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

Second Annual Progress Report (November 2014 - October 2015)
submitted to Gammon Construction Limited

Submitted by
Samuel K.Y. Hung, Ph.D., Hong Kong Cetacean Research Project

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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 their 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 annual 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 November 2014 to October 2015, 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 of HZMB. 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 18 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2014, 2015). 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. The following analyses were performed utilizing the HKLR03 dolphin monitoring data collected under the present impact phase (the second year of TMCLKL construction; i.e. November 2014 to October 2015). In addition, these analyses were also conducted for the one-year baseline phase (one year before any HZMB construction works have commenced; i.e. February 2011 to January 2012); the one-year transitional phase (one year after the HZMB construction works (HKBCF and HKLR works) have commenced, but before the commencement of TMCLKL construction works; i.e. November 2012 to October 2013); and the first year of TMCLKL construction (i.e. November 2013 to October 2014).

2.3.2. Along with the analyzed results from the baseline and transitional as well as the first year of impact phase, results from the second year of impact phase can then be interpreted from the examination of any temporal changes before and during the construction activities of

TMCLKL on dolphin usage in North Lantau waters. For the baseline phase, both baseline monitoring data collected under HZMB contract as well as the AFCD long-term dolphin monitoring data were included to increase the sample size in order to match the similar amount of survey effort in transitional and impact phases, both of which only HKLR03 monitoring data were included for the various analyses.

Distribution analysis

2.3.3. 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.

Encounter rate analysis

2.3.4. 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 collected under Beaufort 3 or below condition would be used for the encounter rate analyses. Dolphin encounter rates during the impact phase were calculated in two ways for comparisons with the HZMB baseline and transitional period monitoring results as well as to the AFCD long-term marine mammal monitoring results.

2.3.5. Firstly, for the comparison with the HZMB 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 the 24 six events during the present 12-month study period (i.e. 24 sets of line-transect surveys in North Lantau), which was also compared with the one deduced from the events during the first year of impact period, transitional period and baseline period.

2.3.6. Secondly, the encounter rates were also calculated using both primary and secondary survey effort as in AFCD long-term monitoring study. The encounter rate of sightings and dolphins were deduced by diving the total number of on-effort sightings (STG) and total number of dolphins (ANI) by the amount of survey effort for the present 12-month study period.

Quantitative grid analysis on habitat use

2.3.7. 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.

2.3.8. 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).

2.3.9. 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

Behavioural analysis

2.3.10. 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. Sighting distribution 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.

Ranging pattern analysis

2.3.11. Location data of individual dolphins that occurred during the 12-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 second year of TMCLKL impact phase monitoring (November 2014 to October 2015), a total of 24 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 3,589.91 km of survey effort was collected, with 97.0% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility). Among the two areas, 1,381.43 km and 2,208.48 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 2,612.04 km, while the effort on secondary lines was 977.87 km. The 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.

3.1.4. From the 24 sets of HKLR03 monitoring surveys from November 2014 to October 2015, a total of 54 groups of 229 Chinese White Dolphins were sighted. All except four dolphin sightings were made during on-effort search. Among the 50 on-effort sightings, 44 of them were made on primary lines, while the other six dolphin sightings were made on secondary lines.

3.1.5. During this 12-month period, all except one dolphin sighting were made in NWL, and the only rare sighting made in NEL on June 26th was a lone animal. A 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 November 2014 to October 2015 is shown in Figure 1.

3.2.2. Similar to the first year of impact phase, the majority of dolphin sightings made in the second year of impact phase were concentrated at the northwestern end of the North Lantau region, mainly around and to the north of Lung Kwu Chau (Figure 1). Some dolphin groups were also sighted near Sha Chau, to the west and north of the Chek Lap Kok Airport, and the lone sighting made in NEL was located to the north of Shum Shui Kok and Yam O (Figure 1).

3.2.3. None of the dolphin groups were sighted in the vicinity of TMCLKL southern viaduct and northern landfall construction sites, as well as the HKLR03 and HKBCF reclamation sites (Figure 1). On the contrary, a few sightings were made in the vicinity of the HKLR09 alignment (Figure 1). Generally speaking, dolphin appeared to have avoided the construction areas of HZMB works during the present impact phase monitoring period, which was consistent with the dolphin distribution during the first year of impact phase.

3.2.4. Dolphin sighting distribution of the present impact phase monitoring period (November 2014 to October 2015) was compared to the ones during the baseline phase (February 2011 to January 2012), the transitional phase (November 2012 to October 2013) and the first year of impact phase (November 2013 to October 2014). In the present impact phase period, dolphins have largely vacated from the NEL survey area and the eastern half of the NWL survey area, which was in stark contrast to their very frequent occurrence around the Brothers Islands, Shum Shui Kok, the waters between Pillar Point and airport platform, and the vicinity of HZMB-associated work sites during the baseline period (Figure 2). Even in the transitional phase, dolphins still utilized these waters in a moderate extent, but such usage has progressively diminished during the first and second years of the TMCLKL impact phase (Figure 2).

3.2.5. The only area where dolphin occurrence was consistent across the four phases was around the Lung Kwu Chau area (Figure 2). Notably, dolphin usage was also diminished progressively around Sha Chau and to the west of the airport platform, and the waters around Lung Kwu Chau appeared to be the remaining area in North Lantau region where dolphins consistently utilized during the second year of impact phase (Figure 2).

3.3. Encounter rate

3.3.1. During the present 12-month impact phase monitoring period, the average daily encounter rates of Chinese White Dolphins were deduced in NEL and NWL survey areas, and compared to the ones deduced from the baseline, transitional and first year of impact phases (Table 2).

Table 2. Comparison of average daily dolphin encounter rates from first and second years of impact phase, transitional phase and baseline phase monitoring periods (Note: encounter rates deduced from the three periods were calculated based on survey and on-effort sighting data made along the primary transect lines under favourable conditions; ± denotes the standard deviation of the average encounter rates)

	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)	
	Northeast Lantau	**Northwest Lantau**	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2014-15)	0.11 ± 0.54	2.54 ± 2.49	0.11 ± 0.54	11.64 ± 14.04
Impact Phase (2013-14)	0.22 ± 0.74	6.93 ± 4.08	0.76 ± 2.59	26.31 ± 17.56
Transitional Phase (2012-13)	1.70 ± 2.26	7.68 ± 4.36	4.75 ± 7.61	27.51 ± 18.06
Baseline Phase (2011-12)	6.05 ± 5.04	7.75 ± 5.69	19.91 ± 21.30	29.57 ± 26.96

3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the present 12-month study period using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 2.27 sightings and 10.10 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both 0.07.

3.3.3. 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, transitional and impact phase periods. The two variables that were examined included the different periods and the two locations (i.e. NEL and NWL).

3.3.4. For the comparison between the different monitoring periods, the p-value for the differences in average dolphin encounter rates of STG and ANI were 0.000001 and 0.00279 respectively. Even if the alpha value is set at 0.005, significant differences were detected among the different periods in both dolphin encounter rates of STG and ANI.

3.3.5. In NEL, the dolphin encounter rates (both STG and ANI) in the second year of TMCLKL impact monitoring period were close to nil, which was only a tiny fraction of the averages during the baseline phase and transitional phase (Table 2). Such decline has actually existed in this area during the transitional phase (i.e. well before the TMCLKL construction works commenced), with the averages in the transitional phase being much lower than the ones in the baseline phase (reductions of 71.9% for STG and 76.1% respectively). Since then, dolphin occurrence has further diminished to an extremely low level during the first and second years of TMCLKL construction works.

3.3.6. In NWL, the average dolphin encounter rates (STG and ANI) during the present impact phase monitoring period were much lower (reductions of 67.2% and 60.6% respectively) than the ones recorded in the baseline period, indicating a dramatic decline in dolphin usage of this survey area during the second year of TMCLKL impact phase monitoring period (Table 2). Notably, the encounter rates in NWL during the first year of impact phase (2013-14) were only slightly lower than the baseline period, but such decline has quickly escalated during the second year of impact phase (2014-15), signaling a further widespread of declining usage by the dolphins throughout the entire North Lantau region.

3.4. Group size

3.4.1. Group size of Chinese White Dolphins ranged from one to 13 individuals per group in North Lantau region during November 2014 – October 2015. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline, transitional and first year of impact phases, as shown in Table 3.

3.4.2. The average dolphin group sizes in the entire North Lantau region as well as in NWL waters during the present impact phase monitoring period were higher than the ones recorded during the baseline and transitional phases (Table 3). On the other hand, there was only one group of a lone animal found in NEL during the present impact phase monitoring period, and such group size was much lower than the ones during the baseline and transitional phases. Among the 136 dolphin groups sighted during the impact phase, 93 of them were composed of 1-4 individuals only, while there were only four dolphin groups with more than 10 individuals.

Table 3. Comparison of average dolphin group sizes from the first two years of impact phase, transitional phase and baseline phase monitoring periods (± denotes the standard deviation of the average encounter rates)

	Average Dolphin Group Size		
	Overall	**Northeast Lantau**	**Northwest Lantau**
Impact Phase (2014-15)	4.24 ± 3.15 (n = 54)	1.00 (n = 1)	4.30 ± 3.15 (n = 53)
Impact Phase (2013-14)	3.76 ± 2.57 (n = 136)	5.00 ± 2.71 (n = 4)	3.73 ± 2.57 (n = 132)
Transitional Phase (2012-13)	3.37 ± 2.98 (n = 186)	2.64 ± 2.38 (n = 22)	3.47 ± 3.05 (n = 164)
Baseline Phase (2011-12)	3.32 ± 2.86 (n = 288)	2.80 ± 2.35 (n = 79)	3.52 ± 3.01 (n = 209)

3.4.3. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present quarter is shown in Figure 3, with comparison to the ones in the first year of impact phase, transitional phase and baseline phase. During the impact phase in 2014-15, distribution of the larger dolphin groups were mainly concentrated around Lung Kwu Chau and to the north of the island (Figure 3).

3.4.4. Notably, since the transitional phase and the first year of impact phase, distribution of these larger groups has already been restricted to the northwestern portion of North Lantau region. Such restriction was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many also sighted in NEL waters (Figure 3).

3.5. Habitat use

3.5.1. During the impact phase monitoring period in 2014-15, the most heavily utilized habitat by Chinese White Dolphins was only found around Lung Kwu Chau (Figures 4a and 4b). For the rest of North Lantau region, only one grid in NEL as well as a few grids to the north and west of the airport platform in NWL recorded the presence of dolphins in very low density. Moreover, all grids along the alignments of TMCLKL and HKLR09 projects as well as the reclamation sites of HKLR03 and HKBCF projects sites rarely recorded the presence of dolphins in the present 12-month impact monitoring period in 2014-15 (Figures 4a and 4b).

3.5.2. When compared with the habitat use patterns during the baseline phase, dolphin usage in NEL has progressively diminished in the transitional phase and the two periods of impact phases (Figure 5). During the baseline period, a number of grids between Siu Mo To and Shum Shui Kok recorded moderately high to high dolphin densities, and most grids in NEL recorded dolphin usage. This was in stark contrast to the extremely low dolphin usage in this area with only one grid recorded with very low dolphin density during the present impact phase period (Figure 5).

3.5.3. Moreover, usage of NWL waters also declined dramatically during the present impact

phase monitoring period, with the only higher dolphin densities occurred right around the Lung Kwu Chau area, in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and first year of impact phase monitoring. It appeared that there was a more widespread decline of dolphin usage throughout the North Lantau waters during 2014-15 in the midst of the on-going TMCLKL construction works in addition to other HZMB-related construction activities.

3.6. Mother-calf pairs

3.6.1. During the present 12-month impact phase monitoring period, only three unspotted juveniles (UJ) were sighted with their mothers in North Lantau waters. These young calves comprised of 1.3% of all animals sighted, which was a small fraction of the percentages recorded during the previous impact phase in 2013-14 (5.7%), transitional phase (6.7%) and baseline phase (4.5%).

3.6.2. Not surprisingly, these three young calves were only sighted around Lung Kwu Chau, which was drastically different from the distribution patterns during the baseline and transitional phases when the young calves were sighted throughout NWL waters (Figure 6). Their distribution was even further restricted in the second year of impact phase when compared to the one during the first year of impact phase (Figure 6).

3.6.3. None of the young calves were sighted in the vicinity of the TMCLKL/HKLR09 alignments and HKBCF/HKLR03 reclamation sites during the present impact phase monitoring period (Figure 6).

3.7. Activities and associations with fishing boats

3.7.1. Ten and three dolphin sightings were associated with feeding and socializing activities respectively during the 12-month impact phase monitoring period. The percentage of sightings associated with feeding activities during the present impact phase (18.5%) was much higher than the previous impact phase in 2013-14 (5.9%), transitional phase (8.6%) and baseline phase (12.8%).

3.7.2. On the other hand, the percentage of socializing activities during the present impact phase monitoring period (5.5%) was similar to the first year of impact phase (5.9%), but was higher than the one during the baseline period (3.8%) and slightly lower than the one during the transitional period (6.4%). Notably, none of the 54 dolphin groups were engaged in either traveling or resting activity during the present impact phase monitoring period in 2014-15.

3.7.3. Distribution of dolphins engaged in feeding and socializing activities during the present impact phase monitoring period is shown in Figure 7. The sightings associated with feeding activities occurred near Sha Chau and Lung Kwu Chau, as well as to the west and north of the airport platform, while the ones associated with socializing activities were mainly found near Lung Kwu Chau and Black Point (Figure 7). In comparison, feeding activities were frequently sighted along the Urmston Road, within the marine park, to the west of airport platform and around the Brothers Islands during the baseline phase, while the socializing activities were more scattered throughout the North Lantau region in the same period as well as in the transitional phase (Figure 7). It is apparent that the

"hotspots" where dolphins engaged in different activities were very different between the baseline, transitional and impact phases.

3.7.4. During the impact phase monitoring period in 2014-15, only one of the 54 dolphin groups were found to be associated with an operating fishing vessel (a purse-seiner) near Lung Kwu Chau. The extremely rare event of fishing boat association during the two periods of impact phase as well as the transitional phase was quite different from the baseline period with 14 of 288 dolphin groups associated with fishing boats. This was likely related to the trawl ban being implemented in December 2012 in Hong Kong waters.

3.8. Summary of photo-identification works

3.8.1. During the 12-month impact phase monitoring period in 2014-15, a total of 54 individuals sighted 154 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL and the lone individual sighted in NEL was not identified

3.8.2. About two-third of the 54 identified individuals were sighted only once or twice, while the rest were sighted frequently during the 12-month period. For example, seven individuals were sighted more than five to nine times (CH34, NL48, NL104, NL136, NL182, NL284 and WL05), while two individuals (NL202 and NL286) were sighted thirteen times each. Their frequent occurrences during the second year of impact phase monitoring indicated strong reliance of North Lantau waters as their home ranges.

3.8.3. Notably, eight recognized females (i.e. NL33, NL98, NL104, NL123, NL202, NL220, WL05 and WL17) were accompanied with their calves during their re-sightings, and many of these calves are older and already in their juvenile stage. For example, the calves of NL123 (i.e. NL285) and NL202 (NL286) have been accompanying their mothers for over 7-8 years.

3.9. Individual range use

3.9.1. Ranging patterns of the 54 individuals identified during the 12-month impact phase monitoring period in 2014-15 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. All identified dolphins sighted in this 12-month period were utilizing their ranges primarily in NWL, while 25 of them have extended their range use to West Lantau waters (e.g. NL33, NL49, NL165, NL210) based on the HKLR09 monitoring data collected during the same period (Appendix IV). All of these identified dolphins have avoided the NEL waters, the area where many of them have utilized as their core areas of activities in the past.

3.9.3. Temporal changes in range use of 28 individual dolphins that ranged across different survey areas in North, West and South Lantau waters were examined in details during baseline phase, transitional phase and two periods of impact phases (Appendix V). It is apparent that at least 10 individuals (e.g. CH34, NL98, NL136, NL261) have gradually shifted their range use away from their previously important habitat in NEL, while another six individuals (e.g. NL49, NL220, NL259) have utilized NEL waters in the past but have been completely absent from there across the four phases (Appendix V).

3.9.4. Moreover, 21 individual dolphins have diminished their utilization of NWL waters during the TMCLKL impact phases, and at the same time 12 of them (NL33, NL49, NL98, NL123, NL145, NL150, NL210, NL236, NL259, NL261, NL284 and NL287) have increased their utilization of WL waters, apparently expanding their range use into West Lantau waters. Two individuals (NL98 and NL287) were even expanding their range use to Southwest Lantau waters as well during the 2014-15 impact phase period.

3.9.5. Notably, while some individuals have expanded their range use in WL and diminished their range use in NWL, other individuals (e.g. NL37, NL103, NL104, NL220) have utilized waters of Hong Kong generally less during the 2014-15 impact phase period. This corresponded well with a much lower dolphin encounter rate in NWL in 2014-15 impact phase period as explained in Section 3.3.4.

3.9.6. When compared with the list of individuals identified in the previous period of TMCLKL phase in 2013-14, 38 individual dolphins were sighted in 2013-14 but not in 2014-15. After examining the HKCRP photo-identification catalogue which included the long-term monitoring data from other concurrent projects, it was found that 14 of them were not sighted at all in Hong Kong waters in 2014-15. For the other 24 individuals, almost all of them were sighted exclusively in WL and SWL waters during the TMCLKL impact phase in 2014-15. For example, EL01 were sighted eight times in North Lantau waters during 2013-14, but was only sighted once in SWL in 2014-15. NL120 were sighted four times in North Lantau waters during 2013-14, but was sighted seven times in West and Southwest Lantau in 2014-15. NL226 was sighted four times in North Lantau waters during 2013-14, but was sighted eight times in West and Southwest Lantau in 2014-15. These examples indicated that a number of individuals have vacated from North Lantau waters during the TMCLKL impact phase in 2014-15, and have shifted their range use to WL and SWL waters instead.

3.9.7. The apparent range shifts of many identified individual dolphins examined above were also documented in Hung (2015), and could be related to the disturbance of construction activities and other existing threats in the North Lantau region. This should be continuously monitored for the rest of the TMCLKL impact phase monitoring period to determine whether such range shifts are temporary or permanent, and whether the dolphins would continue the North Lantau waters once the HZMB-related construction works have completed.

4. Conclusion

4.1. During the second year of TMCLKL impact phase monitoring of Chinese white dolphins, no adverse impact from the activities of the TMCLKL construction project on the 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 drastically reduced in the entire North Lantau region, and many individuals have shifted away from the important habitats around the Brothers Islands and the rest of North Lantau waters.

4.3. It is critical to monitor the dolphin usage in North Lantau region for the rest of the impact phase monitoring period, 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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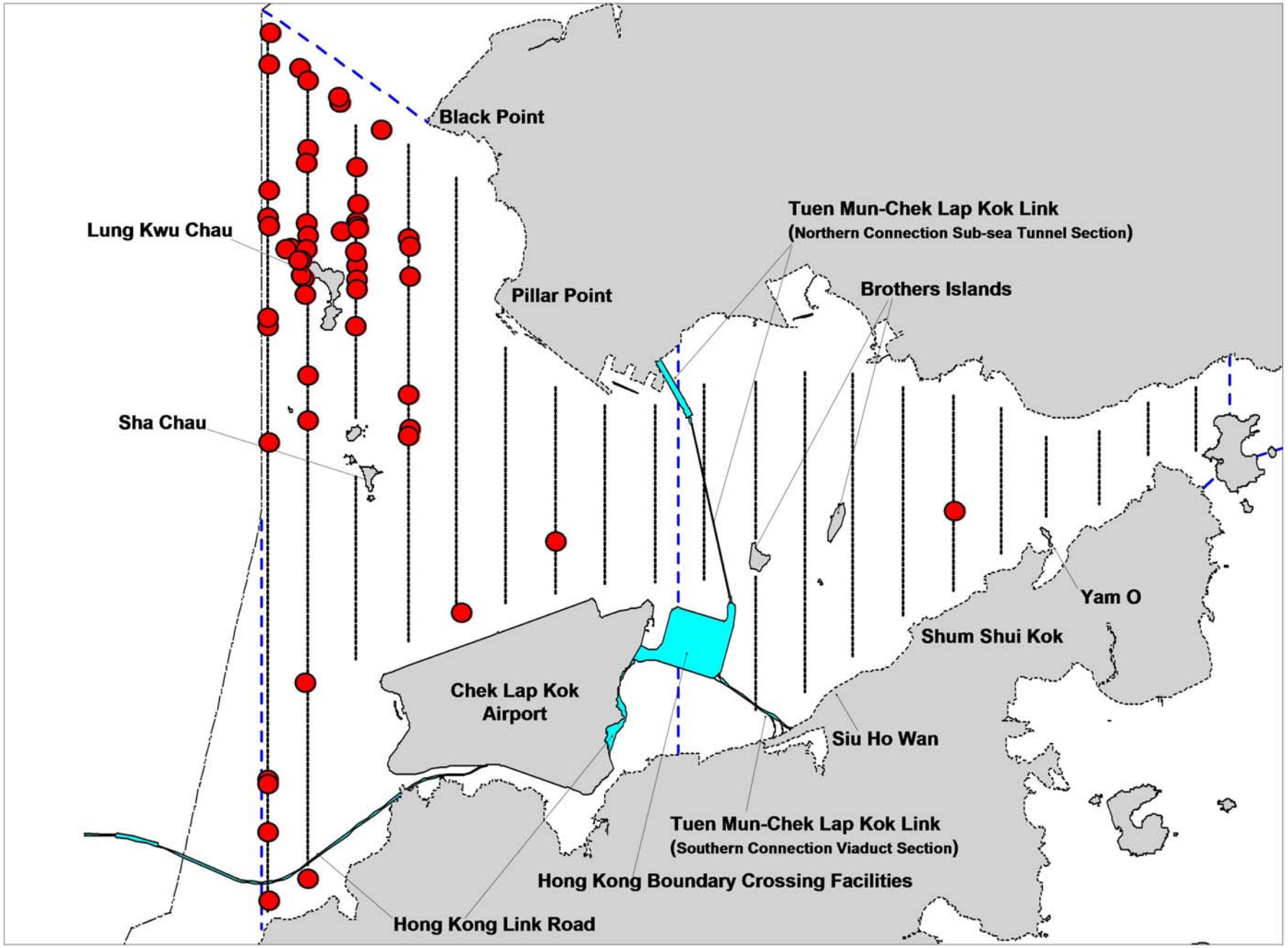


Figure 1. Distribution of Chinese white dolphin sightings in North Lantau region during the second year of TMCLKL construction works (November 2014 to October 2015), utilizing the HKLR03 monitoring data

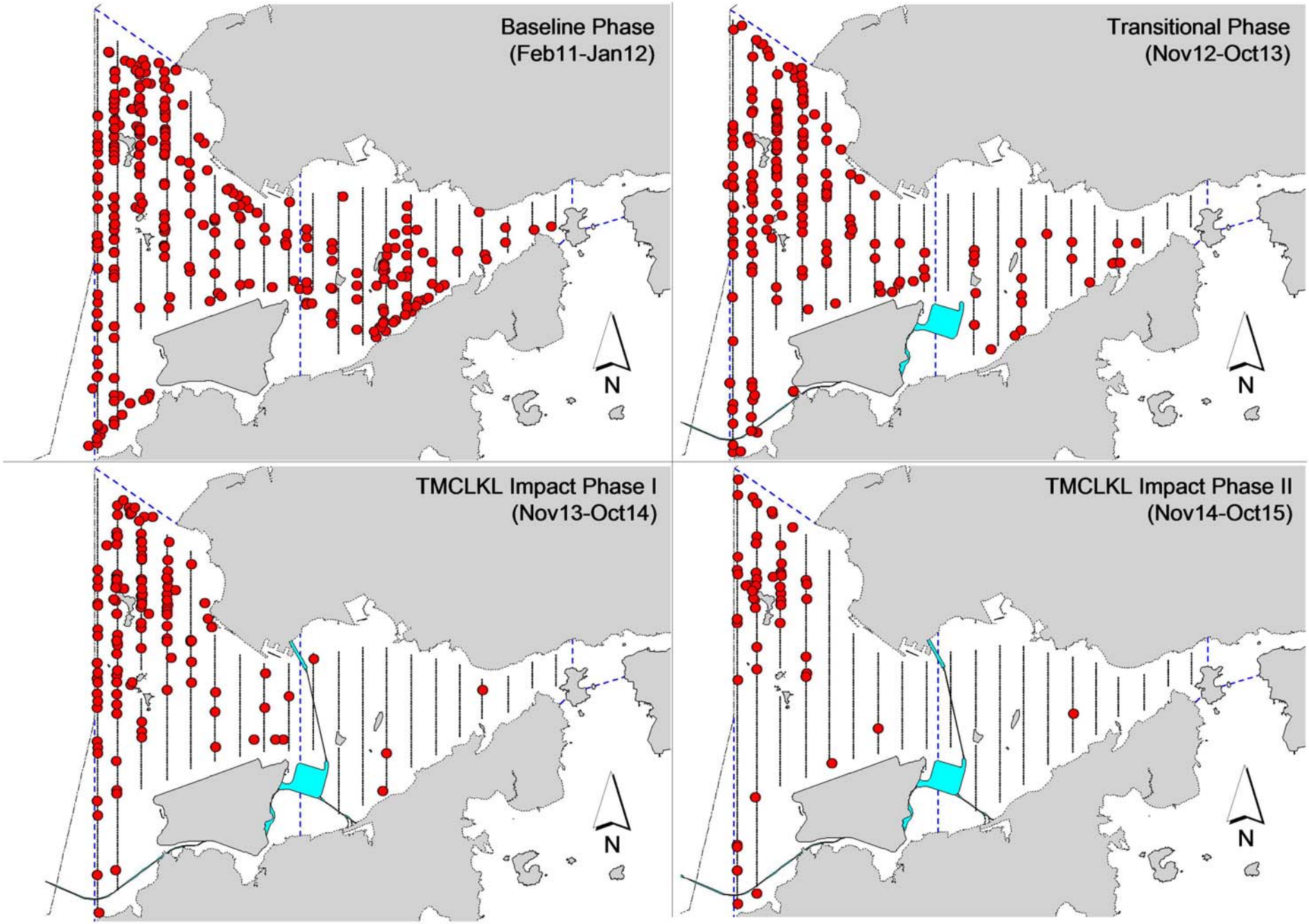


Figure 2. A comparison on distribution of Chinese white dolphin sightings in North Lantau region during the baseline, transitional and two impact phases of TMCLKL construction works

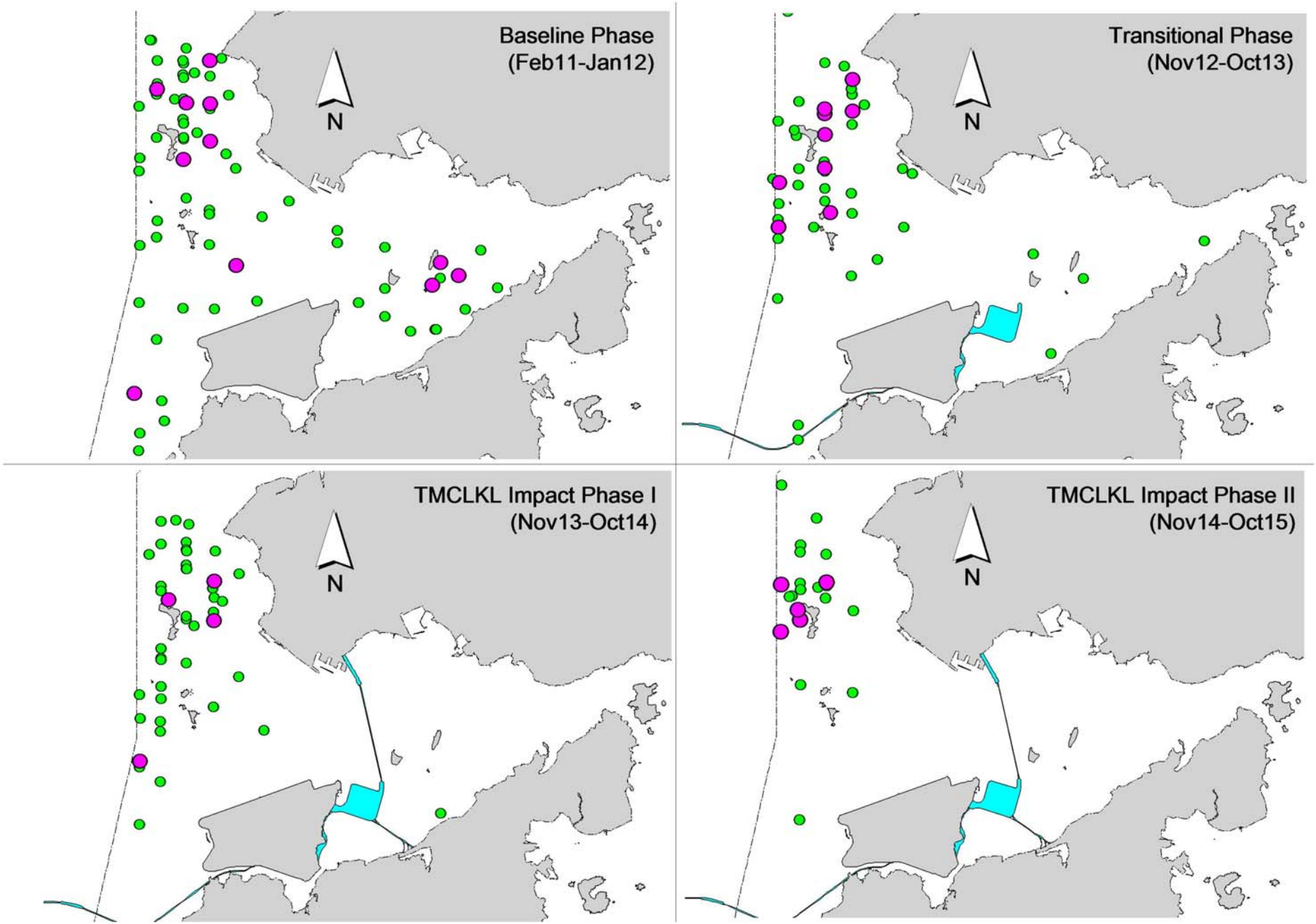


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works
(green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)

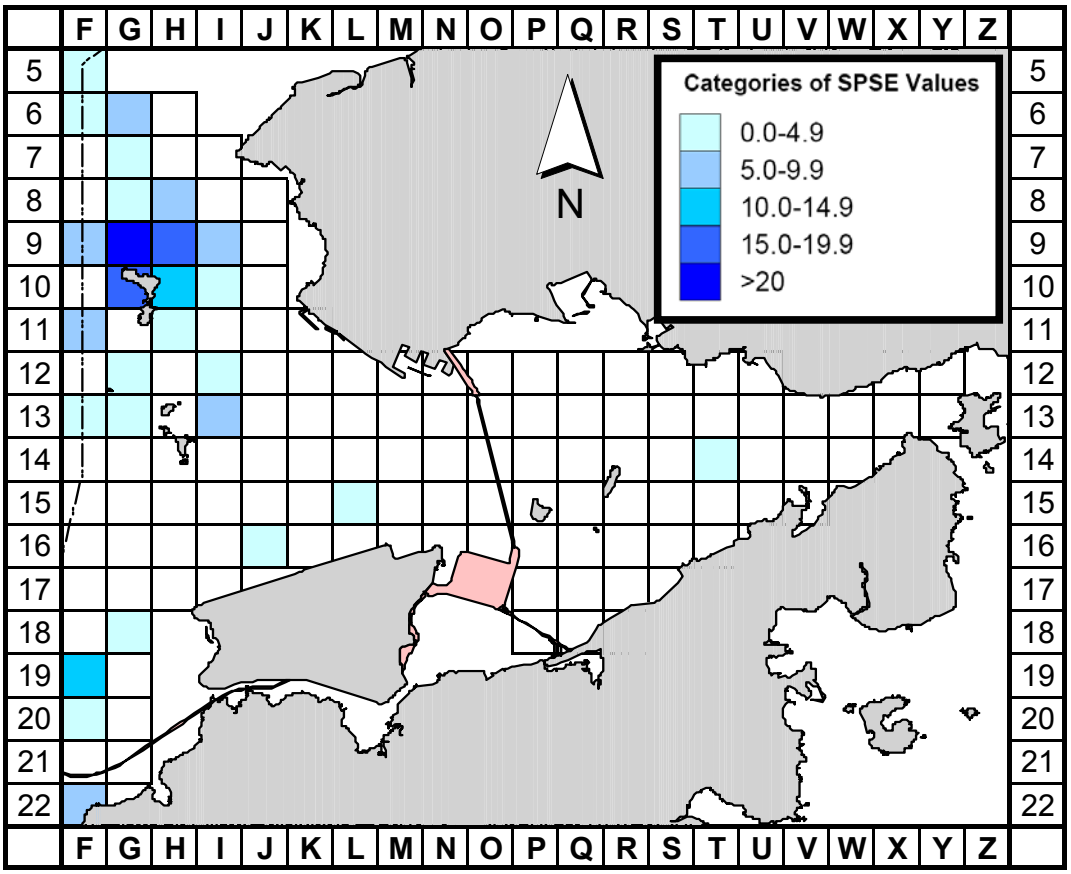


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period monitoring period (Nov14 - Oct15) (SPSE = no. of on-effort sightings per 100 units of survey effort)

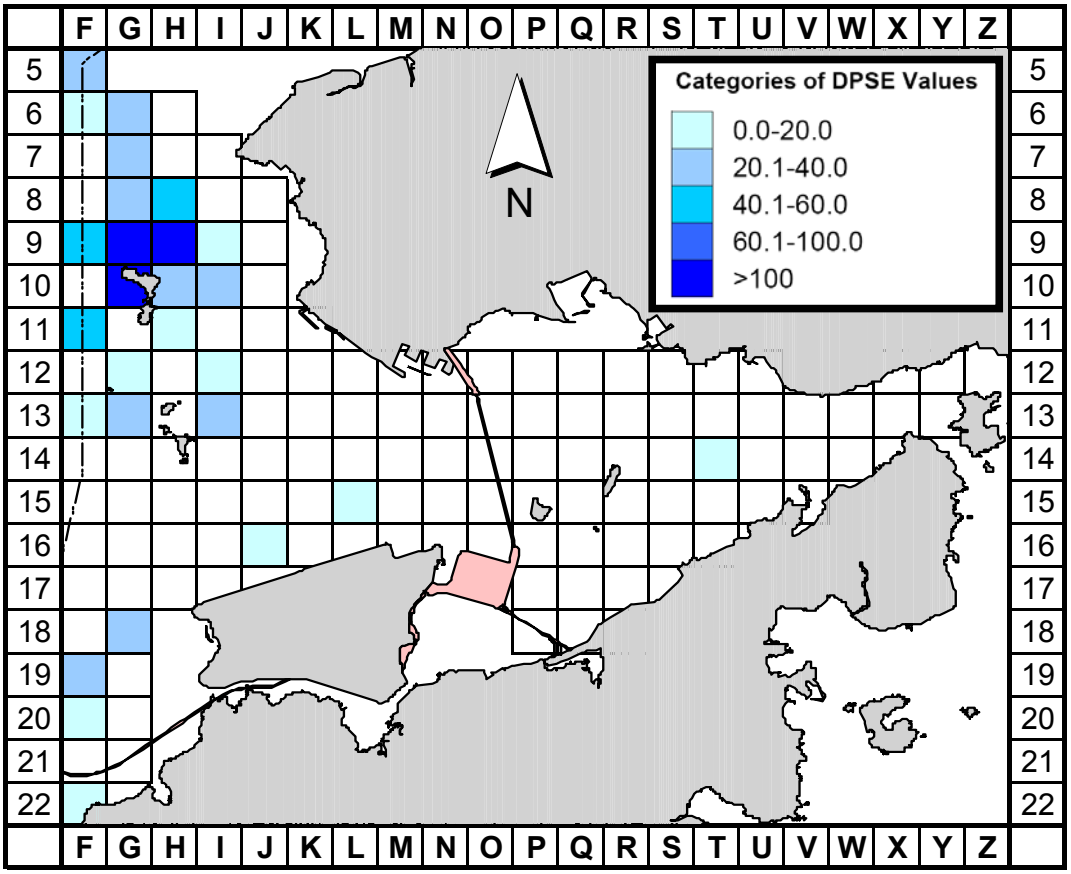


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km^2 in Northeast and Northwest Lantau survey areas, using data collected during HKLR03 impact monitoring period (Nov14 -Oct15) (DPSE = no. of dolphins per 100 units of survey effort)

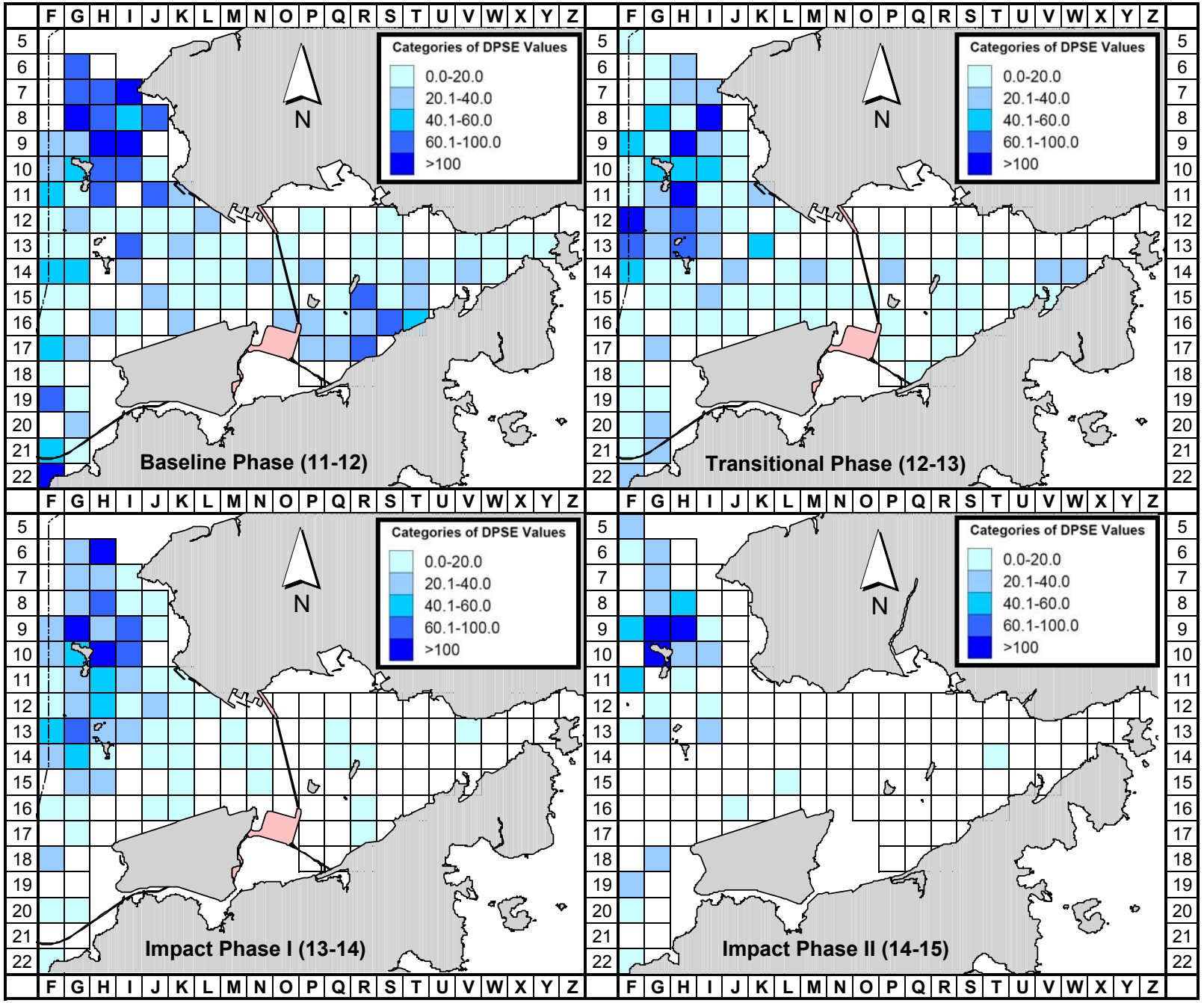


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per km^2 in NWL and NEL survey areas between the two impact phases (Nov14-Oct15 and Nov13-Oct14), transitional phase (Nov12-Oct13) and baseline phase (Feb11-Jan12) monitoring periods (DPSE = no. of dolphins per 100 units of survey effort)

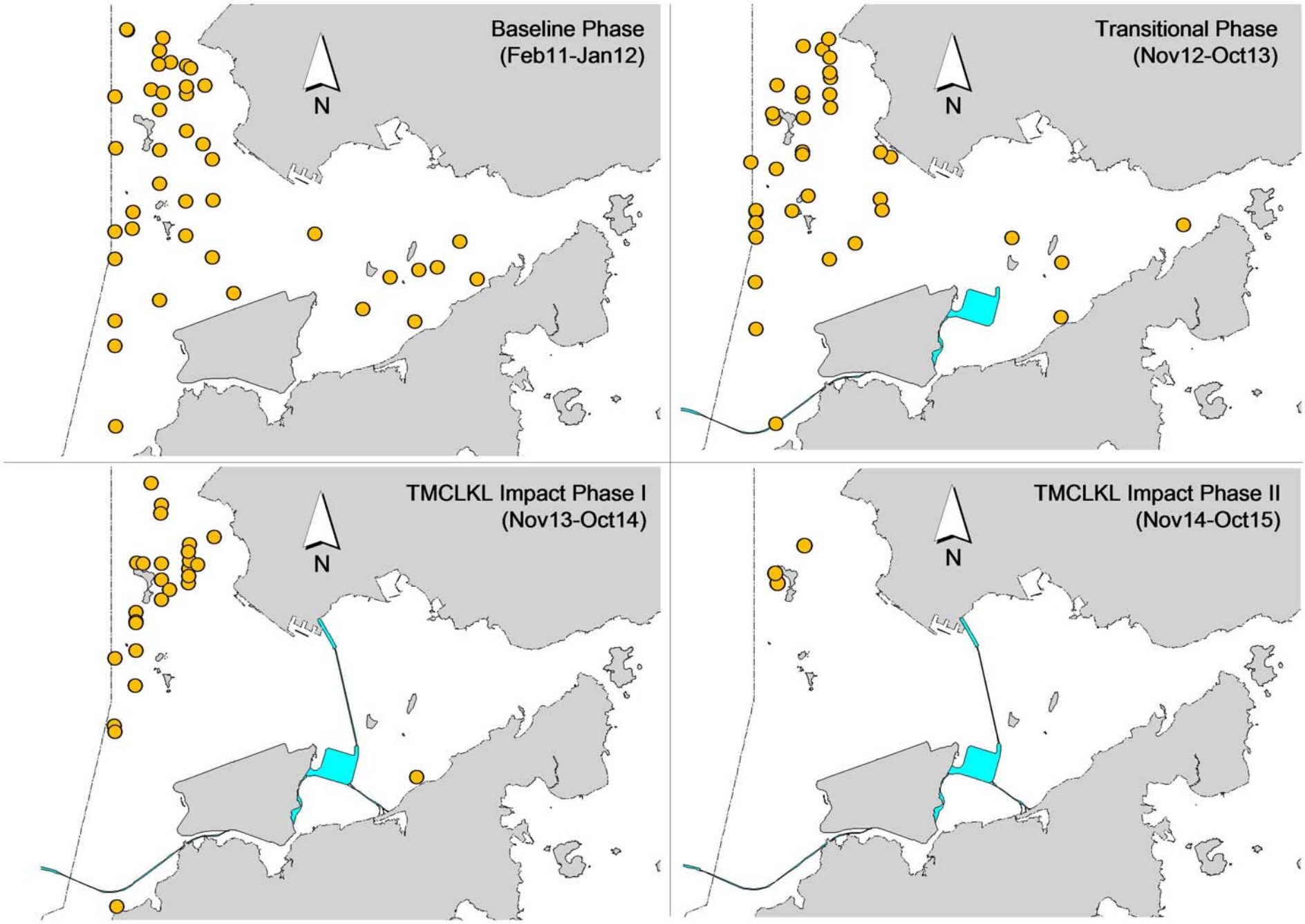


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works

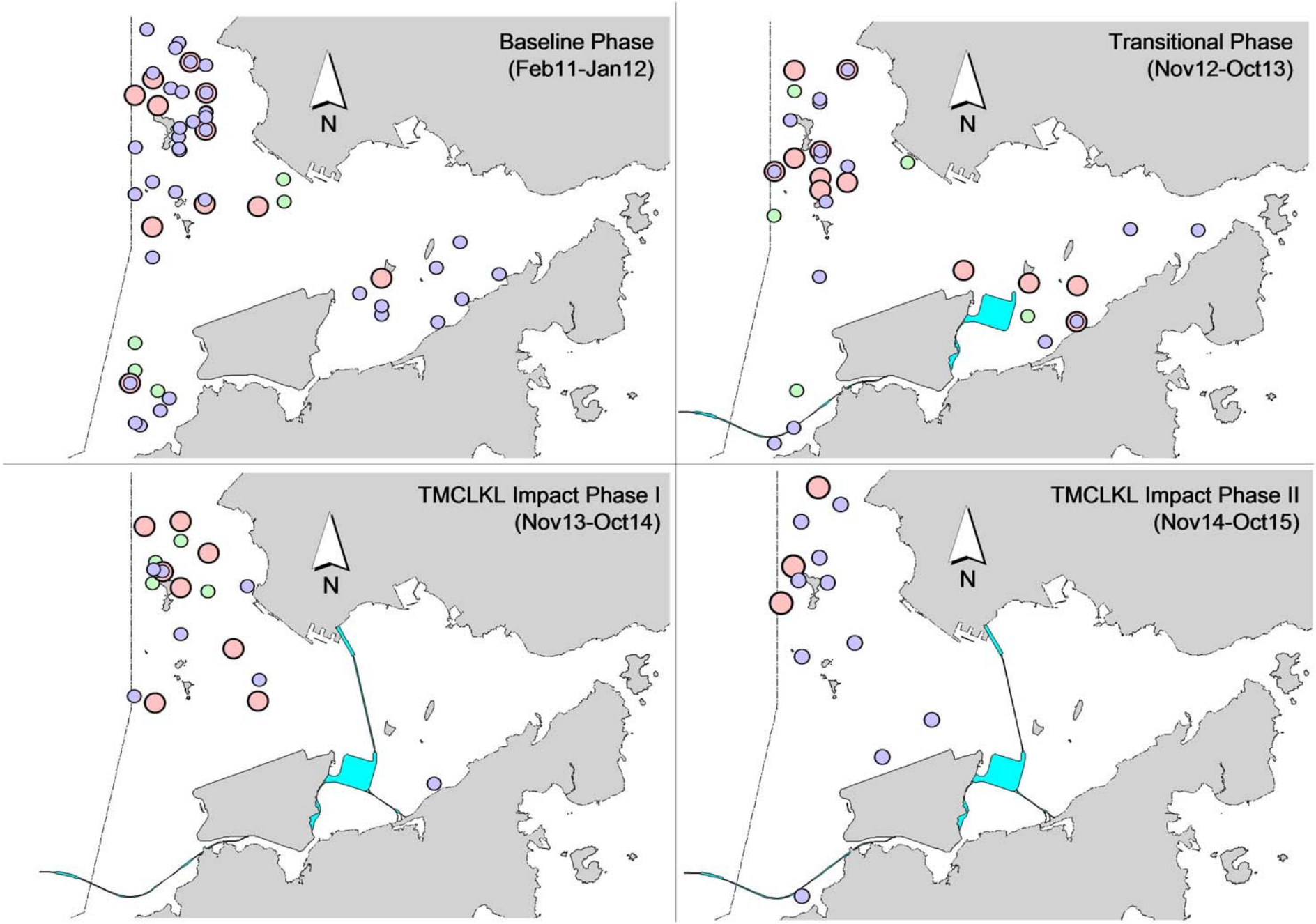


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works

Appendix I. HKLR03 Survey Effort Database (November 2014 - October 201

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Nov-14	NE LANTAU	2	7.47	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NE LANTAU	3	9.93	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NE LANTAU	2	7.41	AUTUMN	STANDARD31516	HKLR	S
4-Nov-14	NE LANTAU	3	1.59	AUTUMN	STANDARD31516	HKLR	S
4-Nov-14	NW LANTAU	1	1.50	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NW LANTAU	2	25.21	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NW LANTAU	3	12.20	AUTUMN	STANDARD31516	HKLR	P
4-Nov-14	NW LANTAU	2	12.82	AUTUMN	STANDARD31516	HKLR	S
4-Nov-14	NW LANTAU	3	0.60	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NE LANTAU	2	8.28	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NE LANTAU	3	9.93	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NE LANTAU	2	9.49	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NE LANTAU	3	1.00	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NW LANTAU	3	26.28	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NW LANTAU	4	6.12	AUTUMN	STANDARD31516	HKLR	P
10-Nov-14	NW LANTAU	3	4.40	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NW LANTAU	4	1.20	AUTUMN	STANDARD31516	HKLR	S
10-Nov-14	NW LANTAU	5	1.10	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NW LANTAU	2	1.30	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NW LANTAU	3	30.29	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NW LANTAU	2	0.60	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NW LANTAU	3	5.98	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NW LANTAU	4	0.63	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NE LANTAU	2	8.30	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NE LANTAU	3	9.41	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NE LANTAU	4	2.40	AUTUMN	STANDARD31516	HKLR	P
12-Nov-14	NE LANTAU	2	7.11	AUTUMN	STANDARD31516	HKLR	S
12-Nov-14	NE LANTAU	3	3.48	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NW LANTAU	2	13.70	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NW LANTAU	3	25.02	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NW LANTAU	4	1.76	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NW LANTAU	2	2.19	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NW LANTAU	3	10.43	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NE LANTAU	1	1.78	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NE LANTAU	2	14.94	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NE LANTAU	3	2.00	AUTUMN	STANDARD31516	HKLR	P
18-Nov-14	NE LANTAU	1	1.20	AUTUMN	STANDARD31516	HKLR	S
18-Nov-14	NE LANTAU	2	7.09	AUTUMN	STANDARD31516	HKLR	S
2-Dec-14	NE LANTAU	2	15.30	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NE LANTAU	3	2.28	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NE LANTAU	2	7.54	WINTER	STANDARD31516	HKLR	S
2-Dec-14	NE LANTAU	3	2.28	WINTER	STANDARD31516	HKLR	S
2-Dec-14	NW LANTAU	2	18.17	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NW LANTAU	3	23.09	WINTER	STANDARD31516	HKLR	P
2-Dec-14	NW LANTAU	2	10.54	WINTER	STANDARD31516	HKLR	S
2-Dec-14	NW LANTAU	3	2.10	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NE LANTAU	1	5.79	WINTER	STANDARD31516	HKLR	P
9-Dec-14	NE LANTAU	2	14.41	WINTER	STANDARD31516	HKLR	P
9-Dec-14	NE LANTAU	1	2.20	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NE LANTAU	2	8.30	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NW LANTAU	1	2.11	WINTER	STANDARD31516	HKLR	P
9-Dec-14	NW LANTAU	2	28.31	WINTER	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
9-Dec-14	NW LANTAU	2	5.13	WINTER	STANDARD31516	HKLR	S
9-Dec-14	NW LANTAU	3	2.45	WINTER	STANDARD31516	HKLR	S
15-Dec-14	NW LANTAU	2	31.56	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NW LANTAU	3	9.34	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NW LANTAU	2	12.90	WINTER	STANDARD31516	HKLR	S
15-Dec-14	NE LANTAU	1	3.57	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NE LANTAU	2	13.37	WINTER	STANDARD31516	HKLR	P
15-Dec-14	NE LANTAU	1	3.76	WINTER	STANDARD31516	HKLR	S
15-Dec-14	NE LANTAU	2	6.50	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NE LANTAU	2	19.81	WINTER	STANDARD31516	HKLR	P
23-Dec-14	NE LANTAU	2	9.69	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NE LANTAU	3	0.90	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NW LANTAU	2	13.36	WINTER	STANDARD31516	HKLR	P
23-Dec-14	NW LANTAU	3	16.71	WINTER	STANDARD31516	HKLR	P
23-Dec-14	NW LANTAU	2	5.81	WINTER	STANDARD31516	HKLR	S
23-Dec-14	NW LANTAU	3	1.82	WINTER	STANDARD31516	HKLR	S
8-Jan-15	NE LANTAU	2	20.00	WINTER	STANDARD31516	HKLR	P
8-Jan-15	NE LANTAU	2	10.40	WINTER	STANDARD31516	HKLR	S
8-Jan-15	NW LANTAU	2	10.06	WINTER	STANDARD31516	HKLR	P
8-Jan-15	NW LANTAU	3	21.99	WINTER	STANDARD31516	HKLR	P
8-Jan-15	NW LANTAU	2	5.53	WINTER	STANDARD31516	HKLR	S
8-Jan-15	NW LANTAU	3	1.94	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NW LANTAU	2	0.89	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NW LANTAU	3	36.39	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NW LANTAU	2	1.05	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NW LANTAU	3	11.06	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NE LANTAU	2	9.56	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NE LANTAU	3	7.91	WINTER	STANDARD31516	HKLR	P
15-Jan-15	NE LANTAU	2	8.56	WINTER	STANDARD31516	HKLR	S
15-Jan-15	NE LANTAU	3	1.17	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NE LANTAU	2	10.35	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NE LANTAU	3	7.00	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NE LANTAU	2	6.55	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NE LANTAU	3	3.90	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NW LANTAU	2	10.38	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NW LANTAU	3	26.22	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NW LANTAU	4	3.10	WINTER	STANDARD31516	HKLR	P
27-Jan-15	NW LANTAU	2	7.53	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NW LANTAU	3	4.15	WINTER	STANDARD31516	HKLR	S
27-Jan-15	NW LANTAU	4	0.80	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NW LANTAU	1	1.41	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NW LANTAU	2	15.47	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NW LANTAU	3	13.03	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NW LANTAU	1	2.34	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NW LANTAU	2	4.25	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NW LANTAU	3	0.60	WINTER	STANDARD31516	HKLR	S
29-Jan-15	NE LANTAU	1	4.67	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NE LANTAU	2	15.57	WINTER	STANDARD31516	HKLR	P
29-Jan-15	NE LANTAU	2	10.56	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NE LANTAU	2	11.79	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NE LANTAU	3	8.03	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NE LANTAU	1	0.20	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NE LANTAU	2	7.00	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NE LANTAU	3	3.88	WINTER	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
5-Feb-15	NW LANTAU	2	11.86	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NW LANTAU	3	19.78	WINTER	STANDARD31516	HKLR	P
5-Feb-15	NW LANTAU	2	3.96	WINTER	STANDARD31516	HKLR	S
5-Feb-15	NW LANTAU	3	4.10	WINTER	STANDARD31516	HKLR	S
13-Feb-15	NW LANTAU	1	10.31	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NW LANTAU	2	24.74	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NW LANTAU	3	4.98	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NW LANTAU	1	4.92	WINTER	STANDARD31516	HKLR	S
13-Feb-15	NW LANTAU	2	8.01	WINTER	STANDARD31516	HKLR	S
13-Feb-15	NE LANTAU	2	16.97	WINTER	STANDARD31516	HKLR	P
13-Feb-15	NE LANTAU	2	9.83	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NE LANTAU	2	17.07	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NE LANTAU	1	2.87	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NE LANTAU	2	7.61	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NW LANTAU	1	0.90	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NW LANTAU	2	36.33	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NW LANTAU	3	2.60	WINTER	STANDARD31516	HKLR	P
16-Feb-15	NW LANTAU	2	10.57	WINTER	STANDARD31516	HKLR	S
16-Feb-15	NW LANTAU	3	2.60	WINTER	STANDARD31516	HKLR	S
25-Feb-15	NW LANTAU	2	9.92	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NW LANTAU	3	19.49	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NW LANTAU	2	3.49	WINTER	STANDARD31516	HKLR	S
25-Feb-15	NW LANTAU	3	4.30	WINTER	STANDARD31516	HKLR	S
25-Feb-15	NE LANTAU	1	1.24	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NE LANTAU	2	16.34	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NE LANTAU	3	1.96	WINTER	STANDARD31516	HKLR	P
25-Feb-15	NE LANTAU	2	10.36	WINTER	STANDARD31516	HKLR	S
4-Mar-15	NW LANTAU	1	1.07	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	2	12.71	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	3	25.62	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	4	1.40	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NW LANTAU	2	8.00	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NW LANTAU	3	3.30	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NW LANTAU	4	1.00	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NE LANTAU	2	5.38	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NE LANTAU	3	12.87	SPRING	STANDARD31516	HKLR	P
4-Mar-15	NE LANTAU	2	3.40	SPRING	STANDARD31516	HKLR	S
4-Mar-15	NE LANTAU	3	5.39	SPRING	STANDARD31516	HKLR	S
11-Mar-15	NW LANTAU	2	25.99	SPRING	STANDARD31516	HKLR	P
11-Mar-15	NW LANTAU	3	5.09	SPRING	STANDARD31516	HKLR	P
11-Mar-15	NW LANTAU	2	7.53	SPRING	STANDARD31516	HKLR	S
11-Mar-15	NE LANTAU	2	20.05	SPRING	STANDARD31516	HKLR	P
11-Mar-15	NE LANTAU	2	10.95	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NW LANTAU	2	3.26	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NW LANTAU	3	36.14	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NW LANTAU	4	0.80	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NW LANTAU	2	2.20	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NW LANTAU	3	10.40	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NE LANTAU	2	14.63	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NE LANTAU	3	1.97	SPRING	STANDARD31516	HKLR	P
17-Mar-15	NE LANTAU	1	1.94	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NE LANTAU	2	7.69	SPRING	STANDARD31516	HKLR	S
17-Mar-15	NE LANTAU	3	0.68	SPRING	STANDARD31516	HKLR	S
26-Mar-15	NW LANTAU	1	20.26	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
26-Mar-15	NW LANTAU	2	10.63	SPRING	STANDARD31516	HKLR	P
26-Mar-15	NW LANTAU	2	6.76	SPRING	STANDARD31516	HKLR	S
26-Mar-15	NE LANTAU	1	11.38	SPRING	STANDARD31516	HKLR	P
26-Mar-15	NE LANTAU	2	8.40	SPRING	STANDARD31516	HKLR	P
26-Mar-15	NE LANTAU	1	4.32	SPRING	STANDARD31516	HKLR	S
26-Mar-15	NE LANTAU	2	6.20	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NE LANTAU	2	14.22	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NE LANTAU	3	5.10	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NE LANTAU	1	0.50	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NE LANTAU	2	9.09	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NE LANTAU	3	0.99	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NW LANTAU	2	4.96	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NW LANTAU	3	25.95	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NW LANTAU	4	0.84	SPRING	STANDARD31516	HKLR	P
8-Apr-15	NW LANTAU	2	2.29	SPRING	STANDARD31516	HKLR	S
8-Apr-15	NW LANTAU	3	5.26	SPRING	STANDARD31516	HKLR	S
10-Apr-15	NW LANTAU	2	14.40	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NW LANTAU	3	26.10	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NW LANTAU	2	9.40	SPRING	STANDARD31516	HKLR	S
10-Apr-15	NW LANTAU	3	4.20	SPRING	STANDARD31516	HKLR	S
10-Apr-15	NE LANTAU	2	15.44	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NE LANTAU	3	1.30	SPRING	STANDARD31516	HKLR	P
10-Apr-15	NE LANTAU	2	10.06	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NW LANTAU	2	4.84	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NW LANTAU	3	29.76	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NW LANTAU	4	5.80	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NW LANTAU	2	0.30	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NW LANTAU	3	7.60	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NW LANTAU	4	4.80	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NE LANTAU	2	3.60	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NE LANTAU	3	11.51	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NE LANTAU	4	2.21	SPRING	STANDARD31516	HKLR	P
17-Apr-15	NE LANTAU	2	4.41	SPRING	STANDARD31516	HKLR	S
17-Apr-15	NE LANTAU	3	5.07	SPRING	STANDARD31516	HKLR	S
22-Apr-15	NE LANTAU	2	20.00	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NE LANTAU	2	10.90	SPRING	STANDARD31516	HKLR	S
22-Apr-15	NW LANTAU	1	3.24	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NW LANTAU	2	25.27	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NW LANTAU	3	3.37	SPRING	STANDARD31516	HKLR	P
22-Apr-15	NW LANTAU	2	7.07	SPRING	STANDARD31516	HKLR	S
22-Apr-15	NW LANTAU	3	0.85	SPRING	STANDARD31516	HKLR	S
4-May-15	NW LANTAU	2	18.60	SPRING	STANDARD31516	HKLR	P
4-May-15	NW LANTAU	3	13.60	SPRING	STANDARD31516	HKLR	P
4-May-15	NW LANTAU	2	2.30	SPRING	STANDARD31516	HKLR	S
4-May-15	NW LANTAU	3	4.80	SPRING	STANDARD31516	HKLR	S
4-May-15	NE LANTAU	1	3.54	SPRING	STANDARD31516	HKLR	P
4-May-15	NE LANTAU	2	10.73	SPRING	STANDARD31516	HKLR	P
4-May-15	NE LANTAU	3	5.40	SPRING	STANDARD31516	HKLR	P
4-May-15	NE LANTAU	2	8.13	SPRING	STANDARD31516	HKLR	S
4-May-15	NE LANTAU	3	2.70	SPRING	STANDARD31516	HKLR	S
8-May-15	NW LANTAU	2	7.57	SPRING	STANDARD31516	HKLR	P
8-May-15	NW LANTAU	3	33.53	SPRING	STANDARD31516	HKLR	P
8-May-15	NW LANTAU	2	2.30	SPRING	STANDARD31516	HKLR	S
8-May-15	NW LANTAU	3	11.20	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
8-May-15	NE LANTAU	2	4.55	SPRING	STANDARD31516	HKLR	P
8-May-15	NE LANTAU	3	12.74	SPRING	STANDARD31516	HKLR	P
8-May-15	NE LANTAU	2	6.25	SPRING	STANDARD31516	HKLR	S
8-May-15	NE LANTAU	3	3.66	SPRING	STANDARD31516	HKLR	S
14-May-15	NE LANTAU	2	12.61	SPRING	STANDARD31516	HKLR	P
14-May-15	NE LANTAU	3	4.43	SPRING	STANDARD31516	HKLR	P
14-May-15	NE LANTAU	2	9.96	SPRING	STANDARD31516	HKLR	S
14-May-15	NW LANTAU	2	5.56	SPRING	STANDARD31516	HKLR	P
14-May-15	NW LANTAU	3	34.27	SPRING	STANDARD31516	HKLR	P
14-May-15	NW LANTAU	4	0.60	SPRING	STANDARD31516	HKLR	P
14-May-15	NW LANTAU	2	8.17	SPRING	STANDARD31516	HKLR	S
14-May-15	NW LANTAU	3	4.80	SPRING	STANDARD31516	HKLR	S
18-May-15	NW LANTAU	2	5.11	SPRING	STANDARD31516	HKLR	P
18-May-15	NW LANTAU	3	24.12	SPRING	STANDARD31516	HKLR	P
18-May-15	NW LANTAU	4	3.37	SPRING	STANDARD31516	HKLR	P
18-May-15	NW LANTAU	2	2.20	SPRING	STANDARD31516	HKLR	S
18-May-15	NW LANTAU	3	4.70	SPRING	STANDARD31516	HKLR	S
18-May-15	NE LANTAU	2	15.13	SPRING	STANDARD31516	HKLR	P
18-May-15	NE LANTAU	3	4.30	SPRING	STANDARD31516	HKLR	P
18-May-15	NE LANTAU	2	10.77	SPRING	STANDARD31516	HKLR	S
2-Jun-15	NW LANTAU	2	10.00	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NW LANTAU	3	30.49	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NW LANTAU	2	7.70	SUMMER	STANDARD31516	HKLR	S
2-Jun-15	NW LANTAU	3	5.61	SUMMER	STANDARD31516	HKLR	S
2-Jun-15	NE LANTAU	2	6.93	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NE LANTAU	3	10.05	SUMMER	STANDARD31516	HKLR	P
2-Jun-15	NE LANTAU	2	9.12	SUMMER	STANDARD31516	HKLR	S
2-Jun-15	NE LANTAU	3	0.80	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NE LANTAU	2	17.06	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NE LANTAU	3	3.30	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NE LANTAU	2	9.14	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NE LANTAU	3	1.30	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NW LANTAU	2	8.02	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NW LANTAU	3	17.50	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NW LANTAU	4	5.86	SUMMER	STANDARD31516	HKLR	P
10-Jun-15	NW LANTAU	2	3.48	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NW LANTAU	3	1.65	SUMMER	STANDARD31516	HKLR	S
10-Jun-15	NW LANTAU	4	2.39	SUMMER	STANDARD31516	HKLR	S
24-Jun-15	NW LANTAU	2	12.10	SUMMER	STANDARD31516	HKLR	P
24-Jun-15	NW LANTAU	3	19.70	SUMMER	STANDARD31516	HKLR	P
24-Jun-15	NW LANTAU	2	4.80	SUMMER	STANDARD31516	HKLR	S
24-Jun-15	NW LANTAU	3	2.40	SUMMER	STANDARD31516	HKLR	S
24-Jun-15	NE LANTAU	2	20.32	SUMMER	STANDARD31516	HKLR	P
24-Jun-15	NE LANTAU	2	10.68	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NW LANTAU	3	30.27	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NW LANTAU	4	10.98	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NW LANTAU	3	6.40	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NW LANTAU	4	6.05	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NE LANTAU	2	14.33	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NE LANTAU	3	3.16	SUMMER	STANDARD31516	HKLR	P
26-Jun-15	NE LANTAU	2	6.53	SUMMER	STANDARD31516	HKLR	S
26-Jun-15	NE LANTAU	3	3.18	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NW LANTAU	2	1.80	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NW LANTAU	3	29.96	SUMMER	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
2-Jul-15	NW LANTAU	4	6.90	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NW LANTAU	5	2.30	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NW LANTAU	3	6.30	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NW LANTAU	4	6.26	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NE LANTAU	2	14.61	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NE LANTAU	3	2.80	SUMMER	STANDARD31516	HKLR	P
2-Jul-15	NE LANTAU	2	6.35	SUMMER	STANDARD31516	HKLR	S
2-Jul-15	NE LANTAU	3	3.44	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NE LANTAU	2	15.85	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NE LANTAU	3	4.59	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NE LANTAU	2	6.60	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NE LANTAU	3	4.36	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NW LANTAU	3	27.41	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NW LANTAU	4	4.20	SUMMER	STANDARD31516	HKLR	P
7-Jul-15	NW LANTAU	3	5.89	SUMMER	STANDARD31516	HKLR	S
7-Jul-15	NW LANTAU	4	1.90	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NW LANTAU	2	17.06	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NW LANTAU	3	14.40	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NW LANTAU	2	4.32	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NW LANTAU	3	2.62	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NE LANTAU	2	14.48	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NE LANTAU	3	5.54	SUMMER	STANDARD31516	HKLR	P
22-Jul-15	NE LANTAU	2	8.78	SUMMER	STANDARD31516	HKLR	S
22-Jul-15	NE LANTAU	3	2.00	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NW LANTAU	2	1.68	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NW LANTAU	3	24.69	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NW LANTAU	4	14.63	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NW LANTAU	2	2.10	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NW LANTAU	3	8.60	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NW LANTAU	4	2.50	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NE LANTAU	2	8.93	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NE LANTAU	3	7.93	SUMMER	STANDARD31516	HKLR	P
27-Jul-15	NE LANTAU	2	7.74	SUMMER	STANDARD31516	HKLR	S
27-Jul-15	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NW LANTAU	2	19.11	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NW LANTAU	3	21.29	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NW LANTAU	2	7.50	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NW LANTAU	3	5.90	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NE LANTAU	2	11.97	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NE LANTAU	3	4.50	SUMMER	STANDARD31516	HKLR	P
10-Aug-15	NE LANTAU	2	8.13	SUMMER	STANDARD31516	HKLR	S
10-Aug-15	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NW LANTAU	1	3.92	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NW LANTAU	2	20.74	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NW LANTAU	3	7.02	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NW LANTAU	2	3.00	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NW LANTAU	3	4.52	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NE LANTAU	2	18.24	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NE LANTAU	3	1.90	SUMMER	STANDARD31516	HKLR	P
14-Aug-15	NE LANTAU	2	8.36	SUMMER	STANDARD31516	HKLR	S
14-Aug-15	NE LANTAU	3	2.10	SUMMER	STANDARD31516	HKLR	S
19-Aug-15	NW LANTAU	2	26.22	SUMMER	STANDARD31516	HKLR	P
19-Aug-15	NW LANTAU	3	12.61	SUMMER	STANDARD31516	HKLR	P
19-Aug-15	NW LANTAU	2	8.42	SUMMER	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
19-Aug-15	NW LANTAU	3	4.39	SUMMER	STANDARD31516	HKLR	S
19-Aug-15	NE LANTAU	2	16.55	SUMMER	STANDARD31516	HKLR	P
19-Aug-15	NE LANTAU	2	9.95	SUMMER	STANDARD31516	HKLR	S
28-Aug-15	NE LANTAU	1	1.65	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NE LANTAU	2	17.34	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NE LANTAU	1	3.09	SUMMER	STANDARD31516	HKLR	S
28-Aug-15	NE LANTAU	2	7.70	SUMMER	STANDARD31516	HKLR	S
28-Aug-15	NW LANTAU	2	16.74	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NW LANTAU	3	14.81	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NW LANTAU	4	1.30	SUMMER	STANDARD31516	HKLR	P
28-Aug-15	NW LANTAU	2	6.65	SUMMER	STANDARD31516	HKLR	S
2-Sep-15	NW LANTAU	2	1.92	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NW LANTAU	3	30.24	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NW LANTAU	3	6.89	AUTUMN	STANDARD31516	HKLR	S
2-Sep-15	NE LANTAU	2	11.59	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NE LANTAU	3	7.98	AUTUMN	STANDARD31516	HKLR	P
2-Sep-15	NE LANTAU	2	8.83	AUTUMN	STANDARD31516	HKLR	S
2-Sep-15	NE LANTAU	3	2.00	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NW LANTAU	2	30.26	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NW LANTAU	3	10.73	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NW LANTAU	2	4.41	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NW LANTAU	3	8.40	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NE LANTAU	2	7.75	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NE LANTAU	3	8.95	AUTUMN	STANDARD31516	HKLR	P
11-Sep-15	NE LANTAU	2	7.97	AUTUMN	STANDARD31516	HKLR	S
11-Sep-15	NE LANTAU	3	2.11	AUTUMN	STANDARD31516	HKLR	S
17-Sep-15	NE LANTAU	2	9.43	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NE LANTAU	3	10.80	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NE LANTAU	2	5.51	AUTUMN	STANDARD31516	HKLR	S
17-Sep-15	NE LANTAU	3	5.22	AUTUMN	STANDARD31516	HKLR	S
17-Sep-15	NW LANTAU	2	4.70	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NW LANTAU	3	28.06	AUTUMN	STANDARD31516	HKLR	P
17-Sep-15	NW LANTAU	3	7.34	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NE LANTAU	2	3.00	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NE LANTAU	3	12.12	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NE LANTAU	4	1.90	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NE LANTAU	2	3.06	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NE LANTAU	3	6.02	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NE LANTAU	4	1.10	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NW LANTAU	2	25.66	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NW LANTAU	3	16.42	AUTUMN	STANDARD31516	HKLR	P
29-Sep-15	NW LANTAU	2	1.60	AUTUMN	STANDARD31516	HKLR	S
29-Sep-15	NW LANTAU	3	11.49	AUTUMN	STANDARD31516	HKLR	S
6-Oct-15	NW LANTAU	2	10.62	AUTUMN	STANDARD31516	HKLR	P
6-Oct-15	NW LANTAU	3	18.78	AUTUMN	STANDARD31516	HKLR	P
6-Oct-15	NW LANTAU	2	0.59	AUTUMN	STANDARD31516	HKLR	S
6-Oct-15	NW LANTAU	3	7.02	AUTUMN	STANDARD31516	HKLR	S
6-Oct-15	NE LANTAU	2	20.01	AUTUMN	STANDARD31516	HKLR	P
6-Oct-15	NE LANTAU	3	10.79	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NW LANTAU	2	23.12	AUTUMN	STANDARD31516	HKLR	P
13-Oct-15	NW LANTAU	3	15.72	AUTUMN	STANDARD31516	HKLR	P
13-Oct-15	NW LANTAU	2	8.61	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NW LANTAU	3	4.20	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NE LANTAU	2	7.15	AUTUMN	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
13-Oct-15	NE LANTAU	3	9.80	AUTUMN	STANDARD31516	HKLR	P
13-Oct-15	NE LANTAU	2	4.56	AUTUMN	STANDARD31516	HKLR	S
13-Oct-15	NE LANTAU	3	5.59	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NE LANTAU	2	14.52	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NE LANTAU	3	2.90	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NE LANTAU	1	2.10	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NE LANTAU	2	7.68	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NW LANTAU	2	14.07	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NW LANTAU	3	27.17	AUTUMN	STANDARD31516	HKLR	P
19-Oct-15	NW LANTAU	2	6.61	AUTUMN	STANDARD31516	HKLR	S
19-Oct-15	NW LANTAU	3	6.25	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NE LANTAU	2	10.41	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NE LANTAU	3	10.00	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NE LANTAU	2	8.99	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NE LANTAU	3	1.60	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NW LANTAU	2	1.22	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NW LANTAU	3	30.67	AUTUMN	STANDARD31516	HKLR	P
26-Oct-15	NW LANTAU	2	0.10	AUTUMN	STANDARD31516	HKLR	S
26-Oct-15	NW LANTAU	3	7.51	AUTUMN	STANDARD31516	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (November 2014 - October 2015)

(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
04-Nov-14	1	1435	13	NW LANTAU	1	73	ON	HKLR	827747	806468	AUTUMN	NONE	P
04-Nov-14	2	1539	1	NW LANTAU	2	0	ON	HKLR	827839	804666	AUTUMN	NONE	P
04-Nov-14	3	1558	2	NW LANTAU	2	118	ON	HKLR	825757	804662	AUTUMN	NONE	P
12-Nov-14	1	1050	4	NW LANTAU	3	105	ON	HKLR	826686	805385	AUTUMN	NONE	P
18-Nov-14	1	1255	2	NW LANTAU	2	334	ON	HKLR	827669	806479	AUTUMN	NONE	P
18-Nov-14	2	1307	7	NW LANTAU	3	ND	OFF	HKLR	827559	806149	AUTUMN	NONE	
02-Dec-14	1	1428	1	NW LANTAU	3	207	ON	HKLR	826916	806457	WINTER	NONE	P
09-Dec-14	1	1315	3	NW LANTAU	2	280	ON	HKLR	824445	807513	WINTER	NONE	P
23-Dec-14	1	1335	1	NW LANTAU	3	151	ON	HKLR	827424	807518	WINTER	NONE	P
08-Jan-15	1	1355	1	NW LANTAU	2	148	ON	HKLR	830029	806123	WINTER	NONE	S
08-Jan-15	2	1421	8	NW LANTAU	3	556	ON	HKLR	827716	805449	WINTER	NONE	P
15-Jan-15	1	1132	2	NW LANTAU	3	189	ON	HKLR	830762	804693	WINTER	NONE	P
15-Jan-15	2	1143	5	NW LANTAU	3	24	ON	HKLR	831349	804705	WINTER	NONE	P
15-Jan-15	3	1156	3	NW LANTAU	3	464	ON	HKLR	830673	805331	WINTER	NONE	S
27-Jan-15	1	1409	2	NW LANTAU	3	163	ON	HKLR	825753	806454	WINTER	NONE	S
27-Jan-15	2	1442	3	NW LANTAU	3	410	ON	HKLR	830429	805475	WINTER	NONE	P
29-Jan-15	1	1104	4	NW LANTAU	3	63	ON	HKLR	824825	805464	WINTER	NONE	P
29-Jan-15	2	1128	6	NW LANTAU	2	143	ON	HKLR	826287	805456	WINTER	NONE	P
29-Jan-15	3	1150	7	NW LANTAU	2	343	ON	HKLR	827483	805469	WINTER	NONE	P
29-Jan-15	4	1208	5	NW LANTAU	2	143	ON	HKLR	829122	805472	WINTER	NONE	P
13-Feb-15	1	1344	1	NW LANTAU	2	103	ON	HKLR	821649	810495	WINTER	NONE	P
04-Mar-15	1	1009	1	NW LANTAU	2	ND	OFF	HKLR	815213	805485	SPRING	NONE	
11-Mar-15	1	1347	1	NW LANTAU	2	ND	OFF	HKLR	829495	806976	SPRING	NONE	
11-Mar-15	2	1519	7	NW LANTAU	2	258	ON	HKLR	818956	805421	SPRING	NONE	P
26-Mar-15	1	1201	3	NW LANTAU	2	21	ON	HKLR	820290	808597	SPRING	NONE	S
08-Apr-15	1	1309	3	NW LANTAU	3	142	ON	HKLR	823791	807532	SPRING	NONE	P
10-Apr-15	1	1103	2	NW LANTAU	2	ND	OFF	HKLR	828359	804688	SPRING	NONE	
22-Apr-15	1	1432	8	NW LANTAU	2	354	ON	HKLR	830139	806113	SPRING	NONE	S
02-Jun-15	1	1110	10	NW LANTAU	3	88	ON	HKLR	827673	804687	SUMMER	NONE	P
26-Jun-15	1	1210	4	NW LANTAU	4	357	ON	HKLR	826650	806456	SUMMER	NONE	P
26-Jun-15	2	1610	1	NE LANTAU	2	0	ON	HKLR	822224	818562	SUMMER	NONE	P
02-Jul-15	1	1051	2	NW LANTAU	3	158	ON	HKLR	823542	804688	SUMMER	NONE	P

Appendix 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
22-Jul-15	1	1055	3	NW LANTAU	3	153	ON	HKLR	827217	805458	SUMMER	NONE	P
22-Jul-15	2	1140	1	NW LANTAU	3	147	ON	HKLR	827280	807549	SUMMER	NONE	P
19-Aug-15	1	1019	1	NW LANTAU	2	45	ON	HKLR	814805	804681	SUMMER	NONE	P
19-Aug-15	2	1031	4	NW LANTAU	2	502	ON	HKLR	816101	804673	SUMMER	NONE	P
19-Aug-15	3	1036	1	NW LANTAU	2	285	ON	HKLR	817097	804675	SUMMER	NONE	P
19-Aug-15	4	1125	5	NW LANTAU	2	733	ON	HKLR	827218	805036	SUMMER	NONE	P
19-Aug-15	5	1221	5	NW LANTAU	2	98	ON	HKLR	827182	806436	SUMMER	NONE	P
28-Aug-15	1	1417	5	NW LANTAU	3	344	ON	HKLR	826693	807538	SUMMER	NONE	P
02-Sep-15	1	1045	8	NW LANTAU	3	629	ON	HKLR	823950	805482	AUTUMN	NONE	P
02-Sep-15	2	1122	12	NW LANTAU	2	240	ON	HKLR	826365	805436	AUTUMN	NONE	P
02-Sep-15	3	1143	12	NW LANTAU	2	75	ON	HKLR	826741	805344	AUTUMN	NONE	P
11-Sep-15	1	1155	6	NW LANTAU	2	349	ON	HKLR	828788	806460	AUTUMN	NONE	P
17-Sep-15	1	1411	7	NW LANTAU	3	134	ON	HKLR	828867	805462	AUTUMN	PURSE-SEINE	P
29-Sep-15	1	1445	5	NW LANTAU	2	430	ON	HKLR	827625	806489	AUTUMN	NONE	P
29-Sep-15	2	1512	4	NW LANTAU	2	281	ON	HKLR	828090	806500	AUTUMN	NONE	P
06-Oct-15	1	1113	2	NW LANTAU	2	72	ON	HKLR	827029	805334	AUTUMN	NONE	P
13-Oct-15	1	1025	2	NW LANTAU	3	195	ON	HKLR	817031	804665	AUTUMN	NONE	P
13-Oct-15	2	1036	3	NW LANTAU	3	102	ON	HKLR	817020	804675	AUTUMN	NONE	P
13-Oct-15	3	1123	10	NW LANTAU	2	745	ON	HKLR	825923	804673	AUTUMN	NONE	P
19-Oct-15	1	1407	2	NW LANTAU	3	14	ON	HKLR	826473	806476	AUTUMN	NONE	P
26-Oct-15	1	1326	6	NW LANTAU	3	73	ON	HKLR	823681	807511	AUTUMN	NONE	P
26-Oct-15	2	1444	2	NW LANTAU	2	107	ON	HKLR	827007	805303	AUTUMN	NONE	S

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in November 2014-October 2015

ID#	DATE	STG#	AREA
CH34	18/11/14	2	NW LANTAU
	15/01/15	1	NW LANTAU
	15/01/15	2	NW LANTAU
	29/01/15	4	NW LANTAU
	11/03/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	28/08/15	1	NW LANTAU
	29/09/15	1	NW LANTAU
	19/10/15	1	NW LANTAU
CH84	02/09/15	3	NW LANTAU
NL33	13/10/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL37	02/06/15	1	NW LANTAU
NL46	04/11/14	1	NW LANTAU
	19/08/15	4	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
NL48	04/11/14	1	NW LANTAU
	18/11/14	2	NW LANTAU
	23/12/14	1	NW LANTAU
	15/01/15	3	NW LANTAU
	02/06/15	1	NW LANTAU
	02/09/15	1	NW LANTAU
	11/09/15	1	NW LANTAU
	17/09/15	1	NW LANTAU
NL49	11/03/15	2	NW LANTAU
NL80	02/09/15	2	NW LANTAU
NL98	15/01/15	2	NW LANTAU
NL103	29/01/15	2	NW LANTAU
NL104	04/11/14	1	NW LANTAU
	08/01/15	2	NW LANTAU
	22/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	19/08/15	4	NW LANTAU
	28/08/15	1	NW LANTAU
	13/10/15	3	NW LANTAU
NL123	08/01/15	2	NW LANTAU
	11/03/15	2	NW LANTAU
	17/09/15	1	NW LANTAU

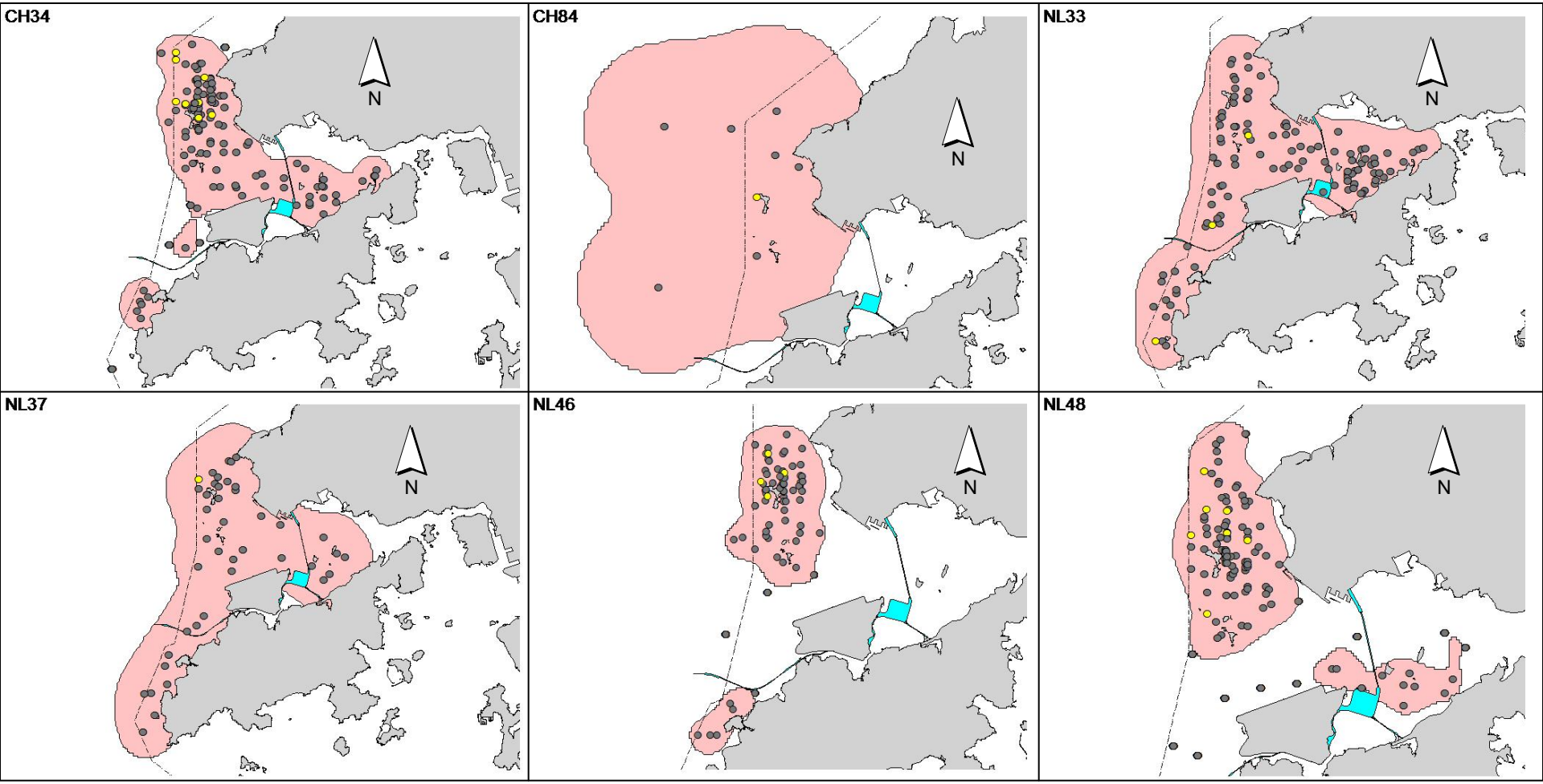
ID#	DATE	STG#	AREA
NL136	02/12/14	1	NW LANTAU
	11/03/15	2	NW LANTAU
	08/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	28/08/15	1	NW LANTAU
	29/09/15	1	NW LANTAU
NL145	08/01/15	2	NW LANTAU
	29/01/15	2	NW LANTAU
NL150	02/09/15	2	NW LANTAU
NL153	22/04/15	1	NW LANTAU
	19/08/15	5	NW LANTAU
NL165	11/03/15	2	NW LANTAU
	02/09/15	1	NW LANTAU
NL182	18/11/14	2	NW LANTAU
	15/01/15	1	NW LANTAU
	15/01/15	2	NW LANTAU
	02/06/15	1	NW LANTAU
	17/09/15	1	NW LANTAU
NL202	12/11/14	1	NW LANTAU
	18/11/14	1	NW LANTAU
	18/11/14	2	NW LANTAU
	08/01/15	2	NW LANTAU
	22/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	26/06/15	1	NW LANTAU
	19/08/15	5	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
	29/09/15	2	NW LANTAU
	13/10/15	3	NW LANTAU
	26/10/15	2	NW LANTAU
NL203	02/09/15	3	NW LANTAU
NL210	12/11/14	1	NW LANTAU
	29/01/15	2	NW LANTAU
	02/09/15	2	NW LANTAU
	13/10/15	3	NW LANTAU
NL213	26/06/15	1	NW LANTAU
NL214	09/12/14	1	NW LANTAU
	28/08/15	1	NW LANTAU
	13/10/15	3	NW LANTAU

Appendix III. (cont'd)

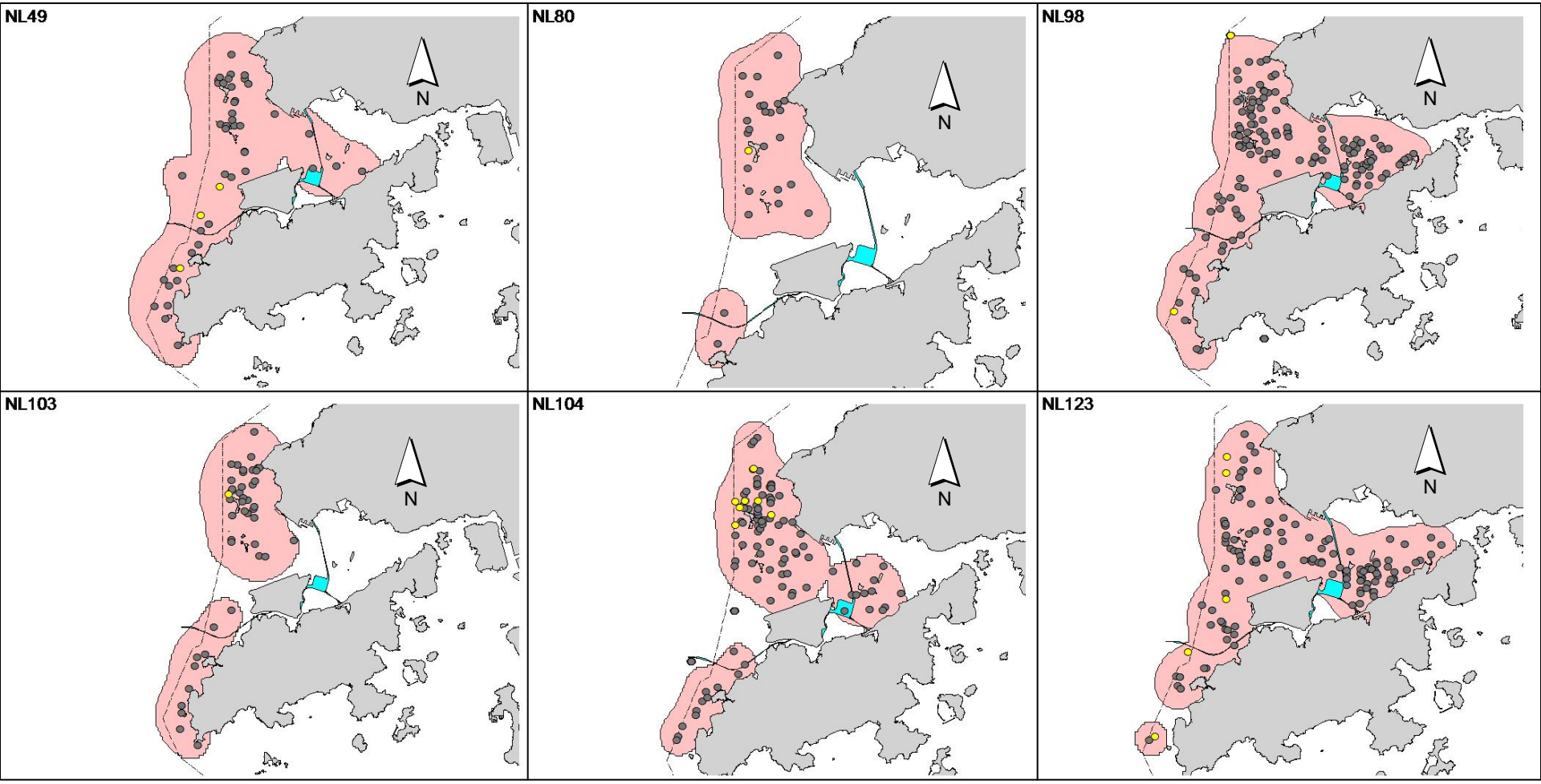
ID#	DATE	STG#	AREA
NL220	09/12/14	1	NW LANTAU
	28/08/15	1	NW LANTAU
	19/10/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL233	22/07/15	1	NW LANTAU
	02/09/15	2	NW LANTAU
NL236	22/04/15	1	NW LANTAU
NL256	04/11/14	1	NW LANTAU
NL259	04/11/14	1	NW LANTAU
	15/01/15	3	NW LANTAU
NL261	08/01/15	2	NW LANTAU
	26/03/15	1	NW LANTAU
	02/09/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL272	12/11/14	1	NW LANTAU
	26/03/15	1	NW LANTAU
	26/10/15	1	NW LANTAU
NL284	15/01/15	2	NW LANTAU
	29/01/15	2	NW LANTAU
	11/03/15	2	NW LANTAU
	26/03/15	1	NW LANTAU
	13/10/15	3	NW LANTAU
	26/10/15	1	NW LANTAU
NL285	08/01/15	2	NW LANTAU
	11/03/15	2	NW LANTAU
	02/09/15	1	NW LANTAU
	11/09/15	1	NW LANTAU
NL286	04/11/14	1	NW LANTAU
	18/11/14	1	NW LANTAU
	18/11/14	2	NW LANTAU
	08/01/15	2	NW LANTAU
	22/04/15	1	NW LANTAU
	02/06/15	1	NW LANTAU
	26/06/15	1	NW LANTAU
	19/08/15	5	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
	06/10/15	1	NW LANTAU
	13/10/15	3	NW LANTAU
	26/10/15	2	NW LANTAU
NL287	29/01/15	1	NW LANTAU

ID#	DATE	STG#	AREA
NL293	19/08/15	1	NW LANTAU
NL297	02/09/15	3	NW LANTAU
NL302	02/09/15	3	NW LANTAU
	11/09/15	1	NW LANTAU
NL306	29/01/15	1	NW LANTAU
	13/02/15	1	NW LANTAU
NL307	09/12/14	1	NW LANTAU
	29/01/15	1	NW LANTAU
	22/04/15	1	NW LANTAU
NL308	02/09/15	2	NW LANTAU
NL310	02/07/15	1	NW LANTAU
	19/08/15	4	NW LANTAU
NL319	26/06/15	1	NW LANTAU
	29/09/15	2	NW LANTAU
SL47	13/10/15	2	NW LANTAU
WL05	04/11/14	1	NW LANTAU
	04/11/14	3	NW LANTAU
	12/11/14	1	NW LANTAU
	02/06/15	1	NW LANTAU
	02/09/15	1	NW LANTAU
	29/09/15	2	NW LANTAU
WL17	27/01/15	1	NW LANTAU
	19/08/15	4	NW LANTAU
	02/09/15	2	NW LANTAU
	17/09/15	1	NW LANTAU
WL79	13/10/15	3	NW LANTAU
WL97	12/11/14	1	NW LANTAU
WL124	19/08/15	3	NW LANTAU
WL167	02/07/15	1	NW LANTAU
WL178	04/03/15	1	NW LANTAU
WL188	29/01/15	2	NW LANTAU
WL231	29/01/15	2	NW LANTAU
WL241	13/10/15	2	NW LANTAU
WL243	13/10/15	2	NW LANTAU

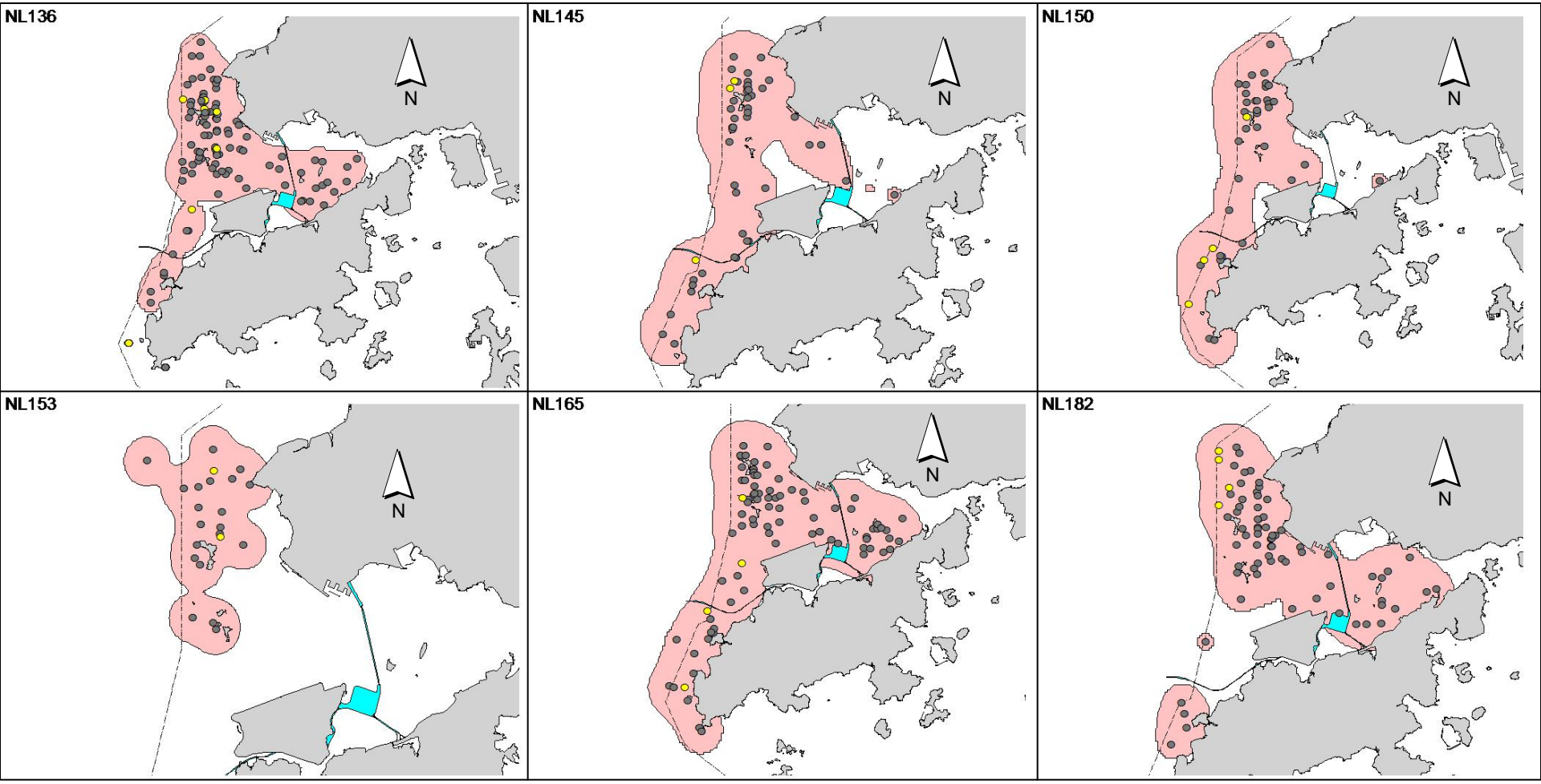
Appendix IV. Ranging patterns (95% kernel ranges) of 54 individual dolphins that were sighted during the first year of TMCLKL construction works, utilizing the HKLR03 and HKLR09 monitoring data
(note: yellow dots indicates sightings made in November 2014 to October 2015)



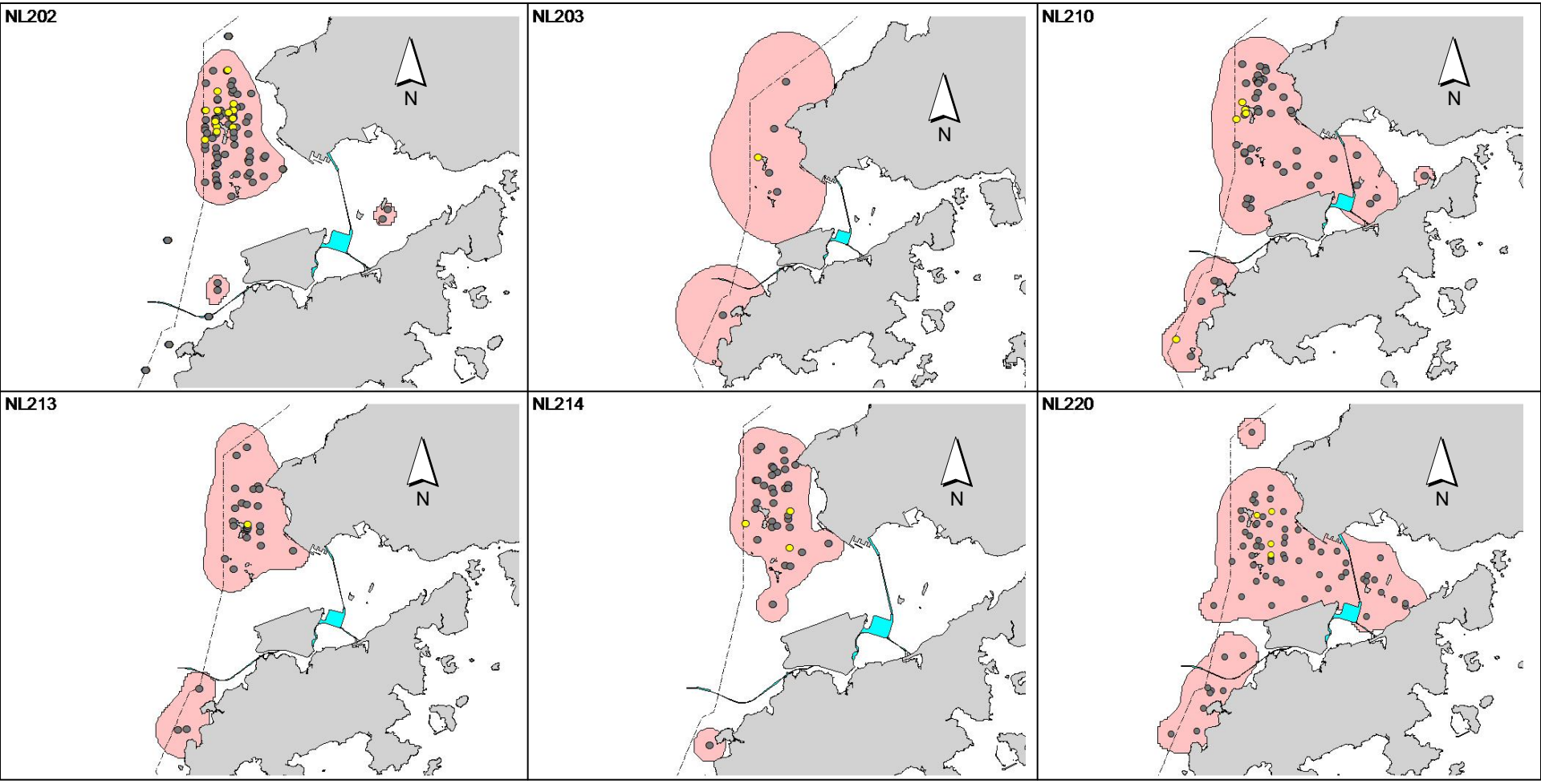
Appendix IV. (cont'd)



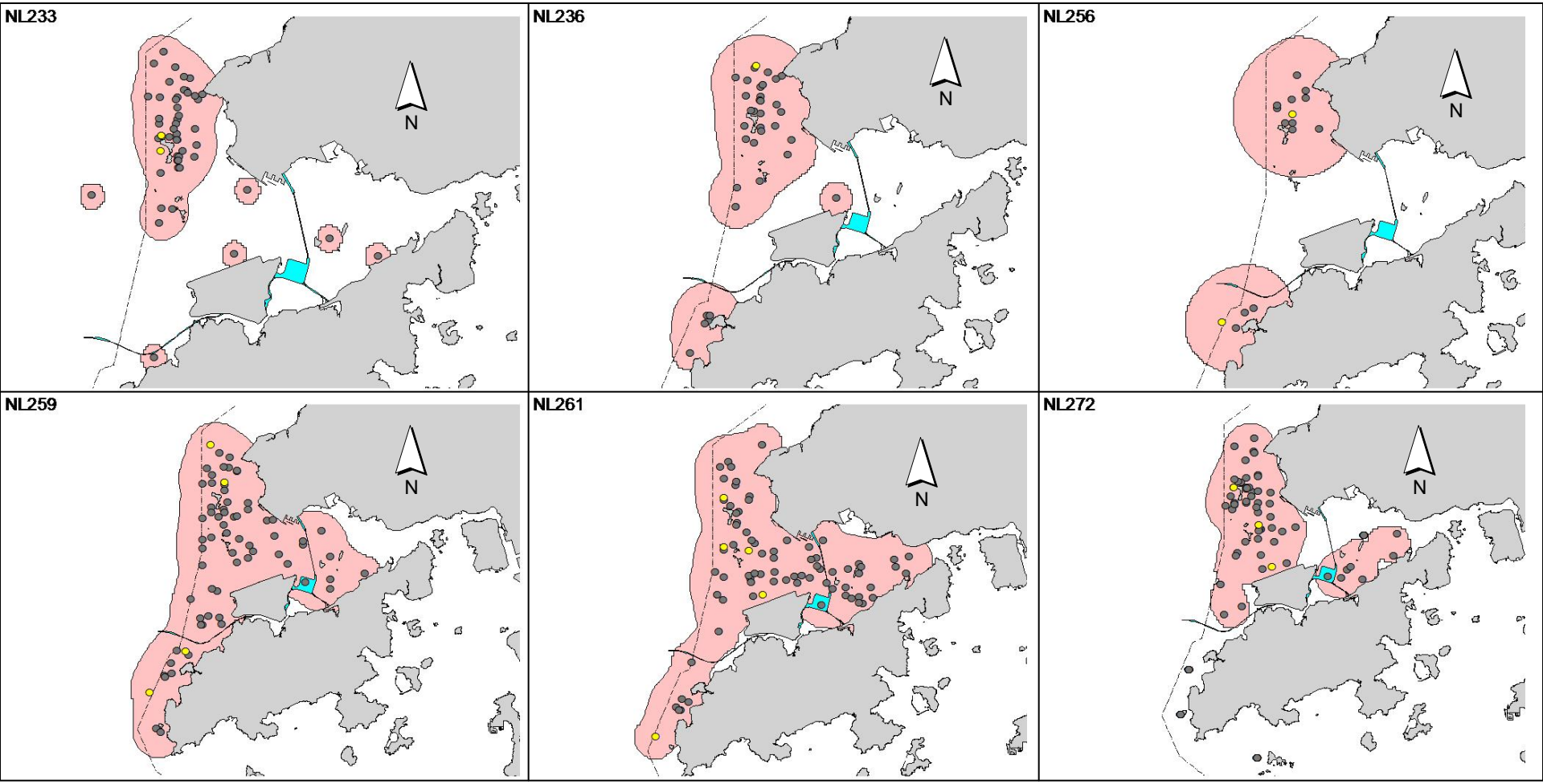
Appendix IV. (cont'd)



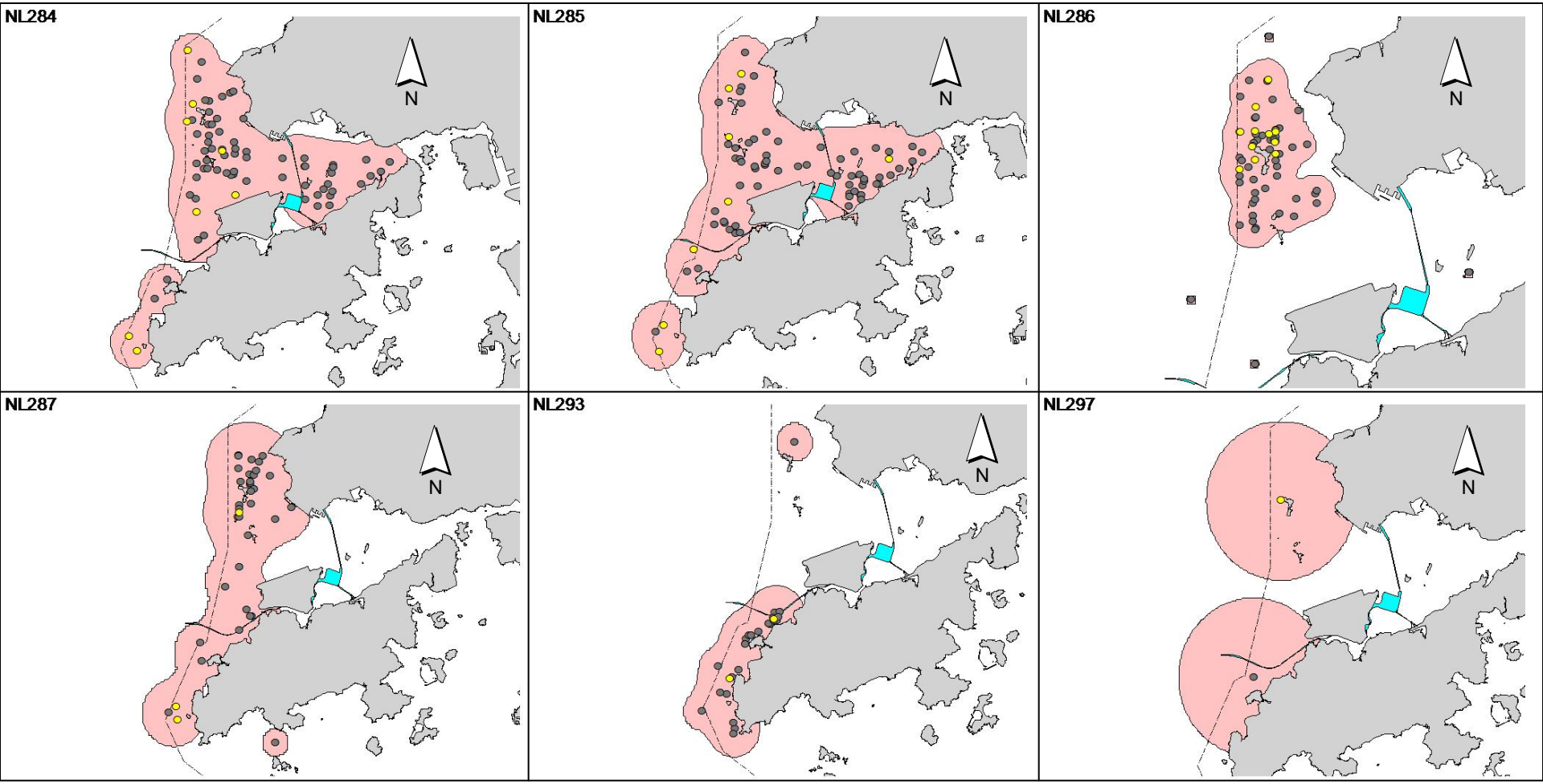
Appendix IV. (cont'd)



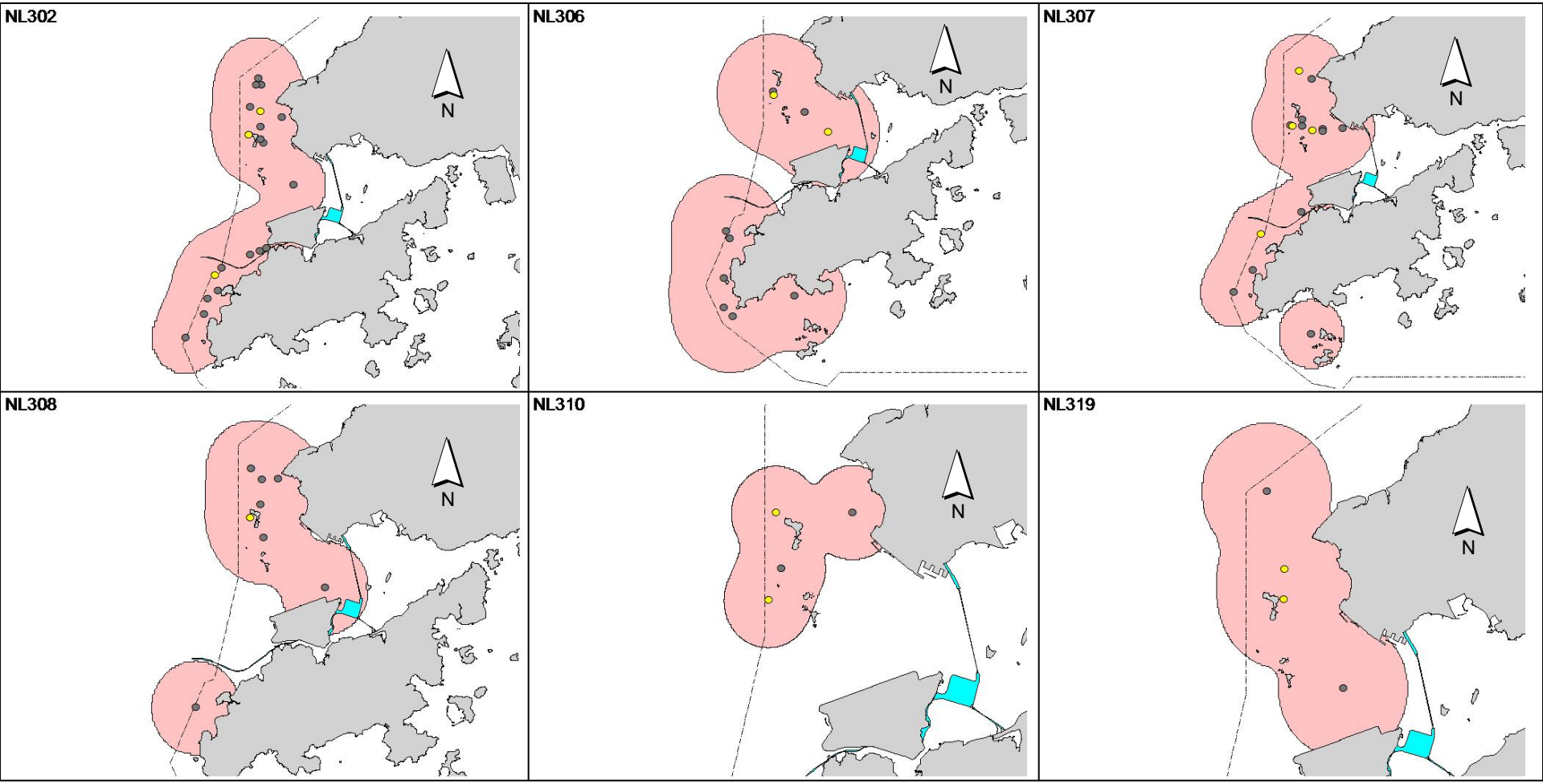
Appendix IV. (cont'd)



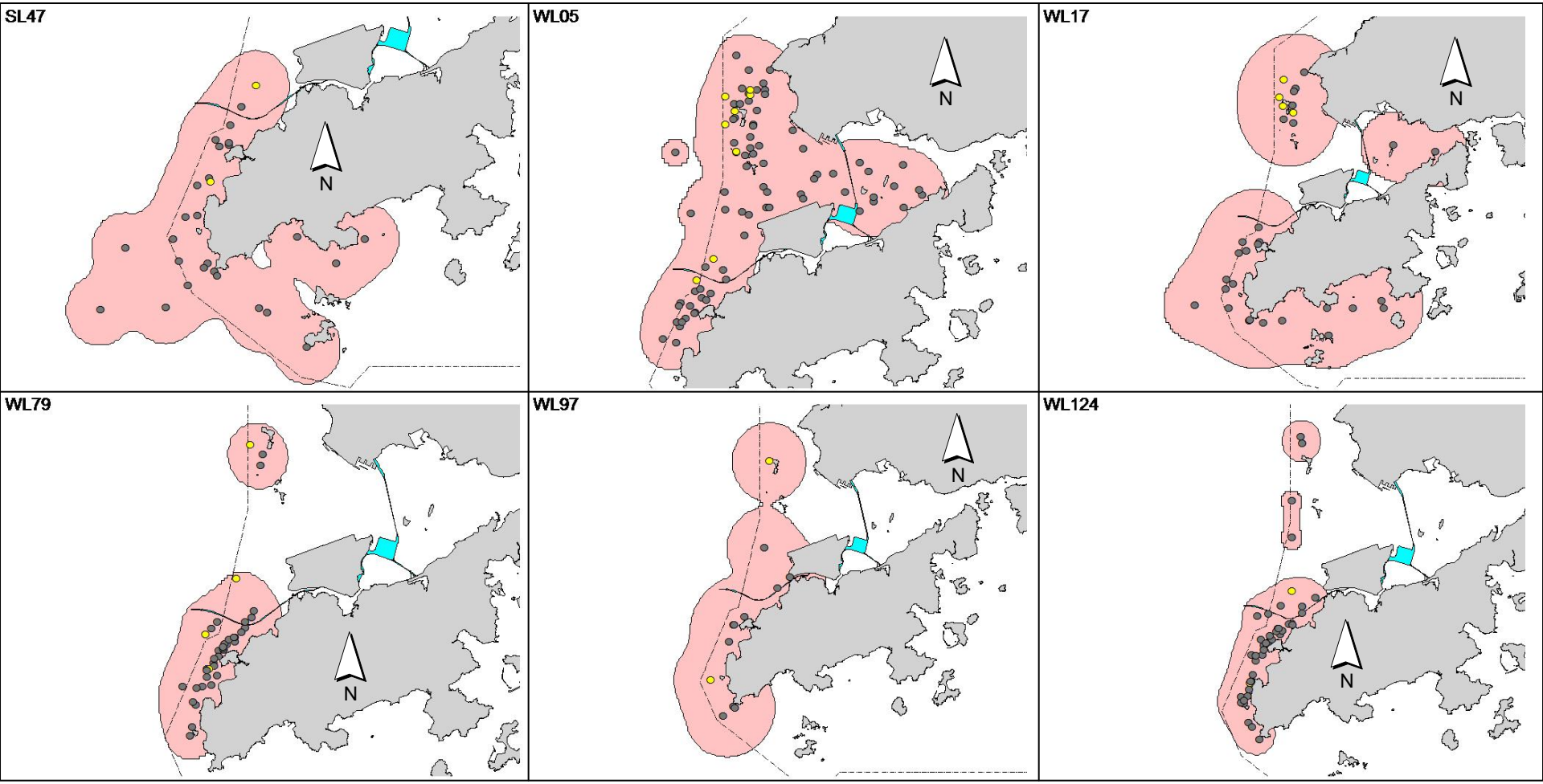
Appendix IV. (cont'd)



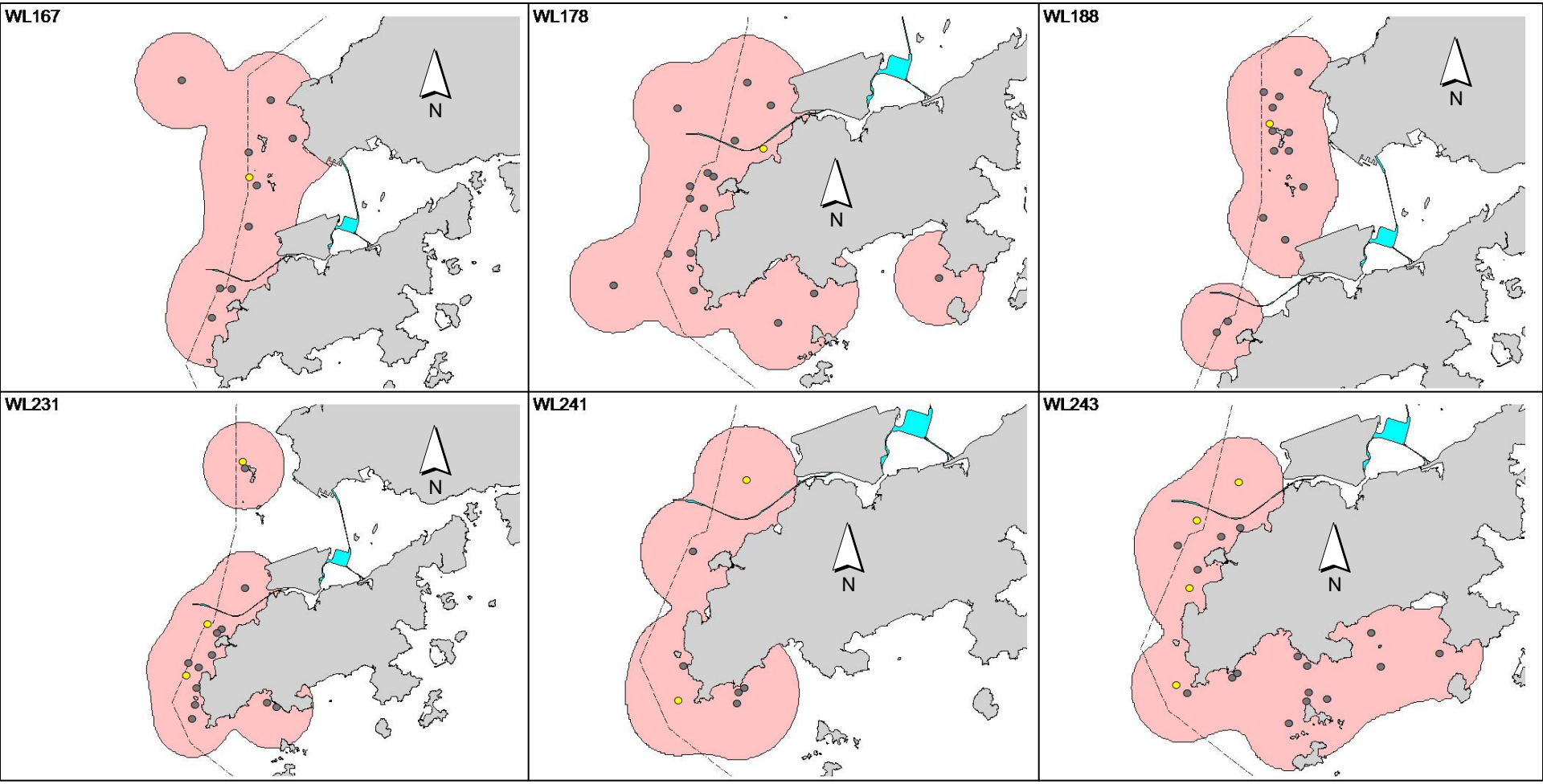
Appendix IV. (cont'd)

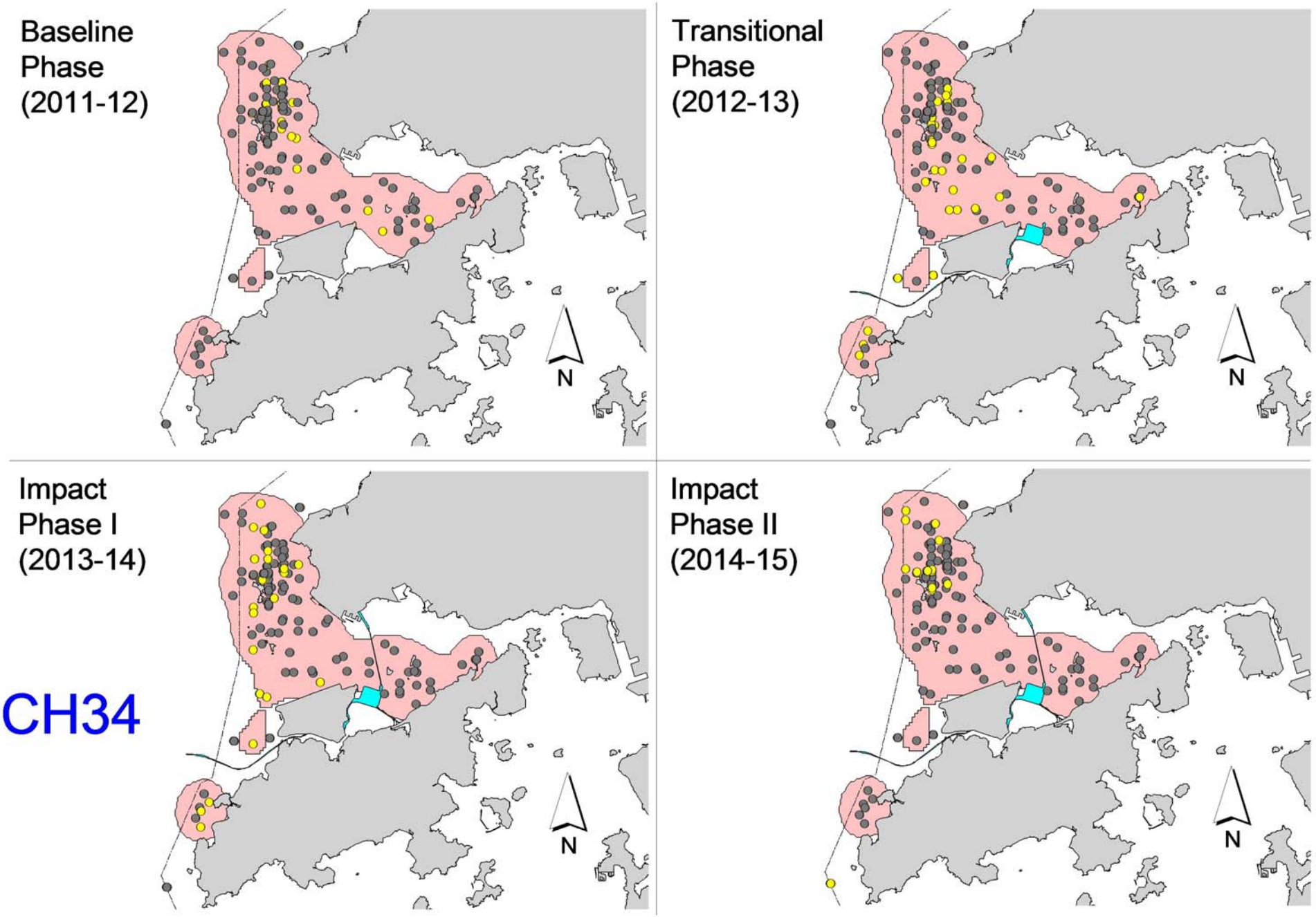


Appendix IV. (cont'd)

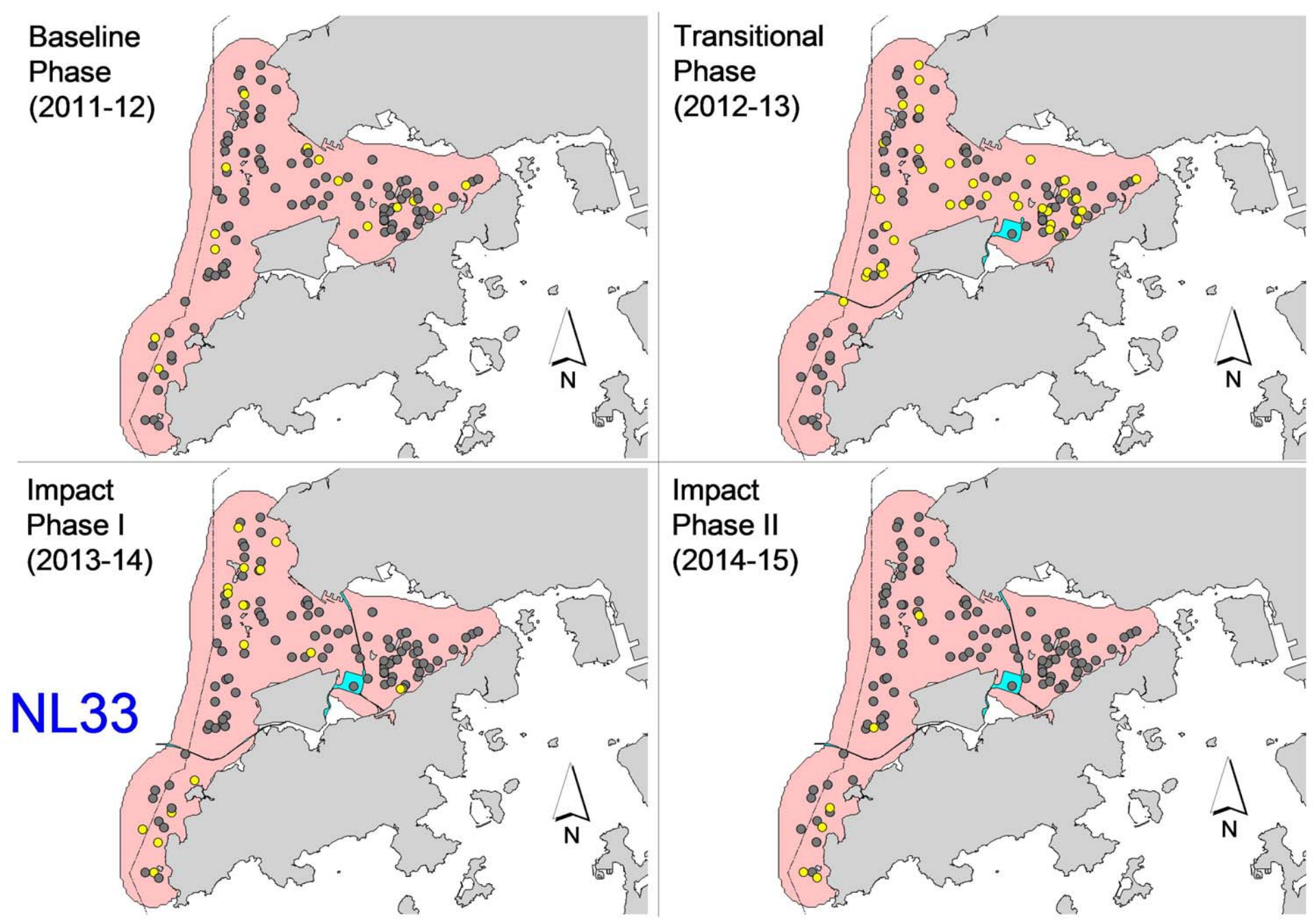


Appendix IV. (cont'd)

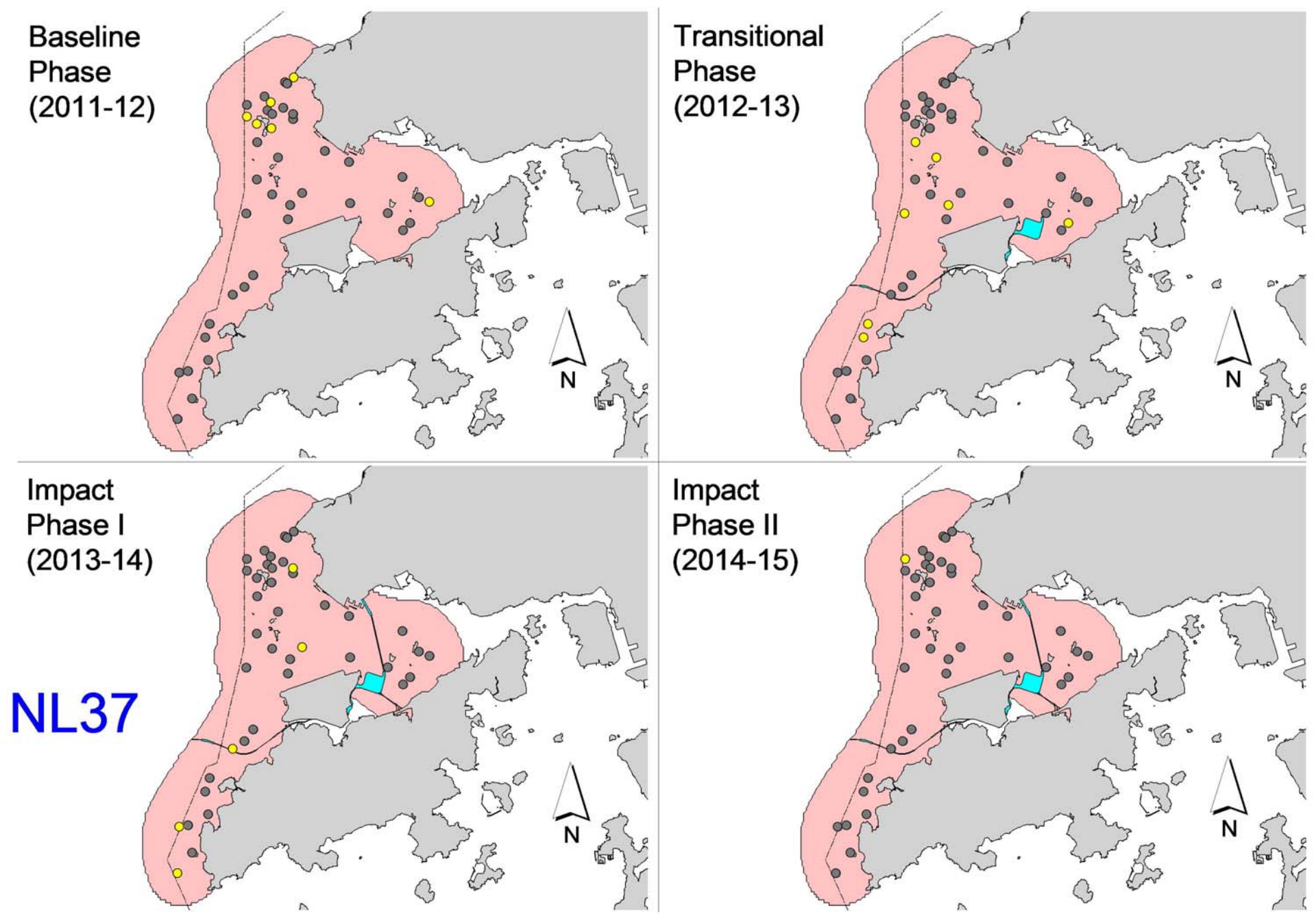




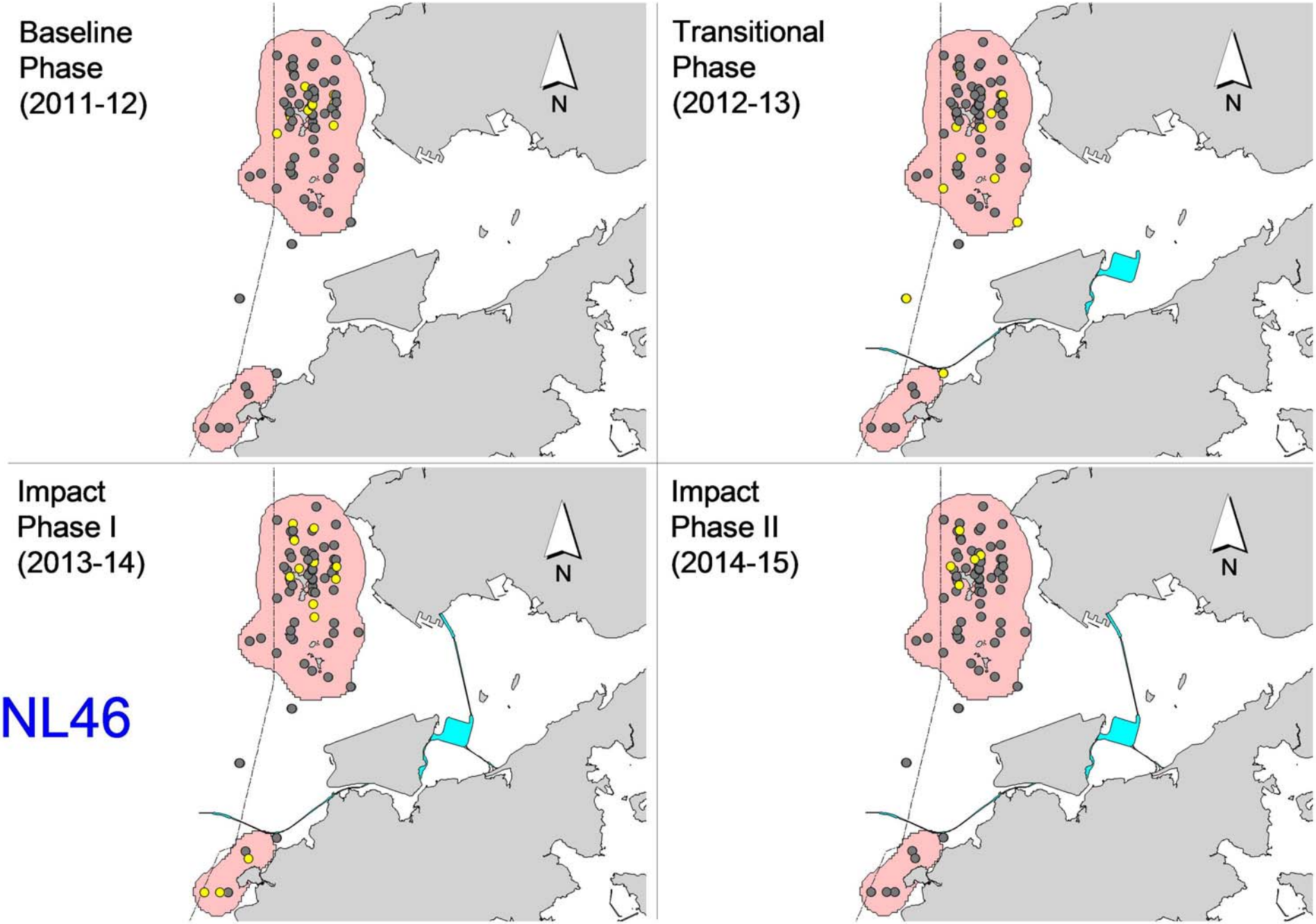
Appendix V. Temporal changes in range use patterns of 28 individual dolphins during baseline, transitional & impact phases of TMCLKL construction (note: yellow dots indicates sightings made in corresponding period)



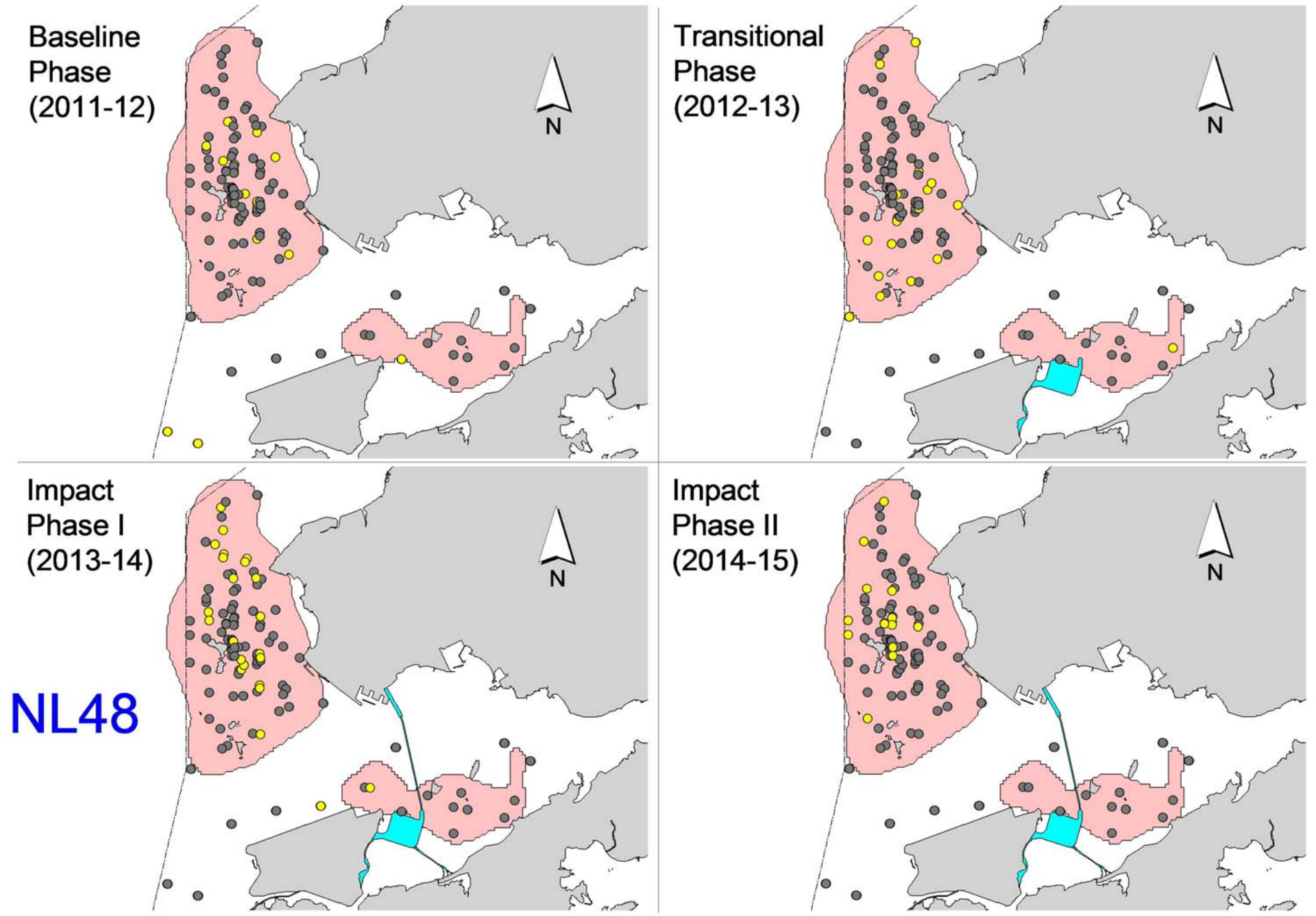
Appendix V. (cont'd)



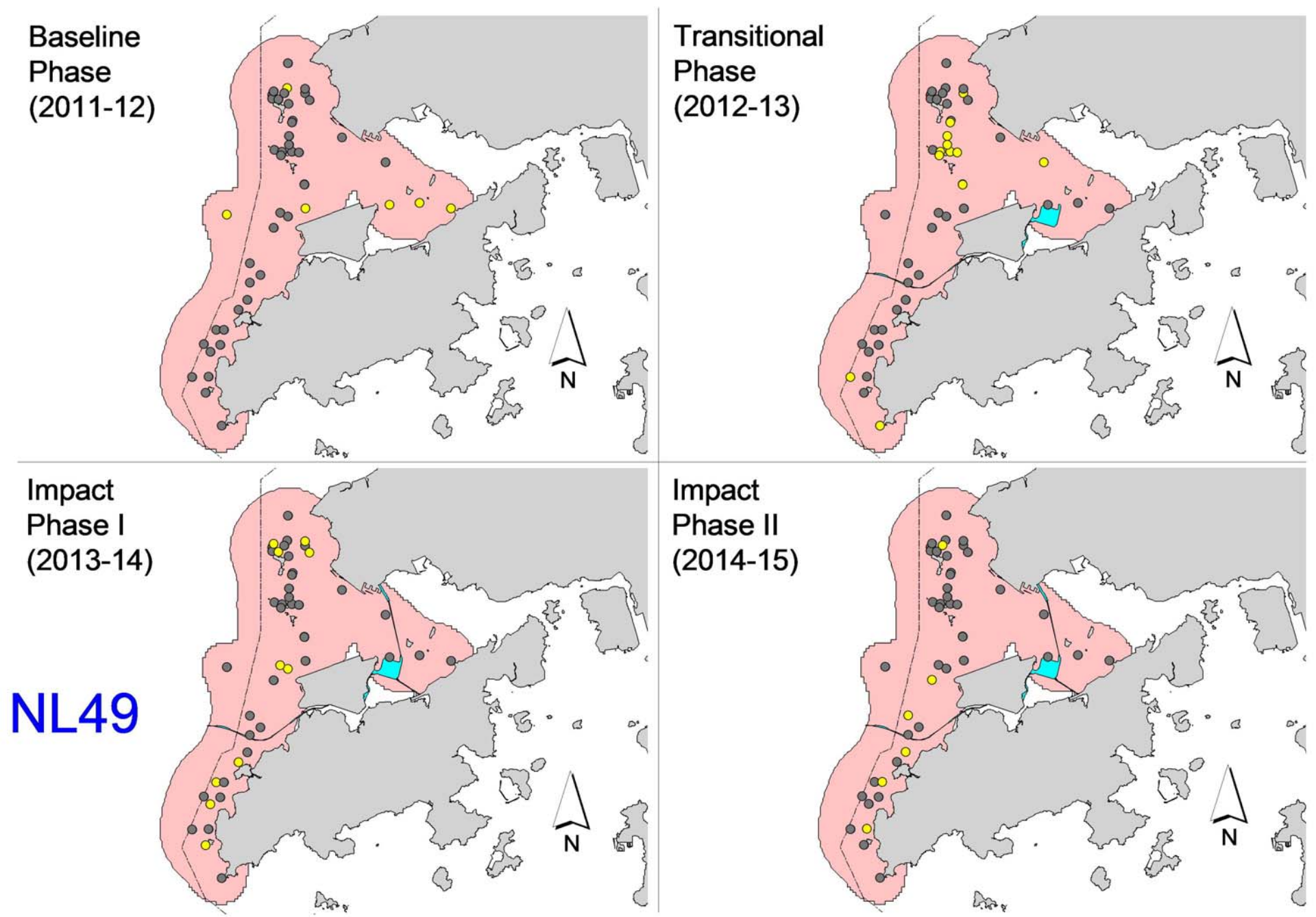
Appendix V. (cont'd)



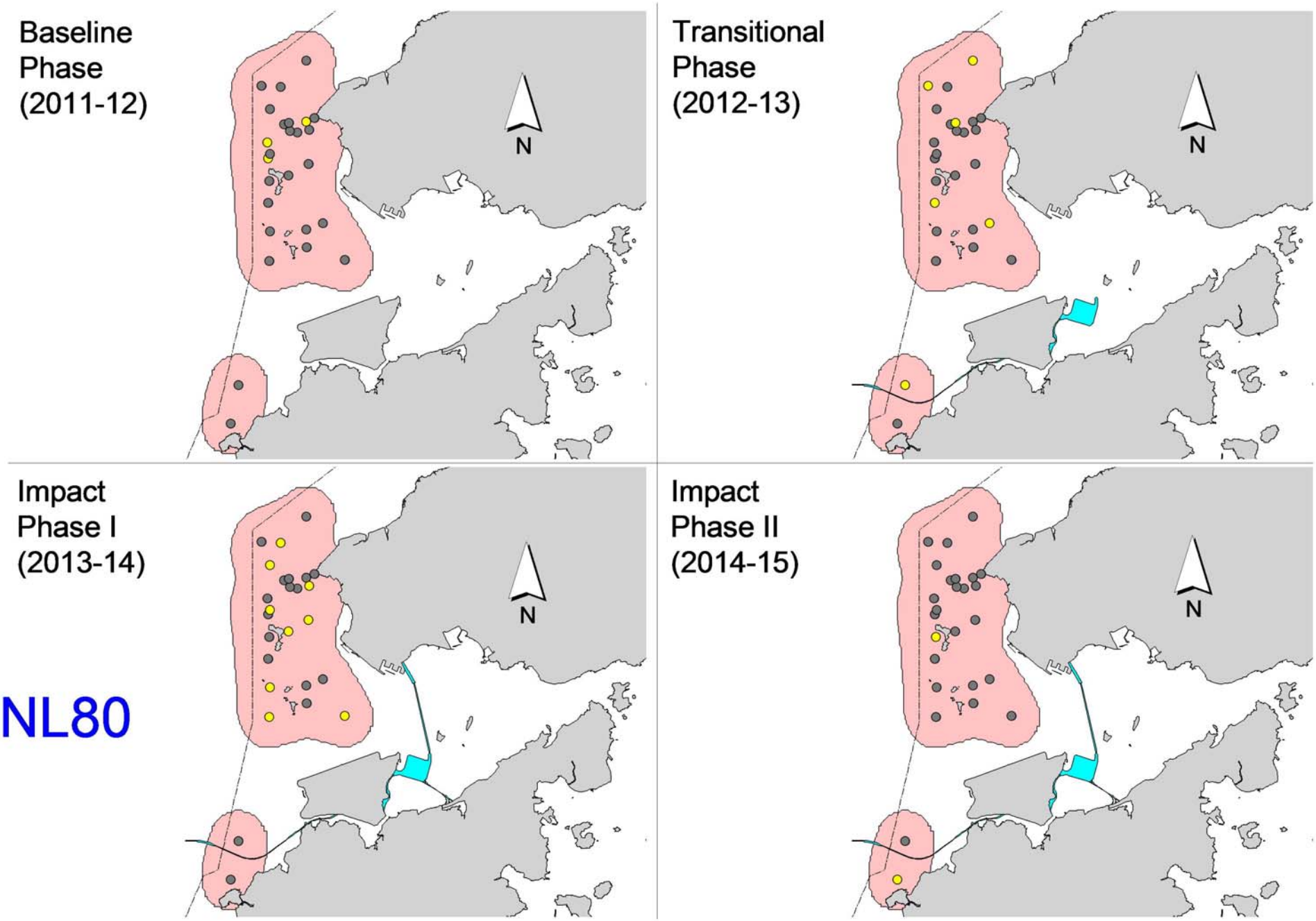
Appendix V. (cont'd)



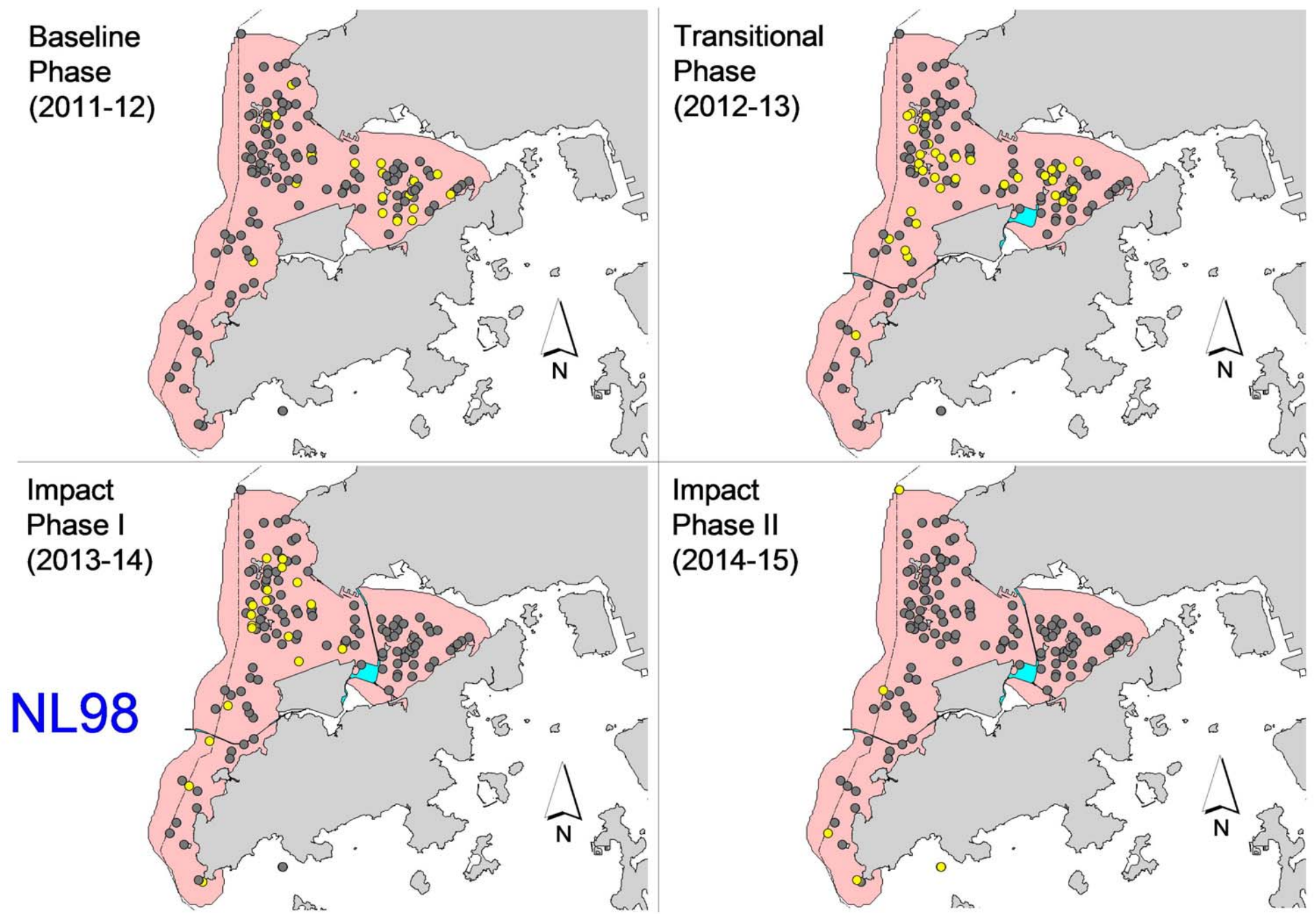
Appendix V. (cont'd)



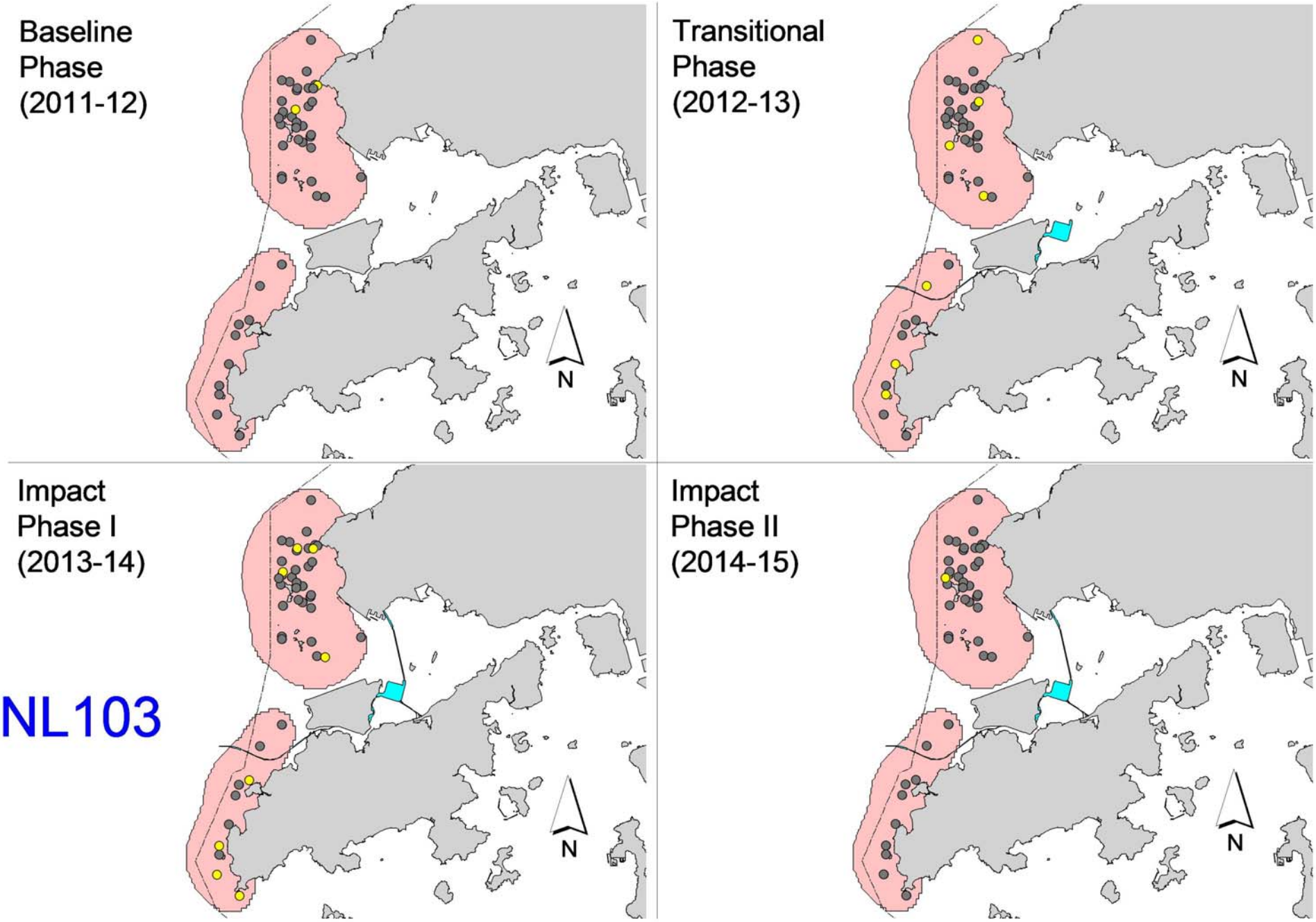
Appendix V. (cont'd)



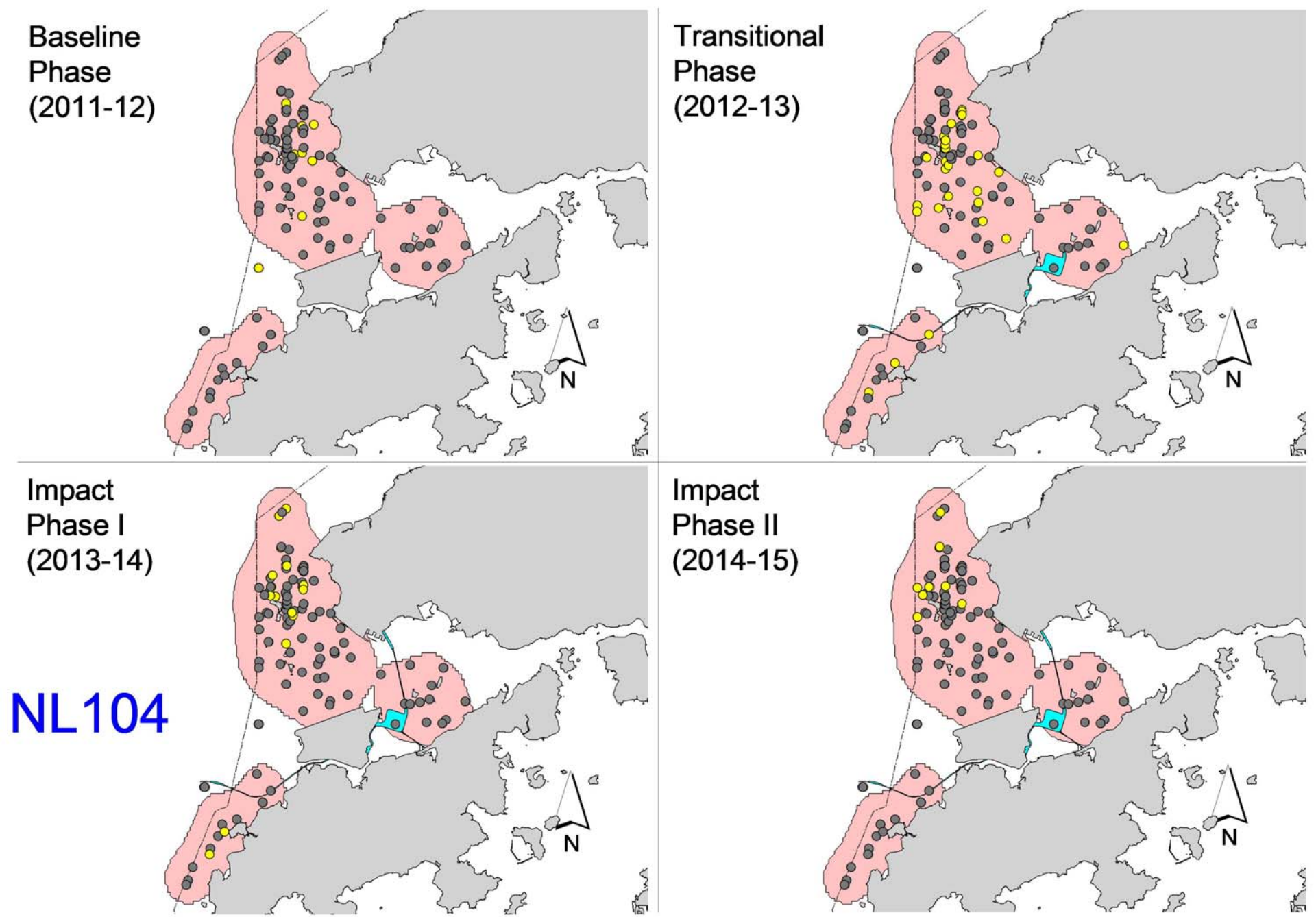
Appendix V. (cont'd)



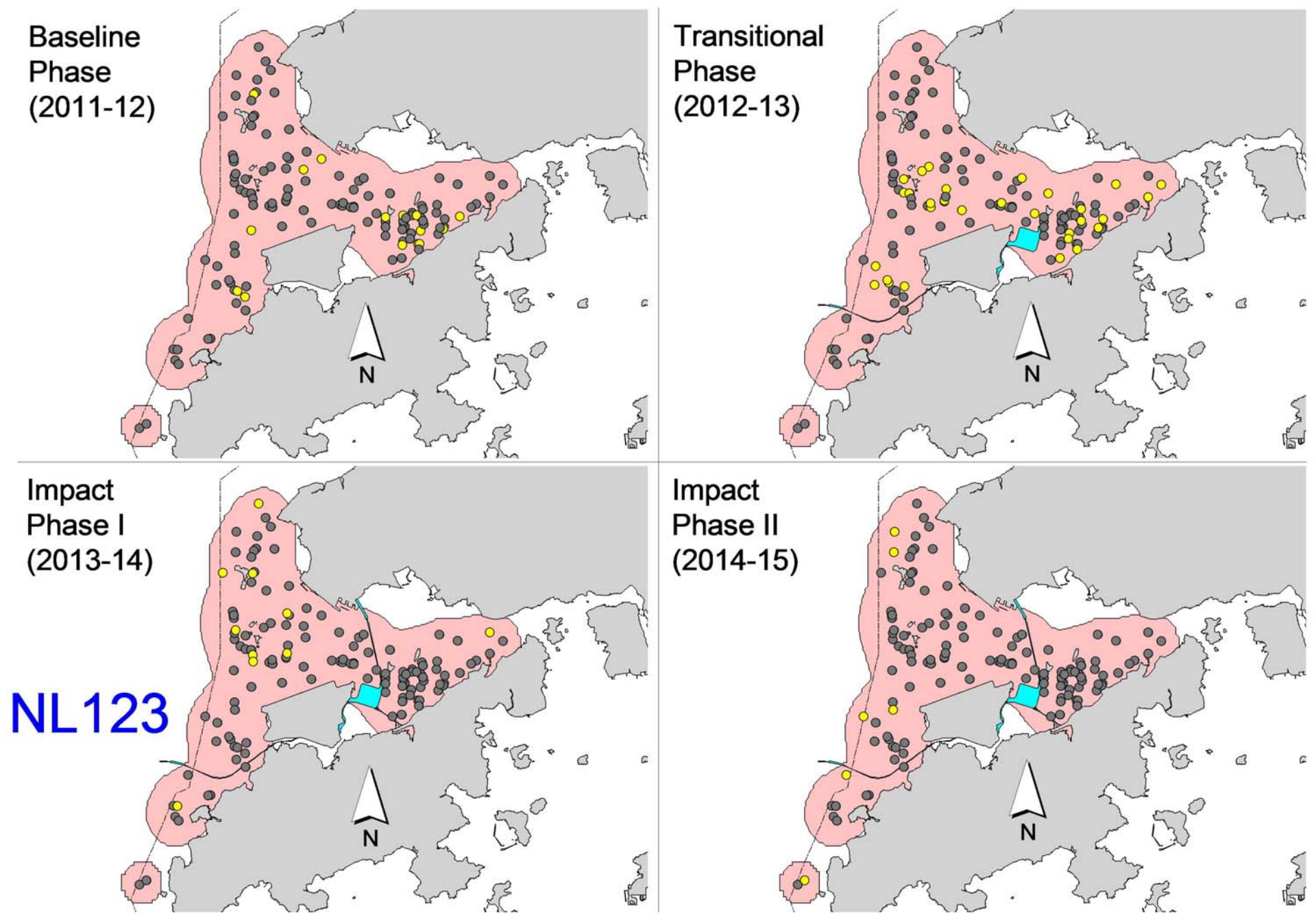
Appendix V. (cont'd)



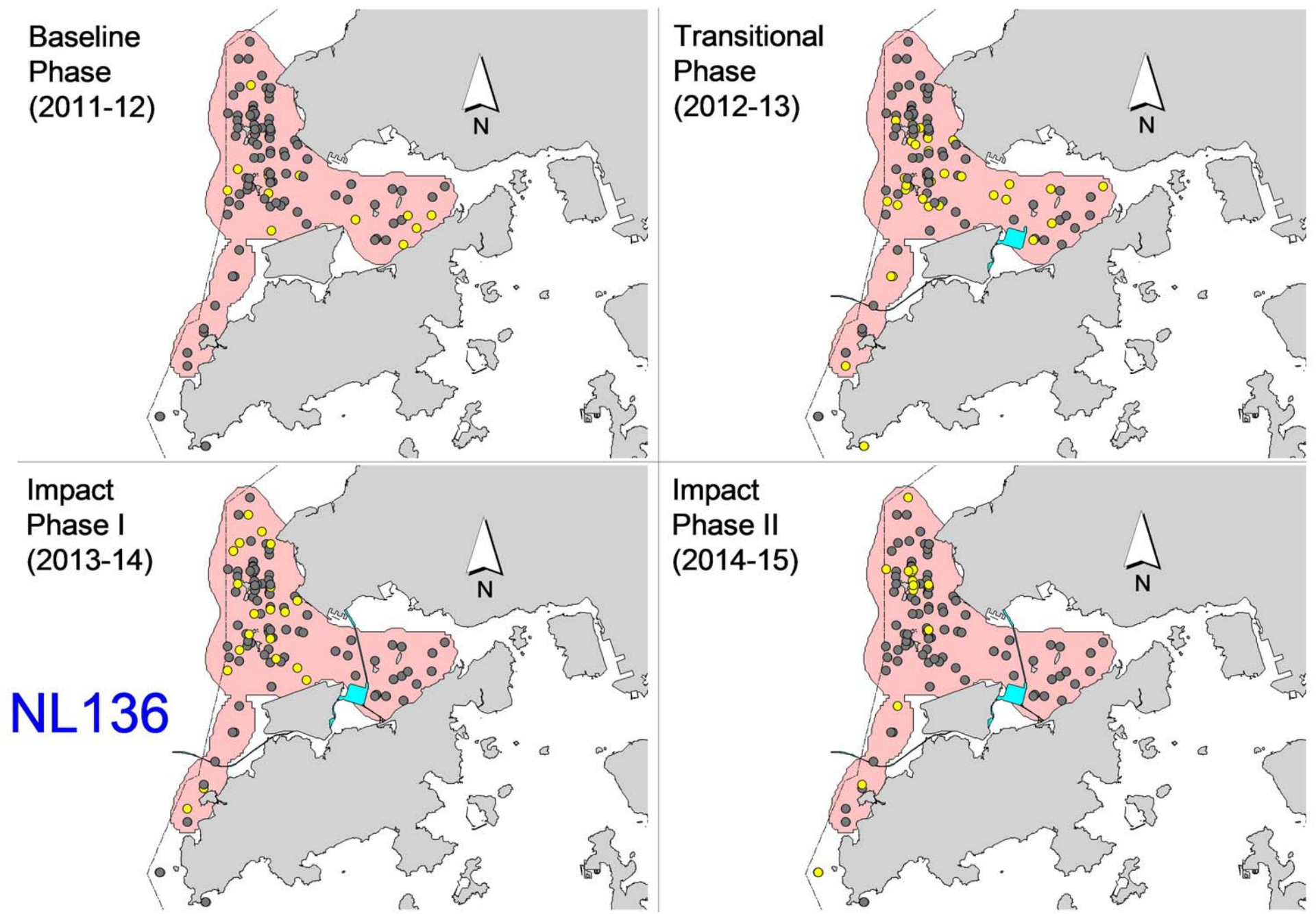
Appendix V. (cont'd)



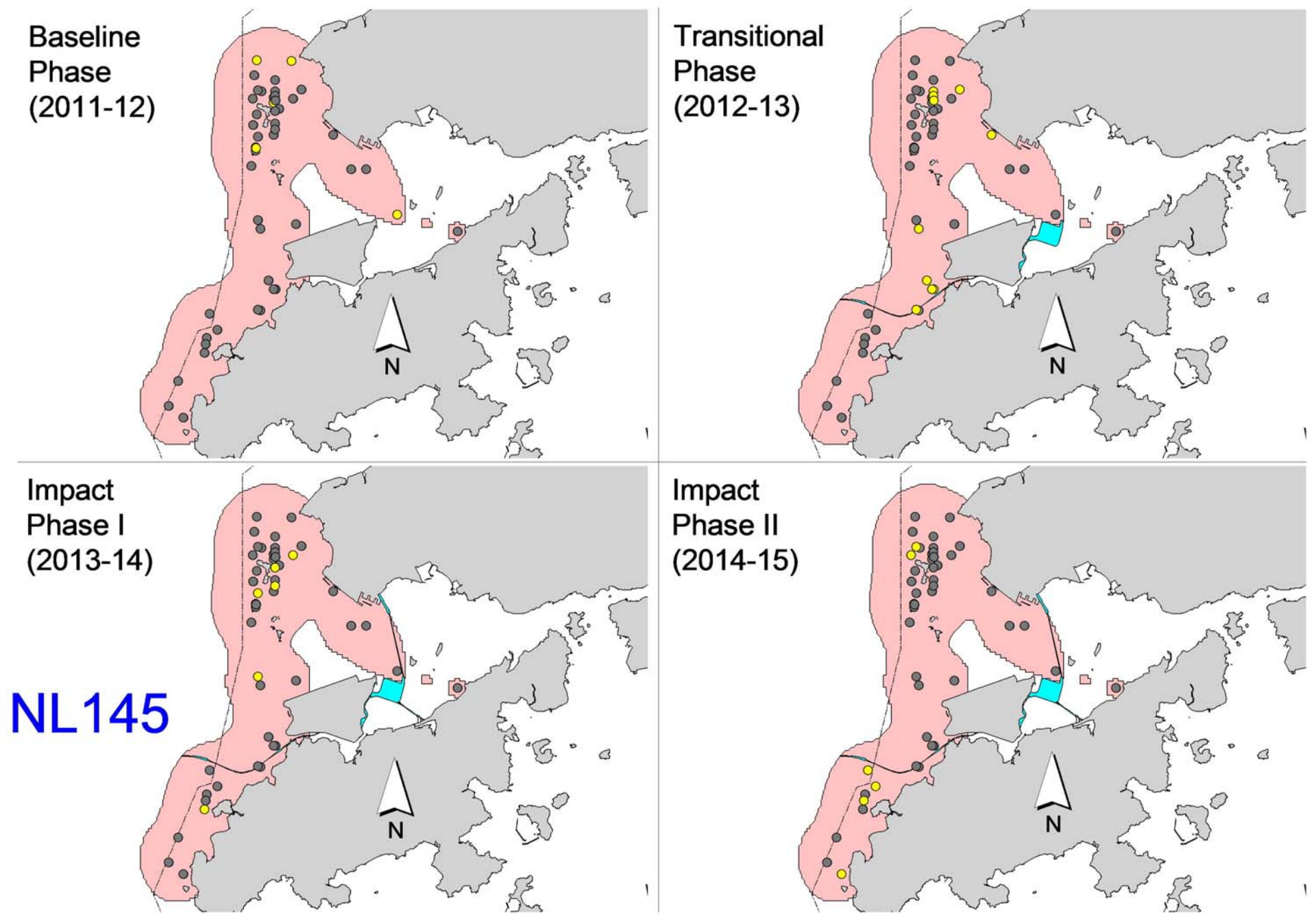
Appendix V. (cont'd)



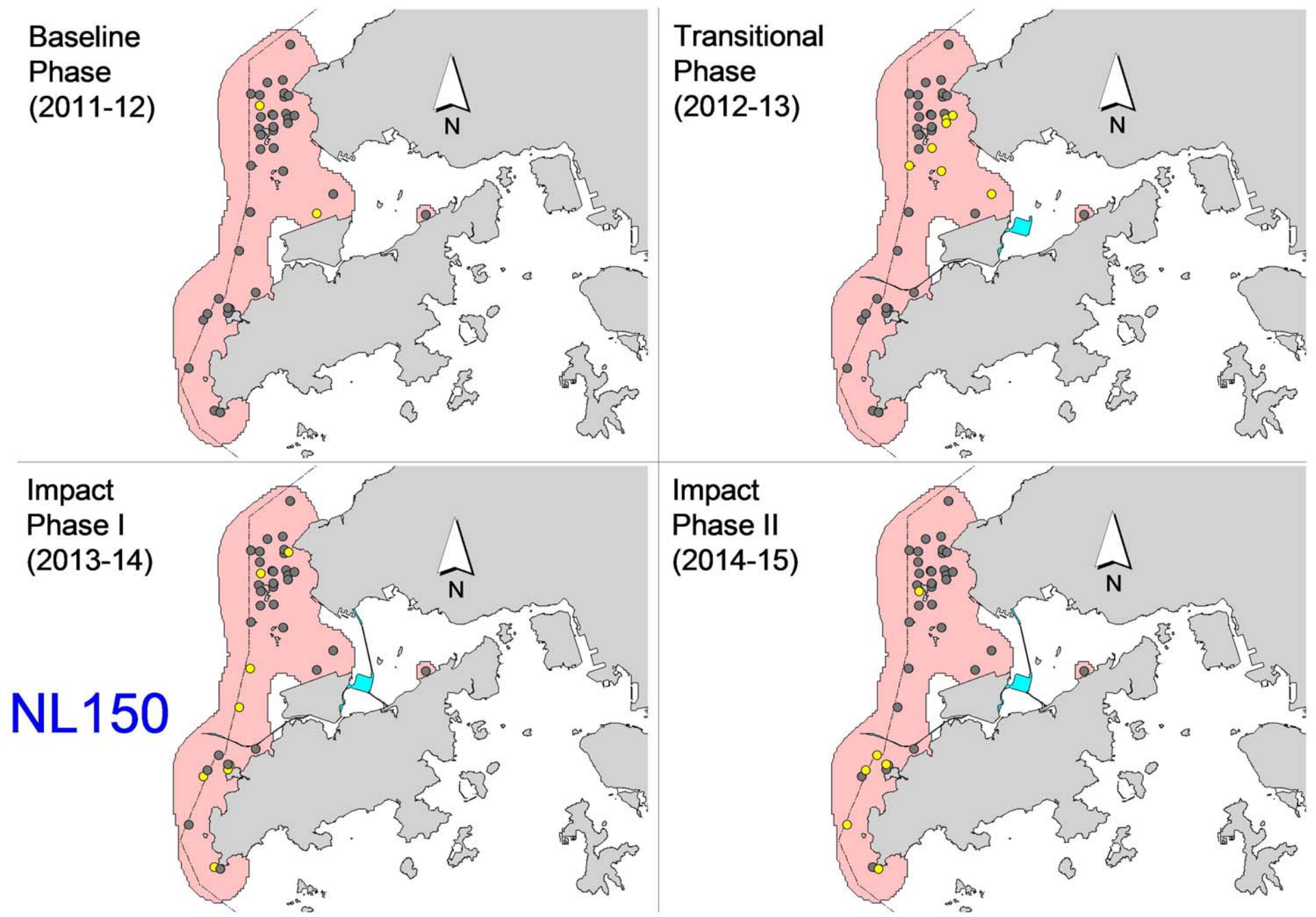
Appendix V. (cont'd)



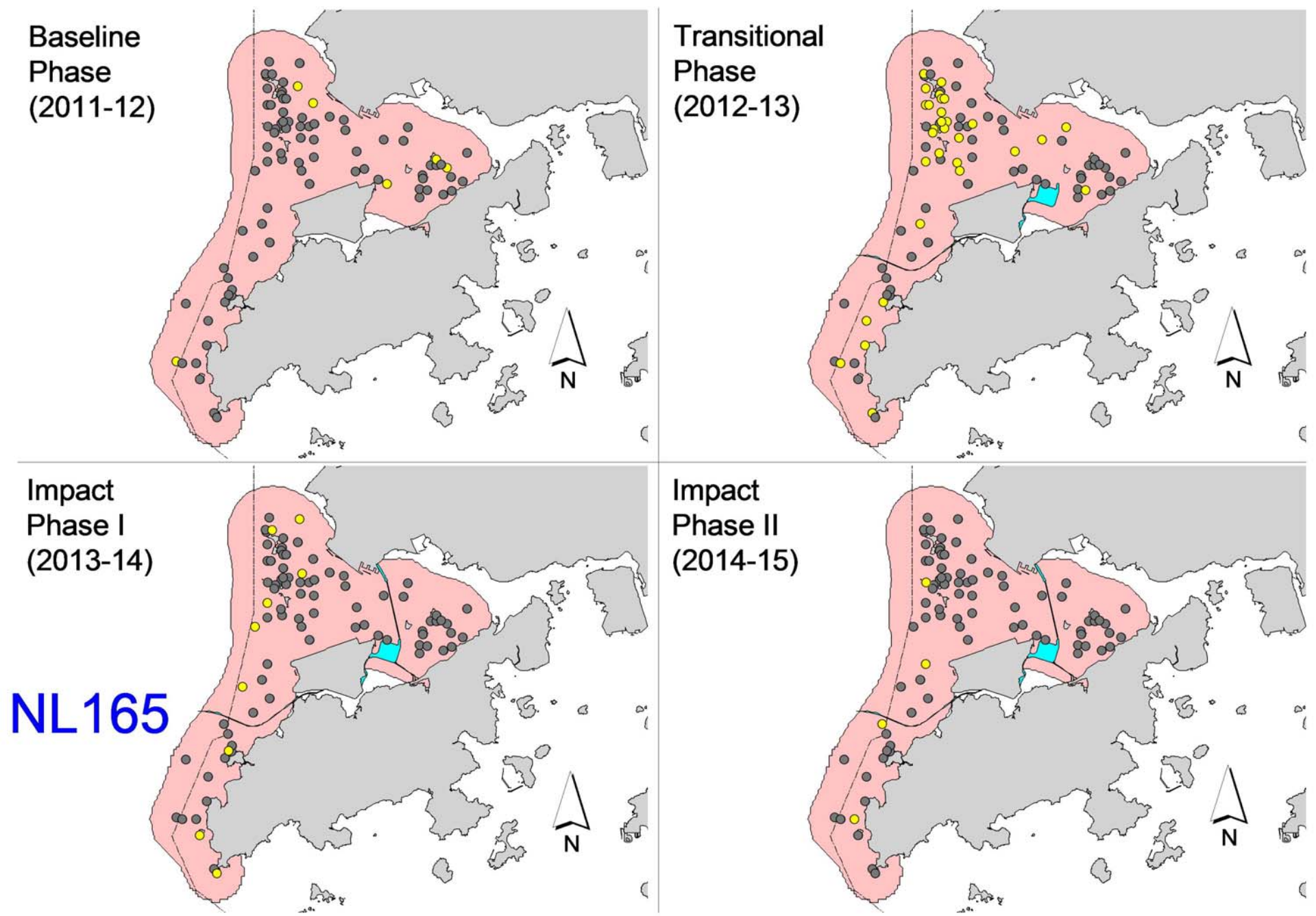
Appendix V. (cont'd)



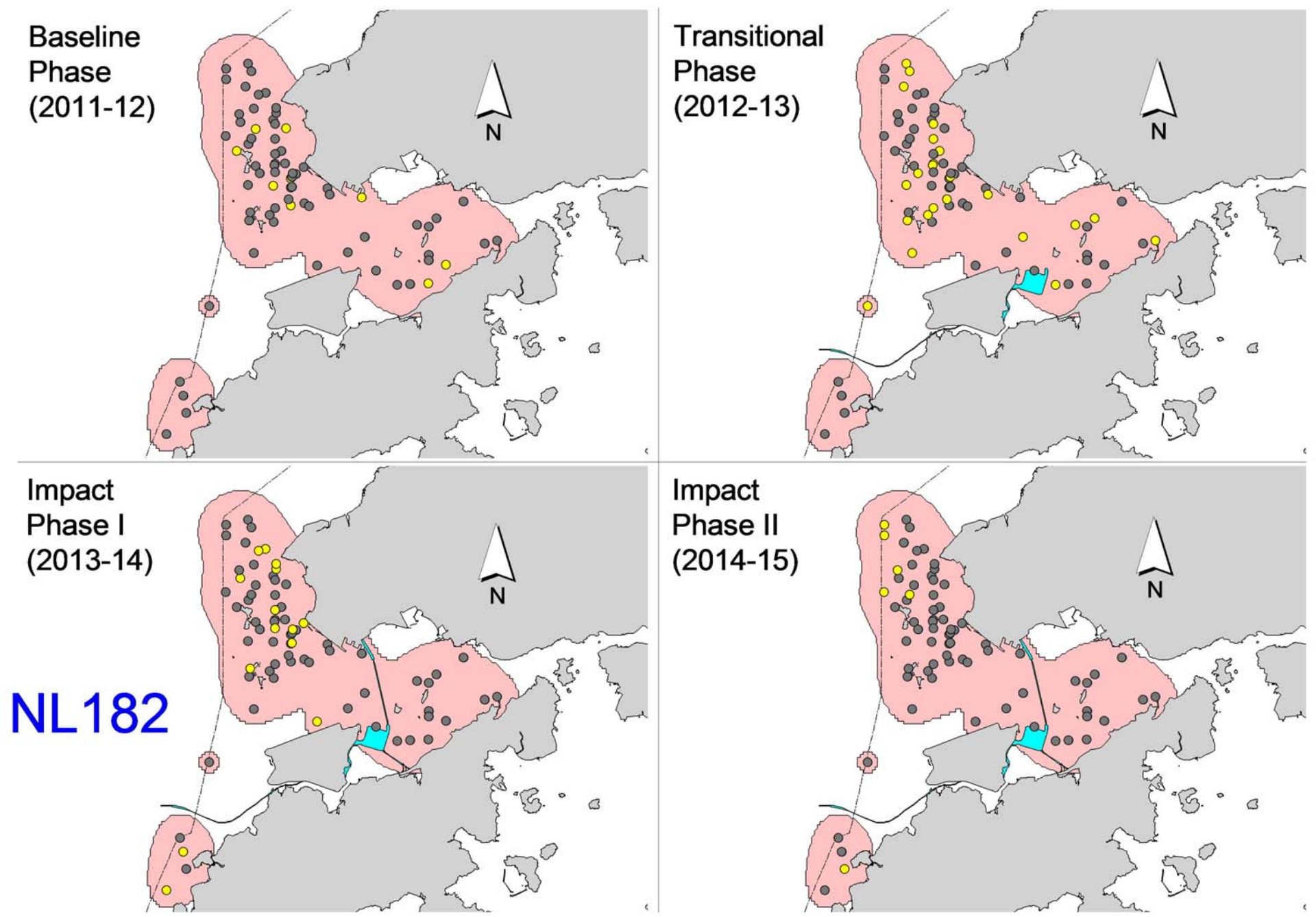
Appendix V. (cont'd)



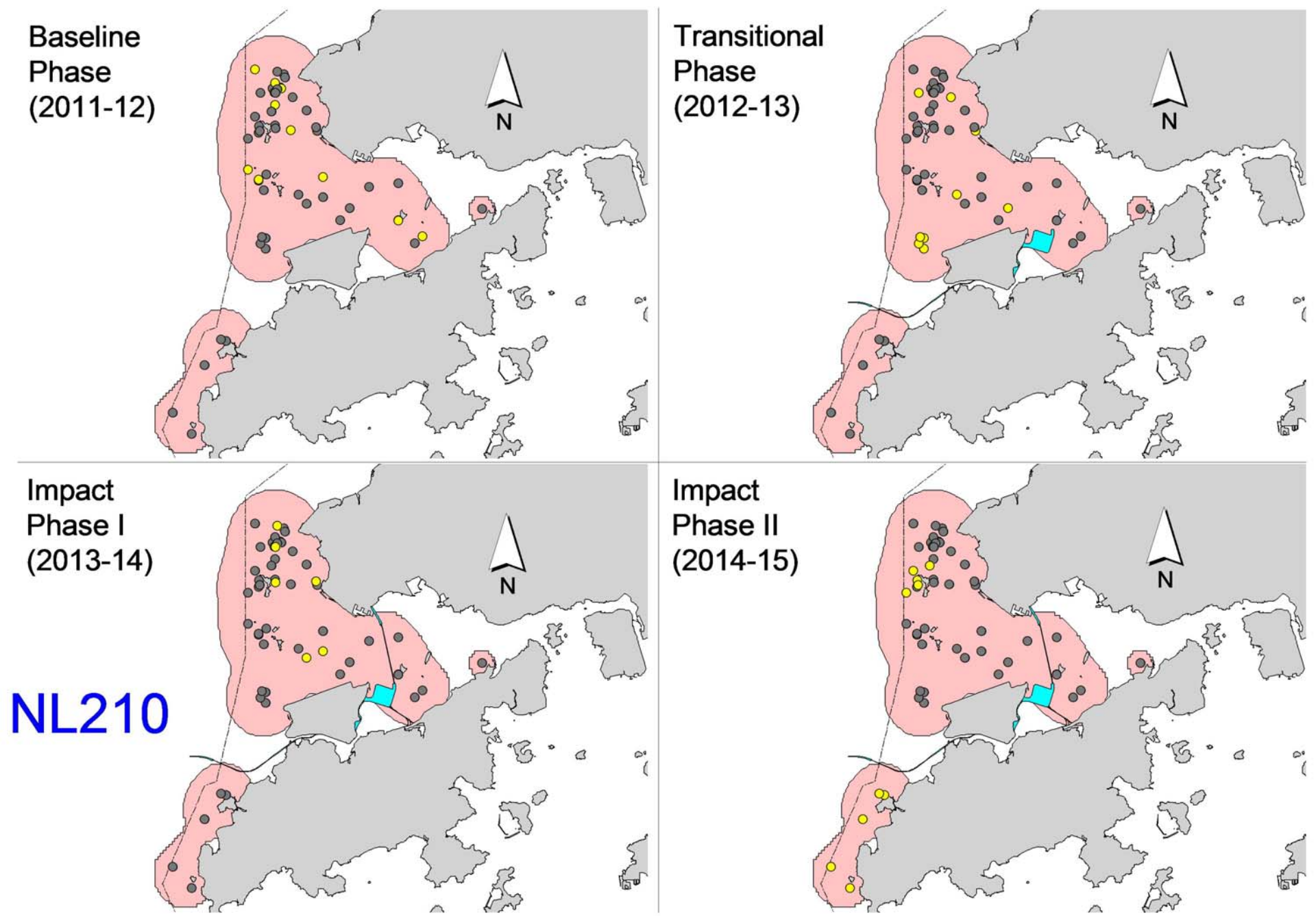
Appendix V. (cont'd)



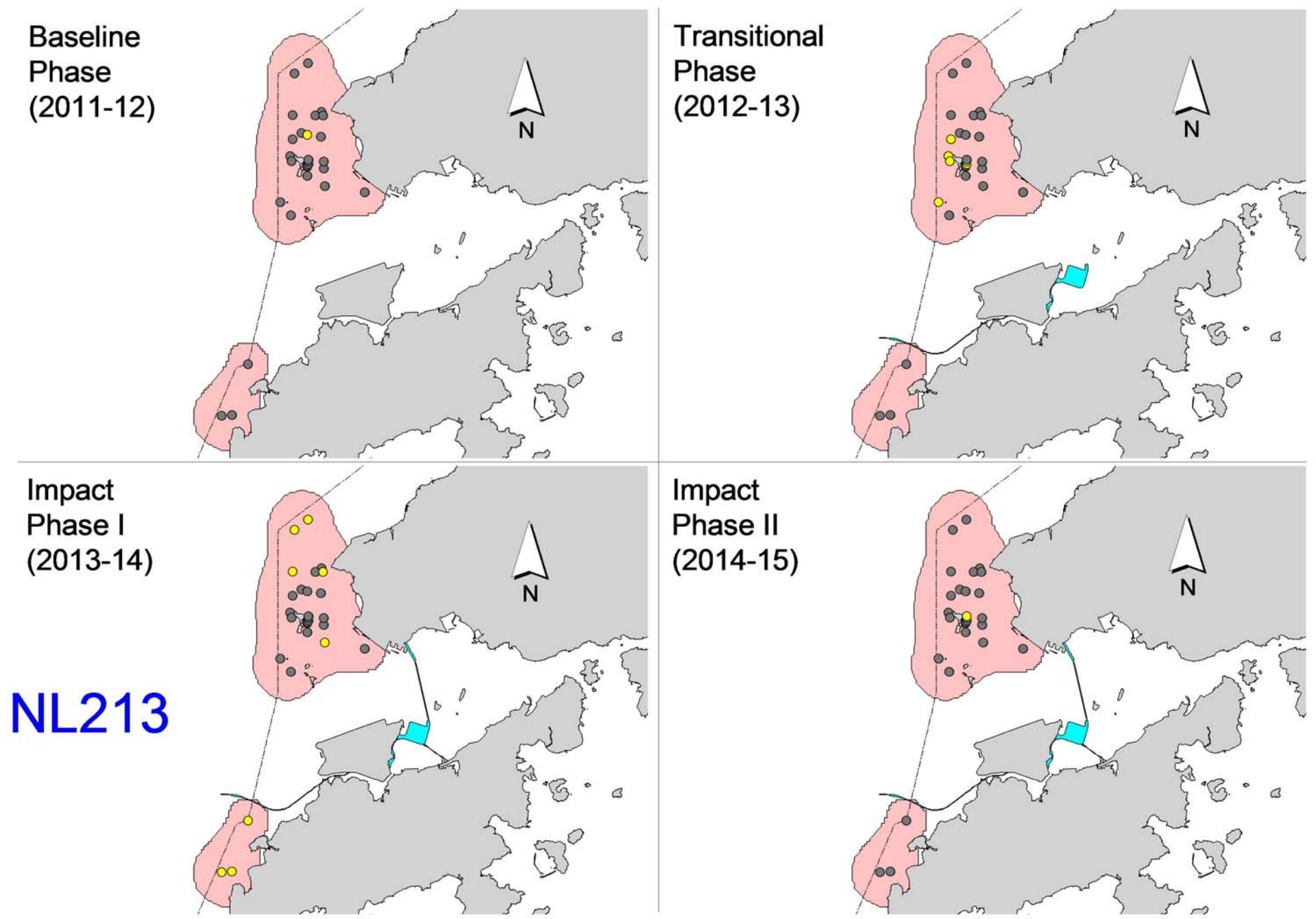
Appendix V. (cont'd)



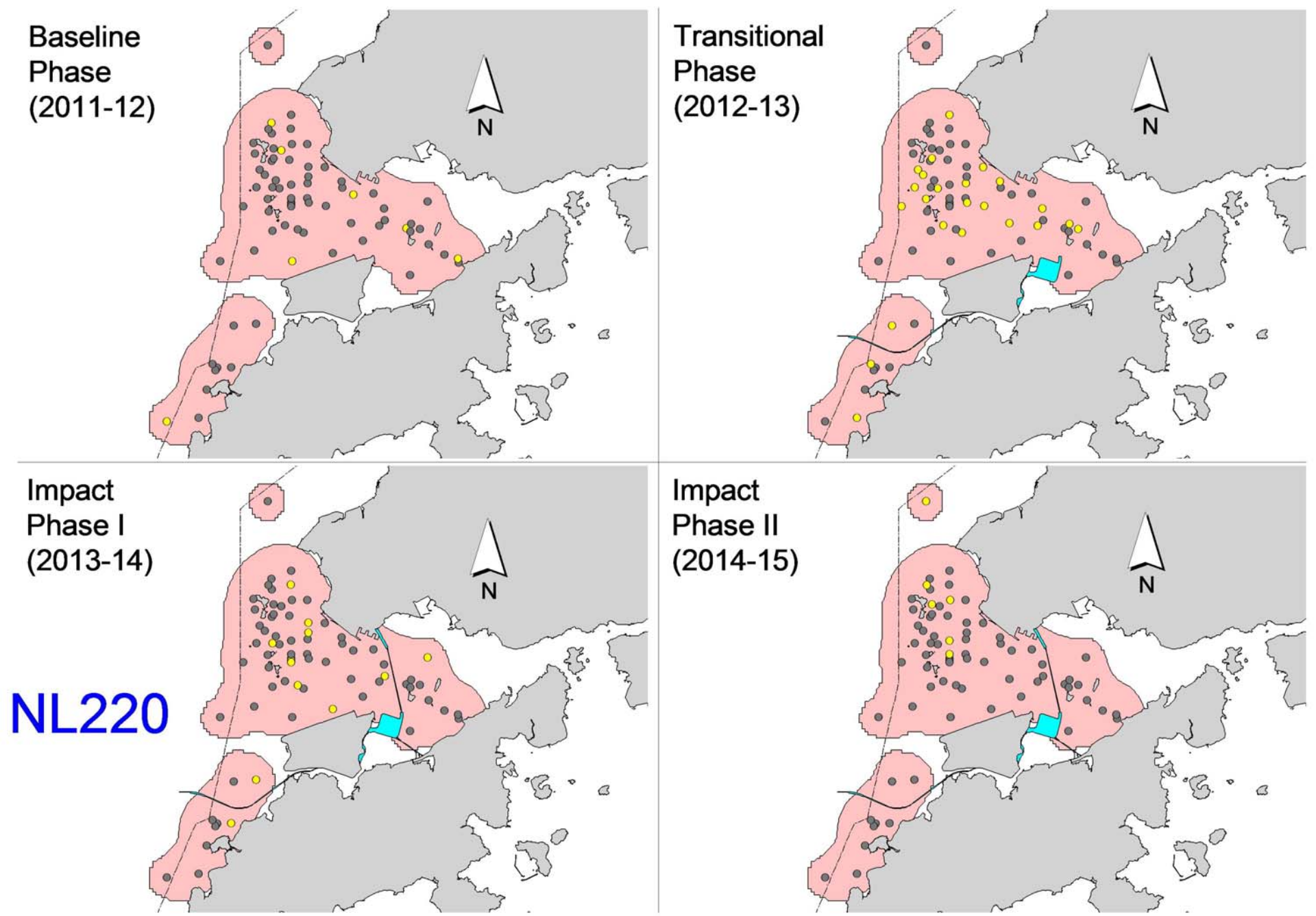
Appendix V. (cont'd)



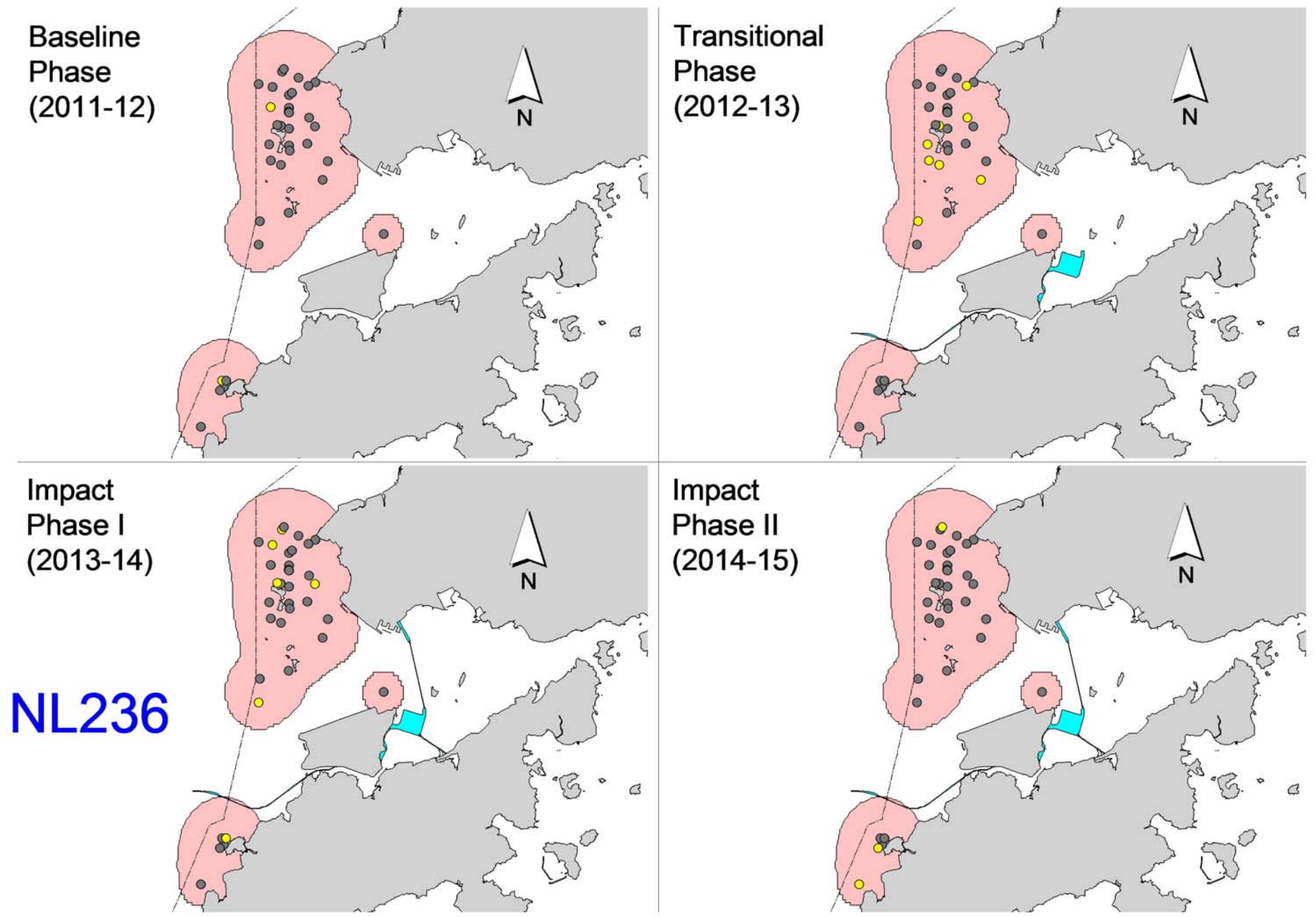
Appendix V. (cont'd)



Appendix V. (cont'd)



Appendix V. (cont'd)



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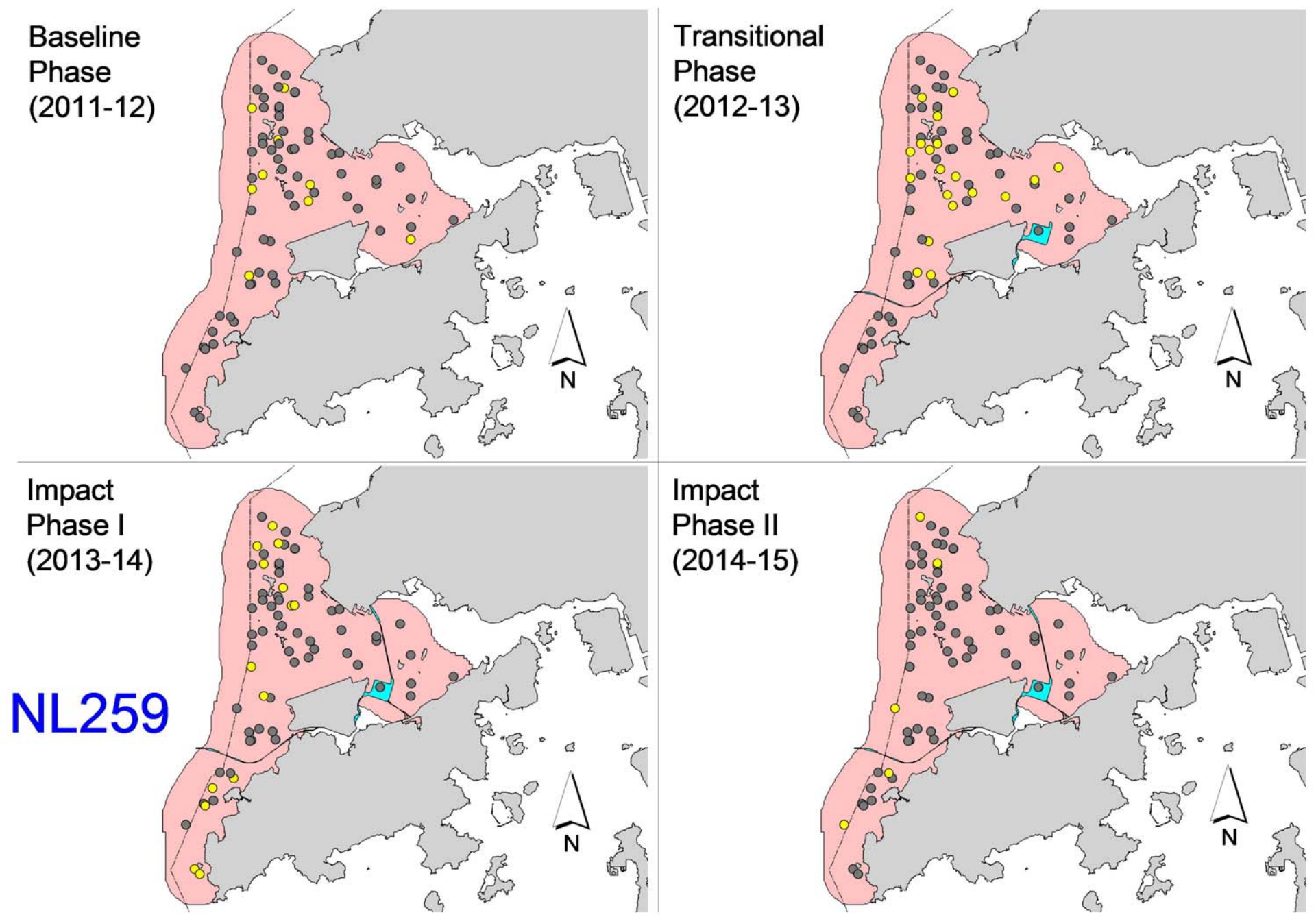

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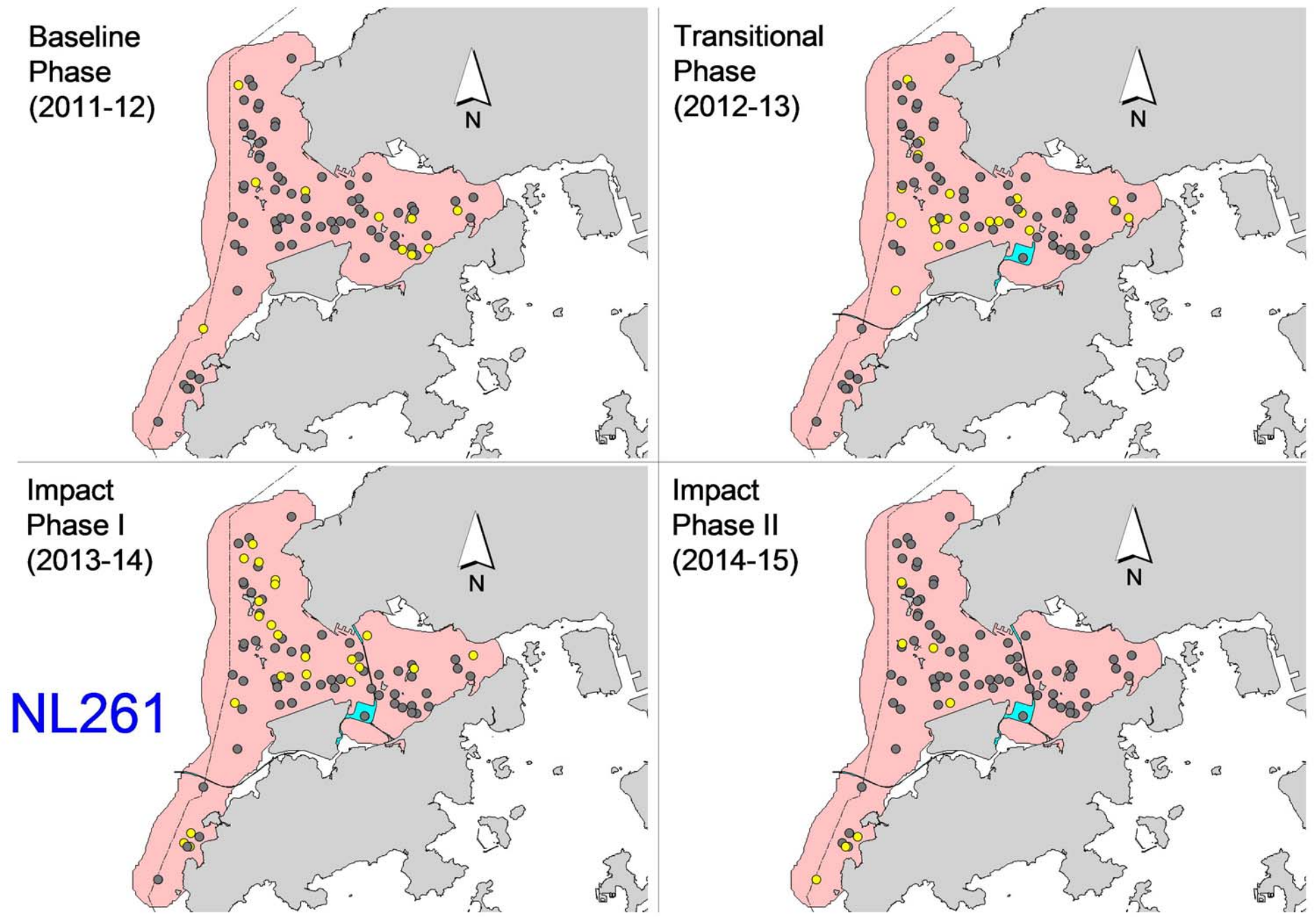

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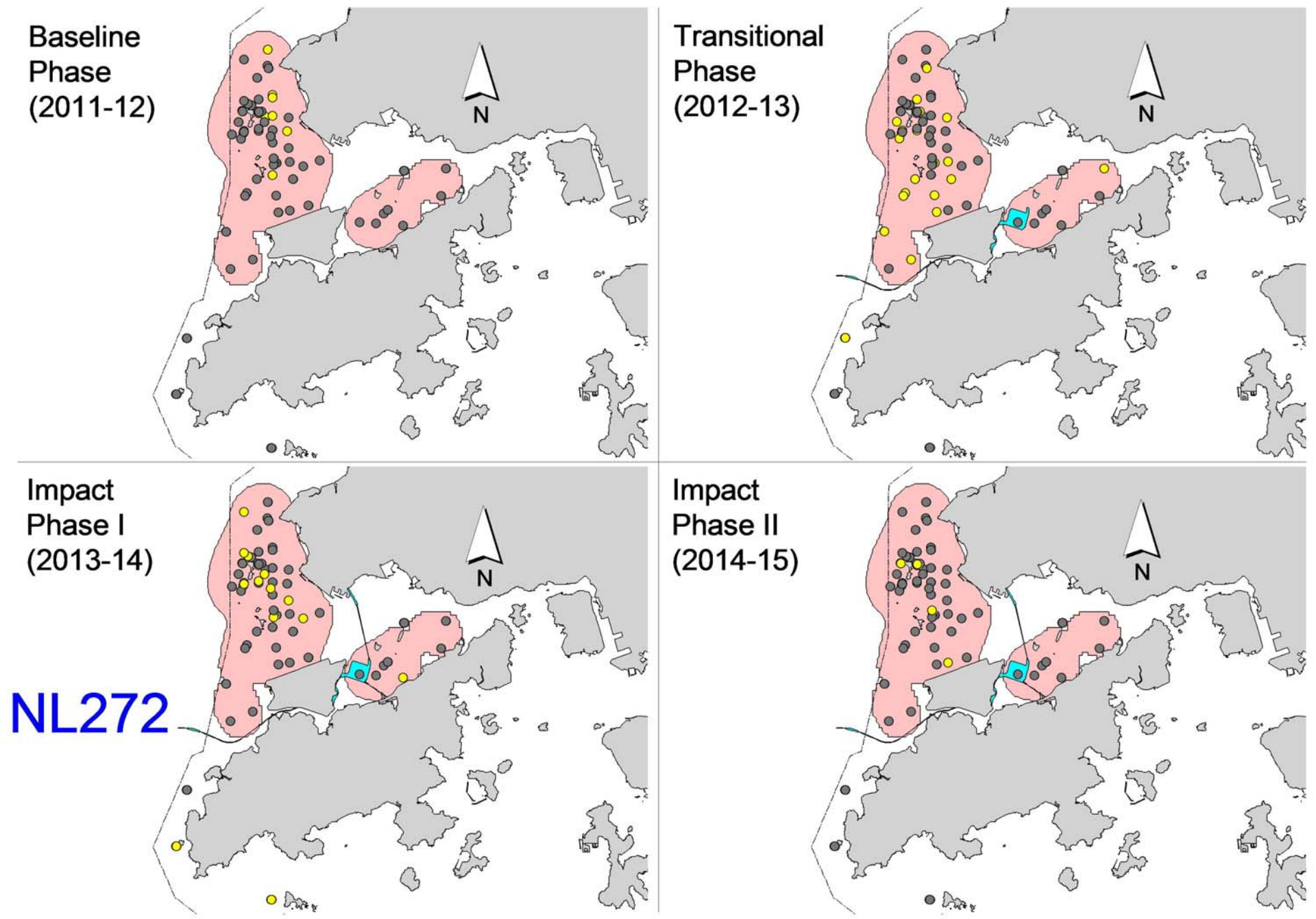

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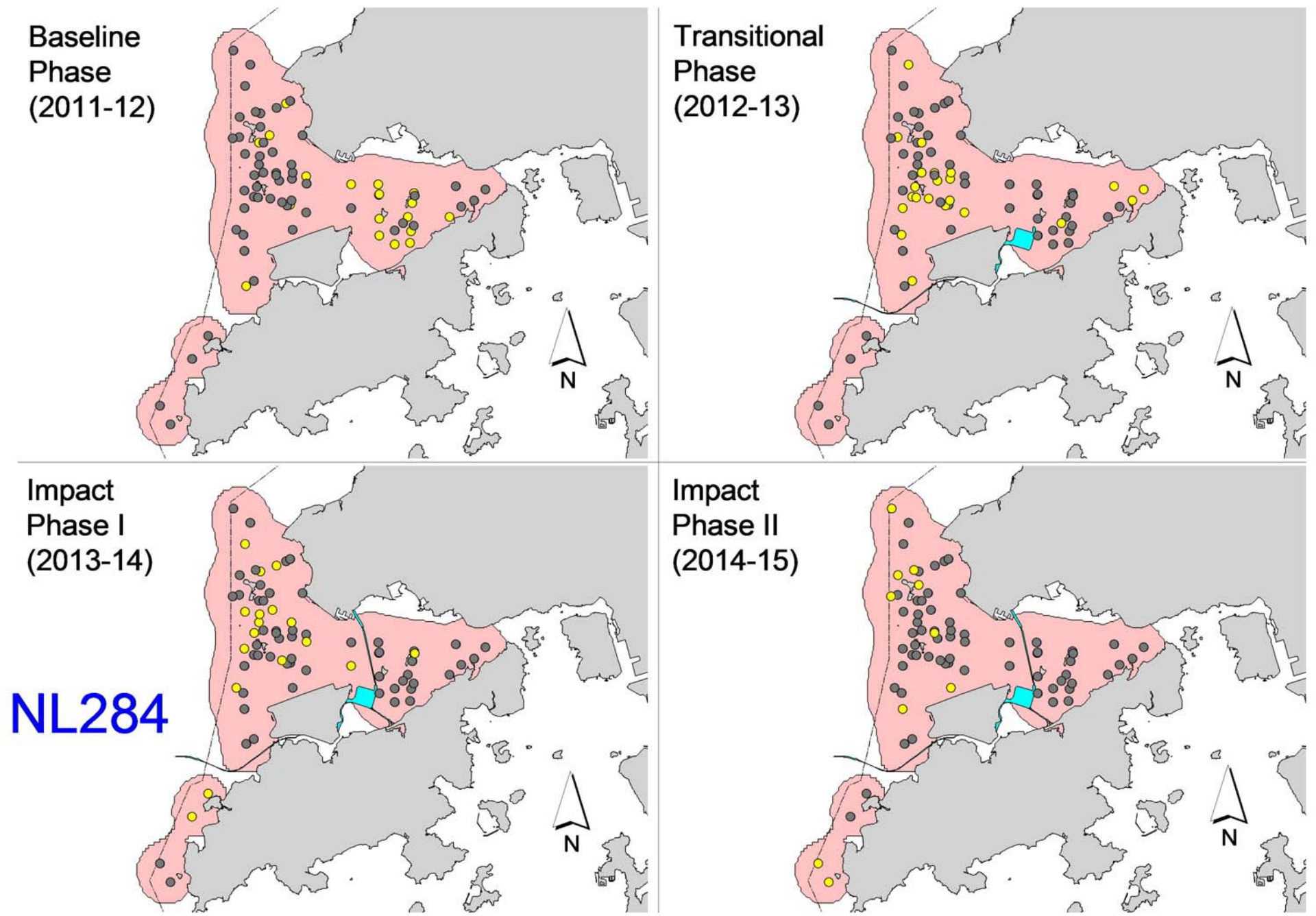

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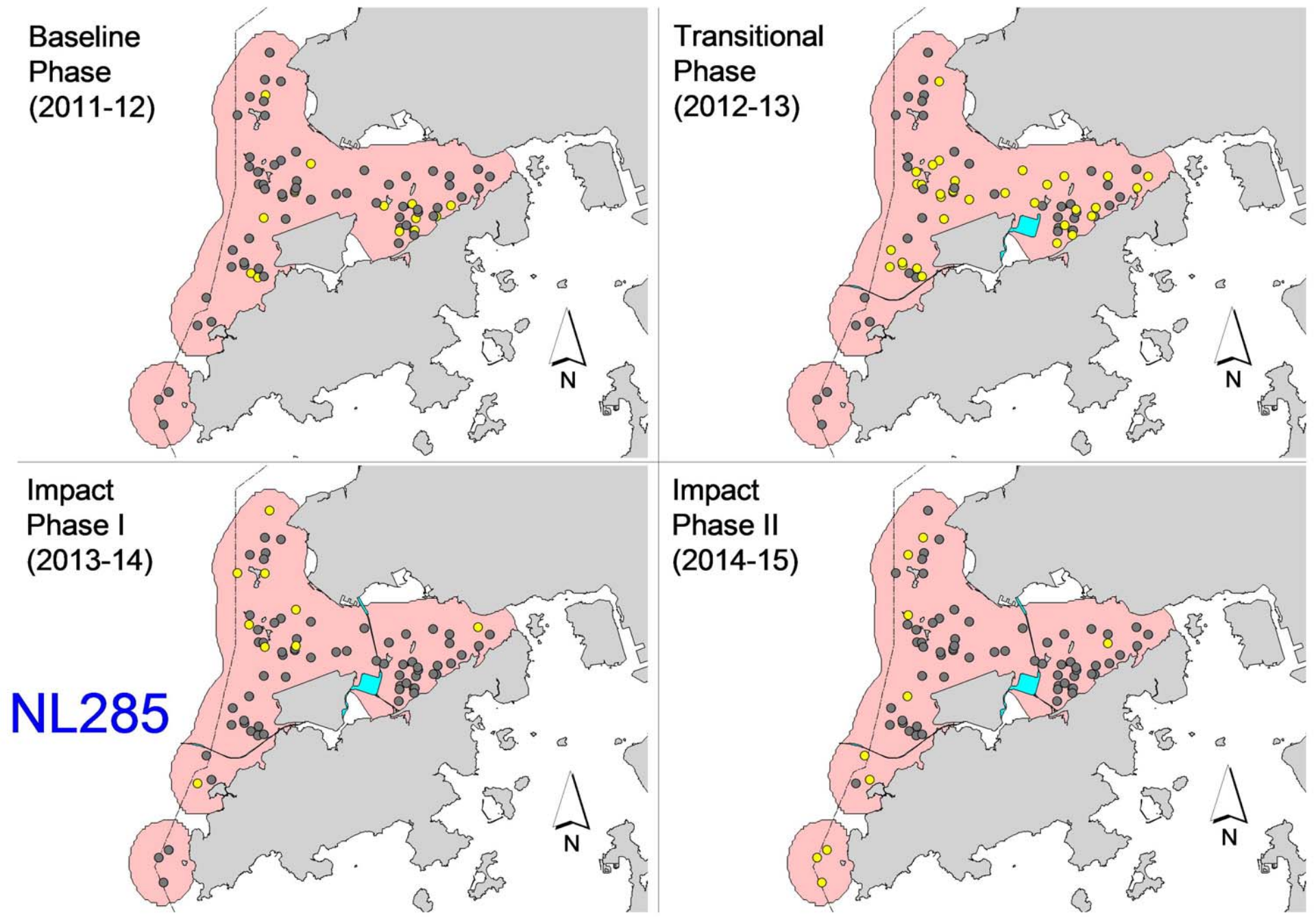

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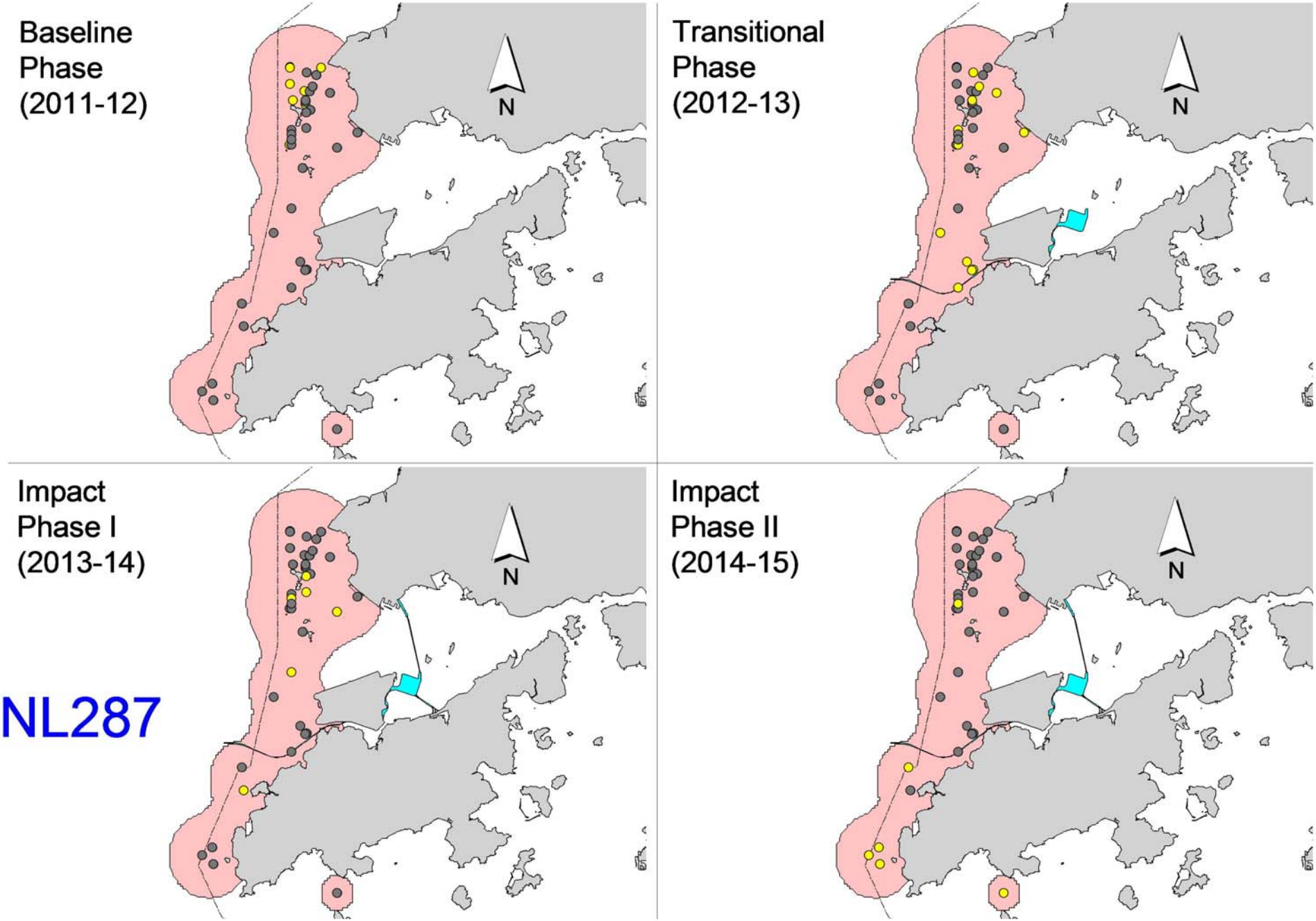
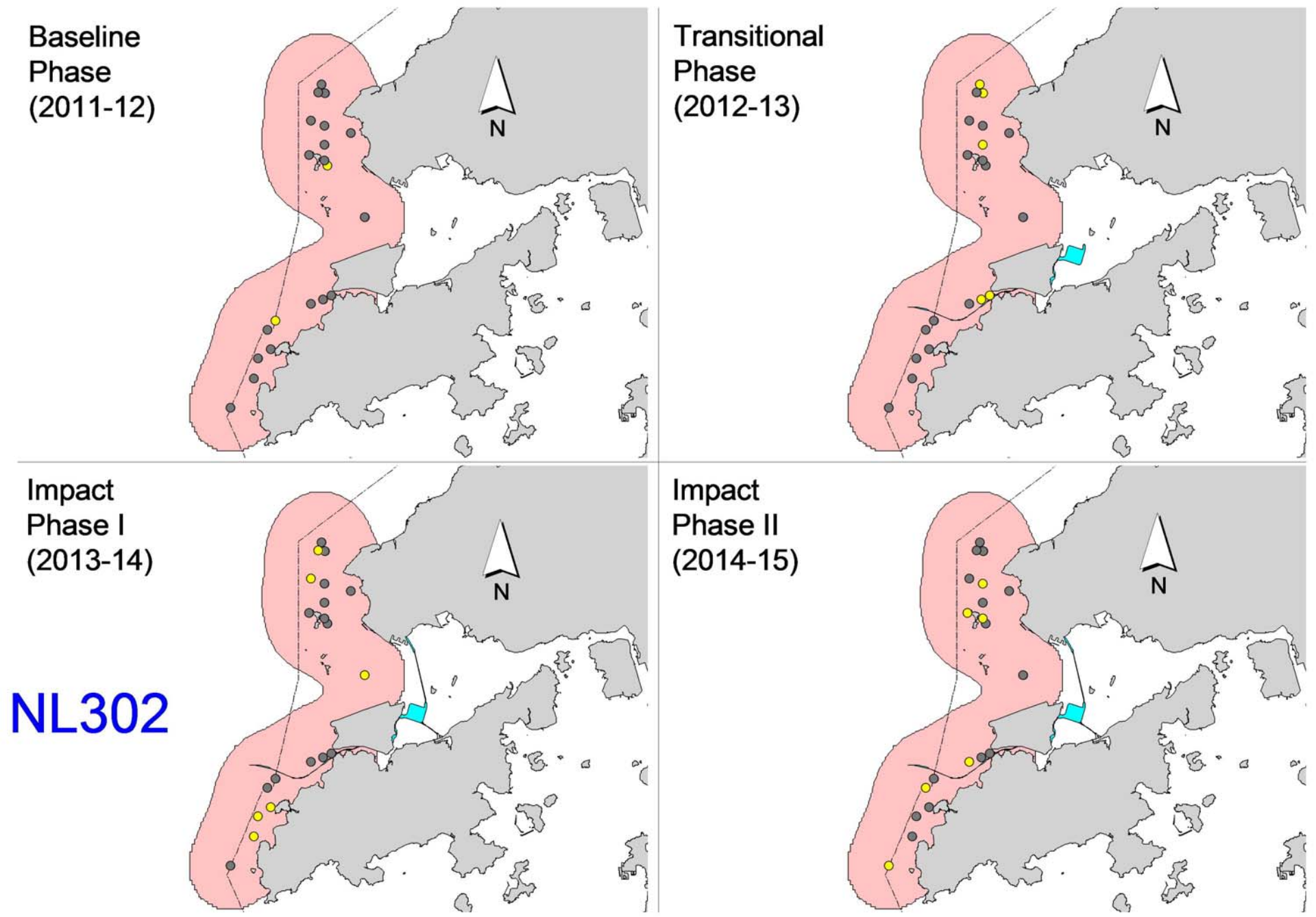


Appendix V. (cont'd)



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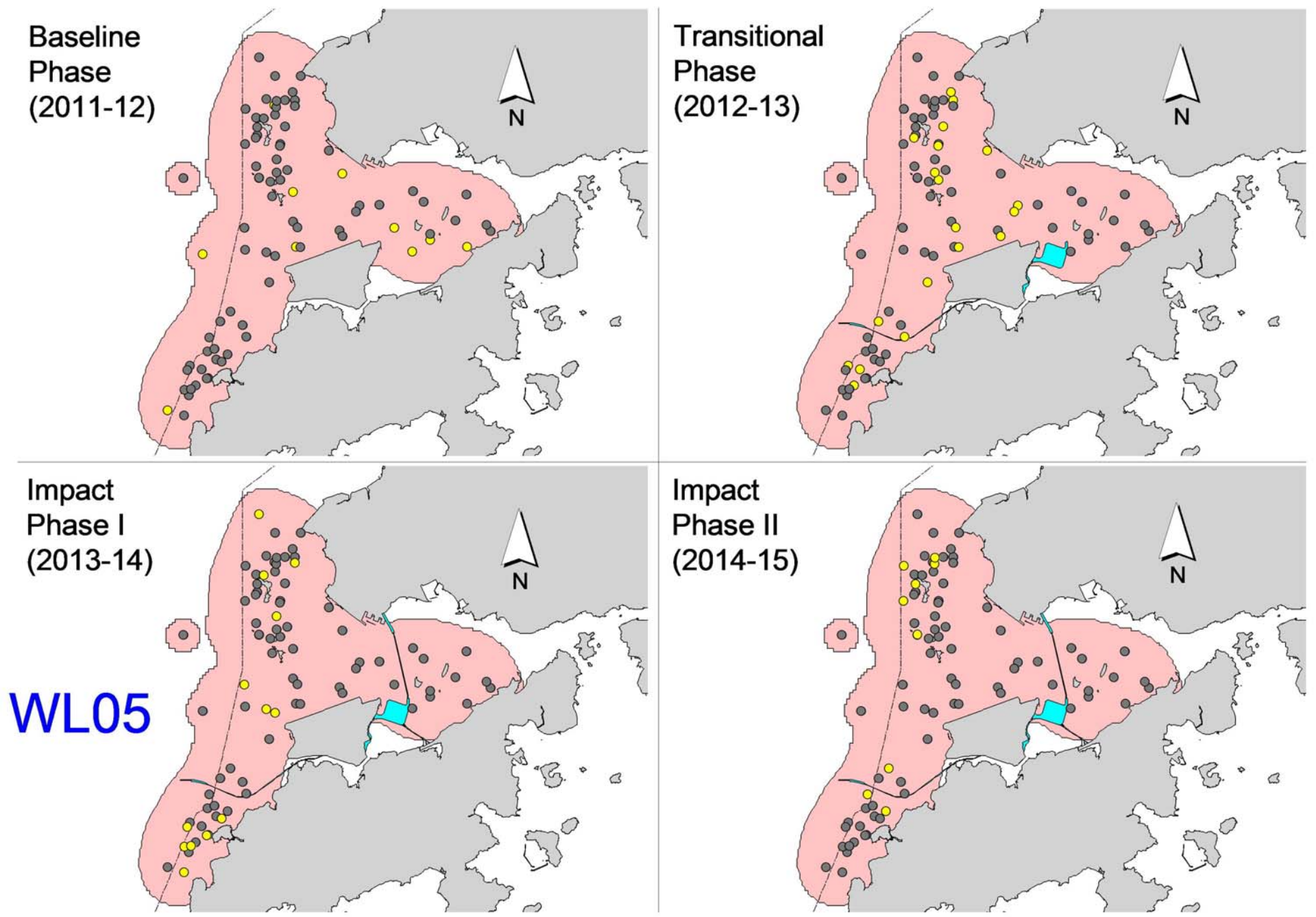

Appendix V. (cont'd)