

Monitoring of Chinese White Dolphins in Southwest Lantau Waters – Seventh Quarterly Report (September-November 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 seventh 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 September to November 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 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-km² grids in SWL survey area on GIS. Sighting densities (number of on-effort sightings per km²) and dolphin densities (total number of dolphins from on-effort sightings per km²) 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 sightings per 100 units of survey effort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of dolphins per 100 units of survey effort. Among the 1-km² 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-km² 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 September to November 2016, three sets of systematic line-transect vessel surveys were conducted on September 19th, October 24th and November 14th 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 September 6th, September 22nd, September 26th, October 6th, October 20th, October 26th, November 4th, November 9th and November 21st (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 212.58 km of survey effort was collected in SWL surveys during this quarter (Table 2), with 100% 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 162.15 km and 50.43 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 491.41 km of survey effort was collected in SWL waters during the three-month period.

- 3.1.3. During the present quarter, 8 groups of 15 Chinese White Dolphins were sighted from the present study's surveys and AFCD monitoring surveys conducted in SWL survey area (Table 2, Appendix II). Seven of the eight dolphin sightings were made during on-effort search. All except one on-effort sighting were made on primary lines.

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

Month	Date	Total Distance (km)	No. of CWD Sighting	No. of Individual
HYD				
September 2016	September 19 th	67.11	2	5
October 2016	October 24 th	75.10	0	0
November 2016	November 14 th	70.37	1	1
	Total	212.58	3	6
AFCD				
September 2016	September 6 th , 22 nd , 26 th	106.43	4	8
October 2016	October 6 th , 20 th , 26 th	69.60	0	0
November 2016	November 4 th , 9 th , 21 st	102.80	1	1
	Total	278.83	5	9

- 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 seven groups of 17 animals sighted (Appendix III).

3.2. *Distribution*

- 3.2.1. Distribution of dolphin sightings made during the monitoring surveys from September to November 2016 is shown in Figure 1. Chinese White Dolphins occurred infrequently in SWL waters during this quarter, with the majority of their sightings being made toward the western end of the survey area near Fan Lau (Figure 1). On the contrary, the dolphins have mostly avoided the southern and eastern portions of the survey area as in previous quarters (Figure 1).
- 3.2.2. On the contrary, the finless porpoises were mostly sighted to the southeastern end of the survey area, mainly in offshore waters to the southeast of Soko Islands, with no overlap with the dolphin sightings at all (Figure 1).
- 3.2.3. Notably, sighting distribution of dolphins in the present quarter (i.e. autumn 2016) was quite different from the previous autumn periods of 2013-15 (Figure 2). Besides a much lower occurrence by the dolphins, they did not occur around the Soko Islands and near

Shui Hau Peninsula at all during the autumn of 2016, as compared to their frequent occurrences in these areas in previous autumn periods (Figure 2).

3.3. *Encounter rate*

- 3.3.1. During the present three-month monitoring period (September-November 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 autumn 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 September - November 2016 (i.e. autumn 2016) (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 autumn months of 2013, 2014 and 2015, 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
Autumn 2016	1.73	1.47	3.75	2.93
Autumn 2015	3.36	4.01	14.38	17.38
Autumn 2014	9.66	9.08	46.53	40.34
Autumn 2013	8.24	11.21	28.27	36.62
Autumn of 2005-14		4.29		17.05

- 3.3.3. Dolphin encounter rates in the present quarter were much lower than each of the previous three autumn periods in 2013-15, as well as the overall autumn period of 2005-14 (Table 3). Such exceptionally low dolphin usage of SWL survey area in the autumn of 2016 was alarming, as this was in stark contrast to the increasing dolphin usage in the past three

years. The dramatic decline in dolphin usage of SWL survey area in the autumn of 2016 should be continuously monitored to determine whether such recent decline is persistent.

3.4. *Group size*

3.4.1. Group size of Chinese White Dolphins ranged from one to five individuals per group in SWL survey area between September and November 2016. The average dolphin group size for the three-month period was only 1.9, which was much lower than the one recorded during the autumn period of 2005-14 (4.0).

3.4.2. Among the eight dolphin groups sighted during this quarter, seven of them were small groups composed of only 1-3 dolphins per group, while there was only one medium-size group of five animals (Appendix II).

3.4.3. Distribution of this medium-sized group is shown in Figure 3, which was located in the waters south of Fan Lau (Figure 3).

3.5. *Habitat use*

3.5.1. From September to November 2016, only six grids have recorded dolphin presence in SWL survey area, and the moderately high to high density grids were located to the south of Fan Lau (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 autumn months of 2012-15, the one in 2016 was very different from the previous years, with the only high density area of dolphin occurrence found near Fan Lau. This is in contrary to the previous habitat use pattern in the autumn months of 2012-15 that dolphin occurrences were consistently located between the Soko Islands, along the stretch of coastline from Fan Lau to Kau Ling Chung as well as Shui Hau Peninsula (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 September to November 2016, only one sighting of a lone dolphin was associated with feeding activity in SWL survey area, which was located near Kau Ling Chung

(Figure 6). None of the eight sightings was associated with any socializing, traveling or milling/resting activity during this quarterly period.

3.7.2. Notably, one of the eight dolphin groups was associated with operating purse-seiner during the present quarter.

3.8. *Summary of photo-identification works*

3.8.1. Between September and November 2016, only 500 digital photographs of Chinese White Dolphins were taken during the SWL monitoring surveys for the photo-identification work.

3.8.2. In total, nine individuals sighted nine times altogether were identified (see the summary table in Appendix IV and photographs of identified individuals in Appendix V). All identified individuals were sighted only once during the three-month period, and none of them was sighted with a calf.

3.9. *Individual range use in SWL waters*

3.9.1. Ranging patterns of these nine 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 VI to facilitate the examination of any temporal changes in their range use in recent years.

3.9.2. All nine individuals were re-sighted well within their home ranges including SWL waters during this three-month period (Appendix VI). Three individuals (WL69, WL123 and WL230) sighted in SWL waters during the present quarter were also sighted in WL waters during HKLR09 monitoring surveys in the same quarter. Another individual, NL269, sighted in SWL waters during the present quarter was 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, one individual (NL120) that used to range primarily in North Lantau waters in the past has spent significantly more time in Southwest Lantau in 2015-16 (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, several individuals (e.g. SL05, WL123, WL235) showed apparent range extensions to Southwest Lantau

waters in 2015-16 (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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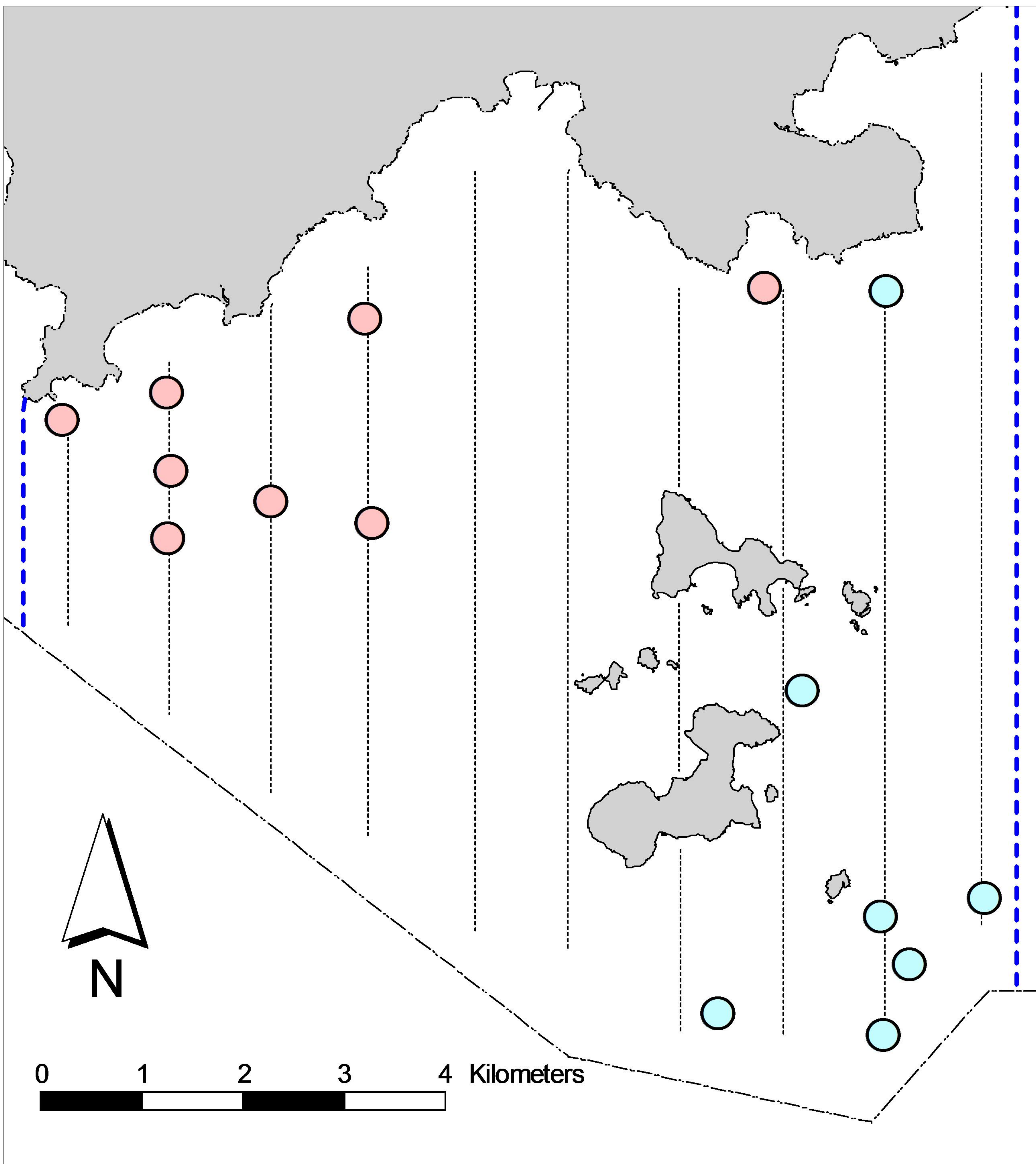


Figure 1. Distribution of marine mammal sightings (pink dots: Chinese White Dolphins; blue dots: Finless Porpoises) during monitoring surveys in Southwest Lantau survey area conducted in September - November 2016

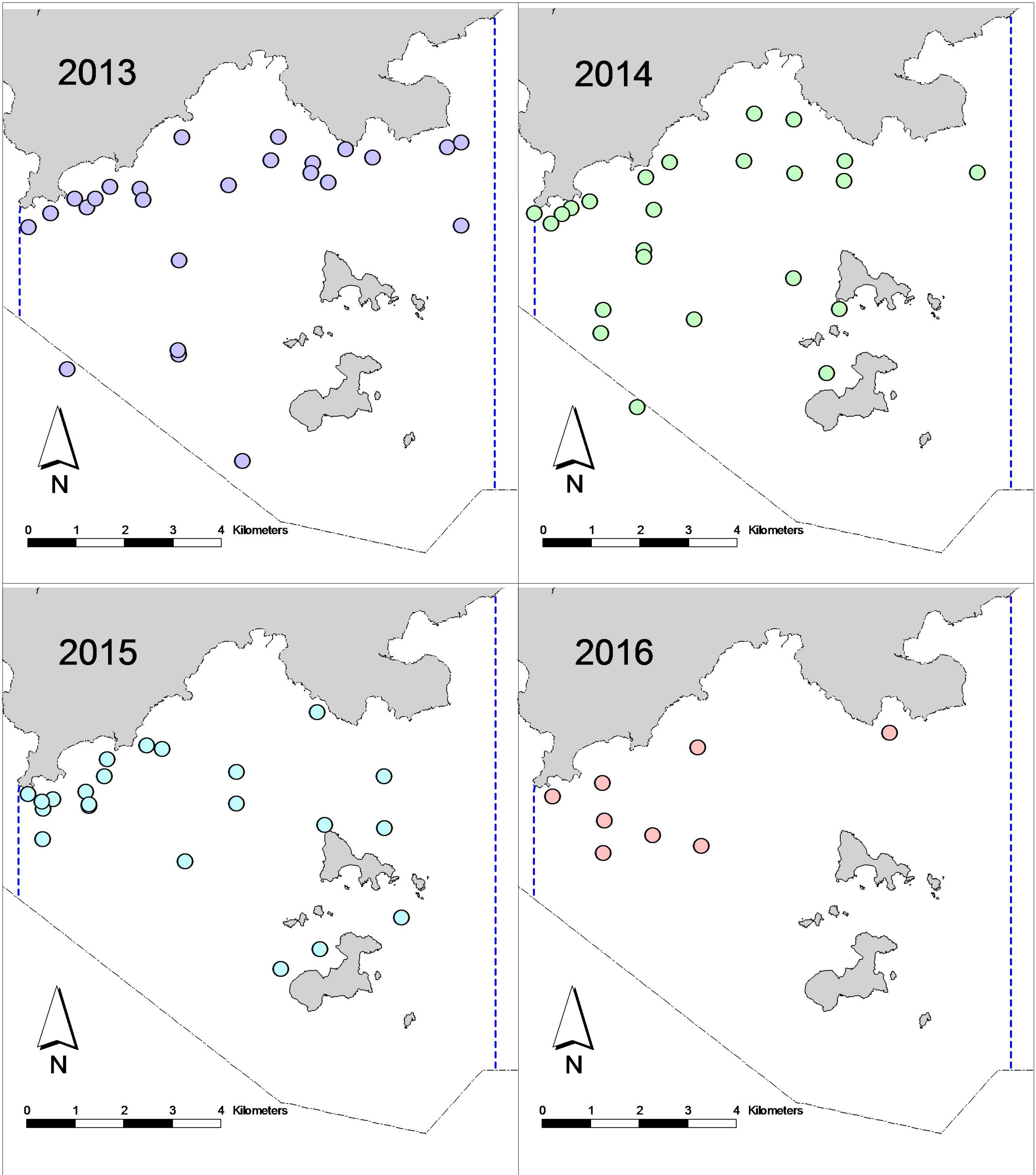


Figure 2. Comparisons on distribution of Chinese White Dolphin sightings in Southwest Lantau survey area during the autumn months of 2013-2016

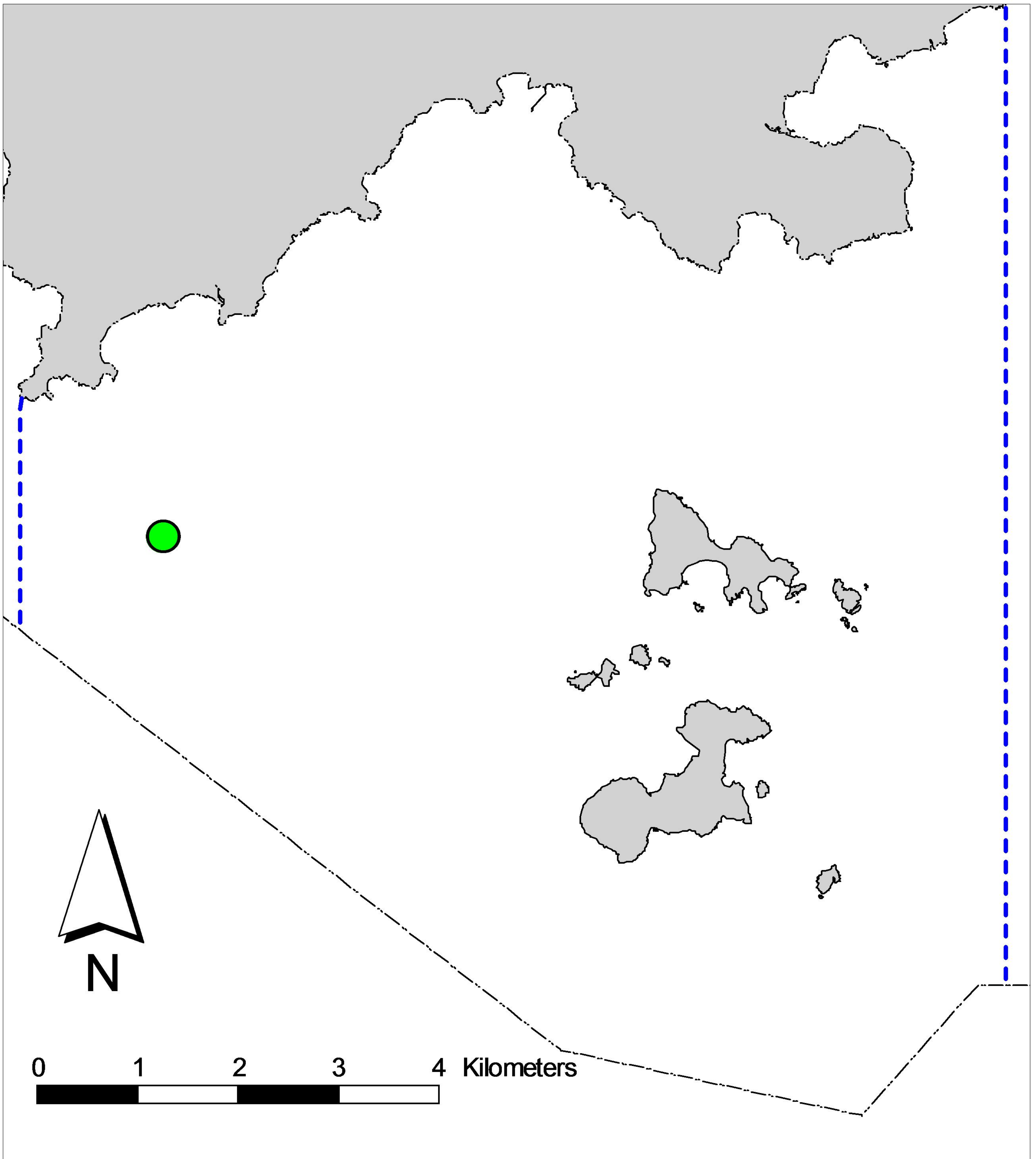


Figure 3. Distribution of Chinese White Dolphins with large group sizes of 5-9 dolphins (green dots) during SWL monitoring surveys conducted in September - November 2016

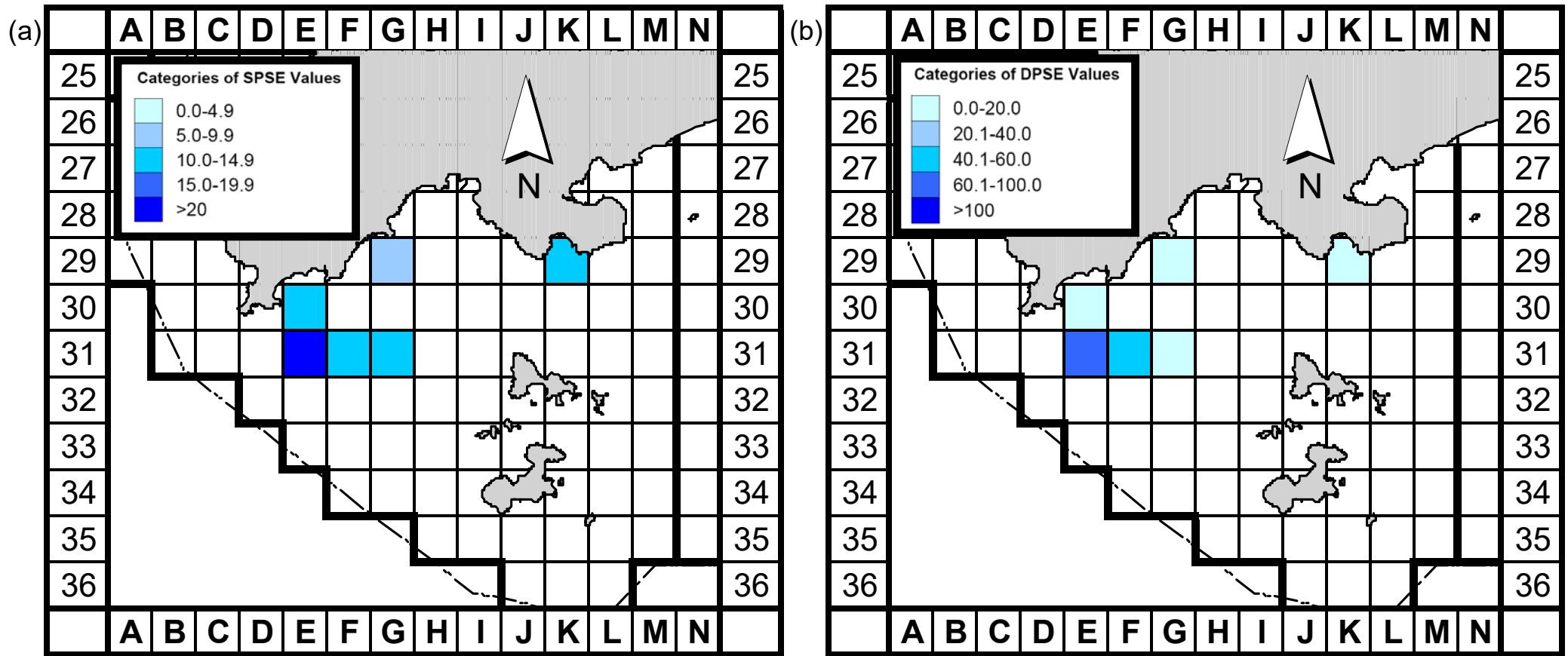


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km² in Southwest Lantau survey area during autumn months (September-November) of 2016 (SPSE = no. of on-effort sightings per 100 units of survey effort)

Figure 4b. Density of Chinese white dolphins with corrected survey effort per km² in Southwest Lantau survey area during autumn months (September-November) of 2016 (DPSE = no. of dolphins per 100 units of survey effort)

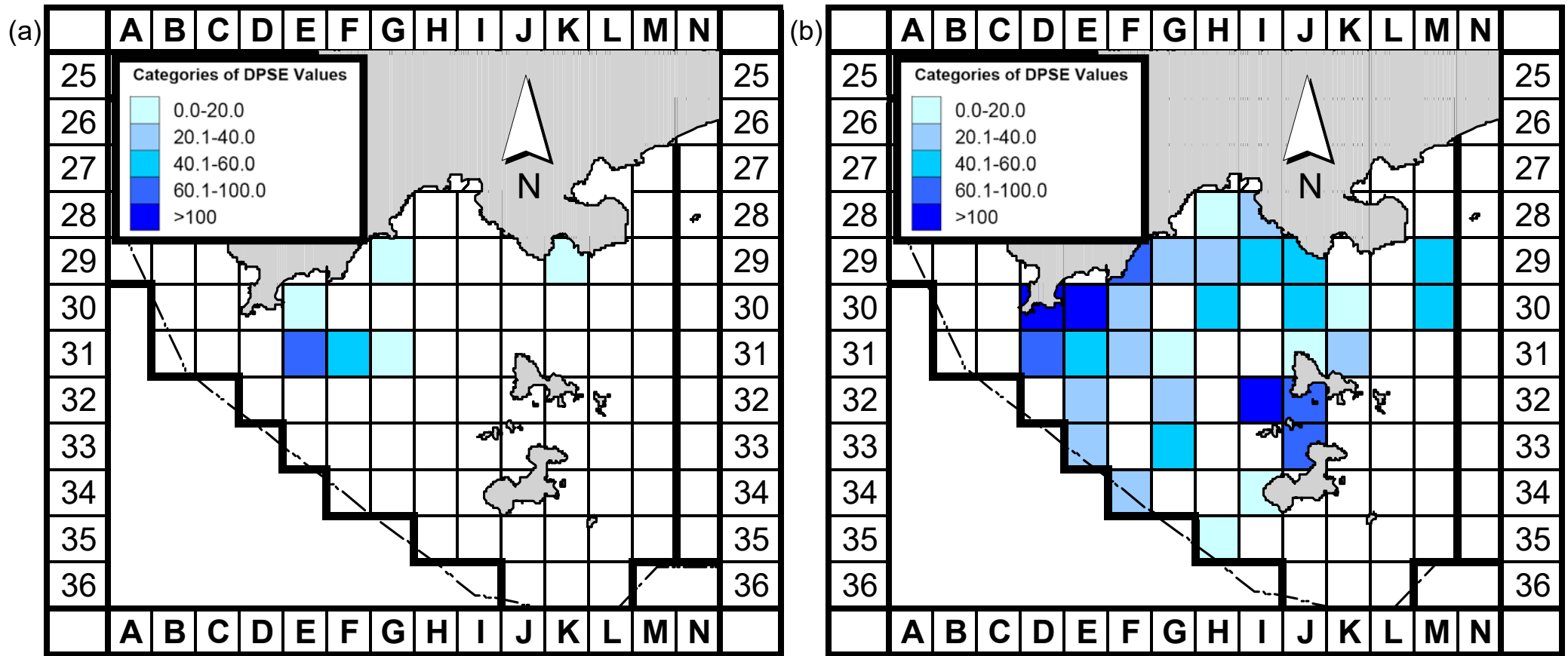


Figure 5a. Density of Chinese white dolphins with corrected survey effort per km² in Southwest Lantau survey area during autumn months (September-November) of 2016 (DPSE = no. of dolphins per 100 units of survey effort)

Figure 5b. Density of Chinese white dolphins with corrected survey effort per km² in Southwest Lantau survey area during autumn months (September-November) of 2012-2015 (DPSE = no. of dolphins per 100 units of survey effort)

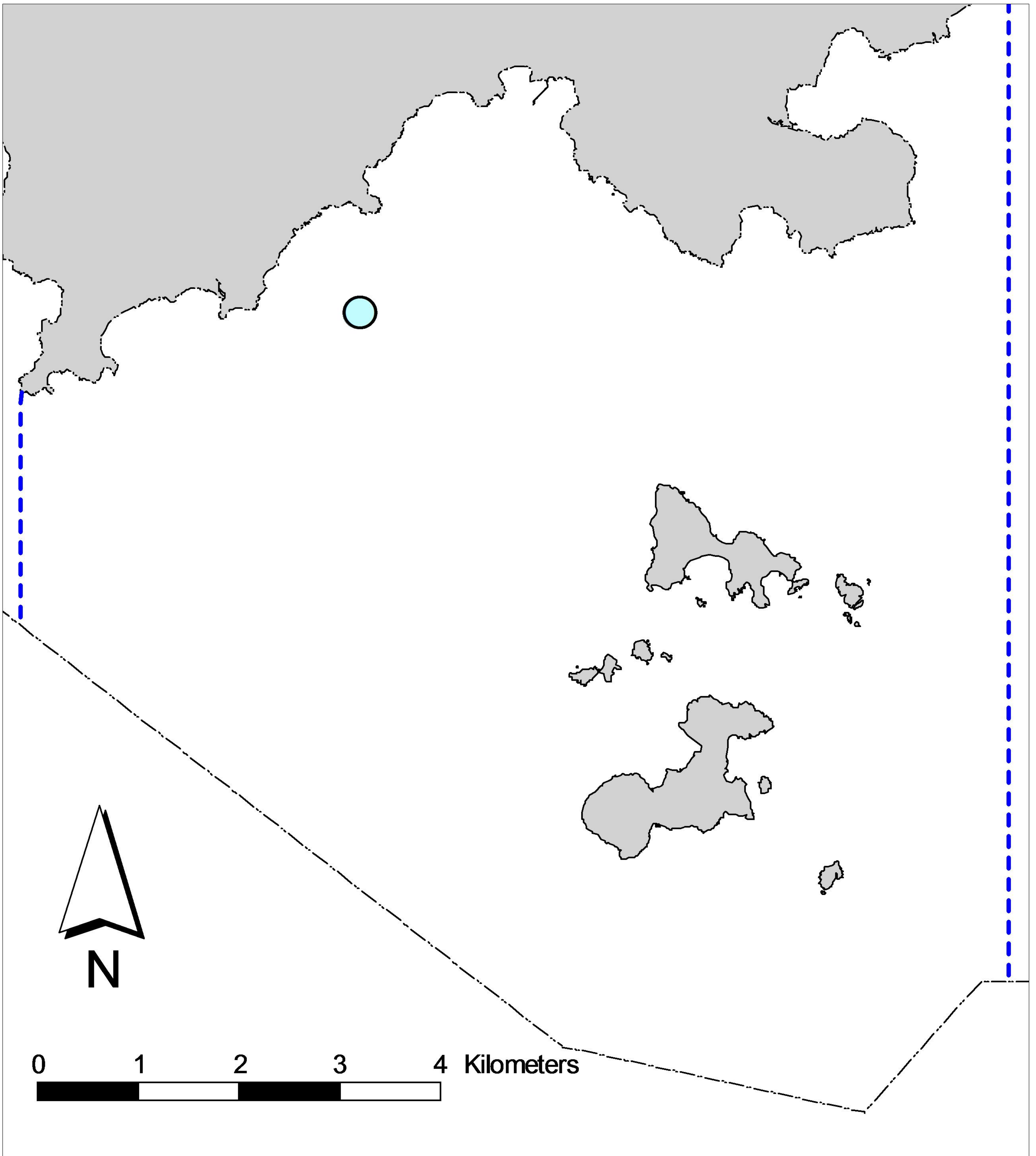


Figure 6. Distribution of Chinese White Dolphins engaged in feeding activity (blue dots) during SWL monitoring surveys conducted in September - November 2016

Appendix I. Survey Effort Database in SWL Survey Area (September-November 2016)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
6-Sep-16	SW LANTAU	1	4.40	AUTUMN	STANDARD31516	HKCRP	P
6-Sep-16	SW LANTAU	2	21.09	AUTUMN	STANDARD31516	HKCRP	P
6-Sep-16	SW LANTAU	1	3.80	AUTUMN	STANDARD31516	HKCRP	S
6-Sep-16	SW LANTAU	2	5.44	AUTUMN	STANDARD31516	HKCRP	S
19-Sep-16	SW LANTAU	2	34.08	AUTUMN	STANDARD36826	HYD-HZMB	P
19-Sep-16	SW LANTAU	3	16.42	AUTUMN	STANDARD36826	HYD-HZMB	P
19-Sep-16	SW LANTAU	2	13.47	AUTUMN	STANDARD36826	HYD-HZMB	S
19-Sep-16	SW LANTAU	3	3.14	AUTUMN	STANDARD36826	HYD-HZMB	S
22-Sep-16	SW LANTAU	2	0.31	AUTUMN	STANDARD31516	HKCRP	P
22-Sep-16	SW LANTAU	3	16.68	AUTUMN	STANDARD31516	HKCRP	P
22-Sep-16	SW LANTAU	4	2.40	AUTUMN	STANDARD31516	HKCRP	P
22-Sep-16	SW LANTAU	2	4.51	AUTUMN	STANDARD31516	HKCRP	S
22-Sep-16	SW LANTAU	3	7.90	AUTUMN	STANDARD31516	HKCRP	S
26-Sep-16	SW LANTAU	2	24.62	AUTUMN	STANDARD36826	HKCRP	P
26-Sep-16	SW LANTAU	3	5.50	AUTUMN	STANDARD36826	HKCRP	P
26-Sep-16	SW LANTAU	2	9.78	AUTUMN	STANDARD36826	HKCRP	S
6-Oct-16	SW LANTAU	2	11.11	AUTUMN	STANDARD31516	HKCRP	P
6-Oct-16	SW LANTAU	3	2.74	AUTUMN	STANDARD31516	HKCRP	S
6-Oct-16	SW LANTAU	2	2.90	AUTUMN	STANDARD31516	HKCRP	P
6-Oct-16	SW LANTAU	3	6.55	AUTUMN	STANDARD31516	HKCRP	S
20-Oct-16	SW LANTAU	2	7.56	AUTUMN	STANDARD31516	HKCRP	P
20-Oct-16	SW LANTAU	3	5.43	AUTUMN	STANDARD31516	HKCRP	P
20-Oct-16	SW LANTAU	2	2.48	AUTUMN	STANDARD31516	HKCRP	S
20-Oct-16	SW LANTAU	3	2.03	AUTUMN	STANDARD31516	HKCRP	S
24-Oct-16	SW LANTAU	2	43.66	AUTUMN	STANDARD36826	HYD-HZMB	P
24-Oct-16	SW LANTAU	3	14.19	AUTUMN	STANDARD36826	HYD-HZMB	P
24-Oct-16	SW LANTAU	2	14.01	AUTUMN	STANDARD36826	HYD-HZMB	S
24-Oct-16	SW LANTAU	3	3.24	AUTUMN	STANDARD36826	HYD-HZMB	S
26-Oct-16	SW LANTAU	2	5.72	AUTUMN	STANDARD36826	HKCRP	P
26-Oct-16	SW LANTAU	3	13.65	AUTUMN	STANDARD36826	HKCRP	P
26-Oct-16	SW LANTAU	2	4.50	AUTUMN	STANDARD36826	HKCRP	S
26-Oct-16	SW LANTAU	3	4.93	AUTUMN	STANDARD36826	HKCRP	S
4-Nov-16	SW LANTAU	2	15.73	AUTUMN	STANDARD36826	HKCRP	P
4-Nov-16	SW LANTAU	3	7.23	AUTUMN	STANDARD36826	HKCRP	P
4-Nov-16	SW LANTAU	2	6.80	AUTUMN	STANDARD36826	HKCRP	S
4-Nov-16	SW LANTAU	3	2.24	AUTUMN	STANDARD36826	HKCRP	S
9-Nov-16	SW LANTAU	2	21.88	AUTUMN	STANDARD36826	HKCRP	P
9-Nov-16	SW LANTAU	3	8.76	AUTUMN	STANDARD36826	HKCRP	P
9-Nov-16	SW LANTAU	2	14.56	AUTUMN	STANDARD36826	HKCRP	S
14-Nov-16	SW LANTAU	1	1.20	AUTUMN	STANDARD36826	HYD-HZMB	P
14-Nov-16	SW LANTAU	2	52.60	AUTUMN	STANDARD36826	HYD-HZMB	P
14-Nov-16	SW LANTAU	1	0.90	AUTUMN	STANDARD36826	HYD-HZMB	S
14-Nov-16	SW LANTAU	2	15.67	AUTUMN	STANDARD36826	HYD-HZMB	S
21-Nov-16	SW LANTAU	2	4.96	AUTUMN	STANDARD36826	HKCRP	P
21-Nov-16	SW LANTAU	3	6.99	AUTUMN	STANDARD36826	HKCRP	P
21-Nov-16	SW LANTAU	4	8.23	AUTUMN	STANDARD36826	HKCRP	P
21-Nov-16	SW LANTAU	2	1.00	AUTUMN	STANDARD36826	HKCRP	S
21-Nov-16	SW LANTAU	3	1.29	AUTUMN	STANDARD36826	HKCRP	S
21-Nov-16	SW LANTAU	4	3.13	AUTUMN	STANDARD36826	HKCRP	S

Appendix II. Chinese White Dolphin Sighting Database in SWL Survey Area (September-November 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
6-Sep-16	4	1501	1	SW LANTAU	1	83	ON	HKCRP	805225	805465	AUTUMN	NONE	P
19-Sep-16	1	1125	2	SW LANTAU	2	144	ON	HYD-HZMB	805705	803486	AUTUMN	NONE	P
19-Sep-16	2	1146	3	SW LANTAU	2	166	ON	HYD-HZMB	805426	804465	AUTUMN	NONE	P
26-Sep-16	6	1201	5	SW LANTAU	2	114	ON	HKCRP	805074	803454	AUTUMN	NONE	P
26-Sep-16	7	1216	1	SW LANTAU	2	163	ON	HKCRP	806436	803436	AUTUMN	NONE	P
26-Sep-16	8	1341	1	SW LANTAU	2	76	ON	HKCRP	807410	809347	AUTUMN	NONE	S
9-Nov-16	4	1225	1	SW LANTAU	3	ND	OFF	HKCRP	806172	802404	AUTUMN	NONE	
14-Nov-16	3	1353	1	SW LANTAU	2	191	ON	HYD-HZMB	807129	805397	AUTUMN	PURSE-SEINE	P

Appendix III. Finless Porpoise Sighting Database in SWL Survey Area (September-November 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
6-Sep-16	2	1229	3	SW LANTAU	2	98	ON	HKCRP	801726	811524	AUTUMN	P
6-Sep-16	3	1354	6	SW LANTAU	2	41	ON	HKCRP	800667	808881	AUTUMN	S
6-Oct-16	4	1325	3	SW LANTAU	2	265	ON	HKCRP	807375	810553	AUTUMN	P
6-Oct-16	5	1358	1	SW LANTAU	2	46	ON	HKCRP	800465	810521	AUTUMN	P
14-Nov-16	1	1048	2	SW LANTAU	2	73	ON	HYD-HZMB	801118	810780	AUTUMN	S
14-Nov-16	2	1056	1	SW LANTAU	2	210	ON	HYD-HZMB	801561	810492	AUTUMN	P
21-Nov-16	1	1250	1	SW LANTAU	4	6	ON	HKCRP	803666	809712	AUTUMN	P

Appendix IV. Individual dolphins identified during SWL monitoring surveys in September-November 2016

ID#	DATE	STG#	AREA
NL120	19/09/16	2	HYD-HZMB
NL269	26/09/16	6	HKCRP
SL05	09/11/16	4	HKCRP
SL60	19/09/16	2	HYD-HZMB
SL64	14/11/16	3	HYD-HZMB
WL69	19/09/16	1	HYD-HZMB
WL123	19/09/16	2	HYD-HZMB
WL230	26/09/16	6	HKCRP
WL235	06/09/16	4	HKCRP

Appendix V. Nine individual dolphins that were identified in Southwest Lantau survey area during September-November 2016



Appendix V. (cont'd)



SL64



WL69



WL123

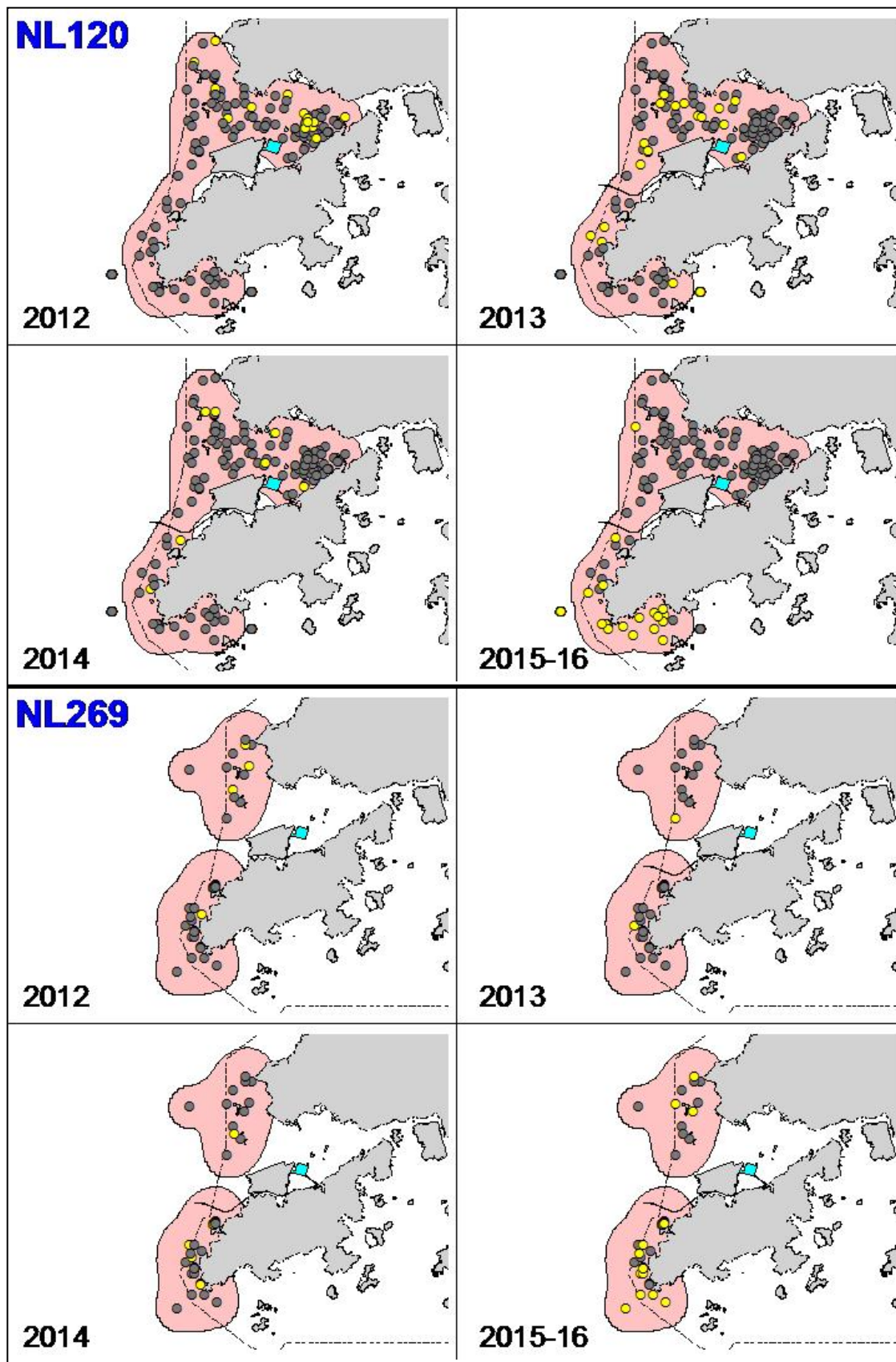


WL230

Appendix V. (cont'd)



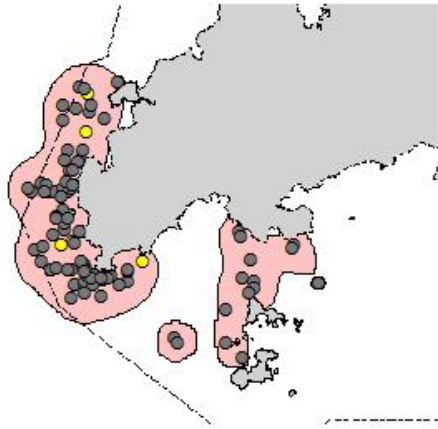
Appendix VI. Ranging patterns (95% kernel ranges) of nine individual dolphins that were sighted in Southwest Lantau survey area during September - November 2016 (note: yellow dots indicates sightings made in the respective years of 2012-16)



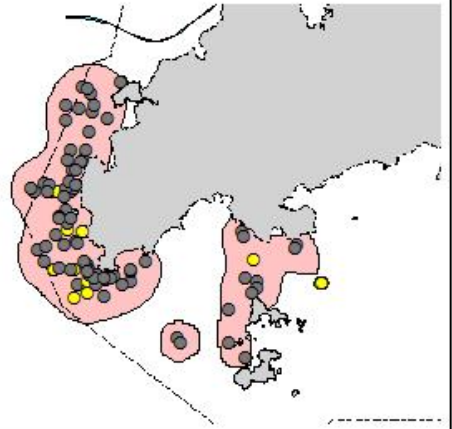
Appendix VI. (cont'd)

SL05

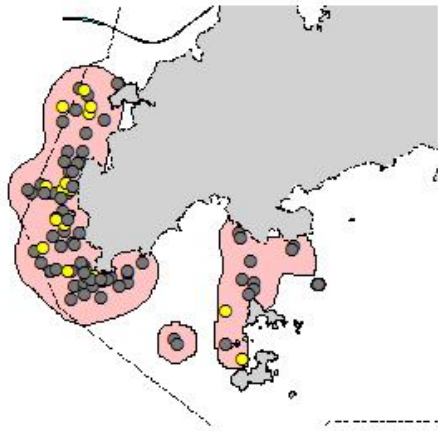
2012



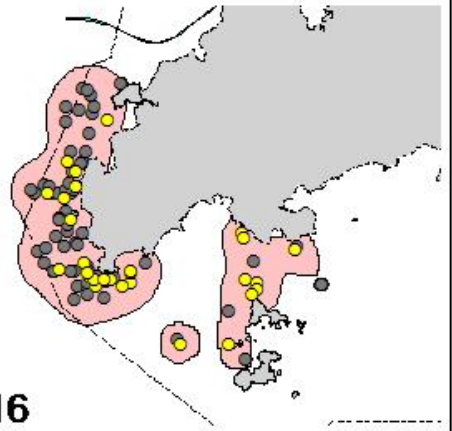
2013



2014

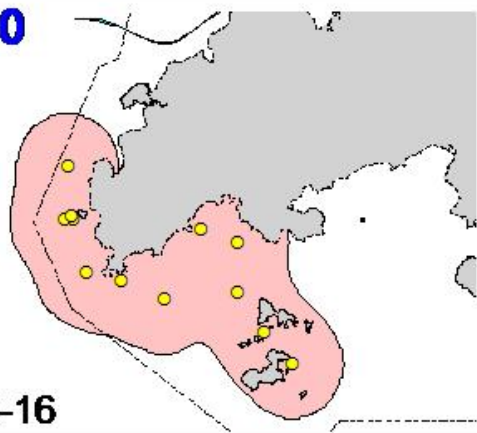


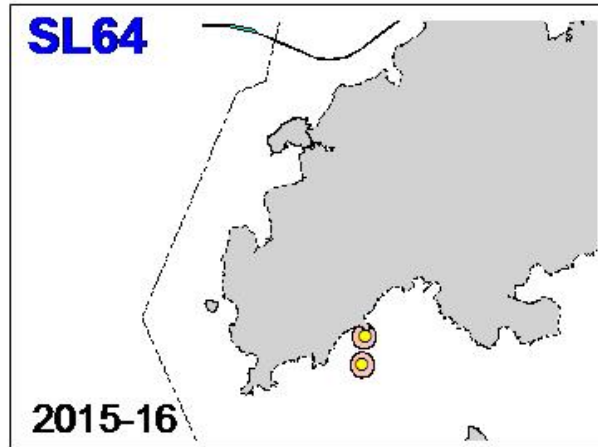
2015-16



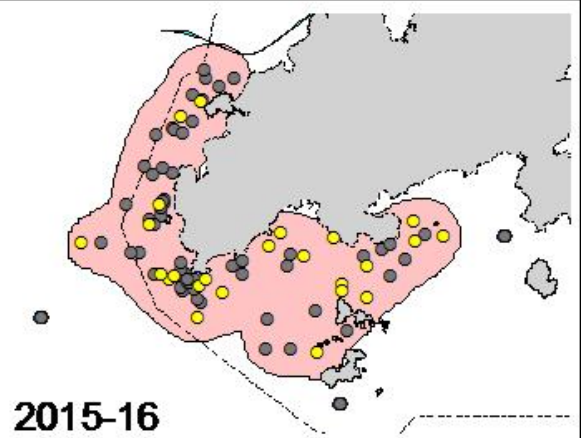
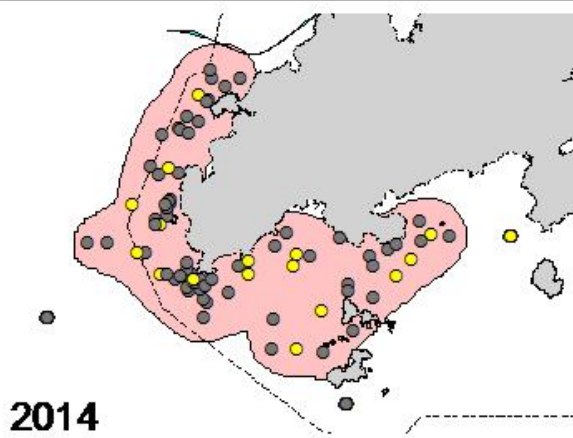
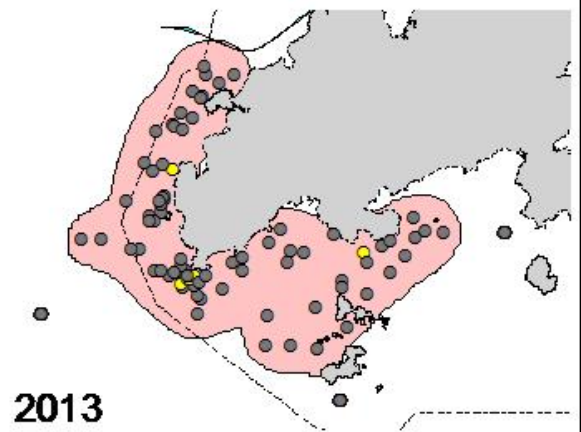
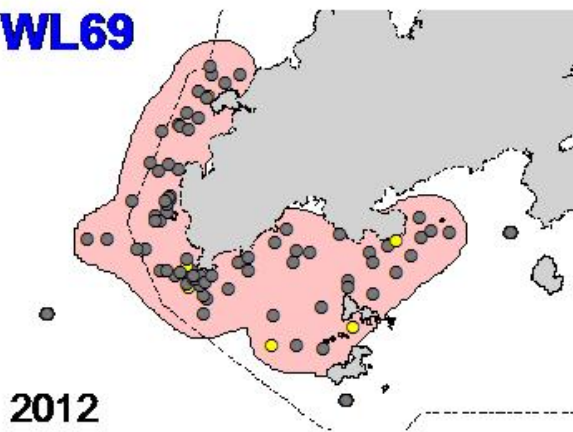
SL60

2015-16





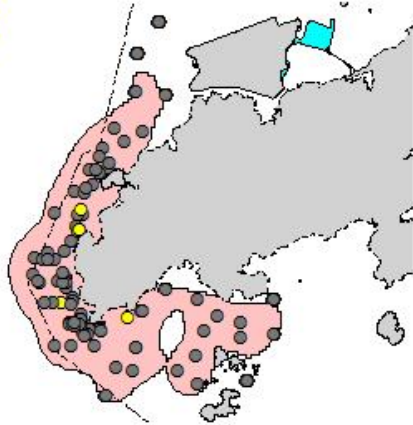
WL69



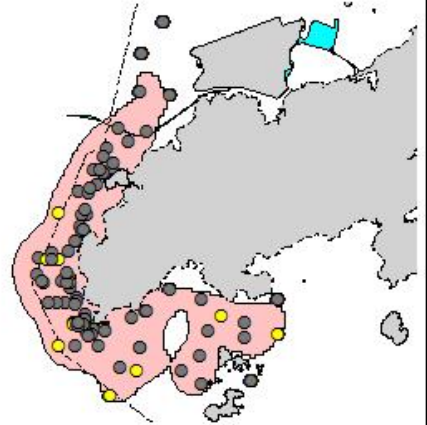
Appendix VI. (cont'd)

WL123

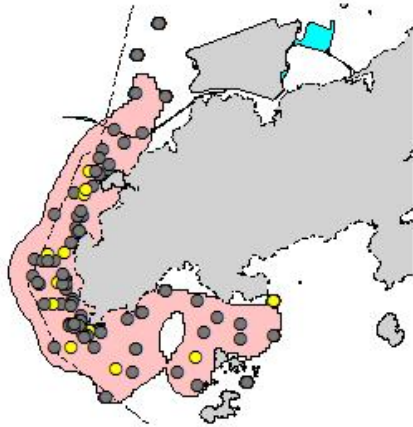
2012



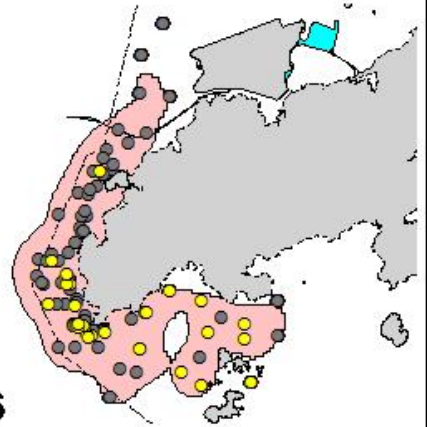
2013



2014

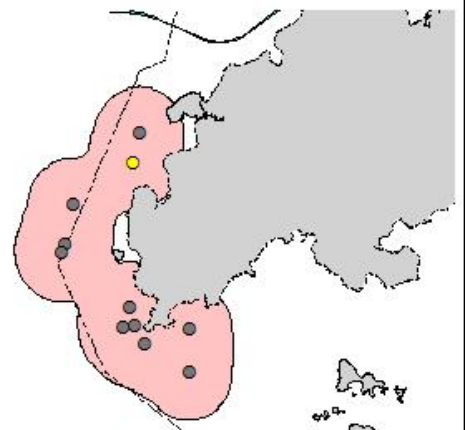


2015-16

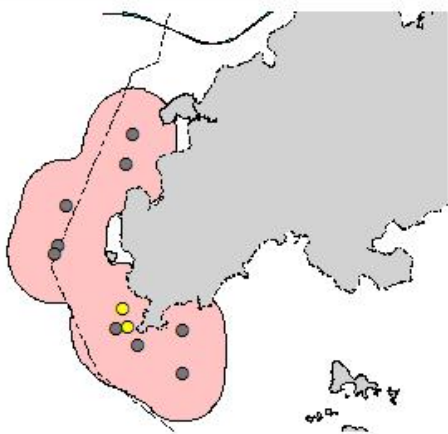


WL230

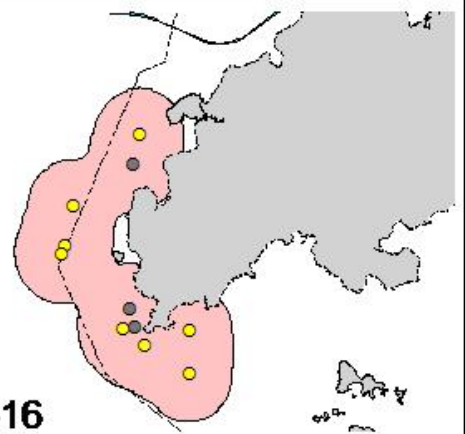
2013



2014



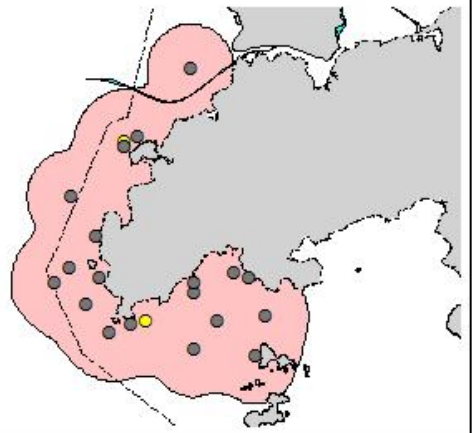
2015-16



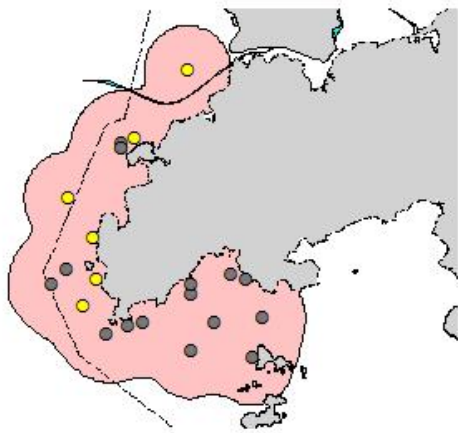
Appendix VI. (cont'd)

WL235

2013



2014



2015-16

