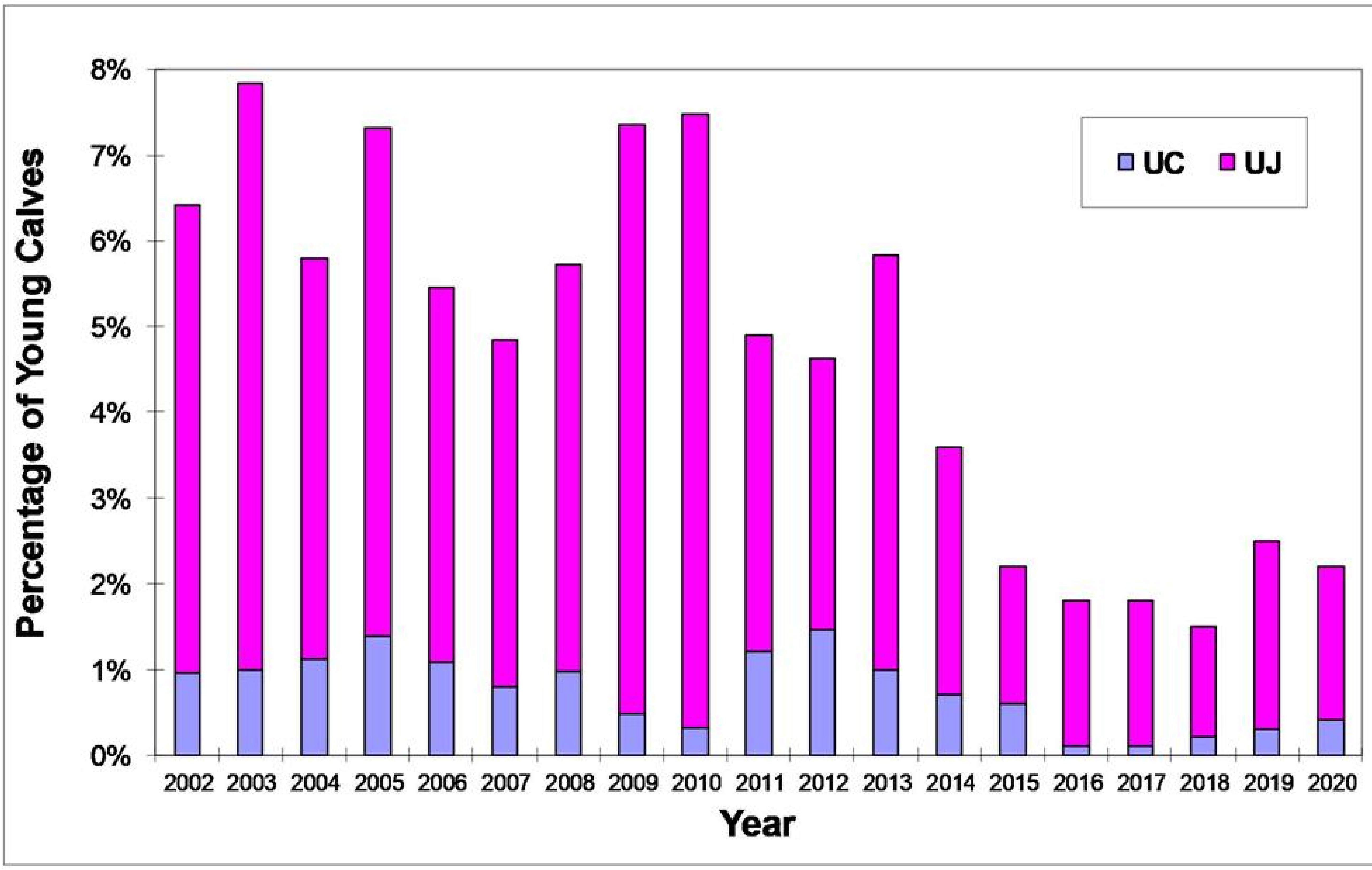


Figure 26. Percentages of young calves (i.e. Unspotted Calves (UC) and Unspotted Juveniles (UJ)) among all dolphin groups during 2002-20

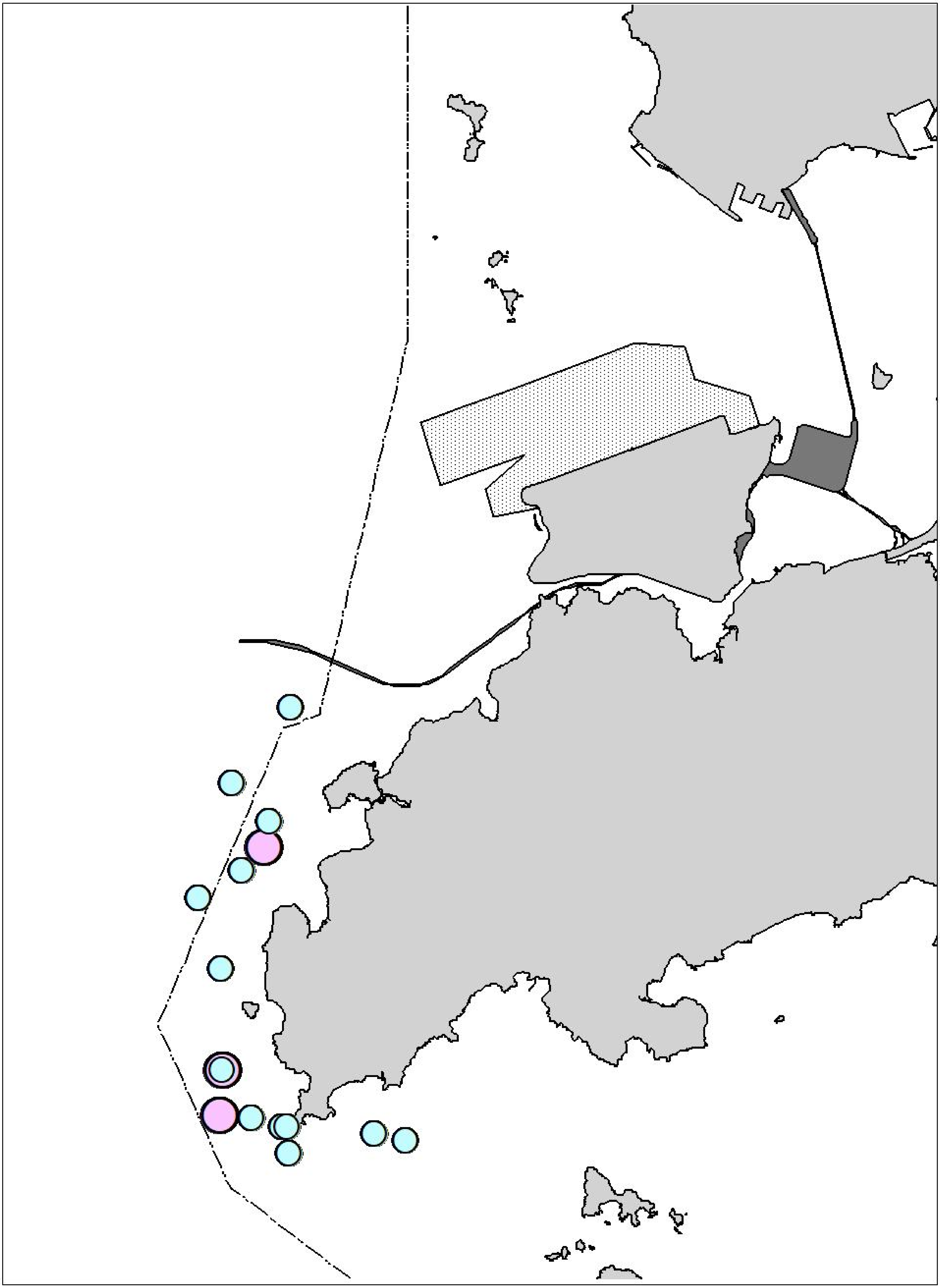


Figure 27. Distribution of Unspotted Calves (purple dots) & Unspotted Juveniles (blue dots) in 2020

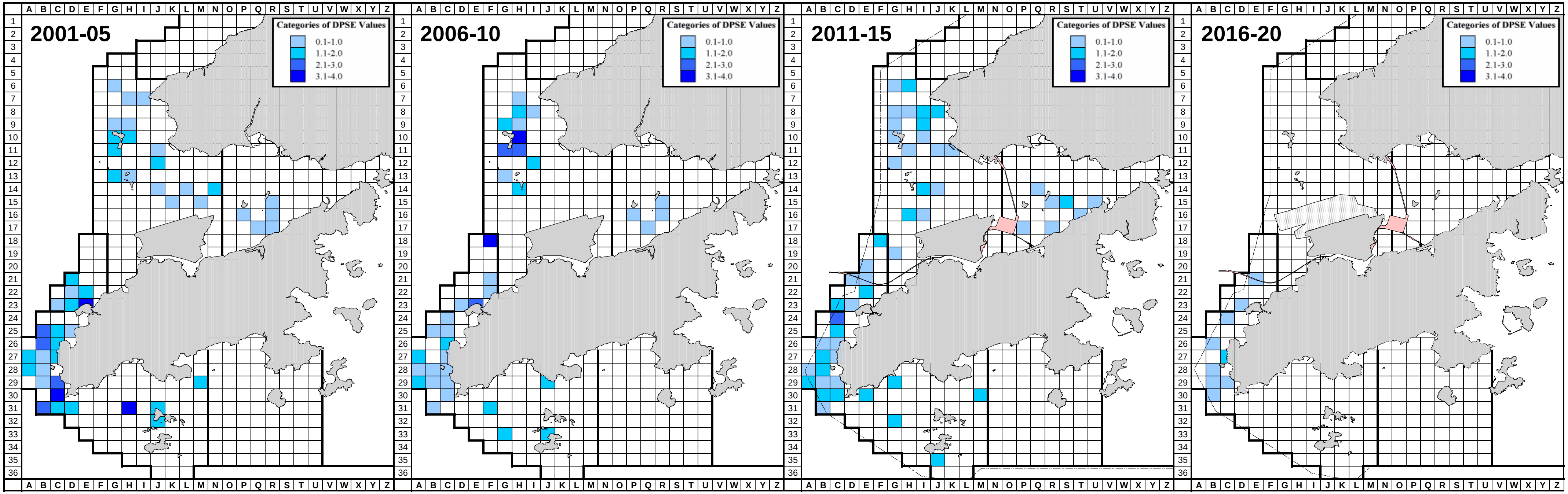


Figure 28. Temporal changes in density of newborn calves (UC) of Chinese White Dolphins with corrected survey effort per km^2 in waters around Lantau Island during 2001-20 (number within grids represent "SPSE" = no. of on-effort sightings per 100 units of survey effort)

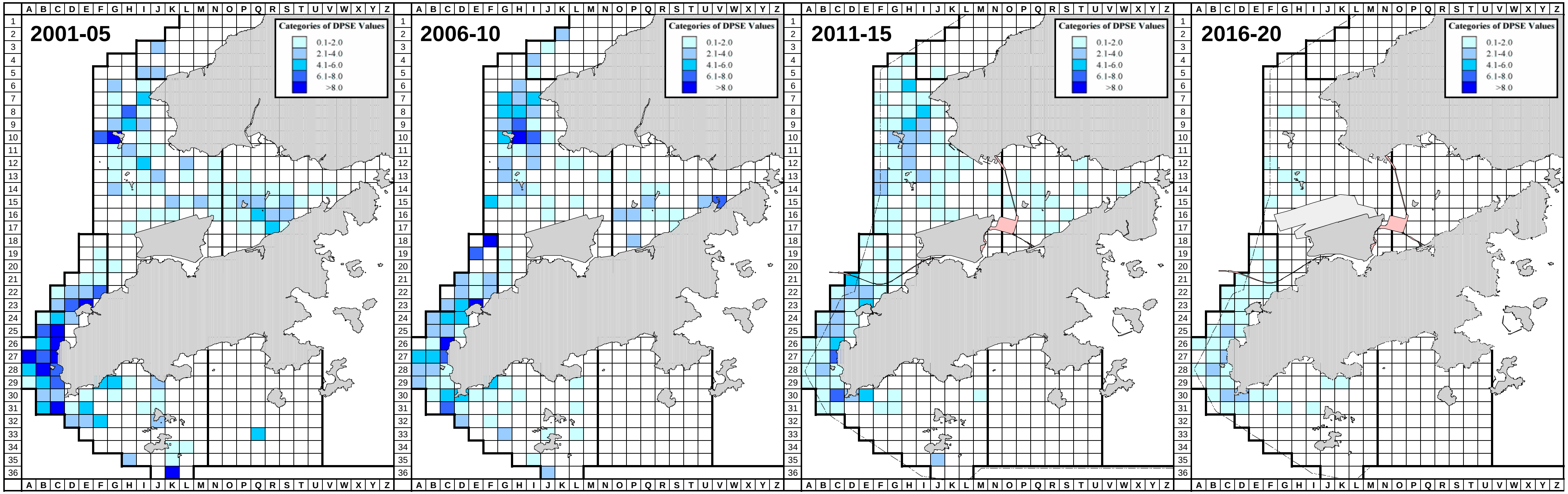


Figure 29. Temporal changes in density of older calves (UJ) of Chinese White Dolphins with corrected survey effort per km^2 in waters around Lantau Island during 2001-20 (number within grids represent "SPSE" = no. of on-effort sightings per 100 units of survey effort)

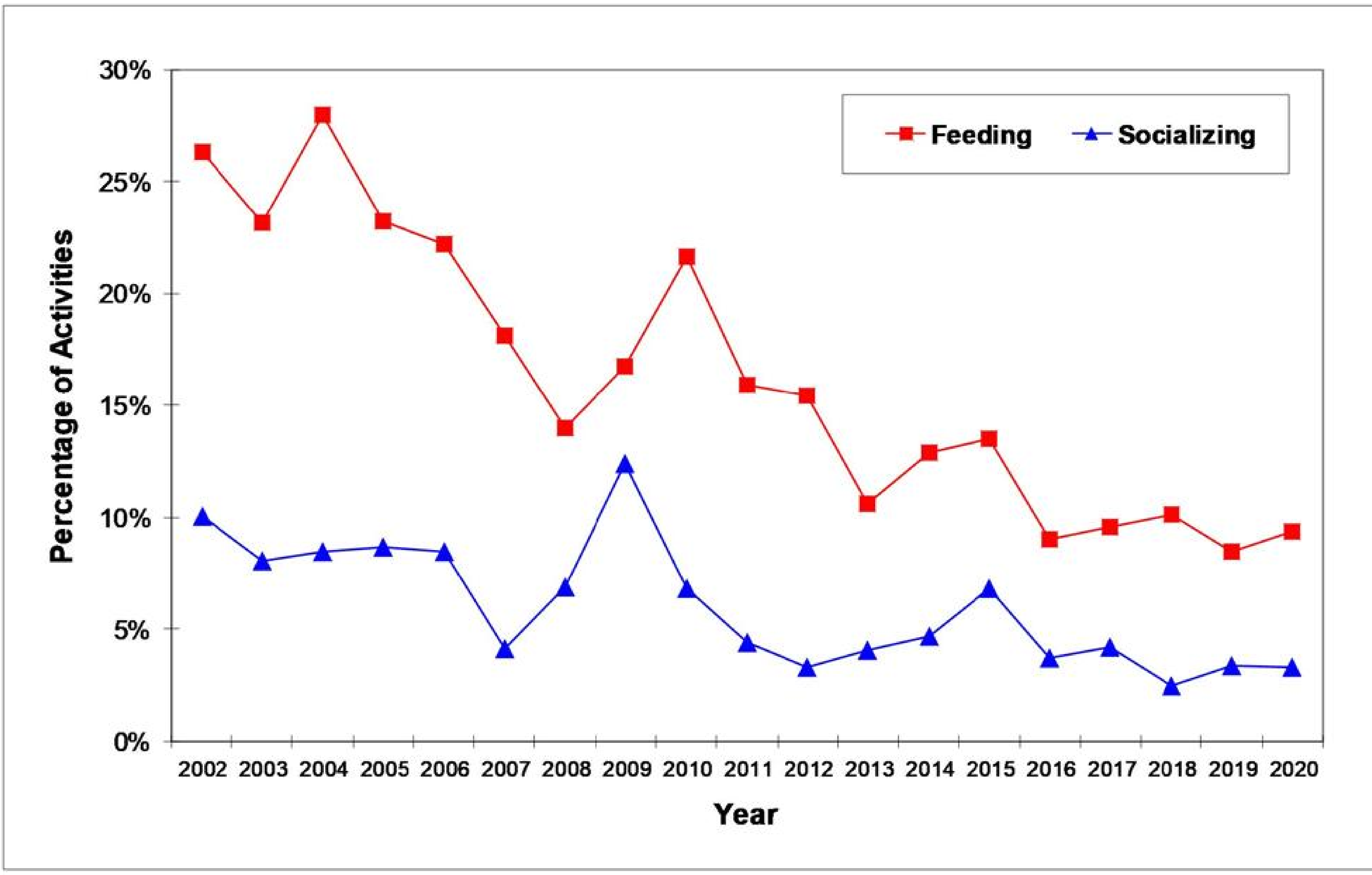


Figure 30. Percentages of feeding and socializing activities among all dolphin groups sighted in Hong Kong during 2002-20

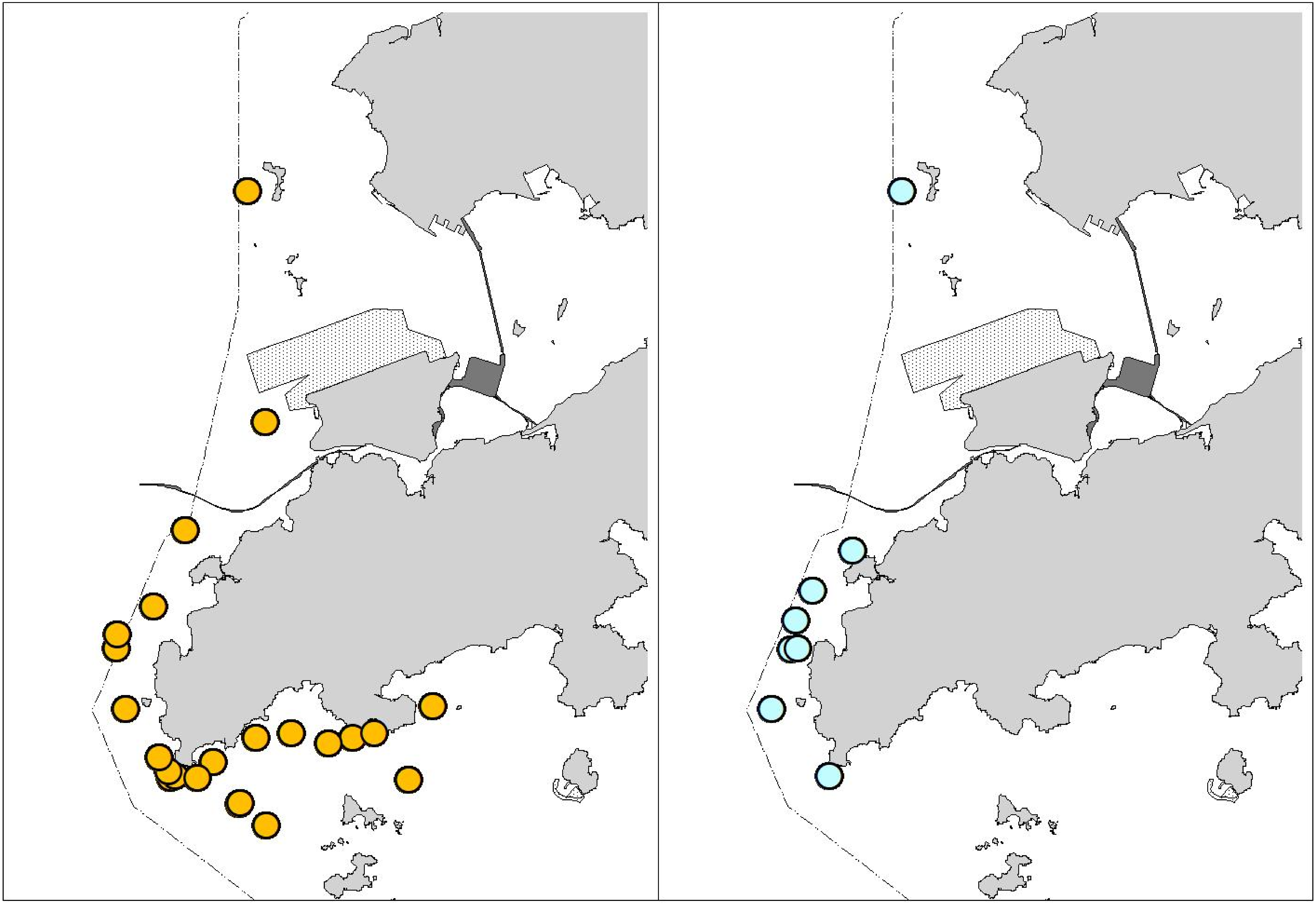


Figure 31. Distribution of Chinese white dolphins engaged in feeding (orange dots) and socializing (blue dots) activities in 2020

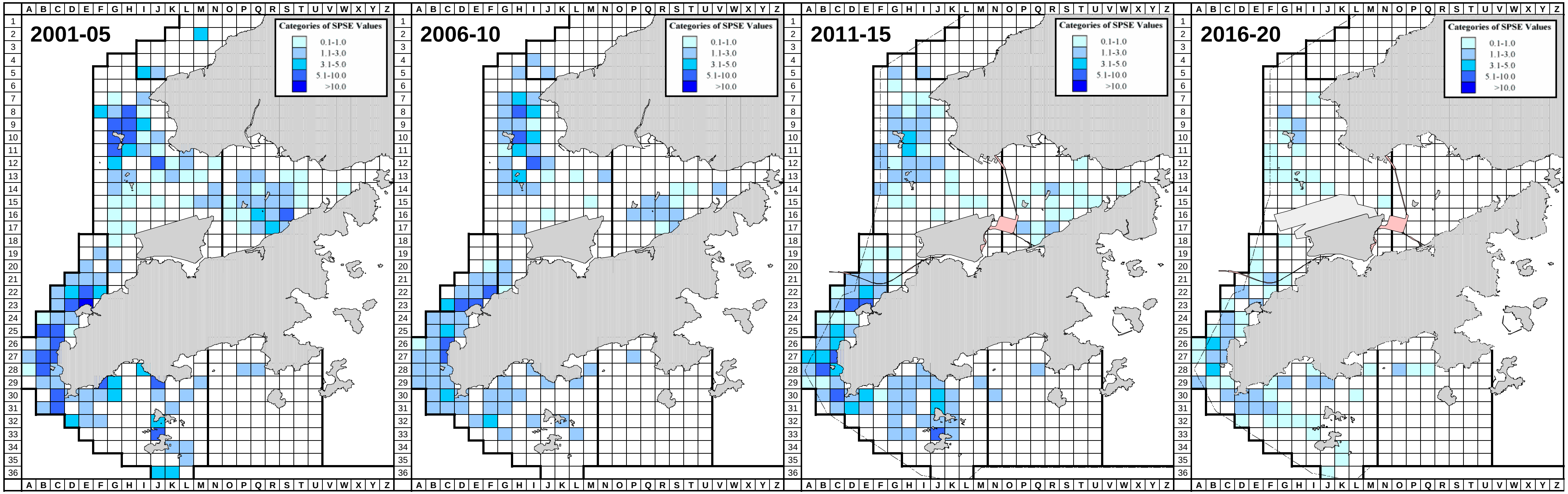


Figure 32. Temporal changes in sighting density of Chinese White Dolphins with corrected survey effort per km^2 engaged in feeding activities in waters around Lantau Island during 2001-20 (number within grids represent "SPSE" = no. of on-effort sightings per 100 units of survey effort)

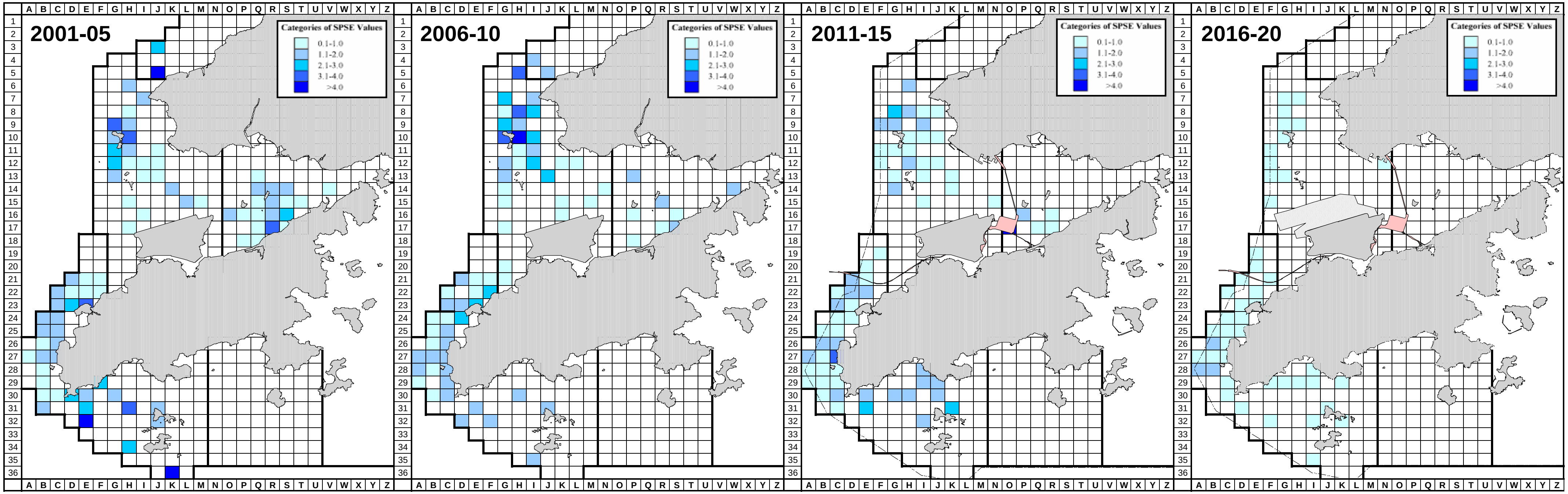


Figure 33. Temporal changes in sighting density of Chinese White Dolphins with corrected survey effort per km^2 engaged in socializing activities in waters around Lantau Island during 2001-20 (number within grids represent "SPSE" = no. of on-effort sightings per 100 units of survey effort)

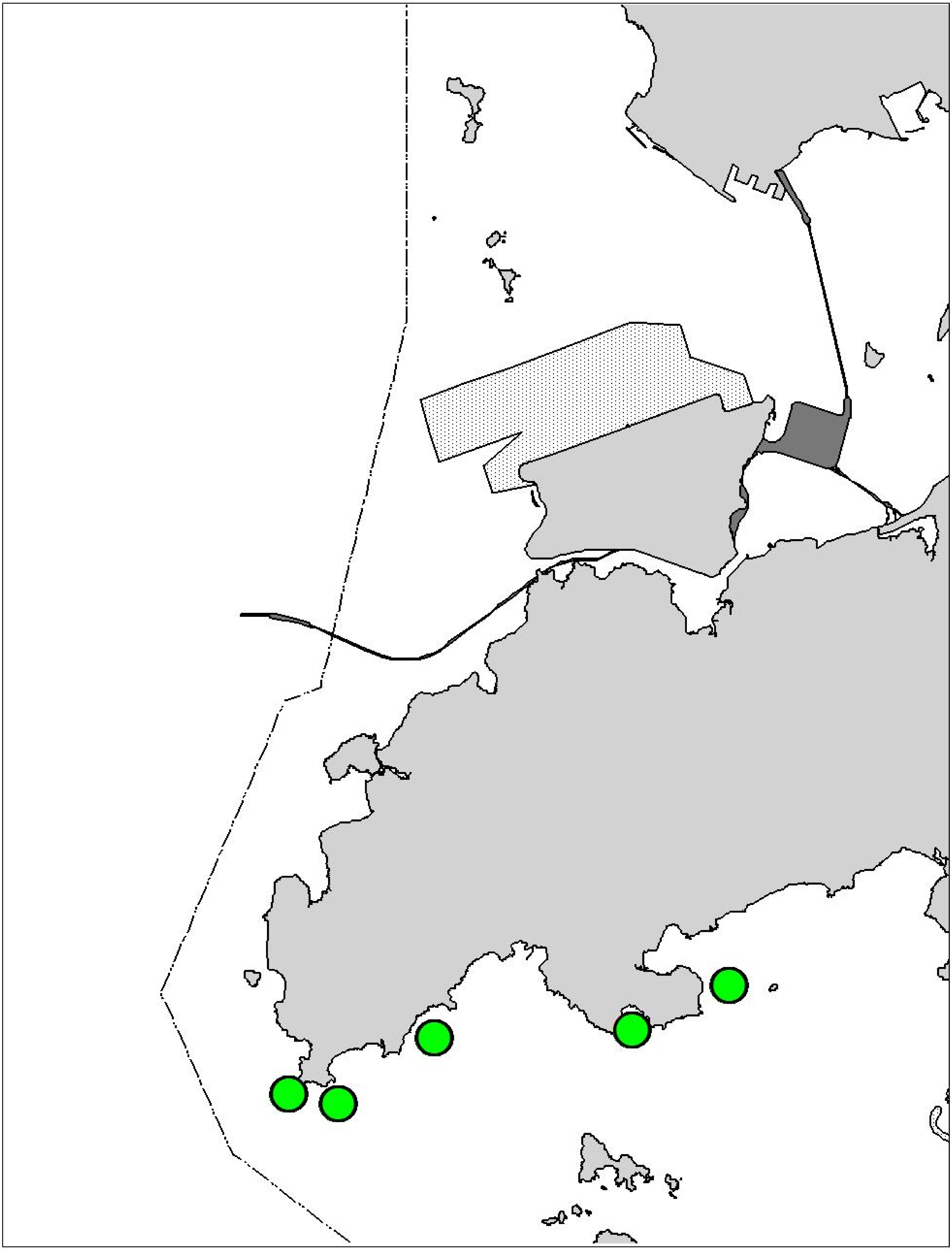


Figure 34. Distribution of dolphin sightings associated with fishing boats (green dots: purse-seiners) in 2020

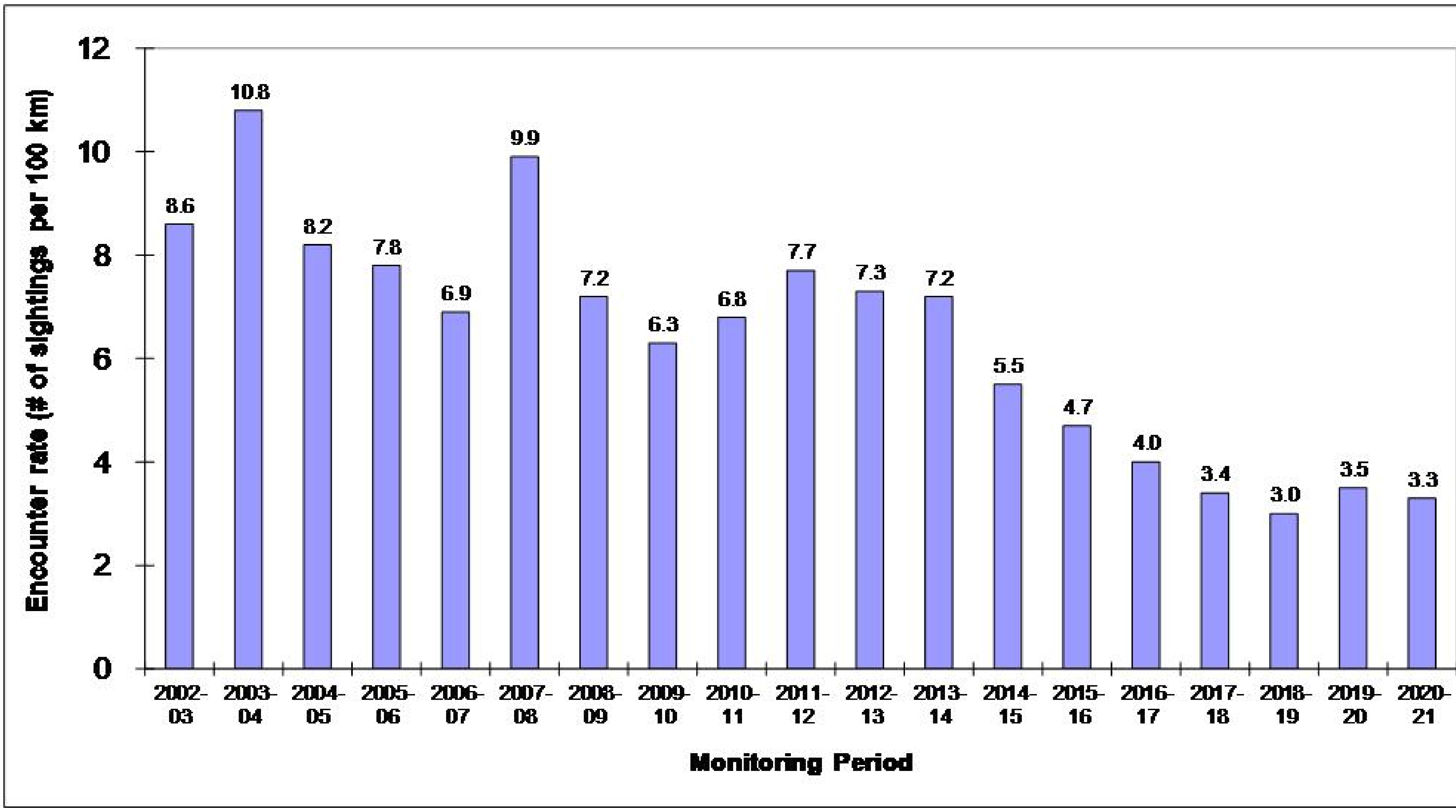


Figure 35a. Temporal trend in encounter rates of Chinese White Dolphins (combined from WL, NWL, NEL and SWL survey areas) in the past 19 monitoring periods from 2002-21

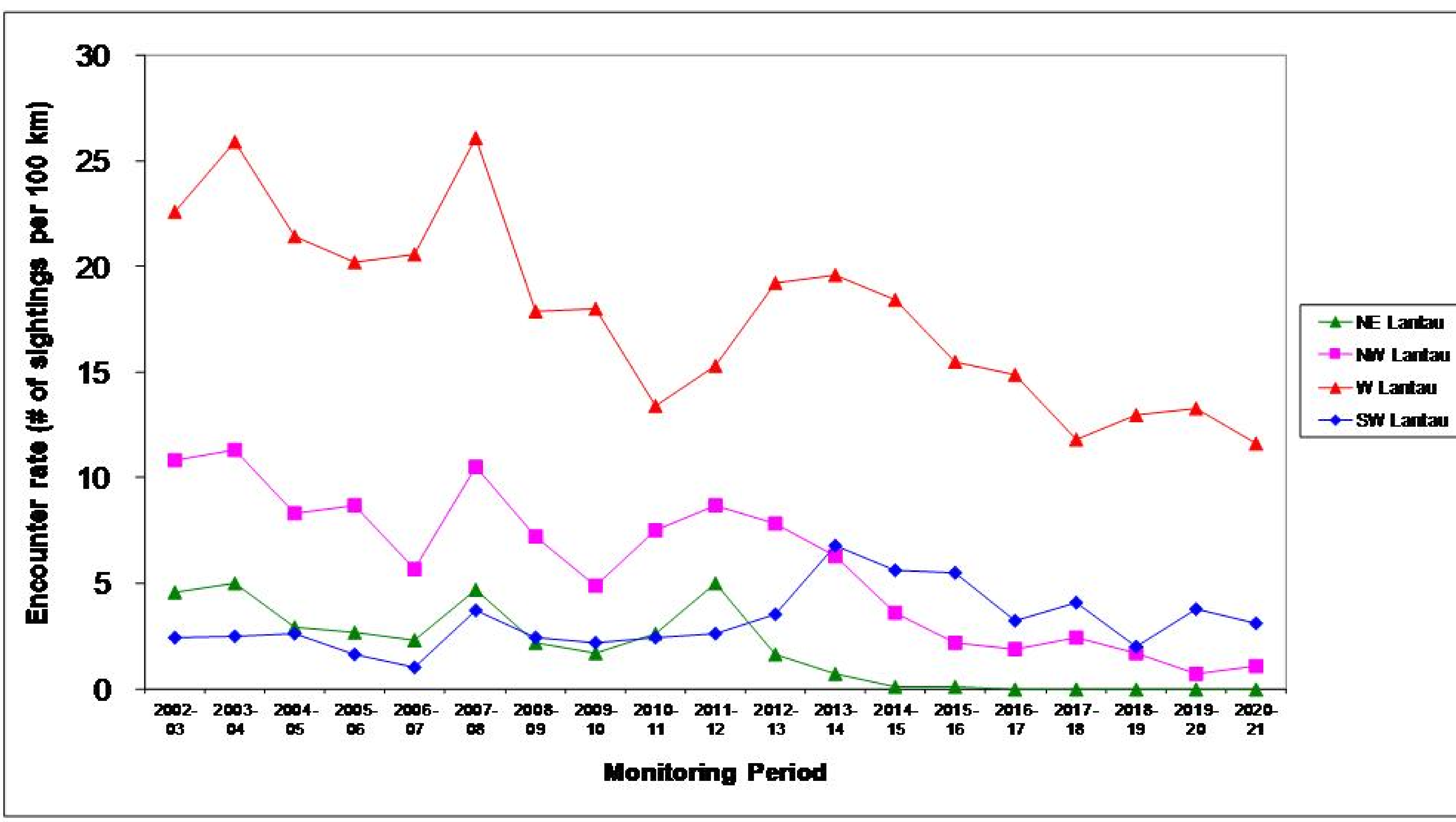


Figure 35b. Temporal trend in encounter rates of Chinese White Dolphins in each of the survey areas in WL, NWL, NEL and SWL waters in the past 19 monitoring periods from 2002-21

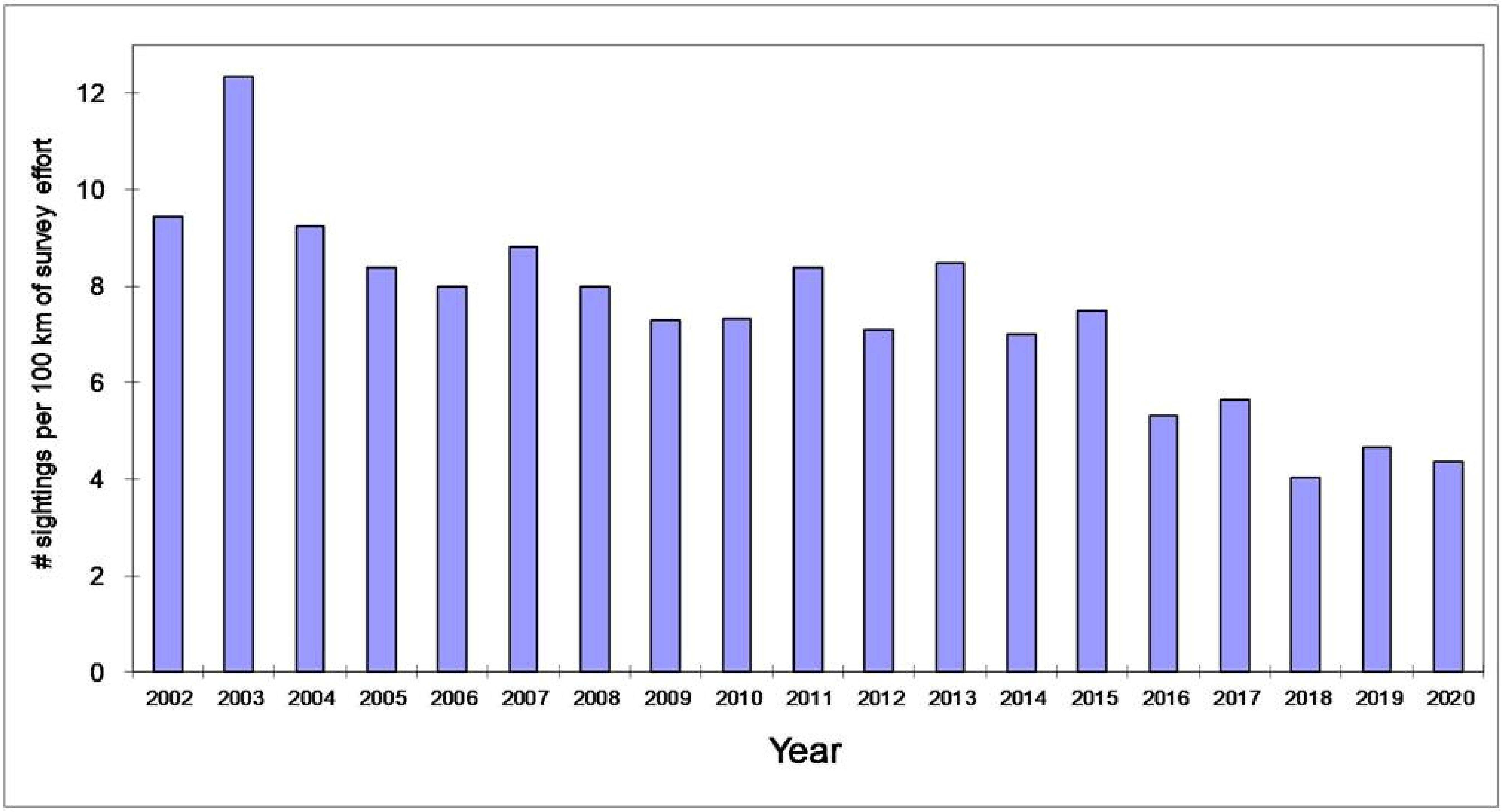


Figure 36a. Temporal trends in combined annual dolphin encounter rates from four survey areas in NEL, NWL, WL and SWL

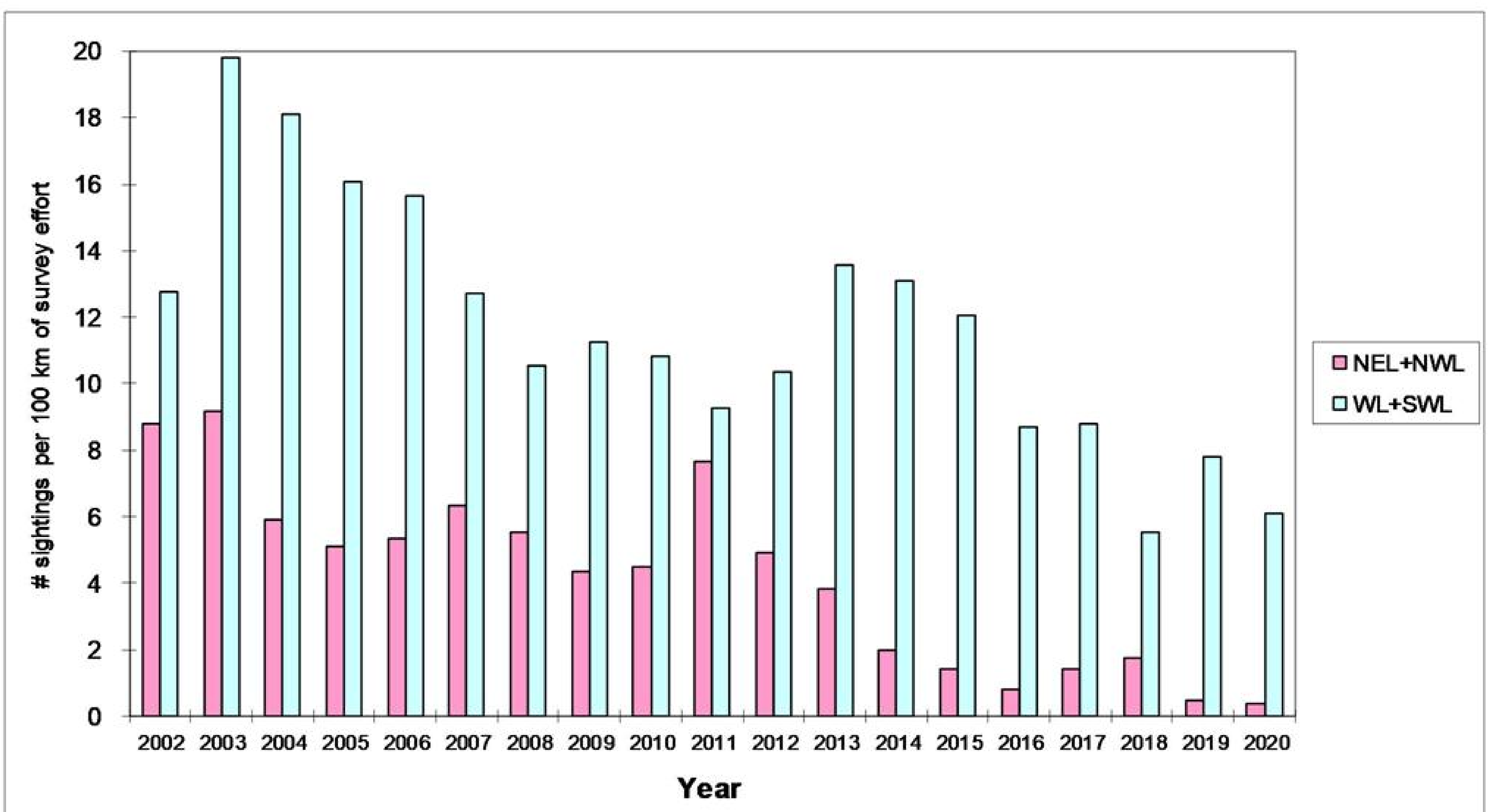


Figure 36b. Temporal trends in annual dolphin encounter rates in North Lantau and West/Southwest Lantau regions

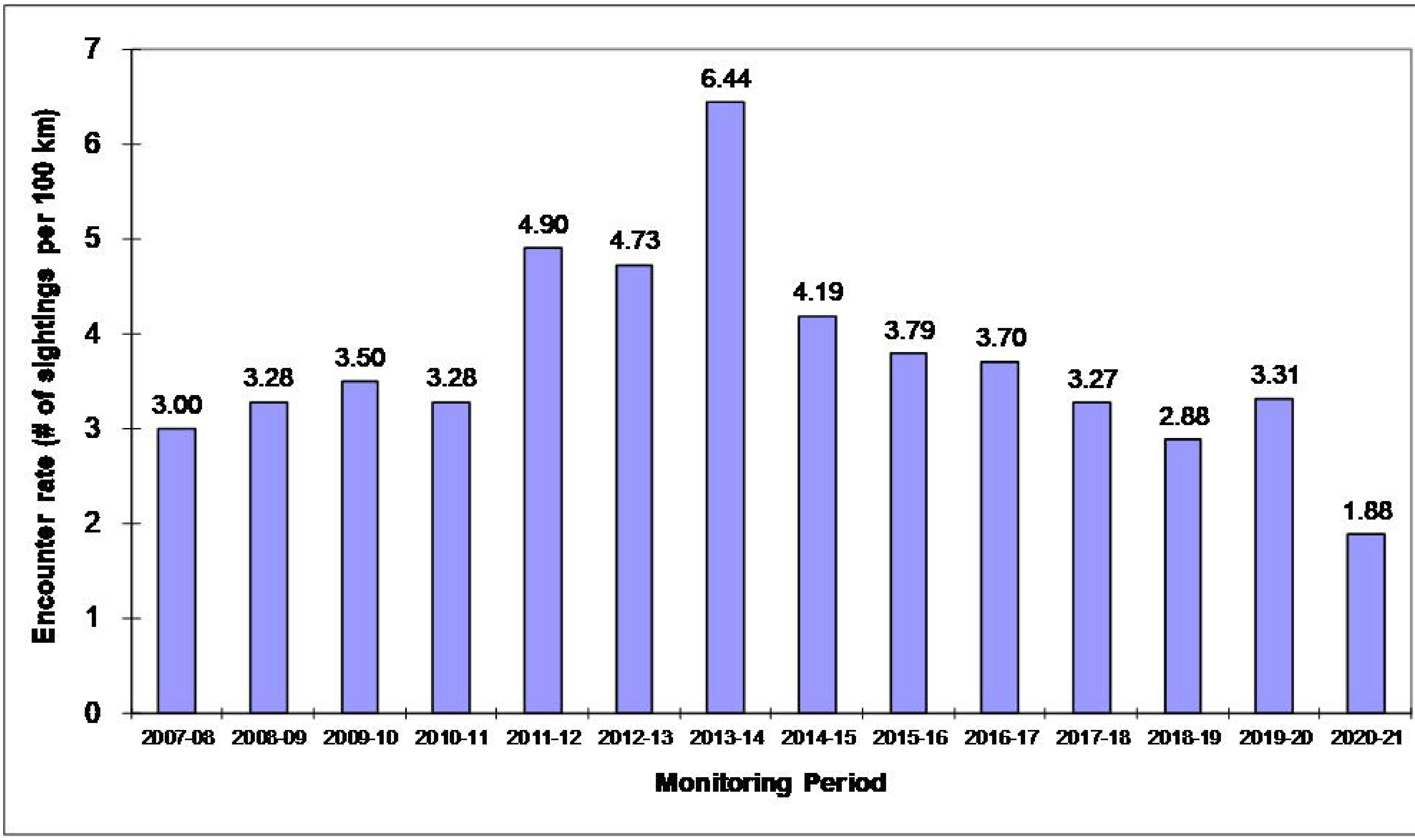


Figure 37. Temporal trend in encounter rates of finless porpoises (combined from SWL, SEL, LM and PT survey areas) in the past 13 monitoring periods from 2007-21

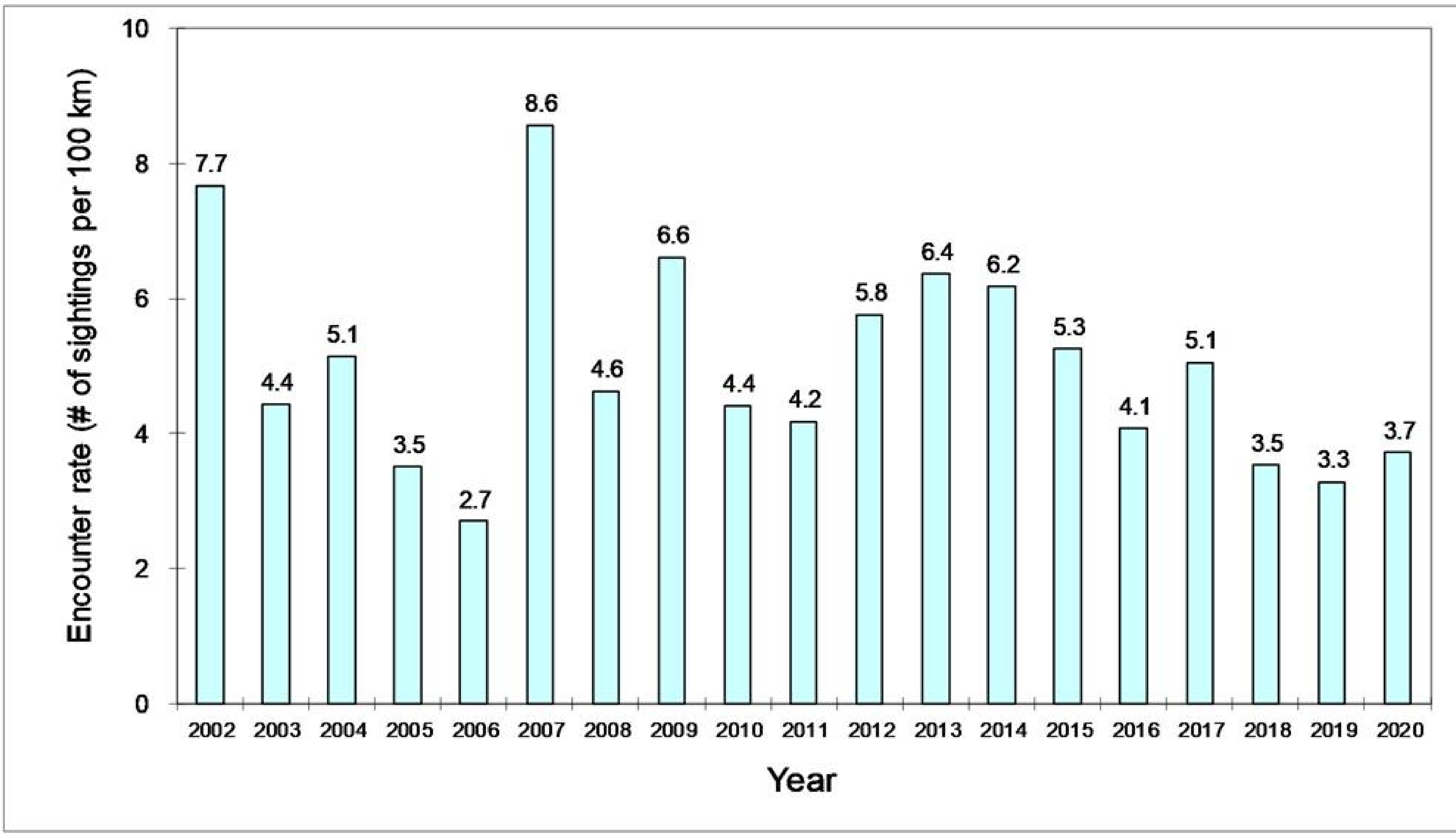


Figure 38a. Temporal trend of annual encounter rates of finless porpoises (combined from SWL, SEL, LM and PT survey areas) from 2002-20

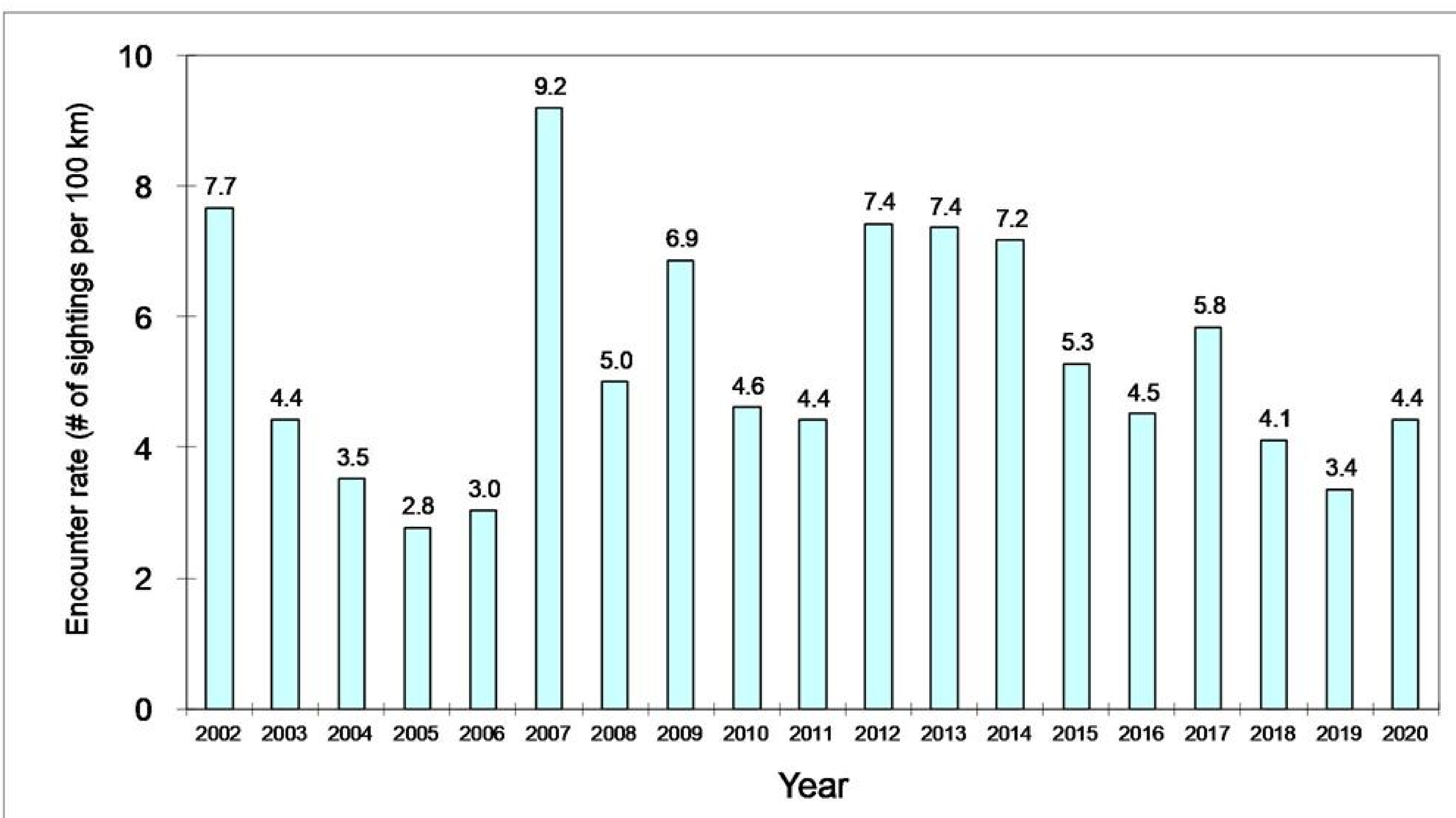


Figure 38b. Temporal trend of porpoise encounter rates in South Lantau and Lamma waters combined from winter/spring months of 2002-20

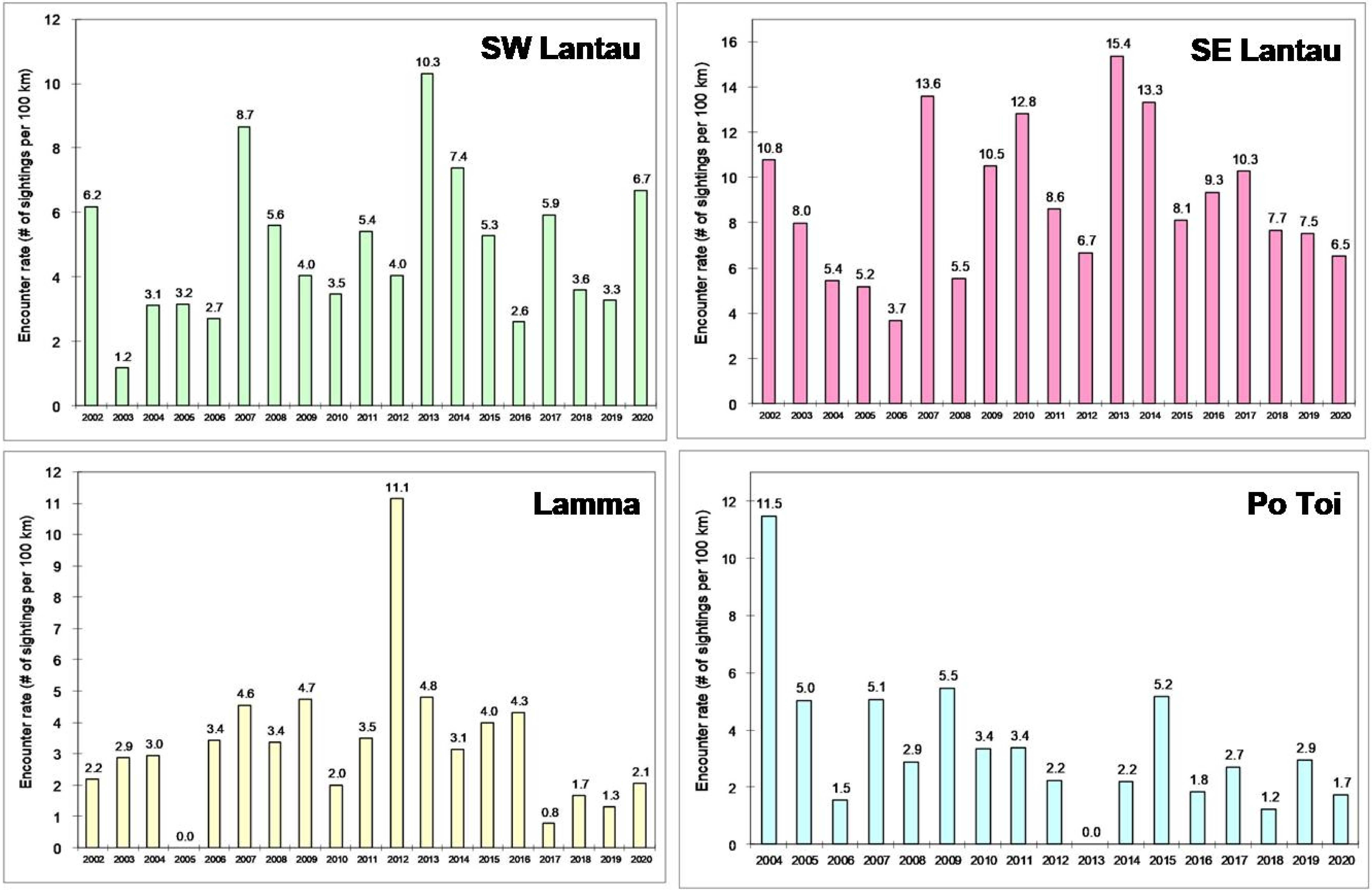


Figure 39. Temporal trends in annual encounter rates of finless porpoises among different survey areas

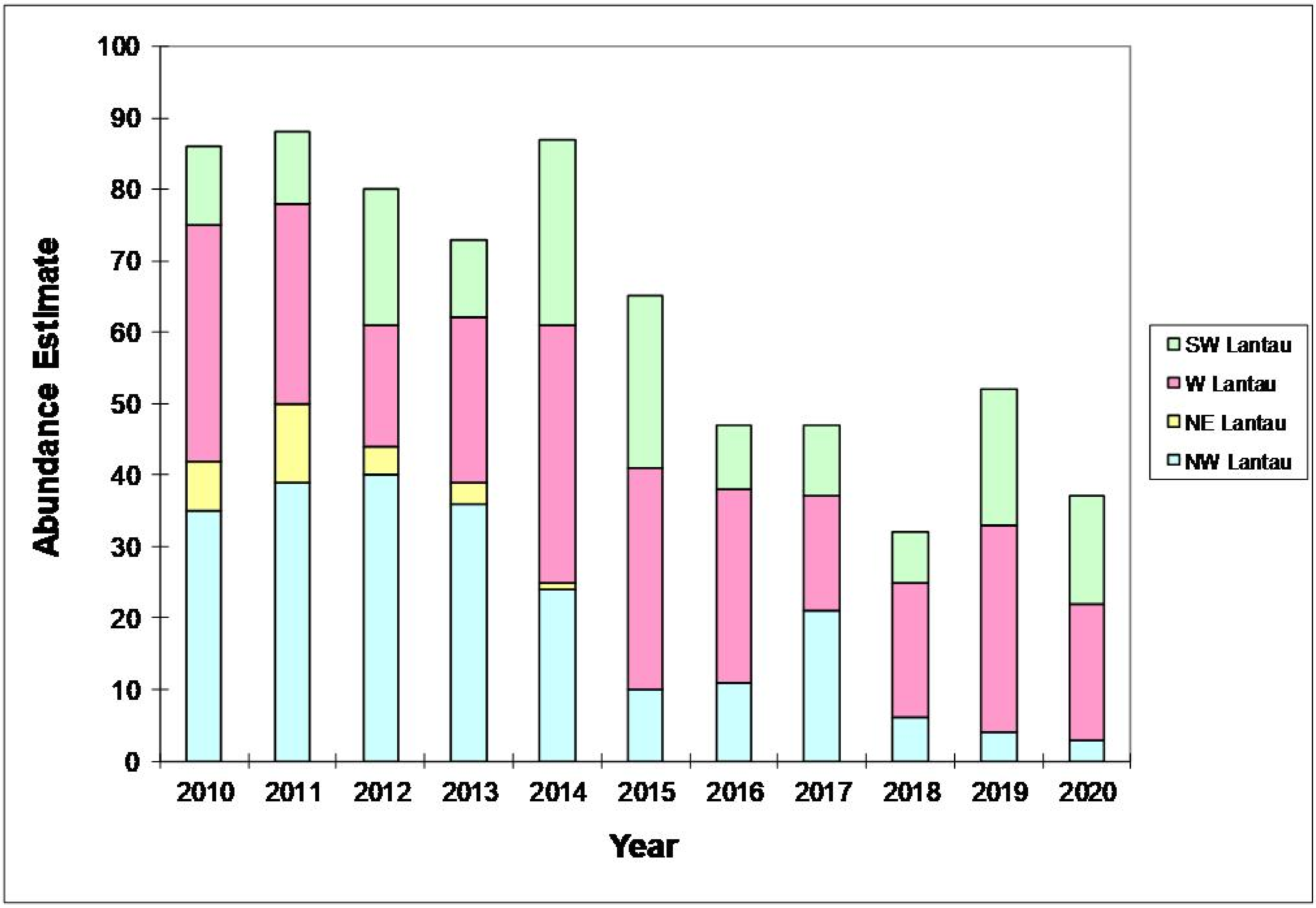


Figure 40. Temporal trends in combined abundance estimates of Chinese White Dolphins in Southwest, West, Northwest & Northeast Lantau from 2010-20

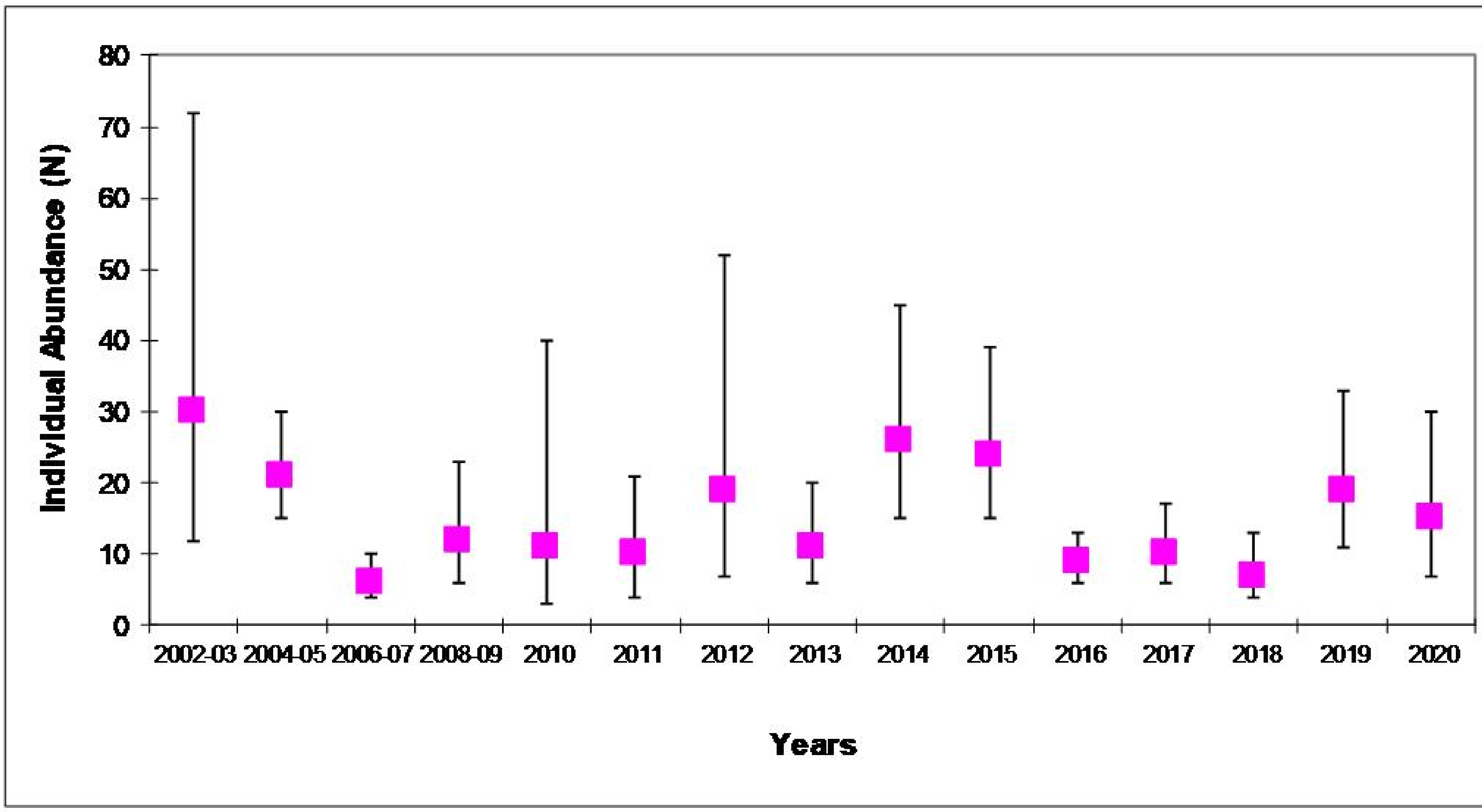


Figure 41. Temporal trend in abundance estimates of Chinese White Dolphins in Southwest Lantau from 2002-20 (error bars: 95% confidence interval of abundance estimates)

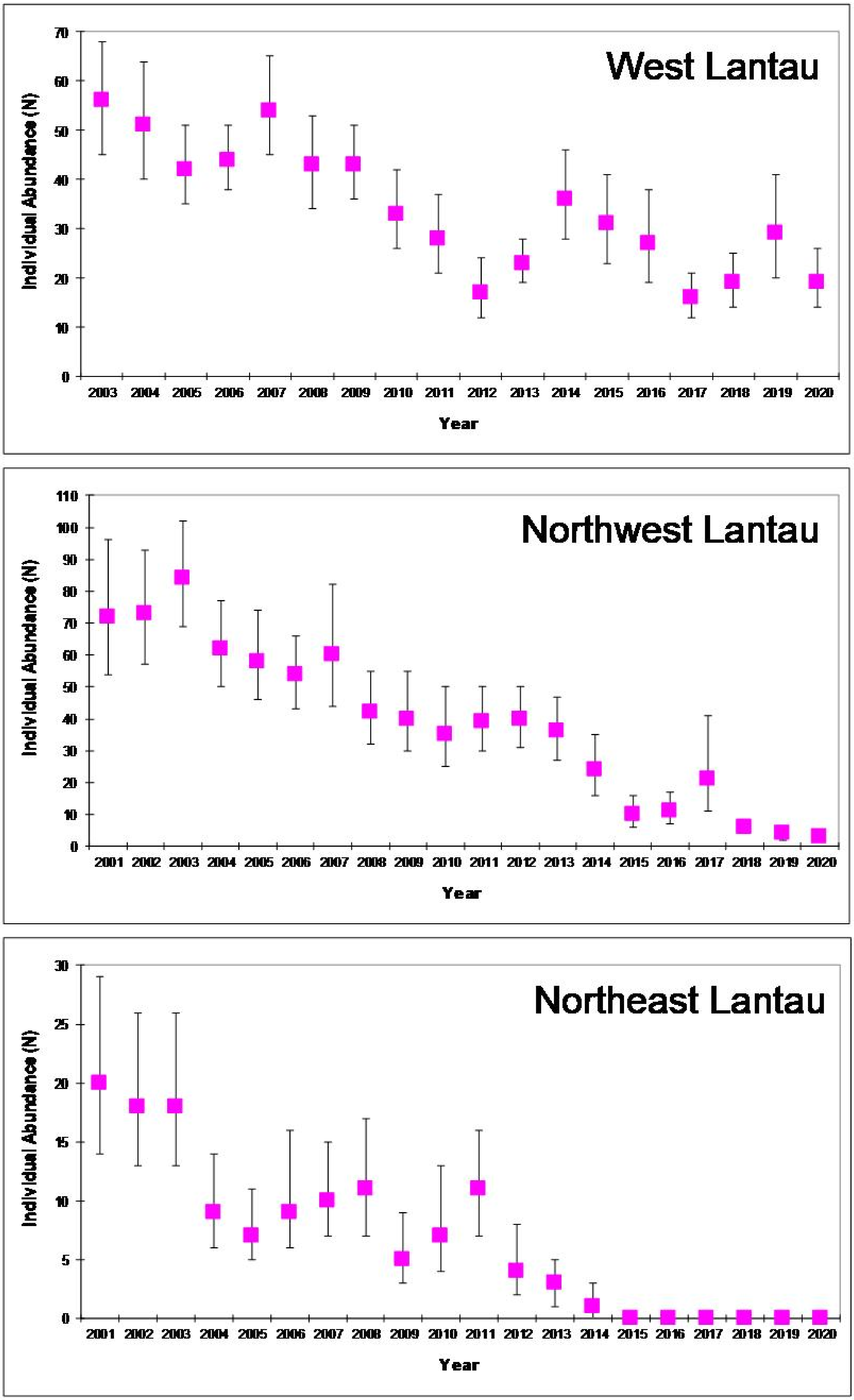


Figure 42. Temporal trends in annual abundance estimates of Chinese White Dolphins in WL, NWL & NEL from 2001-20 (error bars: 95% confidence interval of abundance estimates)

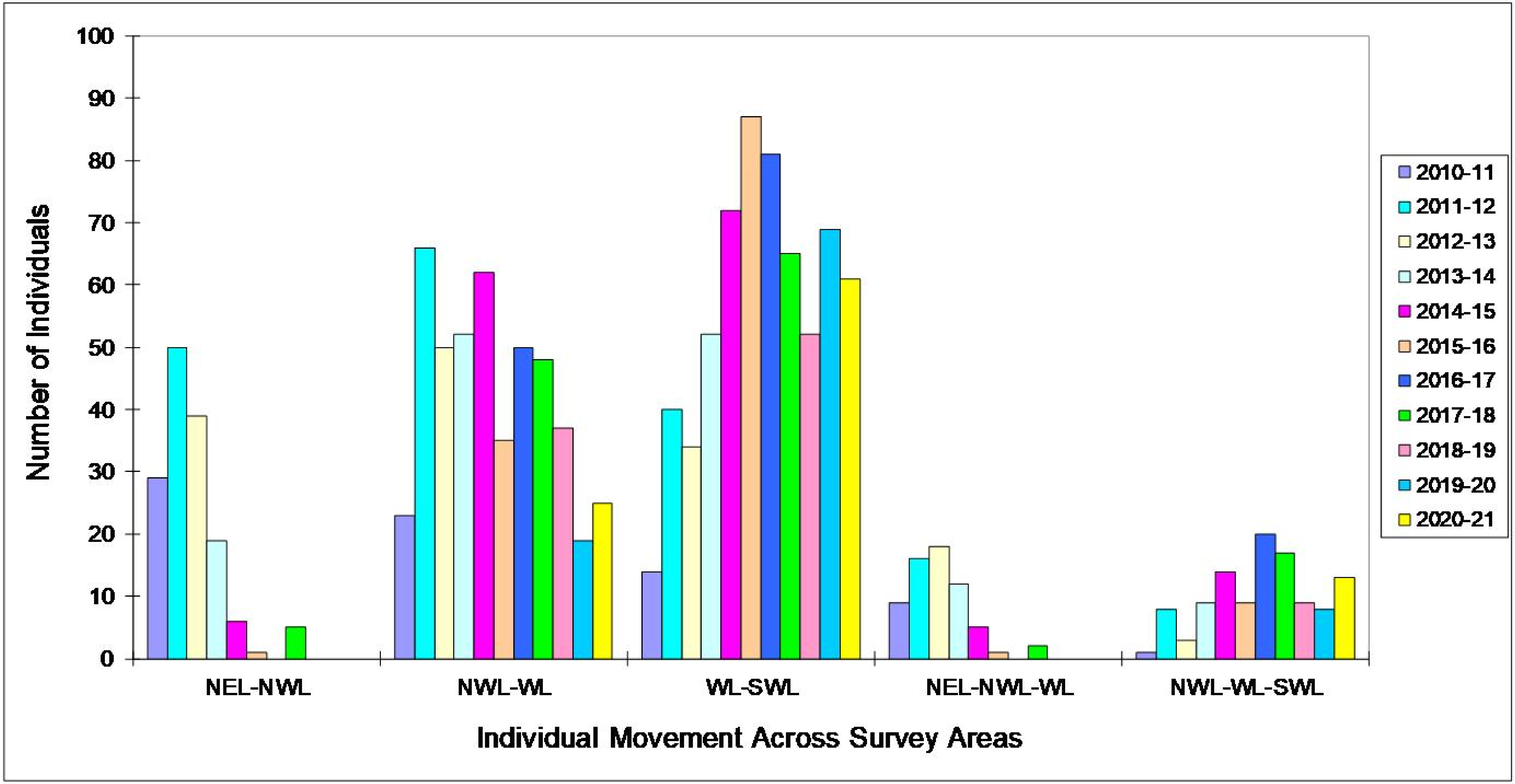


Figure 43. Temporal trends in number of individual dolphins involved in movements across different survey areas around Lantau in the past 11 monitoring periods

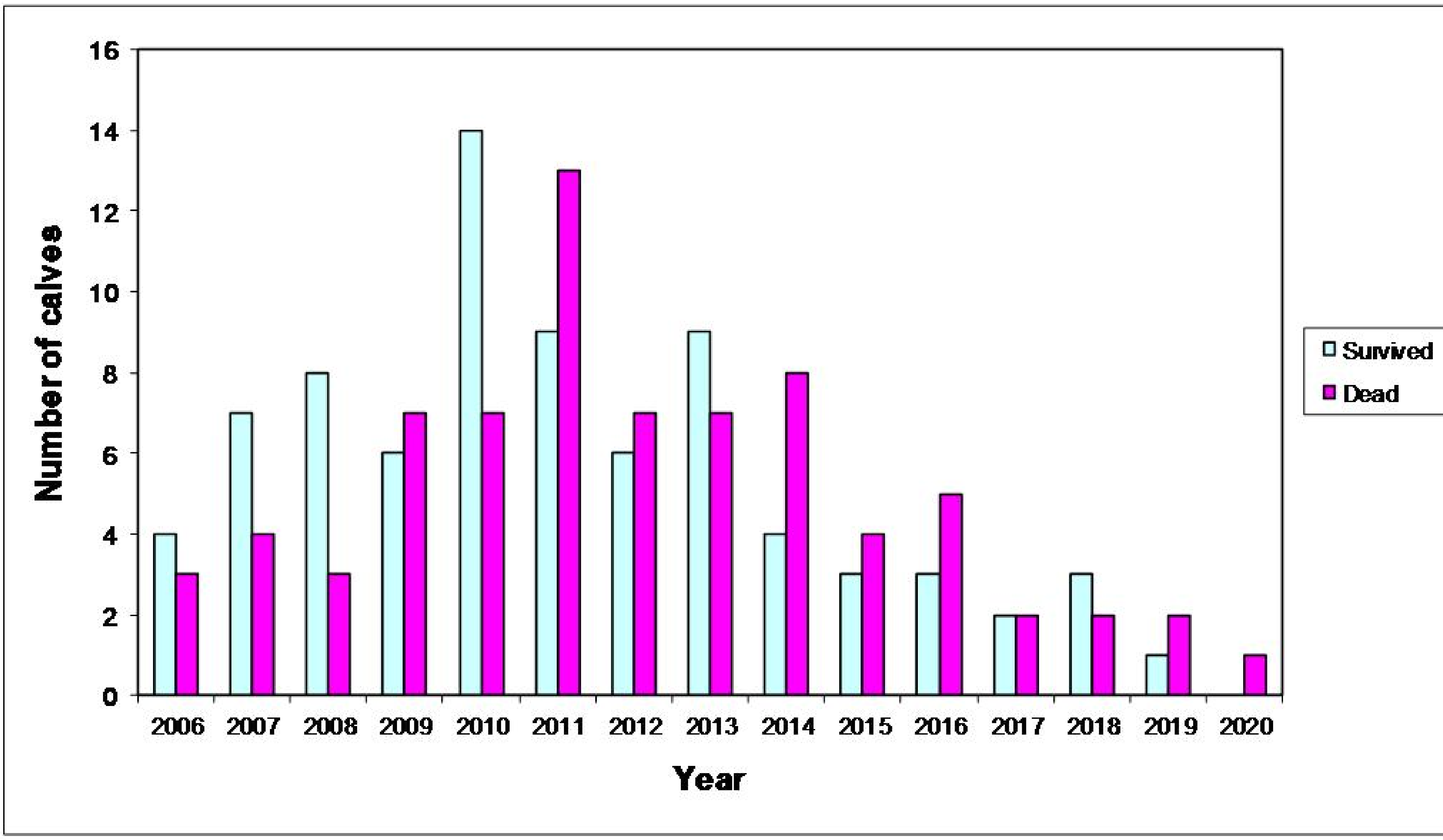


Figure 44. Temporal trend in annual number of calves that have survived and did not survive between 2006 and 2020

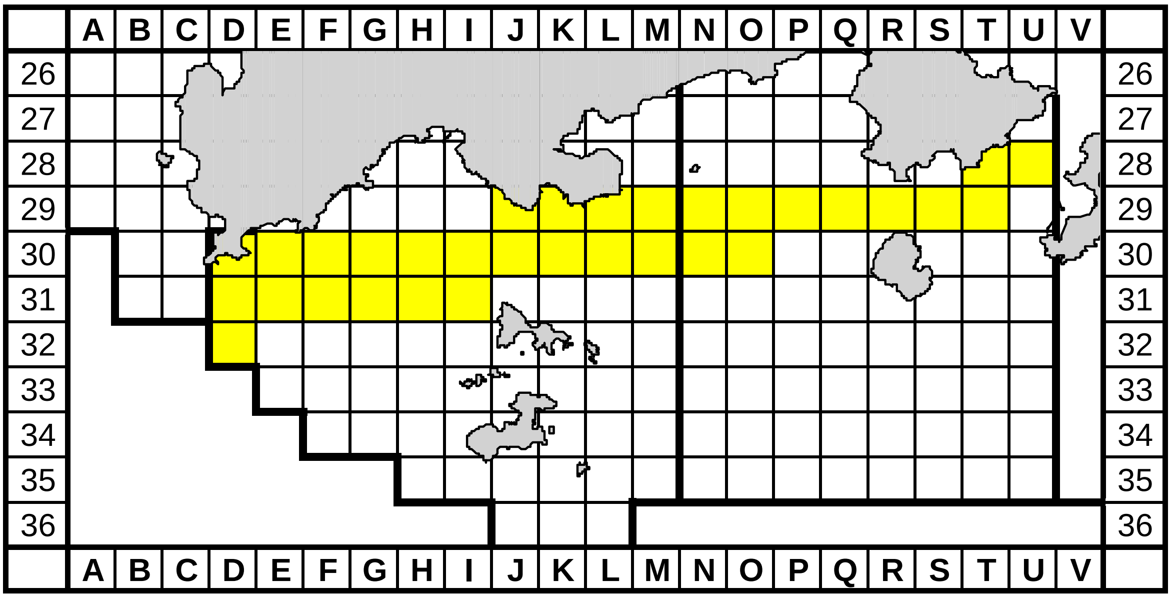


Figure 45. Grids (highlighted in yellow) overlapped with the South Lantau Vessel Fairway (SLVF) in SWL and SEL survey areas

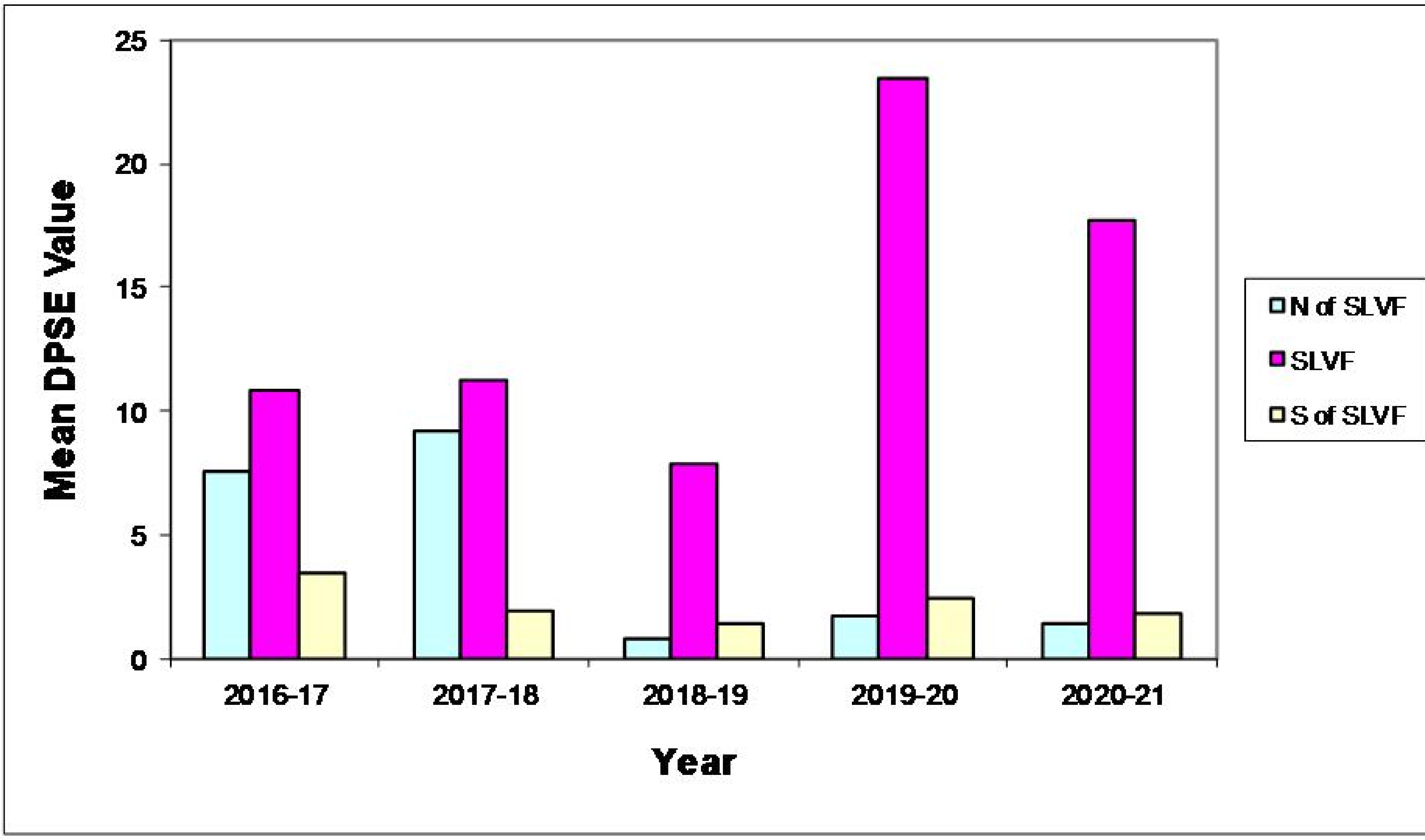


Figure 46a. Comparison of mean DPSE values of Chinese White Dolphins within SLVF, and to the north and south of SLVF, before (2016-20) and after HSF stoppage (2020-21)

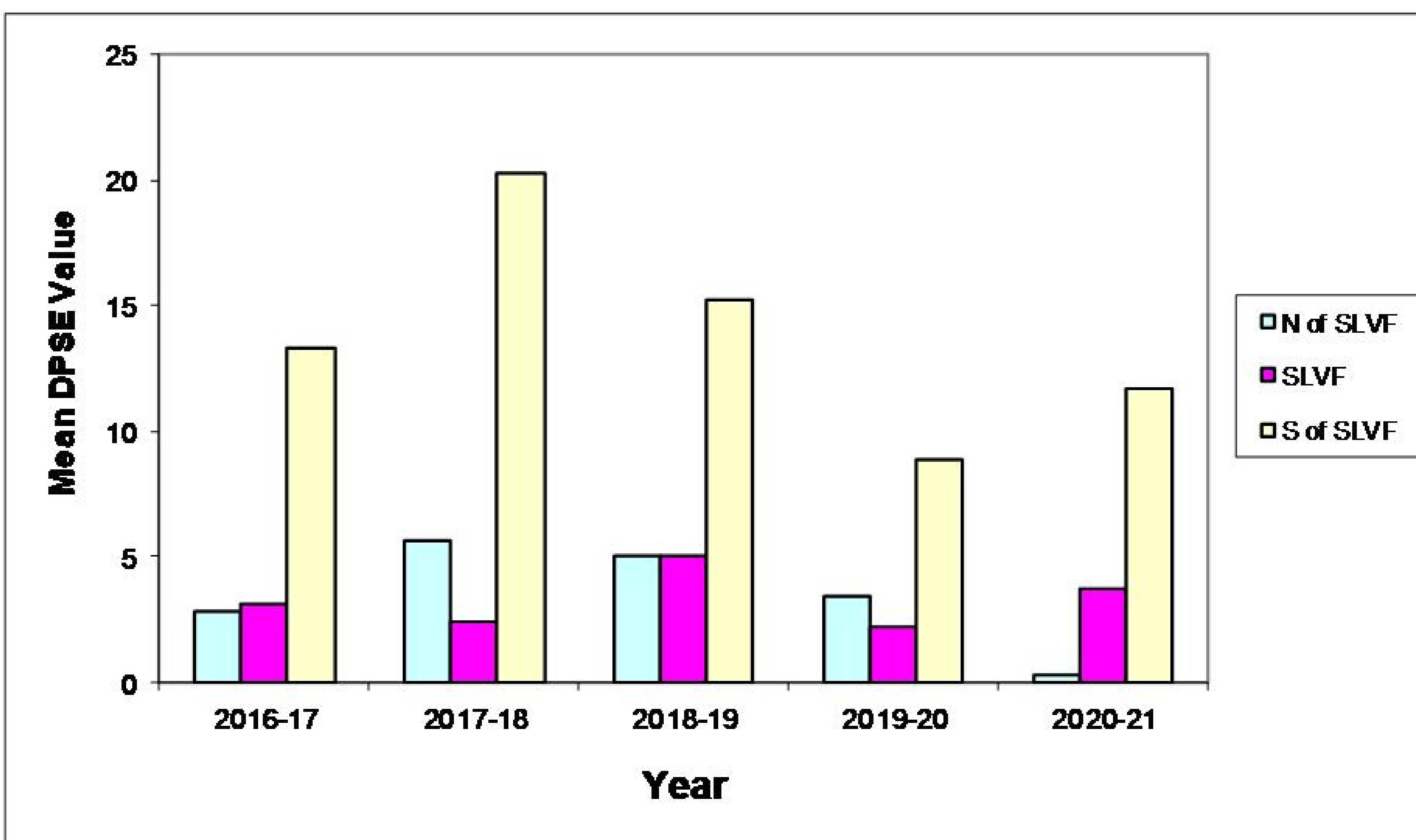


Figure 46b. Comparison of mean DPSE values of finless porpoises within SLVF, and to the north and south of SLVF, before (2016-20) and after HSF stoppage (2020-21)

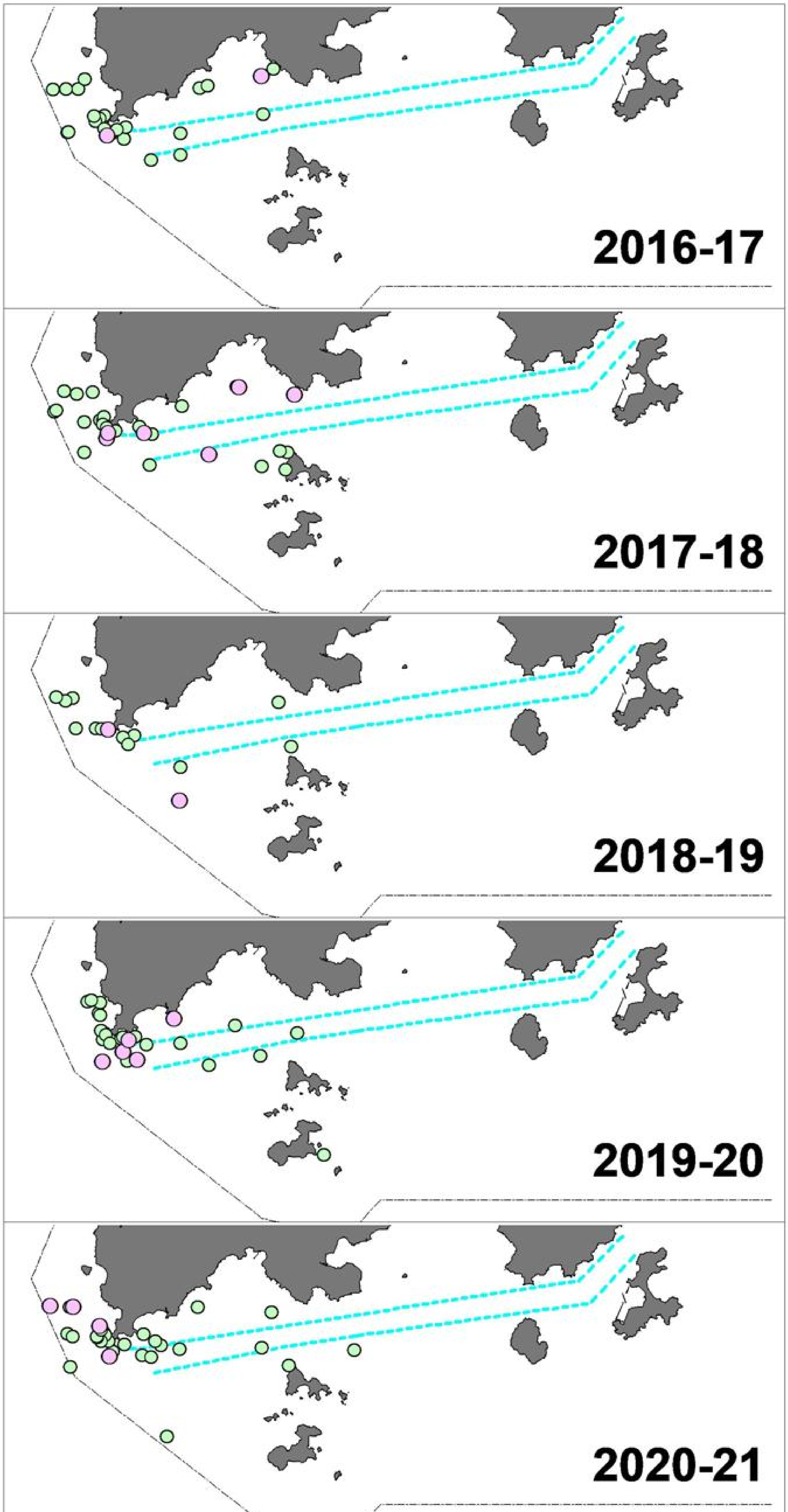


Figure 47. Temporal changes in distribution of larger groups of Chinese White Dolphins (green dots: group size of 5+; purple dots: group size of 10+) across five 12-month periods before (2016-20) and after (2020-21) HSF stoppage in South Lantau waters in relation to South Lantau Vessel Fairway (double blue lines)

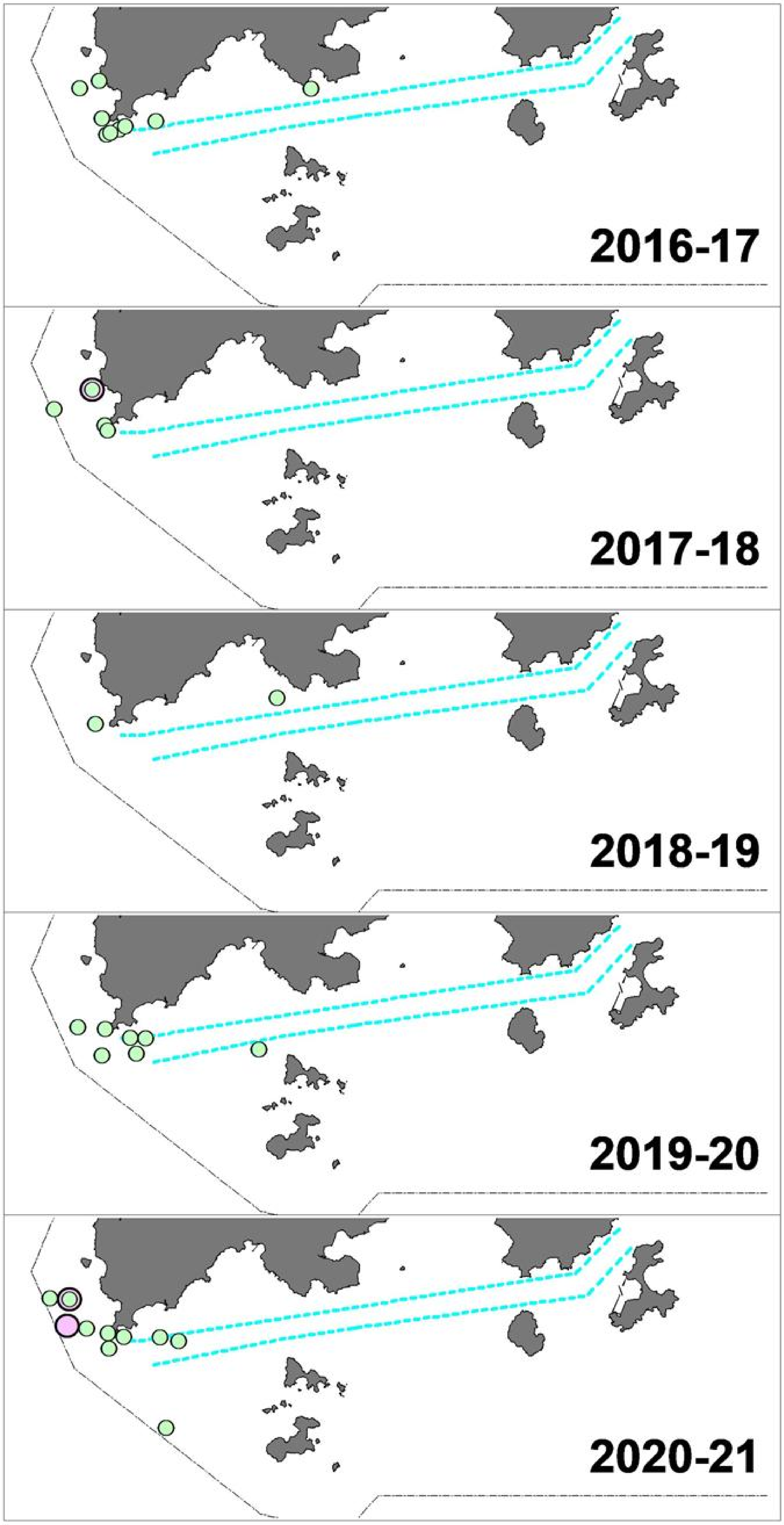


Figure 48. Temporal changes in distribution of Chinese White Dolphins with young calves (purple dots: UCs; green dots: UJs) across five 12-month periods before (2016-20) and after (2020-21) HSF stoppage in South Lantau waters in relation to South Lantau Vessel Fairway (double blue lines)

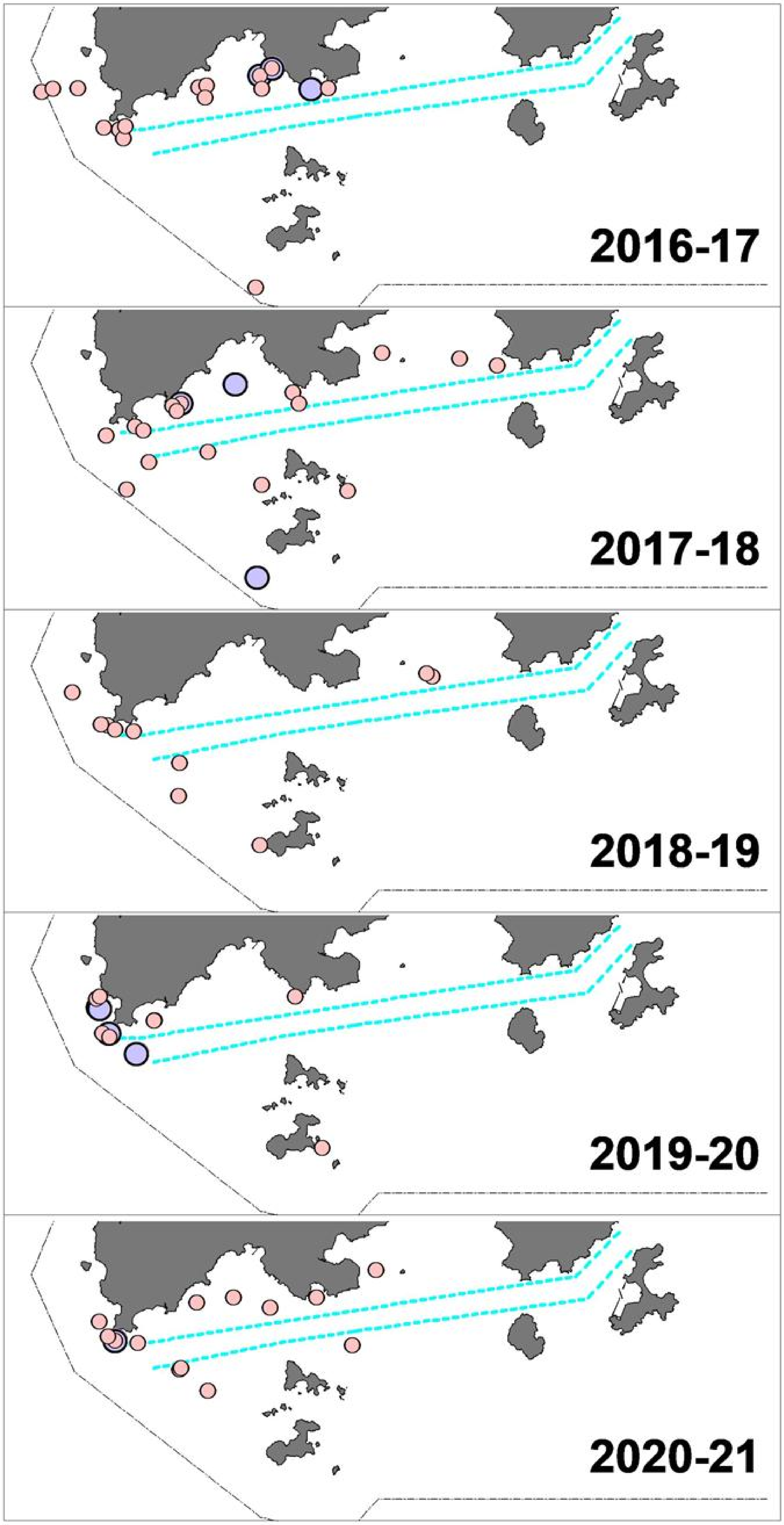


Figure 49. Temporal changes in distribution of Chinese White Dolphins associated with different activities (pink dots: feeding; purple dots: socializing) across five 12-month periods before (2016-20) and after (2020-21) HSF stoppage in South Lantau waters in relation to South Lantau Vessel Fairway (double blue lines)

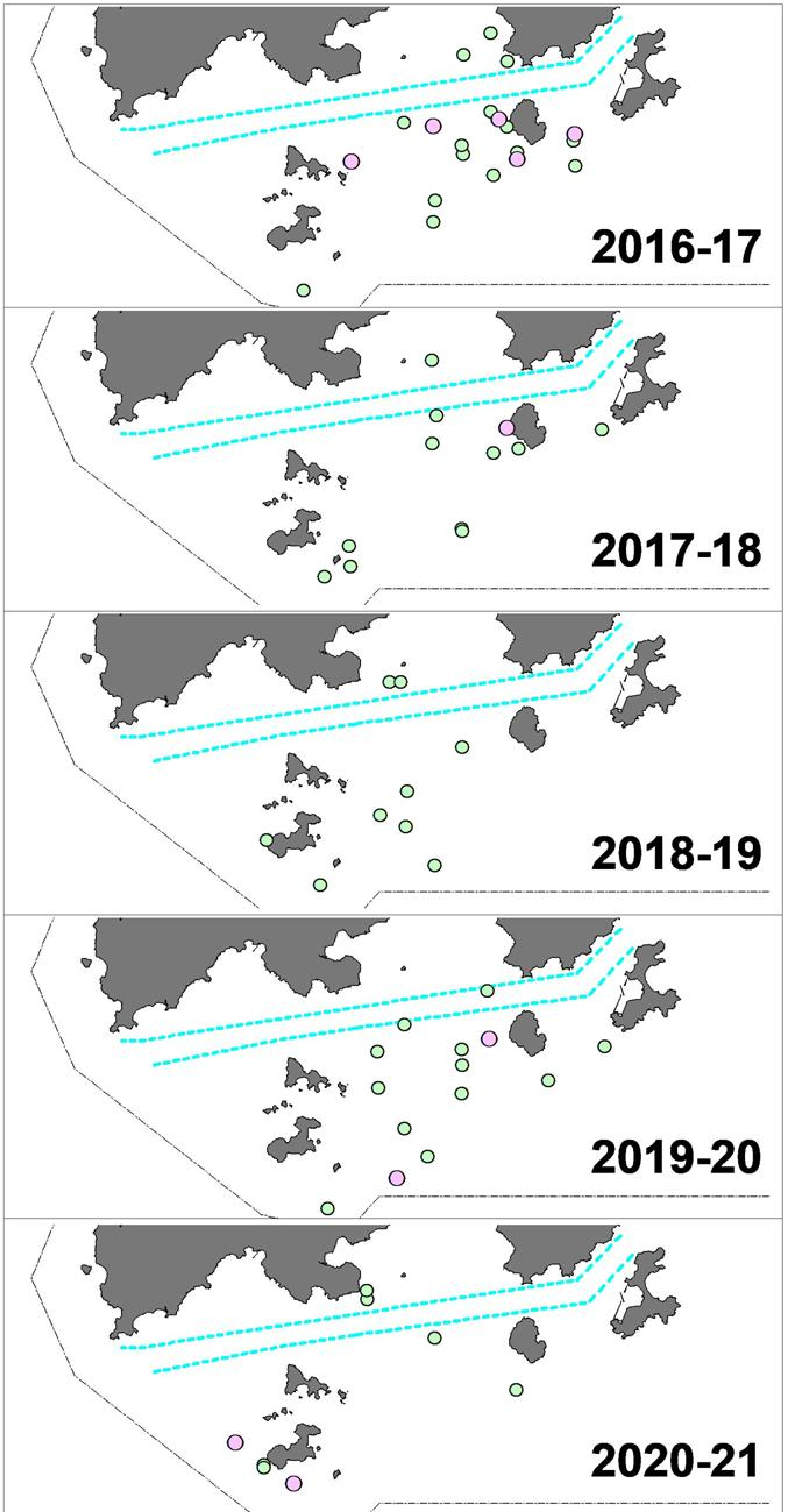


Figure 50. Temporal changes in distribution of larger groups of finless porpoises (green dots: group size of 5+; purple dots: group size of 10+) across five 12-month periods before (2016-20) and after (2020-21) HSF stoppage in South Lantau waters in relation to South Lantau Vessel Fairway (double blue lines)

Appendix I. HKCRP-AFCD Survey Effort Database (April 2020 - March 2021)

(Note: P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
1-Apr-20	SW LANTAU	1	4.88	SPRING	STANDARD36826	P
1-Apr-20	SW LANTAU	2	11.26	SPRING	STANDARD36826	P
1-Apr-20	SW LANTAU	3	1.84	SPRING	STANDARD36826	P
1-Apr-20	SW LANTAU	1	4.17	SPRING	STANDARD36826	S
1-Apr-20	SW LANTAU	2	9.67	SPRING	STANDARD36826	S
9-Apr-20	SE LANTAU	1	1.67	SPRING	STANDARD36826	P
9-Apr-20	SE LANTAU	2	3.15	SPRING	STANDARD36826	P
9-Apr-20	SE LANTAU	3	25.58	SPRING	STANDARD36826	P
9-Apr-20	SE LANTAU	2	3.00	SPRING	STANDARD36826	S
9-Apr-20	SE LANTAU	3	3.72	SPRING	STANDARD36826	S
9-Apr-20	SW LANTAU	2	3.00	SPRING	STANDARD36826	P
9-Apr-20	SW LANTAU	3	19.79	SPRING	STANDARD36826	P
9-Apr-20	SW LANTAU	4	0.87	SPRING	STANDARD36826	P
9-Apr-20	SW LANTAU	2	0.80	SPRING	STANDARD36826	S
9-Apr-20	SW LANTAU	3	5.44	SPRING	STANDARD36826	S
9-Apr-20	SW LANTAU	4	1.33	SPRING	STANDARD36826	S
14-Apr-20	NE LANTAU	2	10.65	SPRING	STANDARD36826	P
14-Apr-20	NE LANTAU	1	1.88	SPRING	STANDARD36826	S
14-Apr-20	NE LANTAU	2	3.97	SPRING	STANDARD36826	S
14-Apr-20	DEEP BAY	2	9.87	SPRING	STANDARD36826	P
14-Apr-20	DEEP BAY	1	2.02	SPRING	STANDARD36826	S
14-Apr-20	DEEP BAY	2	7.91	SPRING	STANDARD36826	S
16-Apr-20	LAMMA	1	18.15	SPRING	STANDARD36826	P
16-Apr-20	LAMMA	2	3.61	SPRING	STANDARD36826	P
16-Apr-20	LAMMA	1	3.20	SPRING	STANDARD36826	S
16-Apr-20	LAMMA	2	5.34	SPRING	STANDARD36826	S
16-Apr-20	PO TOI	1	22.27	SPRING	STANDARD36826	P
16-Apr-20	PO TOI	2	42.37	SPRING	STANDARD36826	P
16-Apr-20	PO TOI	3	3.80	SPRING	STANDARD36826	P
16-Apr-20	PO TOI	1	2.02	SPRING	STANDARD36826	S
16-Apr-20	PO TOI	2	9.04	SPRING	STANDARD36826	S
17-Apr-20	SE LANTAU	2	25.95	SPRING	STANDARD36826	P
17-Apr-20	SE LANTAU	3	1.34	SPRING	STANDARD36826	P
17-Apr-20	SE LANTAU	2	9.85	SPRING	STANDARD36826	S
20-Apr-20	LAMMA	1	24.47	SPRING	STANDARD36826	P
20-Apr-20	LAMMA	2	15.00	SPRING	STANDARD36826	P
20-Apr-20	LAMMA	1	5.23	SPRING	STANDARD36826	S
20-Apr-20	LAMMA	2	4.10	SPRING	STANDARD36826	S
20-Apr-20	SE LANTAU	1	2.35	SPRING	STANDARD36826	P
20-Apr-20	SE LANTAU	2	27.32	SPRING	STANDARD36826	P
20-Apr-20	SE LANTAU	1	2.10	SPRING	STANDARD36826	S
20-Apr-20	SE LANTAU	2	4.55	SPRING	STANDARD36826	S
21-Apr-20	W LANTAU	2	0.95	SPRING	STANDARD36826	P
21-Apr-20	W LANTAU	3	5.07	SPRING	STANDARD36826	P
21-Apr-20	W LANTAU	2	2.92	SPRING	STANDARD36826	S
21-Apr-20	W LANTAU	3	7.23	SPRING	STANDARD36826	S
27-Apr-20	W LANTAU	1	4.31	SPRING	STANDARD36826	S
27-Apr-20	W LANTAU	2	5.53	SPRING	STANDARD36826	S
27-Apr-20	SW LANTAU	2	8.79	SPRING	STANDARD36826	P
27-Apr-20	SW LANTAU	3	19.43	SPRING	STANDARD36826	P
27-Apr-20	SW LANTAU	2	4.35	SPRING	STANDARD36826	S
27-Apr-20	SW LANTAU	3	7.50	SPRING	STANDARD36826	S
27-Apr-20	SE LANTAU	2	2.20	SPRING	STANDARD36826	P
27-Apr-20	SE LANTAU	3	13.85	SPRING	STANDARD36826	P
27-Apr-20	SE LANTAU	3	7.05	SPRING	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
28-Apr-20	NW LANTAU	1	2.00	SPRING	STANDARD36826	P
28-Apr-20	NW LANTAU	2	15.00	SPRING	STANDARD36826	P
28-Apr-20	NW LANTAU	3	7.70	SPRING	STANDARD36826	P
28-Apr-20	NW LANTAU	1	2.50	SPRING	STANDARD36826	S
28-Apr-20	NW LANTAU	2	4.30	SPRING	STANDARD36826	S
28-Apr-20	NW LANTAU	3	2.60	SPRING	STANDARD36826	S
28-Apr-20	W LANTAU	2	3.71	SPRING	STANDARD36826	P
28-Apr-20	W LANTAU	3	7.51	SPRING	STANDARD36826	P
28-Apr-20	W LANTAU	4	5.90	SPRING	STANDARD36826	P
28-Apr-20	W LANTAU	2	3.54	SPRING	STANDARD36826	S
28-Apr-20	W LANTAU	3	4.56	SPRING	STANDARD36826	S
28-Apr-20	W LANTAU	4	2.29	SPRING	STANDARD36826	S
4-May-20	LAMMA	1	10.66	SPRING	STANDARD36826	P
4-May-20	LAMMA	2	28.48	SPRING	STANDARD36826	P
4-May-20	LAMMA	3	31.70	SPRING	STANDARD36826	P
4-May-20	LAMMA	1	4.86	SPRING	STANDARD36826	S
4-May-20	LAMMA	2	3.02	SPRING	STANDARD36826	S
4-May-20	LAMMA	3	16.58	SPRING	STANDARD36826	S
6-May-20	SW LANTAU	2	6.60	SPRING	STANDARD36826	P
6-May-20	SW LANTAU	3	5.89	SPRING	STANDARD36826	P
6-May-20	SW LANTAU	2	3.56	SPRING	STANDARD36826	S
6-May-20	SW LANTAU	3	1.11	SPRING	STANDARD36826	S
8-May-20	SE LANTAU	1	4.40	SPRING	STANDARD36826	P
8-May-20	SE LANTAU	2	20.29	SPRING	STANDARD36826	P
8-May-20	SE LANTAU	3	4.00	SPRING	STANDARD36826	P
8-May-20	SE LANTAU	1	1.00	SPRING	STANDARD36826	S
8-May-20	SE LANTAU	2	4.81	SPRING	STANDARD36826	S
8-May-20	SE LANTAU	3	2.10	SPRING	STANDARD36826	S
8-May-20	SW LANTAU	1	1.73	SPRING	STANDARD36826	P
8-May-20	SW LANTAU	2	17.96	SPRING	STANDARD36826	P
8-May-20	SW LANTAU	3	2.95	SPRING	STANDARD36826	P
8-May-20	SW LANTAU	2	5.26	SPRING	STANDARD36826	S
8-May-20	SW LANTAU	3	2.40	SPRING	STANDARD36826	S
11-May-20	PO TOI	1	23.52	SPRING	STANDARD36826	P
11-May-20	PO TOI	2	61.58	SPRING	STANDARD36826	P
11-May-20	PO TOI	2	10.10	SPRING	STANDARD36826	S
12-May-20	DEEP BAY	2	5.17	SPRING	STANDARD36826	P
12-May-20	DEEP BAY	3	5.10	SPRING	STANDARD36826	P
12-May-20	DEEP BAY	2	6.83	SPRING	STANDARD36826	S
12-May-20	DEEP BAY	3	3.10	SPRING	STANDARD36826	S
12-May-20	NE LANTAU	2	16.14	SPRING	STANDARD36826	P
12-May-20	NE LANTAU	2	6.16	SPRING	STANDARD36826	S
13-May-20	W LANTAU	1	8.65	SPRING	STANDARD36826	P
13-May-20	W LANTAU	2	7.30	SPRING	STANDARD36826	P
13-May-20	W LANTAU	3	5.75	SPRING	STANDARD36826	P
13-May-20	W LANTAU	4	1.48	SPRING	STANDARD36826	P
13-May-20	W LANTAU	1	5.22	SPRING	STANDARD36826	S
13-May-20	W LANTAU	2	2.08	SPRING	STANDARD36826	S
13-May-20	W LANTAU	3	3.13	SPRING	STANDARD36826	S
13-May-20	W LANTAU	4	1.28	SPRING	STANDARD36826	S
13-May-20	SW LANTAU	3	12.87	SPRING	STANDARD36826	P
13-May-20	SW LANTAU	4	1.30	SPRING	STANDARD36826	P
13-May-20	SW LANTAU	2	0.97	SPRING	STANDARD36826	S
13-May-20	SW LANTAU	3	2.81	SPRING	STANDARD36826	S
13-May-20	SW LANTAU	4	9.35	SPRING	STANDARD36826	S
20-May-20	SE LANTAU	2	2.00	SPRING	STANDARD36826	P
20-May-20	SE LANTAU	3	7.71	SPRING	STANDARD36826	P
20-May-20	SE LANTAU	2	6.43	SPRING	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
20-May-20	SE LANTAU	3	1.59	SPRING	STANDARD36826	S
20-May-20	SE LANTAU	4	3.27	SPRING	STANDARD36826	S
28-May-20	LAMMA	2	24.42	SPRING	STANDARD36826	P
28-May-20	LAMMA	3	14.40	SPRING	STANDARD36826	P
28-May-20	LAMMA	2	7.23	SPRING	STANDARD36826	S
28-May-20	LAMMA	3	2.00	SPRING	STANDARD36826	S
28-May-20	SE LANTAU	2	25.83	SPRING	STANDARD36826	P
28-May-20	SE LANTAU	3	4.55	SPRING	STANDARD36826	P
28-May-20	SE LANTAU	1	1.35	SPRING	STANDARD36826	S
28-May-20	SE LANTAU	2	4.67	SPRING	STANDARD36826	S
2-Jun-20	SW LANTAU	2	13.49	SUMMER	STANDARD36826	P
2-Jun-20	SW LANTAU	3	1.32	SUMMER	STANDARD36826	P
2-Jun-20	SW LANTAU	2	5.03	SUMMER	STANDARD36826	S
2-Jun-20	SW LANTAU	3	2.22	SUMMER	STANDARD36826	S
3-Jun-20	SE LANTAU	2	3.92	SUMMER	STANDARD36826	P
3-Jun-20	SE LANTAU	3	21.87	SUMMER	STANDARD36826	P
3-Jun-20	SE LANTAU	3	11.10	SUMMER	STANDARD36826	S
3-Jun-20	SW LANTAU	2	3.37	SUMMER	STANDARD36826	P
3-Jun-20	SW LANTAU	3	12.28	SUMMER	STANDARD36826	P
3-Jun-20	SW LANTAU	2	3.30	SUMMER	STANDARD36826	S
3-Jun-20	SW LANTAU	3	8.55	SUMMER	STANDARD36826	S
9-Jun-20	NE LANTAU	2	35.73	SUMMER	STANDARD36826	P
9-Jun-20	NE LANTAU	2	11.47	SUMMER	STANDARD36826	S
9-Jun-20	NE LANTAU	3	0.80	SUMMER	STANDARD36826	S
10-Jun-20	NW LANTAU	2	9.69	SUMMER	STANDARD36826	P
10-Jun-20	NW LANTAU	3	14.80	SUMMER	STANDARD36826	P
10-Jun-20	NW LANTAU	2	4.41	SUMMER	STANDARD36826	S
10-Jun-20	NW LANTAU	3	6.80	SUMMER	STANDARD36826	S
10-Jun-20	W LANTAU	2	2.15	SUMMER	STANDARD36826	P
10-Jun-20	W LANTAU	3	14.69	SUMMER	STANDARD36826	P
10-Jun-20	W LANTAU	2	1.10	SUMMER	STANDARD36826	S
10-Jun-20	W LANTAU	3	8.33	SUMMER	STANDARD36826	S
16-Jun-20	DEEP BAY	2	1.70	SUMMER	STANDARD36826	P
16-Jun-20	DEEP BAY	3	8.33	SUMMER	STANDARD36826	P
16-Jun-20	DEEP BAY	2	1.20	SUMMER	STANDARD36826	S
16-Jun-20	DEEP BAY	3	8.14	SUMMER	STANDARD36826	S
16-Jun-20	NE LANTAU	2	7.03	SUMMER	STANDARD36826	P
16-Jun-20	NE LANTAU	2	10.77	SUMMER	STANDARD36826	S
17-Jun-20	SE LANTAU	3	3.19	SUMMER	STANDARD36826	P
17-Jun-20	SW LANTAU	2	2.40	SUMMER	STANDARD36826	P
17-Jun-20	SW LANTAU	3	20.44	SUMMER	STANDARD36826	P
17-Jun-20	SW LANTAU	2	0.95	SUMMER	STANDARD36826	S
17-Jun-20	SW LANTAU	3	8.01	SUMMER	STANDARD36826	S
17-Jun-20	W LANTAU	2	1.85	SUMMER	STANDARD36826	S
17-Jun-20	W LANTAU	3	7.09	SUMMER	STANDARD36826	S
22-Jun-20	SE LANTAU	2	14.83	SUMMER	STANDARD36826	P
22-Jun-20	SE LANTAU	3	11.00	SUMMER	STANDARD36826	P
22-Jun-20	SE LANTAU	2	3.30	SUMMER	STANDARD36826	S
22-Jun-20	SE LANTAU	3	3.67	SUMMER	STANDARD36826	S
23-Jun-20	W LANTAU	3	9.50	SUMMER	STANDARD36826	S
23-Jun-20	SW LANTAU	2	16.90	SUMMER	STANDARD36826	P
23-Jun-20	SW LANTAU	3	8.25	SUMMER	STANDARD36826	P
23-Jun-20	SW LANTAU	2	3.24	SUMMER	STANDARD36826	S
23-Jun-20	SW LANTAU	3	7.85	SUMMER	STANDARD36826	S
23-Jun-20	SE LANTAU	2	14.31	SUMMER	STANDARD36826	P
23-Jun-20	SE LANTAU	2	2.99	SUMMER	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
29-Jun-20	PO TOI	0	8.17	SUMMER	STANDARD36826	P
29-Jun-20	PO TOI	1	35.59	SUMMER	STANDARD36826	P
29-Jun-20	PO TOI	2	43.49	SUMMER	STANDARD36826	P
29-Jun-20	PO TOI	0	2.05	SUMMER	STANDARD36826	S
29-Jun-20	PO TOI	1	4.30	SUMMER	STANDARD36826	S
29-Jun-20	PO TOI	2	5.10	SUMMER	STANDARD36826	S
6-Jul-20	SW LANTAU	2	12.66	SUMMER	STANDARD36826	P
6-Jul-20	SW LANTAU	3	7.64	SUMMER	STANDARD36826	P
6-Jul-20	SW LANTAU	2	7.07	SUMMER	STANDARD36826	S
6-Jul-20	SW LANTAU	3	6.08	SUMMER	STANDARD36826	S
7-Jul-20	DEEP BAY	2	5.39	SUMMER	STANDARD36826	P
7-Jul-20	DEEP BAY	3	4.20	SUMMER	STANDARD36826	P
7-Jul-20	DEEP BAY	2	6.81	SUMMER	STANDARD36826	S
7-Jul-20	DEEP BAY	3	2.90	SUMMER	STANDARD36826	S
7-Jul-20	NE LANTAU	2	17.82	SUMMER	STANDARD36826	P
7-Jul-20	NE LANTAU	2	8.58	SUMMER	STANDARD36826	S
8-Jul-20	SE LANTAU	2	1.65	SUMMER	STANDARD36826	P
8-Jul-20	SE LANTAU	3	24.28	SUMMER	STANDARD36826	P
8-Jul-20	SE LANTAU	4	1.40	SUMMER	STANDARD36826	P
8-Jul-20	SE LANTAU	3	11.25	SUMMER	STANDARD36826	S
8-Jul-20	SW LANTAU	2	2.02	SUMMER	STANDARD36826	P
8-Jul-20	SW LANTAU	3	13.00	SUMMER	STANDARD36826	P
8-Jul-20	SW LANTAU	2	1.16	SUMMER	STANDARD36826	S
8-Jul-20	SW LANTAU	3	2.37	SUMMER	STANDARD36826	S
8-Jul-20	SW LANTAU	4	1.73	SUMMER	STANDARD36826	S
13-Jul-20	SW LANTAU	2	1.53	SUMMER	STANDARD36826	P
13-Jul-20	SW LANTAU	2	10.08	SUMMER	STANDARD36826	S
14-Jul-20	SAI KUNG	0	9.37	SUMMER	STANDARD36826	P
14-Jul-20	SAI KUNG	1	14.48	SUMMER	STANDARD36826	P
14-Jul-20	SAI KUNG	2	6.80	SUMMER	STANDARD36826	P
14-Jul-20	SAI KUNG	3	27.10	SUMMER	STANDARD36826	P
14-Jul-20	SAI KUNG	0	1.97	SUMMER	STANDARD36826	S
14-Jul-20	SAI KUNG	2	10.10	SUMMER	STANDARD36826	S
14-Jul-20	SAI KUNG	3	3.30	SUMMER	STANDARD36826	S
20-Jul-20	W LANTAU	2	3.93	SUMMER	STANDARD36826	P
20-Jul-20	W LANTAU	3	3.82	SUMMER	STANDARD36826	P
20-Jul-20	W LANTAU	2	2.77	SUMMER	STANDARD36826	S
20-Jul-20	W LANTAU	3	4.54	SUMMER	STANDARD36826	S
21-Jul-20	PO TOI	1	5.50	SUMMER	STANDARD36826	P
21-Jul-20	PO TOI	2	65.60	SUMMER	STANDARD36826	P
21-Jul-20	PO TOI	3	11.90	SUMMER	STANDARD36826	P
21-Jul-20	PO TOI	1	1.80	SUMMER	STANDARD36826	S
21-Jul-20	PO TOI	2	8.70	SUMMER	STANDARD36826	S
21-Jul-20	PO TOI	3	2.00	SUMMER	STANDARD36826	S
23-Jul-20	NINEPINS	1	35.24	SUMMER	STANDARD36826	P
23-Jul-20	NINEPINS	2	35.26	SUMMER	STANDARD36826	P
23-Jul-20	NINEPINS	1	2.20	SUMMER	STANDARD36826	S
23-Jul-20	NINEPINS	2	6.00	SUMMER	STANDARD36826	S
27-Jul-20	SE LANTAU	1	18.46	SUMMER	STANDARD36826	P
27-Jul-20	SE LANTAU	2	11.95	SUMMER	STANDARD36826	P
27-Jul-20	SE LANTAU	1	6.29	SUMMER	STANDARD36826	S
27-Jul-20	SE LANTAU	2	1.00	SUMMER	STANDARD36826	S
27-Jul-20	SW LANTAU	1	5.59	SUMMER	STANDARD36826	P
27-Jul-20	SW LANTAU	2	12.43	SUMMER	STANDARD36826	P
27-Jul-20	SW LANTAU	3	3.50	SUMMER	STANDARD36826	P
27-Jul-20	SW LANTAU	2	5.05	SUMMER	STANDARD36826	S
27-Jul-20	SW LANTAU	3	6.03	SUMMER	STANDARD36826	S
28-Jul-20	NINEPINS	1	12.90	SUMMER	STANDARD36826	P
28-Jul-20	NINEPINS	2	32.10	SUMMER	STANDARD36826	P
28-Jul-20	NINEPINS	2	2.00	SUMMER	STANDARD36826	S
28-Jul-20	PO TOI	2	28.24	SUMMER	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
28-Jul-20	PO TOI	2	4.50	SUMMER	STANDARD36826	S
29-Jul-20	NW LANTAU	1	15.68	SUMMER	STANDARD36826	P
29-Jul-20	NW LANTAU	2	7.44	SUMMER	STANDARD36826	P
29-Jul-20	NW LANTAU	1	7.38	SUMMER	STANDARD36826	S
29-Jul-20	NW LANTAU	2	4.00	SUMMER	STANDARD36826	S
29-Jul-20	W LANTAU	1	6.09	SUMMER	STANDARD36826	P
29-Jul-20	W LANTAU	2	8.69	SUMMER	STANDARD36826	P
29-Jul-20	W LANTAU	1	4.17	SUMMER	STANDARD36826	S
29-Jul-20	W LANTAU	2	4.95	SUMMER	STANDARD36826	S
6-Aug-20	SW LANTAU	2	5.81	SUMMER	STANDARD36826	P
6-Aug-20	SW LANTAU	3	12.34	SUMMER	STANDARD36826	P
6-Aug-20	SW LANTAU	2	2.32	SUMMER	STANDARD36826	S
6-Aug-20	SW LANTAU	3	7.07	SUMMER	STANDARD36826	S
7-Aug-20	SW LANTAU	2	7.94	SUMMER	STANDARD36826	P
7-Aug-20	SW LANTAU	3	18.21	SUMMER	STANDARD36826	P
7-Aug-20	SW LANTAU	2	1.10	SUMMER	STANDARD36826	S
7-Aug-20	SW LANTAU	3	6.87	SUMMER	STANDARD36826	S
7-Aug-20	SE LANTAU	2	26.57	SUMMER	STANDARD36826	P
7-Aug-20	SE LANTAU	2	11.73	SUMMER	STANDARD36826	S
10-Aug-20	SW LANTAU	1	3.27	SUMMER	STANDARD36826	P
10-Aug-20	SW LANTAU	2	15.13	SUMMER	STANDARD36826	P
10-Aug-20	SW LANTAU	1	1.26	SUMMER	STANDARD36826	S
10-Aug-20	SW LANTAU	2	11.74	SUMMER	STANDARD36826	S
11-Aug-20	NINEPINS	2	42.60	SUMMER	STANDARD36826	P
11-Aug-20	NINEPINS	3	7.30	SUMMER	STANDARD36826	P
11-Aug-20	NINEPINS	2	2.20	SUMMER	STANDARD36826	S
11-Aug-20	PO TOI	1	1.10	SUMMER	STANDARD36826	P
11-Aug-20	PO TOI	2	30.30	SUMMER	STANDARD36826	P
11-Aug-20	PO TOI	3	3.50	SUMMER	STANDARD36826	P
11-Aug-20	PO TOI	1	1.50	SUMMER	STANDARD36826	S
11-Aug-20	PO TOI	3	1.90	SUMMER	STANDARD36826	S
14-Aug-20	DEEP BAY	1	0.82	SUMMER	STANDARD36826	P
14-Aug-20	DEEP BAY	2	3.42	SUMMER	STANDARD36826	P
14-Aug-20	DEEP BAY	3	6.62	SUMMER	STANDARD36826	P
14-Aug-20	DEEP BAY	1	1.38	SUMMER	STANDARD36826	S
14-Aug-20	DEEP BAY	2	1.08	SUMMER	STANDARD36826	S
14-Aug-20	DEEP BAY	3	3.08	SUMMER	STANDARD36826	S
14-Aug-20	NE LANTAU	2	13.66	SUMMER	STANDARD36826	P
14-Aug-20	NE LANTAU	2	4.64	SUMMER	STANDARD36826	S
17-Aug-20	NW LANTAU	2	21.22	SUMMER	STANDARD36826	P
17-Aug-20	NW LANTAU	3	2.50	SUMMER	STANDARD36826	P
17-Aug-20	NW LANTAU	2	11.08	SUMMER	STANDARD36826	S
17-Aug-20	W LANTAU	2	14.81	SUMMER	STANDARD36826	P
17-Aug-20	W LANTAU	3	4.27	SUMMER	STANDARD36826	P
17-Aug-20	W LANTAU	2	9.02	SUMMER	STANDARD36826	S
17-Aug-20	W LANTAU	3	2.21	SUMMER	STANDARD36826	S
24-Aug-20	NINEPINS	2	24.10	SUMMER	STANDARD36826	P
24-Aug-20	NINEPINS	3	0.80	SUMMER	STANDARD36826	P
24-Aug-20	PO TOI	2	13.80	SUMMER	STANDARD36826	P
24-Aug-20	PO TOI	3	32.50	SUMMER	STANDARD36826	P
24-Aug-20	PO TOI	2	12.40	SUMMER	STANDARD36826	S
24-Aug-20	PO TOI	3	4.40	SUMMER	STANDARD36826	S
31-Aug-20	SAI KUNG	2	40.45	SUMMER	STANDARD36826	P
31-Aug-20	SAI KUNG	2	7.08	SUMMER	STANDARD36826	S
1-Sep-20	NINEPINS	1	15.20	AUTUMN	STANDARD36826	P
1-Sep-20	NINEPINS	2	32.57	AUTUMN	STANDARD36826	P
1-Sep-20	NINEPINS	3	12.76	AUTUMN	STANDARD36826	P
1-Sep-20	NINEPINS	2	6.95	AUTUMN	STANDARD36826	S
1-Sep-20	NINEPINS	3	2.10	AUTUMN	STANDARD36826	S
1-Sep-20	PO TOI	2	5.20	AUTUMN	STANDARD36826	P
3-Sep-20	NINEPINS	1	12.49	AUTUMN	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
3-Sep-20	NINEPINS	2	21.54	AUTUMN	STANDARD36826	P
3-Sep-20	NINEPINS	3	13.50	AUTUMN	STANDARD36826	P
3-Sep-20	NINEPINS	2	4.67	AUTUMN	STANDARD36826	S
3-Sep-20	PO TOI	1	2.30	AUTUMN	STANDARD36826	P
3-Sep-20	PO TOI	2	32.40	AUTUMN	STANDARD36826	P
3-Sep-20	PO TOI	1	0.40	AUTUMN	STANDARD36826	S
3-Sep-20	PO TOI	2	2.90	AUTUMN	STANDARD36826	S
4-Sep-20	LAMMA	1	16.04	AUTUMN	STANDARD36826	P
4-Sep-20	LAMMA	2	52.40	AUTUMN	STANDARD36826	P
4-Sep-20	LAMMA	3	8.80	AUTUMN	STANDARD36826	P
4-Sep-20	LAMMA	1	4.26	AUTUMN	STANDARD36826	S
4-Sep-20	LAMMA	2	13.20	AUTUMN	STANDARD36826	S
4-Sep-20	LAMMA	3	5.00	AUTUMN	STANDARD36826	S
7-Sep-20	SE LANTAU	2	30.25	AUTUMN	STANDARD36826	P
7-Sep-20	SE LANTAU	2	6.85	AUTUMN	STANDARD36826	S
7-Sep-20	SW LANTAU	2	25.90	AUTUMN	STANDARD36826	P
7-Sep-20	SW LANTAU	3	0.96	AUTUMN	STANDARD36826	P
7-Sep-20	SW LANTAU	2	8.30	AUTUMN	STANDARD36826	S
7-Sep-20	SW LANTAU	3	2.14	AUTUMN	STANDARD36826	S
8-Sep-20	SW LANTAU	1	11.69	AUTUMN	STANDARD36826	P
8-Sep-20	SW LANTAU	2	9.16	AUTUMN	STANDARD36826	P
8-Sep-20	SW LANTAU	1	4.56	AUTUMN	STANDARD36826	S
8-Sep-20	SW LANTAU	2	8.57	AUTUMN	STANDARD36826	S
15-Sep-20	W LANTAU	2	7.21	AUTUMN	STANDARD36826	P
15-Sep-20	W LANTAU	3	0.78	AUTUMN	STANDARD36826	P
15-Sep-20	W LANTAU	2	8.67	AUTUMN	STANDARD36826	S
16-Sep-20	W LANTAU	2	7.04	AUTUMN	STANDARD36826	P
16-Sep-20	W LANTAU	3	5.87	AUTUMN	STANDARD36826	P
16-Sep-20	W LANTAU	2	4.60	AUTUMN	STANDARD36826	S
16-Sep-20	W LANTAU	3	5.85	AUTUMN	STANDARD36826	S
16-Sep-20	NW LANTAU	2	16.80	AUTUMN	STANDARD36826	P
16-Sep-20	NW LANTAU	3	9.10	AUTUMN	STANDARD36826	P
16-Sep-20	NW LANTAU	2	8.70	AUTUMN	STANDARD36826	S
23-Sep-20	DEEP BAY	1	5.21	AUTUMN	STANDARD36826	P
23-Sep-20	DEEP BAY	2	4.70	AUTUMN	STANDARD36826	P
23-Sep-20	DEEP BAY	0	3.20	AUTUMN	STANDARD36826	S
23-Sep-20	DEEP BAY	1	5.09	AUTUMN	STANDARD36826	S
23-Sep-20	DEEP BAY	2	2.00	AUTUMN	STANDARD36826	S
23-Sep-20	NE LANTAU	2	9.19	AUTUMN	STANDARD36826	P
23-Sep-20	NE LANTAU	3	4.69	AUTUMN	STANDARD36826	P
23-Sep-20	NE LANTAU	2	6.70	AUTUMN	STANDARD36826	S
23-Sep-20	NE LANTAU	3	2.02	AUTUMN	STANDARD36826	S
24-Sep-20	SE LANTAU	1	12.38	AUTUMN	STANDARD36826	P
24-Sep-20	SE LANTAU	2	12.41	AUTUMN	STANDARD36826	P
24-Sep-20	SE LANTAU	1	8.21	AUTUMN	STANDARD36826	S
24-Sep-20	SE LANTAU	2	2.20	AUTUMN	STANDARD36826	S
5-Oct-20	SW LANTAU	3	7.59	AUTUMN	STANDARD36826	P
5-Oct-20	SW LANTAU	4	7.52	AUTUMN	STANDARD36826	P
5-Oct-20	SW LANTAU	3	5.63	AUTUMN	STANDARD36826	S
5-Oct-20	SW LANTAU	4	1.96	AUTUMN	STANDARD36826	S
8-Oct-20	SE LANTAU	2	8.91	AUTUMN	STANDARD36826	P
8-Oct-20	SE LANTAU	3	17.11	AUTUMN	STANDARD36826	P
8-Oct-20	SE LANTAU	2	1.40	AUTUMN	STANDARD36826	S
8-Oct-20	SE LANTAU	3	6.18	AUTUMN	STANDARD36826	S
12-Oct-20	DEEP BAY	2	9.72	AUTUMN	STANDARD36826	P
12-Oct-20	DEEP BAY	2	6.48	AUTUMN	STANDARD36826	S
12-Oct-20	NE LANTAU	2	17.53	AUTUMN	STANDARD36826	P
12-Oct-20	NE LANTAU	2	10.27	AUTUMN	STANDARD36826	S
20-Oct-20	W LANTAU	2	1.40	AUTUMN	STANDARD36826	P
20-Oct-20	W LANTAU	3	10.20	AUTUMN	STANDARD36826	P
20-Oct-20	W LANTAU	4	1.45	AUTUMN	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
20-Oct-20	W LANTAU	2	5.46	AUTUMN	STANDARD36826	S
20-Oct-20	W LANTAU	3	13.49	AUTUMN	STANDARD36826	S
20-Oct-20	W LANTAU	4	1.10	AUTUMN	STANDARD36826	S
20-Oct-20	NW LANTAU	3	21.02	AUTUMN	STANDARD36826	P
20-Oct-20	NW LANTAU	3	9.88	AUTUMN	STANDARD36826	S
21-Oct-20	SE LANTAU	3	15.13	AUTUMN	STANDARD36826	P
21-Oct-20	SE LANTAU	4	12.54	AUTUMN	STANDARD36826	P
21-Oct-20	SE LANTAU	2	1.90	AUTUMN	STANDARD36826	S
21-Oct-20	SE LANTAU	3	3.30	AUTUMN	STANDARD36826	S
21-Oct-20	SE LANTAU	4	1.93	AUTUMN	STANDARD36826	S
21-Oct-20	SW LANTAU	3	18.66	AUTUMN	STANDARD36826	P
21-Oct-20	SW LANTAU	4	0.70	AUTUMN	STANDARD36826	P
21-Oct-20	SW LANTAU	2	0.60	AUTUMN	STANDARD36826	S
21-Oct-20	SW LANTAU	3	7.88	AUTUMN	STANDARD36826	S
21-Oct-20	SW LANTAU	4	2.50	AUTUMN	STANDARD36826	S
22-Oct-20	W LANTAU	3	5.34	AUTUMN	STANDARD36826	P
22-Oct-20	W LANTAU	3	4.48	AUTUMN	STANDARD36826	S
22-Oct-20	W LANTAU	4	1.89	AUTUMN	STANDARD36826	S
22-Oct-20	SW LANTAU	3	6.32	AUTUMN	STANDARD36826	P
22-Oct-20	SW LANTAU	4	1.94	AUTUMN	STANDARD36826	P
22-Oct-20	SW LANTAU	2	1.00	AUTUMN	STANDARD36826	S
22-Oct-20	SW LANTAU	3	10.54	AUTUMN	STANDARD36826	S
27-Oct-20	SE LANTAU	3	12.87	AUTUMN	STANDARD36826	P
27-Oct-20	SE LANTAU	2	2.89	AUTUMN	STANDARD36826	S
27-Oct-20	SE LANTAU	3	7.84	AUTUMN	STANDARD36826	S
27-Oct-20	SW LANTAU	2	1.35	AUTUMN	STANDARD36826	P
27-Oct-20	SW LANTAU	3	24.62	AUTUMN	STANDARD36826	P
27-Oct-20	SW LANTAU	3	10.64	AUTUMN	STANDARD36826	S
28-Oct-20	NW LANTAU	2	24.35	AUTUMN	STANDARD36826	P
28-Oct-20	NW LANTAU	3	2.36	AUTUMN	STANDARD36826	P
28-Oct-20	NW LANTAU	2	15.09	AUTUMN	STANDARD36826	S
28-Oct-20	W LANTAU	2	13.10	AUTUMN	STANDARD36826	P
28-Oct-20	W LANTAU	3	1.54	AUTUMN	STANDARD36826	P
28-Oct-20	W LANTAU	2	9.07	AUTUMN	STANDARD36826	S
28-Oct-20	W LANTAU	3	2.08	AUTUMN	STANDARD36826	S
2-Nov-20	SE LANTAU	1	3.60	AUTUMN	STANDARD36826	P
2-Nov-20	SE LANTAU	2	25.37	AUTUMN	STANDARD36826	P
2-Nov-20	SE LANTAU	3	2.20	AUTUMN	STANDARD36826	P
2-Nov-20	SE LANTAU	2	5.47	AUTUMN	STANDARD36826	S
2-Nov-20	SE LANTAU	3	0.43	AUTUMN	STANDARD36826	S
2-Nov-20	SW LANTAU	2	22.71	AUTUMN	STANDARD36826	P
2-Nov-20	SW LANTAU	3	2.40	AUTUMN	STANDARD36826	P
2-Nov-20	SW LANTAU	2	4.88	AUTUMN	STANDARD36826	S
2-Nov-20	SW LANTAU	3	2.10	AUTUMN	STANDARD36826	S
3-Nov-20	W LANTAU	2	1.82	AUTUMN	STANDARD36826	P
3-Nov-20	W LANTAU	3	19.63	AUTUMN	STANDARD36826	P
3-Nov-20	W LANTAU	2	3.18	AUTUMN	STANDARD36826	S
3-Nov-20	W LANTAU	3	8.39	AUTUMN	STANDARD36826	S
3-Nov-20	SW LANTAU	2	21.37	AUTUMN	STANDARD36826	P
3-Nov-20	SW LANTAU	2	13.23	AUTUMN	STANDARD36826	S
9-Nov-20	DEEP BAY	2	5.07	AUTUMN	STANDARD36826	P
9-Nov-20	DEEP BAY	3	3.32	AUTUMN	STANDARD36826	P
9-Nov-20	DEEP BAY	2	10.21	AUTUMN	STANDARD36826	S
9-Nov-20	NE LANTAU	2	14.13	AUTUMN	STANDARD36826	P
9-Nov-20	NE LANTAU	2	9.67	AUTUMN	STANDARD36826	S
11-Nov-20	W LANTAU	2	3.90	AUTUMN	STANDARD36826	P
11-Nov-20	W LANTAU	3	5.79	AUTUMN	STANDARD36826	P
11-Nov-20	W LANTAU	2	15.00	AUTUMN	STANDARD36826	S
11-Nov-20	W LANTAU	3	6.05	AUTUMN	STANDARD36826	S
11-Nov-20	NW LANTAU	1	3.00	AUTUMN	STANDARD36826	P
11-Nov-20	NW LANTAU	2	25.68	AUTUMN	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
11-Nov-20	NW LANTAU	2	11.62	AUTUMN	STANDARD36826	S
12-Nov-20	SE LANTAU	2	17.45	AUTUMN	STANDARD36826	P
12-Nov-20	SE LANTAU	3	9.85	AUTUMN	STANDARD36826	P
12-Nov-20	SE LANTAU	2	5.72	AUTUMN	STANDARD36826	S
12-Nov-20	SE LANTAU	3	4.28	AUTUMN	STANDARD36826	S
12-Nov-20	SW LANTAU	2	9.60	AUTUMN	STANDARD36826	P
12-Nov-20	SW LANTAU	3	15.06	AUTUMN	STANDARD36826	P
12-Nov-20	SW LANTAU	2	2.80	AUTUMN	STANDARD36826	S
12-Nov-20	SW LANTAU	3	9.44	AUTUMN	STANDARD36826	S
16-Nov-20	W LANTAU	2	14.59	AUTUMN	STANDARD36826	P
16-Nov-20	W LANTAU	3	5.83	AUTUMN	STANDARD36826	P
16-Nov-20	W LANTAU	2	9.27	AUTUMN	STANDARD36826	S
16-Nov-20	W LANTAU	3	1.35	AUTUMN	STANDARD36826	S
16-Nov-20	SW LANTAU	2	3.56	AUTUMN	STANDARD36826	P
16-Nov-20	SW LANTAU	3	19.40	AUTUMN	STANDARD36826	P
16-Nov-20	SW LANTAU	3	11.84	AUTUMN	STANDARD36826	S
19-Nov-20	PO TOI	1	25.32	AUTUMN	STANDARD36826	P
19-Nov-20	PO TOI	2	52.33	AUTUMN	STANDARD36826	P
19-Nov-20	PO TOI	1	2.60	AUTUMN	STANDARD36826	S
19-Nov-20	PO TOI	2	11.05	AUTUMN	STANDARD36826	S
24-Nov-20	NW LANTAU	2	15.22	AUTUMN	STANDARD36826	P
24-Nov-20	NW LANTAU	3	8.78	AUTUMN	STANDARD36826	P
24-Nov-20	NW LANTAU	2	6.92	AUTUMN	STANDARD36826	S
24-Nov-20	NW LANTAU	3	3.98	AUTUMN	STANDARD36826	S
24-Nov-20	W LANTAU	2	15.42	AUTUMN	STANDARD36826	P
24-Nov-20	W LANTAU	2	8.02	AUTUMN	STANDARD36826	S
24-Nov-20	W LANTAU	3	1.24	AUTUMN	STANDARD36826	S
26-Nov-20	SE LANTAU	1	1.20	AUTUMN	STANDARD36826	P
26-Nov-20	SE LANTAU	2	28.96	AUTUMN	STANDARD36826	P
26-Nov-20	SE LANTAU	1	0.90	AUTUMN	STANDARD36826	S
26-Nov-20	SE LANTAU	2	7.14	AUTUMN	STANDARD36826	S
26-Nov-20	SW LANTAU	2	20.73	AUTUMN	STANDARD36826	P
26-Nov-20	SW LANTAU	3	3.34	AUTUMN	STANDARD36826	P
26-Nov-20	SW LANTAU	2	6.82	AUTUMN	STANDARD36826	S
26-Nov-20	SW LANTAU	3	2.01	AUTUMN	STANDARD36826	S
30-Nov-20	NW LANTAU	2	1.07	AUTUMN	STANDARD36826	P
30-Nov-20	NW LANTAU	3	26.69	AUTUMN	STANDARD36826	P
30-Nov-20	NW LANTAU	3	9.74	AUTUMN	STANDARD36826	S
30-Nov-20	W LANTAU	3	17.86	AUTUMN	STANDARD36826	P
30-Nov-20	W LANTAU	3	10.44	AUTUMN	STANDARD36826	S
2-Dec-20	W LANTAU	2	0.43	WINTER	STANDARD36826	P
2-Dec-20	W LANTAU	3	20.25	WINTER	STANDARD36826	P
2-Dec-20	W LANTAU	4	1.36	WINTER	STANDARD36826	P
2-Dec-20	W LANTAU	2	2.36	WINTER	STANDARD36826	S
2-Dec-20	W LANTAU	3	7.85	WINTER	STANDARD36826	S
2-Dec-20	W LANTAU	4	1.33	WINTER	STANDARD36826	S
2-Dec-20	SW LANTAU	2	6.60	WINTER	STANDARD36826	P
2-Dec-20	SW LANTAU	3	12.62	WINTER	STANDARD36826	P
2-Dec-20	SW LANTAU	2	2.48	WINTER	STANDARD36826	S
2-Dec-20	SW LANTAU	3	5.90	WINTER	STANDARD36826	S
3-Dec-20	DEEP BAY	3	9.24	WINTER	STANDARD36826	P
3-Dec-20	DEEP BAY	3	6.16	WINTER	STANDARD36826	S
3-Dec-20	NE LANTAU	2	0.70	WINTER	STANDARD36826	P
3-Dec-20	NE LANTAU	3	12.42	WINTER	STANDARD36826	P
3-Dec-20	NE LANTAU	2	2.00	WINTER	STANDARD36826	S
3-Dec-20	NE LANTAU	3	4.98	WINTER	STANDARD36826	S
9-Dec-20	LAMMA	2	33.50	WINTER	STANDARD36826	P
9-Dec-20	LAMMA	3	46.85	WINTER	STANDARD36826	P
9-Dec-20	LAMMA	2	8.70	WINTER	STANDARD36826	S
9-Dec-20	LAMMA	3	10.95	WINTER	STANDARD36826	S
10-Dec-20	DEEP BAY	1	0.60	WINTER	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
10-Dec-20	DEEP BAY	2	8.84	WINTER	STANDARD36826	P
10-Dec-20	DEEP BAY	1	4.30	WINTER	STANDARD36826	S
10-Dec-20	DEEP BAY	2	5.86	WINTER	STANDARD36826	S
10-Dec-20	NE LANTAU	2	10.36	WINTER	STANDARD36826	P
10-Dec-20	NE LANTAU	2	4.24	WINTER	STANDARD36826	S
11-Dec-20	W LANTAU	1	2.94	WINTER	STANDARD36826	P
11-Dec-20	W LANTAU	2	18.57	WINTER	STANDARD36826	P
11-Dec-20	W LANTAU	2	10.39	WINTER	STANDARD36826	S
11-Dec-20	SW LANTAU	2	17.62	WINTER	STANDARD36826	P
11-Dec-20	SW LANTAU	3	2.89	WINTER	STANDARD36826	P
11-Dec-20	SW LANTAU	2	6.70	WINTER	STANDARD36826	S
14-Dec-20	NW LANTAU	2	7.97	WINTER	STANDARD36826	P
14-Dec-20	NW LANTAU	3	23.47	WINTER	STANDARD36826	P
14-Dec-20	NW LANTAU	2	7.74	WINTER	STANDARD36826	S
14-Dec-20	NW LANTAU	3	2.32	WINTER	STANDARD36826	S
14-Dec-20	W LANTAU	2	4.51	WINTER	STANDARD36826	P
14-Dec-20	W LANTAU	3	12.04	WINTER	STANDARD36826	P
14-Dec-20	W LANTAU	2	4.18	WINTER	STANDARD36826	S
14-Dec-20	W LANTAU	3	4.84	WINTER	STANDARD36826	S
14-Dec-20	SW LANTAU	2	2.10	WINTER	STANDARD36826	S
14-Dec-20	SW LANTAU	3	7.15	WINTER	STANDARD36826	S
4-Jan-21	W LANTAU	2	20.58	WINTER	STANDARD36826	P
4-Jan-21	W LANTAU	3	1.79	WINTER	STANDARD36826	P
4-Jan-21	W LANTAU	2	10.13	WINTER	STANDARD36826	S
4-Jan-21	SW LANTAU	2	12.76	WINTER	STANDARD36826	P
4-Jan-21	SW LANTAU	2	5.25	WINTER	STANDARD36826	S
5-Jan-21	LAMMA	1	19.35	WINTER	STANDARD36826	P
5-Jan-21	LAMMA	2	55.30	WINTER	STANDARD36826	P
5-Jan-21	LAMMA	1	6.44	WINTER	STANDARD36826	S
5-Jan-21	LAMMA	2	22.21	WINTER	STANDARD36826	S
6-Jan-21	SE LANTAU	2	20.61	WINTER	STANDARD36826	P
6-Jan-21	SE LANTAU	3	9.55	WINTER	STANDARD36826	P
6-Jan-21	SE LANTAU	2	3.30	WINTER	STANDARD36826	S
6-Jan-21	SE LANTAU	3	3.94	WINTER	STANDARD36826	S
6-Jan-21	SW LANTAU	2	20.23	WINTER	STANDARD36826	P
6-Jan-21	SW LANTAU	3	6.10	WINTER	STANDARD36826	P
6-Jan-21	SW LANTAU	2	5.94	WINTER	STANDARD36826	S
6-Jan-21	SW LANTAU	3	4.70	WINTER	STANDARD36826	S
13-Jan-21	NW LANTAU	1	1.94	WINTER	STANDARD36826	P
13-Jan-21	NW LANTAU	2	22.02	WINTER	STANDARD36826	P
13-Jan-21	NW LANTAU	3	0.60	WINTER	STANDARD36826	P
13-Jan-21	NW LANTAU	2	9.75	WINTER	STANDARD36826	S
13-Jan-21	W LANTAU	2	18.14	WINTER	STANDARD36826	P
13-Jan-21	W LANTAU	1	1.30	WINTER	STANDARD36826	S
13-Jan-21	W LANTAU	2	10.44	WINTER	STANDARD36826	S
14-Jan-21	SE LANTAU	1	12.15	WINTER	STANDARD36826	P
14-Jan-21	SE LANTAU	2	14.99	WINTER	STANDARD36826	P
14-Jan-21	SE LANTAU	1	2.16	WINTER	STANDARD36826	S
14-Jan-21	SE LANTAU	2	8.18	WINTER	STANDARD36826	S
14-Jan-21	SW LANTAU	1	7.76	WINTER	STANDARD36826	P
14-Jan-21	SW LANTAU	2	9.56	WINTER	STANDARD36826	P
14-Jan-21	SW LANTAU	1	3.54	WINTER	STANDARD36826	S
14-Jan-21	SW LANTAU	2	5.52	WINTER	STANDARD36826	S
15-Jan-21	LAMMA	2	5.50	WINTER	STANDARD36826	P
15-Jan-21	LAMMA	3	25.59	WINTER	STANDARD36826	P
15-Jan-21	LAMMA	2	3.01	WINTER	STANDARD36826	S
15-Jan-21	LAMMA	3	6.30	WINTER	STANDARD36826	S
15-Jan-21	PO TOI	1	1.60	WINTER	STANDARD36826	P
15-Jan-21	PO TOI	2	31.91	WINTER	STANDARD36826	P
15-Jan-21	PO TOI	3	2.93	WINTER	STANDARD36826	P
15-Jan-21	PO TOI	1	1.10	WINTER	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
15-Jan-21	PO TOI	2	9.06	WINTER	STANDARD36826	S
25-Jan-21	DEEP BAY	1	3.08	WINTER	STANDARD36826	P
25-Jan-21	DEEP BAY	2	7.79	WINTER	STANDARD36826	P
25-Jan-21	DEEP BAY	2	9.33	WINTER	STANDARD36826	S
25-Jan-21	NE LANTAU	2	5.60	WINTER	STANDARD36826	P
25-Jan-21	NE LANTAU	2	7.60	WINTER	STANDARD36826	S
27-Jan-21	W LANTAU	2	10.01	WINTER	STANDARD36826	P
27-Jan-21	W LANTAU	3	4.83	WINTER	STANDARD36826	P
27-Jan-21	W LANTAU	2	7.70	WINTER	STANDARD36826	S
27-Jan-21	W LANTAU	3	1.27	WINTER	STANDARD36826	S
1-Feb-21	W LANTAU	1	17.42	WINTER	STANDARD36826	P
1-Feb-21	W LANTAU	2	4.47	WINTER	STANDARD36826	P
1-Feb-21	W LANTAU	1	10.82	WINTER	STANDARD36826	S
1-Feb-21	W LANTAU	2	1.00	WINTER	STANDARD36826	S
1-Feb-21	SW LANTAU	1	9.17	WINTER	STANDARD36826	P
1-Feb-21	SW LANTAU	2	10.91	WINTER	STANDARD36826	P
1-Feb-21	SW LANTAU	1	6.63	WINTER	STANDARD36826	S
1-Feb-21	SW LANTAU	2	3.48	WINTER	STANDARD36826	S
4-Feb-21	SE LANTAU	2	15.97	WINTER	STANDARD36826	P
4-Feb-21	SE LANTAU	3	12.05	WINTER	STANDARD36826	P
4-Feb-21	SE LANTAU	2	3.10	WINTER	STANDARD36826	S
4-Feb-21	SE LANTAU	3	3.98	WINTER	STANDARD36826	S
4-Feb-21	SW LANTAU	2	2.95	WINTER	STANDARD36826	P
4-Feb-21	SW LANTAU	3	23.78	WINTER	STANDARD36826	P
4-Feb-21	SW LANTAU	3	9.17	WINTER	STANDARD36826	S
5-Feb-21	LAMMA	2	5.91	WINTER	STANDARD36826	P
5-Feb-21	LAMMA	3	27.53	WINTER	STANDARD36826	P
5-Feb-21	LAMMA	4	0.80	WINTER	STANDARD36826	P
5-Feb-21	LAMMA	2	7.56	WINTER	STANDARD36826	S
5-Feb-21	LAMMA	3	2.80	WINTER	STANDARD36826	S
5-Feb-21	SE LANTAU	2	12.10	WINTER	STANDARD36826	P
5-Feb-21	SE LANTAU	3	9.20	WINTER	STANDARD36826	P
5-Feb-21	SE LANTAU	2	5.30	WINTER	STANDARD36826	S
5-Feb-21	SE LANTAU	3	4.00	WINTER	STANDARD36826	S
5-Feb-21	SW LANTAU	3	6.45	WINTER	STANDARD36826	P
5-Feb-21	SW LANTAU	3	1.86	WINTER	STANDARD36826	S
8-Feb-21	DEEP BAY	1	4.91	WINTER	STANDARD36826	P
8-Feb-21	DEEP BAY	2	5.24	WINTER	STANDARD36826	P
8-Feb-21	DEEP BAY	1	6.35	WINTER	STANDARD36826	S
8-Feb-21	NE LANTAU	3	9.97	WINTER	STANDARD36826	P
8-Feb-21	NE LANTAU	3	4.23	WINTER	STANDARD36826	S
11-Feb-21	SE LANTAU	2	12.50	WINTER	STANDARD36826	P
11-Feb-21	SE LANTAU	3	17.97	WINTER	STANDARD36826	P
11-Feb-21	SE LANTAU	2	3.20	WINTER	STANDARD36826	S
11-Feb-21	SE LANTAU	3	4.03	WINTER	STANDARD36826	S
11-Feb-21	SW LANTAU	2	16.70	WINTER	STANDARD36826	P
11-Feb-21	SW LANTAU	3	0.70	WINTER	STANDARD36826	P
11-Feb-21	SW LANTAU	2	8.30	WINTER	STANDARD36826	S
11-Feb-21	SW LANTAU	3	3.00	WINTER	STANDARD36826	S
19-Feb-21	W LANTAU	1	0.20	WINTER	STANDARD36826	P
19-Feb-21	W LANTAU	2	16.18	WINTER	STANDARD36826	P
19-Feb-21	W LANTAU	2	8.56	WINTER	STANDARD36826	S
19-Feb-21	SW LANTAU	2	14.71	WINTER	STANDARD36826	P
19-Feb-21	SW LANTAU	2	13.18	WINTER	STANDARD36826	S
22-Feb-21	LAMMA	1	36.62	WINTER	STANDARD36826	P
22-Feb-21	LAMMA	2	44.44	WINTER	STANDARD36826	P
22-Feb-21	LAMMA	1	9.01	WINTER	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
22-Feb-21	LAMMA	2	12.68	WINTER	STANDARD36826	S
23-Feb-21	W LANTAU	2	3.93	WINTER	STANDARD36826	P
23-Feb-21	W LANTAU	3	6.05	WINTER	STANDARD36826	P
23-Feb-21	W LANTAU	2	3.27	WINTER	STANDARD36826	S
23-Feb-21	W LANTAU	3	6.18	WINTER	STANDARD36826	S
1-Mar-21	SE LANTAU	1	4.53	SPRING	STANDARD36826	P
1-Mar-21	SE LANTAU	2	22.04	SPRING	STANDARD36826	P
1-Mar-21	SE LANTAU	3	3.70	SPRING	STANDARD36826	P
1-Mar-21	SE LANTAU	1	0.50	SPRING	STANDARD36826	S
1-Mar-21	SE LANTAU	2	4.33	SPRING	STANDARD36826	S
1-Mar-21	SE LANTAU	3	2.20	SPRING	STANDARD36826	S
1-Mar-21	SW LANTAU	1	1.80	SPRING	STANDARD36826	P
1-Mar-21	SW LANTAU	2	23.80	SPRING	STANDARD36826	P
1-Mar-21	SW LANTAU	3	1.10	SPRING	STANDARD36826	P
1-Mar-21	SW LANTAU	1	0.30	SPRING	STANDARD36826	S
1-Mar-21	SW LANTAU	2	6.52	SPRING	STANDARD36826	S
5-Mar-21	W LANTAU	2	15.73	SPRING	STANDARD36826	P
5-Mar-21	W LANTAU	3	5.55	SPRING	STANDARD36826	P
5-Mar-21	W LANTAU	2	12.24	SPRING	STANDARD36826	S
5-Mar-21	W LANTAU	3	1.24	SPRING	STANDARD36826	S
5-Mar-21	SW LANTAU	2	9.25	SPRING	STANDARD36826	P
5-Mar-21	SW LANTAU	3	1.70	SPRING	STANDARD36826	P
5-Mar-21	SW LANTAU	2	4.95	SPRING	STANDARD36826	S
8-Mar-21	DEEP BAY	2	9.83	SPRING	STANDARD36826	P
8-Mar-21	DEEP BAY	1	2.39	SPRING	STANDARD36826	S
8-Mar-21	DEEP BAY	2	6.98	SPRING	STANDARD36826	S
8-Mar-21	NE LANTAU	3	7.85	SPRING	STANDARD36826	P
8-Mar-21	NE LANTAU	2	5.58	SPRING	STANDARD36826	S
8-Mar-21	NE LANTAU	3	1.87	SPRING	STANDARD36826	S
9-Mar-21	NW LANTAU	2	21.35	SPRING	STANDARD36826	P
9-Mar-21	NW LANTAU	3	4.10	SPRING	STANDARD36826	P
9-Mar-21	NW LANTAU	2	10.35	SPRING	STANDARD36826	S
9-Mar-21	W LANTAU	1	1.60	SPRING	STANDARD36826	P
9-Mar-21	W LANTAU	2	17.55	SPRING	STANDARD36826	P
9-Mar-21	W LANTAU	1	1.40	SPRING	STANDARD36826	S
9-Mar-21	W LANTAU	2	10.68	SPRING	STANDARD36826	S
9-Mar-21	SW LANTAU	2	9.82	SPRING	STANDARD36826	S
19-Mar-21	SE LANTAU	2	5.62	SPRING	STANDARD36826	P
19-Mar-21	SE LANTAU	3	21.73	SPRING	STANDARD36826	P
19-Mar-21	SE LANTAU	2	3.95	SPRING	STANDARD36826	S
19-Mar-21	SE LANTAU	3	5.44	SPRING	STANDARD36826	S
19-Mar-21	SW LANTAU	2	7.50	SPRING	STANDARD36826	P
19-Mar-21	SW LANTAU	3	10.91	SPRING	STANDARD36826	P
19-Mar-21	SW LANTAU	2	8.61	SPRING	STANDARD36826	S
19-Mar-21	SW LANTAU	3	1.95	SPRING	STANDARD36826	S
24-Mar-21	LAMMA	2	29.31	SPRING	STANDARD36826	P
24-Mar-21	LAMMA	3	5.21	SPRING	STANDARD36826	P
24-Mar-21	LAMMA	2	8.70	SPRING	STANDARD36826	S
24-Mar-21	SE LANTAU	2	29.85	SPRING	STANDARD36826	P
24-Mar-21	SE LANTAU	2	5.85	SPRING	STANDARD36826	S
24-Mar-21	SW LANTAU	1	6.08	SPRING	STANDARD36826	P
25-Mar-21	W LANTAU	2	7.94	SPRING	STANDARD36826	P
25-Mar-21	W LANTAU	3	8.50	SPRING	STANDARD36826	P
25-Mar-21	W LANTAU	4	1.00	SPRING	STANDARD36826	P
25-Mar-21	W LANTAU	2	4.18	SPRING	STANDARD36826	S
25-Mar-21	W LANTAU	3	5.48	SPRING	STANDARD36826	S
25-Mar-21	W LANTAU	4	1.00	SPRING	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
29-Mar-21	LAMMA	0	2.21	SPRING	STANDARD36826	P
29-Mar-21	LAMMA	1	19.21	SPRING	STANDARD36826	P
29-Mar-21	LAMMA	2	56.53	SPRING	STANDARD36826	P
29-Mar-21	LAMMA	3	5.30	SPRING	STANDARD36826	P
29-Mar-21	LAMMA	0	0.64	SPRING	STANDARD36826	S
29-Mar-21	LAMMA	1	3.55	SPRING	STANDARD36826	S
29-Mar-21	LAMMA	2	15.60	SPRING	STANDARD36826	S

Appendix II. HKCRP-AFCD Chinese White Dolphin Sighting Database (April 2020 - March 2021)
(Note: P = sightings made on primary lines; S = sightings made on secondary lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
21-Apr-20	1	1331	1	W LANTAU	2	81	ON	HKCRP	813569	802503	SPRING	NONE	P
21-Apr-20	2	1347	7	W LANTAU	2	341	ON	HKCRP	813148	802605	SPRING	NONE	S
21-Apr-20	3	1417	2	W LANTAU	3	36	ON	HKCRP	809933	799650	SPRING	NONE	S
21-Apr-20	4	1445	4	W LANTAU	3	67	ON	HKCRP	809320	801184	SPRING	NONE	S
27-Apr-20	1	1025	3	W LANTAU	1	193	ON	HKCRP	813823	803040	SPRING	NONE	S
27-Apr-20	2	1107	1	W LANTAU	2	67	ON	HKCRP	806251	802105	SPRING	NONE	S
28-Apr-20	1	1307	4	W LANTAU	2	68	ON	HKCRP	813613	802823	SPRING	NONE	P
28-Apr-20	2	1441	1	W LANTAU	4	113	ON	HKCRP	807439	800664	SPRING	NONE	P
6-May-20	1	1355	4	SW LANTAU	2	202	ON	HKCRP	806095	802538	SPRING	NONE	P
6-May-20	2	1500	2	SW LANTAU	2	601	ON	HKCRP	806795	806520	SPRING	NONE	P
8-May-20	1	1521	2	SW LANTAU	2	51	ON	HKCRP	804483	805505	SPRING	NONE	P
13-May-20	1	1105	5	W LANTAU	1	181	ON	HKCRP	812464	801697	SPRING	NONE	P
13-May-20	2	1138	5	W LANTAU	2	117	ON	HKCRP	811456	801653	SPRING	NONE	P
13-May-20	3	1155	3	W LANTAU	2	149	ON	HKCRP	811458	800808	SPRING	NONE	P
13-May-20	4	1238	1	W LANTAU	3	71	ON	HKCRP	808436	800564	SPRING	NONE	P
20-May-20	1	1350	2	SW LANTAU	3	ND	OFF	HKCRP	806083	802724	SPRING	NONE	
2-Jun-20	1	1355	3	SW LANTAU	2	111	ON	HKCRP	805205	804496	SUMMER	NONE	P
2-Jun-20	2	1411	2	SW LANTAU	2	97	ON	HKCRP	806334	804364	SUMMER	NONE	P
2-Jun-20	3	1445	1	SW LANTAU	2	182	ON	HKCRP	806806	806510	SUMMER	NONE	P
3-Jun-20	2	1529	5	SW LANTAU	2	ND	OFF	HKCRP	803146	804017	SUMMER	NONE	
3-Jun-20	3	1602	1	SW LANTAU	2	ND	OFF	HKCRP	806114	809788	SUMMER	NONE	
10-Jun-20	1	1341	1	W LANTAU	3	44	ON	HKCRP	809907	801340	SUMMER	NONE	S
10-Jun-20	2	1351	2	W LANTAU	3	34	ON	HKCRP	809465	800587	SUMMER	NONE	P
10-Jun-20	3	1412	1	W LANTAU	3	39	ON	HKCRP	808413	800533	SUMMER	NONE	P
10-Jun-20	4	1446	2	W LANTAU	3	70	ON	HKCRP	806709	800178	SUMMER	NONE	S
10-Jun-20	5	1500	4	W LANTAU	3	43	ON	HKCRP	806074	801693	SUMMER	NONE	S
10-Jun-20	6	1517	2	SW LANTAU	2	ND	OFF	HKCRP	806455	804828	SUMMER	NONE	
17-Jun-20	1	1012	4	W LANTAU	2	165	ON	HKCRP	813878	803153	SUMMER	NONE	S
17-Jun-20	2	1047	3	W LANTAU	3	19	ON	HKCRP	807182	801530	SUMMER	NONE	S
17-Jun-20	3	1105	4	SW LANTAU	2	ND	OFF	HKCRP	806162	802208	SUMMER	NONE	
17-Jun-20	4	1157	2	SW LANTAU	2	ND	OFF	HKCRP	806602	803560	SUMMER	NONE	
17-Jun-20	5	1223	5	SW LANTAU	3	443	ON	HKCRP	806085	807385	SUMMER	NONE	P
17-Jun-20	6	1358	4	SW LANTAU	3	ND	OFF	HKCRP	806239	802085	SUMMER	NONE	

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
17-Jun-20	7	1432	8	SW LANTAU	2	ND	OFF	HKCRP	807269	807728	SUMMER	NONE	
22-Jun-20	1	1306	8	SW LANTAU	2	ND	OFF	HKCRP	805839	803146	SUMMER	NONE	
22-Jun-20	2	1339	3	SW LANTAU	2	ND	OFF	HKCRP	806594	807396	SUMMER	NONE	
22-Jun-20	3	1359	1	SW LANTAU	2	ND	OFF	HKCRP	807609	809358	SUMMER	PURSE-SEINE	
23-Jun-20	1	1021	6	W LANTAU	3	126	ON	HKCRP	813127	802430	SUMMER	NONE	S
23-Jun-20	2	1048	1	W LANTAU	3	721	ON	HKCRP	808091	801212	SUMMER	NONE	S
23-Jun-20	3	1054	7	W LANTAU	3	58	ON	HKCRP	806572	801797	SUMMER	NONE	S
23-Jun-20	4	1109	4	SW LANTAU	2	127	ON	HKCRP	806095	802518	SUMMER	NONE	P
23-Jun-20	5	1144	3	SW LANTAU	3	279	ON	HKCRP	804872	804495	SUMMER	NONE	P
23-Jun-20	6	1157	3	SW LANTAU	2	60	ON	HKCRP	805249	804548	SUMMER	NONE	P
23-Jun-20	7	1208	1	SW LANTAU	2	270	ON	HKCRP	806168	804498	SUMMER	NONE	P
23-Jun-20	8	1224	5	SW LANTAU	2	55	ON	HKCRP	807440	805099	SUMMER	PURSE-SEINE	S
23-Jun-20	9	1256	2	SW LANTAU	2	700	ON	HKCRP	805522	806508	SUMMER	NONE	P
23-Jun-20	10	1350	8	SW LANTAU	3	28	ON	HKCRP	805507	808333	SUMMER	NONE	S
6-Jul-20	1	1233	5	SW LANTAU	3	ND	OFF	HKCRP	805974	802115	SUMMER	NONE	
6-Jul-20	2	1256	1	SW LANTAU	2	770	ON	HKCRP	806591	803344	SUMMER	NONE	S
6-Jul-20	3	1307	1	SW LANTAU	2	18	ON	HKCRP	805824	804559	SUMMER	NONE	P
6-Jul-20	4	1322	2	SW LANTAU	3	267	ON	HKCRP	803676	804472	SUMMER	NONE	P
6-Jul-20	5	1443	2	SW LANTAU	2	51	ON	HKCRP	803702	808598	SUMMER	NONE	P
6-Jul-20	6	1545	9	SW LANTAU	2	257	ON	HKCRP	806001	810644	SUMMER	NONE	P
8-Jul-20	1	1410	1	SW LANTAU	2	103	ON	HKCRP	804154	809795	SUMMER	NONE	P
8-Jul-20	2	1434	3	SW LANTAU	2	29	ON	HKCRP	805616	809633	SUMMER	NONE	P
8-Jul-20	3	1502	1	SW LANTAU	3	6	ON	HKCRP	807410	809223	SUMMER	NONE	S
8-Jul-20	4	1537	1	SW LANTAU	2	ND	OFF	HKCRP	806259	809201	SUMMER	NONE	
17-Jul-20	3	1550	2	W LANTAU	4	ND	OFF	HELI	813503	802400	SUMMER	NONE	
20-Jul-20	1	1415	1	W LANTAU	3	122	ON	HKCRP	812430	801996	SUMMER	NONE	S
20-Jul-20	2	1443	4	W LANTAU	3	326	ON	HKCRP	809744	799711	SUMMER	NONE	S
20-Jul-20	3	1506	1	W LANTAU	2	203	ON	HKCRP	807714	801428	SUMMER	NONE	S
20-Jul-20	4	1515	5	W LANTAU	2	122	ON	HKCRP	806295	801961	SUMMER	PURSE-SEINE	S
20-Jul-20	5	1526	1	SW LANTAU	2	ND	OFF	HKCRP	806082	803023	SUMMER	PURSE-SEINE	
20-Jul-20	6	1549	2	SW LANTAU	2	ND	OFF	HKCRP	806182	808850	SUMMER	NONE	
29-Jul-20	1	1303	2	W LANTAU	1	41	ON	HKCRP	815042	802465	SUMMER	NONE	S
29-Jul-20	2	1315	5	W LANTAU	1	57	ON	HKCRP	814488	802948	SUMMER	NONE	P
29-Jul-20	3	1404	4	W LANTAU	2	142	ON	HKCRP	811446	801045	SUMMER	NONE	P

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
29-Jul-20	4	1441	2	W LANTAU	2	261	ON	HKCRP	808280	800893	SUMMER	NONE	P
29-Jul-20	5	1504	1	W LANTAU	2	225	ON	HKCRP	806720	800168	SUMMER	NONE	S
6-Aug-20	1	1317	2	SW LANTAU	3	174	ON	HKCRP	806205	802549	SUMMER	NONE	P
6-Aug-20	2	1405	9	SW LANTAU	2	134	ON	HKCRP	806035	804477	SUMMER	NONE	P
7-Aug-20	1	1518	3	SW LANTAU	3	27	ON	HKCRP	805335	805435	SUMMER	NONE	P
7-Aug-20	2	1543	1	SW LANTAU	3	ND	OFF	HKCRP	807333	808893	SUMMER	NONE	
17-Aug-20	1	1426	1	W LANTAU	3	179	ON	HKCRP	808413	800863	SUMMER	NONE	P
15-Sep-20	1	1411	1	W LANTAU	2	698	ON	HKCRP	813683	801308	AUTUMN	NONE	S
15-Sep-20	2	1439	2	W LANTAU	2	33	ON	HKCRP	810493	801507	AUTUMN	NONE	S
15-Sep-20	3	1523	5	W LANTAU	2	148	ON	HKCRP	806506	801848	AUTUMN	NONE	S
15-Sep-20	4	1539	5	SW LANTAU	2	ND	OFF	HKCRP	806169	803797	AUTUMN	NONE	
16-Sep-20	1	1241	1	W LANTAU	2	17	ON	HKCRP	815139	804053	AUTUMN	NONE	P
16-Sep-20	2	1311	2	W LANTAU	2	0	ON	HKCRP	813568	802905	AUTUMN	NONE	P
16-Sep-20	3	1337	6	W LANTAU	2	0	ON	HKCRP	812420	801552	AUTUMN	NONE	P
16-Sep-20	4	1431	1	W LANTAU	3	51	ON	HKCRP	809356	799793	AUTUMN	NONE	P
16-Sep-20	5	1445	8	W LANTAU	3	23	ON	HKCRP	808326	800213	AUTUMN	NONE	P
16-Sep-20	6	1522	1	SW LANTAU	2	ND	OFF	HKCRP	806217	802209	AUTUMN	NONE	
16-Sep-20	7	1528	1	SW LANTAU	2	ND	OFF	HKCRP	806249	802972	AUTUMN	NONE	
24-Sep-20	1	1318	1	SW LANTAU	2	ND	OFF	HKCRP	807615	806419	AUTUMN	NONE	
22-Oct-20	1	1322	1	W LANTAU	3	123	ON	HKCRP	813362	801276	AUTUMN	NONE	S
27-Oct-20	1	1435	1	SW LANTAU	3	79	ON	HKCRP	803845	803183	AUTUMN	NONE	S
27-Oct-20	2	1452	6	SW LANTAU	3	411	ON	HKCRP	806318	801703	AUTUMN	NONE	P
27-Oct-20	3	1531	6	SW LANTAU	3	ND	OFF	HKCRP	806303	803622	AUTUMN	NONE	
27-Oct-20	4	1555	2	SW LANTAU	2	ND	OFF	HKCRP	807444	808636	AUTUMN	NONE	
28-Oct-20	1	1349	2	W LANTAU	2	241	ON	HKCRP	813306	801307	AUTUMN	NONE	S
28-Oct-20	2	1455	4	W LANTAU	2	42	ON	HKCRP	807449	800850	AUTUMN	NONE	P
28-Oct-20	3	1514	3	W LANTAU	3	133	ON	HKCRP	805435	800577	AUTUMN	NONE	S
2-Nov-20	3	1252	1	SW LANTAU	2	103	ON	HKCRP	808514	811473	AUTUMN	PURSE-SEINE	P
2-Nov-20	4	1508	1	SW LANTAU	2	10	ON	HKCRP	805978	805446	AUTUMN	NONE	P
3-Nov-20	1	1134	1	W LANTAU	3	65	ON	HKCRP	810453	799795	AUTUMN	NONE	S
3-Nov-20	2	1234	1	W LANTAU	3	146	ON	HKCRP	806464	800631	AUTUMN	NONE	P
3-Nov-20	3	1253	4	W LANTAU	3	112	ON	HKCRP	805400	801031	AUTUMN	NONE	P
3-Nov-20	4	1312	2	SW LANTAU	2	ND	OFF	HKCRP	806195	802373	AUTUMN	NONE	
11-Nov-20	1	1036	2	W LANTAU	2	90	ON	HKCRP	807171	801365	AUTUMN	NONE	S

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
11-Nov-20	2	1042	1	W LANTAU	2	14	ON	HKCRP	806307	801745	AUTUMN	NONE	S
11-Nov-20	3	1048	1	W LANTAU	2	50	ON	HKCRP	806041	801785	AUTUMN	NONE	S
11-Nov-20	4	1112	5	W LANTAU	3	431	ON	HKCRP	807439	800592	AUTUMN	NONE	P
11-Nov-20	5	1149	2	W LANTAU	3	83	ON	HKCRP	810054	799732	AUTUMN	NONE	S
16-Nov-20	1	1030	1	W LANTAU	2	145	ON	HKCRP	815418	802847	AUTUMN	NONE	P
16-Nov-20	2	1052	4	W LANTAU	2	285	ON	HKCRP	813592	802472	AUTUMN	NONE	P
16-Nov-20	3	1141	3	W LANTAU	2	226	ON	HKCRP	811028	800126	AUTUMN	NONE	S
16-Nov-20	4	1215	4	W LANTAU	4	30	ON	HKCRP	808414	800409	AUTUMN	NONE	P
24-Nov-20	1	1121	1	NW LANTAU	2	134	ON	HKCRP	827900	807529	AUTUMN	NONE	P
24-Nov-20	2	1400	2	W LANTAU	2	208	ON	HKCRP	810441	800115	AUTUMN	NONE	P
24-Nov-20	3	1449	7	W LANTAU	2	40	ON	HKCRP	807439	800582	AUTUMN	NONE	P
24-Nov-20	4	1515	10	W LANTAU	2	ND	OFF	HKCRP	806805	801632	AUTUMN	NONE	
24-Nov-20	5	1532	2	SW LANTAU	2	ND	OFF	HKCRP	806304	802817	AUTUMN	NONE	
24-Nov-20	6	1545	1	SW LANTAU	2	ND	OFF	HKCRP	807096	805717	AUTUMN	NONE	
26-Nov-20	2	1504	4	SW LANTAU	2	432	ON	HKCRP	806899	804499	AUTUMN	NONE	P
26-Nov-20	3	1536	1	SW LANTAU	2	ND	OFF	HKCRP	807005	806706	AUTUMN	NONE	
30-Nov-20	1	1125	3	NW LANTAU	3	88	ON	HKCRP	826518	806466	AUTUMN	NONE	P
2-Dec-20	1	1047	5	W LANTAU	3	107	ON	HKCRP	814497	803536	WINTER	NONE	P
2-Dec-20	2	1156	1	W LANTAU	3	68	ON	HKCRP	810440	800496	WINTER	NONE	P
2-Dec-20	3	1230	1	W LANTAU	3	142	ON	HKCRP	808434	801017	WINTER	NONE	P
2-Dec-20	4	1242	1	W LANTAU	3	86	ON	HKCRP	807327	801283	WINTER	NONE	P
11-Dec-20	1	1128	2	W LANTAU	2	71	ON	HKCRP	810663	799930	WINTER	NONE	S
11-Dec-20	2	1151	1	W LANTAU	2	16	ON	HKCRP	810471	801373	WINTER	NONE	P
11-Dec-20	3	1220	3	W LANTAU	2	103	ON	HKCRP	808402	800760	WINTER	NONE	P
11-Dec-20	4	1256	6	W LANTAU	2	123	ON	HKCRP	806429	801570	WINTER	NONE	P
11-Dec-20	5	1329	6	SW LANTAU	2	25	ON	HKCRP	806525	803189	WINTER	NONE	S
14-Dec-20	1	1125	5	NW LANTAU	3	13	ON	HKCRP	827436	806561	WINTER	NONE	P
14-Dec-20	2	1338	3	W LANTAU	3	48	ON	HKCRP	811724	800571	WINTER	NONE	S
14-Dec-20	3	1438	8	W LANTAU	3	142	ON	HKCRP	806462	801549	WINTER	NONE	P
14-Dec-20	4	1501	5	SW LANTAU	3	196	ON	HKCRP	805771	803455	WINTER	NONE	S
4-Jan-21	1	1051	1	W LANTAU	2	168	ON	HKCRP	813591	802761	WINTER	NONE	P
4-Jan-21	2	1108	1	W LANTAU	2	115	ON	HKCRP	812632	800934	WINTER	NONE	S
4-Jan-21	3	1126	1	W LANTAU	2	92	ON	HKCRP	812450	803057	WINTER	NONE	P
4-Jan-21	4	1237	12	W LANTAU	2	5	ON	HKCRP	807474	799901	WINTER	NONE	P

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
4-Jan-21	5	1327	2	W LANTAU	3	259	ON	HKCRP	806440	801745	WINTER	NONE	P
4-Jan-21	6	1359	8	SW LANTAU	2	71	ON	HKCRP	806194	802528	WINTER	NONE	P
4-Jan-21	7	1440	2	SW LANTAU	2	26	ON	HKCRP	804773	804505	WINTER	NONE	P
13-Jan-21	1	1051	2	NW LANTAU	1	7	ON	HKCRP	823891	807501	WINTER	NONE	P
13-Jan-21	2	1106	1	NW LANTAU	1	252	ON	HKCRP	824932	807514	WINTER	NONE	P
27-Jan-21	1	1315	3	W LANTAU	2	333	ON	HKCRP	814497	803639	WINTER	NONE	P
27-Jan-21	2	1441	3	W LANTAU	2	3	ON	HKCRP	808778	800936	WINTER	NONE	S
27-Jan-21	3	1517	5	W LANTAU	2	9	ON	HKCRP	806672	801704	WINTER	NONE	S
1-Feb-21	1	1027	2	W LANTAU	2	24	ON	HKCRP	816745	803788	WINTER	NONE	P
1-Feb-21	2	1108	6	W LANTAU	1	562	ON	HKCRP	813593	801978	WINTER	NONE	P
1-Feb-21	3	1125	5	W LANTAU	1	552	ON	HKCRP	812632	800955	WINTER	NONE	S
1-Feb-21	4	1136	1	W LANTAU	1	577	ON	HKCRP	812475	801532	WINTER	NONE	P
1-Feb-21	5	1202	3	W LANTAU	1	339	ON	HKCRP	811458	800715	WINTER	NONE	P
1-Feb-21	6	1221	7	W LANTAU	1	247	ON	HKCRP	810472	801074	WINTER	NONE	P
4-Feb-21	1	1403	3	SW LANTAU	3	62	ON	HKCRP	807700	808419	WINTER	NONE	S
19-Feb-21	1	1022	2	W LANTAU	2	170	ON	HKCRP	816889	803799	WINTER	GILLNET	P
19-Feb-21	2	1050	4	W LANTAU	2	196	ON	HKCRP	814689	802062	WINTER	GILLNET	S
19-Feb-21	3	1118	5	W LANTAU	2	59	ON	HKCRP	813558	802544	WINTER	NONE	P
19-Feb-21	4	1136	2	W LANTAU	2	514	ON	HKCRP	813549	801864	WINTER	NONE	P
19-Feb-21	5	1229	2	W LANTAU	1	1344	ON	HKCRP	809398	801051	WINTER	NONE	P
19-Feb-21	6	1234	1	W LANTAU	2	434	ON	HKCRP	809443	800597	WINTER	NONE	P
19-Feb-21	7	1246	2	W LANTAU	2	473	ON	HKCRP	808914	799513	WINTER	NONE	S
19-Feb-21	8	1307	1	W LANTAU	2	58	ON	HKCRP	808413	800708	WINTER	NONE	P
19-Feb-21	9	1326	6	W LANTAU	2	541	ON	HKCRP	806662	801457	WINTER	NONE	S
23-Feb-21	1	1412	5	W LANTAU	2	564	ON	HKCRP	810493	801507	WINTER	NONE	S
23-Feb-21	2	1433	1	W LANTAU	2	37	ON	HKCRP	809443	800453	WINTER	NONE	P
23-Feb-21	3	1445	4	W LANTAU	3	75	ON	HKCRP	808811	800864	WINTER	NONE	S
23-Feb-21	4	1512	1	W LANTAU	2	174	ON	HKCRP	806251	802002	WINTER	NONE	S
1-Mar-21	6	1531	1	SW LANTAU	2	ND	OFF	HKCRP	807657	807347	SPRING	NONE	
5-Mar-21	1	1050	2	W LANTAU	3	64	ON	HKCRP	813535	803132	SPRING	NONE	S
5-Mar-21	2	1120	1	W LANTAU	2	211	ON	HKCRP	812454	801006	SPRING	NONE	P
5-Mar-21	3	1142	1	W LANTAU	2	8	ON	HKCRP	811478	801921	SPRING	NONE	P
5-Mar-21	4	1156	1	W LANTAU	2	350	ON	HKCRP	811149	800240	SPRING	NONE	S
5-Mar-21	5	1208	1	W LANTAU	2	103	ON	HKCRP	810451	800682	SPRING	NONE	P

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
5-Mar-21	6	1230	2	W LANTAU	2	54	ON	HKCRP	809444	800195	SPRING	NONE	P
5-Mar-21	8	1339	1	W LANTAU	2	63	ON	HKCRP	806440	801755	SPRING	NONE	S
9-Mar-21	1	1433	7	W LANTAU	2	284	ON	HKCRP	806305	802724	SPRING	NONE	P
9-Mar-21	2	1516	3	SW LANTAU	2	0	ON	HKCRP	806392	803333	SPRING	NONE	S
19-Mar-21	2	1126	1	SE LANTAU	2	281	ON	HKCRP	809261	815268	SPRING	PURSE-SEINE	S

Appendix III. HKCRP-AFCD Finless Porpoise Sighting Database (April 2020 - March 2021)

(Note: P = sightings made on primary lines; S = sightings made on secondary lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	NORTHING	EASTING	SEASON	P/S
1-Apr-20	1	1442	1	SW LANTAU	2	27	ON	800723	808561	SPRING	S
1-Apr-20	2	1526	2	SW LANTAU	1	295	ON	807443	809388	SPRING	S
1-Apr-20	3	1535	2	SW LANTAU	1	417	ON	807551	811152	SPRING	S
1-Apr-20	4	1542	4	SE LANTAU	1	ND	OFF	807626	812503	SPRING	
1-Apr-20	5	1550	2	SE LANTAU	1	ND	OFF	807723	814173	SPRING	
9-Apr-20	1	1205	2	SE LANTAU	3	130	ON	801468	813659	SPRING	S
9-Apr-20	2	1317	1	SW LANTAU	3	281	ON	806853	811460	SPRING	S
17-Apr-20	1	1348	3	SE LANTAU	2	109	ON	805622	812438	SPRING	P
20-Apr-20	1	1507	3	SE LANTAU	2	124	ON	807204	813461	SPRING	P
20-Apr-20	2	1516	7	SE LANTAU	1	195	ON	806384	813511	SPRING	P
20-Apr-20	3	1530	4	SE LANTAU	1	8	ON	804679	813457	SPRING	P
21-Apr-20	5	1529	2	SW LANTAU	1	ND	OFF	807403	807120	SPRING	
21-Apr-20	6	1534	4	SW LANTAU	2	ND	OFF	807445	808605	SPRING	
21-Apr-20	7	1538	2	SW LANTAU	2	ND	OFF	807476	809461	SPRING	
21-Apr-20	8	1544	8	SW LANTAU	2	ND	OFF	807651	811131	SPRING	
27-Apr-20	3	1344	1	SW LANTAU	3	76	ON	806710	810583	SPRING	P
27-Apr-20	4	1401	3	SW LANTAU	3	100	ON	803455	810485	SPRING	P
27-Apr-20	5	1624	1	LAMMA	3	ND	OFF	806120	821049	SPRING	
4-May-20	1	1041	5	LAMMA	1	387	ON	804674	833001	SPRING	S
11-May-20	1	1459	1	PO TOI	2	68	ON	801485	856345	SPRING	P
13-May-20	5	1442	2	SW LANTAU	4	41	ON	801742	808460	SPRING	P
28-May-20	1	950	3	LAMMA	2	48	ON	808797	824599	SPRING	S
3-Jun-20	1	1233	3	SE LANTAU	3	14	ON	802101	812412	SUMMER	S
29-Jun-20	1	1020	3	PO TOI	2	23	ON	801589	850228	SUMMER	P
29-Jun-20	2	1506	2	PO TOI	0	316	ON	805426	855577	SUMMER	P
29-Jun-20	3	1518	1	PO TOI	0	75	ON	805419	858155	SUMMER	P
14-Jul-20	1	1033	1	SAI KUNG	0	183	ON	817447	859973	SUMMER	P
14-Jul-20	2	1101	1	SAI KUNG	0	80	ON	817558	866547	SUMMER	P
17-Jul-20	1	1516	6	NINEPINS	2	ND	OFF	810879	865941	SUMMER	
17-Jul-20	2	1520	3	NINEPINS	2	ND	OFF	811205	861827	SUMMER	
28-Jul-20	1	1455	3	PO TOI	2	169	ON	807490	858307	SUMMER	P
28-Jul-20	2	1605	1	PO TOI	2	209	ON	804543	846460	SUMMER	P
24-Aug-20	1	1006	4	NINEPINS	2	42	ON	808486	846881	SUMMER	P
31-Aug-20	1	1050	1	SAI KUNG	2	666	ON	824658	861167	SUMMER	P
1-Sep-20	3	1552	1	NINEPINS	3	ND	OFF	807544	846675	AUTUMN	
4-Sep-20	1	1007	1	LAMMA	1	50	ON	807441	837673	AUTUMN	P
8-Sep-20	1	1441	2	SW LANTAU	2	112	ON	801155	808500	AUTUMN	P
8-Sep-20	2	1446	12	SW LANTAU	2	63	ON	801520	808522	AUTUMN	P
24-Sep-20	2	1341	2	SW LANTAU	1	ND	OFF	807633	808595	AUTUMN	
24-Sep-20	3	1347	8	SW LANTAU	1	ND	OFF	807950	811111	AUTUMN	
24-Sep-20	4	1538	5	SE LANTAU	1	140	ON	804653	816417	AUTUMN	P
21-Oct-20	1	1308	1	SW LANTAU	3	6	ON	807109	810563	AUTUMN	P
2-Nov-20	1	1035	1	SE LANTAU	2	221	ON	801484	818002	AUTUMN	S
2-Nov-20	2	1206	4	SE LANTAU	2	117	ON	802564	813464	AUTUMN	P
12-Nov-20	1	1154	1	SE LANTAU	2	80	ON	801954	814536	AUTUMN	P
19-Nov-20	1	1116	1	PO TOI	2	23	ON	801457	860254	AUTUMN	P
19-Nov-20	2	1241	3	PO TOI	1	6	ON	803462	860551	AUTUMN	P
26-Nov-20	1	1338	1	SW LANTAU	2	63	ON	802338	809586	AUTUMN	P
11-Dec-20	6	1502	4	SW LANTAU	2	112	ON	802098	807419	WINTER	P
5-Jan-21	1	1056	1	LAMMA	2	113	ON	804585	832558	WINTER	S
5-Jan-21	2	1211	2	LAMMA	2	61	ON	802471	830742	WINTER	P
6-Jan-21	1	1307	4	SW LANTAU	2	10	ON	803896	811496	WINTER	P
14-Jan-21	1	1213	1	SE LANTAU	2	123	ON	801920	814516	WINTER	P
14-Jan-21	2	1222	2	SE LANTAU	2	93	ON	801357	813690	WINTER	S
14-Jan-21	3	1238	4	SE LANTAU	2	18	ON	803153	812341	WINTER	P
14-Jan-21	4	1344	3	SW LANTAU	2	4	ON	802104	810514	WINTER	P
14-Jan-21	5	1353	1	SW LANTAU	2	134	ON	801074	810553	WINTER	P
14-Jan-21	6	1553	1	SW LANTAU	2	ND	OFF	805067	813540	WINTER	
15-Jan-21	1	1432	1	PO TOI	2	12	ON	804504	853051	WINTER	P

Appendix III. (cont'd)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	NORTHING	EASTING	SEASON	P/S
1-Feb-21	7	1515	1	SW LANTAU	2	56	ON	801319	809574	WINTER	P
19-Feb-21	10	1533	1	SW LANTAU	2	95	ON	802452	807543	WINTER	S
22-Feb-21	1	1205	1	LAMMA	1	81	ON	804441	833558	WINTER	P
22-Feb-21	2	1552	2	LAMMA	2	167	ON	807580	823484	WINTER	S
1-Mar-21	1	1225	1	SE LANTAU	3	73	ON	805133	813458	SPRING	P
1-Mar-21	2	1232	2	SE LANTAU	2	33	ON	805986	813418	SPRING	P
1-Mar-21	3	1247	2	SE LANTAU	1	265	ON	809064	813495	SPRING	P
1-Mar-21	4	1312	1	SW LANTAU	2	45	ON	807196	811491	SPRING	P
1-Mar-21	5	1320	1	SW LANTAU	2	22	ON	805734	811520	SPRING	P
1-Mar-21	7	1549	2	SW LANTAU	2	ND	OFF	807749	811802	SPRING	
5-Mar-21	7	1320	1	W LANTAU	2	39	ON	806476	800477	SPRING	S
19-Mar-21	1	1021	2	SE LANTAU	3	148	ON	804772	818459	SPRING	P
19-Mar-21	3	1201	1	SE LANTAU	3	195	ON	805043	814427	SPRING	P
19-Mar-21	4	1402	9	SW LANTAU	2	107	ON	802319	807574	SPRING	S
19-Mar-21	5	1511	2	SW LANTAU	3	177	ON	801657	806531	SPRING	P
24-Mar-21	1	1148	2	LAMMA	2	40	ON	802460	829473	SPRING	P
24-Mar-21	2	1400	1	SE LANTAU	2	41	ON	805319	815480	SPRING	P
24-Mar-21	3	1505	13	SE LANTAU	2	146	ON	801490	813473	SPRING	P
24-Mar-21	4	1524	7	SE LANTAU	2	ND	OFF	801447	812638	SPRING	
24-Mar-21	5	1531	3	SW LANTAU	1	13	ON	801803	811503	SPRING	P
24-Mar-21	6	1534	1	SW LANTAU	1	108	ON	802357	811484	SPRING	P
24-Mar-21	7	1539	2	SW LANTAU	1	105	ON	803165	811506	SPRING	P
24-Mar-21	8	1549	2	SW LANTAU	1	215	ON	805579	811489	SPRING	P
24-Mar-21	9	1601	3	SW LANTAU	1	ND	OFF	808203	811792	SPRING	
24-Mar-21	10	1611	1	SE LANTAU	1	ND	OFF	808077	814483	SPRING	
29-Mar-21	1	933	3	LAMMA	1	87	ON	808427	835343	SPRING	P

Appendix IV. Individual dolphins identified during AFCD surveys (April 2020 to March 2021)

(***in bold & italics: new individuals***)

DOLPHIN ID	DATE	STG#	AREA
CH12	23/06/20	3	WL
	24/11/20	3	WL
	24/11/20	4	WL
	01/02/21	2	WL
CH38	17/06/20	7	SWL
	06/08/20	1	SWL
	16/09/20	5	WL
	03/11/20	3	WL
	11/11/20	4	WL
	24/11/20	4	WL
	04/01/21	4	WL
	04/01/21	6	WL
	04/01/21	7	SWL
CH84	29/07/20	2	WL
CH108	17/06/20	2	WL
	16/11/20	1	WL
	11/12/20	3	WL
	11/12/20	4	WL
CH113	21/04/20	2	WL
CH141	06/07/20	4	SWL
	06/07/20	5	SWL
	27/10/20	3	SWL
	28/10/20	3	WL
	24/11/20	4	WL
CH196	19/02/21	7	WL
CH206	02/12/20	2	WL
	02/12/20	3	WL
	02/12/20	4	WL
CH237	29/07/20	2	WL
CH239	06/07/20	6	SWL
CH240	21/04/20	2	WL
NL33	06/07/20	1	SWL
	20/07/20	4	WL
	14/12/20	1	NWL
NL98	08/07/20	2	SWL
NL120	23/06/20	3	WL
	23/06/20	10	SWL
	08/07/20	2	SWL
NL123	23/06/20	3	WL
	23/06/20	10	SWL
	08/07/20	2	SWL
	14/12/20	1	NWL
NL136	27/04/20	1	WL
	28/04/20	1	WL
NL182	20/07/20	4	WL
	14/12/20	1	NWL
NL202	24/11/20	1	NWL
NL206	16/09/20	5	WL
	24/11/20	2	WL
	11/12/20	1	WL
	23/02/21	1	WL
NL259	11/12/20	3	WL
	11/12/20	4	WL
	13/01/21	2	NWL
NL261	30/11/20	1	NWL
	14/12/20	1	NWL
NL269	06/07/20	6	SWL
	27/01/21	3	WL
	19/02/21	9	WL
NL281	29/07/20	2	WL
NL293	21/04/20	1	WL
	27/04/20	1	WL

DOLPHIN ID	DATE	STG#	AREA
NL301	19/02/21	7	WL
NL306	22/06/20	3	SWL
	02/11/20	3	SWL
	01/03/21	6	SWL
	19/03/21	2	SEL
NL311	06/07/20	3	SWL
	01/02/21	1	WL
NL321	22/06/20	1	SWL
	30/11/20	1	NWL
NL322	***22/06/20***	***1***	***SWL***
NL328	29/07/20	1	WL
NL330	17/06/20	4	SWL
NL331	16/09/20	7	SWL
	27/10/20	4	SWL
	26/11/20	3	SWL
	04/01/21	3	WL
NL332	23/06/20	4	SWL
	23/06/20	6	SWL
	27/01/21	1	WL
SL40	13/05/20	2	WL
	02/06/20	1	SWL
	17/06/20	4	SWL
	17/06/20	6	SWL
	23/06/20	10	SWL
	06/08/20	2	SWL
	15/09/20	4	SWL
	11/11/20	1	WL
	11/11/20	4	WL
	24/11/20	4	WL
	04/01/21	4	WL
	27/01/21	3	WL
SL42	16/09/20	3	WL
SL44	13/05/20	1	WL
	13/05/20	2	WL
	17/06/20	5	SWL
	06/08/20	1	SWL
	07/08/20	1	SWL
	15/09/20	3	WL
	16/11/20	2	WL
	04/01/21	4	WL
	04/01/21	6	WL
	04/01/21	7	SWL
	19/02/21	2	WL
	23/02/21	1	WL
SL58	19/02/21	2	WL
SL59	22/06/20	1	SWL
	05/03/21	1	WL
SL60	13/05/20	3	WL
	10/06/20	3	WL
	17/06/20	7	SWL
	22/06/20	1	SWL
	23/06/20	10	SWL
	26/11/20	2	SWL
	11/12/20	4	WL
	11/12/20	5	SWL
	14/12/20	4	SWL
	04/01/21	6	SWL
	23/02/21	4	WL
	05/03/21	8	WL
	09/03/21	1	WL
SL67	17/08/20	1	WL
SL68	23/06/20	4	SWL

DOLPHIN ID	DATE	STG#	AREA
WL05	23/06/20	3	WL
	23/02/21	1	WL
WL21	10/06/20	2	WL
WL28	03/06/20	2	SWL
	13/01/21	1	NWL
WL29	06/08/20	2	SWL
	28/10/20	2	WL
WL42	17/06/20	7	SWL
	22/06/20	1	SWL
	16/09/20	5	WL
	24/11/20	4	WL
	14/12/20	3	WL
	04/01/21	4	WL
	04/01/21	6	SWL
	23/02/21	3	WL
WL46	23/06/20	1	WL
WL61	17/06/20	5	SWL
	16/09/20	5	WL
	27/10/20	2	SWL
	28/10/20	3	WL
	19/02/21	9	WL
WL66	23/06/20	1	WL
	20/07/20	2	WL
WL68	28/10/20	3	WL
	14/12/20	3	WL
	01/02/21	4	WL
	19/02/21	8	WL
WL72	17/06/20	4	SWL
	04/01/21	4	WL
	04/01/21	6	SWL
	23/02/21	3	WL
WL79	10/06/20	5	WL
	19/02/21	1	WL
WL91	13/05/20	1	WL
	02/06/20	1	SWL
	23/06/20	3	WL
	15/09/20	2	WL
	24/11/20	2	WL
	27/01/21	1	WL
WL92	07/08/20	1	SWL
	16/09/20	5	WL
WL94	22/06/20	1	SWL
	14/12/20	4	SWL
WL98	27/10/20	2	SWL
	28/10/20	1	WL
WL100	10/06/20	5	WL
	17/06/20	2	WL
	17/06/20	3	SWL
WL109	28/04/20	2	WL
	06/08/20	2	SWL
	15/09/20	4	SWL
	24/11/20	4	WL
	04/01/21	4	WL
	27/01/21	2	WL
	01/02/21	6	WL
WL114	08/05/20	1	SWL
	06/07/20	4	SWL
	06/07/20	5	SWL
	15/09/20	3	WL
	14/12/20	3	WL
	19/02/21	9	WL
	09/03/21	1	WL
	09/03/21	2	SWL

Appendix IV. (cont'd)

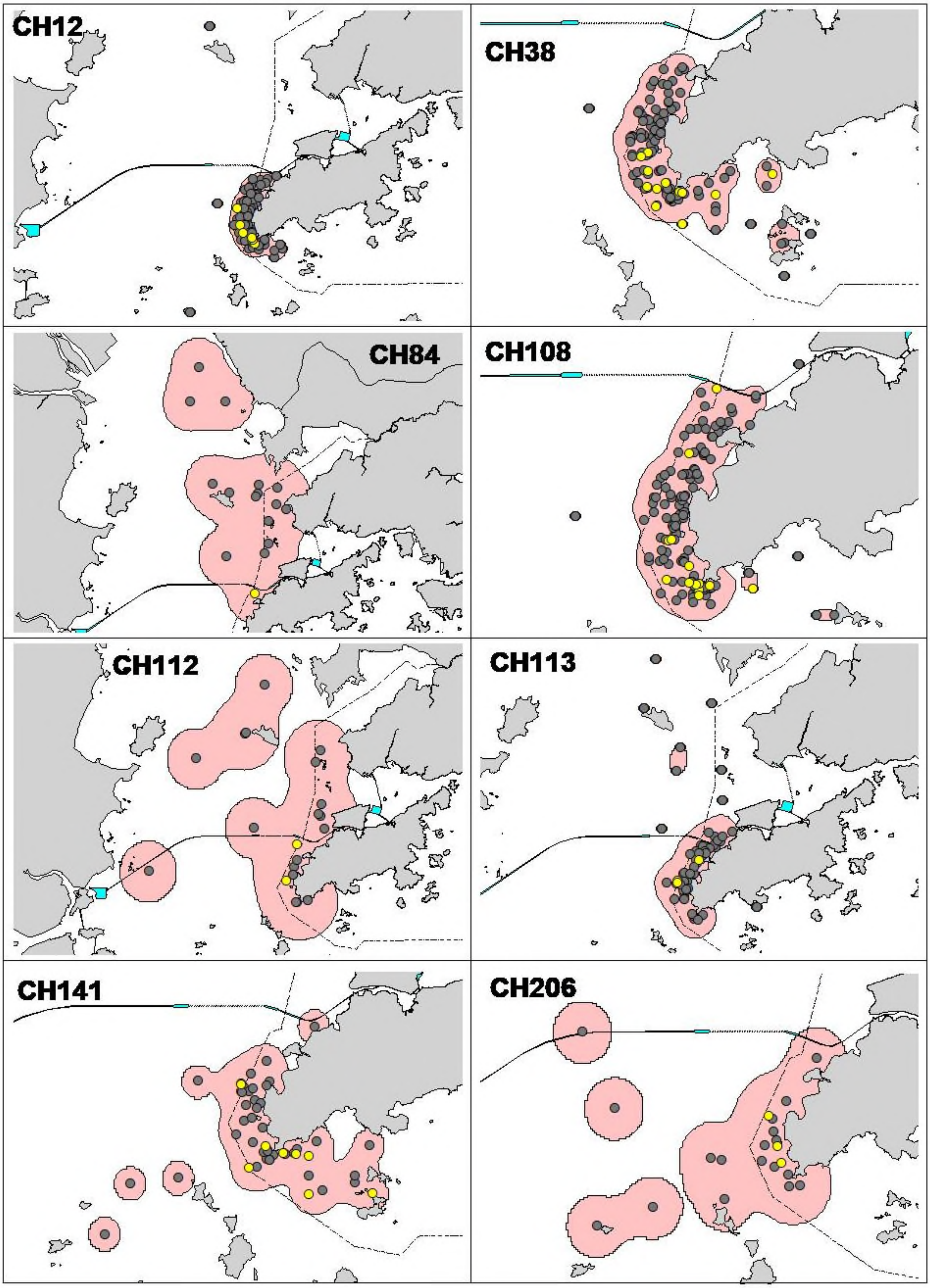
(***in bold & italics: new individuals***)

DOLPHIN ID	DATE	STG#	AREA
WL118	21/04/20	3	WL
	21/04/20	4	WL
	14/12/20	4	SWL
WL123	21/04/20	2	WL
	20/05/20	1	SWL
	23/06/20	10	SWL
	06/07/20	6	SWL
	20/07/20	6	SWL
	03/11/20	3	WL
	26/11/20	2	SWL
	11/12/20	5	SWL
	04/01/21	5	WL
	19/02/21	3	WL
	23/02/21	3	WL
	09/03/21	1	WL
WL128	23/02/21	1	WL
WL129	27/10/20	2	SWL
	28/10/20	2	WL
WL130	28/04/20	1	WL
	13/05/20	2	WL
	02/06/20	1	SWL
	16/09/20	5	WL
	24/11/20	4	WL
	11/12/20	5	SWL
WL131	21/04/20	2	WL
	23/06/20	6	SWL
	23/06/20	10	SWL
	29/07/20	4	WL
	11/11/20	4	WL
	24/11/20	3	WL
	04/01/21	4	WL
	01/02/21	6	WL
WL142	13/05/20	3	WL
	17/06/20	5	SWL
	07/08/20	1	SWL
	15/09/20	3	WL
	16/11/20	4	WL
WL145	03/06/20	2	SWL
	01/02/21	2	WL
WL152	21/04/20	2	WL
	22/06/20	1	SWL
	23/06/20	5	SWL
	23/06/20	10	SWL
	06/08/20	2	SWL
	15/09/20	4	SWL
	03/11/20	3	WL
	26/11/20	2	SWL
	04/01/21	5	WL
	27/01/21	2	WL
	01/02/21	6	WL
WL167	16/09/20	2	WL
WL168	21/04/20	2	WL
	06/05/20	1	SWL
	17/06/20	7	SWL
	23/06/20	8	SWL
	16/11/20	3	WL
	24/11/20	4	WL
	27/01/21	3	WL
	19/02/21	3	WL
WL169	22/06/20	2	SWL
WL171	06/08/20	2	SWL

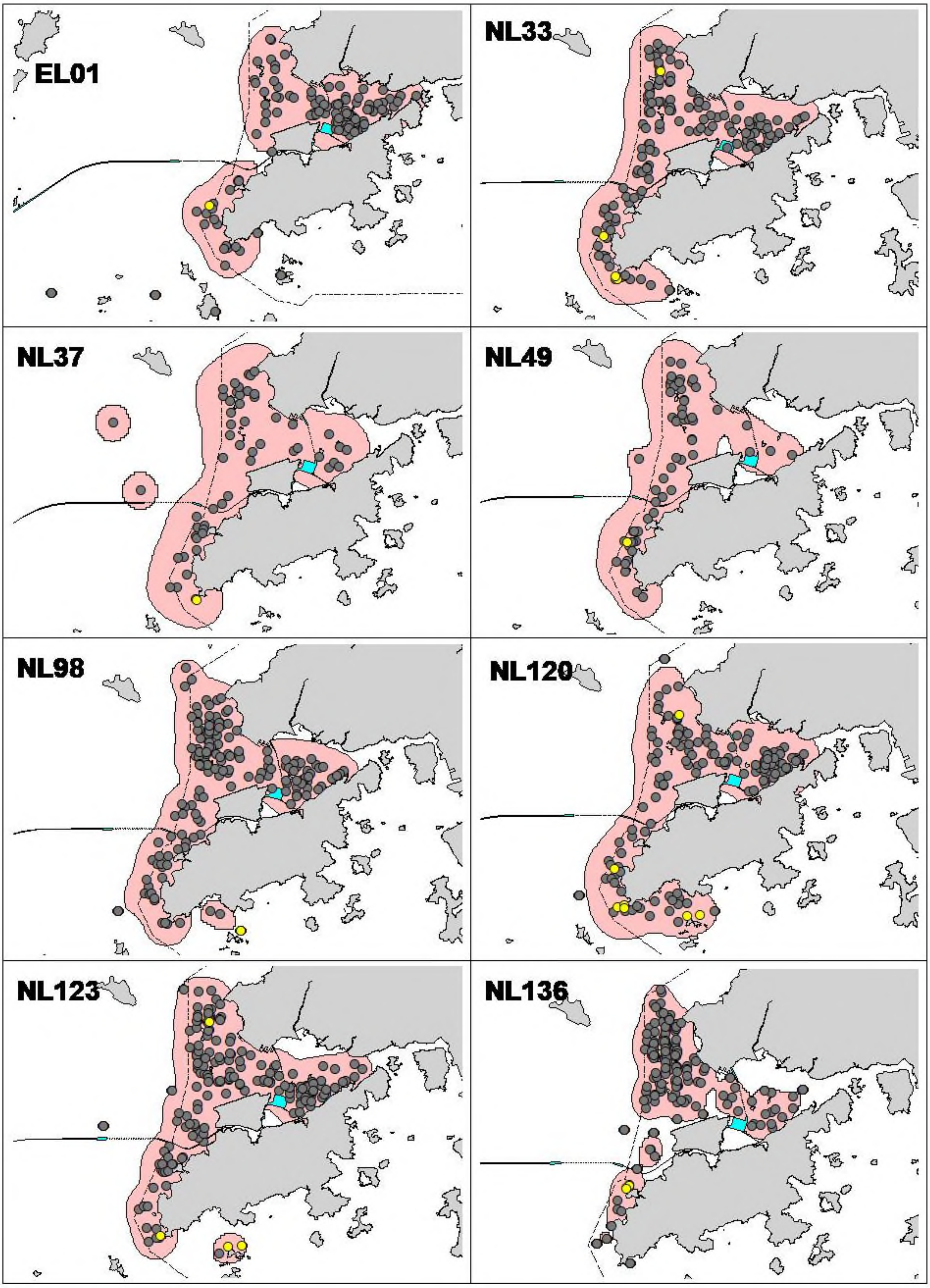
DOLPHIN ID	DATE	STG#	AREA
WL179	16/09/20	5	WL
	11/12/20	4	WL
WL180	21/04/20	4	WL
	23/06/20	10	SWL
	20/07/20	6	SWL
	06/08/20	2	SWL
	07/08/20	2	SWL
	15/09/20	2	WL
	16/09/20	3	WL
	11/11/20	1	WL
	11/11/20	4	WL
	26/11/20	2	SWL
	27/01/21	3	WL
	01/02/21	6	WL
	19/02/21	9	WL
	09/03/21	1	WL
	09/03/21	2	SWL
WL191	04/01/21	2	WL
WL200	16/09/20	3	WL
WL206	02/12/20	1	WL
WL208	19/02/21	2	WL
	05/03/21	6	WL
WL210	23/06/20	4	SWL
WL213	29/07/20	2	WL
WL218	13/05/20	3	WL
WL220	21/04/20	4	WL
	17/06/20	7	SWL
	23/06/20	6	SWL
	06/08/20	2	SWL
	15/09/20	4	SWL
	04/01/21	4	WL
	04/01/21	6	SWL
	01/02/21	6	WL
	04/02/21	1	SWL
	19/02/21	3	WL
	05/03/21	6	WL
	09/03/21	1	WL
	09/03/21	2	SWL
WL221	23/06/20	8	SWL
	02/11/20	4	SWL
	16/11/20	3	WL
	01/02/21	6	WL
	09/03/21	1	WL
WL229	17/06/20	2	WL
	23/06/20	3	WL
WL233	01/02/21	1	WL
WL243	27/10/20	4	SWL
WL246	17/06/20	6	SWL
WL250	28/04/20	1	WL
	06/05/20	2	SWL
	13/05/20	2	WL
	20/05/20	1	SWL
	17/06/20	7	SWL
	23/06/20	8	SWL
	24/09/20	1	SWL
	24/11/20	4	WL
	27/01/21	3	WL
	04/02/21	1	SWL
WL254	23/06/20	3	WL
	11/12/20	5	SWL
	01/02/21	3	WL
WL256	10/06/20	2	WL

DOLPHIN ID	DATE	STG#	AREA
WL268	27/04/20	1	WL
	28/04/20	1	WL
	17/06/20	3	SWL
	16/09/20	2	WL
	11/11/20	5	WL
WL272	02/12/20	1	WL
WL273	20/07/20	4	WL
	19/02/21	1	WL
WL281	23/06/20	5	SWL
	08/07/20	1	SWL
	06/08/20	2	SWL
WL283	02/12/20	1	WL
WL284	06/07/20	6	SWL
	08/07/20	3	SWL
WL286	21/04/20	3	WL
	21/04/20	4	WL
	23/06/20	4	SWL
	14/12/20	4	SWL
WL288	13/01/21	1	NWL
WL290	02/12/20	1	WL
WL291	03/06/20	2	SWL
WL294	27/04/20	2	WL
	17/06/20	7	SWL
	06/07/20	6	SWL
	03/11/20	3	WL
	27/01/21	1	WL
WL296	23/06/20	1	WL
WL299	16/11/20	4	WL
WL300	29/07/20	3	WL
	04/01/21	6	SWL
	09/03/21	1	WL
WL301	05/03/21	1	WL
WL303	06/05/20	2	SWL
	22/06/20	2	SWL
WL304	06/07/20	1	SWL
WL305	11/12/20	5	SWL
	14/12/20	4	SWL
WL307	23/06/20	1	WL
WL309	***21/04/20***	***2***	***WL***
WL311	***28/10/20***	***2***	***WL***
WL312	***29/07/20***	***3***	***WL***
	16/09/20	***3***	***WL***

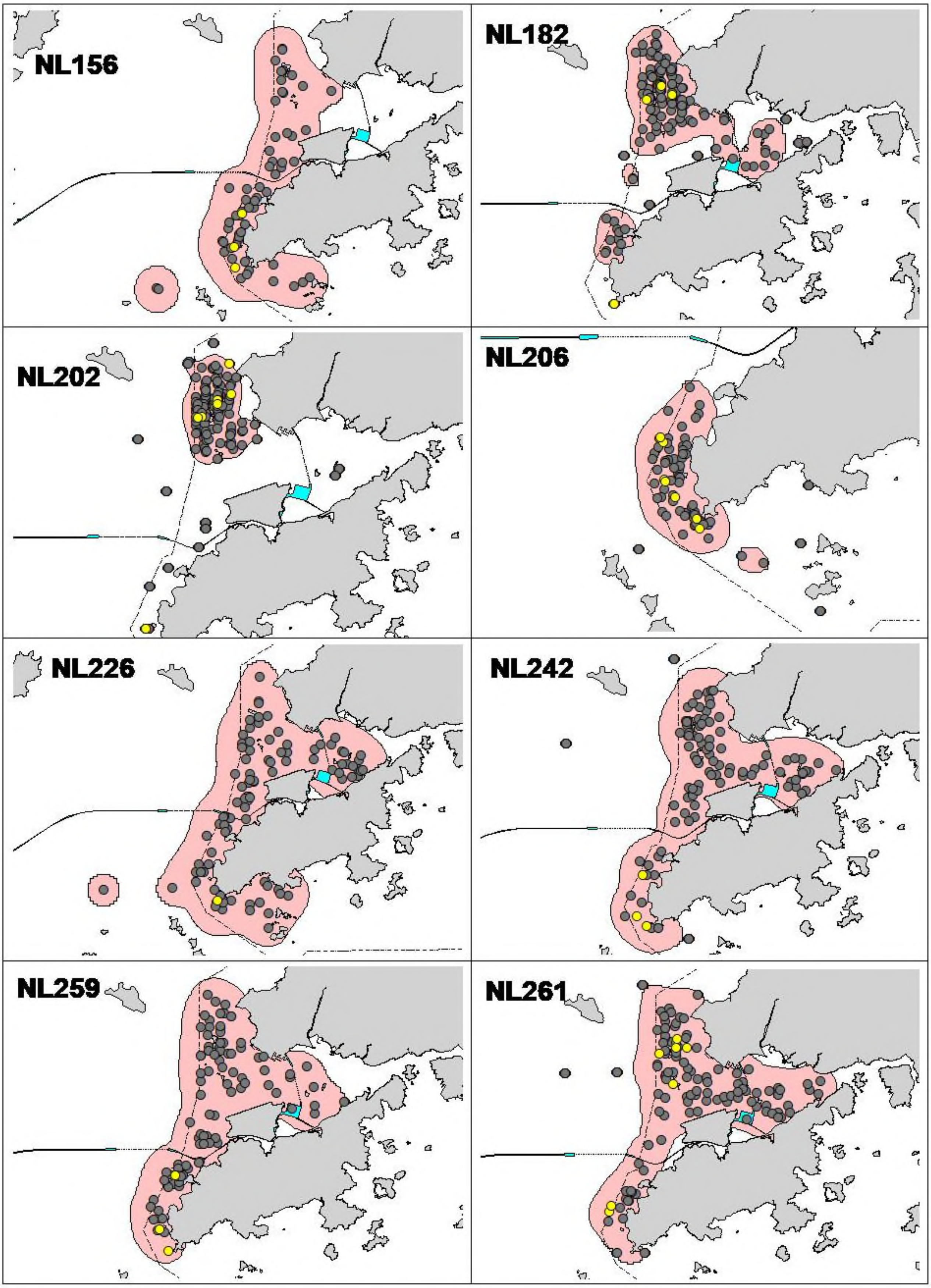
Appendix V. Ranging patterns (95% kernel ranges) of 111 individual dolphins with 10+ re-sightings that were sighted during 2020 (note: yellow dots indicates sightings made in 2020)



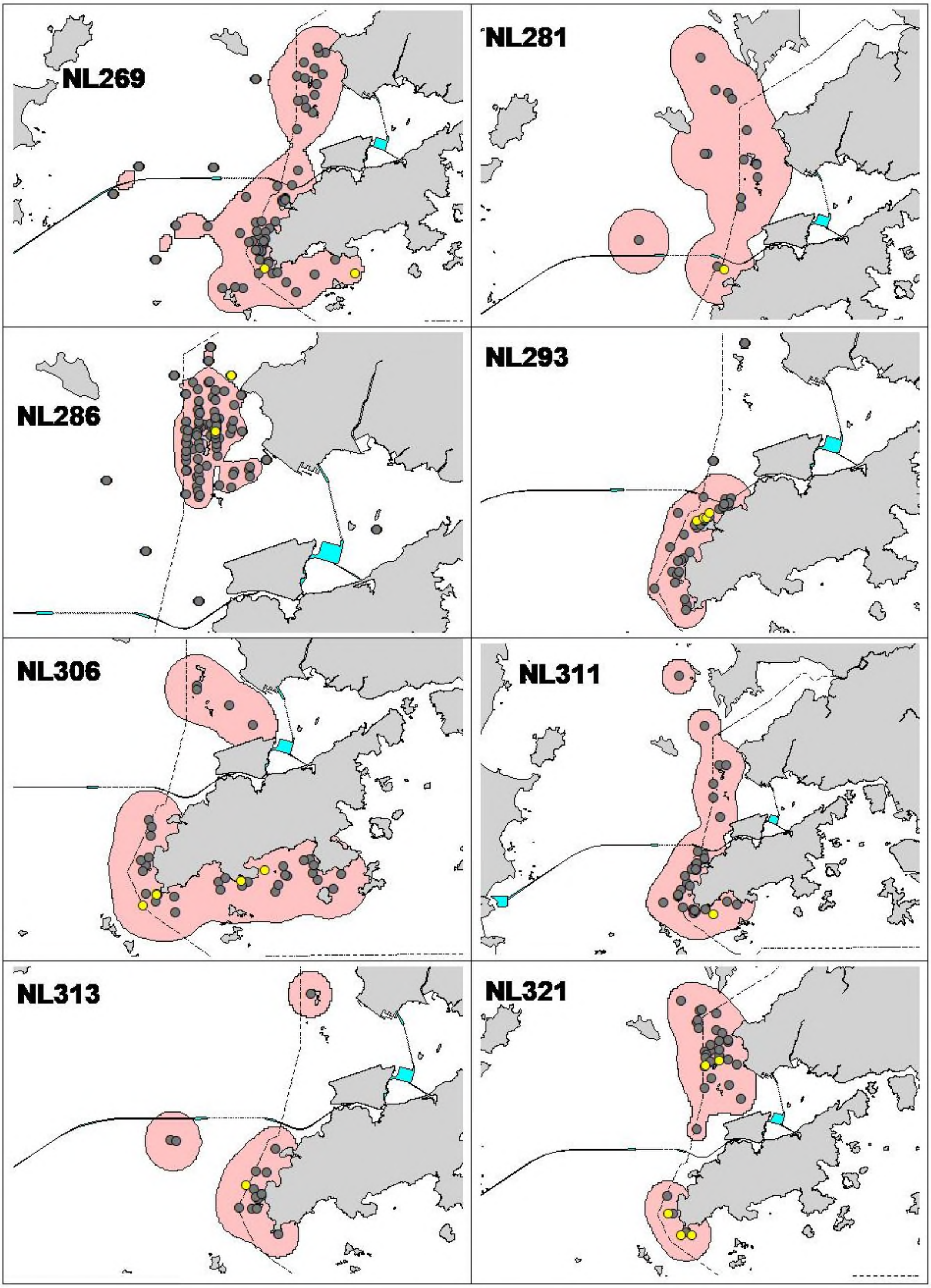
Appendix V. (cont'd).



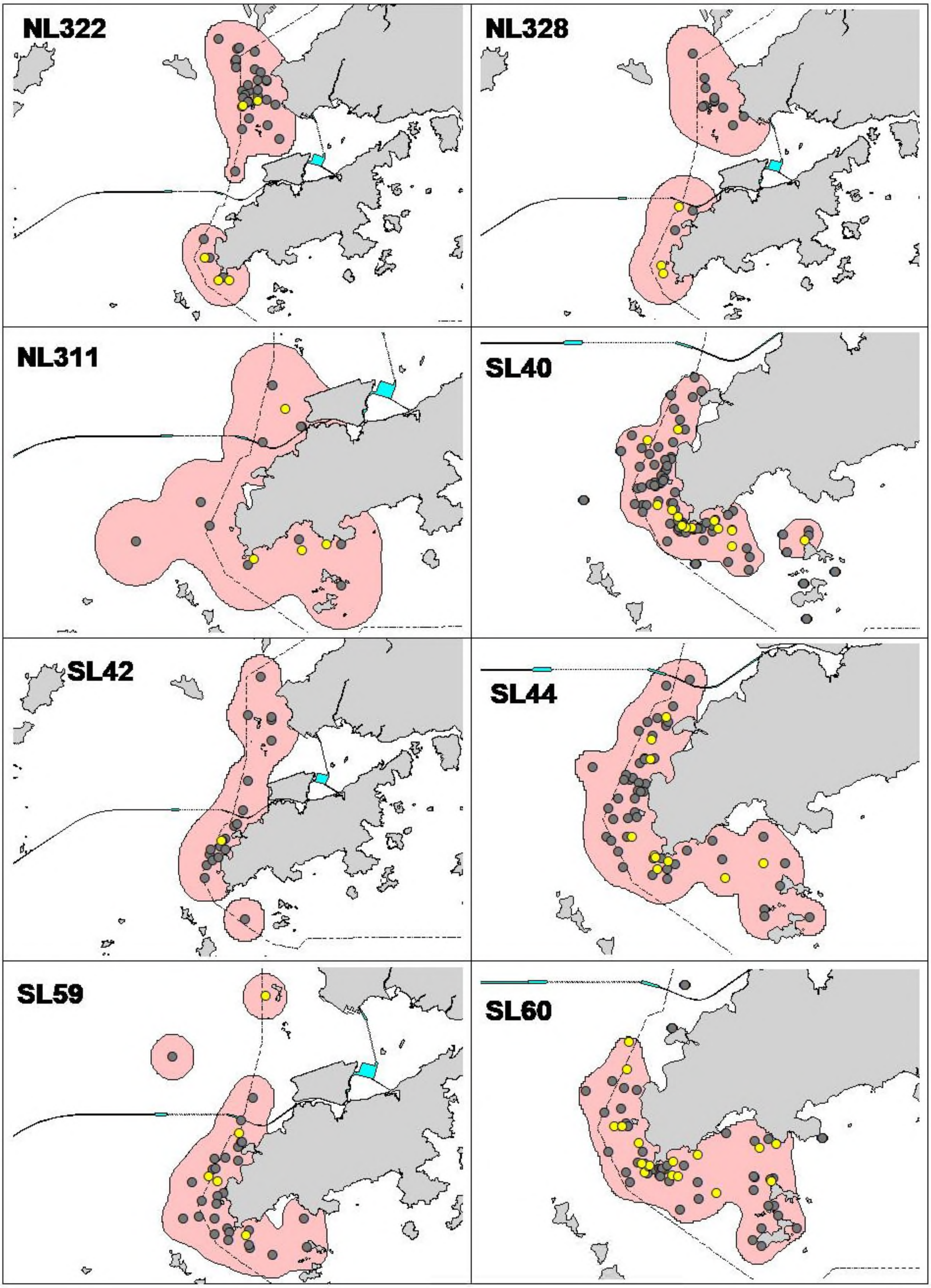
Appendix V. (cont'd).



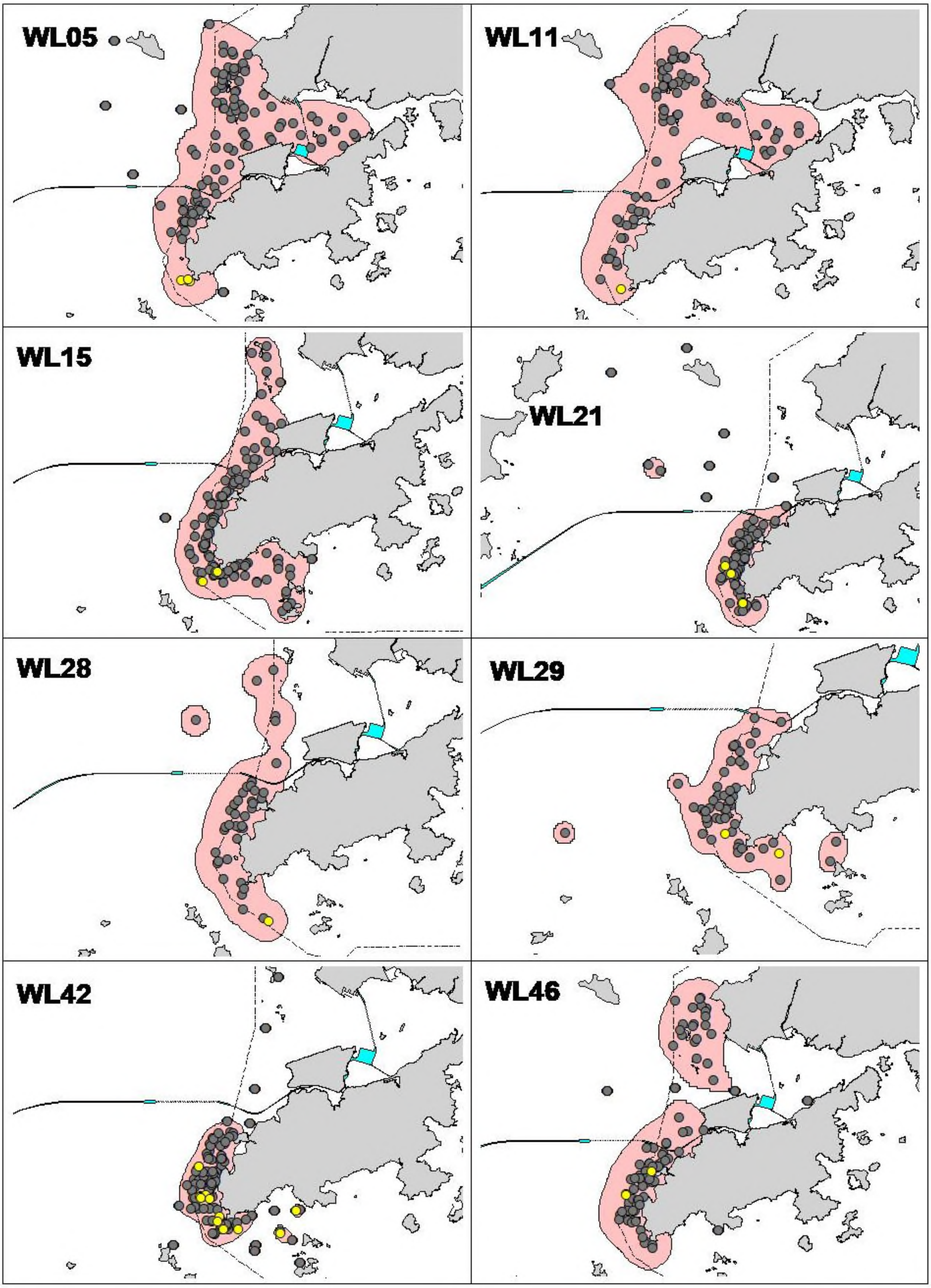
Appendix V. (cont'd).



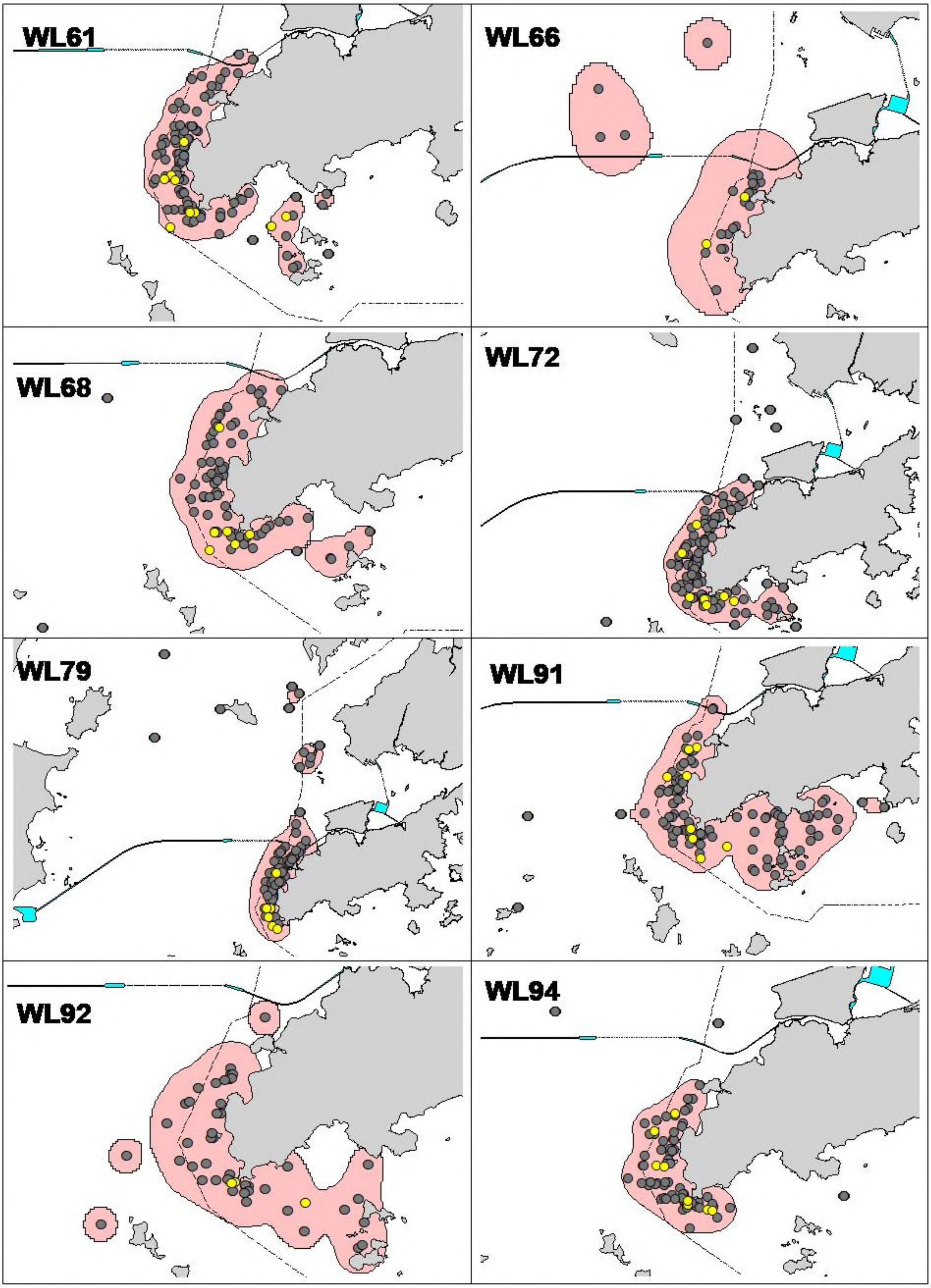
Appendix V. (cont'd).



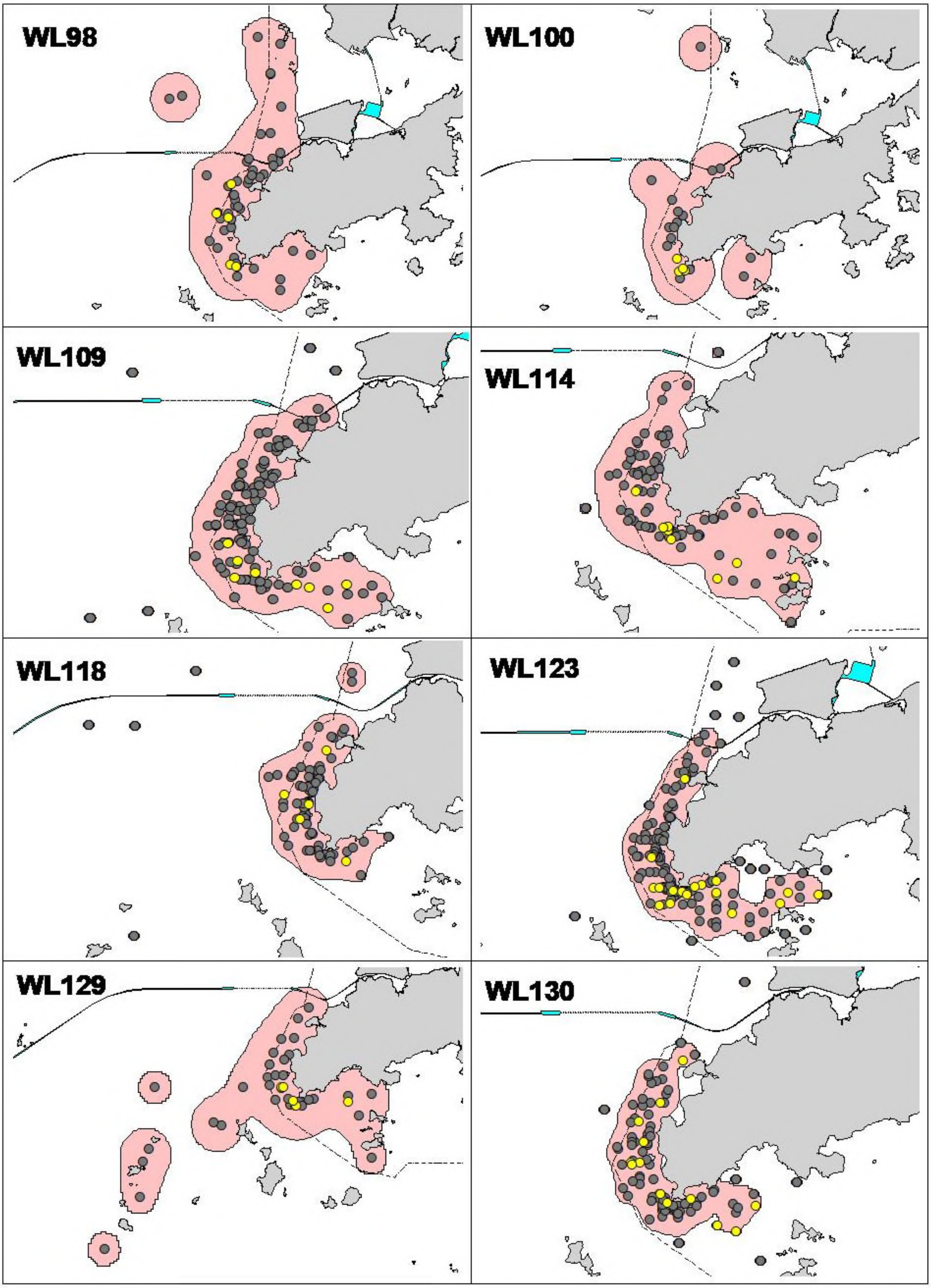
Appendix V. (cont'd).



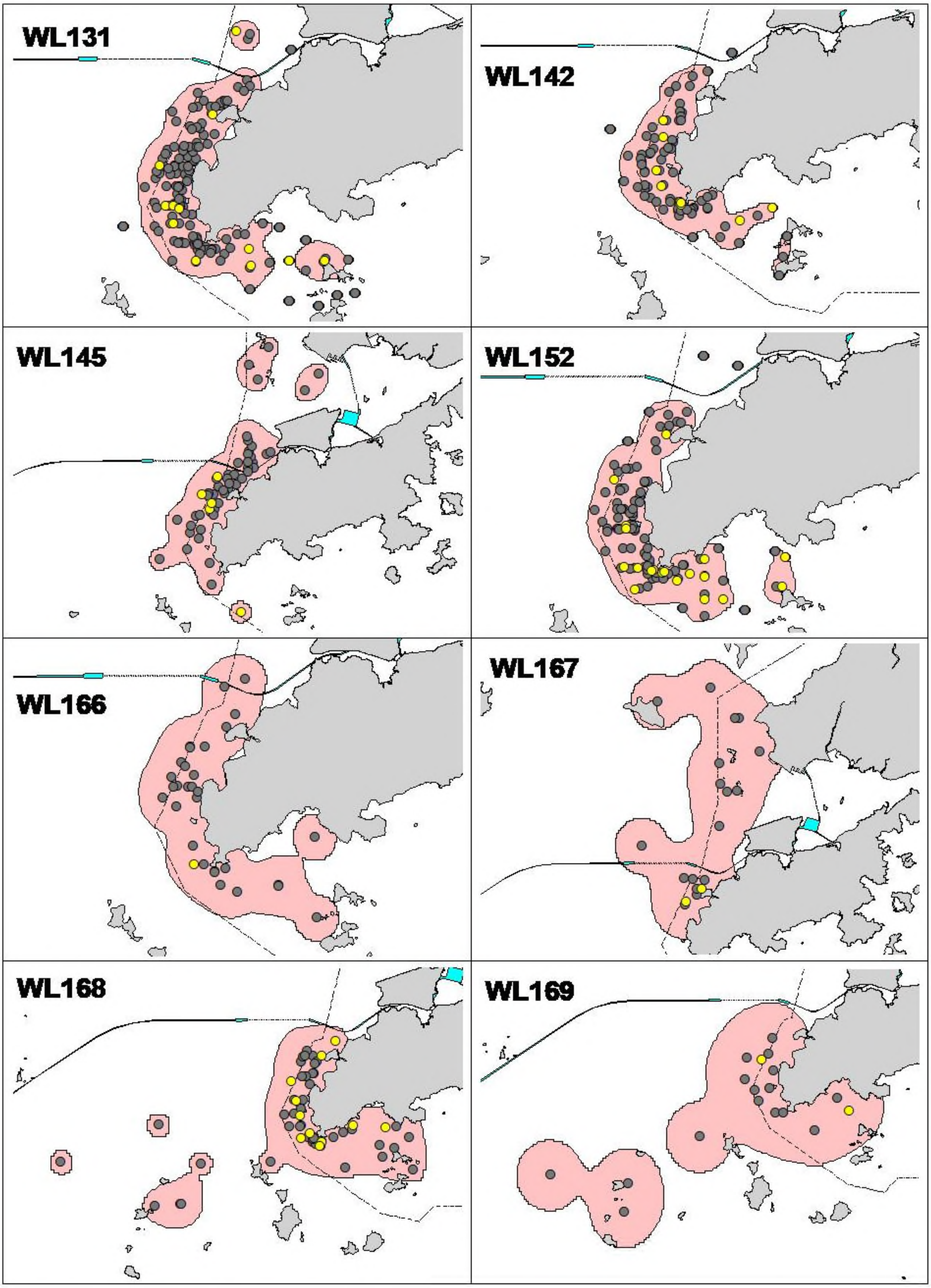
Appendix V. (cont'd).



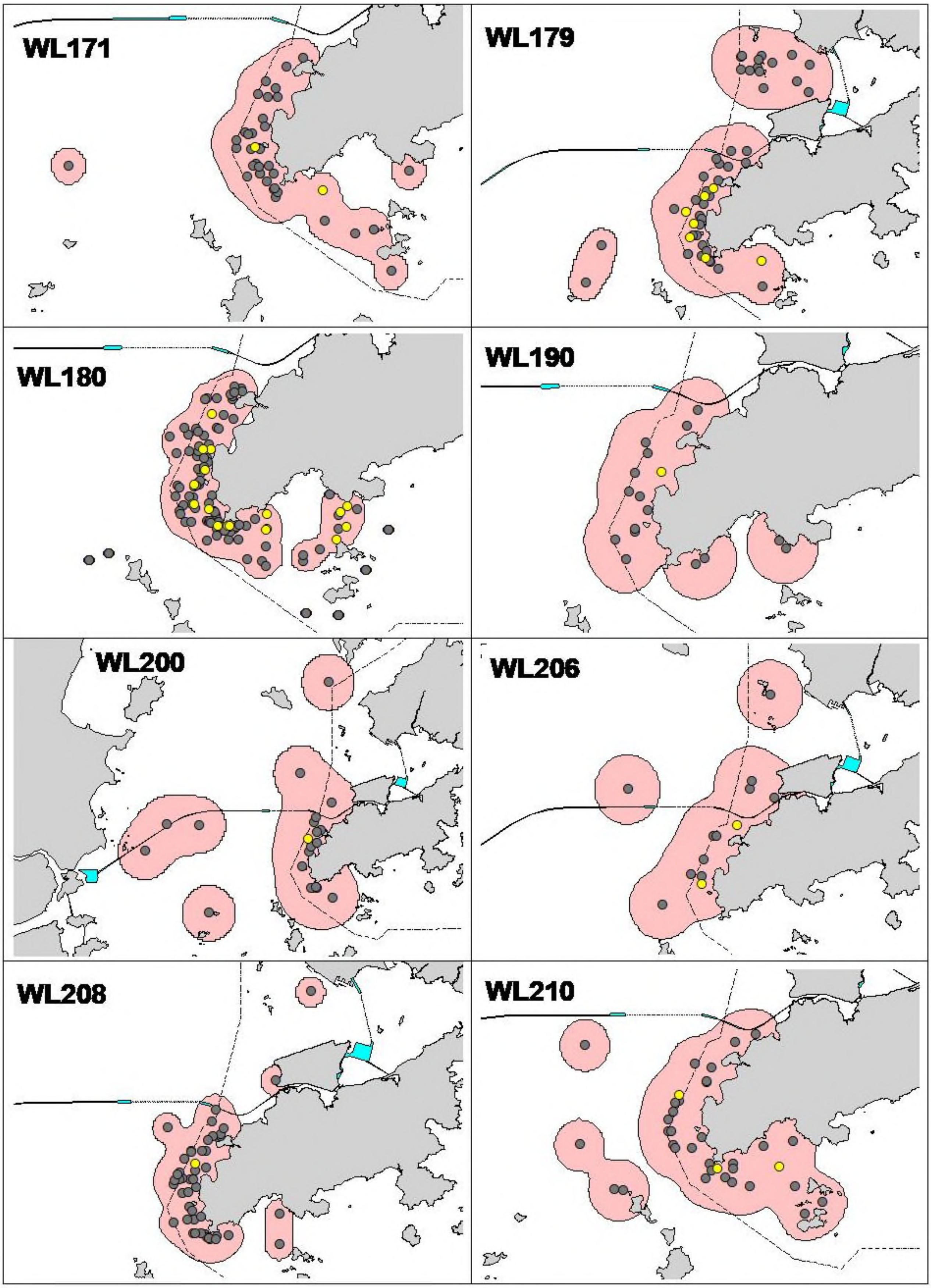
Appendix V. (cont'd).



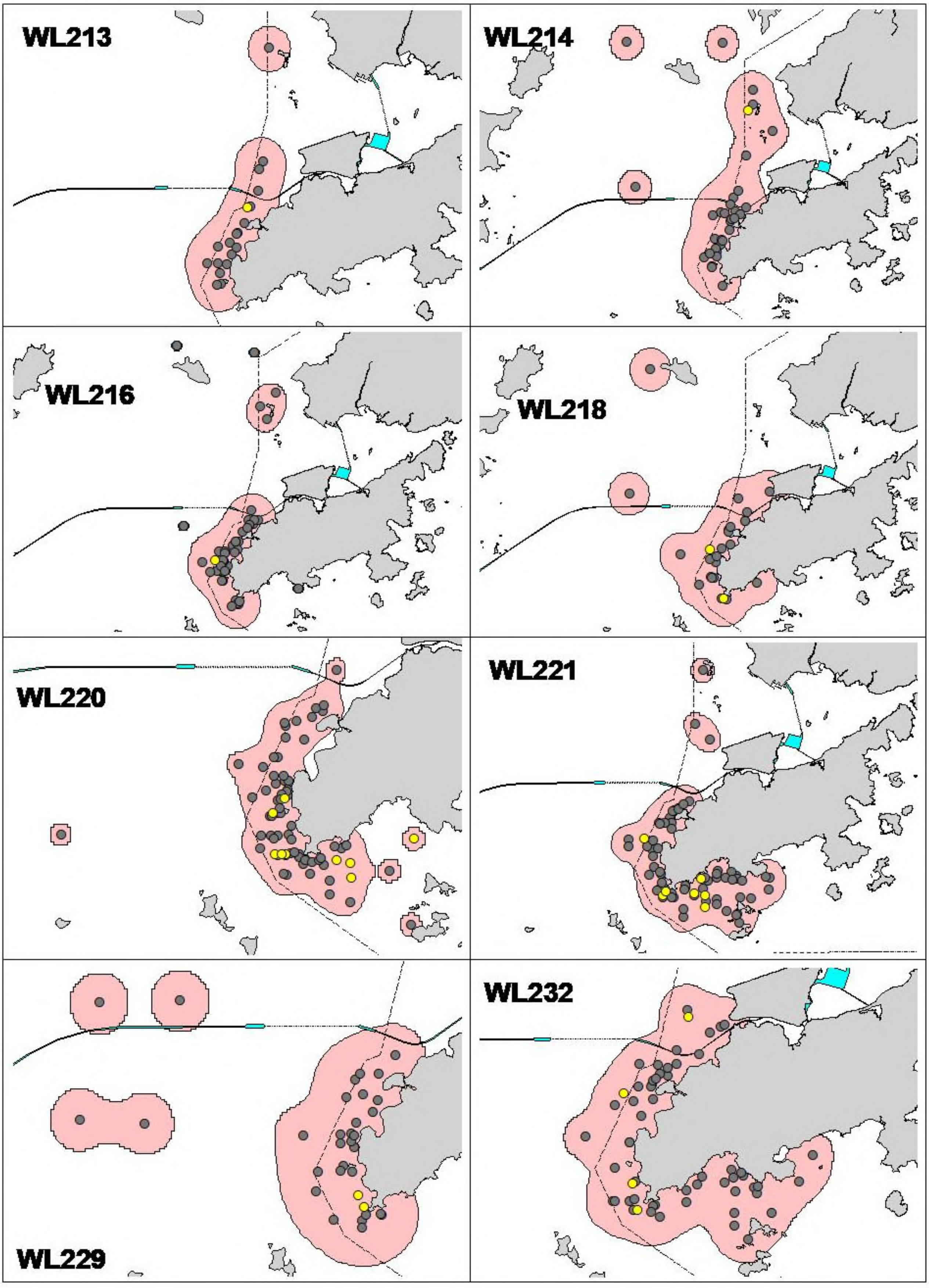
Appendix V. (cont'd).



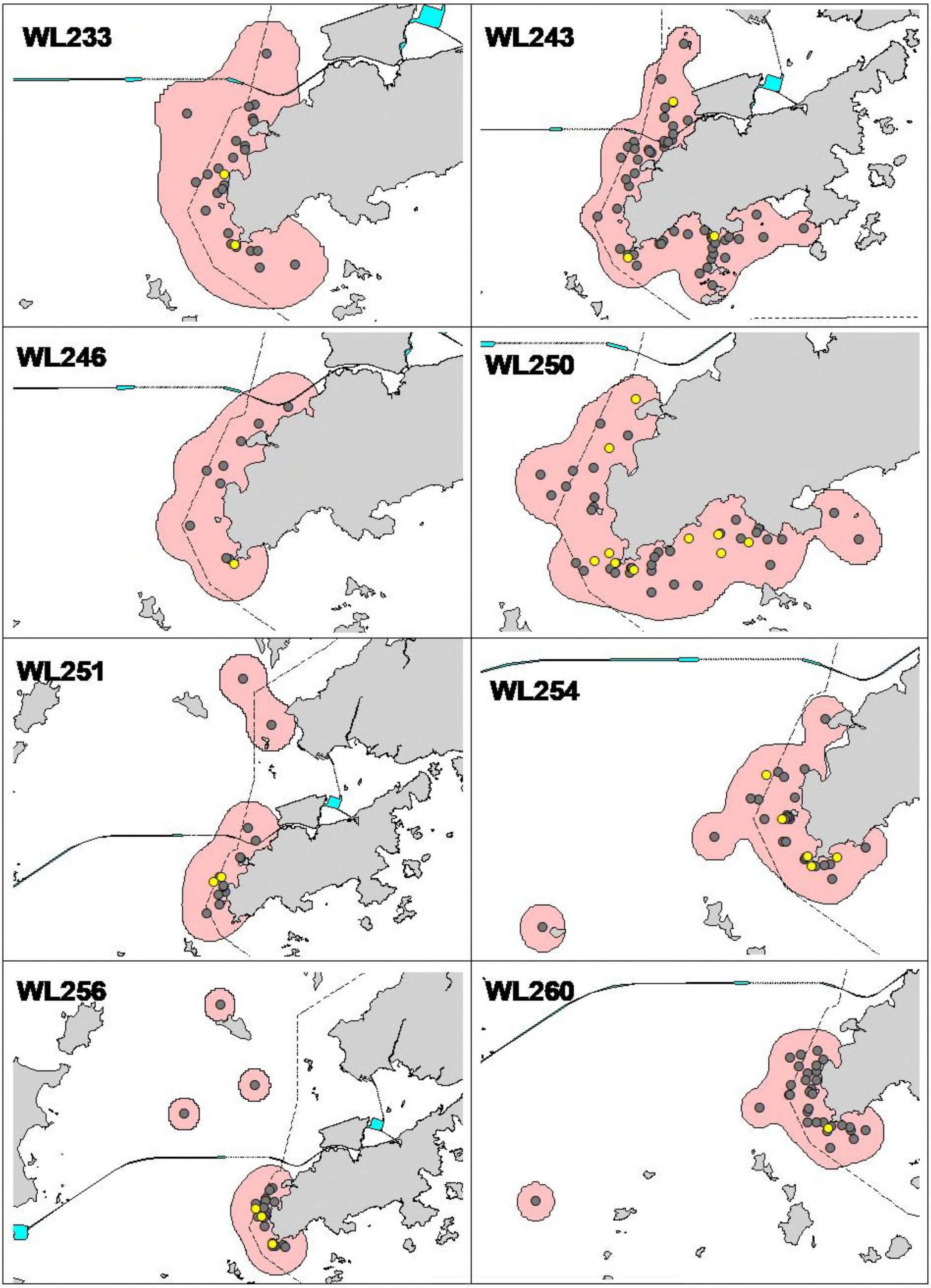
Appendix V. (cont'd).



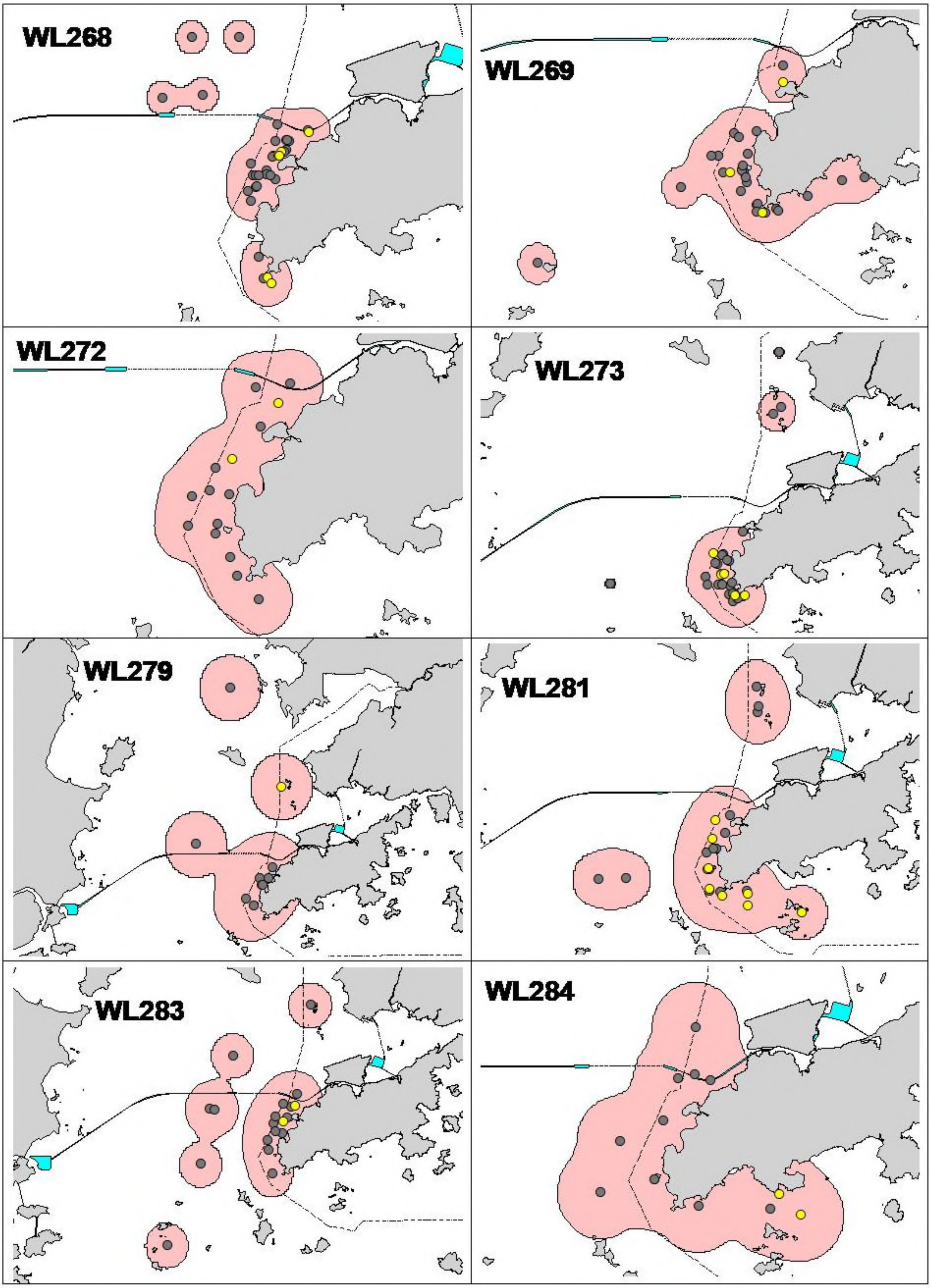
Appendix V. (cont'd).



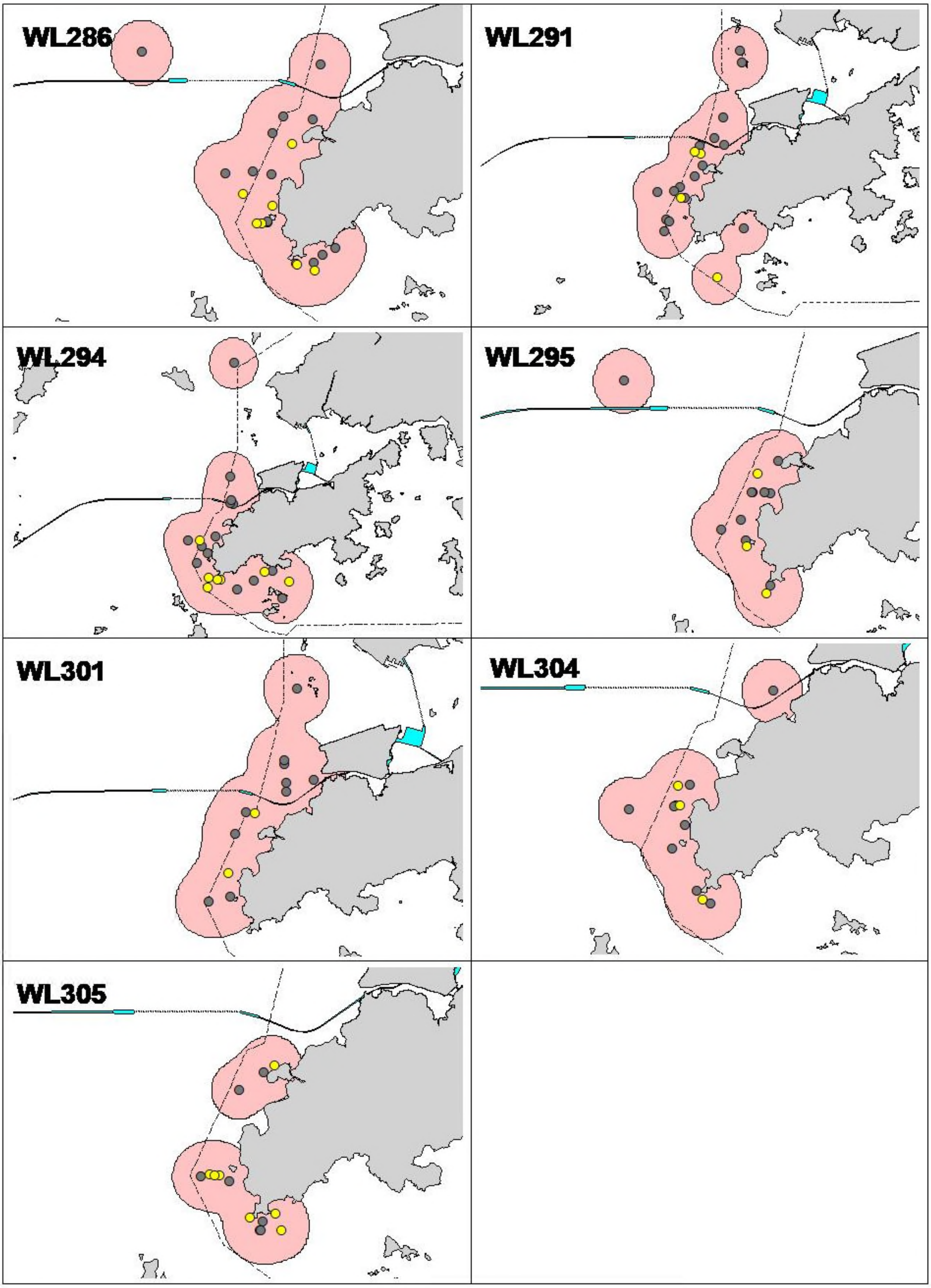
Appendix V. (cont'd).



Appendix V. (cont'd).



Appendix V. (cont'd).



APPENDIX VI Responses to Comments

Monitoring of Marine Mammals in Hong Kong Waters (2020-21)

REVISED DRAFT FINAL REPORT

(1 April 2020 to 31 March 2021)

Responses to Comments

Comments Received	Date Received
WWF-Hong Kong (WWFHK)	6 August 2021
Marine Department (MD)	13 August 2021
WWF-Hong Kong (WWFHK)	19 August 2021

Monitoring of Marine Mammals in Hong Kong Waters (2020-21)

REVISED DRAFT FINAL REPORT

(1 April 2020 to 31 March 2021)

Responses to Comments

Comments	**Responses**
Comments from WWF dated 6 August 2021	
1. Movement sequences in Table 7	
Does "NWL-WL-SWL" mean dolphin movement from NWL to WL to SWL?	The "NWL-WL-SWL" means the individual dolphin was sighted in all three survey areas (i.e. NWL, WL and SWL) during the specified monitoring period. The direction of movement of the individual dolphin among the survey areas is not taken into consideration in the analysis.
2. Figs. 4-9	
symbols of animals sighting are too large and overlap with each other a lot, possible to minimize them?	Reducing the size of the symbols would make it more difficult for readers to see the locations of dense dolphin sightings e.g. west Lautau. A suitable balance has to be made somehow. Raw sighting data will be provided in the Appendix of the report so that interested parties could plot the sightings to suit their specific needs.
3. Figs. 1,2,4-9, 22,25,27,31,34,47-50	
Please provide map scales accordingly	The figures are simply displaying the survey routes or sighting data in Hong Kong. They are not intended for accurate measurements or navigation. Adding a map scale to them serve no additional benefits and hence is not necessary.
4. Fig. 27	
It has been noticed that there were calf sightings outside of HKSAR boundary, does the figure also include results of study conducted in mainland Chinese waters?	The results are from surveys conducted in Hong Kong. The sighting locations of some data seemed to fall within Mainland waters were likely due to inherent inaccuracies of the GPS readings.
5. Figs. 28, 29, 32, 33	

Comments	Responses
Please also provide plots of coefficient of variations (CV) to illustrate prediction uncertainty	These figures are showing the DPSE/SPSE values. The colour of each grid corresponds to a single DPSE/SPSE values, and as such no CV could be calculated.
6. Figs. 41-42	
Please produce a new figure by combining figs. 41-42 to illustrate changes in CWD abundance estimates over years with error bars	The abundance estimates were derived for each survey area, and the annual total abundance figures of CWD in Hong Kong were then calculated by a simple summation of the abundance estimates for each survey area. Under this analysis approach, the error bar for the total abundance can not be derived.
7. Figs. 46a & 46b	
Any significant inter-year or before/during ferry cessation difference identified? Suggest to conduct ANOVA test to verify that	As discussed during the meeting in response to Chairman's similar comments, we acknowledged that further in-depth or alternative analysis could be conducted on the monitoring data, and AFCD would welcome any interested researchers to collaborate with us on this separately.

Monitoring of Marine Mammals in Hong Kong Waters (2020-21)

REVISED DRAFT FINAL REPORT

(1 April 2020 to 31 March 2021)

<u>Responses to Comments</u>

Comments	**Responses**
Comments from MD dated 13 August 2021	
1. Marine Department observes that a term namely **<u>"South Lantau Vessel Fairway (SLVF)</u>**" was found in the report frequently. There is no such South Lantau Vessel Fairway in the list of principal fairways in Hong Kong waters. Furthermore the term of fairway has a particular definition and meaning from marine point of view, therefore this term should be avoided to be used in the report. Please find below attachment for your reference.	A footnote explaining the concerned area of SLVF with respect to the traffic separation schemes recommended by Marine Department has been added on page 16.

Monitoring of Marine Mammals in Hong Kong Waters (2020-21)

REVISED DRAFT FINAL REPORT

(1 April 2020 to 31 March 2021)

Responses to Comments

Comments	Responses
Further comments from WWF dated 19 August 2021	
8. Figures 14, 19:	
Please also provide the error bars to indicate the standard deviations as per Figure3-9a & b by Hung (2008)	Figure 14 and 19 presented the DPSE values of small areas of interest which contained low volume of data when compared with Figure 3-9a & b of Hung (2008). Calculation of DPSE was therefore performed using summation of total sightings and survey efforts within each key areas to generate a single DPSE values, and as such no standard deviations could be derived.
9. Figures 46a, 46b	
Please also provide the error bars to indicate the standard deviations as per Figure3-9a & b by Hung (2008) Hung, K. S. (2008). Habitat use of Indo-pacific humpback dolphins (*Sousa chinensis*) in Hong Kong. (Thesis). University of Hong Kong, Pokfulam, Hong Kong SAR. Retrieved from http://dx.doi.org/10.5353/th_b4088776	As discussed during the meeting in response to Chairman's similar comments, we acknowledged that further in-depth or alternative analysis could be conducted on the monitoring data, and AFCD would welcome any interested researchers to collaborate with us on this separately.

- End -