CONTRACT NO. HY/2012/07
Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link (Southern Connection Viaduct Section)
Dolphin Quarterly Monitoring

2nd Quarterly Progress Report (March-May 2014)
submitted to Gammon Construction Limited

Submitted by
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1. Introduction

1.1. The Tuen Mun-Chek Lap Kok Link (TM-CLKL) comprises a 1.6 km long dual 2-lane viaduct section between the Hong Kong Boundary Crossing Facilities (HKBCF) and the North Lantau Highway and associated roads at Tai Ho. Gammon Construction Limited (hereinafter called the "Contractor") was awarded as the main contractor of "Contract No. HY/2012/07 – Hong Kong-Zhuhai-Macao Bridge Tuen Mun-Chek Lap Kok Link – Southern Connection Viaduct Section".

1.2. According to the updated Environmental Monitoring and Audit (EM&A) Manual (for TM-CLKL), monthly line-transect vessel surveys for Chinese White Dolphin should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas as in AFCD annual marine mammal monitoring programme. However, as such surveys have been undertaken by the HKLR03 and HKBCF projects in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommended by the Highways Department, that the TM-CLKL EM&A project can utilize the monitoring data collected by HKLR03 or HKBCF project to avoid any redundancy in monitoring effort. Such exemption for the dolphin monitoring will end upon the completion of the dolphin monitoring carried out by HKLR03 contract as well as the TM-CLKL Northern Connection Sub-Sea Tunnel Section (HY/2012/08)

1.3. In November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by Gammon Construction Limited as the dolphin specialist for the TM-CLKL Southern Viaduct Section EM&A project. He is responsible for the dolphin monitoring study, including the data collection on Chinese White Dolphins during the construction phase (i.e. impact period) of the TM-CLKL project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas.

1.4. During the construction period of HKLR, the dolphin specialist would be in charge of reviewing and collating information collected by HKLR03 dolphin monitoring programme to

examine any potential impacts of TM-CLKL construction works on the dolphins.

1.5. 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.

1.6. This report is the second quarterly progress report under the TM-CLKL construction phase dolphin monitoring programme submitted to the Gammon Construction Limited, summarizing the results of the surveys findings during the period of March to May 2014 utilizing the survey data collected by HKLR03 project.

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 (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines conducted during the HKLR03 dolphin monitoring surveys are shown in Table 1.

Table 1 Co-ordinates of transect lines conducted by HKLR03 project

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 HKLR03 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, 2013). 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 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). One to two additional experienced observers were available on 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, positions (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 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. 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 HKLR03 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 or 60D 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.

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. Only data

collect under Beaufort 3 or below condition would be used for the encounter rate analyses. 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. 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 quarterly period of March to May 2014.

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, socializing, traveling, and milling/resting) 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 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 level.

3. Monitoring Results

3.1. Summary of survey effort and dolphin sightings

3.1.1. During the period of March to May 2014, six sets of systematic line-transect vessel surveys were conducted under the HKLR03 monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.

3.1.2. From these HKLR03 surveys, a total of 891.87 km of survey effort was collected, with 87.4% 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, 350.40 km and 541.47 km of survey effort were conducted in NEL and NWL survey areas respectively.

3.1.3. The total survey effort conducted on primary lines was 642.67 km, while the effort on secondary lines was 249.20 km. Both survey effort conducted on primary and secondary lines were considered as on-effort survey data. Summary table of the survey effort is shown in Appendix I.

3.1.4. During the six sets of HKLR03 monitoring surveys from March to May 2014, a total of 31 groups of 103 Chinese White Dolphins were sighted. All except one sighting were made during on-effort search. Twenty-five on-effort sightings were made on primary lines, while another five on-effort sightings were made on secondary lines. In this quarterly period, all dolphin groups were sighted in NWL, while none was sighted in NEL. Summary table of the dolphin sightings is shown in Appendix II.

3.2. Distribution

3.2.1. Distribution of dolphin sightings made during the HKLR03 monitoring surveys in March to May 2014 is shown in Figure 1. The majority of dolphin sightings were made in the northwestern portion of the North Lantau region. Dolphin sightings were particularly concentrated to the northern and northeastern sides of Lung Kwu Chau, and at the mouth of Deep Bay near Black Point (Figure 1). Other dolphin sightings were scattered between Lung Kwu Chau and Sha Chau, near Pillar Point, Tap Shek Kok and the airport platform. No dolphin was sighted in NEL survey area during the present quarterly period (Figure 1).

3.2.2. Notably, none of the dolphin groups were sighted in the vicinity of TMCLKL northern landfall or southern viaduct section, and the HKLR03/HKBCF reclamation site (Figure 1).

3.2.3. Sighting distribution of the present impact phase monitoring period (March to May 2014) was compared to the one during the baseline monitoring period (September to November 2011). In the present quarter, dolphin disappeared from the NEL region, which was in stark contrast to their frequent occurrence around the Brothers Islands and in the vicinity of HKBCF reclamation site during the baseline period (Figure 1).

3.2.4. Dolphin occurrence in the northwestern portion of North Lantau region was largely similar between the baseline and impact phase quarters. However, during the present impact monitoring period, there appeared to be much fewer dolphins occurred in the middle portion of North Lantau region, where dolphins supposedly moved between their core areas around Lung Kwu Chau and the Brothers Islands (Figure 1). Moreover, a number of dolphin sightings were made to the west of Chek Lap Kok airport (especially near the HKLR09 alignment) during the baseline period, but only one sighting was made there during the present impact phase period.

3.2.5. As the baseline monitoring period was in the autumn season while the present monitoring period was in the spring season, a direct comparison in dolphin distribution between the two quarterly periods of spring months in 2013 and 2014 was also made to avoid the potential bias in seasonal variation (Figure 2).

3.2.6. Between the two spring periods, none of the dolphin sightings was made in NEL in spring 2014, while there were two sightings made in spring 2013. Moreover, more dolphin sightings were made in the middle portion of North Lantau waters and to the west of the airport platform (especially near the HKLR09 alignment) in spring 2013 than in spring 2014.

3.3. Encounter rate

3.3.1. During the present quarterly 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) for each set of the HKLR03 surveys in NEL and NWL are shown in Table 2. The average encounter rates deduced from the six sets of HKLR03 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 March – May 2014 deduced from HKLR03 monitoring surveys

SURVEY AREA	HKLR03 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 (5 & 11 Mar 2014)	0.00	0.00
	Set 2 (17 & 25 Mar 2014)	0.00	0.00
	Set 3 (4 & 14 Apr 2014)	0.00	0.00
	Set 4 (16 & 24 Apr 2014)	0.00	0.00
	Set 5 (2 & 19 May 2014)	0.00	0.00
	Set 6 (21 & 26 May 2014)	0.00	0.00
Northwest Lantau	Set 1 (5 & 11 Mar 2014)	6.43	23.57
	Set 2 (17 & 25 Mar 2014)	13.15	24.83
	Set 3 (4 & 14 Apr 2014)	4.89	26.88
	Set 4 (16 & 24 Apr 2014)	4.94	11.54
	Set 5 (2 & 19 May 2014)	5.47	18.24
	Set 6 (21 & 26 May 2014)	4.18	9.75

Table 3. Comparison of average dolphin encounter rates from impact monitoring period (March – May 2014) and baseline monitoring period (September – November 2011) (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)

	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)	
	March – May 2014	September - November 2011	March – May 2014	September - November 2011
Northeast Lantau	0.00	6.00 ± 5.05	0.00	22.19 ± 26.81
Northwest Lantau	6.51 ± 3.34	9.85 ± 5.85	19.14 ± 7.19	44.66 ± 29.85

3.3.2. 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 6.00 sightings and 17.34 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both zero as no sighting was made in this area.

3.3.3. In NEL, the average dolphin encounter rates (both STG and ANI) in the present three-month impact phase were zero, which was the lowest since the HKLR03 dolphin

monitoring commenced in October 2012.

3.3.4. On the other hand, the average dolphin encounter rates (STG and ANI) in NWL during the present impact phase monitoring period were much lower (reductions of 34% and 57% respectively) than the ones recorded in the 3-month baseline period, indicating a reduced dolphin usage of this survey area during the present construction period..

3.3.5. 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).

3.3.6. For the comparison between the baseline period and the present quarter (sixth quarter of the impact phase being assessed), the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.0337 and 0.0535 respectively. If the alpha value is set at 0.1, significant difference was detected between the baseline and present quarters in both dolphin encounter rates of STG and ANI.

3.3.7. For the comparison between the baseline period and the cumulative quarters in impact phase (i.e. first six quarters of the impact phase being assessed), the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.0080 and 0.0032 respectively. Even if the alpha value is set at 0.01, significant differences were detected in both the average dolphin encounter rates of STG and ANI (i.e. between the two periods and the locations).

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from 1-13 individuals per group in North Lantau region during March – May 2014. 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 4.

Table 4. Comparison of average dolphin group sizes from impact monitoring period (March – May 2014) and baseline monitoring period (September – November 2011)

	Average Dolphin Group Size	
	March – May 2014	**September – November 2011**
Overall	3.32 ± 2.87 (n = 31)	3.72 ± 3.13 (n = 66)
Northeast Lantau	0.0	3.18 ± 2.16 (n = 17)
Northwest Lantau	3.32 ± 2.87 (n = 31)	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 waters during March – May 2014 were lower than the ones recorded during the

three-month baseline period (Table 4). In fact, 21 of the 31 groups were composed of 1-3 individuals only, while only one group of dolphins was composed of more than 10 individuals.

3.4.3. Distribution of dolphins with larger group sizes (five individuals or more per group) during the present quarter is shown in Figure 3, with comparison to the one in baseline period. In spring 2014, all larger dolphin groups were clustered to the south and north of Lung Kwu Chau (Figure 3). This distribution pattern was quite different from the baseline period, when the larger dolphin groups were distributed more evenly in NWL waters and a few more in NEL waters with no particular concentration (Figure 3).

3.5. Habitat use

3.5.1. From March to May 2014, the most heavily utilized habitats by Chinese White Dolphins mainly concentrated to the north and northeast of Lung Kwu Chau (Figures 4a and 4b). None of the grids in NEL recorded the presence of dolphins. Moreover, all grids near TMCLKL alignment, HKLR03/HKBCF reclamation sites or HKLR09 alignment did not record any presence of dolphins during on-effort search in the present quarterly period.

3.5.2. However, it should be emphasized 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 dramatically different from the present impact monitoring period (Figure 5). During the baseline period, nine grids between Siu Mo To and Shum Shui Kok recorded moderately high to high dolphin densities, which was in contrast to the complete absence of dolphins during the present impact phase period (Figure 5).

3.5.4. On the other hand, the density patterns between the baseline and impact phase monitoring periods were also different in NWL, with higher dolphin usage near Sha Chau, between Pillar Point and airport platform, and along the west boundary of Hong Kong territorial waters during the baseline period (Figure 5).

3.6. Mother-calf pairs

3.6.1. During the three-month study period, a total of five unspotted juveniles (UJ) were sighted in NWL survey areas. These young calves comprised of 4.9% of all animals sighted, which was lower than the percentage recorded during the baseline monitoring period (6.8%).

3.6.2. These young calves were only present near Lung Kwu Chau or at the mouth of Deep Bay (Figure 6), which was very different from their distribution pattern during the baseline period when young calves were sighted throughout the NWL survey area as well as a few sighted in NEL waters. None of these young calves were sighted in the vicinity of the HKBCF/HKLR03 reclamation sites and HKLR09/TMCLKL alignments during the

present quarter (Figure 6).

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 9.7% of the total number of dolphin sightings, which was slightly lower than the one recorded during the baseline period (11.6%). On the contrary, the percentage of socializing activities during the present impact phase monitoring period (6.5%) was slightly higher than the one recorded during the baseline period (5.4%). None of the dolphin groups was engaged in traveling or milling/resting activity during the present impact monitoring period.

3.7.2. Distribution of dolphins engaged in feeding and socializing activities during the present three-month period is shown in Figure 7. The sightings associated with these activities were only found near Lung Kwu Chau but not elsewhere in North Lantau waters, which was drastically different from the distribution pattern of these activities during the baseline period (Figure 7).

3.7.3. During the three-month period, none of the 31 dolphin groups was found to be associated with an operating fishing vessels in North Lantau waters. The rare events of fishing boat association in the present and previous quarters were consistently found, and were likely related to the recent trawl ban being implemented in December 2012 in Hong Kong waters.

3.8. Summary of photo-identification works

3.8.1. From March to May 2014, 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, 45 individuals sighted 74 times altogether were identified (see summary table in Appendix III and photographs of identified individuals in Appendix IV). All of these re-sightings were made in NWL.

3.8.3. Most identified individuals were sighted only once or twice during the three-month period, with the exception of six individuals being sighted thrice, and another two individuals (NL48 and NL261) being sighted four to five times.

3.8.4. Six well-recognized females (NL33, NL46, NL104, NL145, NL202 and NL233) were accompanied with their calves during their re-sightings. All of these mothers were frequently sighted with their calves throughout the HKLR03 impact phase monitoring period since October 2012.

3.9. Individual range use

3.9.1. Ranging patterns of the 45 individuals identified during the three-month study period were determined by fixed kernel method, and are shown in Appendix V.

3.9.2. All individuals sighted in this quarter were utilizing their range use in NWL (especially around Lung Kwu Chau) but have avoided NEL, where some of these individuals have

utilized as their core areas in the past (Appendix V). This is in contrary to the extensive movements between NEL and NWL survey areas observed in the earlier impact monitoring quarters as well as during the baseline period.

3.9.3. For many individuals that have previously utilized the Brothers Islands as their major core area of activities, they have apparently shifted their range use away from this important habitat (e.g. EL01, NL24, NL33, NL120, NL191, NL260; Appendix V). Such shifts of range use and core area use were also well documented by Hung (2014).

4. Conclusion

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

4.2. Although the dolphins infrequently occurred along the alignment of TMCLKL southern connection viaduct in the past and during the baseline 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 quarters, to determine whether the dolphins are continuously affected by the various construction activities in relation to the HZMB-related works, and whether suitable mitigation measure can be applied to revert the situation.

5. References

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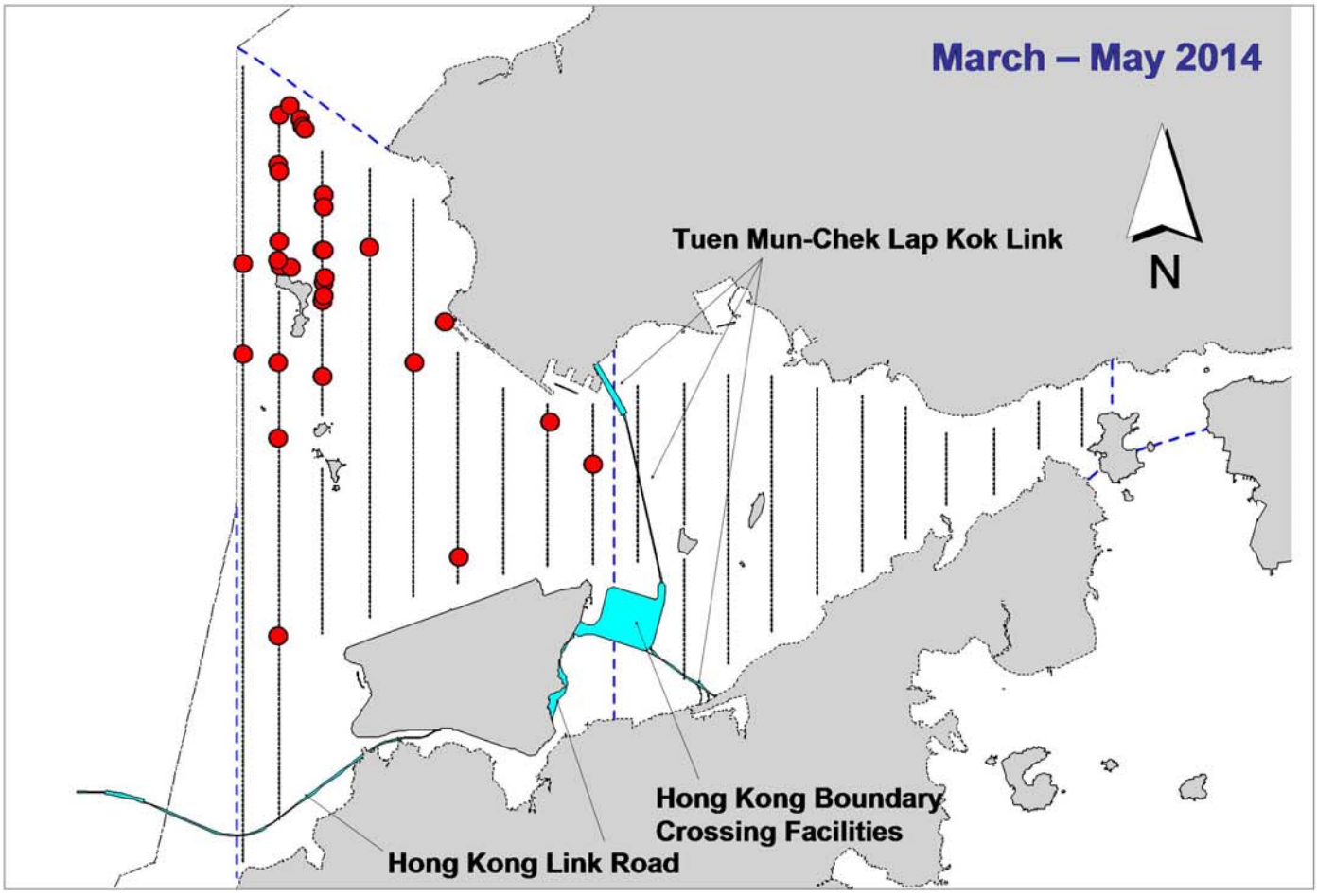


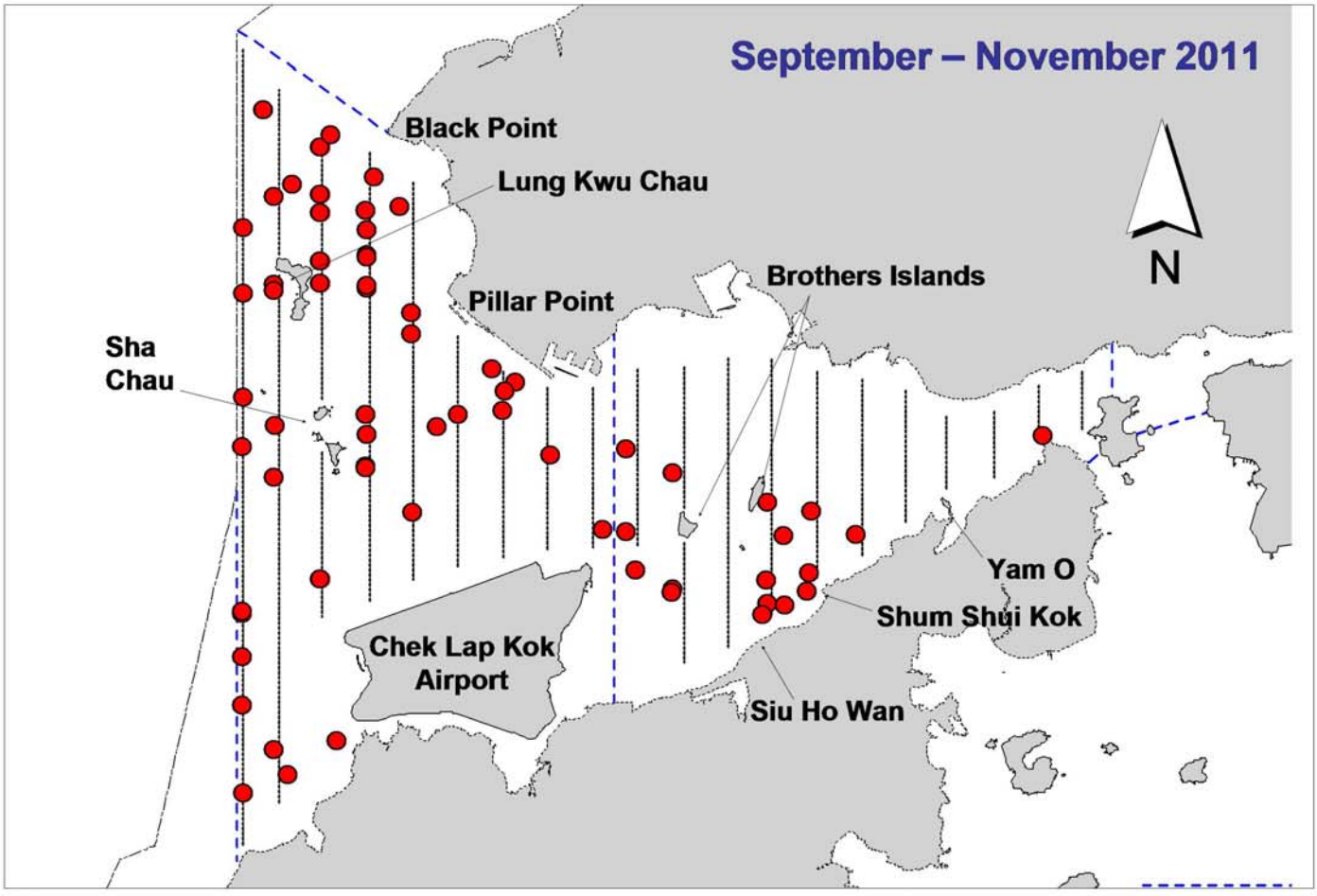
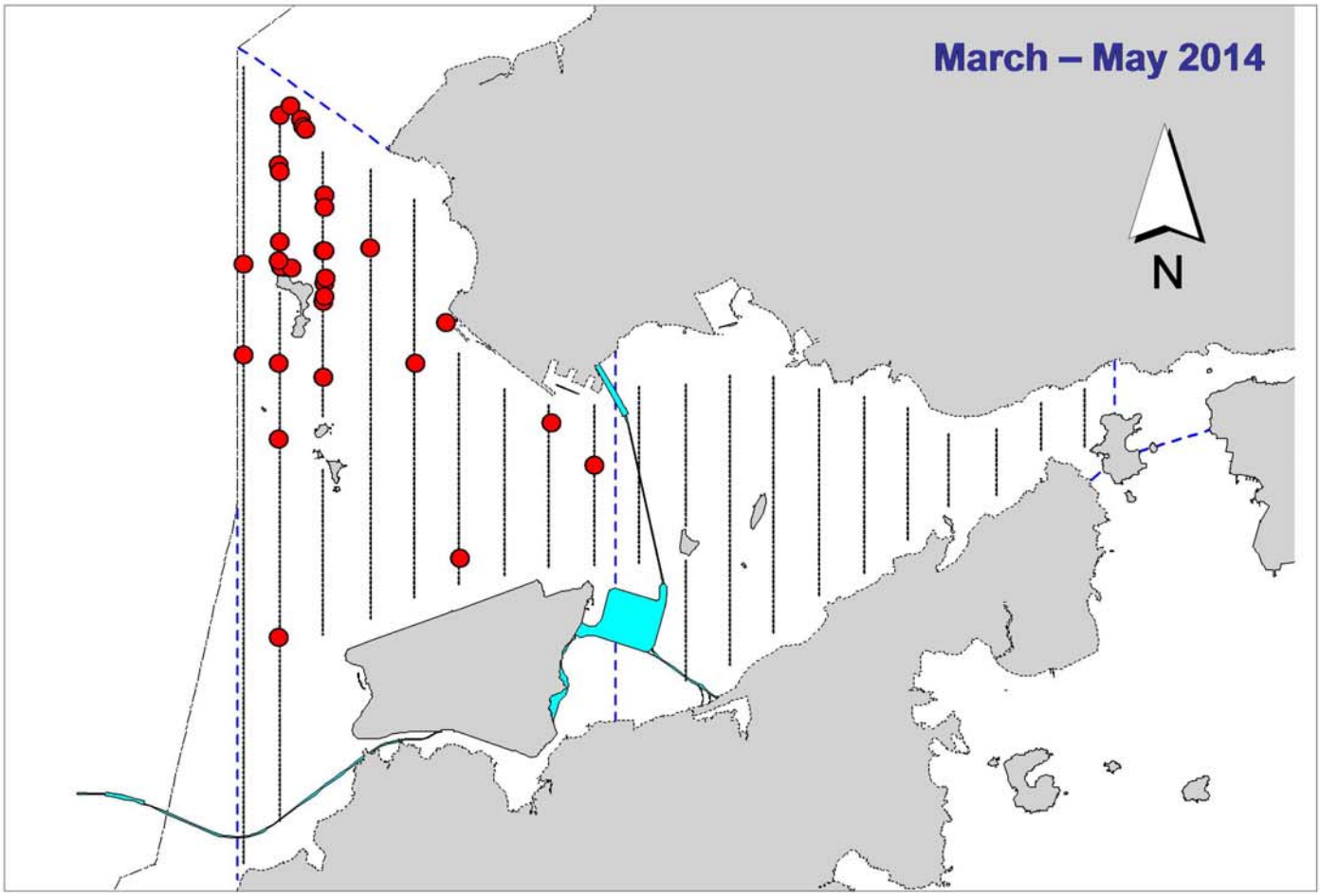


Figure 1. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)



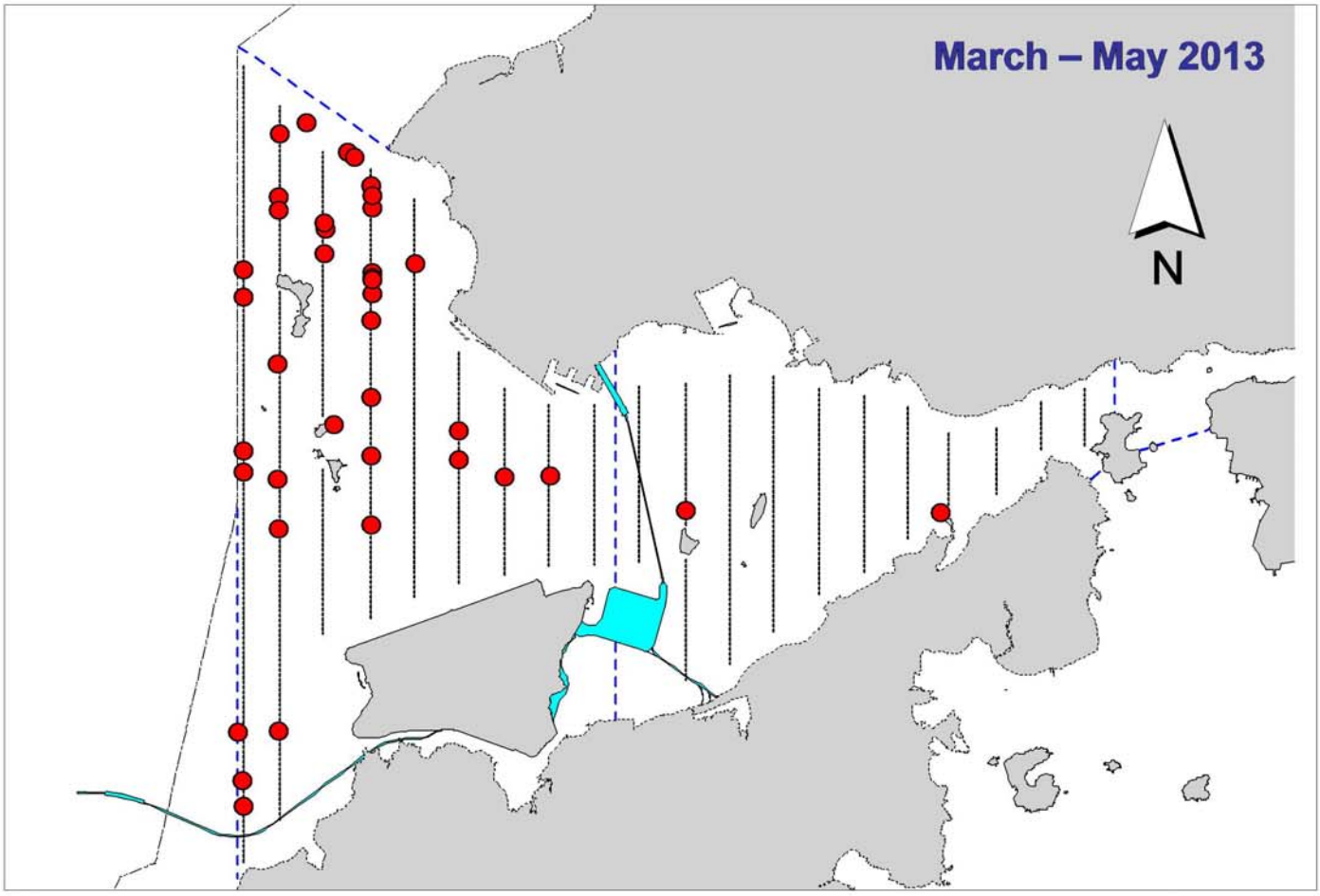


Figure 2. Distribution of Chinese white dolphin sighting in Northwest and Northeast Lantau during the same spring quarter of HKLR03 impact phase in 2014 (top) and 2013 (bottom)

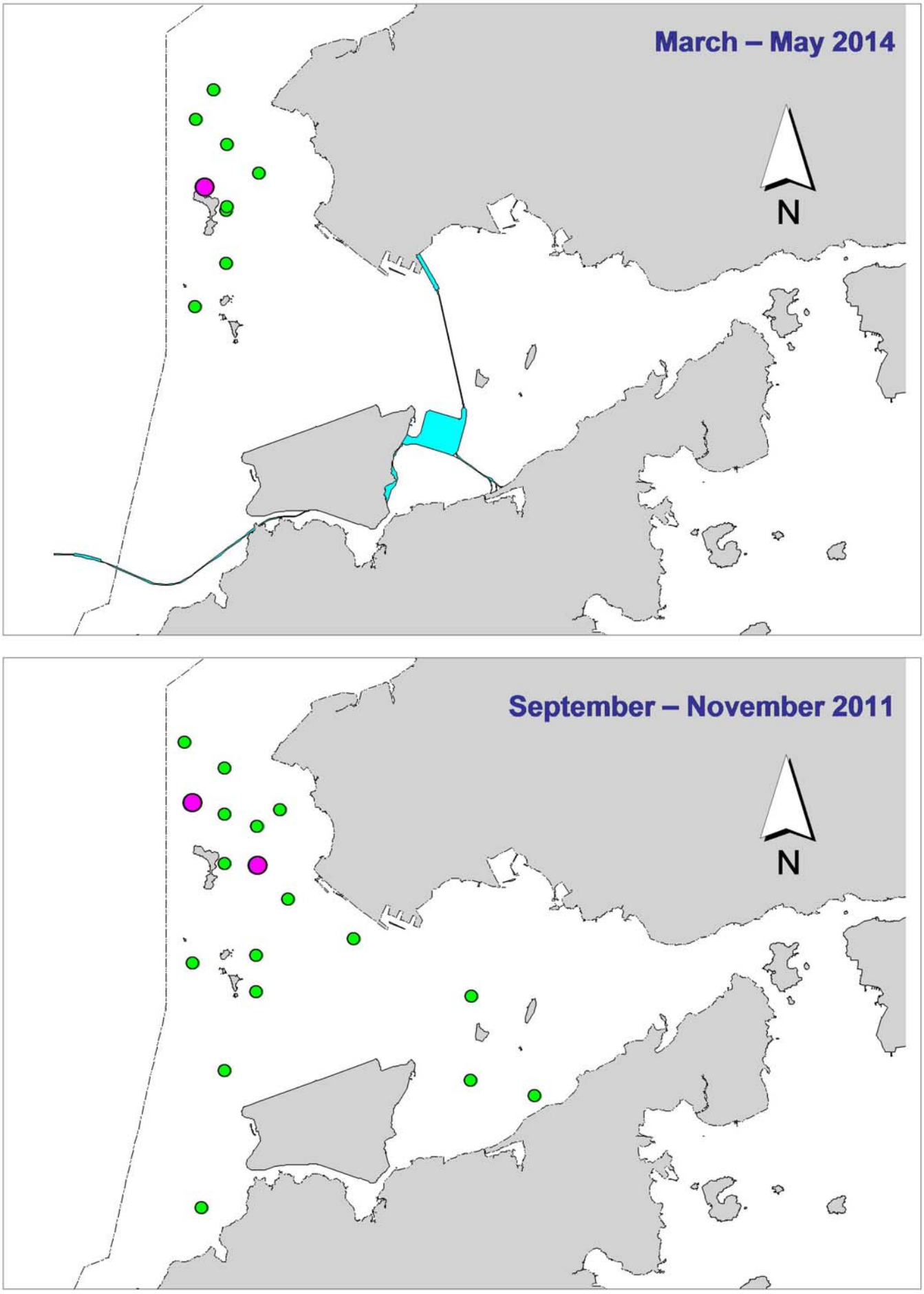


Figure 3. Distribution of Chinese white dolphins with larger group sizes during HKLR03 impact phase (top) and baseline monitoring surveys (bottom) (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

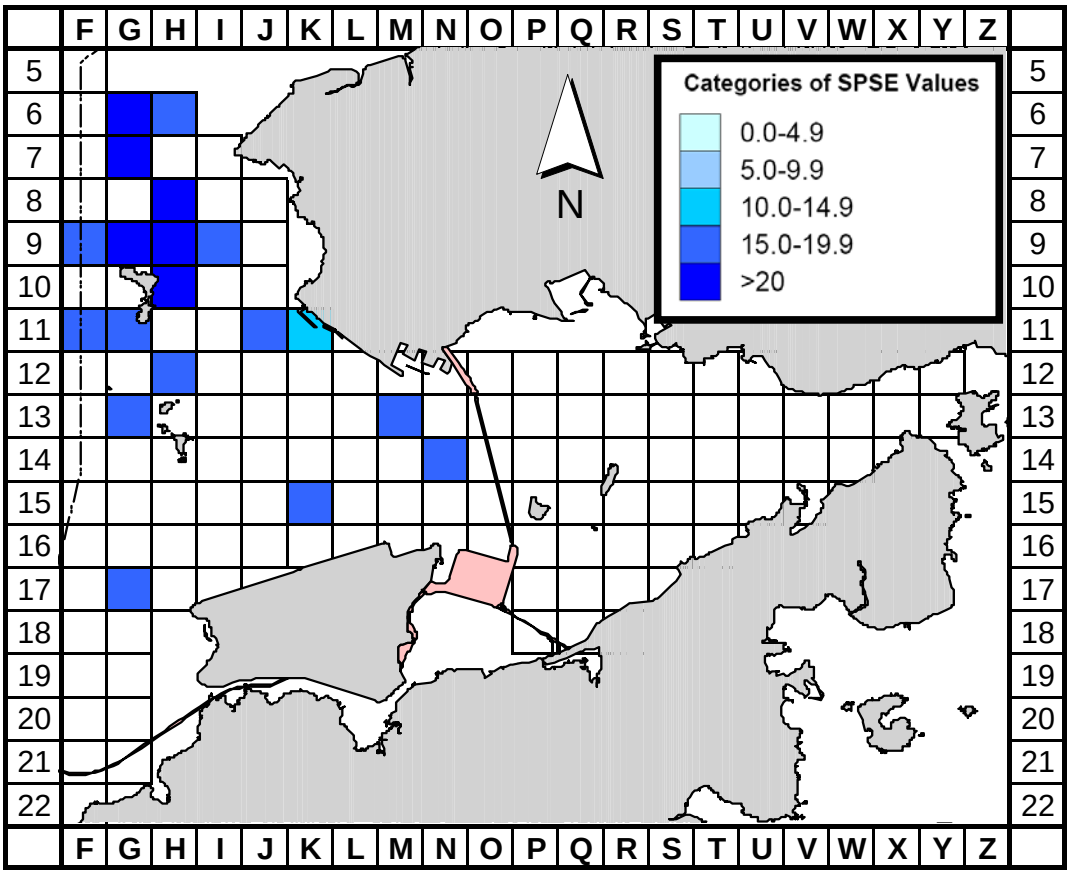


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Mar-May 14) (SPSE = no. of on-effort sightings per 100 units of survey effort)

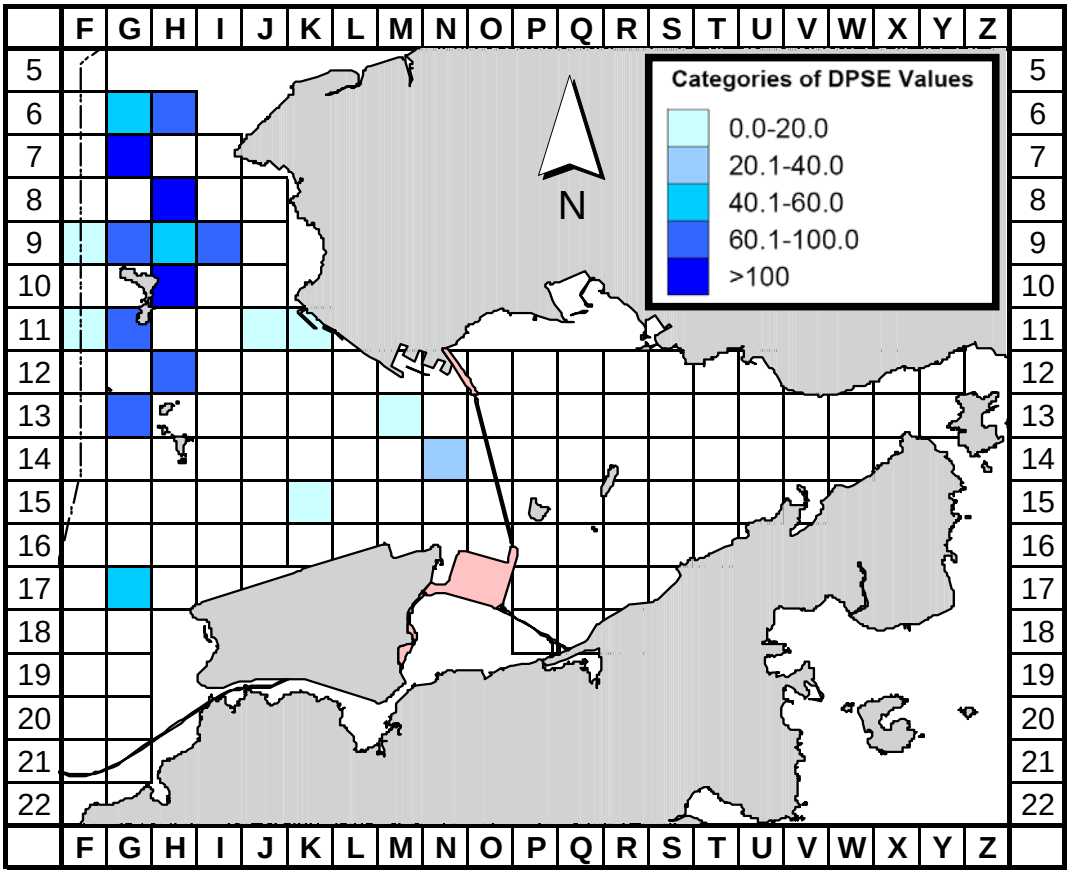


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Mar-May 14) (DPSE = no. of dolphins per 100 units of survey effort)

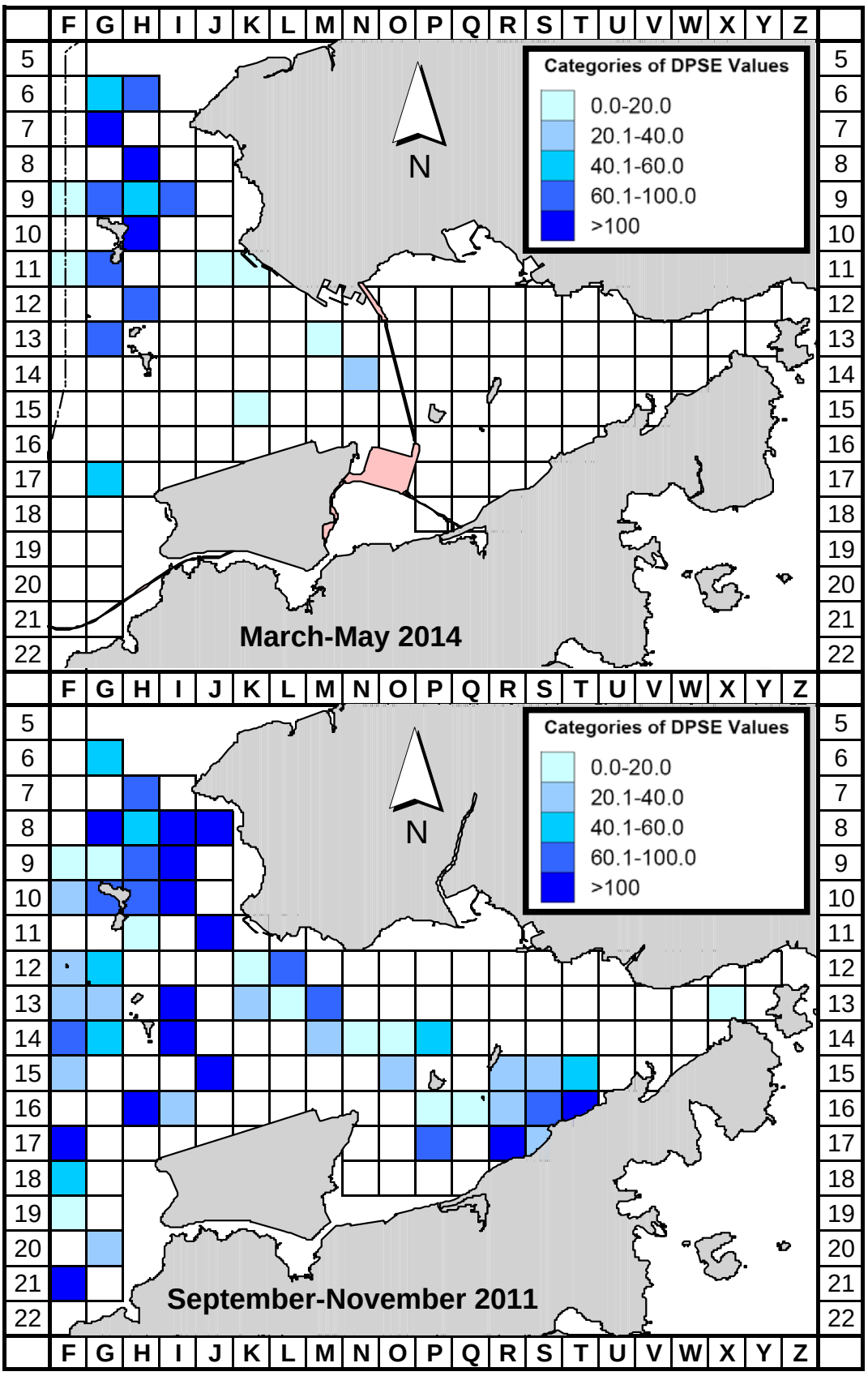


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in Northwest and Northeast Lantau survey area between the impact monitoring period (March-May 2014) and baseline monitoring period (September-November 2011)
(DPSE = no. of dolphins per 100 units of survey effort)

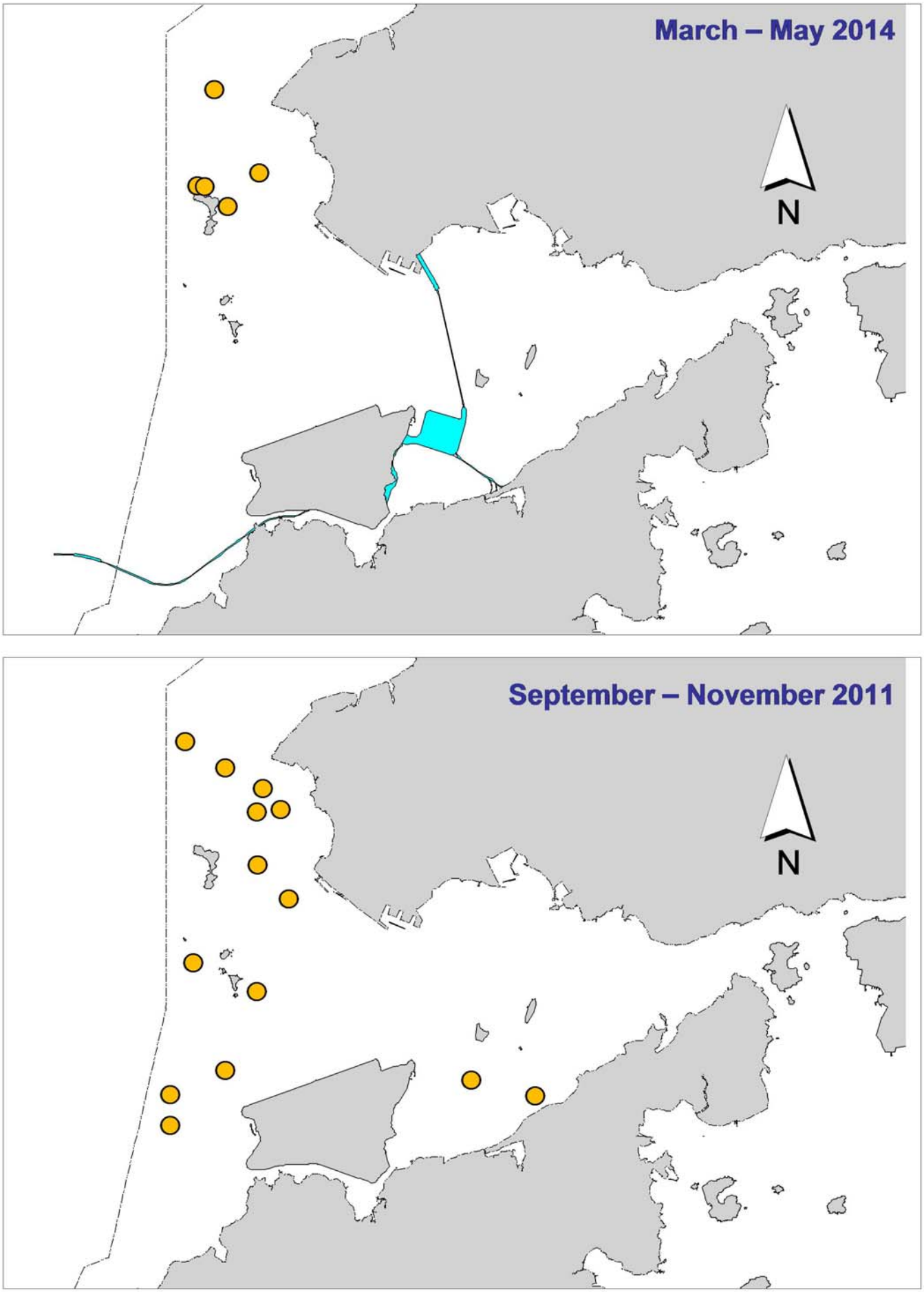


Figure 6. Distribution of young calves of Chinese white dolphins during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

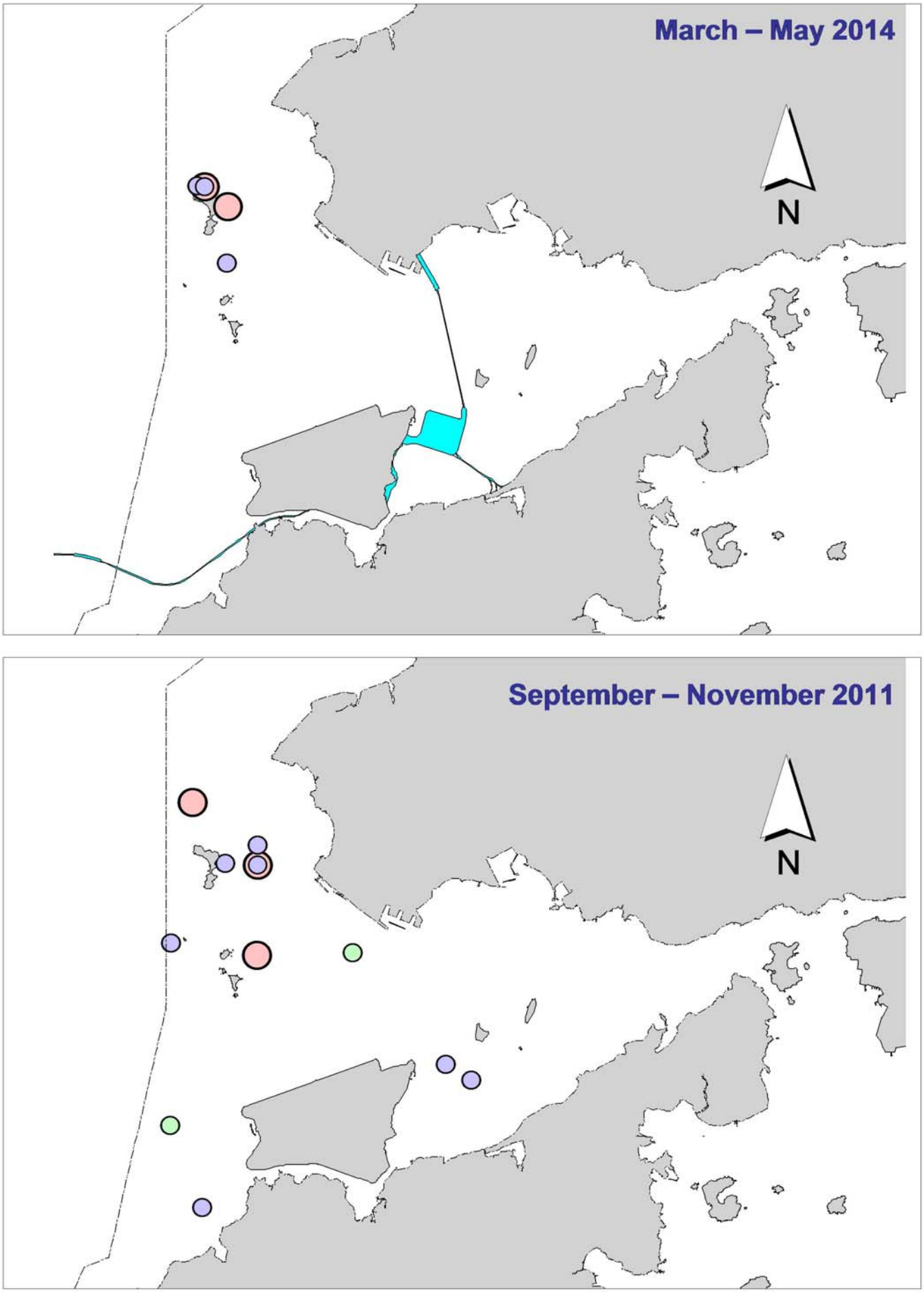


Figure 7. Distribution of Chinese white dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during HKLR03 impact phase (top) and baseline monitoring surveys (bottom)

Appendix I. HKLR03 Survey Effort Database (March-May 2014)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
5-Mar-14	NW LANTAU	1	3.88	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NW LANTAU	2	20.76	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NW LANTAU	3	5.93	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NW LANTAU	2	5.25	SPRING	STANDARD31516	HKLR	S
5-Mar-14	NW LANTAU	3	1.96	SPRING	STANDARD31516	HKLR	S
5-Mar-14	NE LANTAU	2	17.99	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NE LANTAU	3	1.69	SPRING	STANDARD31516	HKLR	P
5-Mar-14	NE LANTAU	2	11.02	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NE LANTAU	2	1.40	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NE LANTAU	3	11.82	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NE LANTAU	4	2.90	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NE LANTAU	2	6.16	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NE LANTAU	3	4.12	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NE LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NW LANTAU	1	1.70	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	2	5.31	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	3	9.08	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	4	18.01	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	5	6.14	SPRING	STANDARD31516	HKLR	P
11-Mar-14	NW LANTAU	2	6.91	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NW LANTAU	3	1.40	SPRING	STANDARD31516	HKLR	S
11-Mar-14	NW LANTAU	4	4.25	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NW LANTAU	0	4.79	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NW LANTAU	1	25.88	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NW LANTAU	2	8.51	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NW LANTAU	0	2.51	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NW LANTAU	1	7.24	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NW LANTAU	2	3.21	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NE LANTAU	1	14.20	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NE LANTAU	2	2.36	SPRING	STANDARD31516	HKLR	P
17-Mar-14	NE LANTAU	1	9.07	SPRING	STANDARD31516	HKLR	S
17-Mar-14	NE LANTAU	2	2.17	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NE LANTAU	1	13.41	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NE LANTAU	2	6.67	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NE LANTAU	1	6.73	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NE LANTAU	2	4.19	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NW LANTAU	1	7.45	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NW LANTAU	2	22.31	SPRING	STANDARD31516	HKLR	P
25-Mar-14	NW LANTAU	1	0.96	SPRING	STANDARD31516	HKLR	S
25-Mar-14	NW LANTAU	2	6.58	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NW LANTAU	1	1.41	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	2	8.57	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	3	14.93	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	4	3.00	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NW LANTAU	2	3.16	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NW LANTAU	3	3.00	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NW LANTAU	4	1.00	SPRING	STANDARD31516	HKLR	S
4-Apr-14	NE LANTAU	2	0.80	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NE LANTAU	3	15.53	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NE LANTAU	4	4.16	SPRING	STANDARD31516	HKLR	P
4-Apr-14	NE LANTAU	2	2.20	SPRING	STANDARD31516	HKLR	S

Appendix 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
4-Apr-14	NE LANTAU	3	8.51	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NE LANTAU	2	0.90	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NE LANTAU	3	9.61	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NE LANTAU	4	6.20	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NE LANTAU	2	1.80	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NE LANTAU	3	6.39	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NE LANTAU	4	2.90	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NW LANTAU	2	1.40	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NW LANTAU	3	14.62	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NW LANTAU	4	23.91	SPRING	STANDARD31516	HKLR	P
14-Apr-14	NW LANTAU	2	2.10	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NW LANTAU	3	7.86	SPRING	STANDARD31516	HKLR	S
14-Apr-14	NW LANTAU	4	2.99	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NW LANTAU	2	4.27	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NW LANTAU	3	24.56	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NW LANTAU	4	2.91	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NW LANTAU	2	2.45	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NW LANTAU	3	4.20	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NE LANTAU	2	3.94	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NE LANTAU	3	15.37	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NE LANTAU	4	1.10	SPRING	STANDARD31516	HKLR	P
16-Apr-14	NE LANTAU	2	1.20	SPRING	STANDARD31516	HKLR	S
16-Apr-14	NE LANTAU	3	9.49	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NW LANTAU	2	1.91	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NW LANTAU	3	29.94	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NW LANTAU	4	8.44	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NW LANTAU	2	0.80	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NW LANTAU	3	9.72	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NW LANTAU	4	2.20	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NE LANTAU	2	5.03	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NE LANTAU	3	10.14	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NE LANTAU	4	1.31	SPRING	STANDARD31516	HKLR	P
24-Apr-14	NE LANTAU	2	7.37	SPRING	STANDARD31516	HKLR	S
24-Apr-14	NE LANTAU	3	3.65	SPRING	STANDARD31516	HKLR	S
2-May-14	NW LANTAU	1	8.33	SPRING	STANDARD31516	HKLR	P
2-May-14	NW LANTAU	2	20.71	SPRING	STANDARD31516	HKLR	P
2-May-14	NW LANTAU	3	11.20	SPRING	STANDARD31516	HKLR	P
2-May-14	NW LANTAU	1	8.11	SPRING	STANDARD31516	HKLR	S
2-May-14	NW LANTAU	2	2.77	SPRING	STANDARD31516	HKLR	S
2-May-14	NW LANTAU	3	1.30	SPRING	STANDARD31516	HKLR	S
2-May-14	NE LANTAU	2	8.93	SPRING	STANDARD31516	HKLR	P
2-May-14	NE LANTAU	3	8.38	SPRING	STANDARD31516	HKLR	P
2-May-14	NE LANTAU	2	7.68	SPRING	STANDARD31516	HKLR	S
2-May-14	NE LANTAU	3	2.51	SPRING	STANDARD31516	HKLR	S
19-May-14	NE LANTAU	1	2.45	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	2	13.17	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	3	2.63	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	P
19-May-14	NE LANTAU	1	1.44	SPRING	STANDARD31516	HKLR	S
19-May-14	NE LANTAU	2	4.97	SPRING	STANDARD31516	HKLR	S
19-May-14	NE LANTAU	3	3.94	SPRING	STANDARD31516	HKLR	S
19-May-14	NW LANTAU	3	14.57	SPRING	STANDARD31516	HKLR	P
19-May-14	NW LANTAU	4	16.43	SPRING	STANDARD31516	HKLR	P

Appendix 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
19-May-14	NW LANTAU	3	4.87	SPRING	STANDARD31516	HKLR	S
19-May-14	NW LANTAU	4	2.01	SPRING	STANDARD31516	HKLR	S
21-May-14	NW LANTAU	1	1.40	SPRING	STANDARD31516	HKLR	P
21-May-14	NW LANTAU	2	13.43	SPRING	STANDARD31516	HKLR	P
21-May-14	NW LANTAU	3	16.59	SPRING	STANDARD31516	HKLR	P
21-May-14	NW LANTAU	1	0.60	SPRING	STANDARD31516	HKLR	S
21-May-14	NW LANTAU	2	4.20	SPRING	STANDARD31516	HKLR	S
21-May-14	NW LANTAU	3	2.50	SPRING	STANDARD31516	HKLR	S
21-May-14	NE LANTAU	2	13.25	SPRING	STANDARD31516	HKLR	P
21-May-14	NE LANTAU	3	6.78	SPRING	STANDARD31516	HKLR	P
21-May-14	NE LANTAU	2	9.07	SPRING	STANDARD31516	HKLR	S
21-May-14	NE LANTAU	3	1.50	SPRING	STANDARD31516	HKLR	S
26-May-14	NW LANTAU	2	21.21	SPRING	STANDARD31516	HKLR	P
26-May-14	NW LANTAU	3	19.14	SPRING	STANDARD31516	HKLR	P
26-May-14	NW LANTAU	2	3.70	SPRING	STANDARD31516	HKLR	S
26-May-14	NW LANTAU	3	9.05	SPRING	STANDARD31516	HKLR	S
26-May-14	NE LANTAU	1	3.10	SPRING	STANDARD31516	HKLR	P
26-May-14	NE LANTAU	2	13.43	SPRING	STANDARD31516	HKLR	P
26-May-14	NE LANTAU	2	10.87	SPRING	STANDARD31516	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (March-May 2014)

(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)

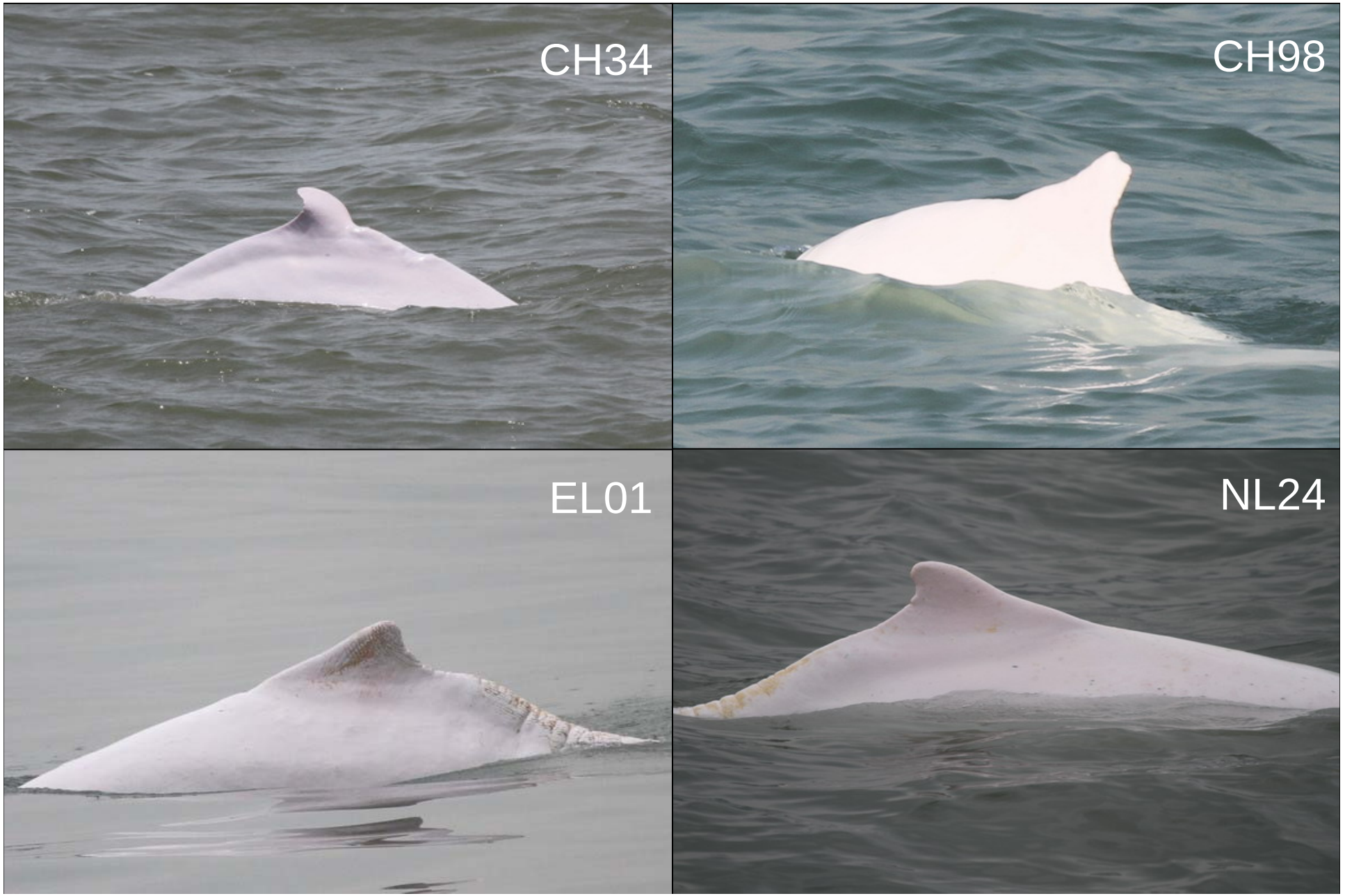
DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
5-Mar-14	1	1053	3	NW LANTAU	2	64	ON	HKLR	827173	805499	SPRING	NONE	P
5-Mar-14	2	1126	13	NW LANTAU	2	ND	OFF	HKLR	827150	805736	SPRING	NONE	
5-Mar-14	3	1323	6	NW LANTAU	2	28	ON	HKLR	827568	807488	SPRING	NONE	P
11-Mar-14	1	1518	2	NW LANTAU	3	86	ON	HKLR	827525	806437	SPRING	NONE	P
17-Mar-14	1	1159	2	NW LANTAU	2	151	ON	HKLR	822985	812516	SPRING	NONE	P
17-Mar-14	2	1411	5	NW LANTAU	1	277	ON	HKLR	824834	806452	SPRING	NONE	P
17-Mar-14	3	1439	1	NW LANTAU	1	36	ON	HKLR	826839	806456	SPRING	NONE	P
17-Mar-14	4	1509	2	NW LANTAU	2	72	ON	HKLR	830273	805938	SPRING	NONE	S
17-Mar-14	5	1541	1	NW LANTAU	1	194	ON	HKLR	827219	804675	SPRING	NONE	P
17-Mar-14	6	1551	1	NW LANTAU	1	125	ON	HKLR	825325	804672	SPRING	NONE	P
25-Mar-14	1	1249	1	NW LANTAU	2	131	ON	HKLR	821041	809495	SPRING	NONE	P
25-Mar-14	2	1452	2	NW LANTAU	2	72	ON	HKLR	826927	806498	SPRING	NONE	P
25-Mar-14	3	1535	3	NW LANTAU	2	299	ON	HKLR	829321	805462	SPRING	NONE	P
25-Mar-14	4	1549	1	NW LANTAU	2	349	ON	HKLR	827693	805469	SPRING	NONE	P
04-Apr-14	1	1021	3	NW LANTAU	3	43	ON	HKLR	819355	805442	SPRING	NONE	P
14-Apr-14	1	1438	8	NW LANTAU	3	94	ON	HKLR	826451	806445	SPRING	NONE	P
14-Apr-14	2	1517	2	NW LANTAU	4	273	ON	HKLR	830117	806010	SPRING	NONE	S
16-Apr-14	1	1048	4	NW LANTAU	2	541	ON	HKLR	825124	805454	SPRING	NONE	P
16-Apr-14	2	1113	1	NW LANTAU	2	385	ON	HKLR	827306	805458	SPRING	NONE	P
16-Apr-14	3	1137	2	NW LANTAU	2	17	ON	HKLR	830362	805465	SPRING	NONE	P
16-Apr-14	4	1150	9	NW LANTAU	2	49	ON	HKLR	830073	806051	SPRING	NONE	S
24-Apr-14	1	1328	1	NW LANTAU	3	123	ON	HKLR	825992	809184	SPRING	NONE	S
02-May-14	1	1128	3	NW LANTAU	3	22	ON	HKLR	830572	805712	SPRING	NONE	S
02-May-14	2	1154	2	NW LANTAU	2	27	ON	HKLR	828677	806460	SPRING	NONE	P
02-May-14	3	1213	7	NW LANTAU	2	522	ON	HKLR	826540	806456	SPRING	NONE	P
02-May-14	4	1333	1	NW LANTAU	1	1233	ON	HKLR	825129	808503	SPRING	NONE	P
19-May-14	1	1405	5	NW LANTAU	4	177	ON	HKLR	829177	805472	SPRING	NONE	P
19-May-14	2	1451	5	NW LANTAU	4	28	ON	HKLR	823530	805461	SPRING	NONE	P
21-May-14	1	1257	1	NW LANTAU	2	242	ON	HKLR	823873	811529	SPRING	NONE	P
26-May-14	1	1209	5	NW LANTAU	3	362	ON	HKLR	828433	806460	SPRING	NONE	P
26-May-14	2	1232	1	NW LANTAU	3	1066	ON	HKLR	827514	806458	SPRING	NONE	P

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in March-May 2014

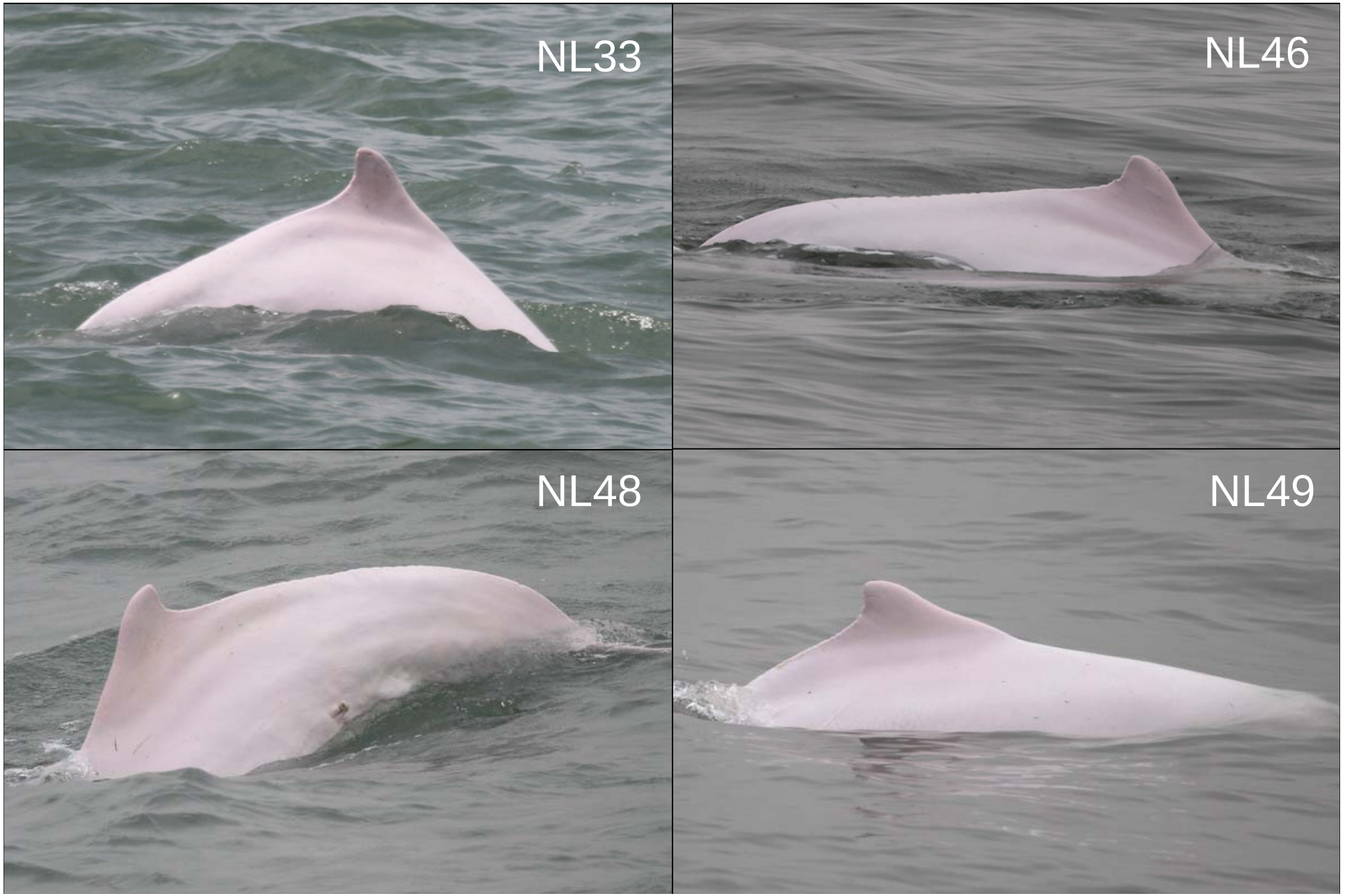
ID#	DATE	STG#	AREA
CH34	26/05/14	1	NW LANTAU
CH98	25/03/14	3	NW LANTAU
EL01	17/03/14	1	NW LANTAU
	16/04/14	2	NW LANTAU
	21/05/14	1	NW LANTAU
NL24	05/03/14	3	NW LANTAU
	14/04/14	1	NW LANTAU
NL33	02/05/14	3	NW LANTAU
NL46	05/03/14	2	NW LANTAU
	19/05/14	1	NW LANTAU
NL48	11/03/14	1	NW LANTAU
	25/03/14	4	NW LANTAU
	16/04/14	4	NW LANTAU
	02/05/14	1	NW LANTAU
NL49	05/03/14	2	NW LANTAU
NL104	05/03/14	2	NW LANTAU
	05/03/14	3	NW LANTAU
	16/04/14	4	NW LANTAU
NL120	14/04/14	1	NW LANTAU
NL136	11/03/14	1	NW LANTAU
	17/03/14	2	NW LANTAU
	25/03/14	3	NW LANTAU
NL145	16/04/14	1	NW LANTAU
	02/05/14	3	NW LANTAU
NL165	05/03/14	2	NW LANTAU
NL182	24/04/14	1	NW LANTAU
NL191	25/03/14	1	NW LANTAU
NL202	16/04/14	4	NW LANTAU
NL210	02/05/14	2	NW LANTAU
NL213	25/03/14	3	NW LANTAU
NL214	16/04/14	3	NW LANTAU
	02/05/14	1	NW LANTAU
NL220	05/03/14	3	NW LANTAU
NL224	16/04/14	3	NW LANTAU
	02/05/14	1	NW LANTAU
NL226	04/04/14	1	NW LANTAU
NL233	05/03/14	1	NW LANTAU
NL236	05/03/14	2	NW LANTAU
NL259	04/04/14	1	NW LANTAU
	16/04/14	4	NW LANTAU
NL260	19/05/14	2	NW LANTAU

ID#	DATE	STG#	AREA
NL261	05/03/14	3	NW LANTAU
	17/03/14	1	NW LANTAU
	16/04/14	4	NW LANTAU
	02/05/14	3	NW LANTAU
	19/05/14	1	NW LANTAU
NL262	05/03/14	3	NW LANTAU
	16/04/14	4	NW LANTAU
	19/05/14	1	NW LANTAU
NL269	19/05/14	2	NW LANTAU
NL272	05/03/14	2	NW LANTAU
	02/05/14	3	NW LANTAU
NL284	17/03/14	2	NW LANTAU
	19/05/14	1	NW LANTAU
NL286	16/04/14	4	NW LANTAU
NL287	16/04/14	1	NW LANTAU
	02/05/14	3	NW LANTAU
NL295	05/03/14	2	NW LANTAU
	19/05/14	2	NW LANTAU
	26/05/14	1	NW LANTAU
NL296	05/03/14	1	NW LANTAU
	05/03/14	2	NW LANTAU
	26/05/14	1	NW LANTAU
NL300	26/05/14	1	NW LANTAU
NL302	19/05/14	1	NW LANTAU
NL303	19/05/14	1	NW LANTAU
NL306	16/04/14	1	NW LANTAU
NL307	17/03/14	2	NW LANTAU
WL04	05/03/14	2	NW LANTAU
WL05	05/03/14	2	NW LANTAU
WL11	05/03/14	2	NW LANTAU
WL17	17/03/14	2	NW LANTAU
	16/04/14	1	NW LANTAU
WL199	05/03/14	2	NW LANTAU

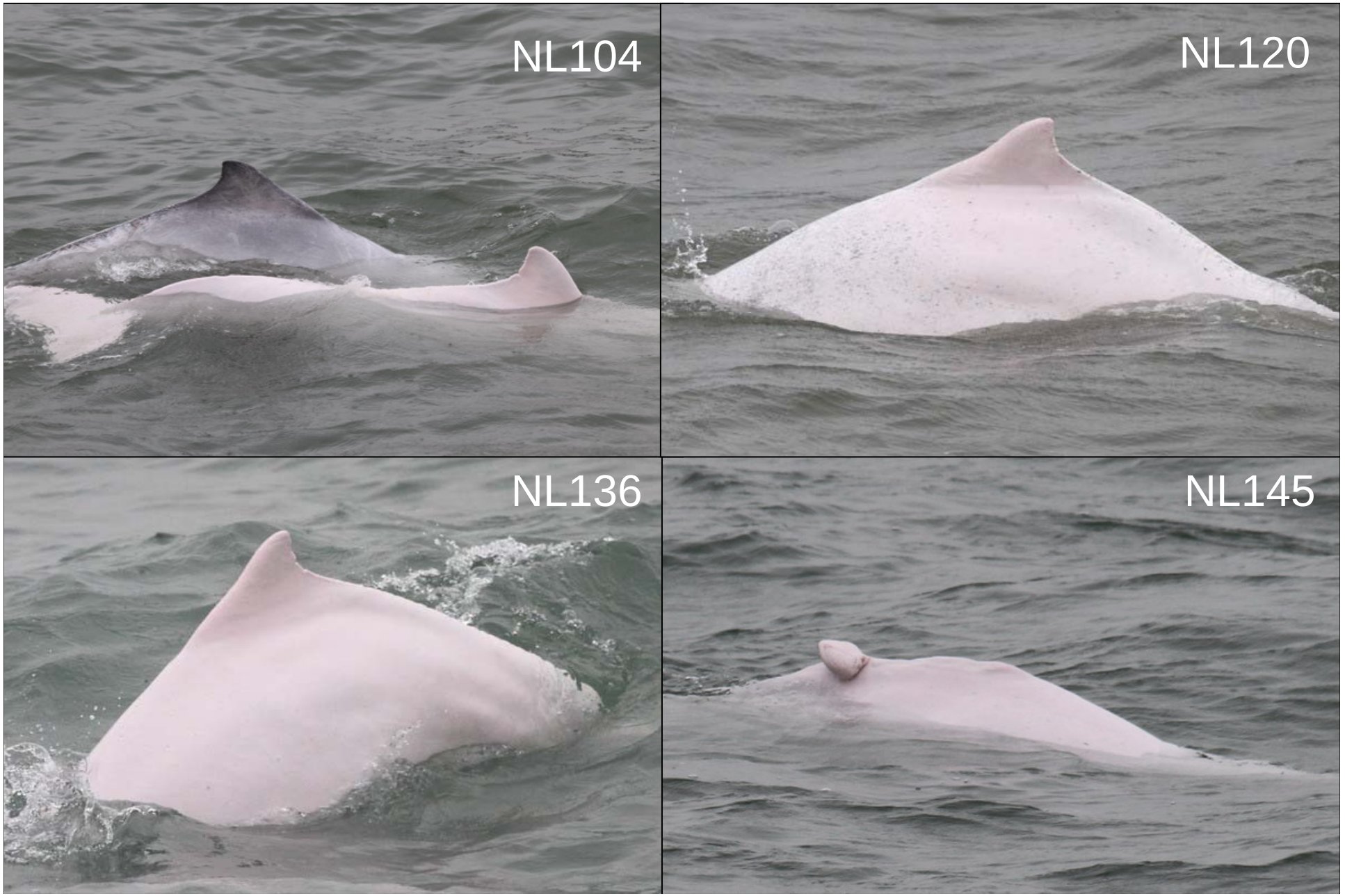
Appendix IV. Forty-five individual dolphins that were identified during March-May 2014 under HKLR03 impact phase monitoring surveys



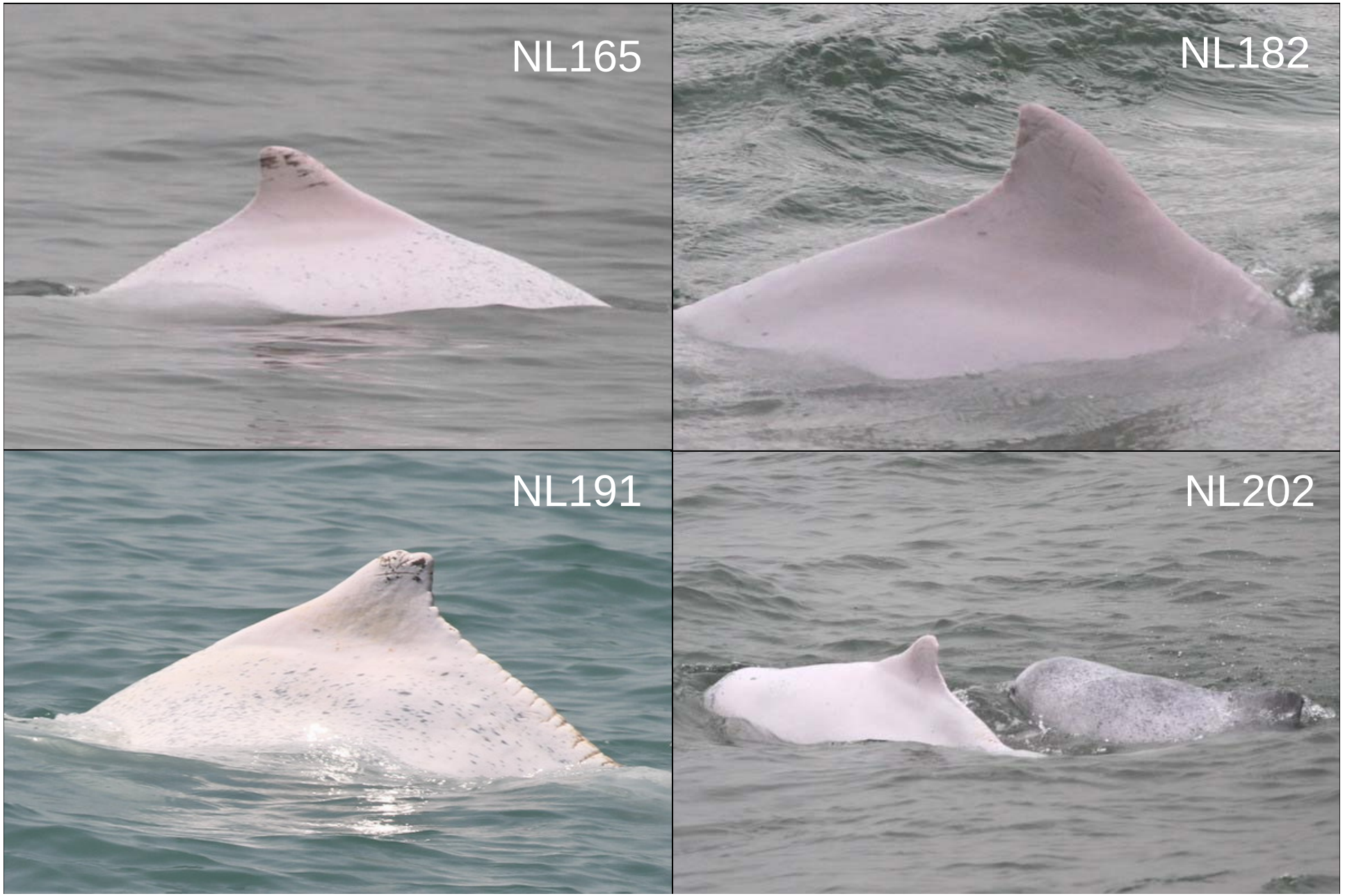
Appendix IV. (cont'd)



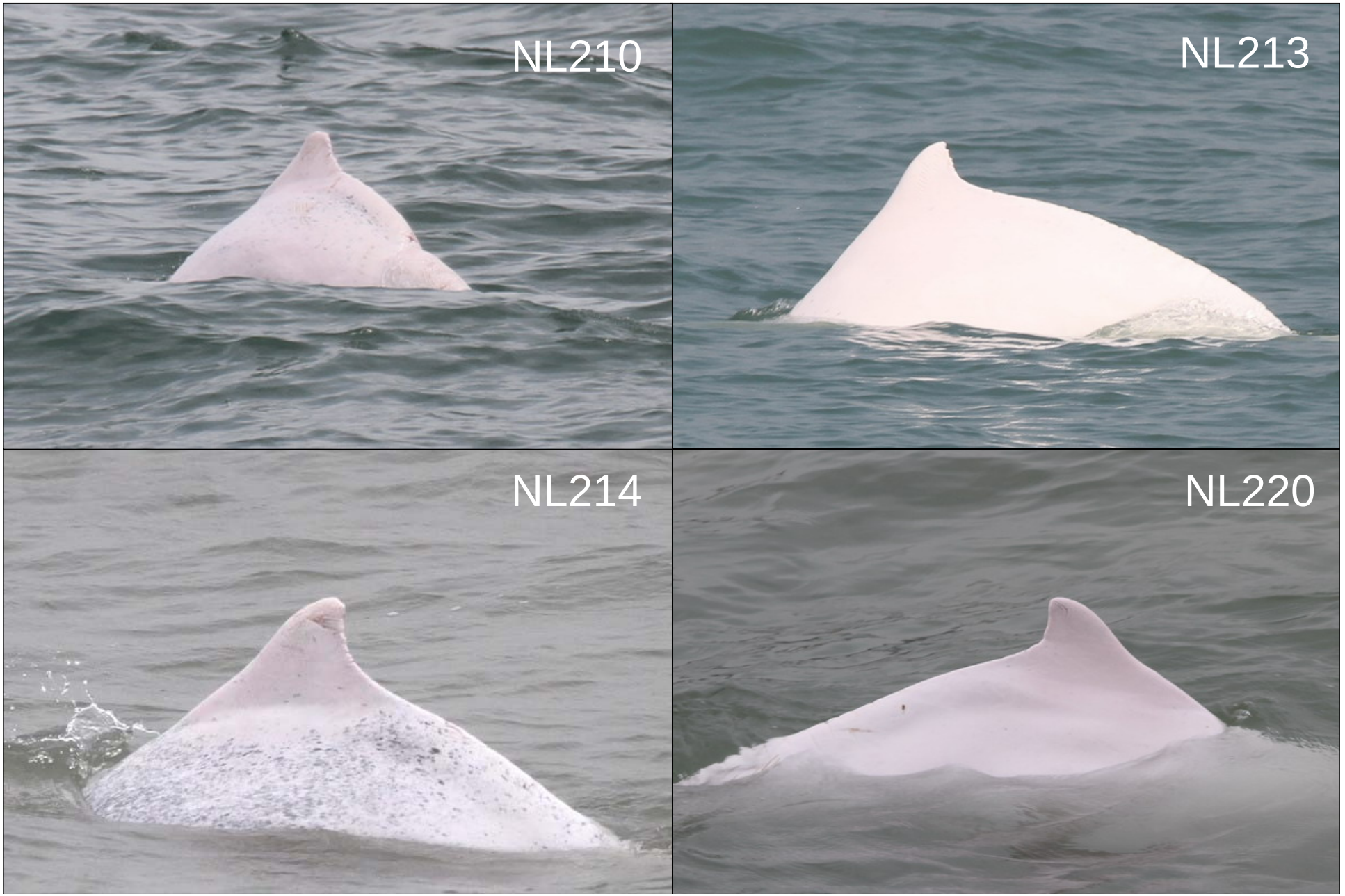
Appendix IV. (cont'd)



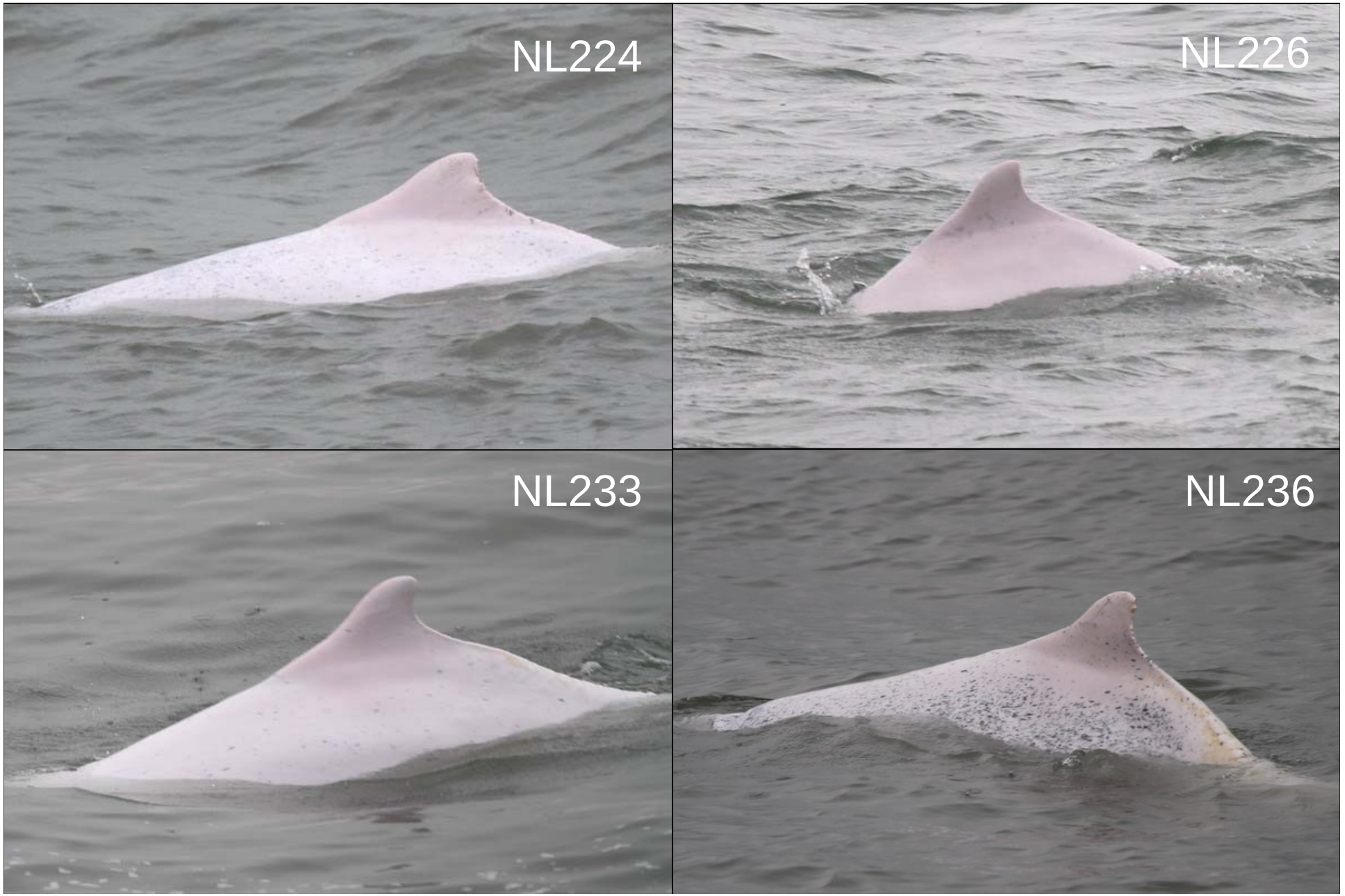
Appendix IV. (cont'd)



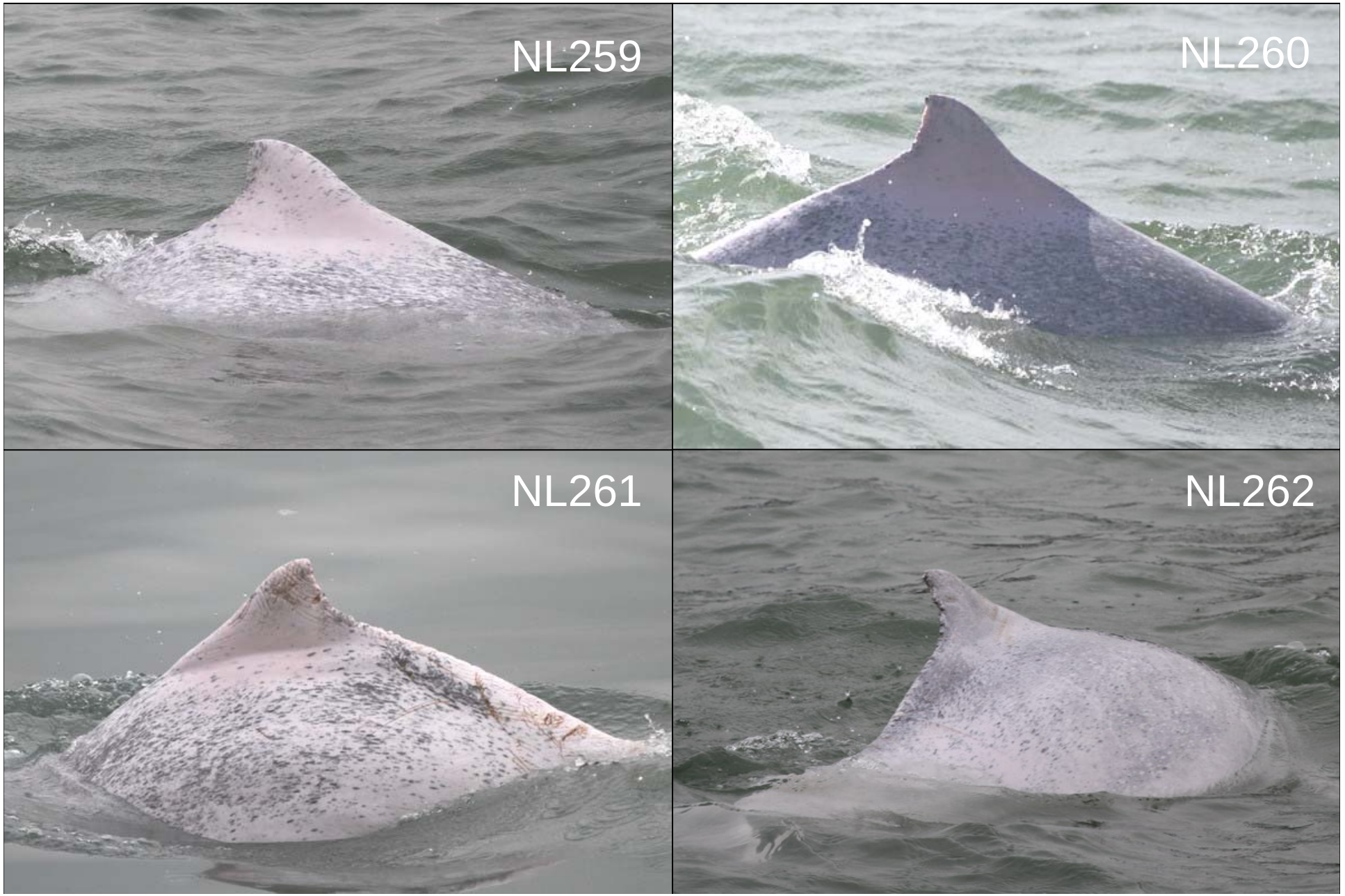
Appendix IV. (cont'd)



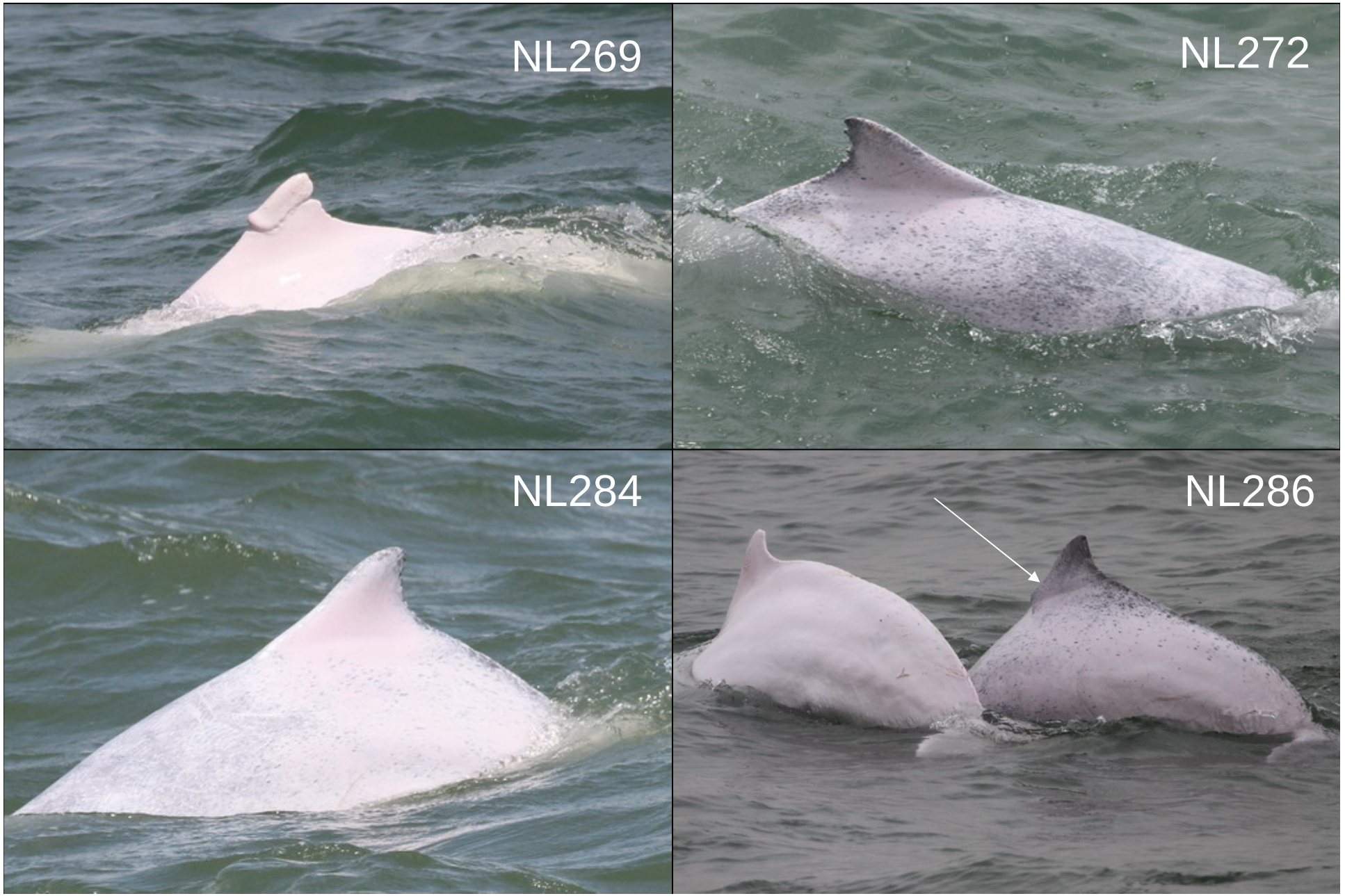
Appendix IV. (cont'd)



Appendix IV. (cont'd)



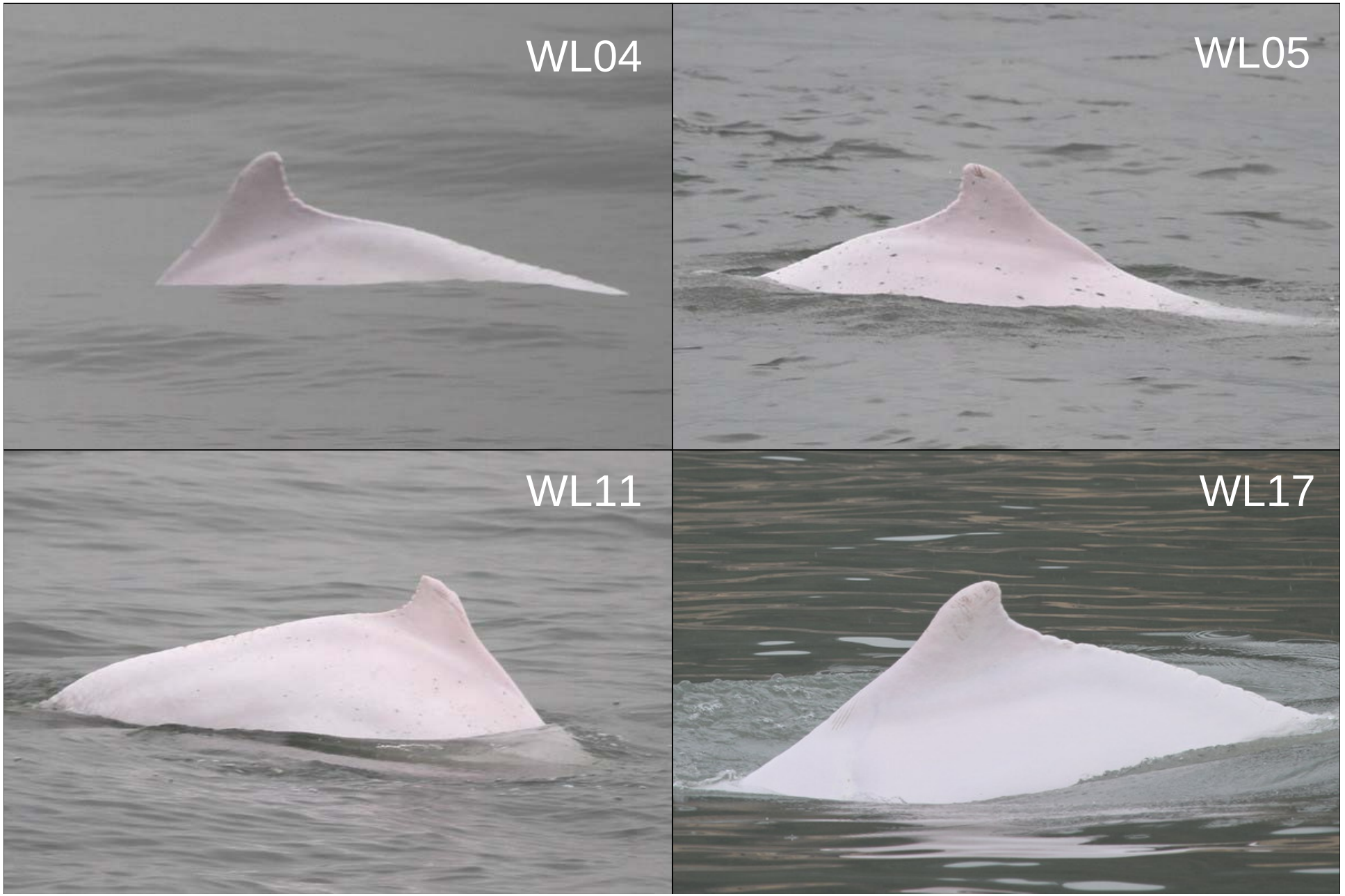
Appendix IV. (cont'd)



Appendix IV. (cont'd)

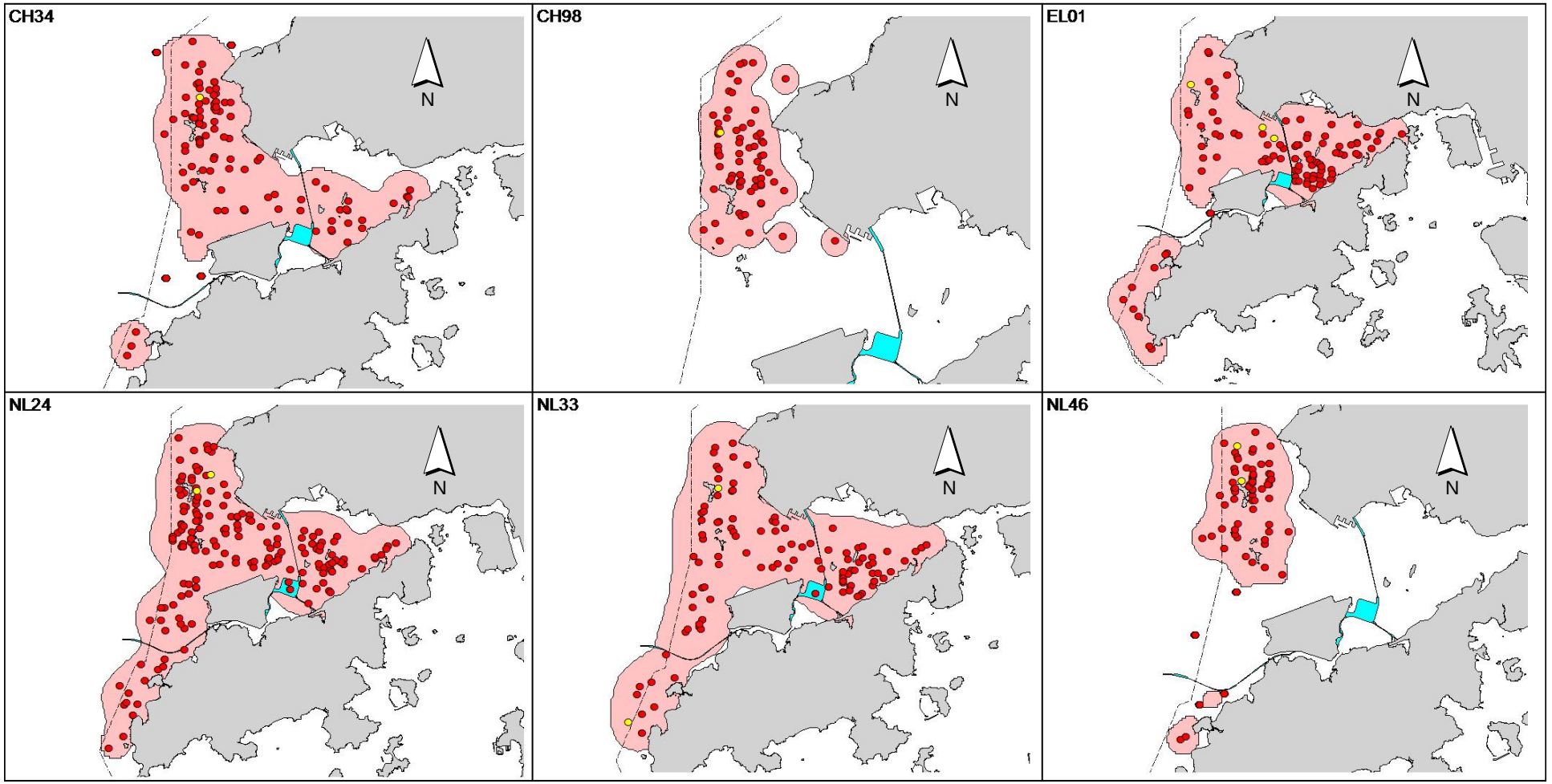
Appendix IV. (cont'd)

Appendix IV. (cont'd)

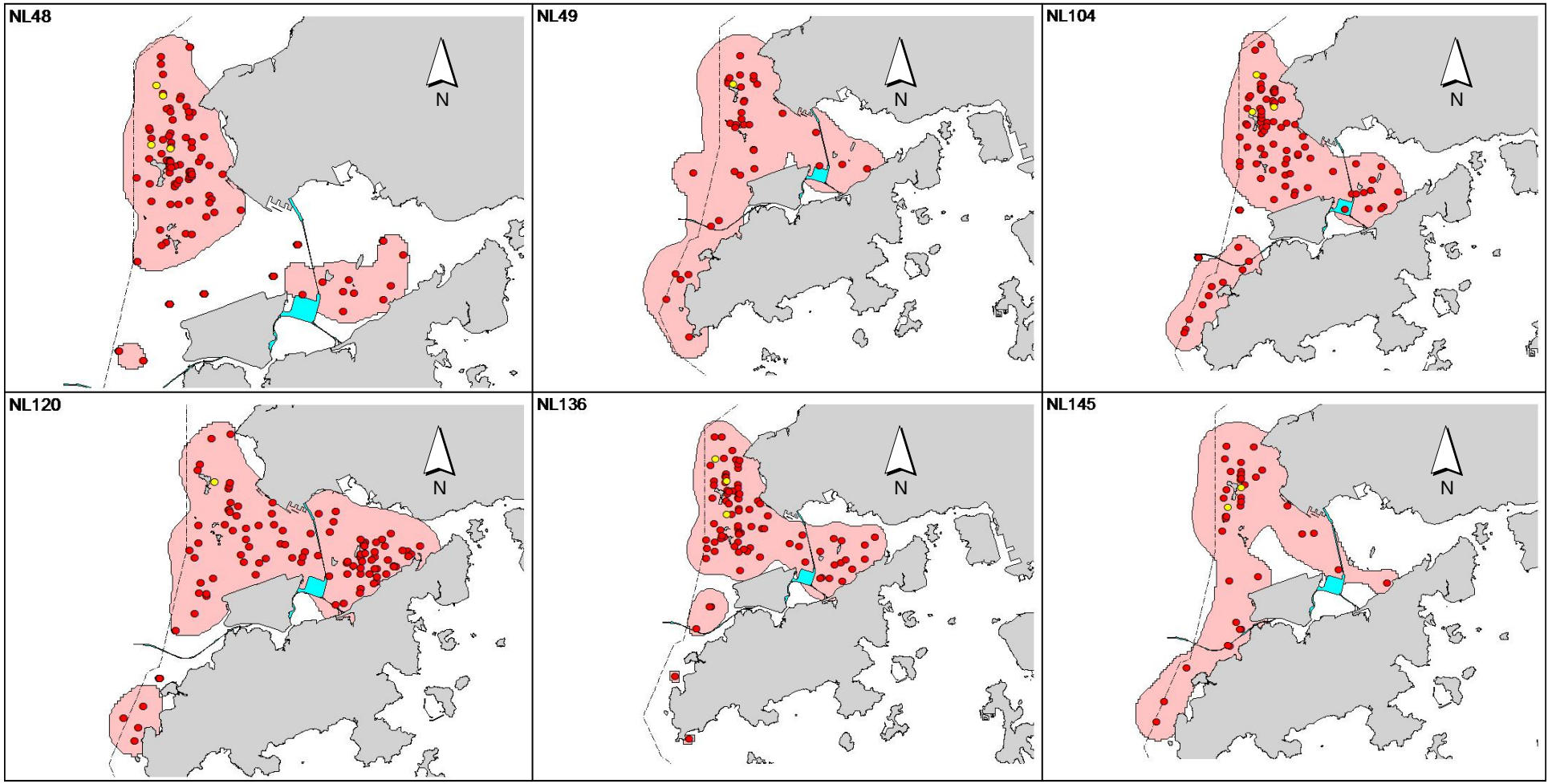


Appendix IV. (cont'd)

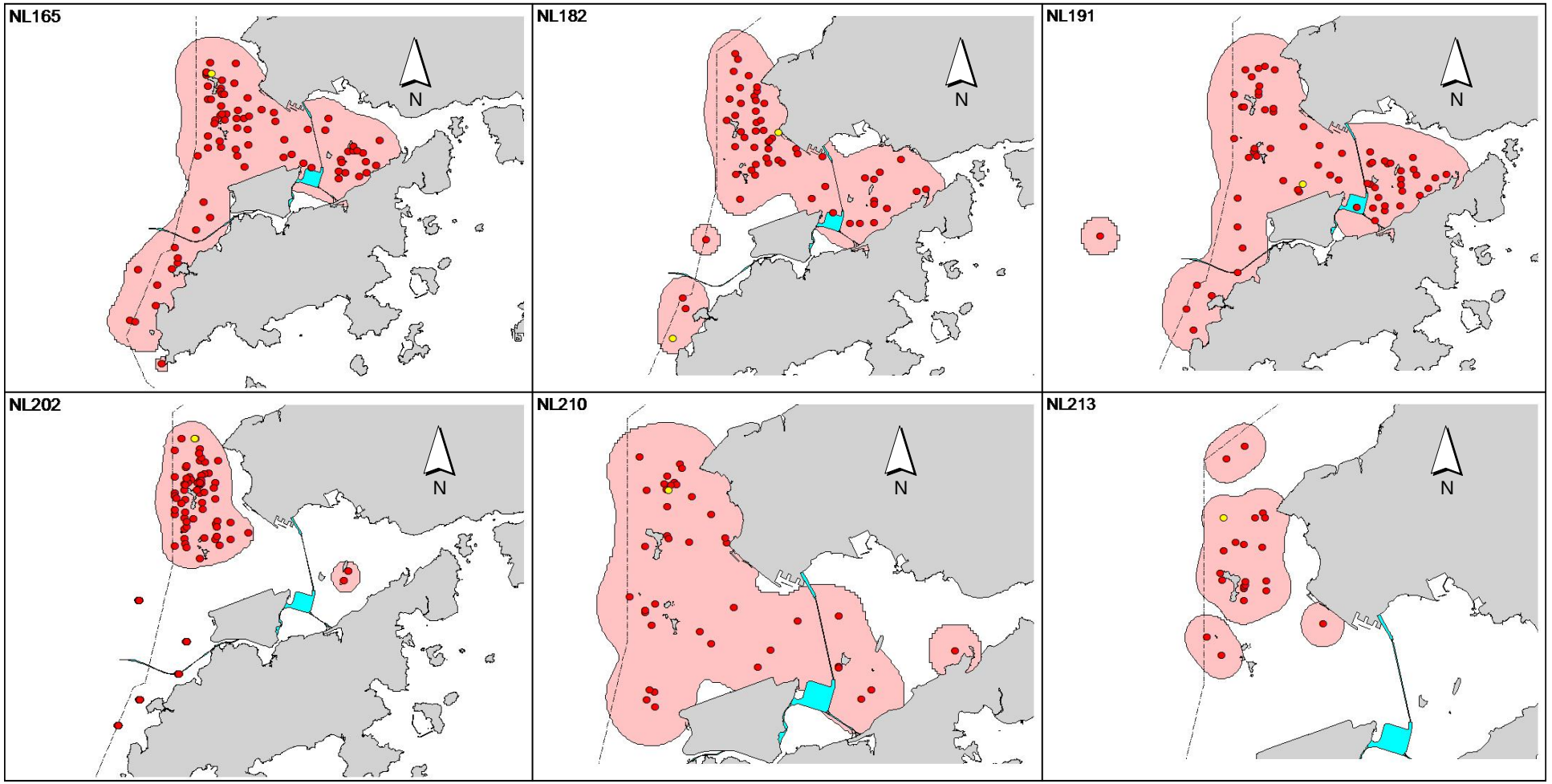
Appendix V. Ranging patterns (95% kernel ranges) of 45 individual dolphins that were sighted during HKLR03 impact phase monitoring period (note: yellow dots indicates sightings made in March-May 2014)



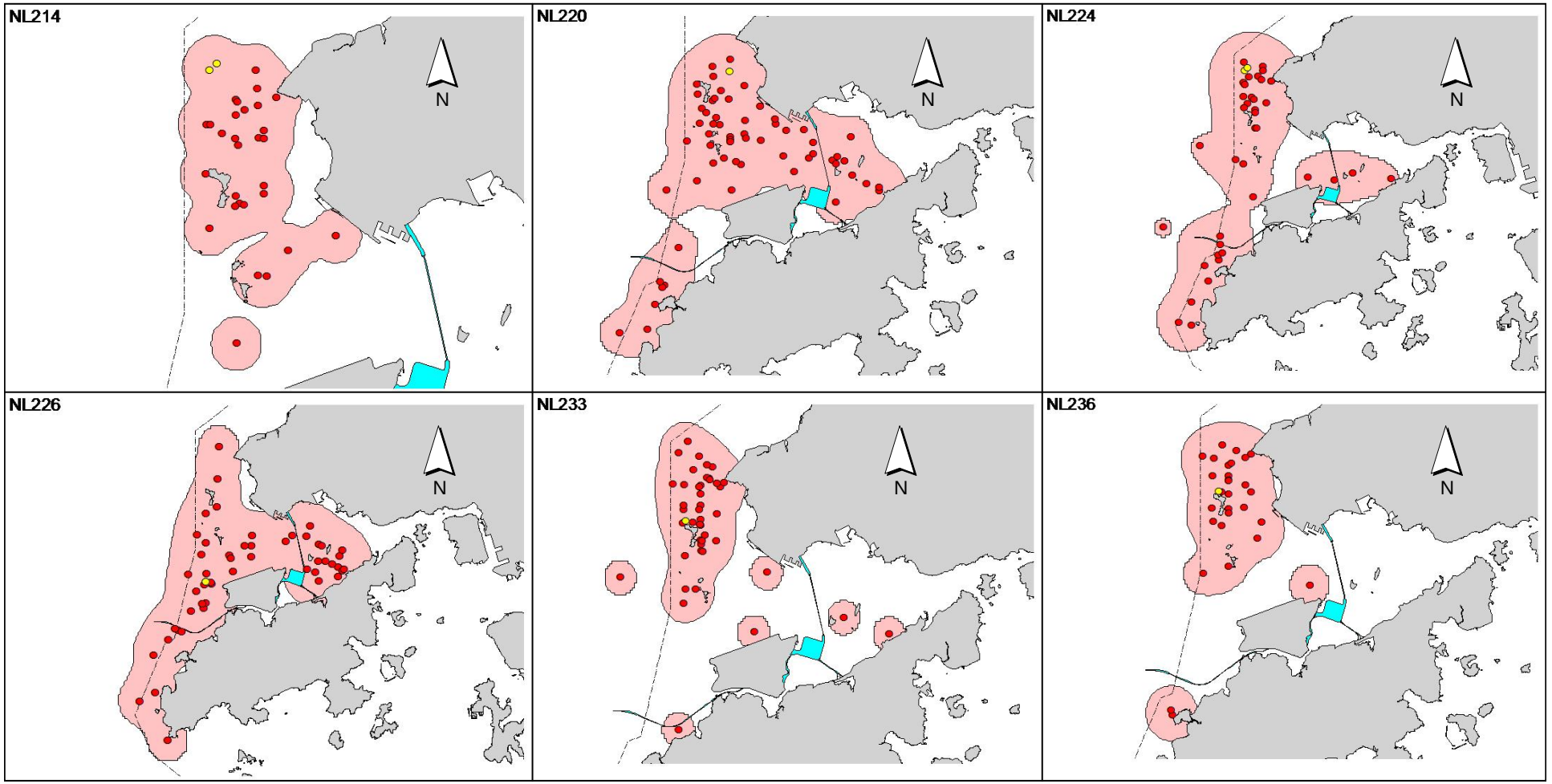
Appendix V. (cont'd)



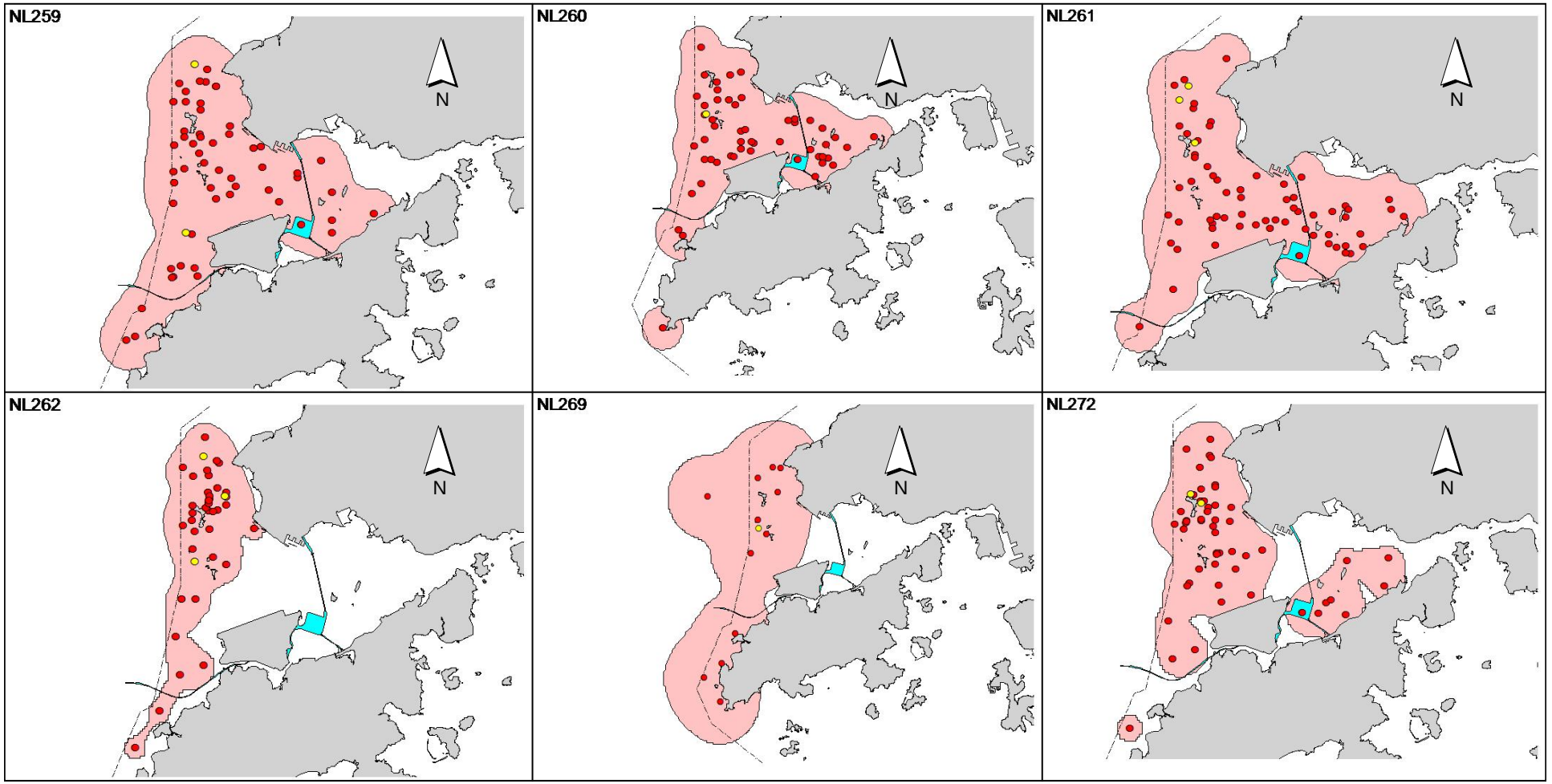
Appendix V. (cont'd)



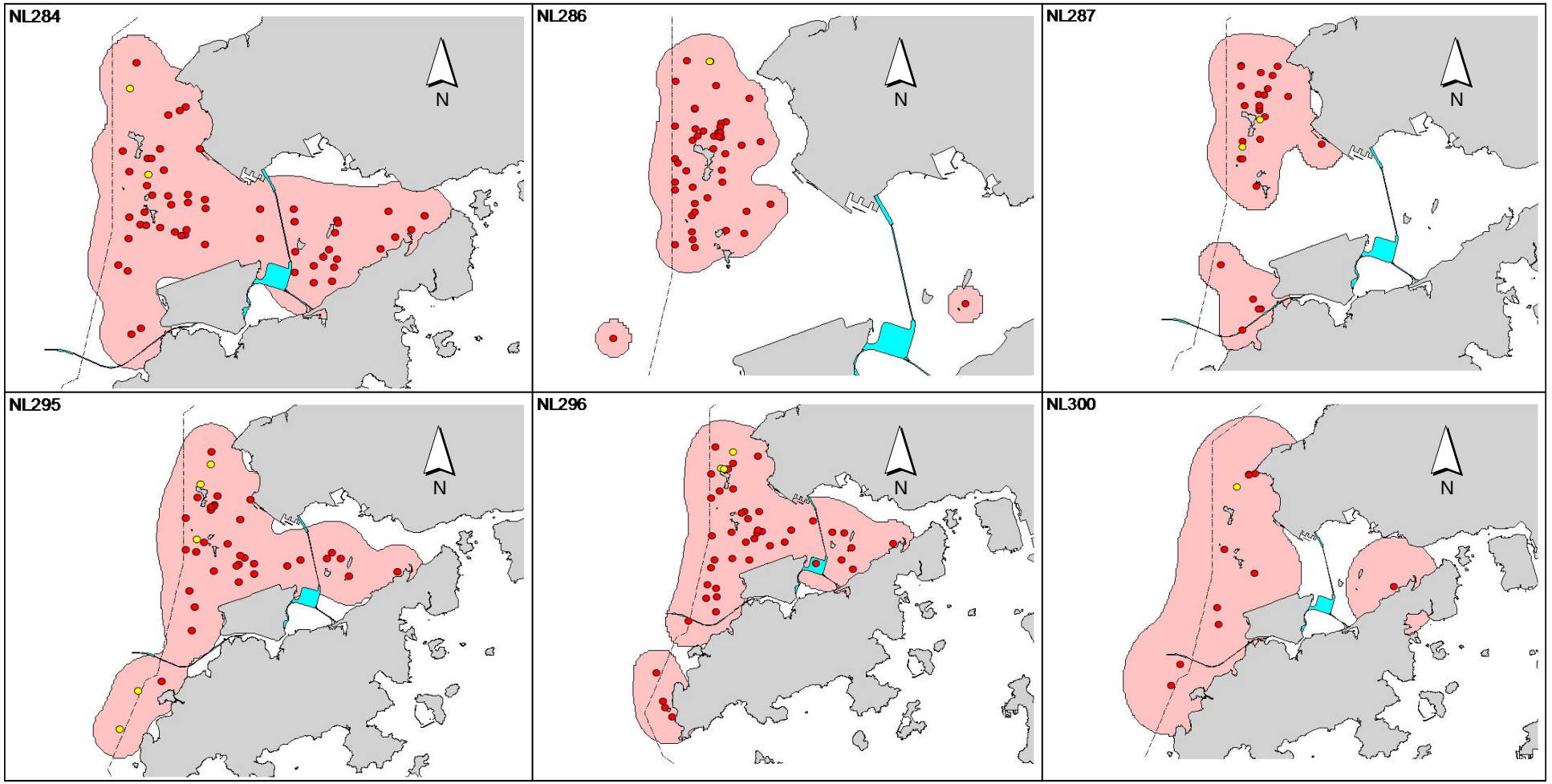
Appendix V. (cont'd)



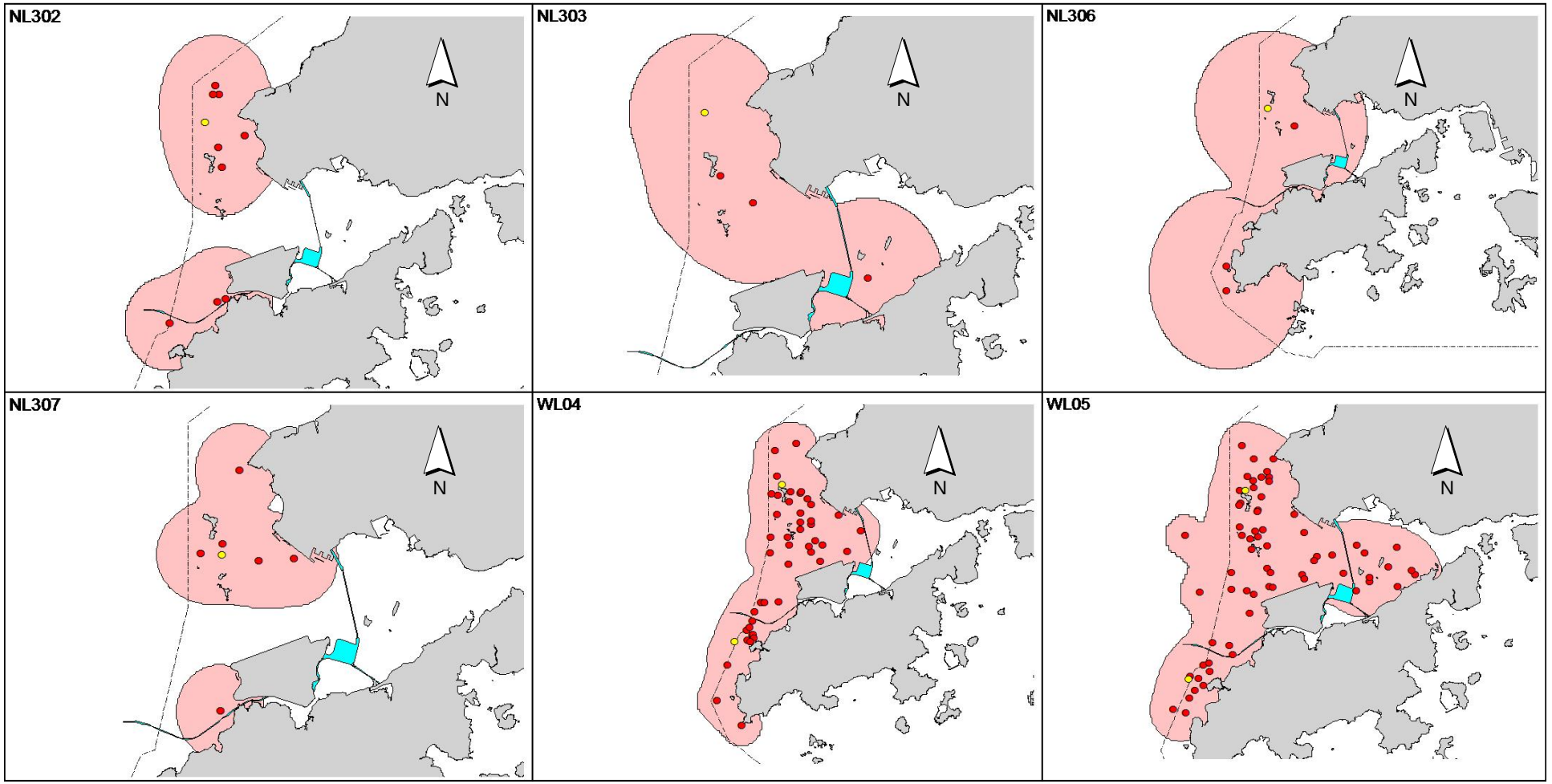
Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)