Monitoring of Chinese White Dolphins in Southwest Lantau Waters – Fifth Quarterly Report (March-May 2016)

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 will supplement the on-going EM&A monitoring results of the HZMB Hong Kong Projects in North and West Lantau waters, and provide 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 fifth 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 March to May 2016.

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 19 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2014). 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 March to May 2016, three sets of systematic line-transect vessel surveys were conducted on March 8th, April 22nd and May 6th to cover all transect lines in SWL survey area once per month. In addition, ten line-transect surveys were also conducted under the AFCD long-term marine mammal monitoring programme in SWL survey area on March 4th, March 14th, March 17th, March 29th, April 7th, April 20th, April 27th, May 4th, May 11th and May 30th (see Appendix I and Table 2). Such AFCD 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 212.61 km of survey effort was collected in SWL survey during this quarter (Table 2), with 97.0% 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 162.16 km and 50.45 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 466.68 km of survey effort was collected in SWL waters during the three-month period.

3.1.3. During the present quarter, 11 groups of 26 Chinese White Dolphins were sighted form

the present study's surveys and AFCD monitoring surveys conducted in SWL survey area (Table 2, Appendix II). Nine of the 11 dolphin sightings were made during on-effort search. Six of the nine on-effort sightings were made on primary lines, while the other three were made on secondary lines.

Table 2. Summary table of survey effort and dolphin sightings collected during the present quarter (i.e. March-May 2016)

Month	Date	Total Distance (km)	No. of CWD Sighting	No. of Individual
HYD				
March 2016	March 8th	71.00	1	2
April 2016	April 22nd	70.12	0	0
May 2016	May 6th	71.49	3	3
	Total	***212.61***	***4***	***5***
AFCD				
March 2016	March 4th, 14th, 17th, 29th	110.27	4	10
April 2016	April 7th, 20th, 27th	61.14	1	6
May 2016	May 4th, 11th, 30th	82.66	2	5
	Total	***254.07***	***7***	***21***

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 12 groups of 31 animals sighted (Appendix III).

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during the monitoring surveys from March to May 2016 is shown in Figure 1. Chinese White Dolphins occurred regularly in Southwest Lantau waters during this quarter, and the majority of their sightings were restricted to the waters near Fan Lau, with a few other sightings also made near the Soko Islands and Shui Hau Peninsula (Figure 1). On the contrary, they have mostly avoided the central and southern portions of the survey area (Figure 1).

3.2.2. On the contrary, the 12 groups of finless porpoises were mostly sighted at the eastern end of the survey area, primarily to the east of the Soko Islands. One porpoise sighting was made near Shek Pik along the South Lantau coastline (Figure 1).

3.2.3. Sighting distribution of dolphins in the present quarter (i.e. spring 2016) was largely similar to the three spring periods of 2013-15 (Figure 2), with most sightings concentrated near Fan Lau. However, dolphin sightings made during the spring months of 2015

appeared to be more widespread than the ones in 2016 or the previous two years.

3.3. Encounter rate

3.3.1. During the present three-month impact phase monitoring period (March-May 2016), 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).

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, 2014 and 2015, while the quarterly encounter rates deduced using the primary and secondary survey effort combined was compared with the ones deduced from all spring months in the past decade (2005-14) (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 March-May 2016 (i.e. spring 2016) (primary lines only, as well as both primary lines and secondary lines were used) in Southwest Lantau survey area in comparison to the ones deduced during spring months of 2013, 2014 and 2015, as well as the ones in the past decade (March-May 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
Spring 2016	1.92	2.03	2.24	3.61
Spring 2015	1.63	2.43	4.07	4.57
Spring 2014	2.35	3.40	2.35	8.26
Spring 2013	3.12	1.93	6.24	3.87
Spring of 2005-14		1.54		4.14

3.3.3. Dolphin encounter rates in the present quarter were more or less similar to the ones from the overall period of 2005-14 as well as the previous three spring periods. With no apparent temporal trend in the past few years, dolphin usage in SWL waters during spring months should be continuously monitored in order to detect any long-term trend.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from one to six individuals per group in SWL survey area between March and May 2016. The average dolphin group size for the three-month period was 2.4, which was much lower than the one recorded during the 2005-14 period (4.0).

3.4.2. Among the 11 dolphin groups sighted during this quarter, eight of them were small groups composed of only 1-3 dolphins per group. On the other hand, two groups were moderate in size with six dolphins per group.

3.4.3. Distribution of dolphins with moderate group sizes is shown in Figure 3, and both were located near Fan Lau.

3.5. Habitat use

3.5.1. From March to May 2016, only seven grids recorded dolphin presence in SWL survey area. The only grid that recorded high density of dolphins was located at Fan Lau, while the rest only recorded low dolphin densities, scattered near Fan Lau, Shui Hui Peninsula and around the Soko Islands (Figures 4a and 4b). However, the results should be treated with cautions as the amount of survey effort collected in each grid 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 spring months of 2012-15, the one in 2016 was similar to previous years, with the only high density area of dolphin occurrence consistently located near Fan Lau (Figures 5a and 5b).

3.6. Mother-calf pairs

3.6.1. During the three-month monitoring period, only one unspotted calf (UJ) was sighted in SWL waters. The rare occurrence of this mother-calf pair was located at Fan Lau (Figure 6).

3.7. Activities and associations with fishing boats

3.7.1. During the three-month monitoring period, only two dolphin sightings were associated with feeding activities, and both were located near Fan Lau (Figure 7).

3.7.2. None of the eleven dolphin groups were associated with any operating fishing boat during the present quarter.

3.8. Summary of photo-identification works

3.8.1. From March to May 2016, nearly 1,200 digital photographs of Chinese White Dolphins were taken during the SWL monitoring surveys for the photo-identification work.

3.8.2. In total, 14 individuals sighted 16 times altogether were identified (see the summary table in Appendix IV and photographs of identified individuals in Appendix V). The majority of identified individuals were sighted only once during the three-month period, with the exception of WL15 and WL168 being sighted twice.

3.9. Individual range use in SWL waters

3.9.1. Ranging patterns of the 14 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 2015-16 are shown separately for each individual in Appendix VII to facilitate the examination of any temporal changes in their range use in recent years.

3.9.2. Notably, only one of the 14 individuals (WL259) was sighted in SWL survey area for the first time during the present quarterly period (Appendix IV). This animal was a newly identified dolphin added to the photo-identification catalogue just in 2015 (Appendix VI). On the contrary, the other 13 individuals were re-sighted well within their home ranges including SWL waters during this three-month period (Appendix VI).

3.9.3. Notably, four individuals (WL15, WL68, WL168 and WL173) sighted in SWL waters during the present quarter were also sighted in WL waters during HKLR09 monitoring surveys in the same quarter. These showed their frequent movements between different survey areas around Lantau Island in this relatively brief period.

3.9.4. With their primary ranges centered in West Lantau waters in the past, several individuals (WL15, WL152, WL168, WL208 and WL216) showed apparent range extensions to Southwest Lantau waters in 2015-16. It remains to be seen whether some of these individuals begin to spend more times in SWL waters as part of their ranges.

4. References

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.

Hung, S. K. 2014. Monitoring of marine mammals in Hong Kong waters – data collection: final report (2013-14). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 231 pp.

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

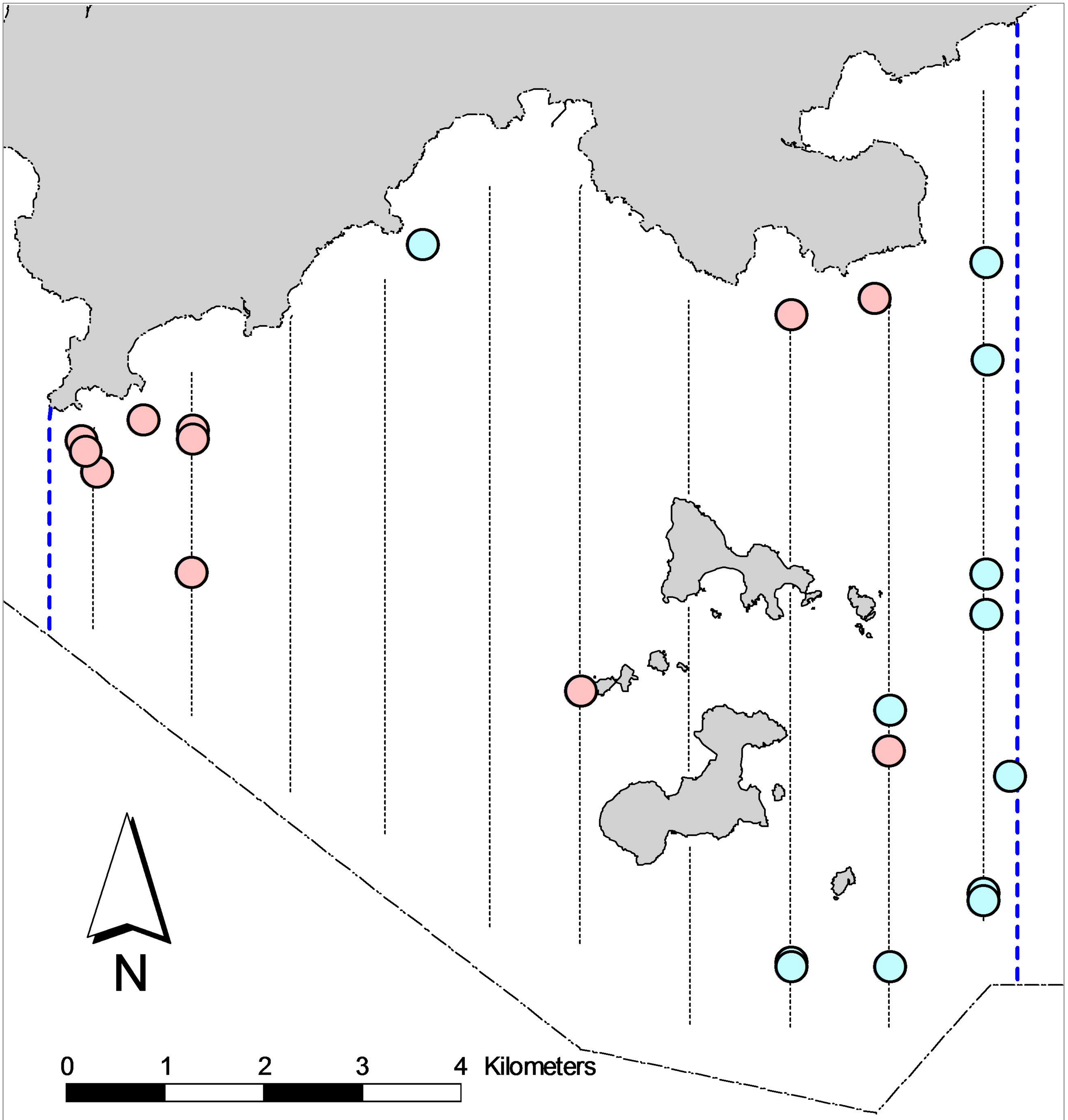


Figure 1. Distribution of marine mammal sightings (pink dots: Chinese White Dolphins; blue dots: Finless Porpoises) during monitoring surveys in Southwest Lantau survey area conducted in March-May 2016

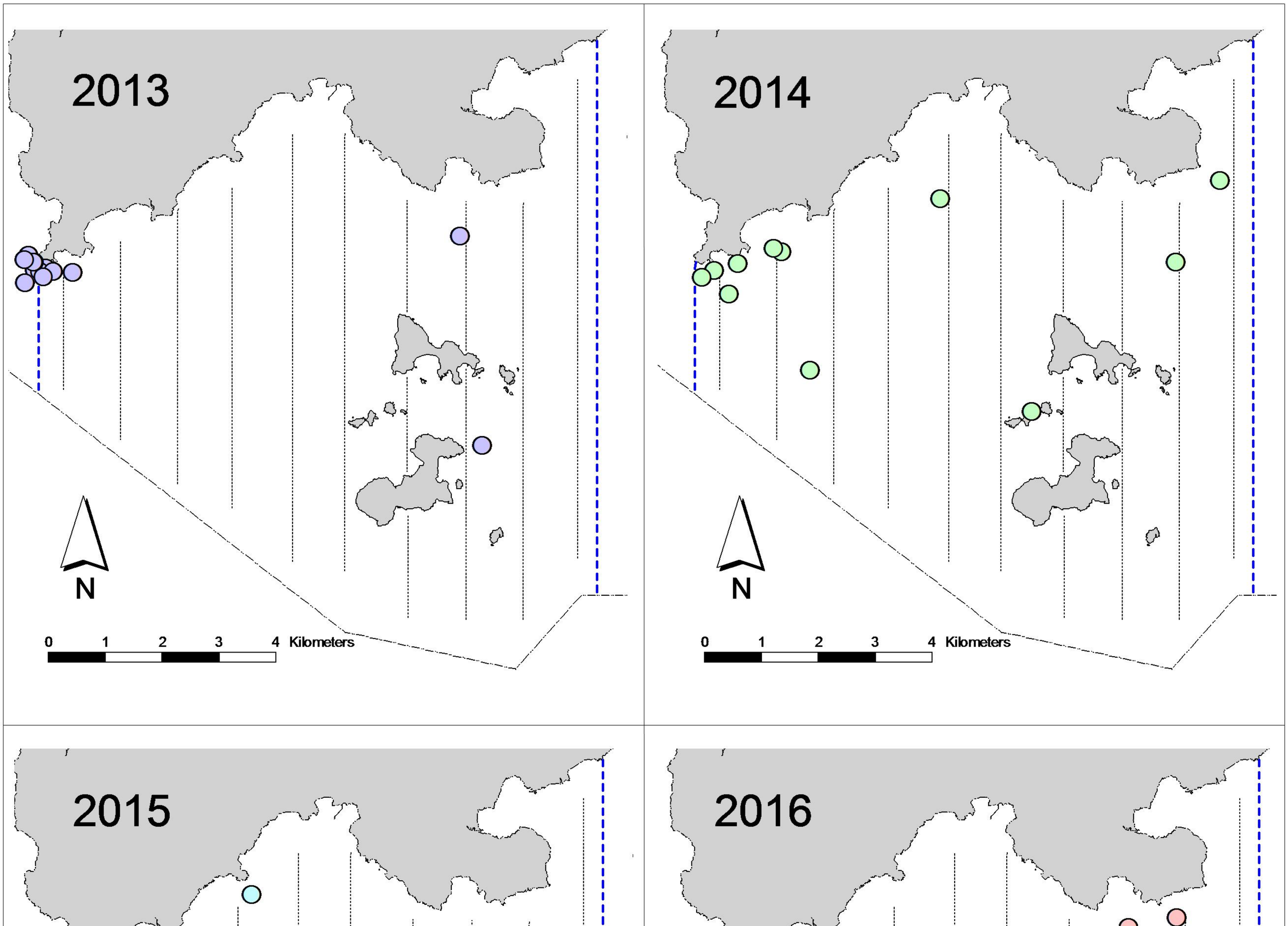


Figure 2. Comparisons on distribution of Chinese White Dolphin sightings in Southwest Lantau survey area during the spring months of 2013-2016

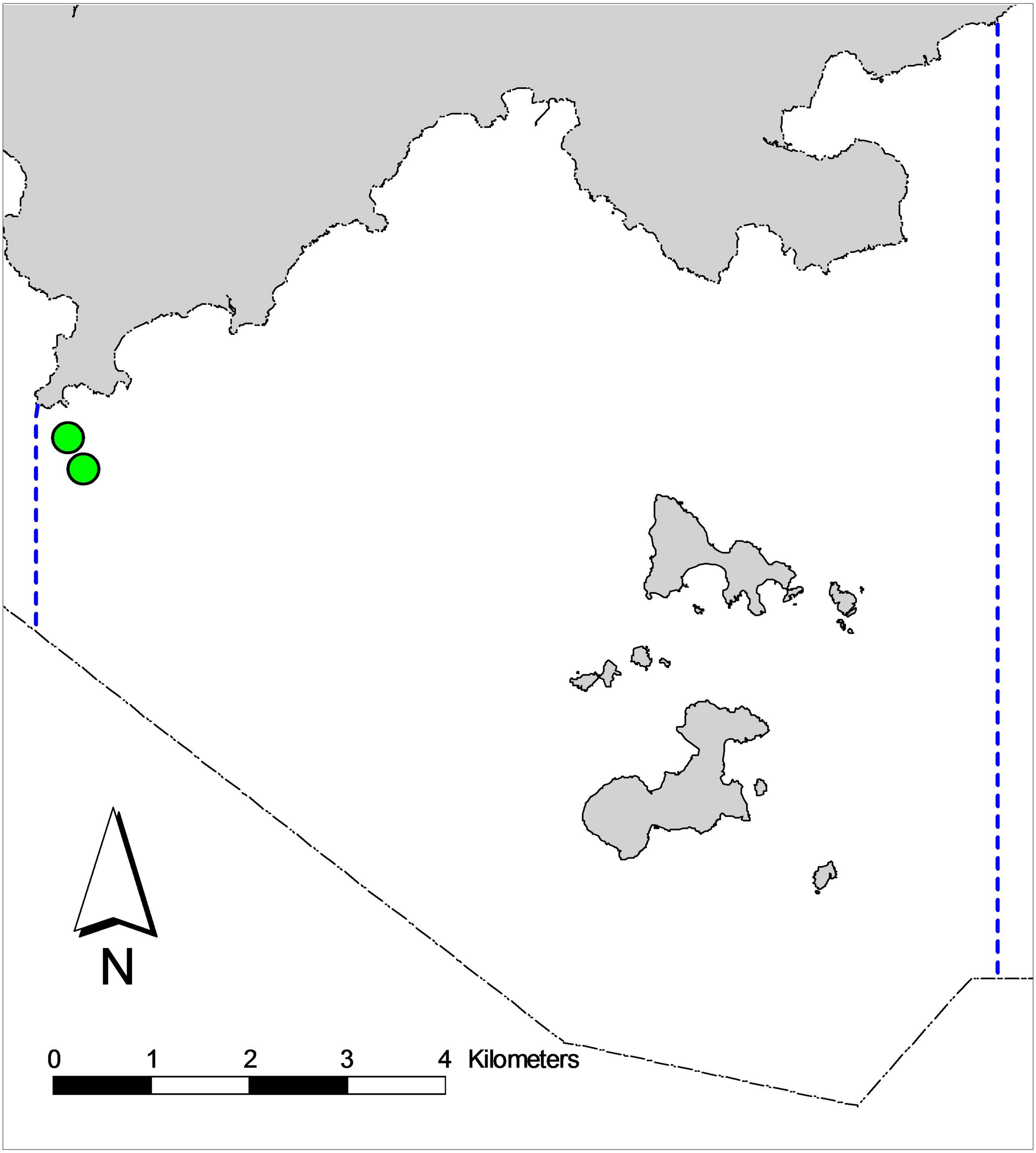


Figure 3. Distribution of Chinese White Dolphins with large group sizes of 5-9 dolphins (green dots) during SWL monitoring surveys conducted in March-May 2016

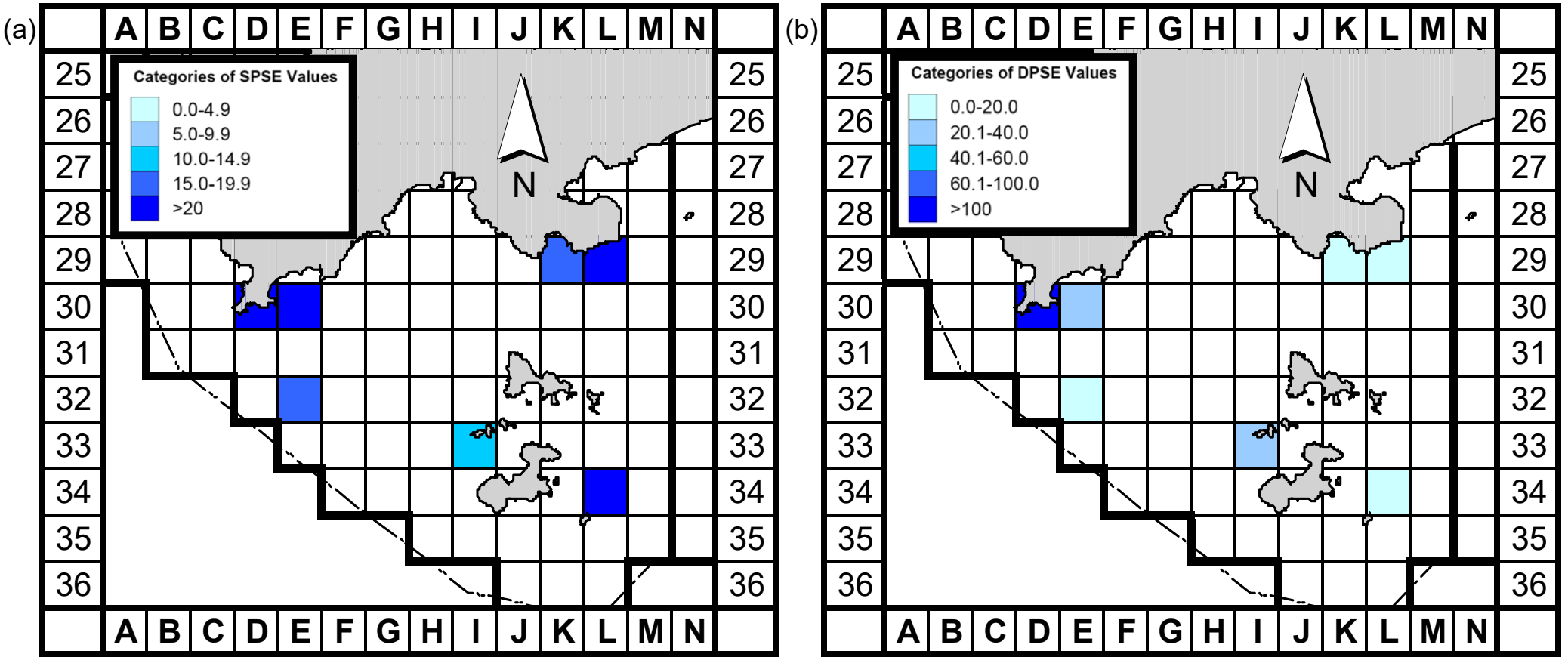


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during spring months (March-May) of 2016 (SPSE = no. of on-effort sightings per 100 units of survey effort)

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

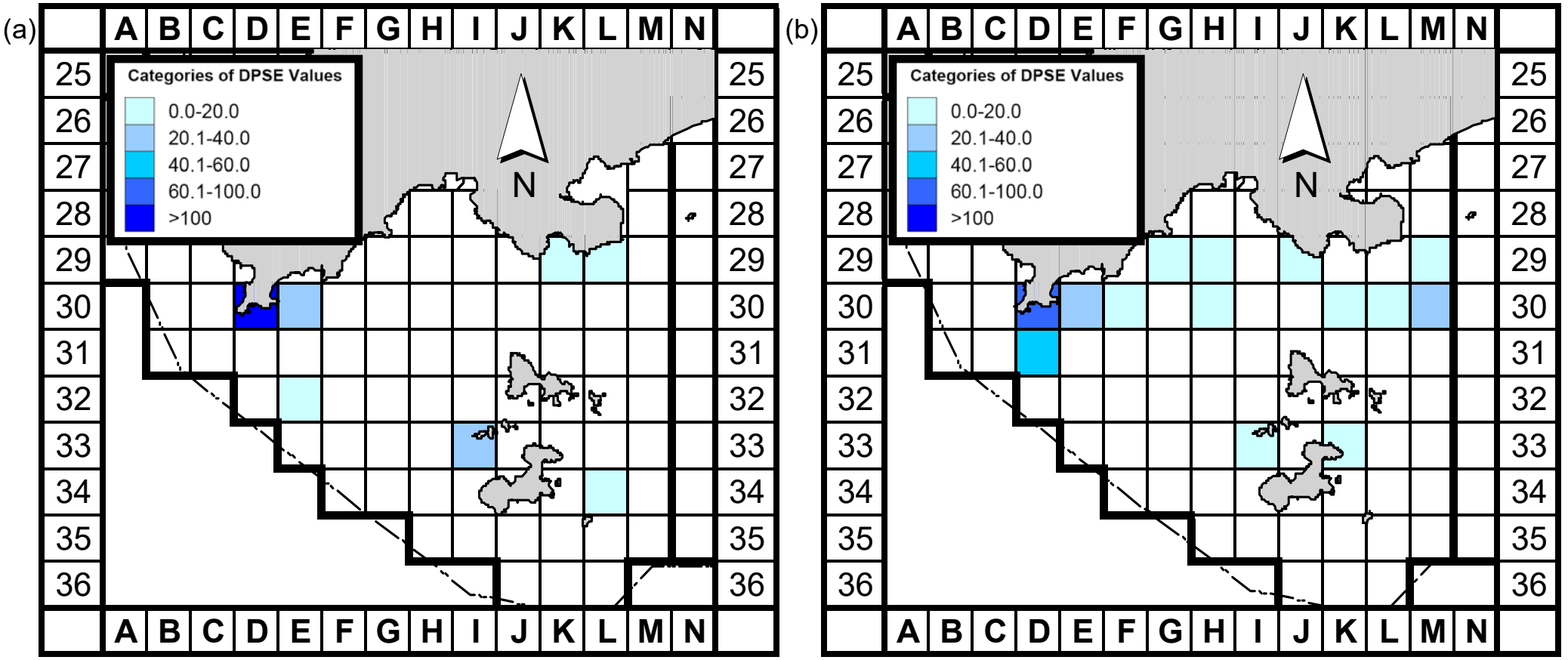


Figure 5a. Density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during spring months (March-May) of 2016 (DPSE = no. of dolphins per 100 units of survey effort)

Figure 5b. Density of Chinese white dolphins with corrected survey effort per km^2 in Southwest Lantau survey area during spring months (March-May) of 2012-2015 (DPSE = no. of dolphins per 100 units of survey effort)

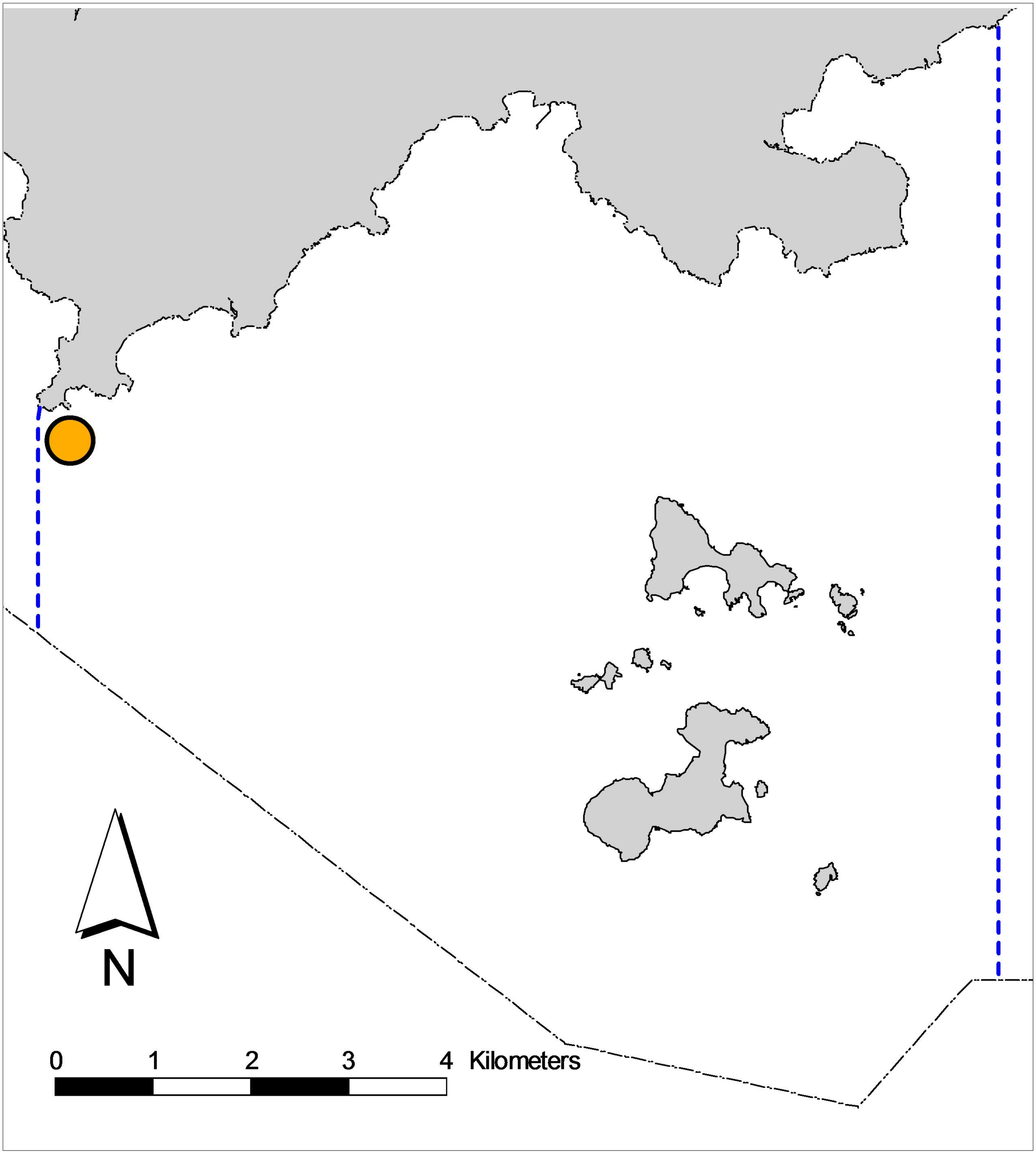


Figure 6. Distribution of young calf of Chinese White Dolphin during SWL monitoring surveys conducted in March-May 2016

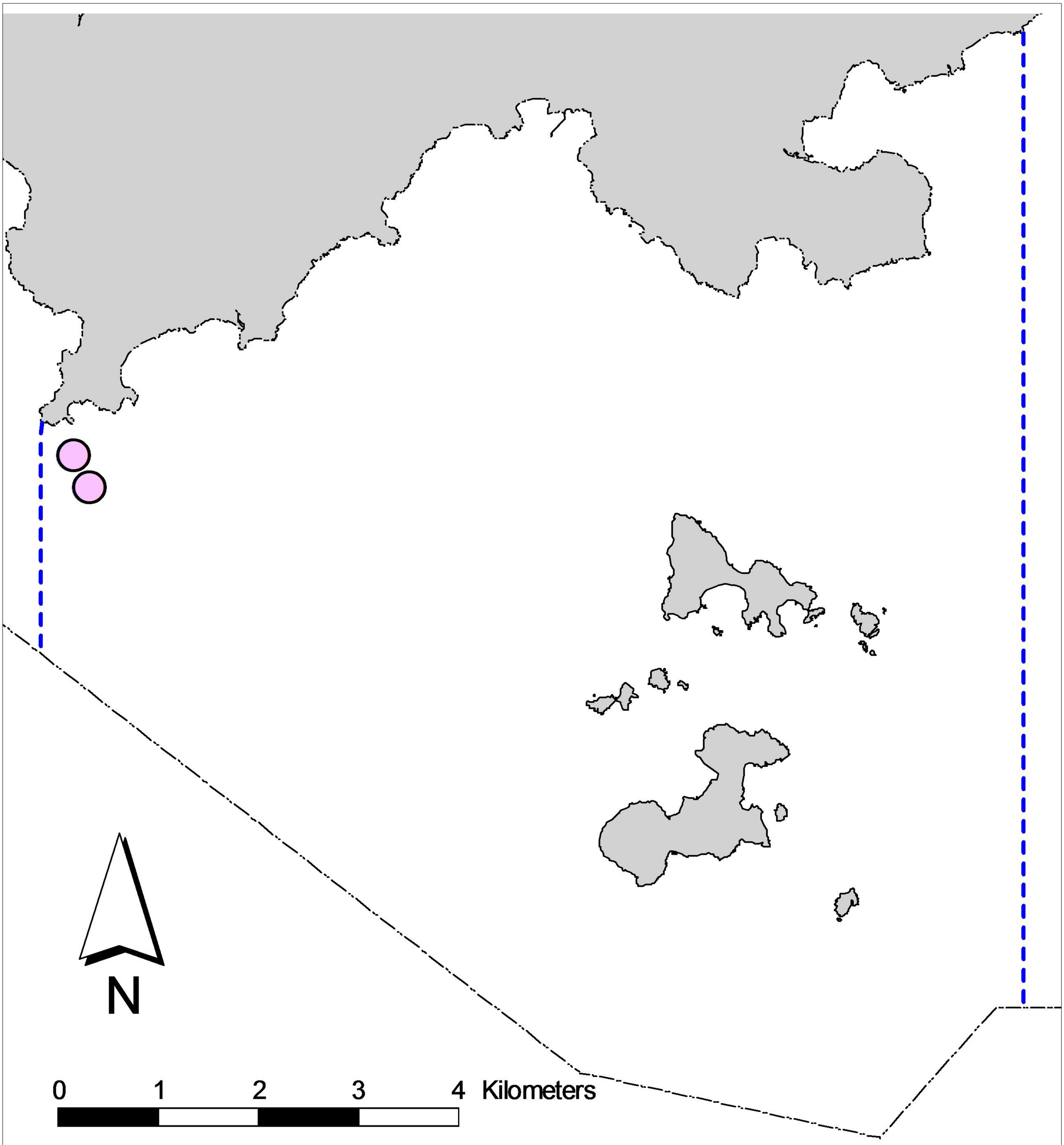


Figure 7. Distribution of Chinese White Dolphins engaged in feeding activities (purple dots) during SWL monitoring surveys conducted in March-May 2016

Appendix I. Survey Effort Database in SWL Survey Area (March-May 2016)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Mar-16	SW LANTAU	1	7.68	SPRING	STANDARD31516	HKCRP	P
4-Mar-16	SW LANTAU	2	9.45	SPRING	STANDARD31516	HKCRP	P
4-Mar-16	SW LANTAU	1	0.33	SPRING	STANDARD31516	HKCRP	S
4-Mar-16	SW LANTAU	2	7.87	SPRING	STANDARD31516	HKCRP	S
8-Mar-16	SW LANTAU	2	17.76	SPRING	STANDARD31516	HYD-HZMB	P
8-Mar-16	SW LANTAU	3	33.70	SPRING	STANDARD31516	HYD-HZMB	P
8-Mar-16	SW LANTAU	4	2.70	SPRING	STANDARD31516	HYD-HZMB	P
8-Mar-16	SW LANTAU	2	9.29	SPRING	STANDARD31516	HYD-HZMB	S
8-Mar-16	SW LANTAU	3	5.24	SPRING	STANDARD31516	HYD-HZMB	S
8-Mar-16	SW LANTAU	4	2.31	SPRING	STANDARD31516	HYD-HZMB	S
14-Mar-16	SW LANTAU	2	8.31	SPRING	STANDARD31516	HKCRP	P
14-Mar-16	SW LANTAU	3	4.00	SPRING	STANDARD31516	HKCRP	P
14-Mar-16	SW LANTAU	2	6.20	SPRING	STANDARD31516	HKCRP	S
14-Mar-16	SW LANTAU	3	3.08	SPRING	STANDARD31516	HKCRP	S
17-Mar-16	SW LANTAU	2	1.57	SPRING	STANDARD31516	HKCRP	P
17-Mar-16	SW LANTAU	3	22.78	SPRING	STANDARD31516	HKCRP	P
17-Mar-16	SW LANTAU	4	4.80	SPRING	STANDARD31516	HKCRP	P
17-Mar-16	SW LANTAU	2	5.00	SPRING	STANDARD31516	HKCRP	S
17-Mar-16	SW LANTAU	3	2.80	SPRING	STANDARD31516	HKCRP	S
17-Mar-16	SW LANTAU	4	4.30	SPRING	STANDARD31516	HKCRP	S
29-Mar-16	SW LANTAU	2	5.86	SPRING	STANDARD31516	HKCRP	P
29-Mar-16	SW LANTAU	3	5.60	SPRING	STANDARD31516	HKCRP	P
29-Mar-16	SW LANTAU	2	7.04	SPRING	STANDARD31516	HKCRP	S
29-Mar-16	SW LANTAU	3	3.10	SPRING	STANDARD31516	HKCRP	S
29-Mar-16	SW LANTAU	4	0.50	SPRING	STANDARD31516	HKCRP	S
7-Apr-16	SW LANTAU	2	3.67	SPRING	STANDARD31516	HKCRP	P
7-Apr-16	SW LANTAU	3	4.16	SPRING	STANDARD31516	HKCRP	P
7-Apr-16	SW LANTAU	2	2.27	SPRING	STANDARD31516	HKCRP	S
20-Apr-16	SW LANTAU	2	6.30	SPRING	STANDARD31516	HKCRP	P
20-Apr-16	SW LANTAU	3	4.88	SPRING	STANDARD31516	HKCRP	P
20-Apr-16	SW LANTAU	4	2.01	SPRING	STANDARD31516	HKCRP	P
20-Apr-16	SW LANTAU	2	4.19	SPRING	STANDARD31516	HKCRP	S
20-Apr-16	SW LANTAU	3	6.42	SPRING	STANDARD31516	HKCRP	S
22-Apr-16	SW LANTAU	0	0.50	SPRING	STANDARD31516	HYD-HZMB	P
22-Apr-16	SW LANTAU	1	21.16	SPRING	STANDARD31516	HYD-HZMB	P
22-Apr-16	SW LANTAU	2	32.23	SPRING	STANDARD31516	HYD-HZMB	P
22-Apr-16	SW LANTAU	1	2.59	SPRING	STANDARD31516	HYD-HZMB	S
22-Apr-16	SW LANTAU	2	11.10	SPRING	STANDARD31516	HYD-HZMB	S
22-Apr-16	SW LANTAU	3	2.54	SPRING	STANDARD31516	HYD-HZMB	S
27-Apr-16	SW LANTAU	2	18.35	SPRING	STANDARD31516	HKCRP	P
27-Apr-16	SW LANTAU	3	0.85	SPRING	STANDARD31516	HKCRP	P
27-Apr-16	SW LANTAU	2	8.04	SPRING	STANDARD31516	HKCRP	S
4-May-16	SW LANTAU	1	1.17	SPRING	STANDARD31516	HKCRP	P
4-May-16	SW LANTAU	2	13.15	SPRING	STANDARD31516	HKCRP	P
4-May-16	SW LANTAU	3	4.71	SPRING	STANDARD31516	HKCRP	P
4-May-16	SW LANTAU	0	0.90	SPRING	STANDARD31516	HKCRP	S
4-May-16	SW LANTAU	2	5.61	SPRING	STANDARD31516	HKCRP	S
4-May-16	SW LANTAU	3	3.20	SPRING	STANDARD31516	HKCRP	S
6-May-16	SW LANTAU	1	2.98	SPRING	STANDARD31516	HYD-HZMB	P
6-May-16	SW LANTAU	2	35.51	SPRING	STANDARD31516	HYD-HZMB	P
6-May-16	SW LANTAU	3	15.62	SPRING	STANDARD31516	HYD-HZMB	P
6-May-16	SW LANTAU	1	0.70	SPRING	STANDARD31516	HYD-HZMB	S

Appendix I. (cont'd)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
6-May-16	SW LANTAU	2	8.58	SPRING	STANDARD31516	HYD-HZMB	S
6-May-16	SW LANTAU	3	6.80	SPRING	STANDARD31516	HYD-HZMB	S
6-May-16	SW LANTAU	4	1.30	SPRING	STANDARD31516	HYD-HZMB	S
11-May-16	SW LANTAU	2	15.29	SPRING	STANDARD31516	HKCRP	P
11-May-16	SW LANTAU	2	11.43	SPRING	STANDARD31516	HKCRP	S
30-May-16	SW LANTAU	2	5.46	SPRING	STANDARD31516	HKCRP	P
30-May-16	SW LANTAU	3	9.84	SPRING	STANDARD31516	HKCRP	P
30-May-16	SW LANTAU	4	5.54	SPRING	STANDARD31516	HKCRP	P
30-May-16	SW LANTAU	3	6.36	SPRING	STANDARD31516	HKCRP	S

Appendix II. Chinese White Dolphin Sighting Database in SWL Survey Area (March-May 2016)

(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
4-Mar-16	1	1313	1	SW LANTAU	1	167	ON	HKCRP	806159	803477	SPRING	NONE	P
4-Mar-16	2	1329	1	SW LANTAU	1	421	ON	HKCRP	804808	803474	SPRING	NONE	P
8-Mar-16	1	1317	2	SW LANTAU	2	223	ON	HYD-HZMB	803671	807422	SPRING	NONE	P
14-Mar-16	1	1340	6	SW LANTAU	2	331	ON	HKCRP	806062	802353	SPRING	NONE	S
14-Mar-16	2	1353	2	SW LANTAU	2	136	ON	HKCRP	806260	802982	SPRING	NONE	S
20-Apr-16	2	1359	6	SW LANTAU	3	ND	OFF	HKCRP	805762	802507	SPRING	NONE	
4-May-16	4	1239	4	SW LANTAU	2	ND	OFF	HKCRP	805962	802394	SPRING	NONE	
4-May-16	5	1255	1	SW LANTAU	2	171	ON	HKCRP	806081	803477	SPRING	NONE	P
6-May-16	1	1442	1	SW LANTAU	2	338	ON	HYD-HZMB	807266	809543	SPRING	NONE	P
6-May-16	2	1452	1	SW LANTAU	2	10	ON	HYD-HZMB	807430	810388	SPRING	NONE	S
6-May-16	3	1518	1	SW LANTAU	2	412	ON	HYD-HZMB	803100	810536	SPRING	NONE	P

Appendix III. Finless Porpoise Sighting Database in SWL Survey Area (March-May 2016)

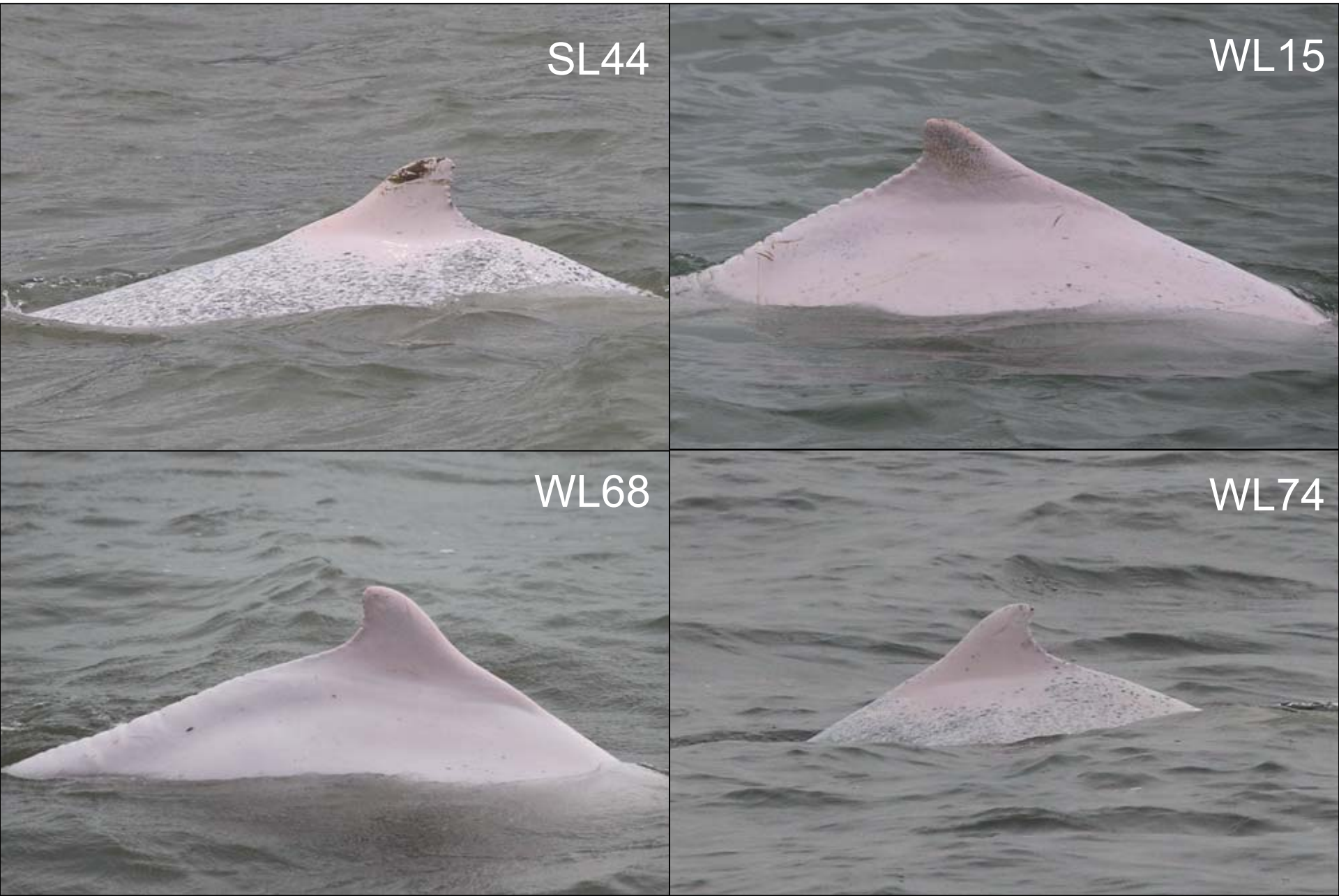
(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	P/S
14-Mar-16	3	1540	1	SW LANTAU	1	ND	OFF	HKCRP	802866	811763	SPRING	
17-Mar-16	3	1345	4	SW LANTAU	4	40	ON	HKCRP	803488	810547	SPRING	P
22-Apr-16	1	1216	2	SW LANTAU	2	37	ON	HYD-HZMB	807937	805811	SPRING	S
22-Apr-16	2	1431	4	SW LANTAU	2	174	ON	HYD-HZMB	801087	809552	SPRING	P
22-Apr-16	3	1531	3	SW LANTAU	0	219	ON	HYD-HZMB	801041	810553	SPRING	P
22-Apr-16	4	1555	1	SW LANTAU	1	13	ON	HYD-HZMB	804793	811519	SPRING	P
22-Apr-16	5	1604	4	SW LANTAU	1	150	ON	HYD-HZMB	806830	811532	SPRING	P
27-Apr-16	5	1242	3	SW LANTAU	2	103	ON	HKCRP	801748	811493	SPRING	P
27-Apr-16	6	1300	1	SW LANTAU	2	74	ON	HKCRP	801053	809542	SPRING	P
6-May-16	4	1551	2	SW LANTAU	2	215	ON	HYD-HZMB	801670	811493	SPRING	P
11-May-16	3	1213	3	SW LANTAU	2	229	ON	HKCRP	807772	811513	SPRING	P
11-May-16	4	1230	3	SW LANTAU	2	280	ON	HKCRP	804405	811518	SPRING	P

Appendix IV. Individual dolphins identified during SWL monitoring surveys in March-May 2016

ID#	DATE	STG#	TYPE
SL44	20/04/16	2	HKCRP
WL15	04/05/16	5	HKCRP
	06/05/16	2	HYD-HZMB
WL68	20/04/16	2	HKCRP
WL74	14/03/16	1	HKCRP
WL91	08/03/16	1	HYD-HZMB
WL130	14/03/16	1	HKCRP
WL142	20/04/16	2	HKCRP
WL152	04/05/16	4	HKCRP
WL168	20/04/16	2	HKCRP
	04/05/16	4	HKCRP
WL173	08/03/16	1	HYD-HZMB
WL208	14/03/16	1	HKCRP
WL216	14/03/16	1	HKCRP
WL259	20/04/16	2	HKCRP
WL263	14/03/16	1	HKCRP

Appendix V. Fourteen individual dolphins that were identified in Southwest Lantau survey area during March-May 2016

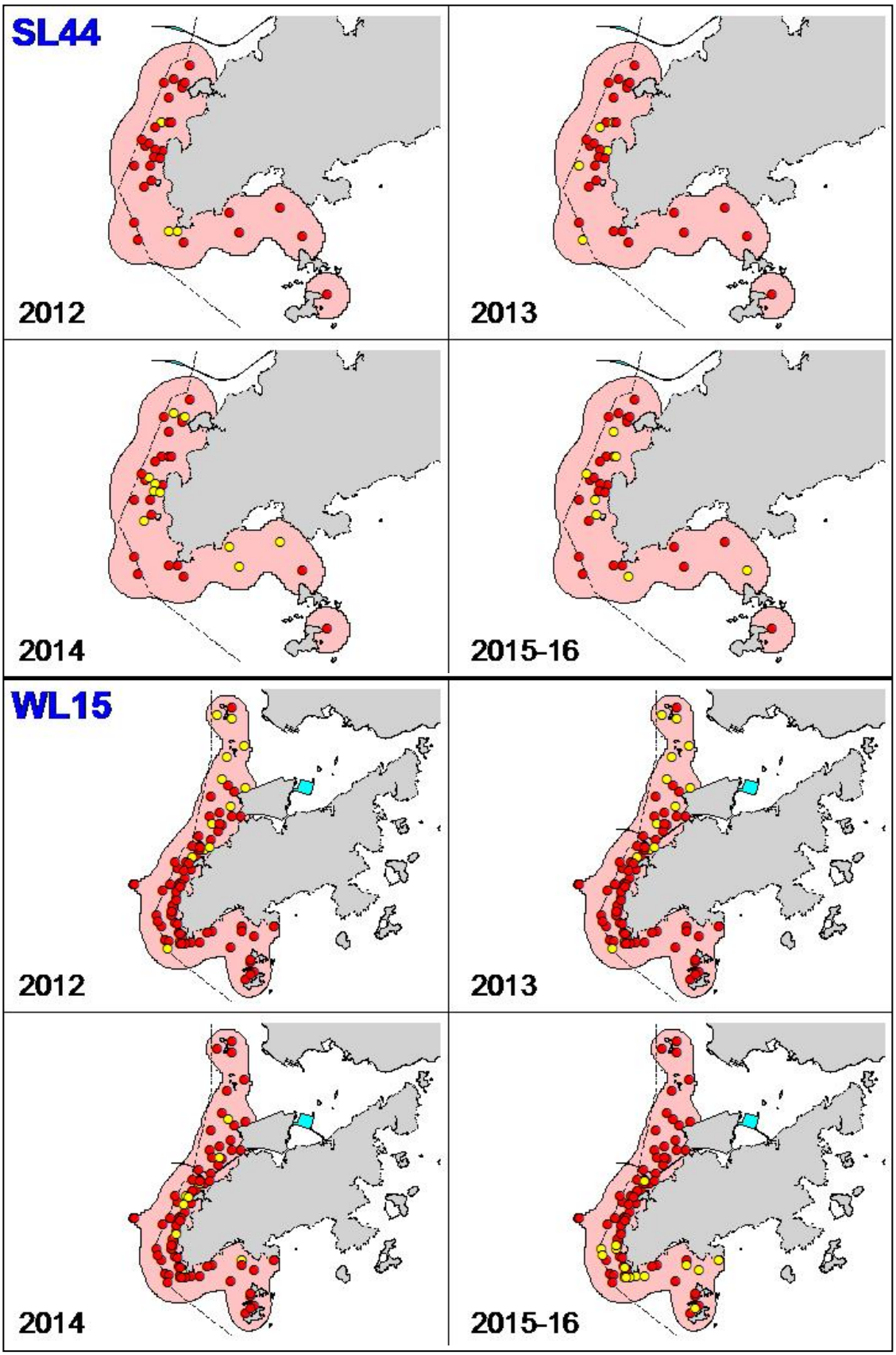



WL91
WL130
WL142
WL152

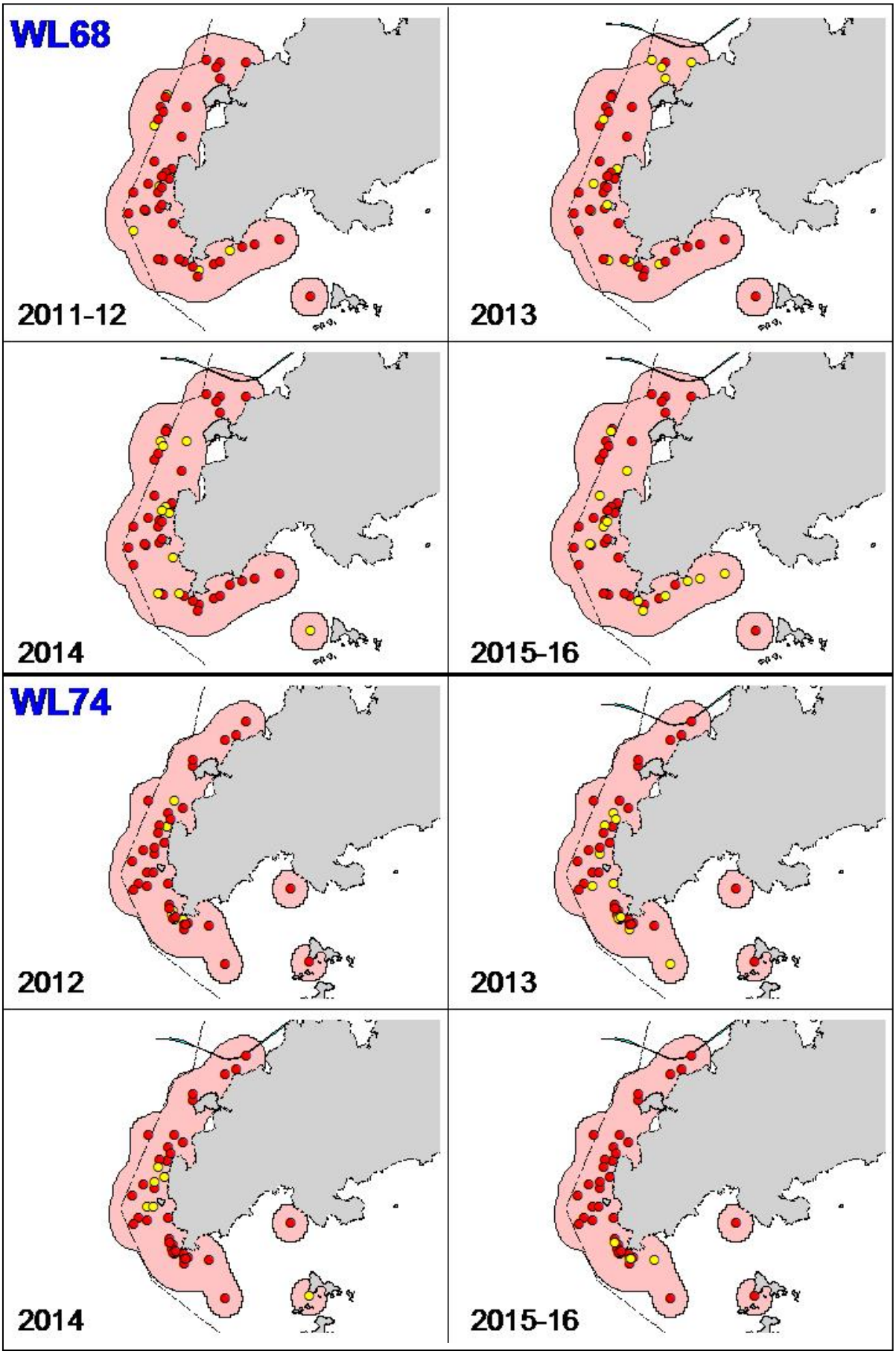
Appendix V. (cont'd)

Appendix V. (cont'd)

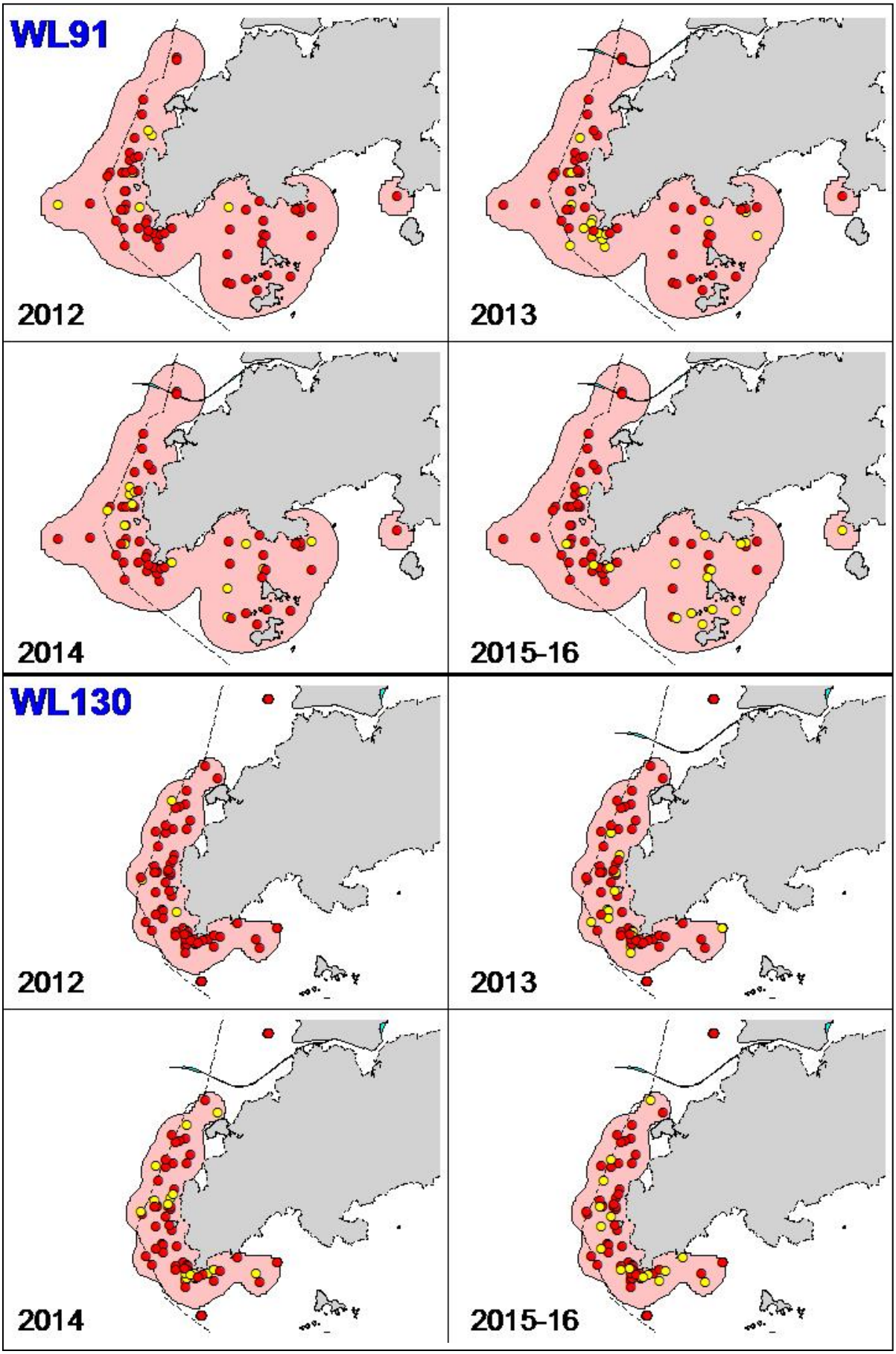
Appendix VI. Ranging patterns (95% kernel ranges) of 14 individual dolphins that were sighted in Southwest Lantau survey area during March-May 2016 (note: yellow dots indicates sightings made in the respective years of 2012-16)

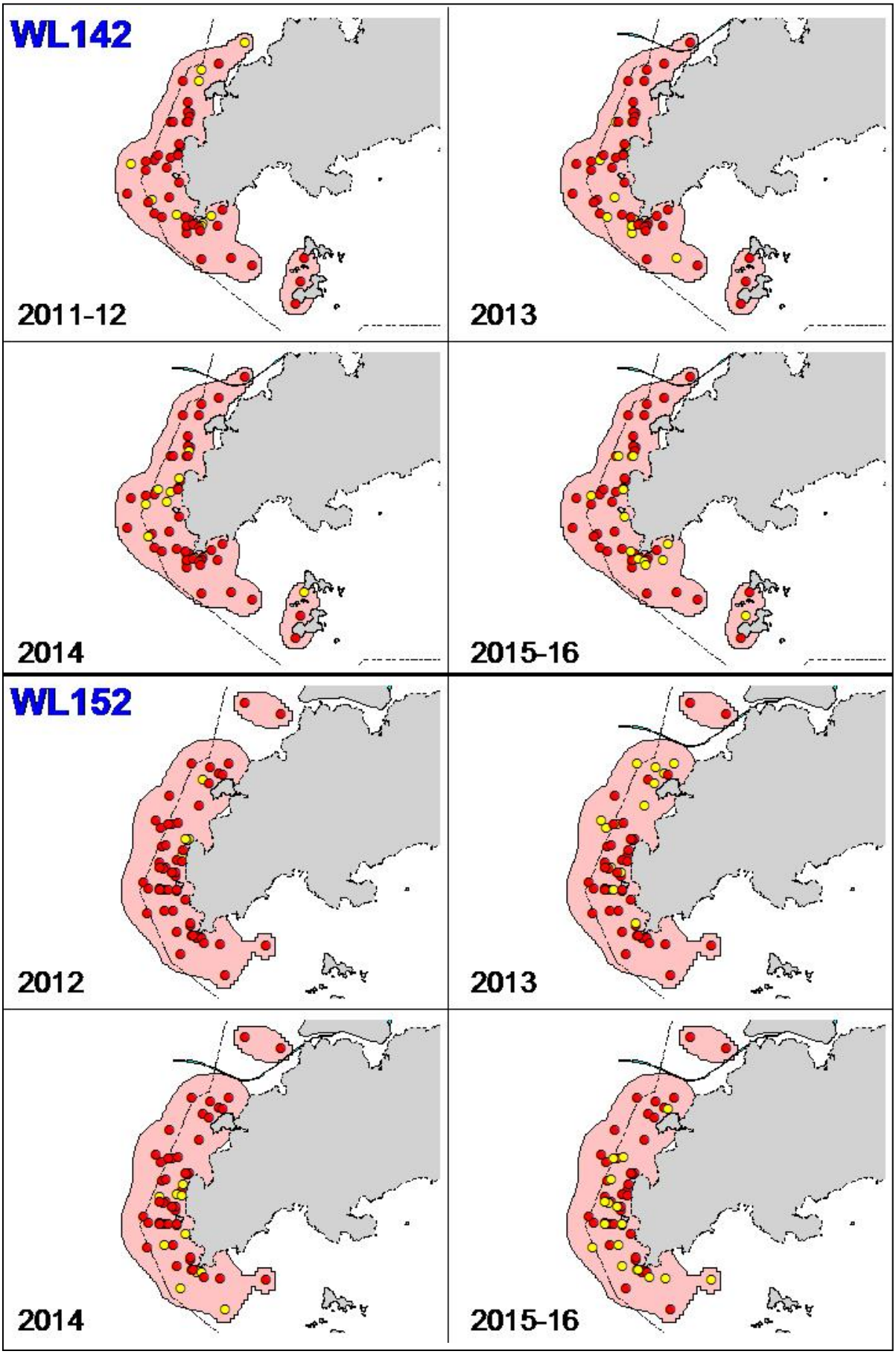


Appendix VI. (cont'd)

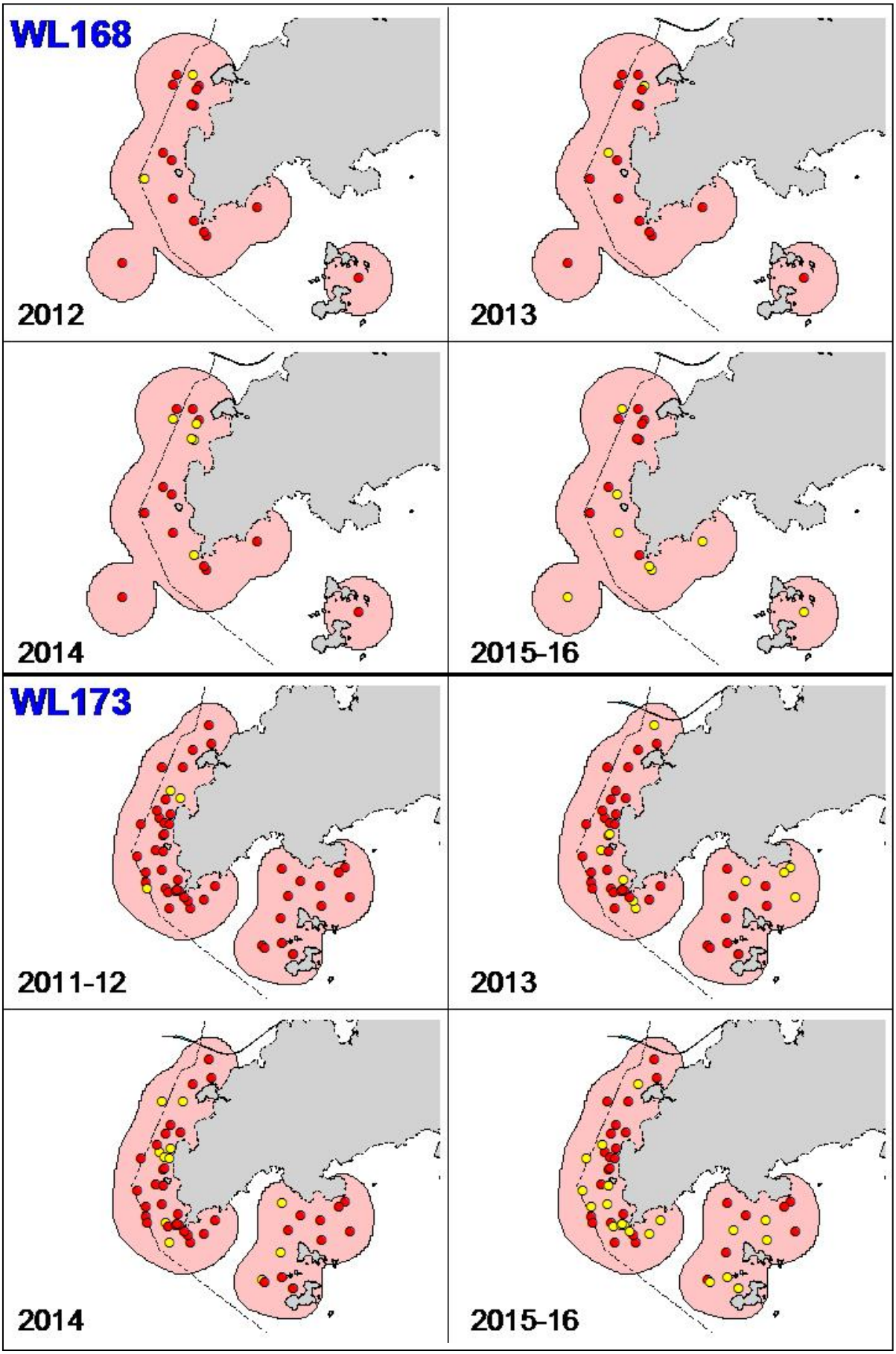


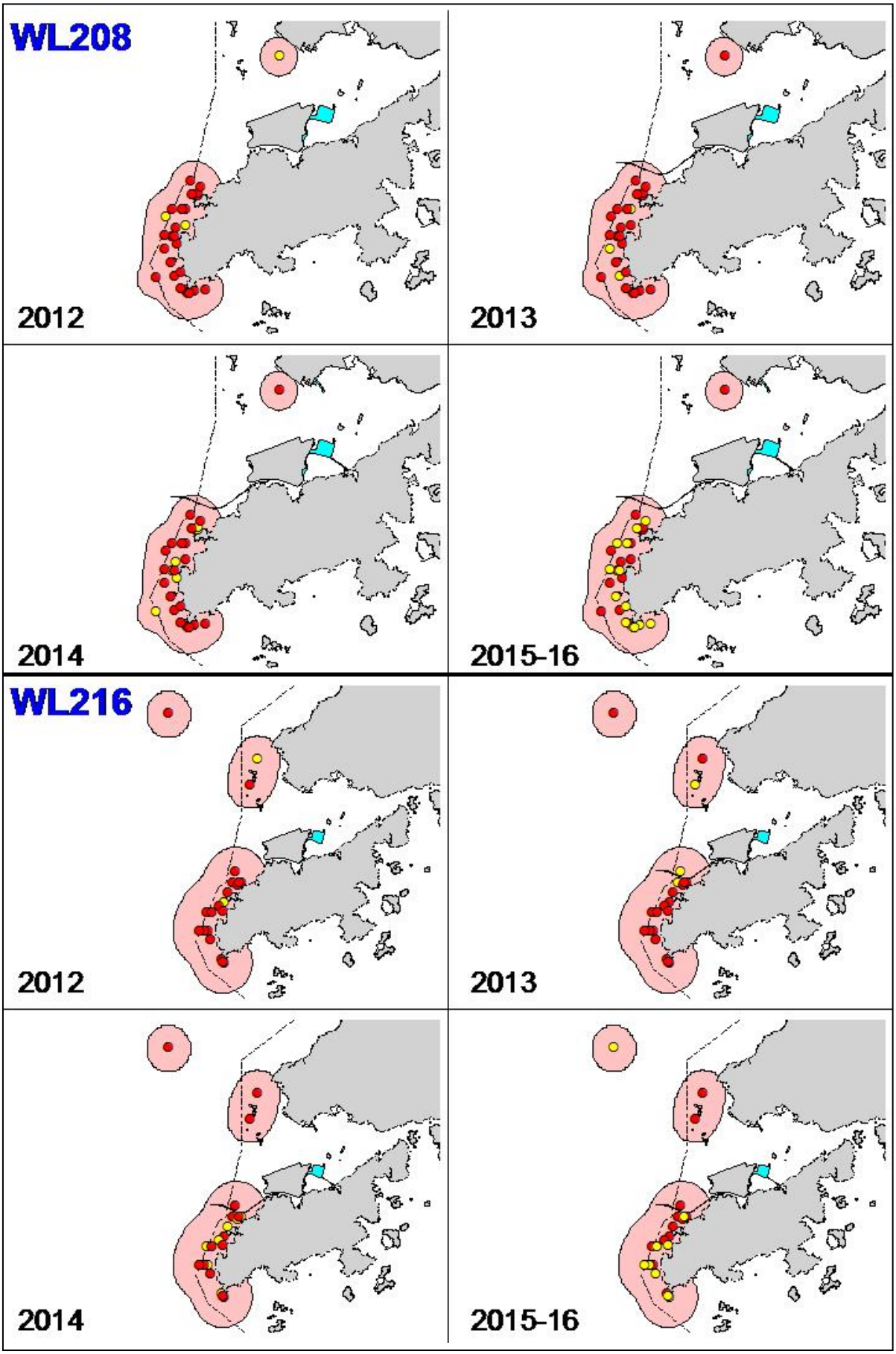
Appendix VI. (cont'd)

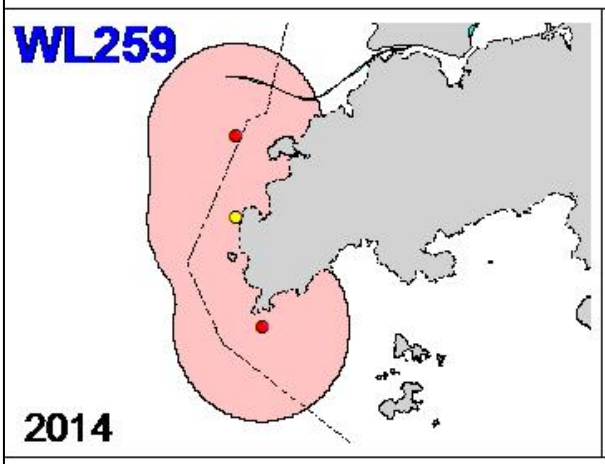


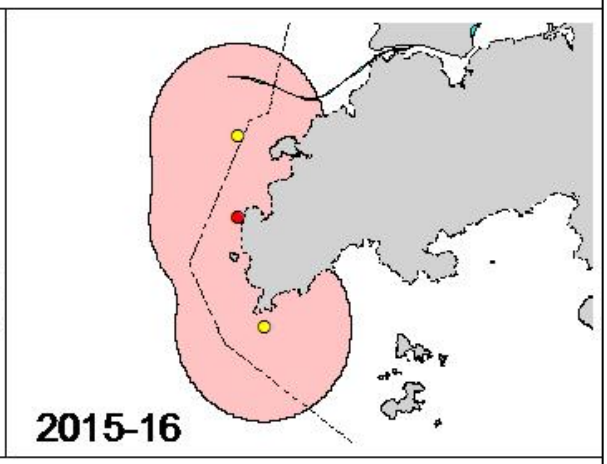

WL142
2011-12
2013
2014
2015-16
WL152
2012
2013
2014
2015-16

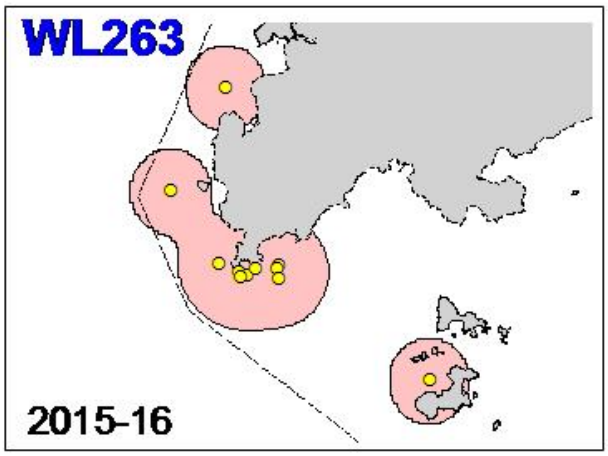
Appendix VI. (cont'd)




WL208
2012
2013
2014
2015-16
WL216
2012
2013
2014
2015-16


WL259
2014


2015-16


WL263
2015-16