Monitoring of Chinese White Dolphins in Southwest Lantau Waters – Eighth Quarterly Report (December 2016 – February 2017)

Submitted to the Environmental Project Office for the HZMB HKLR, HZMB HKBCF and TM-CLKL – Investigation

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1. Introduction

1.1. In March 2015, Hong Kong Cetacean Research Project (HKCRP) was appointed by the Environmental Project Office for the HZMB Hong Kong Projects to undertake a monitoring study of Chinese White Dolphins in Southwest Lantau (SWL) waters.

1.2. The objectives of the monitoring study are to quantify the abundance and density of Chinese White Dolphins in SWL waters, to identify individuals during the monitoring surveys, and to analyze their range use and movement patterns in Hong Kong and the wider Pearl River Estuary waters.

1.3. The monitoring study has been supplementing the on-going EM&A monitoring results of the HZMB Hong Kong Projects in North and West Lantau waters, and provides a more complete picture of dolphin usage and movements between different survey areas in western Hong Kong waters.

1.4. The present report is the eighth quarterly progress report under this dolphin monitoring study submitted to the Environmental Project Office, summarizing the results of the survey findings during the period of December 2016 – February 2017.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

2.1.1. According to the requirement of the technical proposal submitted to the Environmental

Project Office, the present dolphin monitoring programme should cover all transect lines in SWL survey area (see Figure 1) once per month upon instruction. The co-ordinates of all transect lines conducted during the dolphin monitoring survey are shown in Table 1.

Table 1. Co-ordinates of transect lines in SWL survey area (corresponding to transect line layout as shown in Figure 1)

Line #		Northing	Easting		Line #		Northing	Easting
SWL001	1	806180	802510		SWL007	13	807380	808520
	2	804250	802510			14	805600	808520
SWL002	3	806710	803480			15	804400	808520
	4	803450	803480			16	803000	808520
SWL003	5	807270	804500			17	802100	808520
	6	802690	804500			18	800470	808520
SWL004	7	807590	805450		SWL008	19	807380	809550
	8	802295	805450			20	805050	809550
SWL005	9	808490	806500			21	804400	809550
	10	801410	806500			22	800470	809550
SWL006	11	808500	807430		SWL009	23	807380	810550
	12	801250	807430			24	800470	810550
					SWL010	25	809410	811510
						26	801470	811510

2.1.2. The HKCRP survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2015, 2016). For each monitoring 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.

2.1.3. Two experienced observers from HKCRP (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 through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observer was available on the boat to work in shift (i.e. rotate 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.

2.1.4. 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 (*Garmin eTrex Legend*).

2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin 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 group to the transect line was later calculated from the initial sighting distance and angle.

2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines as well as the section around the Soko Islands was labeled as "secondary" survey effort. Both primary and secondary survey effort were presented as on-effort survey effort in this report.

2.2. Photo-identification Work

2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect 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 every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

2.2.2. A professional digital camera (*Canon* EOS 7D model), 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.

2.2.3. 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 detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995. For individual dolphins that are not readily identifiable from the catalogue but have distinct features on their bodies, they will be placed in a pool of "potential new individuals", with decision being made at the end of each year on whether any of them should be incorporated into the photo-ID catalogue.

2.2.4. 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 2000).

2.2.5. 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 computer database.

2.3. Data analysis

2.3.1. Distribution Analysis – The line-transect survey data was integrated with the Geographic Information System (GIS) in order to visualize and interpret different spatial and temporal patterns of dolphin distribution using sighting positions. Location data of dolphin groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView© 3.1) to examine their distribution patterns in details. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, young calves and activities.

2.3.2. Encounter rate analysis – Encounter rates of Chinese white dolphins (number of on-effort sightings per 100 km of survey effort (ER(STG)), and total number of dolphins sighted on-effort per 100 km of survey effort (ER(ANI))) were calculated in SWL survey area in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below would be used for encounter rate analysis. Dolphin encounter rates were calculated in two ways: 1) using primary survey effort alone; and 2) using both primary and secondary survey effort collected.

2.3.3. Quantitative grid analysis on habitat use – To conduct quantitative grid analysis of habitat

use, positions of on-effort sightings of Chinese White Dolphins collected during the quarterly impact phase monitoring period were plotted onto 1-km^2 grids in SWL survey area on GIS. Sighting densities (number of on-effort sightings per km^2) and dolphin densities (total number of dolphins 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 density grids were then further normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on 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 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 density was termed DPSE, representing the number of **d**olphins **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 from on-effort sightings
E = total number of units of survey effort
SA% = percentage of sea area

2.3.4. Behavioural analysis – When dolphins were sighted during vessel surveys, their behaviour was observed. Different activities were categorized (i.e. feeding, milling/resting, traveling, socializing) and recorded on sighting datasheets. This data was then input into a separate database with sighting information, which can be used to determine the distribution of behavioural data with 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 of the dolphins.

2.3.5. Ranging pattern analysis – Location data of individual dolphins that occurred during the three-month impact phase monitoring period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home ranges for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, was loaded as an extension with 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. If the sample size (number of re-sightings of each individual within the study period) were adequate (i.e. a minimum of 15 re-sightings, Hung 2008), the core areas of individuals at two different levels (50% and 25% UD) were also examined to investigate their range use in greater details. To examine the movement pattern within individual ranges, the locations of re-sightings made in the present quarterly period were visually examined and compared to those made in recent years, in order to determine whether any apparent shift in range use occurs in the present quarterly period.

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

3.1.1. During the period of December 2016 to February 2017, three sets of systematic line-transect vessel surveys were conducted on December 9th, January 6th and February 8th to cover all transect lines in SWL survey area once per month. In addition, nine line-transect surveys were also conducted under the AFCD long-term marine mammal monitoring programme in SWL survey area on December 2nd, December 7th, December 13th, January 5th, January 9th, January 17th, February 1st, February 13th and February 17th (see Appendix I and Table 2). With the permission of AFCD, such monitoring survey data were also incorporated into the present study to increase the sample size for various analyses.

3.1.2. For the present study alone, a total of 208.69 km of survey effort was collected in SWL surveys during this quarter (Table 2), with 96.7% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) (Appendix I). The total survey effort conducted on primary and secondary lines were 159.80 km and 48.89 km respectively during the three sets of surveys. For the combined monitoring dataset from both the present study and AFCD monitoring study, a total of 475.28 km of survey effort was collected in SWL waters during the three-month period.

Table 2. Summary table of survey effort and dolphin sightings collected during the present quarter (i.e. December 2016 – February 2017)

Month	Date	Total Distance (km)	No. of CWD Sighting	No. of Individual
HYD				
December 2016	December 9th	68.17	3	8
January 2017	January 6th	70.52	1	4
February 2017	February 8th	70.00	0	0
	Total	***208.69***	***4***	***12***
AFCD				
December 2016	December 2nd, 7th, 13th	97.85	8	17
January 2017	January 5th, 9th, 17th	81.79	1	1
February 2017	February 1st, 13th, 17th	86.95	4	7
	Total	***266.59***	***13***	***25***

3.1.3. During the present quarter, 17 groups of 37 Chinese White Dolphins were sighted form the present study's surveys and AFCD monitoring surveys conducted in SWL survey area (Table 2, Appendix II). Fifteen of the 17 dolphin sightings were made during on-effort search, while 11 of the 15 on-effort sightings were made on primary lines.

3.1.4. In addition, the Indo-Pacific finless porpoises were also sighted during the present quarter in SWL survey area, with a total of 13 groups of 35 animals sighted (Appendix III).

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during the monitoring surveys from December 2016 to February 2017 is shown in Figure 1. Chinese White Dolphins occurred regularly in SWL waters during this quarter, and their sightings were evenly spread throughout the survey area, with the only exception in the southeastern portion of SWL waters (Figure 1).

3.2.2. On the contrary, the finless porpoises were mostly sighted to the southeastern end of the survey area, mainly around the Soko Islands and at the offshore waters to the southeast of Soko Islands, with only very little overlap with dolphin sightings near the Soko Islands (Figure 1).

3.2.3. Notably, sighting distribution of dolphins in the present quarter (i.e. winter of 2016-17) was quite different from the previous three winter periods of 2013-16 (Figure 2). The

dolphin sightings were more evenly spread with more occurrences around the Soko Islands during the winter of 2016-17, while most of these sightings were made along the Lantau coastlines and rarely around the Soko Islands during past three winter periods of 2013-16 (Figure 2).

3.3. Encounter rate

3.3.1. During the present three-month monitoring period (December 2016-February 2017), encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data from the primary transect lines under favourable conditions (Beaufort 3 or below) from the SWL survey area are shown in Table 3. The quarterly encounter rates were calculated by pooling the monthly survey effort and on-effort dolphin sightings from the three months during the present quarter, in order to compare them to the historical data. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present quarter using both primary and secondary survey effort (Table 3).

Table 3. Overall dolphin encounter rates (no. of sightings per 100 km of survey effort) from the present monitoring survey and combined database with AFCD monitoring survey conducted in December 2016 – February 2017 (i.e. winter 2016-17) (primary lines only, as well as both primary lines and secondary lines were used) in SWL survey area in comparison to the ones deduced during winter periods of 2013-14, 2014-15 and 2015-16, as well as the ones in the past decade (2005-14)

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		**Encounter rate (ANI)** (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Primary Lines Only	Both Primary and Secondary Lines	Primary Lines Only	Both Primary and Secondary Lines
Winter 2016-17	3.45	3.28	7.52	7.00
Winter 2015-16	3.74	4.30	16.30	14.82
Winter 2014-15	0.78	0.57	6.22	4.52
Winter 2013-14	9.89	7.63	38.14	27.06
Winter of 2005-14		3.32		10.88

3.3.2. Both types of quarterly encounter rates (ER(STG) and ER(ANI)) deduced from the present quarter were also compared with the same quarters deduced from 2013-14, 2014-15 and 2015-16, while the quarterly encounter rates deduced using the primary and secondary survey effort combined was compared with the ones deduced from all winter months in the past decade (2005-14) (Table 3).

3.3.3. Dolphin encounter rates greatly fluctuated among the past four winter periods in SWL waters. Both quarterly encounter rates (ER(STG) and ER(ANI)) deduced from the

present quarter were lower than the winter period of 2015-16, much higher than the one in 2014-15 and much lower than the one in 2013-14 (Table 3). On the other hand, both encounter rates recorded in the present quarter was slightly lower than the one for the overall winter period of 2005-14 (Table 3).

3.4. Group size

3.4.1. Group sizes of Chinese White Dolphins ranged from one to six individuals per group in SWL survey area between December 2016 and February 2017. The average dolphin group size for the three-month period was only 2.2, which was much lower than the one recorded during the winter period of 2005-14 (3.3).

3.4.2. Among the 17 dolphin groups sighted during this quarter, all except one were small groups composed of only 1-4 dolphins per group, while there was only one medium-sized group of six animals (Appendix II).

3.4.3. Distribution of this medium-sized group is shown in Figure 3, which was located to the south of Kau Ling Chung (Figure 3).

3.5. Habitat use

3.5.1. From December 2016 to February 2017, 15 grids have recorded dolphin presence in SWL survey area (i.e. one on-effort sighting per grid for these 15 grids), and the moderately high to high density grids were located near Fan Lau (Figures 4a and 4b). However, the results should be treated with cautions as the amount of survey effort collected among most grids during the three-month period was fairly low (5-10 units of survey effort for most grids). A more complete picture of dolphin habitat use pattern can be presented when more survey effort for each grid will be collected throughout the impact phase monitoring programme.

3.5.2. When compared with the habitat use pattern recorded during the winter months of 2012-16, the one in 2016-17 was similar to the previous winter periods, but with lower concentrations near Fan Lau and more occurrences around the Soko Islands (Figures 5a and 5b).

3.6. Mother-calf pairs

3.6.1. During the three-month monitoring period, no young calf was sighted at all in SWL waters.

3.7. Activities and associations with fishing boats

3.7.1. From December 2016 to February 2017, none of the 17 sightings was associated with any

feeding, socializing, traveling or milling/resting activity during the quarterly period.

3.7.2. Notably, one group of two dolphins was associated with operating pair-trawler at the southern territorial boundary of Hong Kong during the present quarter.

3.8. Summary of photo-identification works

3.8.1. Between December 2016 and February 2017, nearly 1,000 digital photographs of Chinese White Dolphins were taken during the SWL monitoring surveys for the photo-identification work.

3.8.2. In total, 15 individuals sighted 23 times altogether were identified (see the summary table in Appendix IV and photographs of identified individuals in Appendix V). Nine identified individuals were sighted only once during the three-month period, while the other six individuals were sighted either twice or thrice during the quarterly period (Appendix IV). Notably, NL33 and WL94 were sighted with their older calves of NL322 and WL260 respectively (i.e. both were already in the spotted juvenile stage).

3.9. Individual range use in SWL waters

3.9.1. Ranging patterns of these 15 individuals identified during the three-month study period in SWL waters were determined by the fixed kernel method. Their 95% kernel home ranges including their re-sightings during 2012, 2013, 2014 and 2015-17 are shown separately for each individual in Appendix VI to facilitate the examination of any temporal changes in their range use in recent years.

3.9.2. All 15 individuals were re-sighted well within their home ranges including SWL waters during this three-month period (Appendix VI). Three individuals (NL212, WL123 and WL180) sighted in SWL waters during the present quarter were also sighted in WL waters during HKLR09 monitoring surveys in the same quarter. The mother-calf pair of NL33 and NL322 sighted in SWL waters during the present quarter were also sighted in NWL waters during a HKLR03 monitoring survey in the same quarter. These individuals showed frequent movements between different survey areas around Lantau Island in this relatively brief period.

3.9.4. Notably, NL33 that used to range primarily in North Lantau waters in the past has spent more time in Southwest Lantau in 2015-17 (Appendix VI), showing apparent range shift away from its former prime habitat as described in Hung (2016).

3.9.5. With their primary ranges centered in West Lantau waters in the past, many individuals (e.g. WL15, WL62, WL94) showed apparent range extensions to Southwest Lantau

waters in 2015-17 (Appendix VI). It remains to be seen whether some of these individuals would continue to spend more times in SWL waters as part of their ranges in the near future.

4. References

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Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

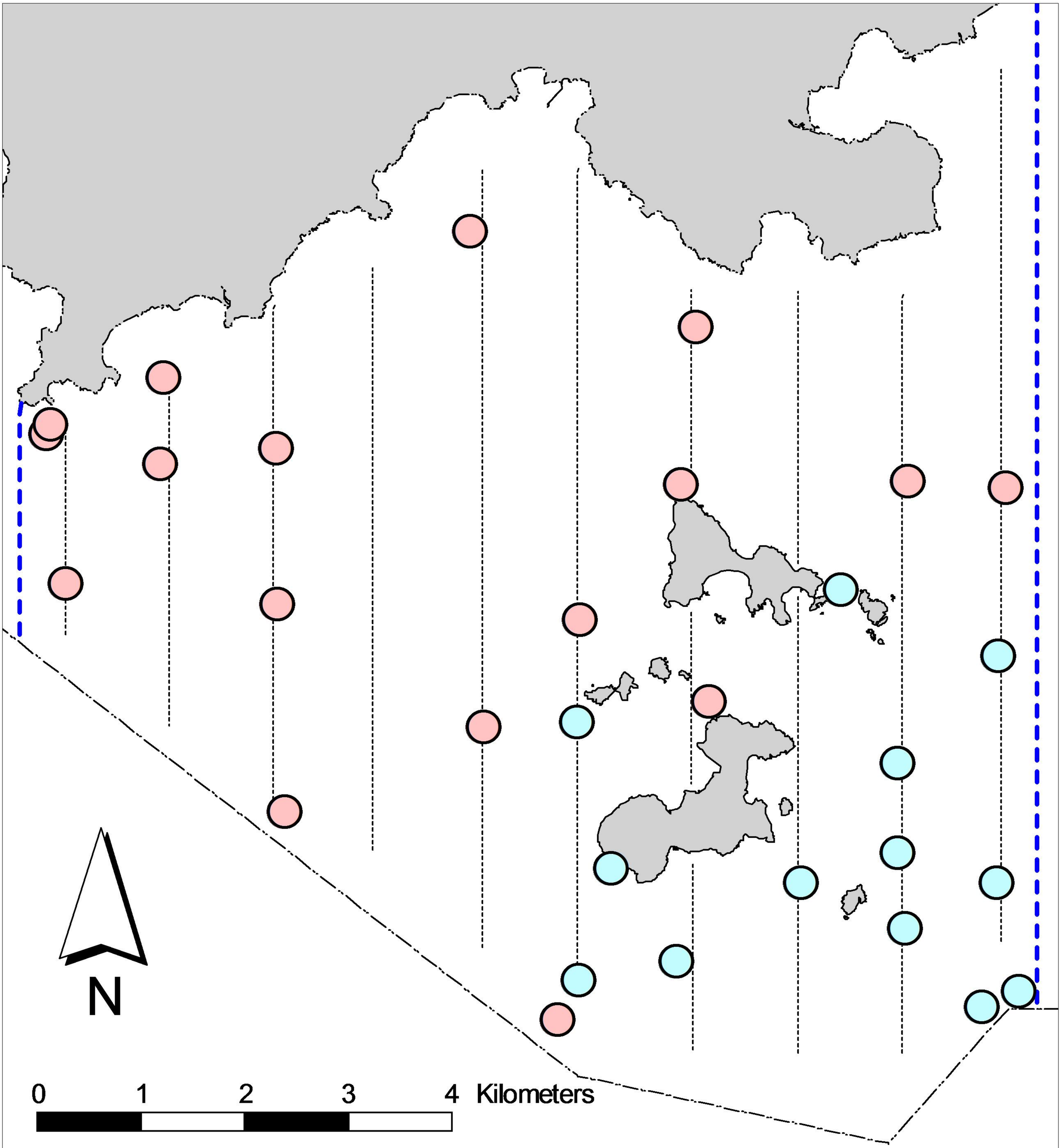


Figure 1. Distribution of marine mammal sightings (pink dots: Chinese White Dolphins; blue dots: Finless Porpoises) during monitoring surveys in Southwest Lantau survey area conducted in December 2016 – February 2017

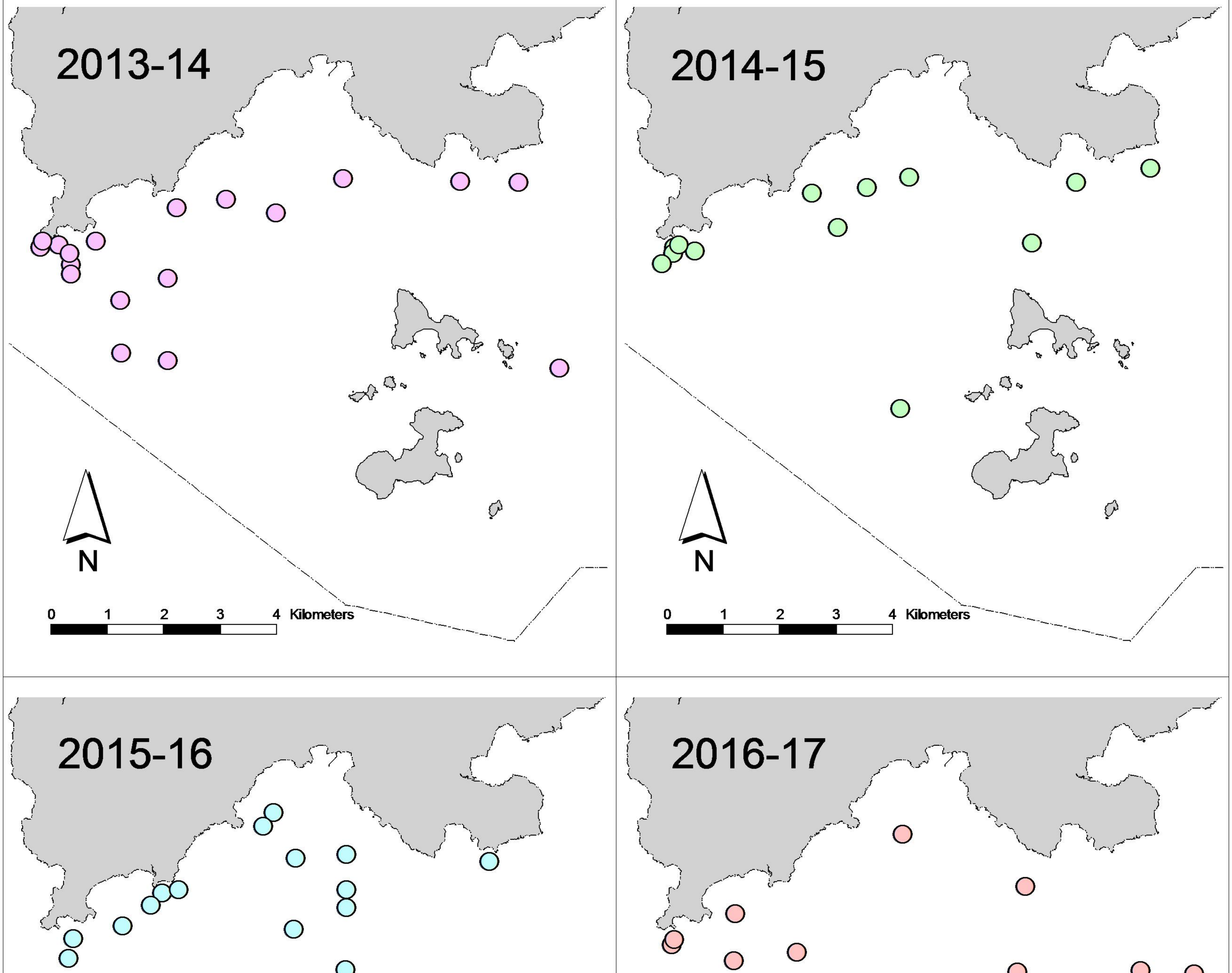


Figure 2. Comparisons on distribution of Chinese White Dolphin sightings in Southwest Lantau survey area during the four winter periods of 2013-2017

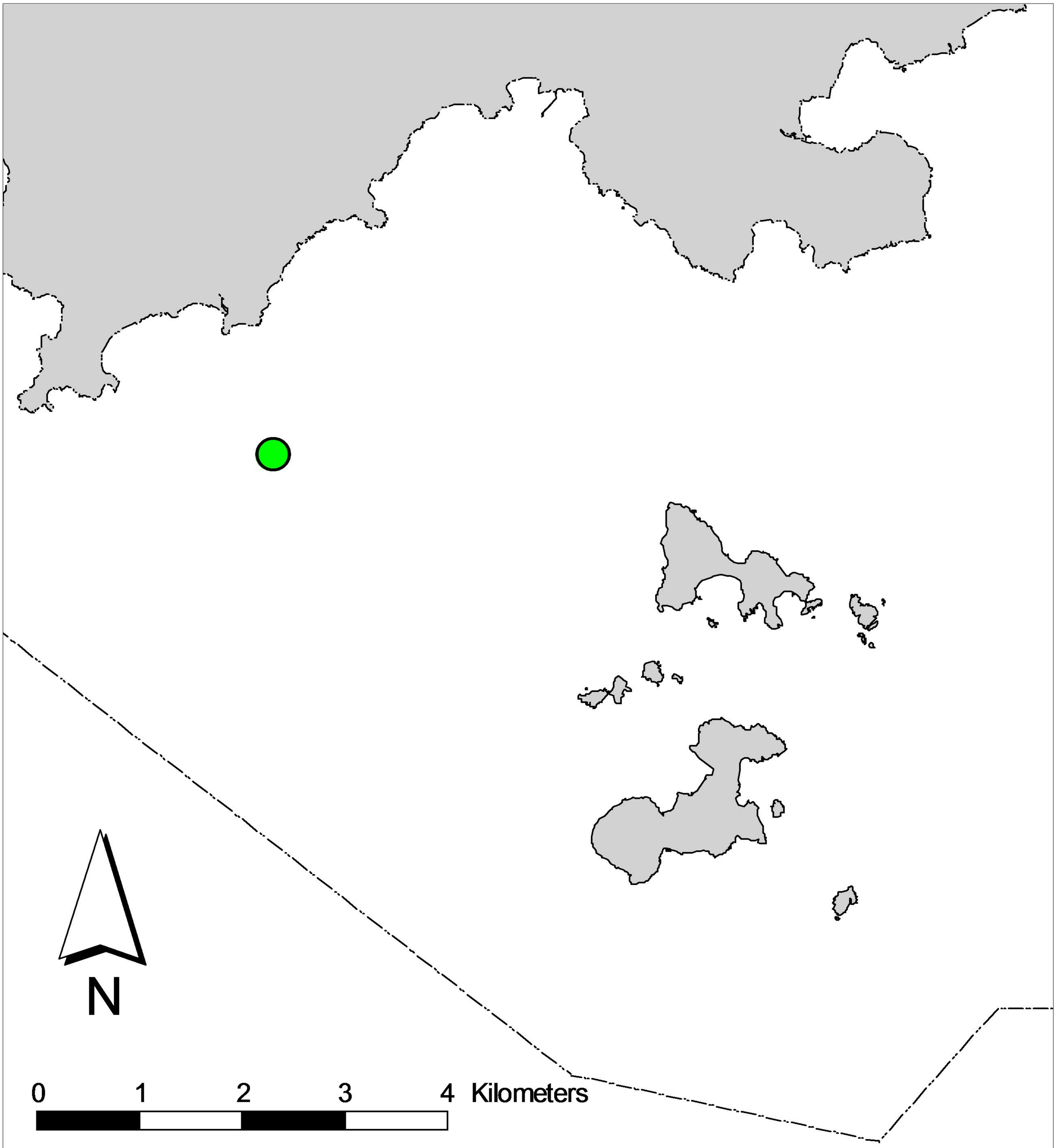


Figure 3. Distribution of Chinese White Dolphins with medium group sizes of 5-9 dolphins (green dots) during SWL monitoring surveys conducted in December 2016 – February 2017

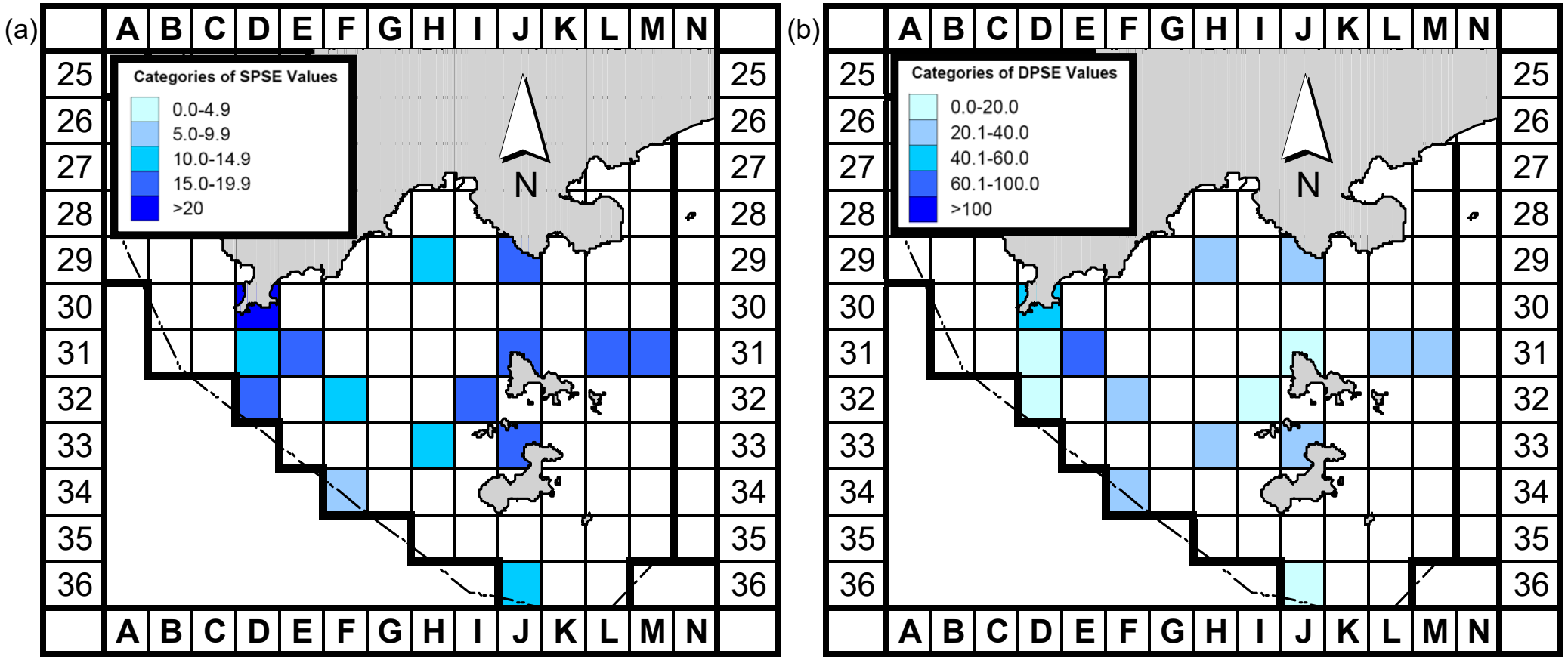
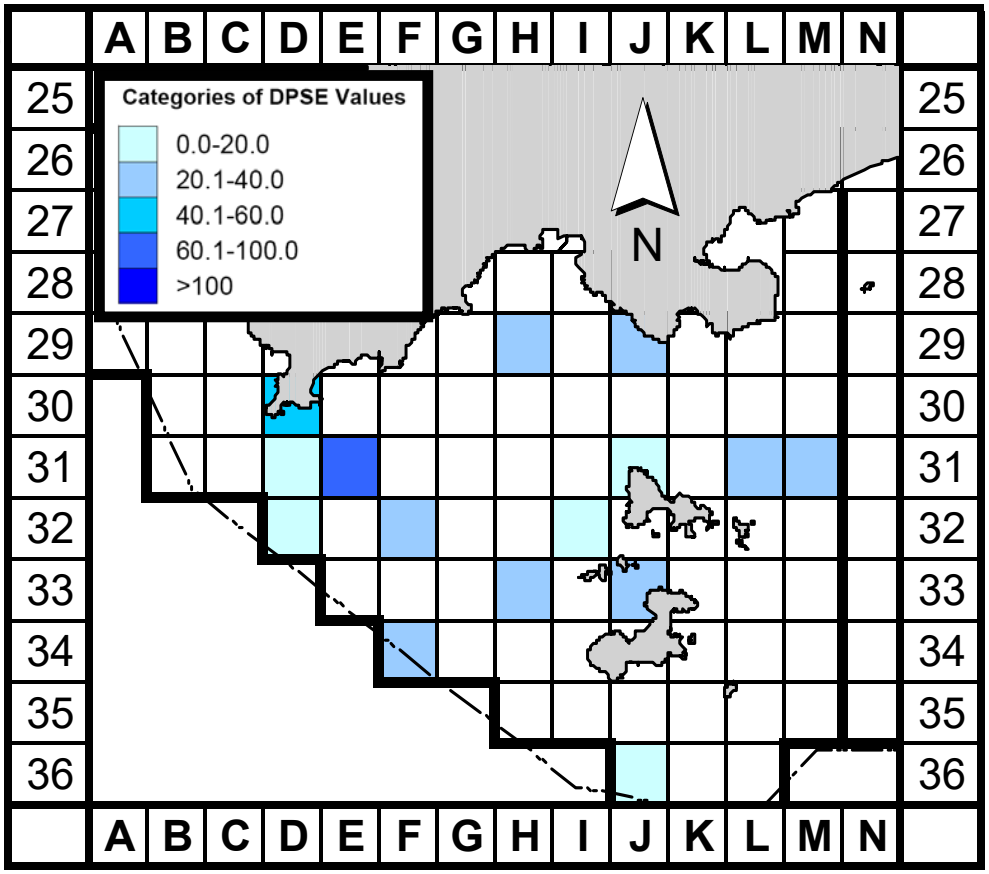


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during winter months (December-February) of 2016-17 (SPSE = no. of on-effort sightings per 100 units of survey effort)

Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during winter months (December-February) of 2016-17 (DPSE = no. of dolphins per 100 units of survey effort)

(a)



(b)

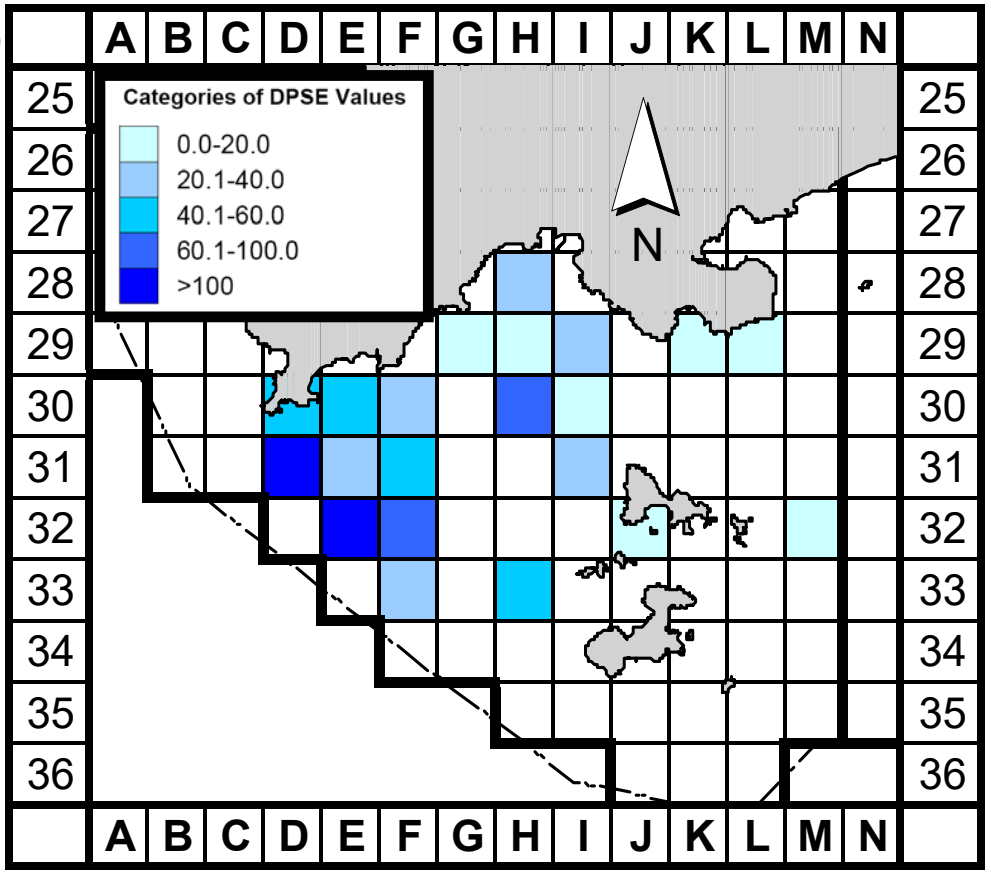


Figure 5a. Density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during winter months (December-February) of 2016-17 (DPSE = no. of dolphins per 100 units of survey effort)

Figure 5b. Density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during winter months (December-February) of 2012-2016 (DPSE = no. of dolphins per 100 units of survey effort)

Appendix I. Survey Effort Database in SWL Survey Area (December 2016 - February 2017)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
2-Dec-16	SW LANTAU	2	11.38	WINTER	STANDARD36826	HKCRP	P
2-Dec-16	SW LANTAU	3	3.48	WINTER	STANDARD36826	HKCRP	P
2-Dec-16	SW LANTAU	2	4.61	WINTER	STANDARD36826	HKCRP	S
2-Dec-16	SW LANTAU	3	2.20	WINTER	STANDARD36826	HKCRP	S
7-Dec-16	SW LANTAU	2	24.77	WINTER	STANDARD36826	HKCRP	P
7-Dec-16	SW LANTAU	3	2.54	WINTER	STANDARD36826	HKCRP	P
7-Dec-16	SW LANTAU	2	8.03	WINTER	STANDARD36826	HKCRP	S
9-Dec-16	SW LANTAU	2	48.65	WINTER	STANDARD36826	HYD-HZMB	P
9-Dec-16	SW LANTAU	3	3.18	WINTER	STANDARD36826	HYD-HZMB	P
9-Dec-16	SW LANTAU	2	14.00	WINTER	STANDARD36826	HYD-HZMB	S
9-Dec-16	SW LANTAU	3	2.34	WINTER	STANDARD36826	HYD-HZMB	S
13-Dec-16	SW LANTAU	2	24.94	WINTER	STANDARD36826	HKCRP	P
13-Dec-16	SW LANTAU	3	1.35	WINTER	STANDARD36826	HKCRP	P
13-Dec-16	SW LANTAU	2	11.01	WINTER	STANDARD36826	HKCRP	S
13-Dec-16	SW LANTAU	3	3.54	WINTER	STANDARD36826	HKCRP	S
5-Jan-17	SW LANTAU	2	12.94	WINTER	STANDARD36826	HKCRP	P
5-Jan-17	SW LANTAU	3	8.40	WINTER	STANDARD36826	HKCRP	P
5-Jan-17	SW LANTAU	2	9.96	WINTER	STANDARD36826	HKCRP	S
5-Jan-17	SW LANTAU	3	1.80	WINTER	STANDARD36826	HKCRP	S
6-Jan-17	SW LANTAU	1	20.87	WINTER	STANDARD36826	HYD-HZMB	P
6-Jan-17	SW LANTAU	2	33.03	WINTER	STANDARD36826	HYD-HZMB	P
6-Jan-17	SW LANTAU	1	4.63	WINTER	STANDARD36826	HYD-HZMB	S
6-Jan-17	SW LANTAU	2	11.99	WINTER	STANDARD36826	HYD-HZMB	S
9-Jan-17	SW LANTAU	2	2.66	WINTER	STANDARD36826	HKCRP	P
9-Jan-17	SW LANTAU	3	8.58	WINTER	STANDARD36826	HKCRP	P
9-Jan-17	SW LANTAU	3	7.56	WINTER	STANDARD36826	HKCRP	S
17-Jan-17	SW LANTAU	2	7.86	WINTER	STANDARD36826	HKCRP	P
17-Jan-17	SW LANTAU	3	10.35	WINTER	STANDARD36826	HKCRP	P
17-Jan-17	SW LANTAU	2	3.04	WINTER	STANDARD36826	HKCRP	S
17-Jan-17	SW LANTAU	3	8.64	WINTER	STANDARD36826	HKCRP	S
1-Feb-17	SW LANTAU	2	25.25	WINTER	STANDARD36826	HKCRP	P
1-Feb-17	SW LANTAU	3	0.66	WINTER	STANDARD36826	HKCRP	P
1-Feb-17	SW LANTAU	2	10.14	WINTER	STANDARD36826	HKCRP	S
1-Feb-17	SW LANTAU	3	0.83	WINTER	STANDARD36826	HKCRP	S
8-Feb-17	SW LANTAU	2	25.13	WINTER	STANDARD36826	HYD-HZMB	P
8-Feb-17	SW LANTAU	3	23.23	WINTER	STANDARD36826	HYD-HZMB	P
8-Feb-17	SW LANTAU	4	5.71	WINTER	STANDARD36826	HYD-HZMB	P
8-Feb-17	SW LANTAU	2	8.46	WINTER	STANDARD36826	HYD-HZMB	S
8-Feb-17	SW LANTAU	3	6.31	WINTER	STANDARD36826	HYD-HZMB	S
8-Feb-17	SW LANTAU	4	1.16	WINTER	STANDARD36826	HYD-HZMB	S
13-Feb-17	SW LANTAU	3	7.09	WINTER	STANDARD36826	HKCRP	P
13-Feb-17	SW LANTAU	4	5.74	WINTER	STANDARD36826	HKCRP	P
13-Feb-17	SW LANTAU	5	0.40	WINTER	STANDARD36826	HKCRP	P
13-Feb-17	SW LANTAU	3	5.60	WINTER	STANDARD36826	HKCRP	S
13-Feb-17	SW LANTAU	4	4.17	WINTER	STANDARD36826	HKCRP	S
13-Feb-17	SW LANTAU	5	1.00	WINTER	STANDARD36826	HKCRP	S
17-Feb-17	SW LANTAU	1	2.78	WINTER	STANDARD36826	HKCRP	P
17-Feb-17	SW LANTAU	2	8.55	WINTER	STANDARD36826	HKCRP	P
17-Feb-17	SW LANTAU	3	1.35	WINTER	STANDARD36826	HKCRP	P
17-Feb-17	SW LANTAU	1	3.74	WINTER	STANDARD36826	HKCRP	S
17-Feb-17	SW LANTAU	2	9.65	WINTER	STANDARD36826	HKCRP	S

Appendix II. Chinese White Dolphin Sighting Database in SWL Survey Area (December 2016 - February 2017)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
2-Dec-16	1	1400	2	SW LANTAU	2	437	ON	HKCRP	804551	804515	WINTER	NONE	P
7-Dec-16	6	1230	2	SW LANTAU	2	614	ON	HKCRP	806613	803416	WINTER	NONE	P
7-Dec-16	7	1243	1	SW LANTAU	2	140	ON	HKCRP	805816	803383	WINTER	NONE	P
7-Dec-16	8	1344	3	SW LANTAU	2	33	ON	HKCRP	807936	806378	WINTER	NONE	S
9-Dec-16	1	1212	1	SW LANTAU	2	65	ON	HYD-HZMB	805629	808395	WINTER	NONE	S
9-Dec-16	2	1409	6	SW LANTAU	2	384	ON	HYD-HZMB	805958	804497	WINTER	NONE	P
9-Dec-16	3	1450	1	SW LANTAU	3	298	ON	HYD-HZMB	804733	802473	WINTER	NONE	P
13-Dec-16	1	1126	3	SW LANTAU	2	146	ON	HKCRP	802657	804583	WINTER	NONE	P
13-Dec-16	2	1230	2	SW LANTAU	2	219	ON	HKCRP	803429	806493	WINTER	NONE	P
13-Dec-16	3	1308	2	SW LANTAU	3	90	ON	HKCRP	800770	807210	WINTER	PAIR	S
13-Dec-16	4	1336	2	SW LANTAU	3	87	ON	HKCRP	803668	808680	WINTER	NONE	S
6-Jan-17	4	1516	4	SW LANTAU	2	ND	OFF	HYD-HZMB	806095	802280	WINTER	NONE	
17-Jan-17	6	1352	1	SW LANTAU	2	323	ON	HKCRP	804401	807423	WINTER	NONE	P
1-Feb-17	6	1444	2	SW LANTAU	2	1105	ON	HKCRP	805658	810592	WINTER	NONE	P
1-Feb-17	7	1541	2	SW LANTAU	2	176	ON	HKCRP	805612	811530	WINTER	NONE	P
17-Feb-17	8	1145	1	SW LANTAU	3	ND	OFF	HKCRP	806184	802322	WINTER	NONE	
17-Feb-17	11	1308	2	SW LANTAU	2	1005	ON	HKCRP	807068	808542	WINTER	NONE	P

Appendix III. Finless Porpoise Sighting Database in SWL Survey Area (December 2016 - February 2017)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	P/S
6-Jan-17	1	1032	6	SW LANTAU	1	139	ON	HYD-HZMB	804084	811466	WINTER	P
6-Jan-17	2	1045	2	SW LANTAU	1	131	ON	HYD-HZMB	802014	811452	WINTER	P
6-Jan-17	3	1209	1	SW LANTAU	2	79	ON	HYD-HZMB	801299	808356	WINTER	P
1-Feb-17	4	1355	1	SW LANTAU	2	58	ON	HKCRP	803482	807401	WINTER	P
1-Feb-17	5	1428	2	SW LANTAU	2	ND	OFF	HKCRP	802017	809564	WINTER	
8-Feb-17	1	1134	1	SW LANTAU	2	4	ON	HYD-HZMB	804674	809940	WINTER	S
17-Feb-17	9	1223	3	SW LANTAU	2	364	ON	HKCRP	801135	807417	WINTER	S
17-Feb-17	10	1242	3	SW LANTAU	2	169	ON	HKCRP	802142	807729	WINTER	S
17-Feb-17	12	1340	1	SW LANTAU	2	345	ON	HKCRP	803111	810495	WINTER	P
17-Feb-17	13	1344	5	SW LANTAU	1	179	ON	HKCRP	802292	810493	WINTER	P
17-Feb-17	14	1353	7	SW LANTAU	1	273	ON	HKCRP	801605	810554	WINTER	P
17-Feb-17	15	1403	1	SW LANTAU	1	ND	OFF	HKCRP	800895	811306	WINTER	
17-Feb-17	16	1405	2	SW LANTAU	1	ND	OFF	HKCRP	801039	811657	WINTER	

Appendix IV. Individual dolphins identified during SWL monitoring surveys in December 2016 - February 2017

ID#	DATE	STG#	TYPE
NL33	09/12/16	2	HYD-HZMB
NL212	06/01/17	4	HYD-HZMB
NL322	09/12/16	2	HYD-HZMB
SL60	09/12/16	1	HYD-HZMB
	13/12/16	4	HKCRP
SL64	13/12/16	1	HKCRP
WL15	07/12/16	8	HKCRP
	09/12/16	2	HYD-HZMB
	06/01/17	4	HYD-HZMB
WL47	13/12/16	1	HKCRP
WL62	13/12/16	1	HKCRP
	01/02/17	6	HKCRP
	01/02/17	7	HKCRP
WL91	06/01/17	4	HYD-HZMB
	01/02/17	6	HKCRP
WL94	07/12/16	7	HKCRP
	09/12/16	2	HYD-HZMB
WL123	13/12/16	2	HKCRP
	13/12/16	4	HKCRP
WL152	07/12/16	6	HKCRP
WL180	06/01/17	4	HYD-HZMB
WL221	09/12/16	2	HYD-HZMB
WL260	09/12/16	2	HYD-HZMB

Appendix V. Fifteen individual dolphins that were identified in Southwest Lantau survey area during December 2016 – February 2017


SL64


WL15


WL47


WL62

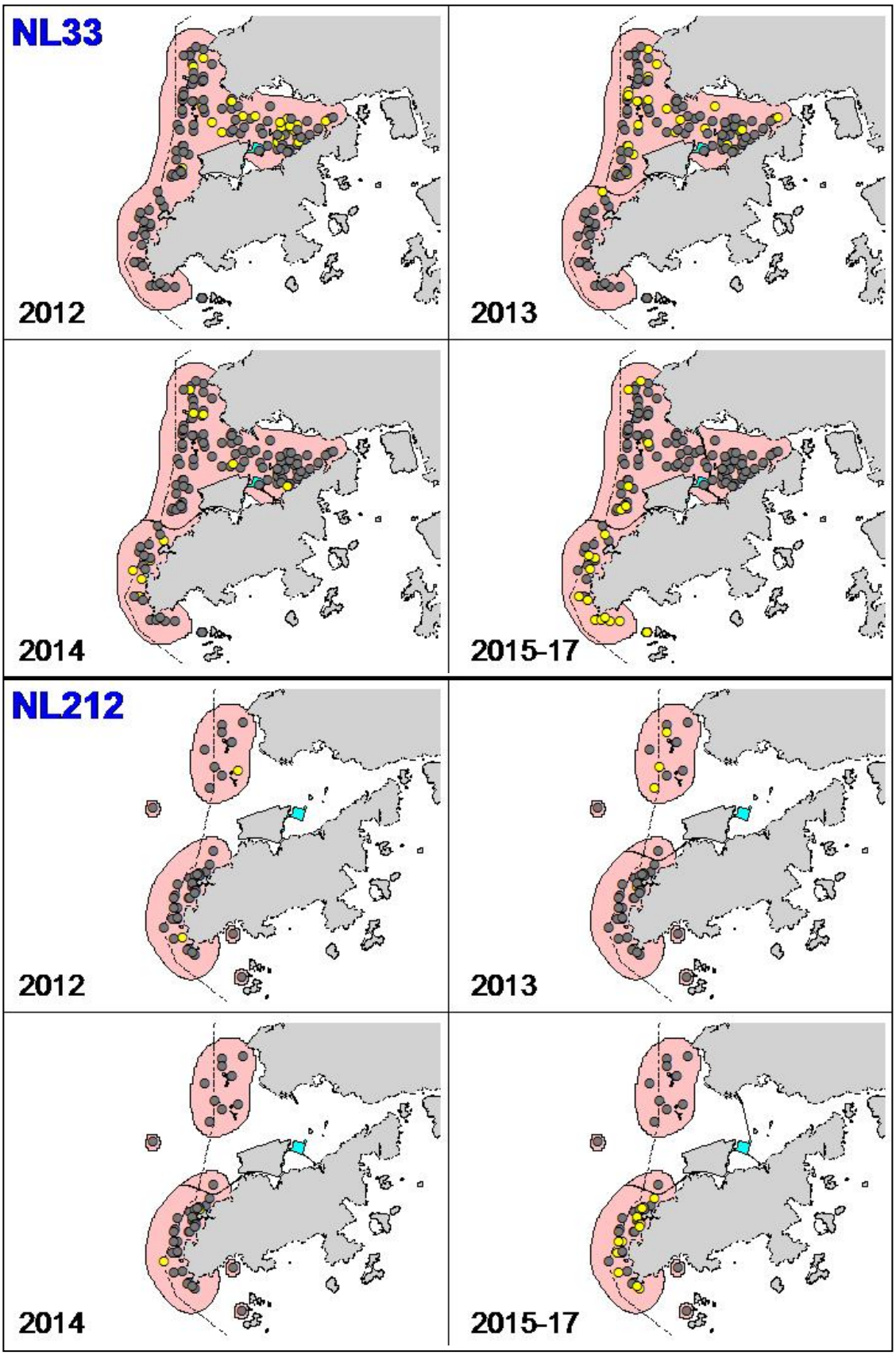
Appendix V. (cont'd)

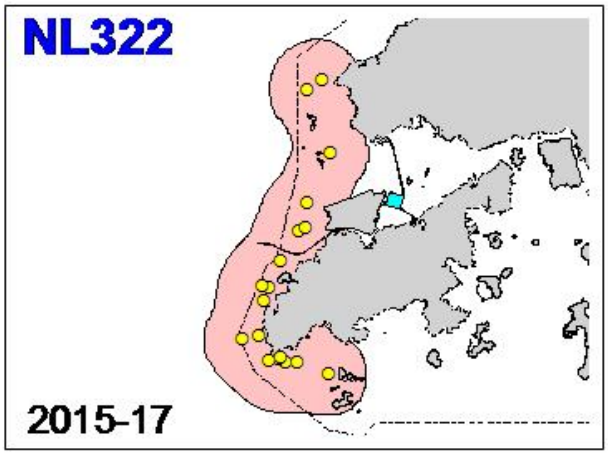

WL180

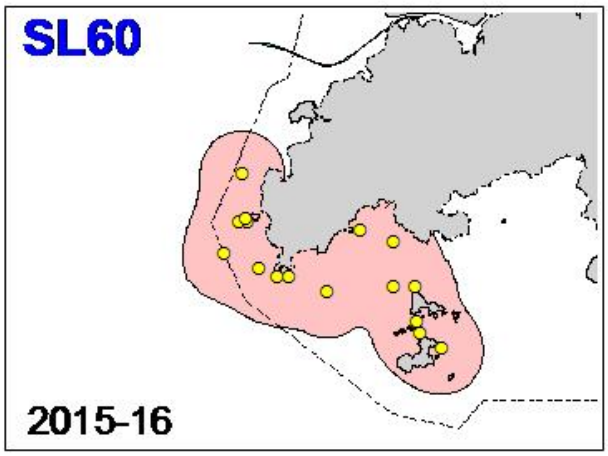

WL221

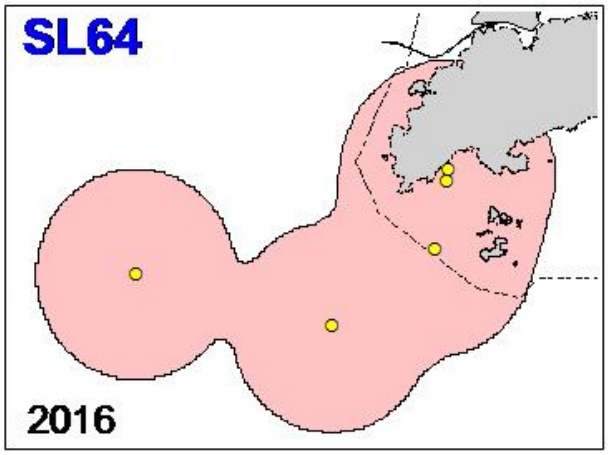

WL260

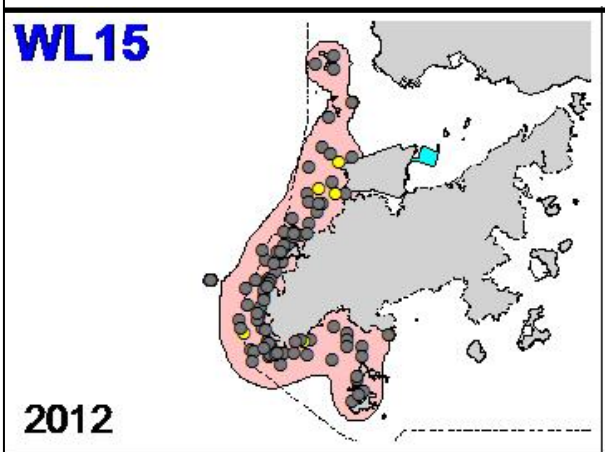
Appendix VI. Ranging patterns (95% kernel ranges) of 15 individual dolphins that were sighted in Southwest Lantau survey area during December 2016 – February 2017 (note: yellow dots indicates sightings made in the respective years of 2012-17)

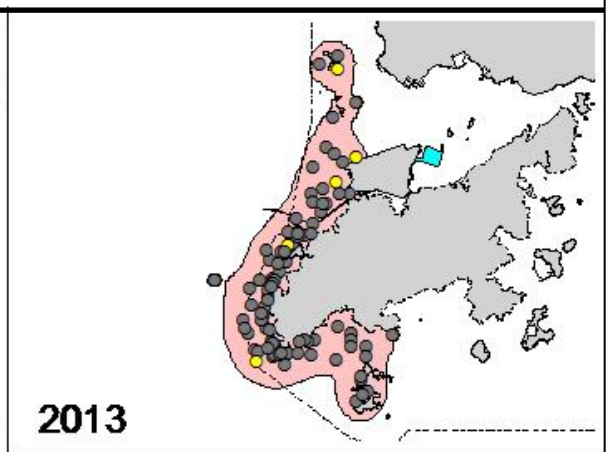


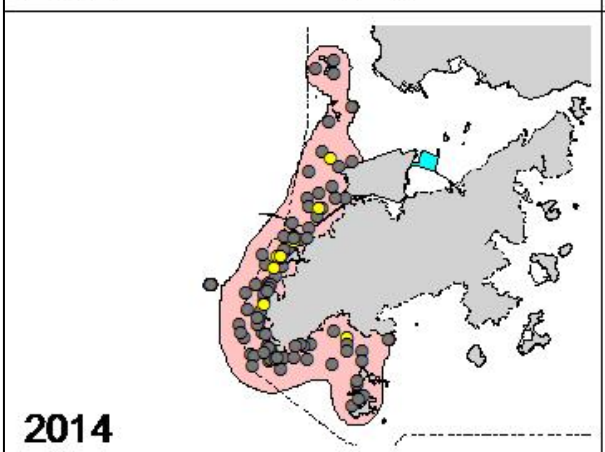

NL322
2015-17

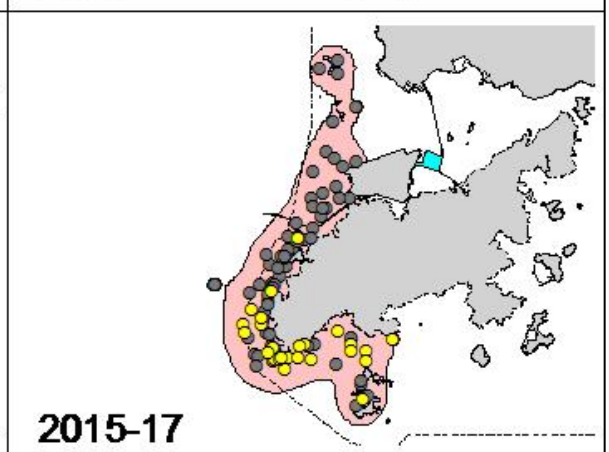

SL60
2015-16

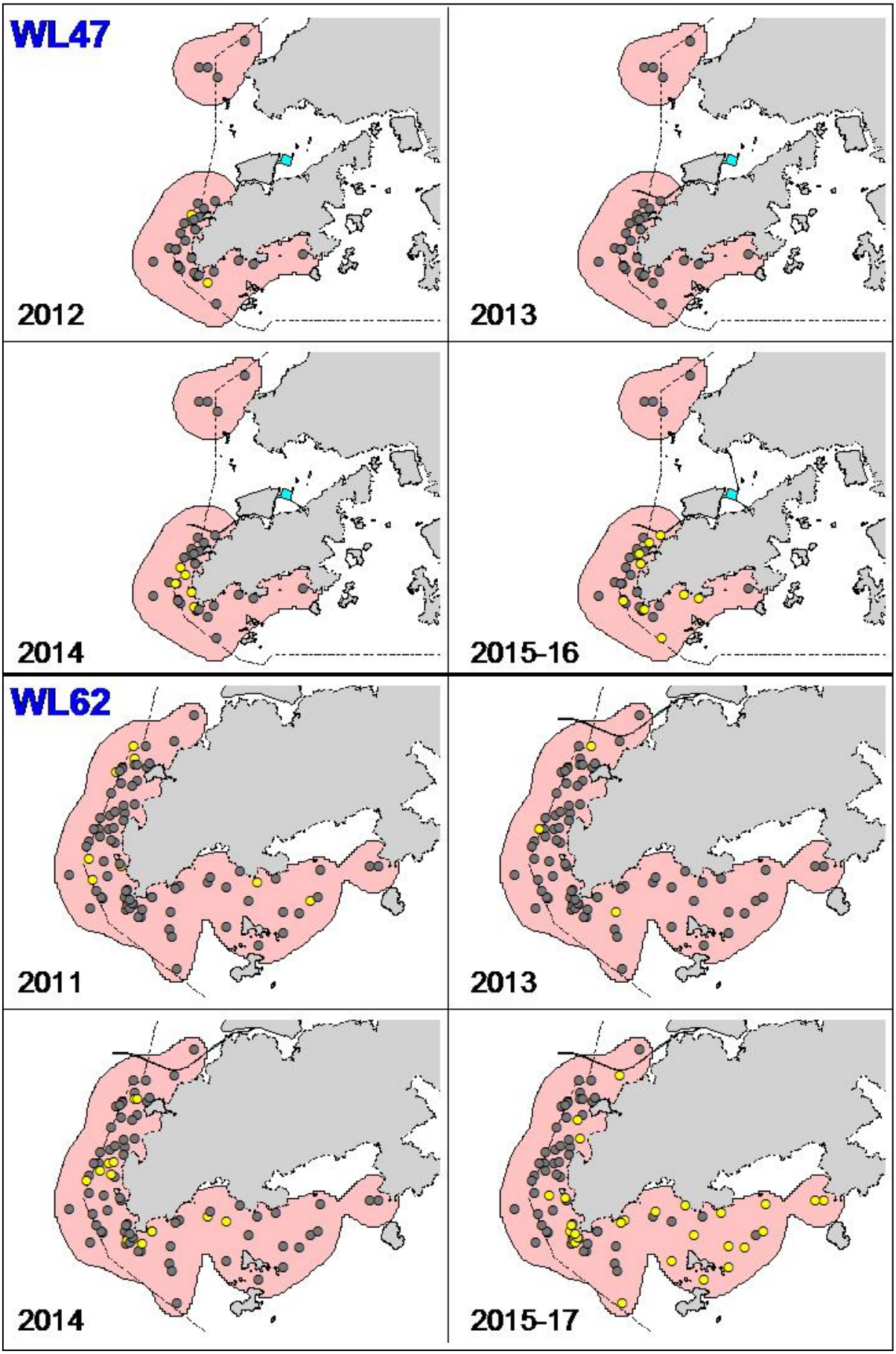

SL64
2016


WL15
2012

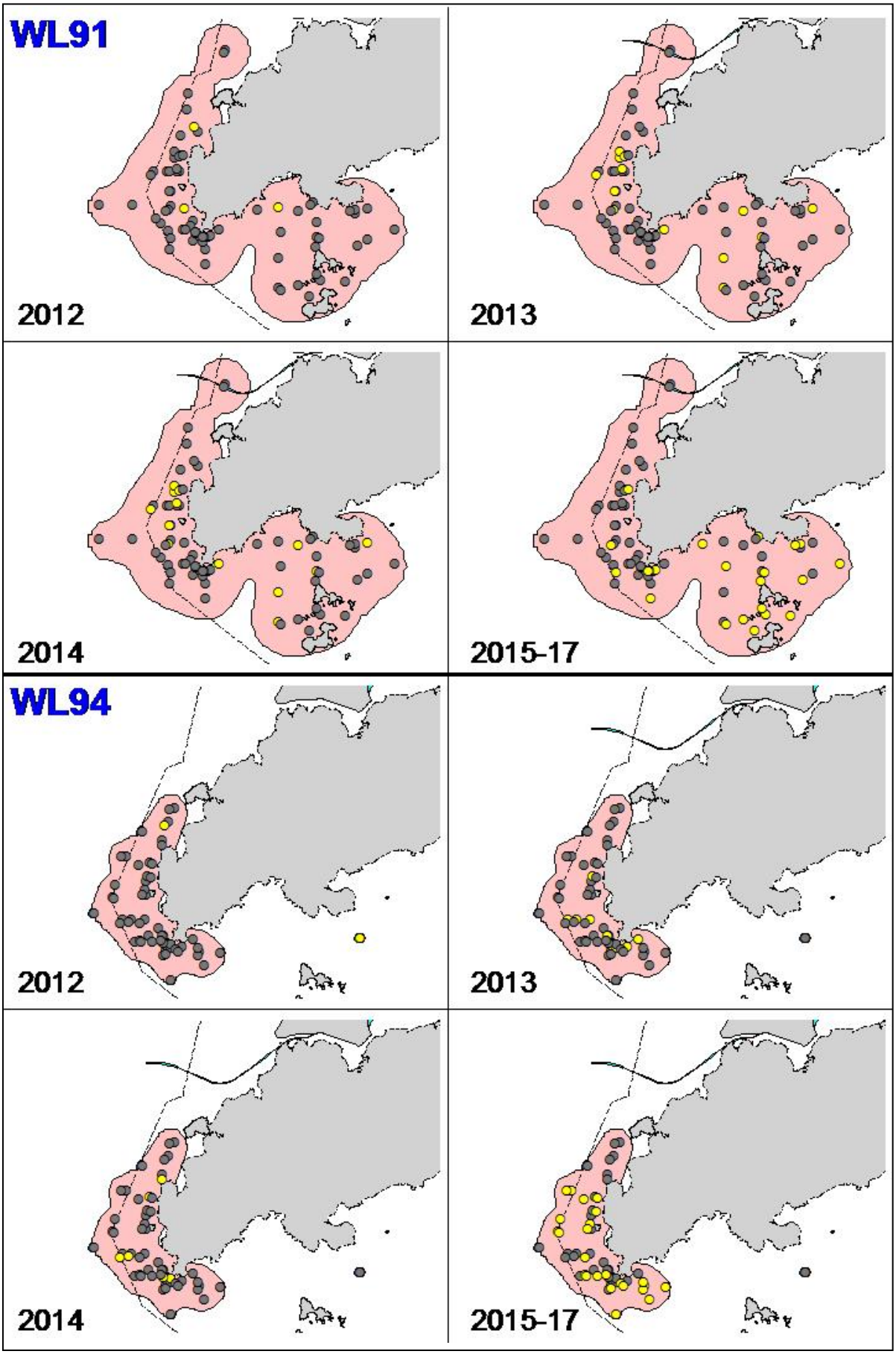

2013


2014

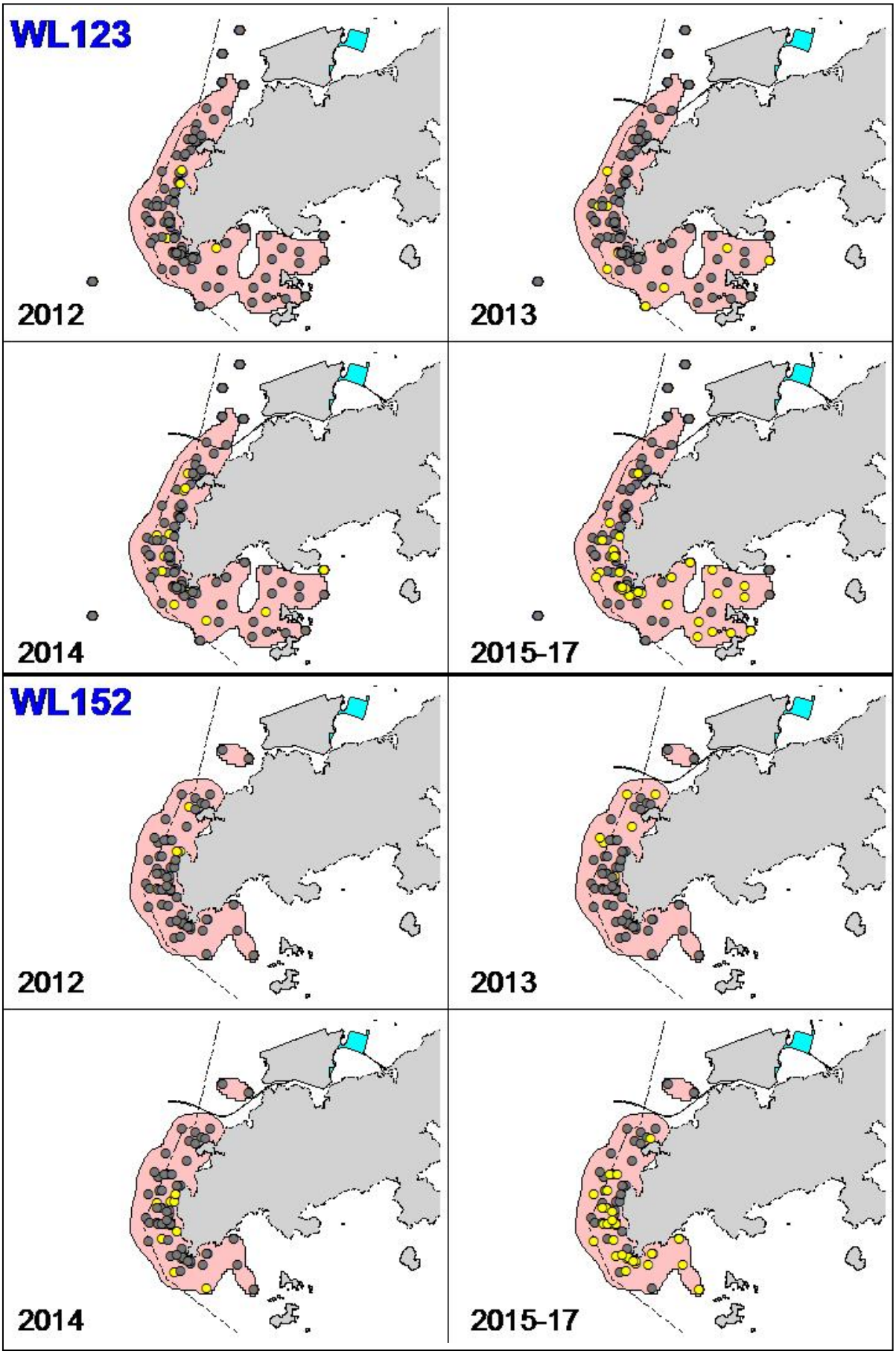

2015-17


WL47
2012
2013
2014
2015-16
WL62
2011
2013
2014
2015-17

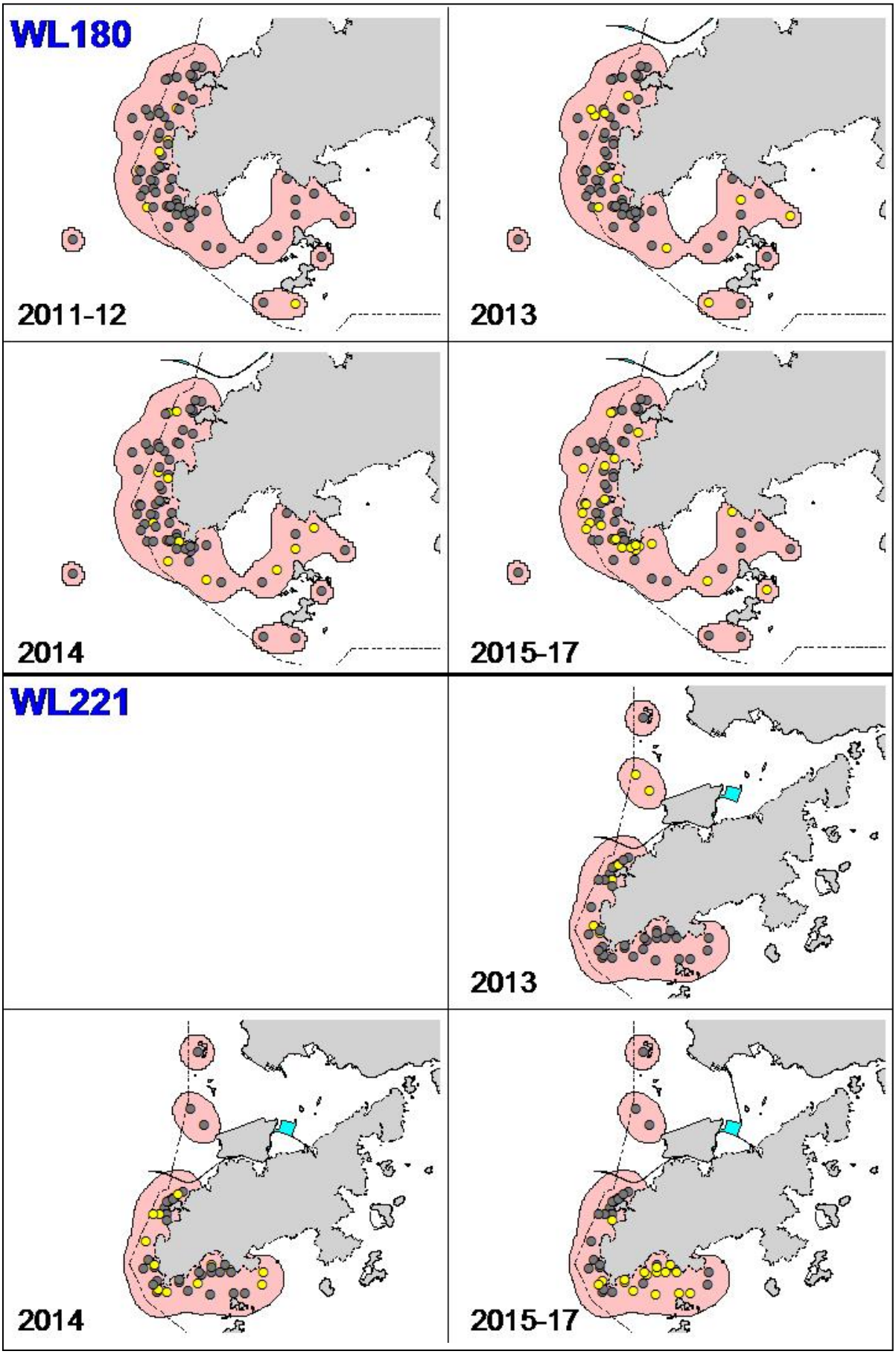
Appendix VI. (cont'd)



Appendix VI. (cont'd)



Appendix VI. (cont'd)



Appendix VI. (cont'd)