Contract No. HY/2011/03
Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road – Section between Scenic Hill and Hong Kong Boundary Crossing Facilities Dolphin Monitoring

Quarterly Progress Report (September-November 2013)
submitted to China State Construction Engineering (HK) Ltd.

Submitted by
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1. Introduction

1.1. The Hong Kong Link Road (HKLR) serves to connect the Hong Kong-Zhuhai-Macao Bridge (HZMB) Main Bridge at the Hong Kong Special Administrative Region (HKSAR) Boundary and the HZMB Hong Kong Boundary Crossing Facilities (HKBCF) located at the northeastern waters of the Hong Kong International Airport. The construction of HKLR is separated into two sections, with the construction for the section between Scenic Hill and Hong Kong Boundary Crossing Facilities being commenced in October 2012.

1.2. According to the updated Environmental Monitoring and Audit (EM&A) Manual (for HKLR), monthly line-transect vessel surveys for Chinese White Dolphin should be conducted to cover the Northwest and Northeast Lantau survey areas as in AFCD annual marine mammal monitoring programme.

1.3. In October 2012, Hong Kong Cetacean Research Project (HKCRP) has been commissioned to conduct this 54-month dolphin monitoring study in order to collect data on Chinese White Dolphins during the construction phase (i.e. impact period) of the HKLR03 project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas, and to analyze the collected survey data to monitor distribution, encounter rate, activities and occurrence of dolphin calves. Photo-identification will also be collected from individual Chinese White Dolphins to examine their individual range patterns.

1.4. From the monitoring results, any changes in dolphin occurrence within the study area will be examined for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.

1.5. This report is the fifth quarterly progress report under the HKLR03 construction phase dolphin monitoring programme submitted to the China State Construction Engineering (HK) Limited, summarizing the results of the surveys findings during the period of September to November 2013.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

2.1.1. According to the requirement of the updated EM&A manual, dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas twice per month throughout the entire construction period. The co-ordinates of all transect lines are shown in Table 1.

Table 1. Co-ordinates of transect lines

Line No.		Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	814577		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805475	815457		14	Start Point	817537	820220
2	End Point	805477	826654		14	End Point	817537	824613
3	Start Point	806464	819435		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	819771		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	820220		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	820466		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	820690		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321
8	Start Point	811508	820847		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613

9	Start Point	812516	820892		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	820872		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818449		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807					
12	End Point	815542	824882					

2.1.2. The 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 16 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2012). 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 (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 *Steiner* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). One to two additional experienced observers were available on 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 Figure1) was labeled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as "secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas (Hung 2013). Therefore, 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. Two professional digital cameras (*Canon* EOS 7D and 60D models), each equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

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.

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, and total number of dolphins sighted on-effort per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Dolphin encounter rates were calculated in two ways for comparisons with the HZMB baseline monitoring results as well as to AFCD long-term marine mammal monitoring results.

Firstly, for the comparison with the HZMB baseline monitoring results, the encounter rates were calculated using primary survey effort alone, and only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. The average encounter rate of sightings (STG) and average encounter rate of dolphins (ANI) were deduced based on the encounter rates from six events during the present quarter (i.e. six sets of line-transect surveys in North Lantau), which was also compared with the one deduced from the six events during the baseline period (i.e. six sets of line-transect surveys in North Lantau).

Secondly, the encounter rates were calculated using both primary and secondary survey effort collected under Beaufort 3 or below condition as in AFCD long-term monitoring study. The encounter rate of sightings and dolphins were deduced by dividing the total number of on-effort sightings (STG) and total number of dolphins (ANI) by the amount of survey effort for the entire quarterly period (September-November 2013).

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 among NWL and NEL survey areas 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 3-month baseline 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 level.

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

3.1.1. During the period of September to November 2013, six sets of systematic line-transect vessel surveys were conducted to cover all transect lines in NWL and NEL survey areas twice per month.

3.1.2. From these surveys, a total of 862.46 km of survey effort was collected, with 94.3% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility). Among the two areas, 331.22 km and 531.24 km of survey effort were conducted in NEL and NWL survey areas respectively. In addition, the total survey effort conducted on primary lines was 644.87 km, while the effort on secondary lines was 217.59 km. Survey effort conducted on primary and secondary lines were both considered as on-effort survey data. Summary table of the survey effort is shown in Appendix I.

3.1.3. During the six sets of monitoring surveys in September to November 2013, a total of 45 groups of 187 Chinese White Dolphins were sighted. All except two sightings were made during on-effort search. Thirty-four on-effort sightings were made on primary lines, while another nine on-effort sightings

were made on secondary lines. In this quarterly period, only two groups of eight dolphins were sighted in NEL, while the other 43 groups of 179 dolphins were sighted in NWL. Summary table of the dolphin sightings is shown in Appendix II.

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during monitoring surveys in September to November 2013 is shown in Figure 1. Almost all sightings were made in the northwestern portion of the North Lantau region, similar to the dolphin distribution pattern in the previous quarter. In particular, dolphin groups were mainly sighted around Lung Kwu Chau, Shau Chau, Black Point, and along the Urmston Road section between Black Point and Lung Kwu Chau (Figure 1). Moreover, a few sightings were also made to the west and northeast of Chek Lap Kok airport platform, and two sightings were made near Tai Mo To (Figure 1).

3.2.2. A few dolphin groups were sighted in the vicinity of the HKBCF reclamation site, but none was sighted near HKLR03 reclamation site (Figure 1). In contrary to the previous quarter, no sighting was made along or near the HKLR09 alignment.

3.2.3. Sighting distribution between the impact phase monitoring period (September to November 2013) was compared to the one in the baseline monitoring period (September to November 2011). During the present monitoring period, dolphins rarely occurred in NEL region, which was in stark contrast to their frequent occurrence around the Brothers Islands and HKBCF reclamation site during the baseline period (Figure 1).

3.2.4. The low occurrence of dolphins in NEL region (particularly around the Brothers Islands and Shum Shui Kok) has been documented repeatedly in previous quarters. This should be a serious concern for the HZMB-related construction activities (including the upcoming TM-CLKL bored piling works) in this area, especially when considered that the present period (September to November) in 2013 was exactly the same three-month period as the baseline monitoring period, and any speculation of seasonal fluctuation in dolphin occurrence can be ruled out. To ensure the continuous usage of NEL waters by the dolphins, every possible measure should be implemented by the contractors and relevant authorities to minimize all disturbances to the dolphins, as a future marine park around the Brothers Islands will be established in this important dolphin habitat as a compensation measure for the habitat loss resulted from the HKBCF and HKLR reclamation works.

3.2.5. On the other hand, dolphin occurrence in the western portion of North Lantau region was largely similar between the two periods, except that fewer dolphins were sighted to the west of the airport and near Pillar Point (Figure 1).

3.3. Encounter rate

3.3.1. During the present three-month study period, the 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 each of the survey areas are shown in Table 2. The average encounter rates deduced from the six sets of surveys were also compared with the ones deduced from the baseline monitoring period (September – November 2011) (Table 3).

Table 2. Dolphin encounter rates (sightings per 100 km of survey effort) during September – November 2013

SURVEY AREA	**DOLPHIN MONITORING DATES**	**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	**Primary Lines Only**
Northeast Lantau	Set 1 (3 & 5 Sep 2013)	0.00	0.00
	Set 2 (10 & 18 Sep 2013)	3.44	6.87
	Set 3 (8 & 15 Oct 2013)	0.00	0.00
	Set 4 (17 & 22 Oct 2013)	2.63	15.78
	Set 5 (1 & 5 Nov 2013)	0.00	0.00
	Set 6 (8 & 13 Nov 2013)	0.00	0.00
Northwest Lantau	Set 1 (3 & 5 Sep 2013)	1.48	8.88
	Set 2 (10 & 18 Sep 2013)	4.19	12.57
	Set 3 (8 & 15 Oct 2013)	3.91	13.69
	Set 4 (17 & 22 Oct 2013)	12.24	33.67
	Set 5 (1 & 5 Nov 2013)	10.30	50.02
	Set 6 (8 & 13 Nov 2013)	16.09	76.06

Table 3. Comparison of average dolphin encounter rates from impact monitoring period (September-November 2013) and baseline monitoring period (September-November 2011)

	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)	
	September - November 2013	**September - November 2011**	**September - November 2013**	**September - November 2011**
Northeast Lantau	1.01 ± 1.59	6.00 ± 5.05	3.77 ± 6.49	22.19 ± 26.81
Northwest Lantau	8.04 ± 5.70	9.85 ± 5.85	32.48 ± 26.51	44.66 ± 29.85

Note: Encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions.

Table 4. Comparison of average dolphin encounter rates in Northeast Lantau survey area from all quarters of impact monitoring period and baseline monitoring period (September-November 2011)

	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)
September-November 2011 (Baseline)	6.00 ± 5.05	22.19 ± 26.81
December 2012-February 2013 (Impact)	3.14 ± 3.21	6.33 ± 8.64
March-May 2013 (Impact)	0.42 ± 1.03	0.42 ± 1.03
June-August 2013 (Impact)	0.88 ± 1.36	0.88 ± 1.36
September-November 2013 (Impact)	1.01 ± 1.59	3.77 ± 6.49

Note: Encounter rates deduced from the baseline monitoring period have been recalculated based only on survey effort and on-effort sighting data made along the primary transect lines under favourable conditions.

3.3.2. In NEL, the average dolphin encounter rates (both STG and ANI) in the present three-month study period were much lower (reductions of 83.2% and 83.0% respectively) than the ones recorded in the 3-month baseline period (Table 3). In fact, dolphin occurrence in NEL in the past three quarters have been exceptionally low when compared to the baseline period (Table 4), which has prompted the triggering of the Event and Action Plan (in fact, the present quarter was the fourth consecutive quarter being accessed that have triggered the Action Level under the Event and Action Plan).

3.3.3. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present impact phase monitoring period were also lower (reductions of 18.3% and 27.3% respectively) than the ones recorded in the 3-month

baseline period, indicating a reduced dolphin usage of this survey area.

3.3.4. A two-way ANOVA with repeated measures and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the baseline and impact monitoring periods. The two variables that were examined included the two periods (baseline and impact phases) and two locations (NEL and NWL).

3.3.5. For the comparison between the baseline period and the present quarter (fourth quarter of the impact phase), the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.1424 and 0.2339 respectively. If the alpha value is set at 0.1, no significant difference was detected between the baseline and present quarters in both the encounter rates of STG and ANI.

3.3.6. For the comparison between the baseline period and the cumulative quarters in impact phase (i.e. first four quarters of the impact phase), the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.0366 and 0.0179 respectively. If the alpha value is set at 0.1, significant differences were detected in both the average dolphin encounter rates of STG and ANI (i.e. between the two periods and the locations).

3.3.7. 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. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 8.33 sightings and 33.93 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were 0.62 sightings and 2.50 dolphins per 100 km of survey effort respectively.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from 1-11 individuals per group in North Lantau region during September to November 2013. The average dolphin group sizes from these three months were compared with the ones deduced from the baseline period in September to November 2011, as shown in Table 5.

Table 5. Comparison of average dolphin group sizes from impact monitoring period (September-November 2013) and baseline monitoring period (September-November 2011)

	Average Dolphin Group Size	
	September to November 2013	**September-November 2011**
Overall	4.16 ± 2.46 (n = 45)	3.72 ± 3.13 (n = 66)
Northeast Lantau	4.00 ± 2.83 (n = 2)	3.18 ± 2.16 (n = 17)
Northwest Lantau	4.16 ± 2.48 (n = 43)	3.92 ± 3.40 (n = 49)

3.4.2. The average dolphin group sizes in the entire North Lantau region as well as in NWL during September to November 2013 were slightly higher than the ones recorded in the 3-month baseline period (Table 5). Although the average group size in NEL was quite high during the present monitoring period when compared to the baseline period, the sample size of the two dolphin groups in 2013 was very small for such comparison.

3.4.3. Distribution of dolphins with larger group sizes during September to November 2013 is shown in Figure 2, and was compared with the one in baseline period. In 2013, most larger dolphin groups mainly clustered around Lung Kwu Chau and off Lung Kwu Tan, while these larger groups were more scattered in the Northwest Lantau region without any apparent concentration during the baseline monitoring period in 2011 (Figure 2). Notably, none of the larger dolphin groups were sighted near the HKBCF or HKLR03 reclamation sites in 2011.

3.5. Habitat use

3.5.1. From September-November 2013, the most heavily utilized habitats by Chinese White Dolphins mainly concentrated around Lung Kwu Chau, near Pak Chau, and the Urmston Road section between Lung Kwu Chau and Lung Kwu Tan (Figures 3a and 3b). Only two grids in NEL recorded the presence of dolphins, with one of the grids overlap with the HKBCF work site. None of the grids near HKLR03 reclamation site or HKLR09 bridge alignment recorded the presence of dolphins

3.5.2. It should be noted that the amount of survey effort collected in each grid during the three-month period was fairly low (6-12 units of survey effort for most grids), and therefore the habitat use pattern derived from the three-month dataset should be treated with caution. A more complete picture of dolphin habitat use pattern will be presented when more survey effort for each grid will

be collected throughout the impact phase monitoring programme.

3.5.3. When compared with the habitat use patterns during the baseline period, dolphin usage in NEL was noticeably much lower in the present impact monitoring period (Figure 4). During the baseline period, dolphin densities were particularly higher along the coastline between Shum Shui Kok and Siu Ho Wan, while this area was vacated by dolphins during the present impact phase period. On the other hand, the density patterns between the baseline and impact phase monitoring periods were similar in the Northwest Lantau region.

3.5.4. The absence of dolphins in the identified important habitats around the Brothers Islands and Shum Shui Kok in consecutive quarters in 2013 is of serious concern. The future Brothers Islands Marine Park will be established in this area upon the completion of HKBCF reclamation works, as an important compensation measure for the habitat loss in relation to HZMB projects. It should be further examined whether the very low usage of dolphins would continue in this important dolphin habitat, and the potential measures should be implemented soon that may enhance the dolphin usage of this area.

3.6. Mother-calf pairs

3.6.1. During the three-month study period, a total of four unspotted calves (UC) and 14 unspotted juveniles (UJ) were sighted in NEL and NWL survey areas. These young calves comprised 9.6% of all animals sighted, which was higher than the percentage recorded during the baseline monitoring period (6.8%).

3.6.2. The occurrence of these young calves mainly concentrated around Lung Kwu Chau and off Lung Kwu Tan, and most of them were involved in larger dolphin groups (Figure 5). None of these calves were sighted in the vicinity of the HKBCF or HKLR03 reclamation site during the present quarter.

3.7. Activities and associations with fishing boats

3.7.1. A total of five dolphin sightings were associated with feeding and socializing activities during the three-month study period. The percentage of feeding activities comprised of 4.4% of the total number of dolphin sightings, which was much lower than the one recorded during the baseline period (11.6%). On the contrary, the percentage of socializing activities were 6.6% during the present impact phase monitoring period, which was slightly higher than the one recorded during the baseline period (5.4%). Only one group of dolphins was engaged in traveling activity, and the rarity of this observed activity was similar to the baseline monitoring period and previous impact phase monitoring periods.

3.7.2. Distribution of dolphins engaged in different activities during the three-month study period is shown in Figure 6. No apparent concentration of sightings was found for all three types of observed activities.

3.7.3. During the three-month period, only one of the 45 dolphin groups was found to be associated with an operating gill-netter. The extremely low level of fishing boat association in the present and previous quarters was consistently found, and was likely related to the recent trawl ban being implemented in 2013 in Hong Kong waters.

3.8. Summary of photo-identification works

3.8.1. From September to November 2013, over 3,000 digital photographs of Chinese White Dolphins were taken during the impact phase monitoring surveys for the photo-identification work.

3.8.2. In total, 56 individuals sighted 110 times altogether were identified (see summary table in Appendix III and photographs of identified individuals in Appendix IV). Only eight of these 110 re-sightings were made in NEL, which involved eight different individuals. Notably, these were the same individuals that were repeatedly sighted before in NEL throughout the HKLR03 impact phase monitoring surveys as well as in the baseline monitoring period.

3.8.3. Most identified individuals were sighted only once or twice during the three-month period, with the exception of 11 individuals being sighted thrice, and four individuals being sighted four times (CH34, NL33, NL98 and WL05). One individual, NL220 were sighted five times, but three of those sightings were made on the same survey day.

3.8.4. Notably, nine of these 56 individuals were also sighted in West Lantau waters during the HKLR09 monitoring surveys in the same 3-month period, showing their extensive movement between North and West Lantau regions.

3.8.5. Twelve well-recognized females were accompanied with their calves during their re-sightings. Besides NL80, NL182 and WL 124, the other mothers (NL33, NL93, NL98, NL123, NL145, NL188, NL220, NL221 and NL264) were frequently sighted with their calves throughout the HKLR03 impact phase monitoring period.

3.9. Individual range use

3.9.1. Ranging patterns of the 56 individuals identified during the three-month study period were determined by fixed kernel method, and are shown in Appendix V.

3.9.2. Only a few individuals had their range extended to NEL survey area, while other individuals mostly focused their range use in NWL survey area during the present quarter. In contrast to the extensive movements between NEL and NWL survey areas in the first two impact monitoring quarters (October 2012 - February 2013) and the baseline period (September-November 2011), many of these identified individuals appeared to abandon their usage in NEL waters during the present and previous quarters, even though they were regularly sighted there before and their core areas were centered around the Brothers Islands (e.g. NL24, NL33, NL139, NL261) (Appendix V).

3.9.6. It is apparent that the majority of individual dolphins that utilized NEL waters in the past has either diminished or avoided this area for their recent range use. This coincided well with the noticeable decline in dolphin occurrence in NEL as discussed in Section 3.3. This is of serious concern, as the Brothers Islands in NEL was once identified an important habitat for many year-round residents that focused their core area use there (Hung 2008). Therefore, the ranging pattern of individual dolphins should be continuously monitored around Lantau waters, and measures should be taken to ensure that dolphins will continue to move between NWL and NEL without any hindrance as a result of the HZMB-related construction works.

4. Conclusion

4.1. During this quarter of dolphin monitoring, no adverse impact from the activities of this construction project on Chinese White Dolphins was noticeable from general observations.

4.2. Although the dolphins rarely occurred in the area of HKLR03 construction in the past, during the baseline monitoring period and throughout the five quarters of impact monitoring period, it is apparent that dolphin usage has been significantly reduced in NEL, and many individuals have shifted away from the important habitat around the Brothers Islands.

4.3. It is critical to monitor the dolphin usage in North Lantau region in the

upcoming months, to determine whether the dolphins are continuously affected by the various construction activities in relation to the HZMB works, and whether suitable mitigation measure can be applied to revert the situation.

5. References

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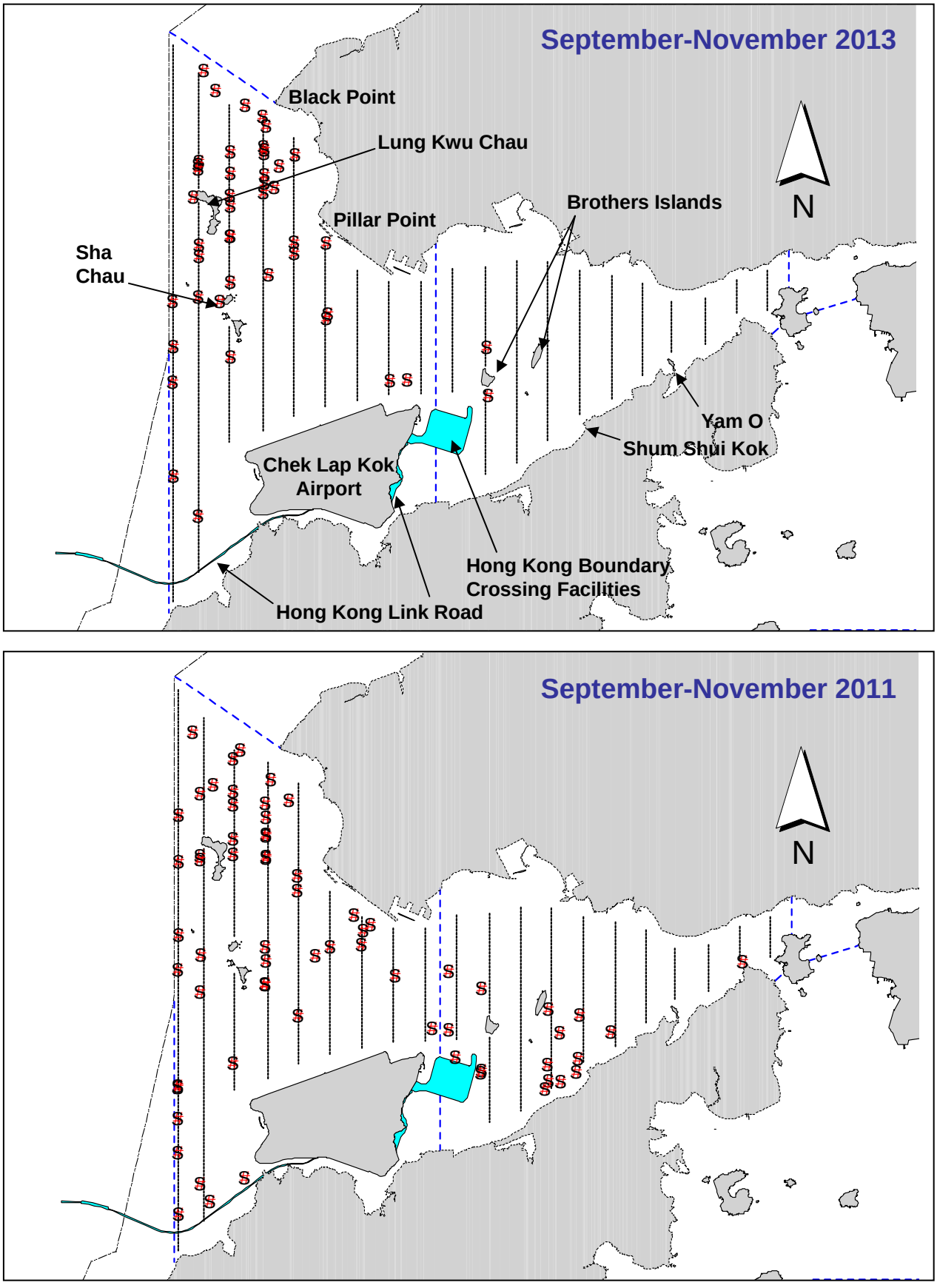


Figure 1. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

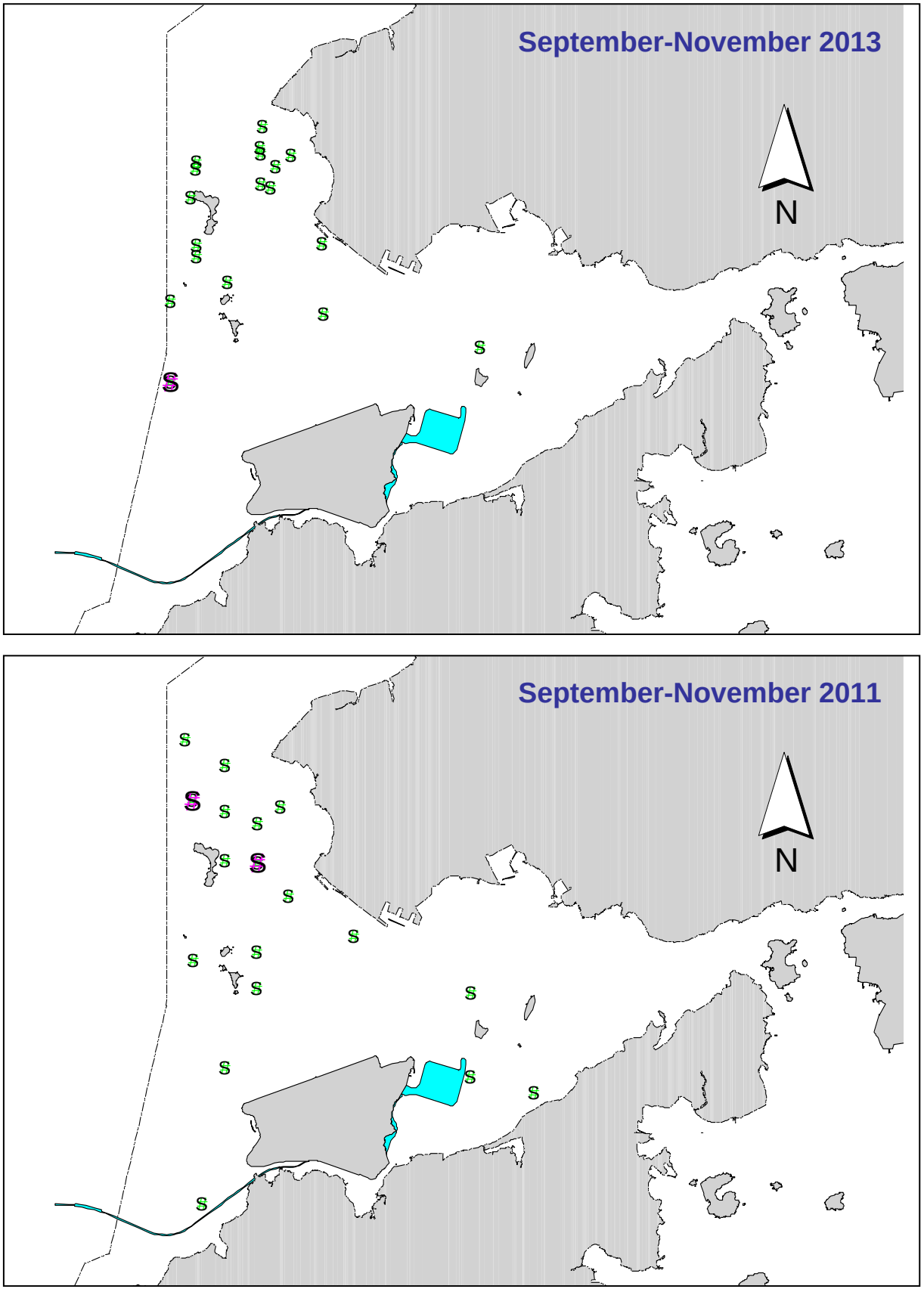


Figure 2. Distribution of Chinese white dolphins with larger group sizes during HKLR03 impact phase (top) and baseline monitoring surveys (bottom) (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

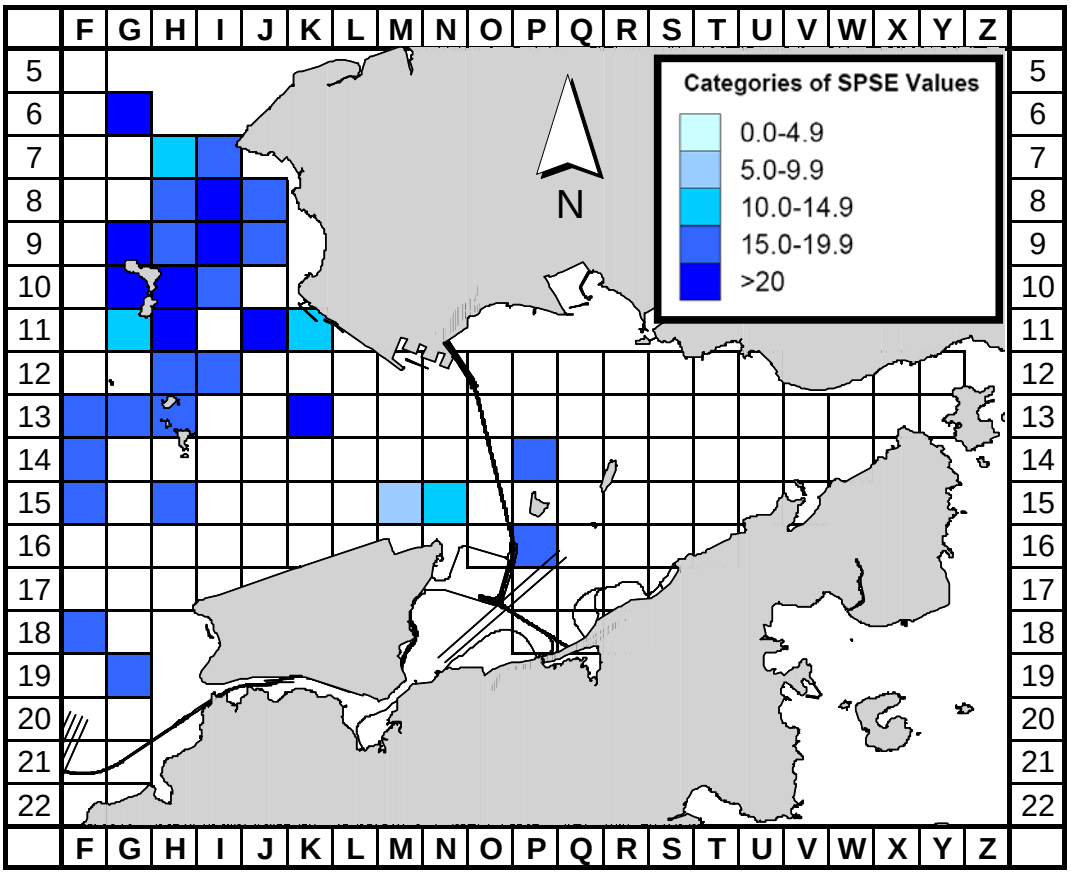


Figure 3a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Sep-Nov 13) (SPSE = no. of on-effort sightings per 100 units of survey effort)

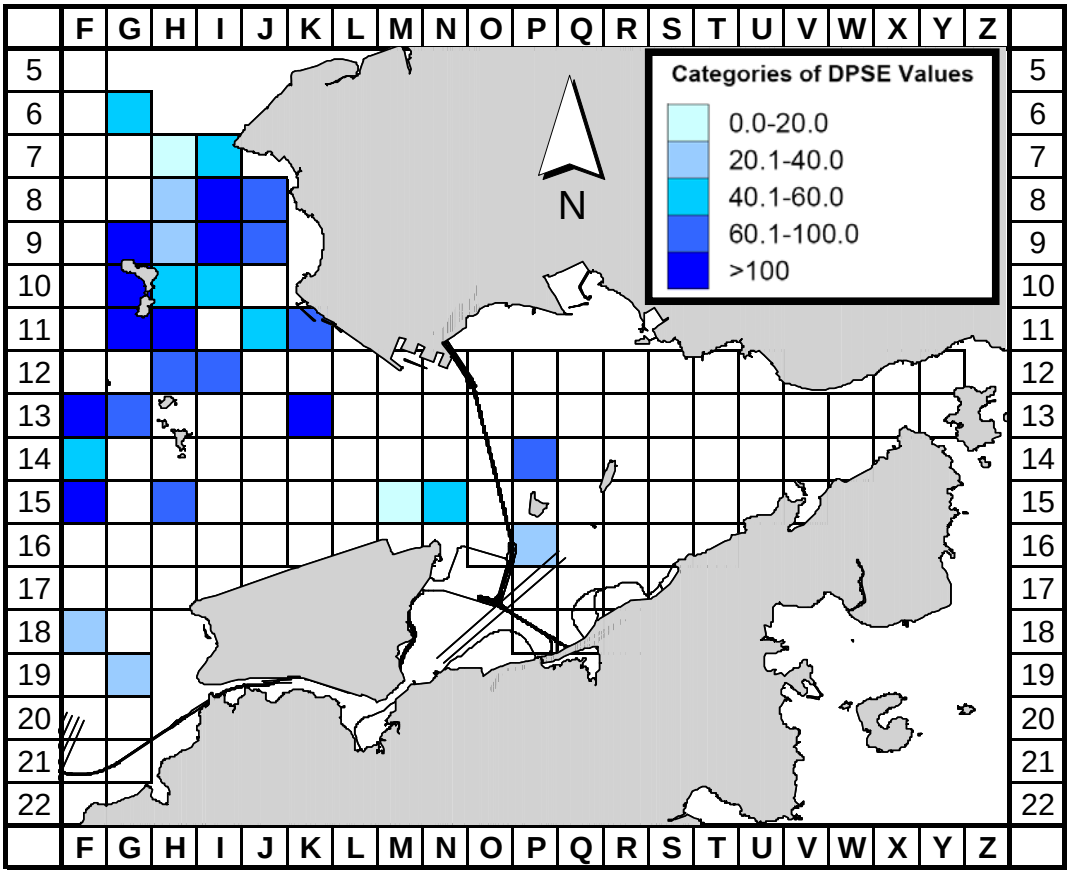


Figure 3b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Sep-Nov 13) (DPSE = no. of dolphins per 100 units of survey effort)

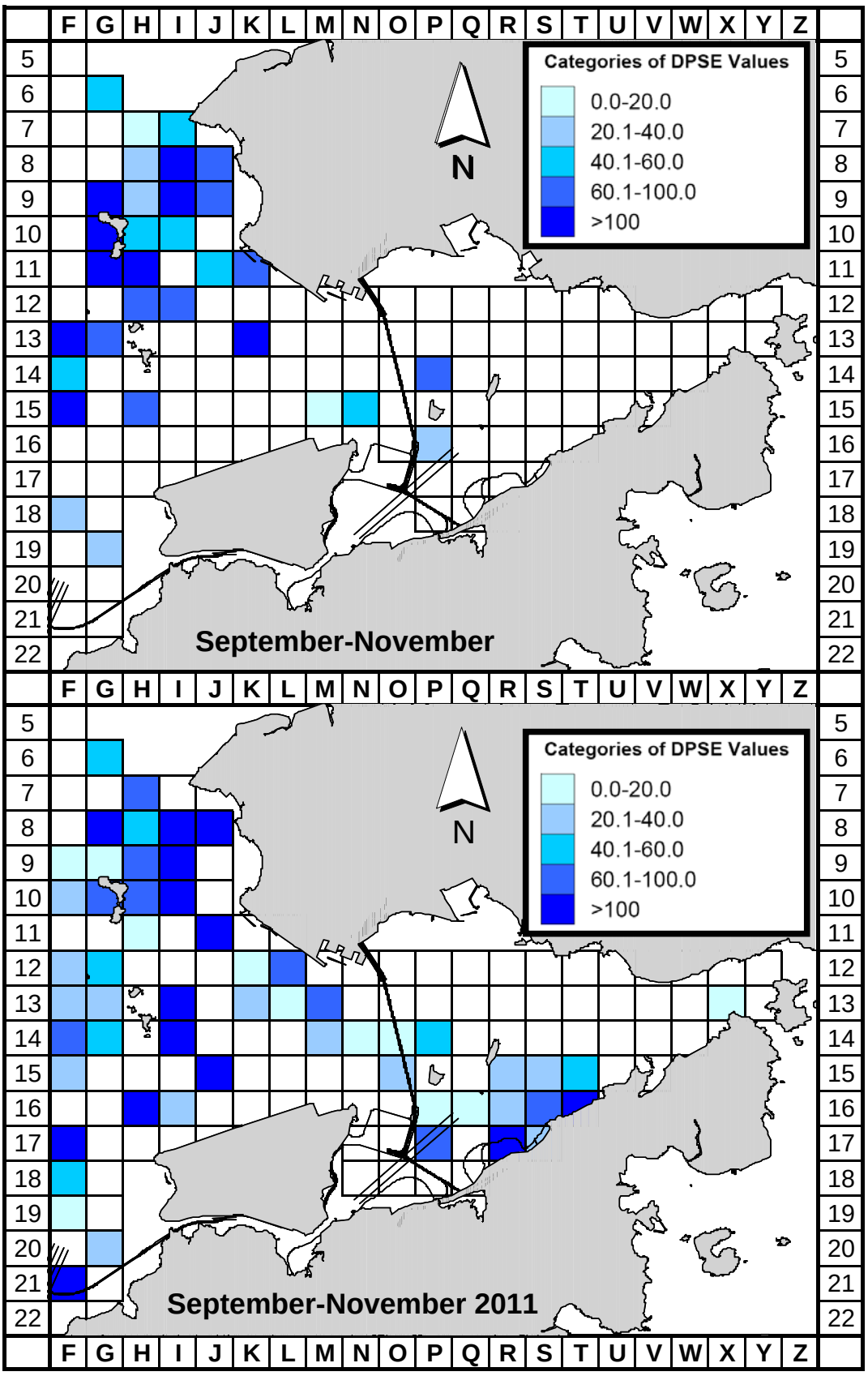


Figure 4. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in Northwest and Northeast Lantau survey area between the impact monitoring period (Sept-Nov 2013) and baseline monitoring period (Sept-Nov 2011)
(DPSE = no. of dolphins per 100 units of survey effort)

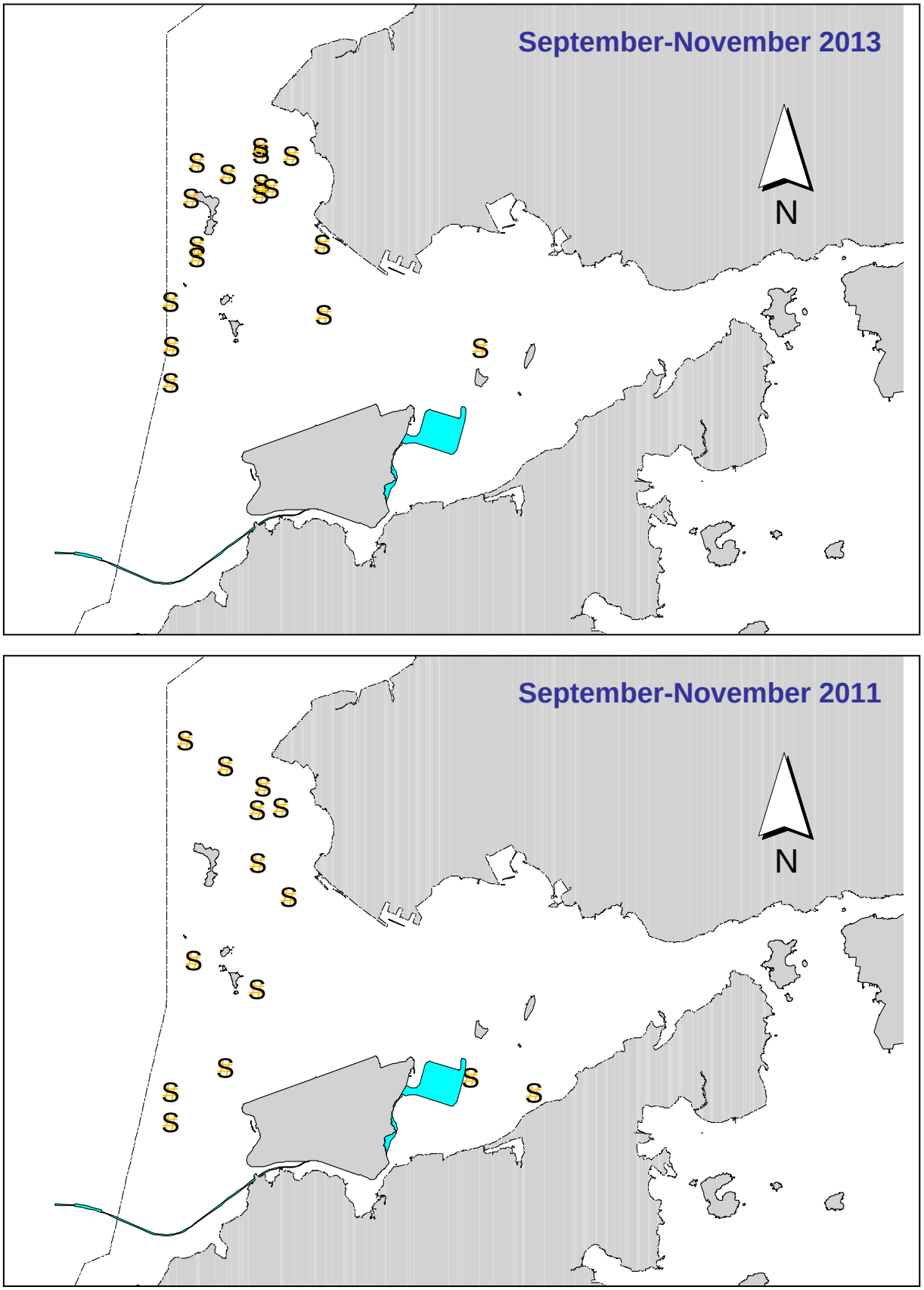


Figure 5. Distribution of young calves of Chinese white dolphins during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

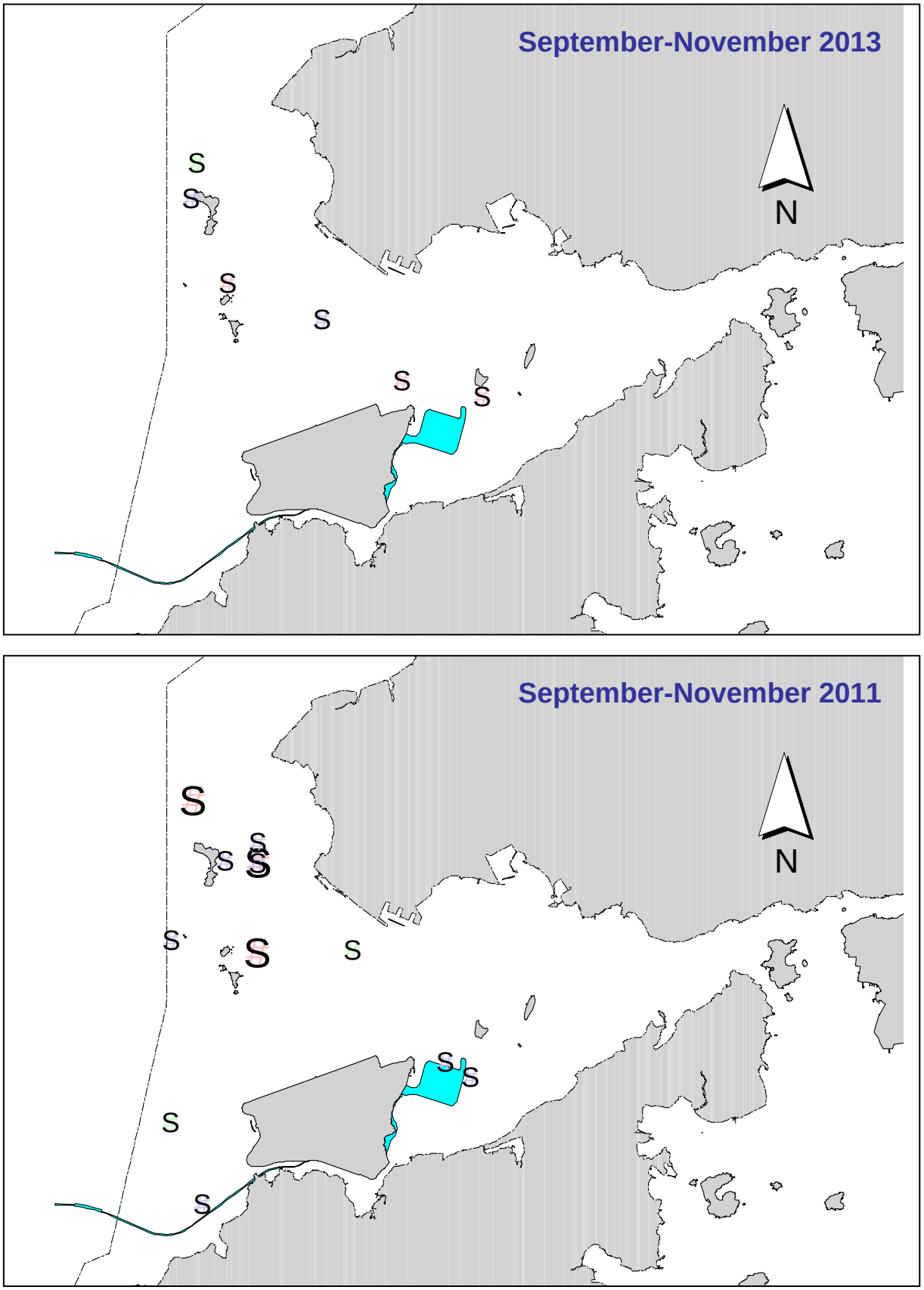


Figure 6. Distribution of Chinese white dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

Annex I. HKLR03 Survey Effort Database (September-November 2013)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
3-Sep-13	NE LANTAU	1	4.10	AUTUMN	STANDARD31516	HKLR	P
3-Sep-13	NE LANTAU	2	13.80	AUTUMN	STANDARD31516	HKLR	P
3-Sep-13	NE LANTAU	1	4.22	AUTUMN	STANDARD31516	HKLR	S
3-Sep-13	NE LANTAU	2	5.08	AUTUMN	STANDARD31516	HKLR	S
3-Sep-13	NW LANTAU	1	1.40	AUTUMN	STANDARD31515	HKLR	P
3-Sep-13	NW LANTAU	2	35.28	AUTUMN	STANDARD31516	HKLR	P
3-Sep-13	NW LANTAU	3	4.23	AUTUMN	STANDARD31516	HKLR	P
3-Sep-13	NW LANTAU	2	11.67	AUTUMN	STANDARD31516	HKLR	S
3-Sep-13	NW LANTAU	3	1.42	AUTUMN	STANDARD31516	HKLR	S
5-Sep-13	NW LANTAU	1	4.40	AUTUMN	STANDARD31516	HKLR	P
5-Sep-13	NW LANTAU	2	10.05	AUTUMN	STANDARD31516	HKLR	P
5-Sep-13	NW LANTAU	3	12.22	AUTUMN	STANDARD31516	HKLR	P
5-Sep-13	NW LANTAU	4	4.35	AUTUMN	STANDARD31516	HKLR	P
5-Sep-13	NW LANTAU	2	0.70	AUTUMN	STANDARD31516	HKLR	S
5-Sep-13	NW LANTAU	3	4.07	AUTUMN	STANDARD31516	HKLR	S
5-Sep-13	NW LANTAU	4	2.94	AUTUMN	STANDARD31516	HKLR	S
5-Sep-13	NE LANTAU	2	7.70	AUTUMN	STANDARD31516	HKLR	P
5-Sep-13	NE LANTAU	3	12.80	AUTUMN	STANDARD31516	HKLR	P
5-Sep-13	NE LANTAU	1	0.90	AUTUMN	STANDARD31516	HKLR	S
5-Sep-13	NE LANTAU	2	8.60	AUTUMN	STANDARD31516	HKLR	S
5-Sep-13	NE LANTAU	3	1.00	AUTUMN	STANDARD31516	HKLR	S
10-Sep-13	NE LANTAU	1	8.82	AUTUMN	STANDARD31516	HKLR	P
10-Sep-13	NE LANTAU	2	9.18	AUTUMN	STANDARD31516	HKLR	P
10-Sep-13	NE LANTAU	1	2.19	AUTUMN	STANDARD31516	HKLR	S
10-Sep-13	NE LANTAU	2	4.30	AUTUMN	STANDARD31516	HKLR	S
10-Sep-13	NE LANTAU	3	2.11	AUTUMN	STANDARD31516	HKLR	S
10-Sep-13	NW LANTAU	1	5.52	AUTUMN	STANDARD31516	HKLR	P
10-Sep-13	NW LANTAU	2	32.26	AUTUMN	STANDARD31516	HKLR	P
10-Sep-13	NW LANTAU	3	3.40	AUTUMN	STANDARD31516	HKLR	P
10-Sep-13	NW LANTAU	1	0.32	AUTUMN	STANDARD31516	HKLR	S
10-Sep-13	NW LANTAU	2	11.97	AUTUMN	STANDARD31516	HKLR	S
18-Sep-13	NE LANTAU	3	11.11	AUTUMN	STANDARD31516	HKLR	P
18-Sep-13	NE LANTAU	4	8.60	AUTUMN	STANDARD31516	HKLR	P
18-Sep-13	NE LANTAU	2	0.97	AUTUMN	STANDARD31516	HKLR	S
18-Sep-13	NE LANTAU	3	7.52	AUTUMN	STANDARD31516	HKLR	S
18-Sep-13	NE LANTAU	4	2.00	AUTUMN	STANDARD31516	HKLR	S
18-Sep-13	NW LANTAU	2	10.48	AUTUMN	STANDARD31516	HKLR	P
18-Sep-13	NW LANTAU	3	19.93	AUTUMN	STANDARD31516	HKLR	P
18-Sep-13	NW LANTAU	4	1.34	AUTUMN	STANDARD31516	HKLR	P
18-Sep-13	NW LANTAU	2	3.81	AUTUMN	STANDARD31516	HKLR	S
18-Sep-13	NW LANTAU	3	3.49	AUTUMN	STANDARD31516	HKLR	S
8-Oct-13	NW LANTAU	2	1.46	AUTUMN	STANDARD31516	HKLR	P
8-Oct-13	NW LANTAU	3	19.09	AUTUMN	STANDARD31516	HKLR	P
8-Oct-13	NW LANTAU	4	20.08	AUTUMN	STANDARD31516	HKLR	P
8-Oct-13	NW LANTAU	3	2.90	AUTUMN	STANDARD31516	HKLR	S
8-Oct-13	NW LANTAU	4	9.37	AUTUMN	STANDARD31516	HKLR	S
8-Oct-13	NW LANTAU	5	0.90	AUTUMN	STANDARD31516	HKLR	S
8-Oct-13	NE LANTAU	2	6.60	AUTUMN	STANDARD31516	HKLR	P
8-Oct-13	NE LANTAU	3	10.67	AUTUMN	STANDARD31516	HKLR	P
8-Oct-13	NE LANTAU	2	6.46	AUTUMN	STANDARD31516	HKLR	S
8-Oct-13	NE LANTAU	3	3.87	AUTUMN	STANDARD31516	HKLR	S

Annex I. (cont'd)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
15-Oct-13	NW LANTAU	2	23.21	AUTUMN	STANDARD31516	HKLR	P
15-Oct-13	NW LANTAU	3	7.37	AUTUMN	STANDARD31516	HKLR	P
15-Oct-13	NW LANTAU	2	7.56	AUTUMN	STANDARD31516	HKLR	S
15-Oct-13	NE LANTAU	2	13.30	AUTUMN	STANDARD31516	HKLR	P
15-Oct-13	NE LANTAU	3	6.89	AUTUMN	STANDARD31516	HKLR	**P**
15-Oct-13	NE LANTAU	2	9.51	AUTUMN	STANDARD31516	HKLR	S
15-Oct-13	NE LANTAU	3	1.10	AUTUMN	STANDARD31516	HKLR	S
17-Oct-13	NE LANTAU	2	5.05	AUTUMN	STANDARD31516	HKLR	P
17-Oct-13	NE LANTAU	3	15.02	AUTUMN	STANDARD31516	HKLR	P
17-Oct-13	NE LANTAU	2	4.49	AUTUMN	STANDARD31516	HKLR	S
17-Oct-13	NE LANTAU	3	6.24	AUTUMN	STANDARD31516	HKLR	S
17-Oct-13	NW LANTAU	2	14.04	AUTUMN	STANDARD31516	HKLR	P
17-Oct-13	NW LANTAU	3	15.63	AUTUMN	STANDARD31516	HKLR	P
17-Oct-13	NW LANTAU	2	3.86	AUTUMN	STANDARD31516	HKLR	S
17-Oct-13	NW LANTAU	3	4.55	AUTUMN	STANDARD31516	HKLR	S
22-Oct-13	NW LANTAU	1	2.11	AUTUMN	STANDARD31516	HKLR	P
22-Oct-13	NW LANTAU	2	18.78	AUTUMN	STANDARD31516	HKLR	P
22-Oct-13	NW LANTAU	3	14.78	AUTUMN	STANDARD31516	HKLR	P
22-Oct-13	NW LANTAU	1	2.43	AUTUMN	STANDARD31516	HKLR	S
22-Oct-13	NW LANTAU	2	2.22	AUTUMN	STANDARD31516	HKLR	S
22-Oct-13	NW LANTAU	3	6.44	AUTUMN	STANDARD31516	HKLR	S
22-Oct-13	NE LANTAU	1	0.97	AUTUMN	STANDARD31516	HKLR	P
22-Oct-13	NE LANTAU	2	16.73	AUTUMN	STANDARD31516	HKLR	P
22-Oct-13	NE LANTAU	3	0.26	AUTUMN	STANDARD31516	HKLR	P
22-Oct-13	NE LANTAU	2	9.78	AUTUMN	STANDARD31516	HKLR	S
22-Oct-13	NE LANTAU	3	0.31	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NW LANTAU	1	6.43	AUTUMN	STANDARD31516	HKLR	P
1-Nov-13	NW LANTAU	2	28.32	AUTUMN	STANDARD31516	HKLR	P
1-Nov-13	NW LANTAU	3	19.23	AUTUMN	STANDARD31516	HKLR	P
1-Nov-13	NW LANTAU	1	2.25	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NW LANTAU	2	5.73	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NW LANTAU	3	4.87	AUTUMN	STANDARD31516	HKLR	S
1-Nov-13	NE LANTAU	2	3.67	AUTUMN	STANDARD31516	HKLR	P
5-Nov-13	NE LANTAU	2	34.75	AUTUMN	STANDARD31516	HKLR	P
5-Nov-13	NE LANTAU	2	10.65	AUTUMN	STANDARD31516	HKLR	S
5-Nov-13	NW LANTAU	2	13.99	AUTUMN	STANDARD31516	HKLR	P
5-Nov-13	NW LANTAU	2	6.61	AUTUMN	STANDARD31516	HKLR	S
8-Nov-13	NW LANTAU	0	1.73	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	1	10.57	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	2	39.88	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	3	1.50	AUTUMN	STANDARD31516	HKLR	P
8-Nov-13	NW LANTAU	1	1.29	AUTUMN	STANDARD31516	HKLR	S
8-Nov-13	NW LANTAU	2	5.53	AUTUMN	STANDARD31516	HKLR	S
8-Nov-13	NW LANTAU	3	2.36	AUTUMN	STANDARD31516	HKLR	S
13-Nov-13	NE LANTAU	1	5.70	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NE LANTAU	2	21.79	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NE LANTAU	3	9.60	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NE LANTAU	2	11.71	AUTUMN	STANDARD31516	HKLR	S
13-Nov-13	NE LANTAU	3	1.10	AUTUMN	STANDARD31516	HKLR	S
13-Nov-13	NW LANTAU	1	1.93	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NW LANTAU	2	5.89	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NW LANTAU	3	6.87	AUTUMN	STANDARD31516	HKLR	P
13-Nov-13	NW LANTAU	2	4.22	AUTUMN	STANDARD31516	HKLR	S

Annex II. HKLR03 Chinese White Dolphin Sighting Database (September-November 2013)

(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
3-Sep-13	1	1454	2	NW LANTAU	2	223	ON	HKLR	830628	805630	AUTUMN	NONE	S
5-Sep-13	1	1323	6	NW LANTAU	3	242	ON	HKLR	825416	809502	AUTUMN	NONE	P
10-Sep-13	1	1121	2	NE LANTAU	2	75	ON	HKLR	820812	814615	AUTUMN	NONE	P
10-Sep-13	2	1213	3	NW LANTAU	2	89	ON	HKLR	821281	812060	AUTUMN	NONE	S
18-Sep-13	1	1208	1	NW LANTAU	3	400	ON	HKLR	821271	811525	AUTUMN	NONE	P
18-Sep-13	2	1356	5	NW LANTAU	2	87	ON	HKLR	828132	807540	AUTUMN	NONE	P
18-Sep-13	3	1417	3	NW LANTAU	2	120	ON	HKLR	829251	807491	AUTUMN	NONE	P
15-Oct-13	1	1019	2	NW LANTAU	2	163	ON	HKLR	817184	805458	AUTUMN	NONE	P
15-Oct-13	2	1126	5	NW LANTAU	2	336	ON	HKLR	827871	805470	AUTUMN	NONE	P
17-Oct-13	1	1413	7	NW LANTAU	2	115	ON	HKLR	828321	807520	AUTUMN	NONE	P
17-Oct-13	2	1440	2	NW LANTAU	3	125	ON	HKLR	829573	806935	AUTUMN	NONE	S
17-Oct-13	3	1514	1	NW LANTAU	2	238	ON	HKLR	827804	805449	AUTUMN	NONE	P
17-Oct-13	4	1529	5	NW LANTAU	2	0	ON	HKLR	826819	805303	AUTUMN	NONE	S
22-Oct-13	1	943	8	NW LANTAU	3	1847	ON	HKLR	823278	809550	AUTUMN	NONE	S
22-Oct-13	2	1036	6	NW LANTAU	3	530	ON	HKLR	827755	808013	AUTUMN	NONE	S
22-Oct-13	3	1122	2	NW LANTAU	2	142	ON	HKLR	825440	808493	AUTUMN	NONE	P
22-Oct-13	4	1226	2	NW LANTAU	3	53	ON	HKLR	823661	806141	AUTUMN	NONE	S
22-Oct-13	5	1233	5	NW LANTAU	2	0	ON	HKLR	824236	806472	AUTUMN	NONE	S
22-Oct-13	6	1244	3	NW LANTAU	2	48	ON	HKLR	825632	806464	AUTUMN	GILLNET	P
22-Oct-13	7	1255	2	NW LANTAU	2	18	ON	HKLR	826540	806476	AUTUMN	NONE	P
22-Oct-13	8	1305	2	NW LANTAU	2	155	ON	HKLR	827547	806458	AUTUMN	NONE	P
22-Oct-13	9	1313	2	NW LANTAU	1	295	ON	HKLR	828179	806480	AUTUMN	NONE	P
22-Oct-13	10	1413	3	NW LANTAU	3	231	ON	HKLR	822302	804655	AUTUMN	NONE	P
22-Oct-13	11	1600	6	NE LANTAU	3	128	ON	HKLR	822285	814576	AUTUMN	NONE	P
1-Nov-13	1	1049	4	NW LANTAU	2	74	ON	HKLR	823145	809509	AUTUMN	NONE	P
1-Nov-13	2	1152	3	NW LANTAU	3	214	ON	HKLR	826947	807517	AUTUMN	NONE	P
1-Nov-13	3	1203	7	NW LANTAU	3	159	ON	HKLR	827235	807539	AUTUMN	NONE	P
1-Nov-13	4	1225	1	NW LANTAU	2	137	ON	HKLR	827490	807539	AUTUMN	NONE	P
1-Nov-13	5	1236	3	NW LANTAU	2	358	ON	HKLR	828232	807530	AUTUMN	NONE	P
1-Nov-13	6	1252	7	NW LANTAU	2	ND	OFF	HKLR	828941	807583	AUTUMN	NONE	N/A
1-Nov-13	7	1312	4	NW LANTAU	2	72	ON	HKLR	830018	805999	AUTUMN	NONE	S
1-Nov-13	8	1458	11	NW LANTAU	3	60	ON	HKLR	821228	804642	AUTUMN	NONE	P

Annex II. (cont'd)

(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
5-Nov-13	1	1421	5	NW LANTAU	2	378	ON	HKLR	828097	808508	AUTUMN	NONE	P
8-Nov-13	1	1041	4	NW LANTAU	1	302	ON	HKLR	824489	807678	AUTUMN	NONE	P
8-Nov-13	2	1103	8	NW LANTAU	2	694	ON	HKLR	827091	807858	AUTUMN	NONE	P
8-Nov-13	3	1152	7	NW LANTAU	3	299	ON	HKLR	827660	805459	AUTUMN	NONE	P
8-Nov-13	4	1215	9	NW LANTAU	2	756	ON	HKLR	825357	805465	AUTUMN	NONE	P
8-Nov-13	5	1232	5	NW LANTAU	2	ND	OFF	HKLR	825025	805464	AUTUMN	NONE	N/A
8-Nov-13	6	1249	4	NW LANTAU	2	7	ON	HKLR	823806	805462	AUTUMN	NONE	P
8-Nov-13	7	1400	2	NW LANTAU	2	155	ON	HKLR	818382	804657	AUTUMN	NONE	P
8-Nov-13	8	1426	8	NW LANTAU	2	149	ON	HKLR	823675	804648	AUTUMN	NONE	P
8-Nov-13	9	1526	1	NW LANTAU	2	45	ON	HKLR	826872	806446	AUTUMN	NONE	P
8-Nov-13	10	1536	4	NW LANTAU	1	225	ON	HKLR	825643	806454	AUTUMN	NONE	P
8-Nov-13	11	1606	4	NW LANTAU	2	223	ON	HKLR	821988	806457	AUTUMN	NONE	P
13-Nov-13	1	1451	1	NW LANTAU	3	343	ON	HKLR	825118	808482	AUTUMN	NONE	P

Annex III. Individual dolphins identified during HKLR03 monitoring surveys in September-November 2013

ID#	DATE	STG#	AREA
CH34	18/09/13	2	NW LANTAU
	05/11/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
CH98	17/10/13	1	NW LANTAU
	17/10/13	3	NW LANTAU
EL01	10/09/13	1	NE LANTAU
	10/09/13	2	NW LANTAU
	05/11/13	1	NW LANTAU
NL11	22/10/13	2	NW LANTAU
NL24	22/10/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
NL33	05/11/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
	08/11/13	11	NW LANTAU
NL37	08/11/13	2	NW LANTAU
NL46	22/10/13	8	NW LANTAU
	01/11/13	3	NW LANTAU
NL48	08/11/13	9	NW LANTAU
NL49	22/10/13	5	NW LANTAU
	08/11/13	2	NW LANTAU
NL80	01/11/13	3	NW LANTAU
	01/11/13	6	NW LANTAU
	08/11/13	6	NW LANTAU
NL93	01/11/13	8	NW LANTAU
NL98	22/10/13	1	NW LANTAU
	22/10/13	4	NW LANTAU
	22/10/13	11	NE LANTAU
	01/11/13	2	NW LANTAU
NL103	17/10/13	1	NW LANTAU
	08/11/13	3	NW LANTAU
NL105	18/09/13	2	NW LANTAU
NL123	22/10/13	11	NE LANTAU
	08/11/13	11	NW LANTAU
NL136	01/11/13	8	NW LANTAU
NL139	01/11/13	8	NW LANTAU
	08/11/13	1	NW LANTAU
NL145	22/10/13	2	NW LANTAU
	01/11/13	3	NW LANTAU

ID#	DATE	STG#	AREA
NL150	22/10/13	2	NW LANTAU
	08/11/13	3	NW LANTAU
NL165	22/10/13	5	NW LANTAU
	01/11/13	8	NW LANTAU
	08/11/13	1	NW LANTAU
NL182	17/10/13	1	NW LANTAU
	22/10/13	3	NW LANTAU
	01/11/13	6	NW LANTAU
NL188	05/09/13	1	NW LANTAU
	22/10/13	10	NW LANTAU
	08/11/13	8	NW LANTAU
NL191	10/09/13	1	NE LANTAU
	10/09/13	2	NW LANTAU
NL212	08/11/13	3	NW LANTAU
NL213	15/10/13	2	NW LANTAU
	22/10/13	7	NW LANTAU
NL214	17/10/13	4	NW LANTAU
NL220	05/09/13	1	NW LANTAU
	17/10/13	1	NW LANTAU
	22/10/13	1	NW LANTAU
	22/10/13	4	NW LANTAU
	22/10/13	11	NE LANTAU
NL221	15/10/13	2	NW LANTAU
	17/10/13	1	NW LANTAU
	17/10/13	4	NW LANTAU
NL226	01/11/13	1	NW LANTAU
NL236	18/09/13	3	NW LANTAU
	01/11/13	7	NW LANTAU
	08/11/13	2	NW LANTAU
NL242	18/09/13	2	NW LANTAU
	08/11/13	4	NW LANTAU
	08/11/13	5	NW LANTAU
NL244	10/09/13	2	NW LANTAU
NL259	01/11/13	8	NW LANTAU
NL261	01/11/13	1	NW LANTAU
	08/11/13	1	NW LANTAU
	08/11/13	10	NW LANTAU
NL262	01/11/13	8	NW LANTAU
NL264	05/09/13	1	NW LANTAU
NL269	01/11/13	8	NW LANTAU

Annex III. (cont'd)

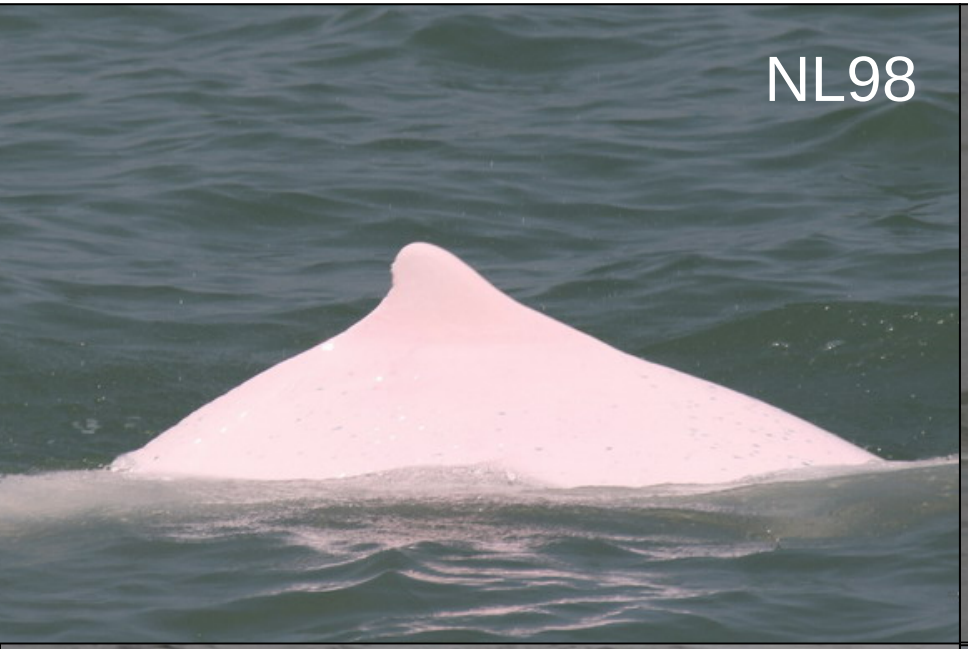
ID#	DATE	STG#	AREA
NL272	01/11/13	1	NW LANTAU
	08/11/13	4	NW LANTAU
NL284	01/11/13	1	NW LANTAU
NL285	22/10/13	11	NE LANTAU
	08/11/13	11	NW LANTAU
NL287	22/10/13	2	NW LANTAU
NL288	05/09/13	1	NW LANTAU
NL295	22/10/13	6	NW LANTAU
	22/10/13	11	NE LANTAU
NL296	22/10/13	6	NW LANTAU
	22/10/13	11	NE LANTAU
	05/11/13	1	NW LANTAU
NL300	08/11/13	6	NW LANTAU
NL301	01/11/13	4	NW LANTAU
	01/11/13	6	NW LANTAU
SL35	08/11/13	10	NW LANTAU
WL04	01/11/13	8	NW LANTAU
WL05	05/09/13	1	NW LANTAU
	18/09/13	2	NW LANTAU
	22/10/13	5	NW LANTAU
	01/11/13	8	NW LANTAU
WL11	05/09/13	1	NW LANTAU
	08/11/13	2	NW LANTAU
WL15	08/11/13	10	NW LANTAU
WL46	17/10/13	1	NW LANTAU
WL79	08/11/13	4	NW LANTAU
WL98	08/11/13	4	NW LANTAU
WL124	15/10/13	2	NW LANTAU
	08/11/13	8	NW LANTAU

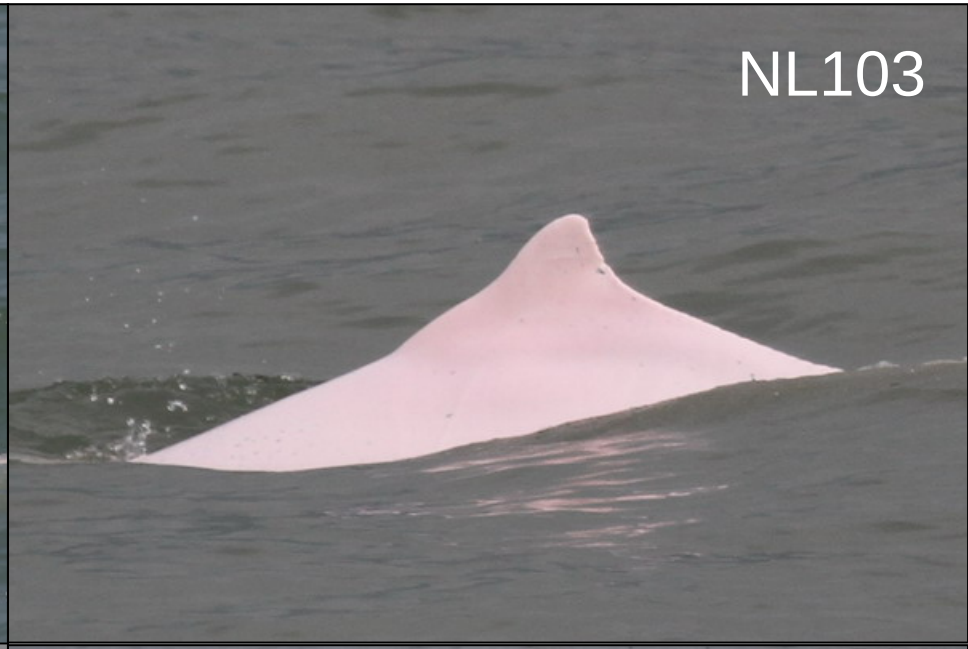
Annex IV. Fifty-six individual dolphins that were identified during September-November 2013 under HKLR03 impact phase monitoring surveys

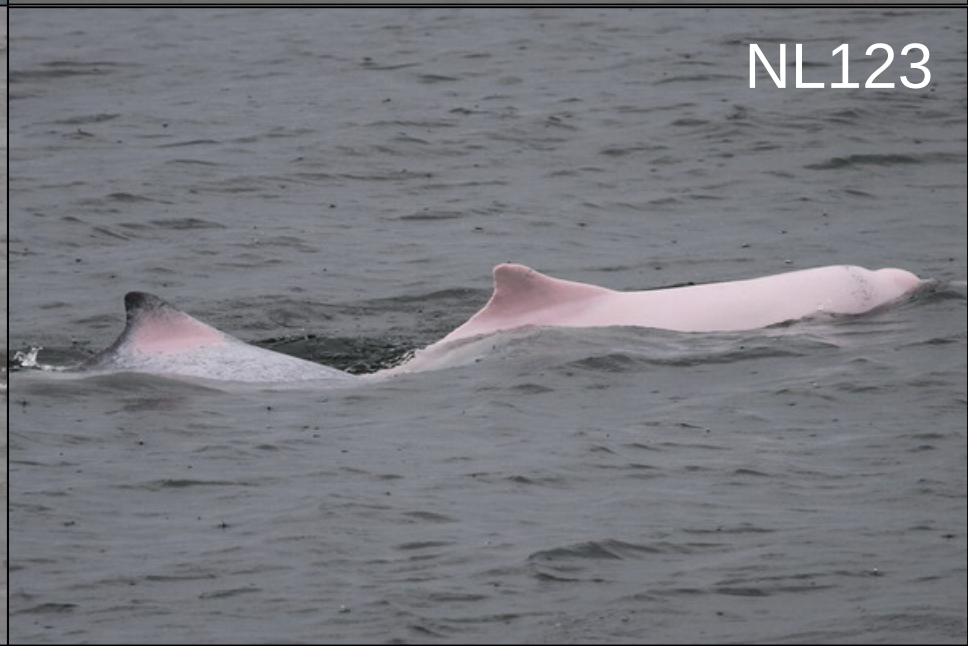
Annex IV. (cont'd)

Annex IV. (cont'd)

Annex IV. (cont'd)



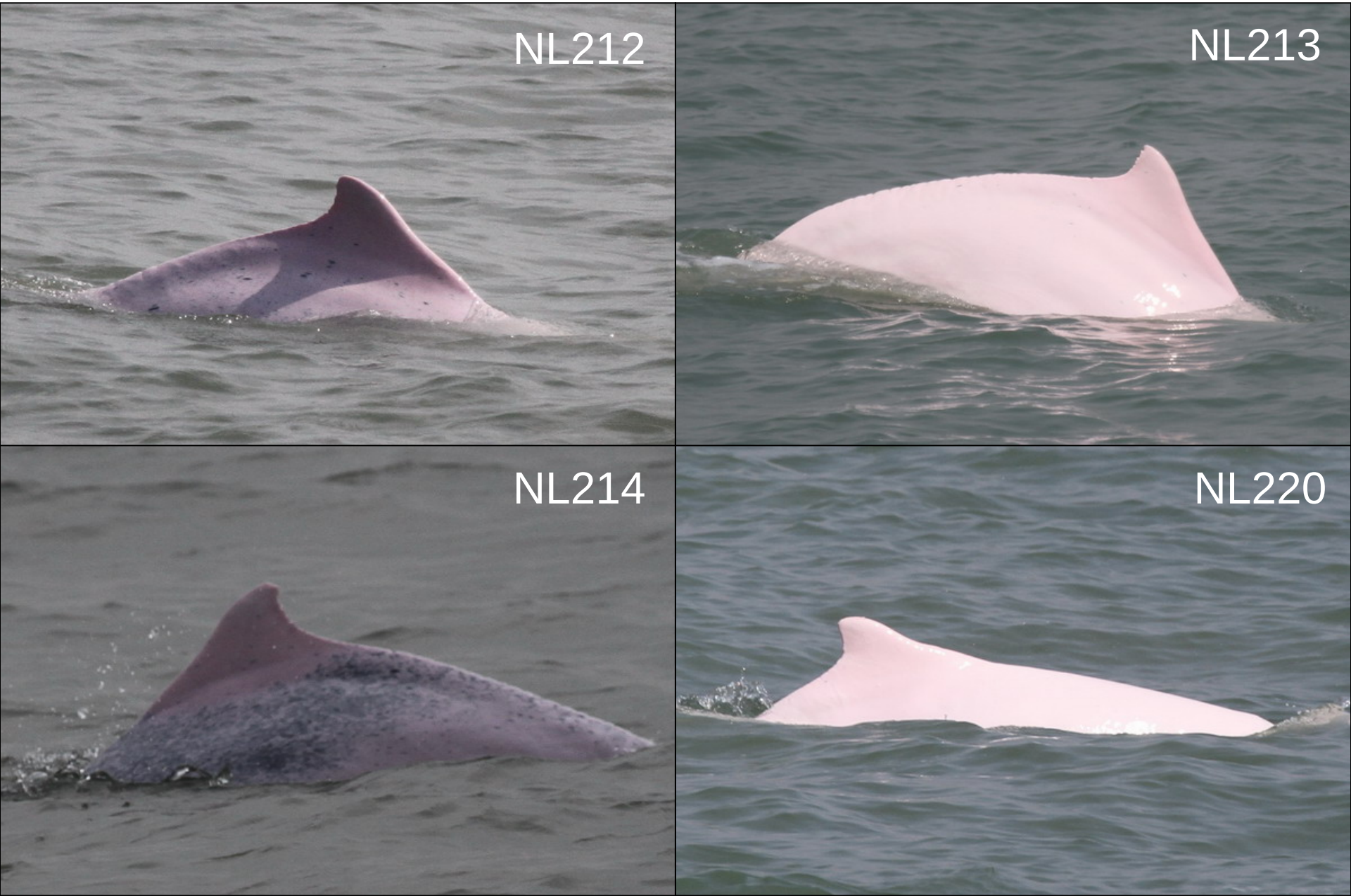




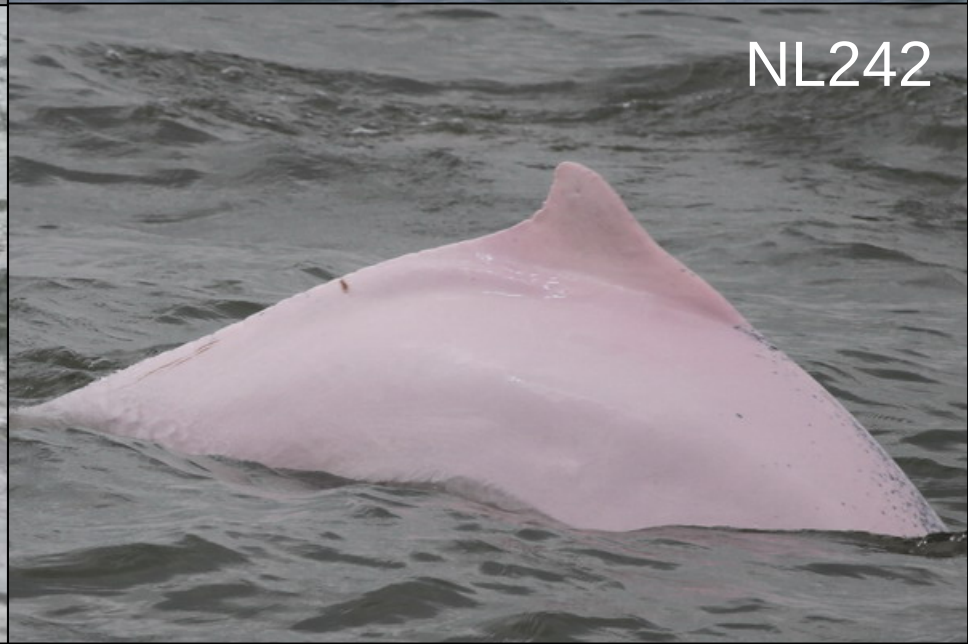
Annex IV. (cont'd)

Annex IV. (cont'd)

Annex IV. (cont'd)



Annex IV. (cont'd)



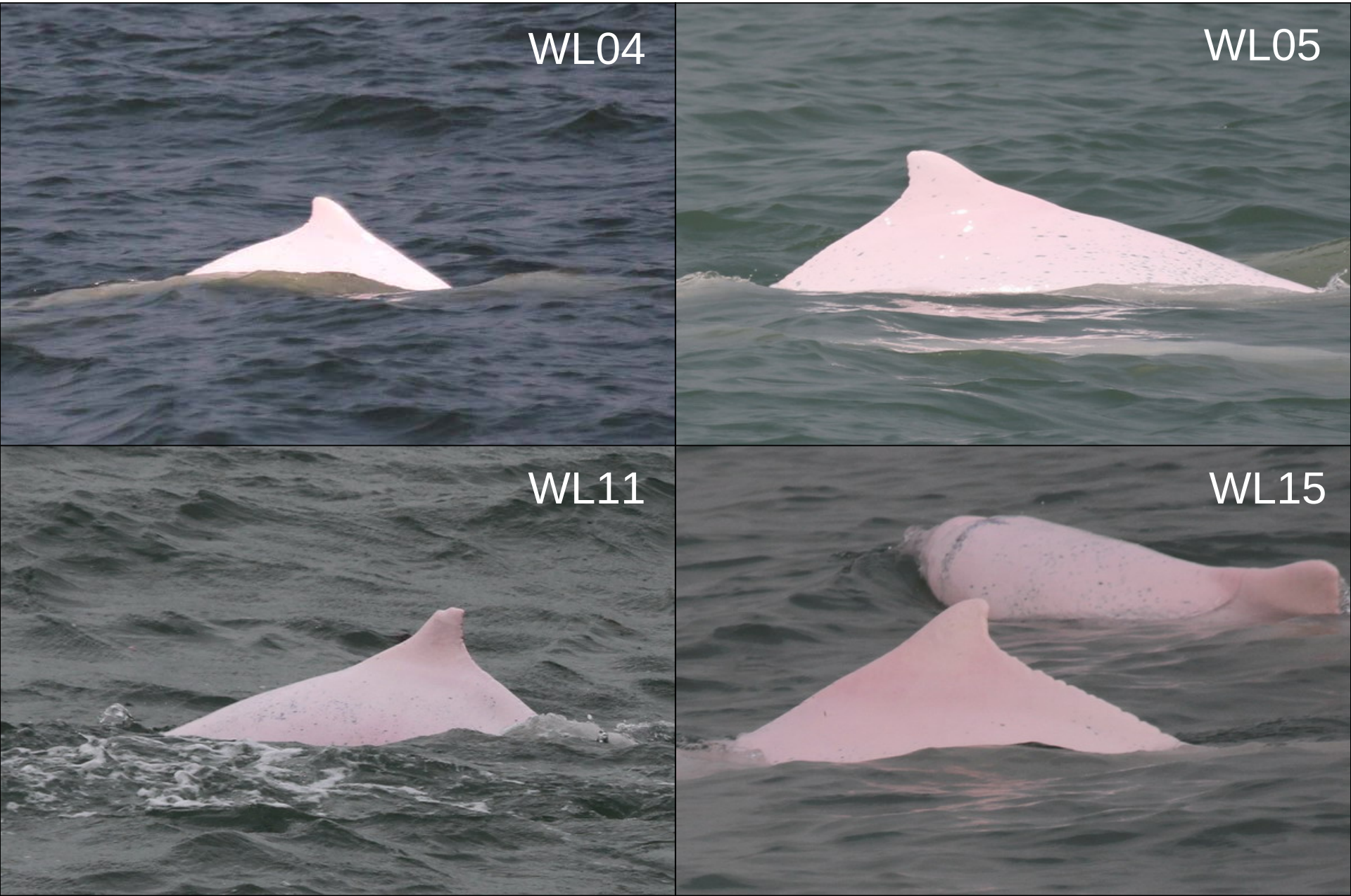
Annex IV. (cont'd)

Annex IV. (cont'd)

Annex IV. (cont'd)

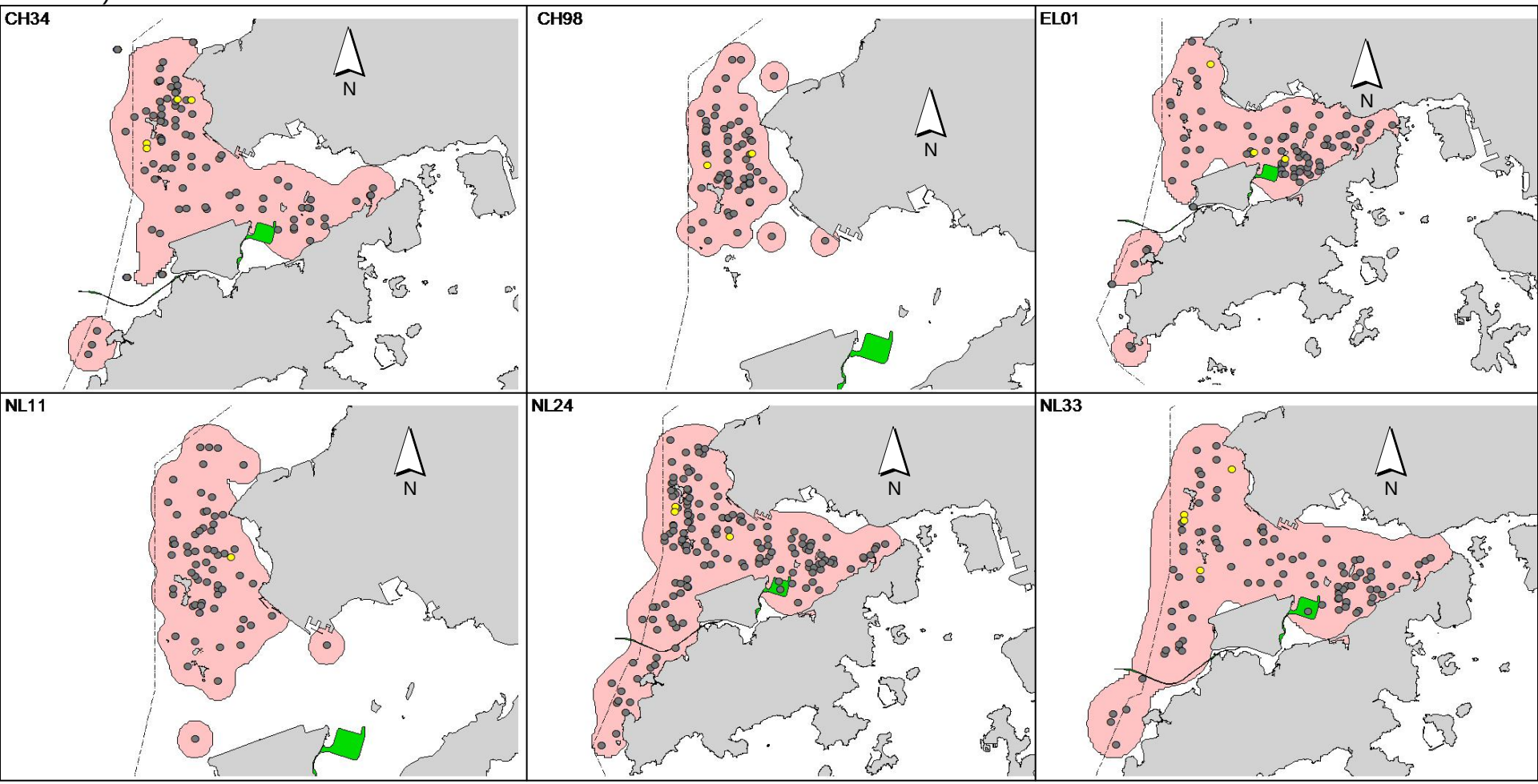
Annex IV. (cont'd)

Annex IV. (cont'd)

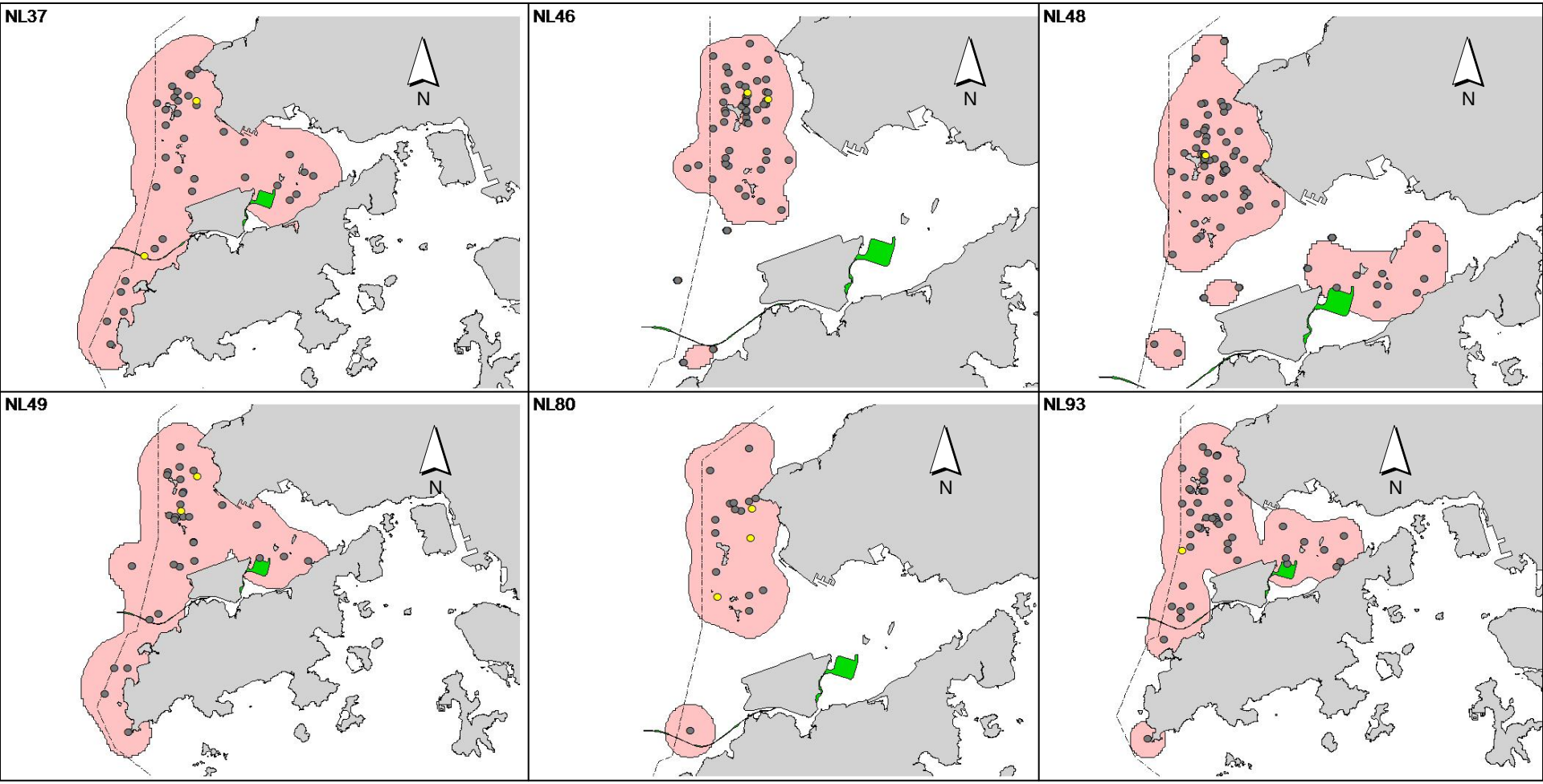


Annex IV. (cont'd)

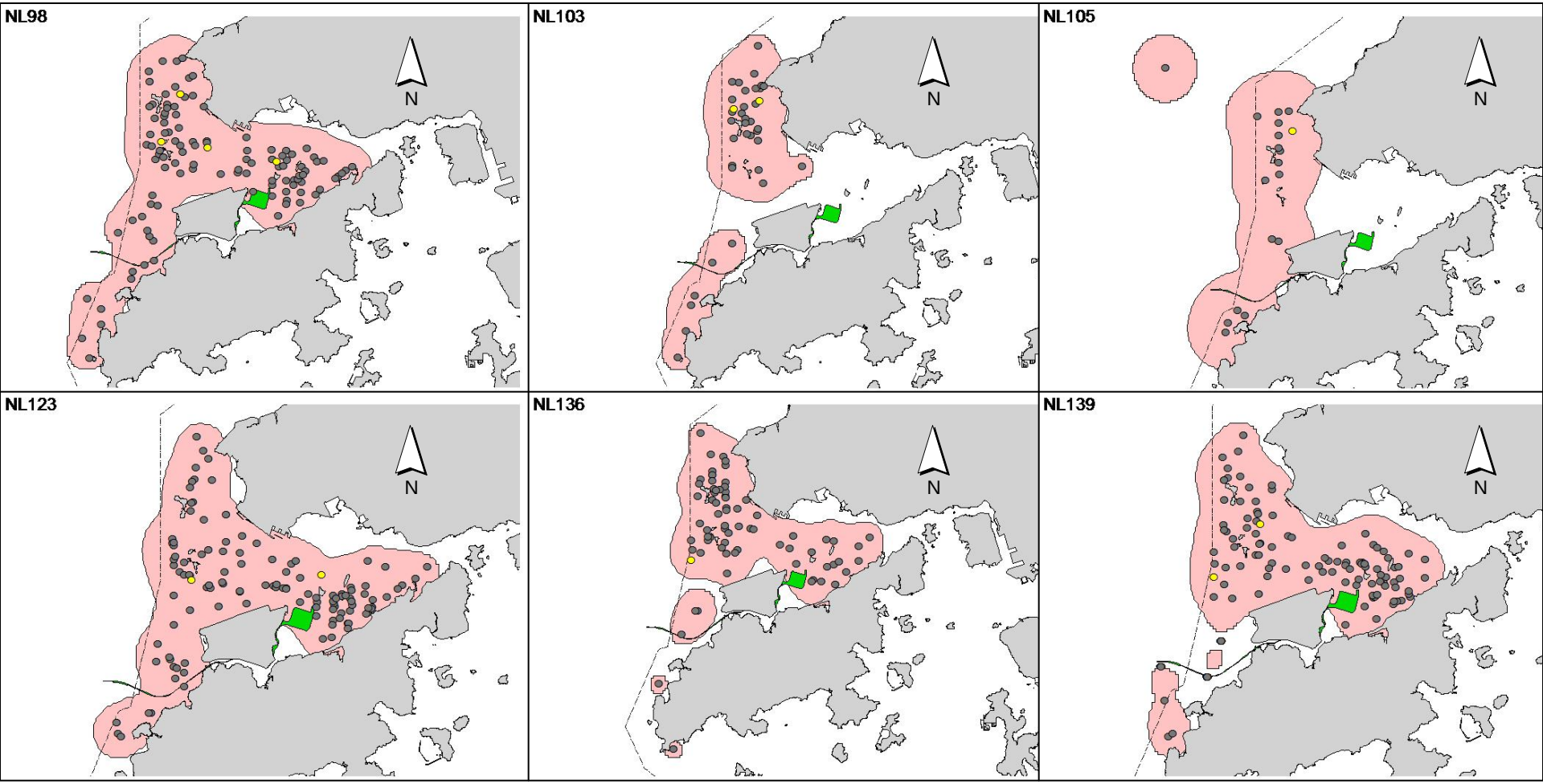
Annex V. Ranging patterns (95% kernel ranges) of 56 individual dolphins that were sighted during HKLR03 impact phase monitoring period (note: yellow dots indicates sightings made in September – November 2013)



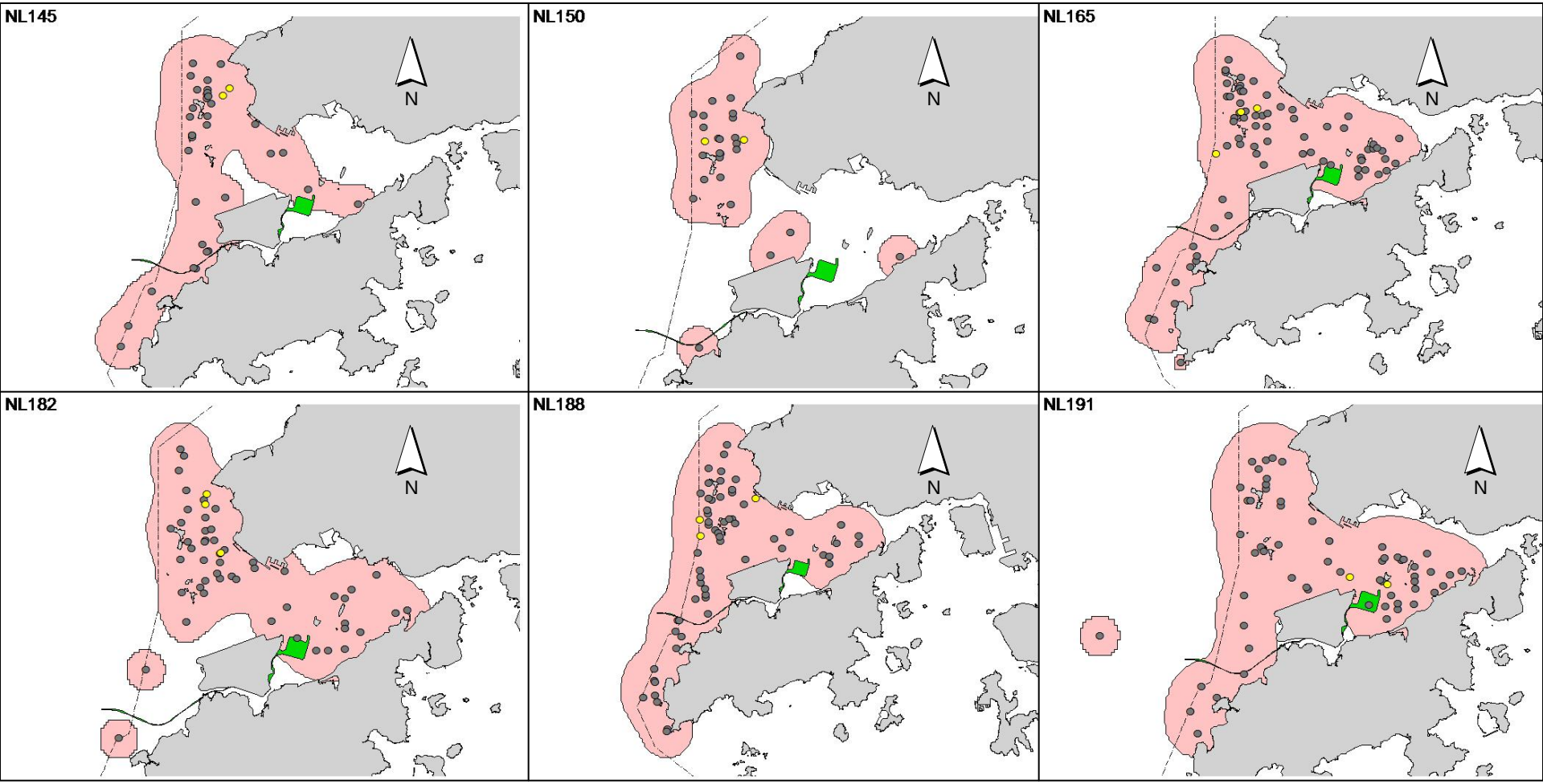
Annex V. (cont'd)



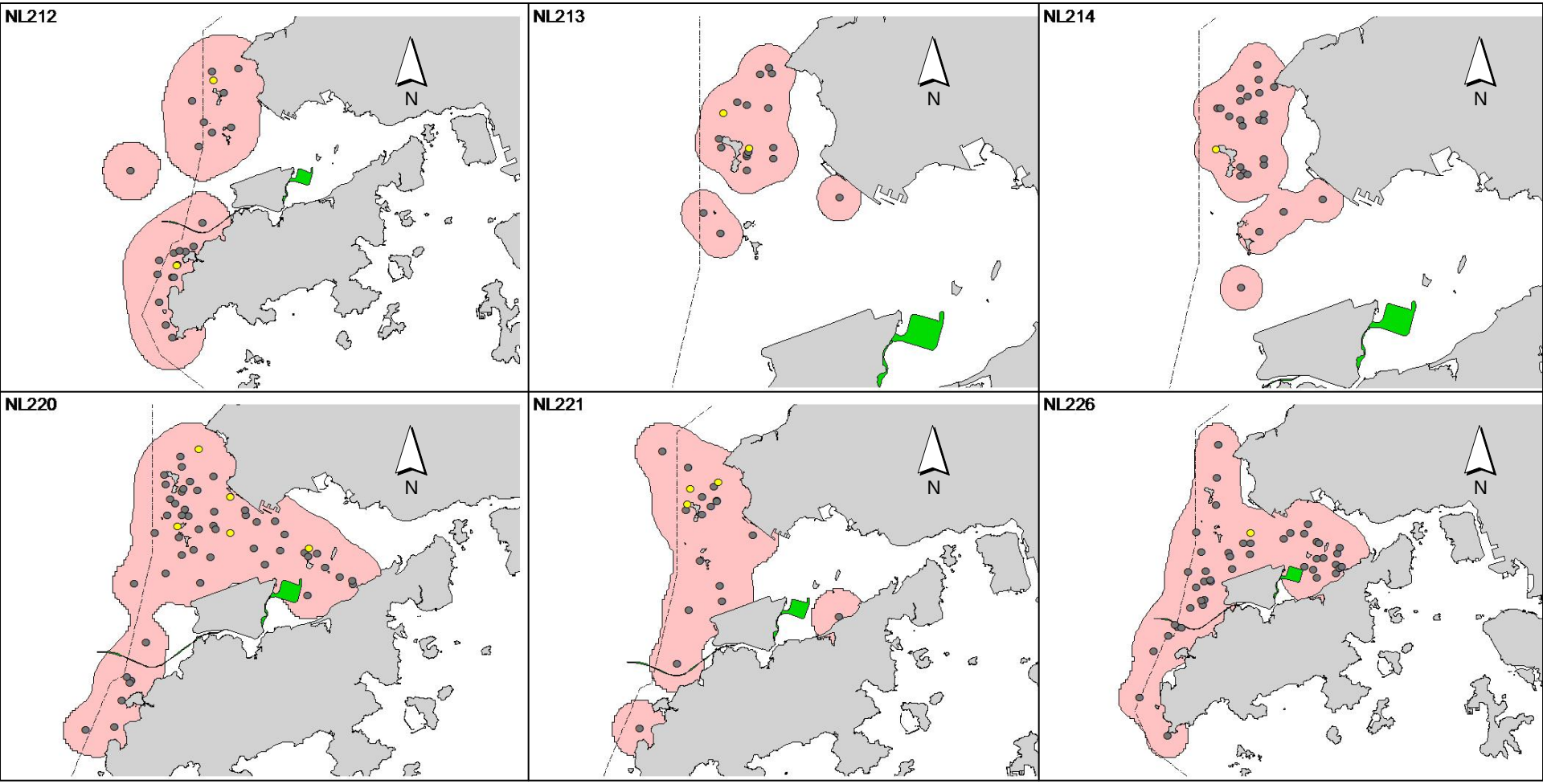
Annex V. (cont'd)



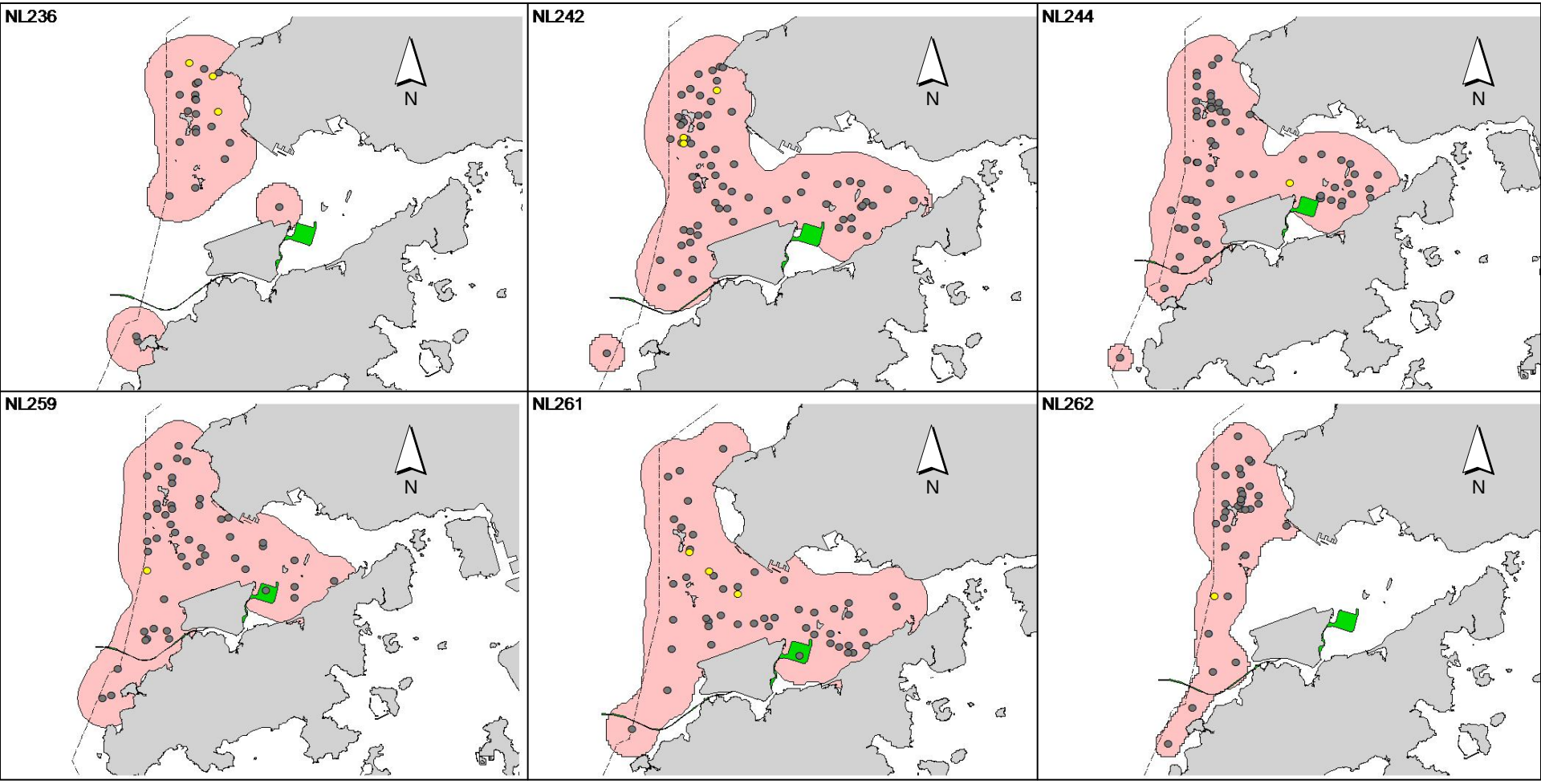
Annex V. (cont'd)



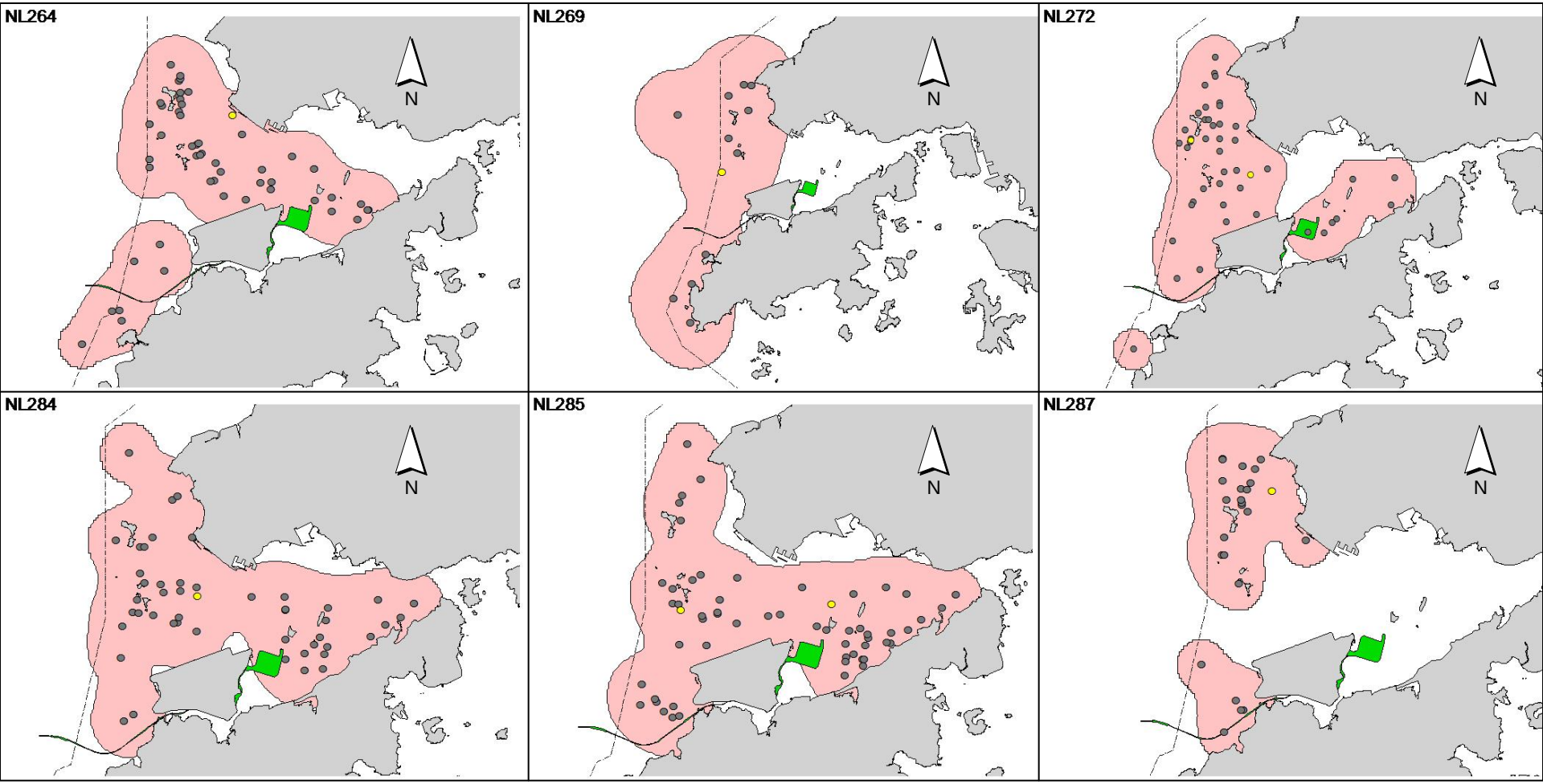
Annex V. (cont'd)



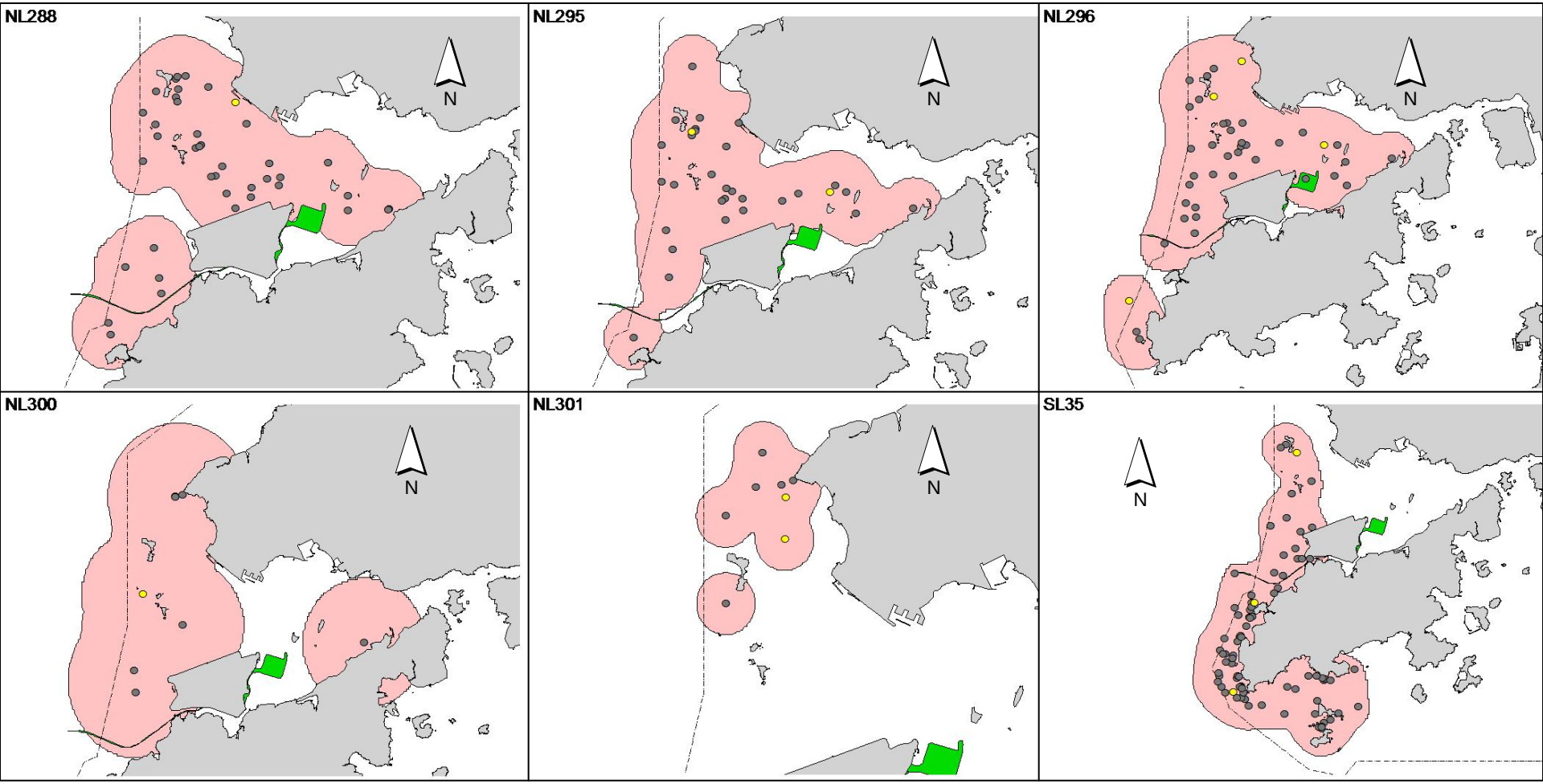
Annex V. (cont'd)



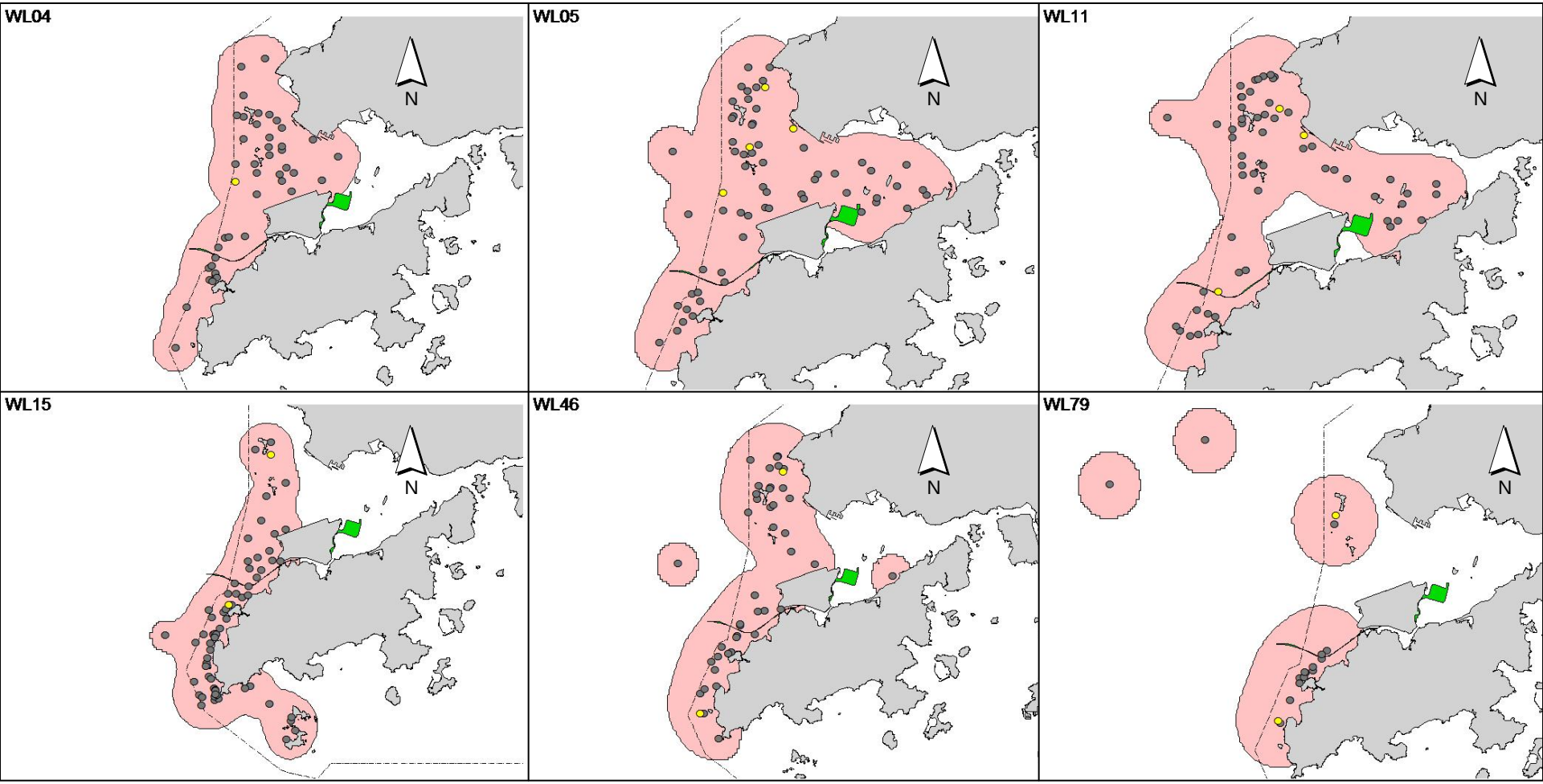
Annex V. (cont'd)



Annex V. (cont'd)



Annex V. (cont'd)



Annex V. (cont'd)