

## Appendix E

# Impact Dolphin Monitoring Survey

**CONTRACT NO. HY/2012/08**

**Hong Kong-Zhuhai-Macao Bridge Tuen Mun – Chek Lap Kok Link  
(Northern Connection Sub-sea Tunnel Section)  
Chinese White Dolphin Monitoring**

*Sixth Annual Progress Report (November 2018 - October 2019)  
submitted to Dragages – Bouygues Joint Venture & ERM Hong Kong Ltd.*

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

22 January 2021

**1. Introduction**

- 1.1. As part of the Hong Kong-Zhuhai-Macao Bridge, the Tuen Mun-Chek Lap Kok Link (TM-CLKL) Northern Connection Sub-sea Tunnel Section (Contract no. HY/2012/08) comprises the sub-sea TBM tunnels (two tubes with cross passages) across the Urmston Road to connect Tuen Area 40 and Hong Kong Boundary Crossing Facilities (HKBCF) of approximately 4 km in length with dual 2-lane carriageway, the tunnels at both the southern landfall and the northern landfall for construction of approach roads to the sub-sea TBM tunnels of approximately 1.5 km in length, as well as the northern landfall reclamation of approximately 16.5 hectares and about 20.km long seawalls. Dragages – Bouygues Joint Venture (hereinafter called the “Contractor”) was awarded as the main contractor for the Northern Connection Sub-sea Tunnel Section, and ERM Hong Kong Limited would serve as the Environmental Team to implement the Environmental Monitoring and Audit (EM&A) programme.
- 1.2. According to the updated 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.
- 1.3. In November 2013, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by ERM Hong Kong Limited as the dolphin specialist for the TM-CLKL Northern Connection Sub-sea Tunnel Section EM&A project. He is responsible for the dolphin monitoring study, including the data collection on Chinese

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White Dolphins during the construction phase (i.e. impact period) of the TMCLKL08 project in Northwest Lantau (NWL) and Northeast Lantau (NEL) survey areas.

- 1.4. During the construction period of HKLR03/TMCLKL08 projects, the dolphin specialist would be in charge of reviewing and collating data and information collected by HKLR03/ TMCLKL08 dolphin monitoring programme to examine any potential impacts of TMCLKL08 construction works on the dolphins. From the monitoring results, any changes in dolphin occurrence within the study area will be examined for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.
- 1.5. This report is the sixth annual progress report under the TMCLKL08 construction phase dolphin monitoring programme submitted to the Contractor, summarizing the results of the surveys findings during the period of November 2018 to October 2019, utilizing the survey data collected by HKLR03/TMCLKL08 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/TMCLKL08 dolphin monitoring surveys are shown in Table 1.

Table 1 Co-ordinates of transect lines conducted by HKLR03/TMCLKL08 survey teams

Line No.		Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	815456		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805476	820800		14	Start Point	817537	820220
2	End Point	805476	826654		14	End Point	817537	824613
3	Start Point	806464	821150		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	821500		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	821850		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671

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6	Start Point	809490	822150		18	Start Point	821504	822371
6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	822000		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321
8	Start Point	811508	821123		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613
9	Start Point	812516	821303		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	821176		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818853		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807		24	Start Point	805476	815900
12	End Point	815542	824882		24	End Point	805476	819100

- 2.1.2. The HKLR03/TMCLKL08 survey teams 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 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2018). 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.
- 2.1.4. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced 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.
- 2.1.5. 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.

- 2.1.6. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.7. 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.
- 2.1.8. 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/TMCLKL08 survey teams would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.
- 2.2.2. A professional digital camera (*Canon EOS 7D* model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.
- 2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.
- 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/TMCLKL08 dolphin monitoring data collected under the present impact phase (the sixth year of TMCLKL construction; i.e. November 2018 to October 2019). 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 to fifth years of TMCLKL construction (i.e. November 2013 to October 2014, November 2014 to October 2015, November 2015 to October 2016; November 2016 to October 2017; and November 2017 to October 2018).
- 2.3.2. Along with the analyzed results from the baseline and transitional as well as the first five years of impact phase, results from the sixth 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.

#### 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<sup>®</sup> 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 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 ones deduced from the events during the first five years of impact period as well as the



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 dividing 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 12-month impact phase monitoring period were plotted onto 1-km<sup>2</sup> grids among NWL and NEL survey areas on GIS. Sighting densities (number of on-effort sightings per km<sup>2</sup>) and dolphin densities (total number of dolphins from on-effort sightings per km<sup>2</sup>) 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 sightings per 100 units of survey effort. In addition, the derived unit for actual dolphin density was termed DPSE, representing the number of dolphins per 100 units of survey effort. Among the 1-km<sup>2</sup> 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<sup>2</sup> 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 present 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<sup>®</sup> 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 sixth year of TMCLKL impact phase monitoring (i.e. November 2018 to October 2019), a total of 24 sets of systematic line-transect vessel surveys were conducted from the HKLR03/TMCLKL08 monitoring works to cover all transect lines in NWL and NEL survey areas twice per month.
- 3.1.2. From these surveys, a total of 3,181.16 km of survey effort was collected, with 94.9% 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, 1,177.95 km and 2,003.21 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 2,304.73 km, while the effort on secondary lines was 876.43 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/TMCLKL08 monitoring surveys conducted between November 2018 and October 2019, a total of 27 groups of 68 Chinese White Dolphins were sighted. All except three dolphin groups were sighted during on-effort search. Among the 24 on-effort sightings, 19 of them were made on primary lines, while the other five dolphin sightings were made on secondary lines.
- 3.1.5. During this 12-month period, all dolphin sightings were made in NWL, and while none of them were made in NEL. 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/TMCLKL08 monitoring surveys in November 2018 to October 2019 is shown in Figure 1.
- 3.2.2. The majority of dolphin sightings made during the sixth year of impact phase were



concentrated at the northwestern portion of the North Lantau region, with slightly higher concentration at the northern portion of the Sha Chau and Lung Kwu Chau Marine Park (Figure 1). Some sightings were also made near Black Point, at the Urmston Road section between Lung Kwu Tan and Lung Kwu Chau, as well as at the southwestern corner of the NWL survey area (or adjacent to the HKLR09 alignment) (Figure 1).

- 3.2.3. Notably, none of the dolphin groups were sighted in the vicinity of the entire alignment of TMCLKL as well as the reclamation sites of HKLR03 and HKBCF (Figure 1). On the contrary, four sightings were made adjacent to the HKLR09 alignment to the west of Shum Wat (Figure 1). In general, dolphins appeared to have mostly avoided the construction areas of HZMB works during the present impact phase monitoring period, which was consistent with the dolphin distribution during the first five years of the TMCLKL construction works.
- 3.2.4. Dolphin sighting distribution of the present impact phase monitoring period (November 2018 to October 2019) was compared with the ones during the baseline phase (February 2011 to January 2012), the transitional phase (November 2012 to October 2013) and the first five years of impact phase (November 2013 to October 2018) (Figure 2).
- 3.2.5. During the present impact phase period in 2018-19, dolphin distribution was quite similar to the previous four impact phase periods in 2014-15, 2015-16, 2016-17 and 2017-18, with dolphins being largely vacated from the eastern and central portions of the North Lantau region (Figure 2). This 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 six periods of impact phase of TMCLKL construction (Figure 2).
- 3.2.6. The only area where dolphin occurrence was consistently high across the eight periods was around the Lung Kwu Chau area, but even so, such occurrence has been progressively diminishing in past six monitoring periods. This was even more evident in 2018-19 with much lower occurrence in this area (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 five years of impact phases (Table 2).
  - 3.3.2. To facilitate the comparison with the AFCD long-term monitoring results, the encounter rates were also calculated for the same 12-month study period using both primary and secondary survey effort. The encounter rates of sightings (STG) and dolphins (ANI) in NWL were 1.28 sightings and 3.32 dolphins per 100 km of survey effort respectively, while the encounter rates of sightings (STG) and dolphins (ANI) in NEL were both nil with no on-effort sighting being made there in 2018-19.

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

	<b>Encounter rate (STG)</b> (no. of on-effort dolphin sightings per 100 km of survey effort)		<b>Encounter rate (ANI)</b> (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	<b>Northeast Lantau</b>	<b>Northwest Lantau</b>	<b>Northeast Lantau</b>	<b>Northwest Lantau</b>
<b>Impact Phase (2018-19)</b>	0.00	1.42 $\pm$ 1.80	0.00	3.62 $\pm$ 4.93
<b>Impact Phase (2017-18)</b>	0.00	2.68 $\pm$ 3.04	0.00	9.02 $\pm$ 14.63
<b>Impact Phase (2016-17)</b>	0.00	2.35 $\pm$ 2.62	0.00	8.57 $\pm$ 11.05
<b>Impact Phase (2015-16)</b>	0.00	2.10 $\pm$ 1.83	0.00	8.54 $\pm$ 8.53
<b>Impact Phase (2014-15)</b>	0.11 $\pm$ 0.54	2.54 $\pm$ 2.49	0.11 $\pm$ 0.54	11.64 $\pm$ 14.04
<b>Impact Phase (2013-14)</b>	0.22 $\pm$ 0.74	6.93 $\pm$ 4.08	0.76 $\pm$ 2.59	26.31 $\pm$ 17.56
<b>Transitional Phase (2012-13)</b>	1.70 $\pm$ 2.26	7.68 $\pm$ 4.36	4.75 $\pm$ 7.61	27.51 $\pm$ 18.06
<b>Baseline Phase (2011-12)</b>	6.05 $\pm$ 5.04	7.75 $\pm$ 5.69	19.91 $\pm$ 21.30	29.57 $\pm$ 26.96

- 3.3.3. In NEL, the dolphin encounter rates (both STG and ANI) during the sixth year of TMCLKL impact monitoring period were nil as in the previous three 12-month periods in 2015-16, 2016-17 and 2017-18, which was in stark contrast to the averages during the baseline phase and transitional phase (Table 2). Such progressive decline has actually existed in this area since the transitional phase in 2012-13 (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 impact phase periods of TMCLKL construction works, and then to complete absences in the subsequent periods.
- 3.3.4. In NWL, the average dolphin encounter rates (STG and ANI) during the present impact phase monitoring period were much lower (reductions of 81.7% and 87.8% respectively) than the ones recorded in the baseline period, indicating a dramatic decline in dolphin usage of this survey area during the sixth year of TMCLKL impact phase monitoring period (Table 2). Moreover, those encounter rates consistently remained at low levels in the five consecutive 12-month monitoring periods between 2014-19.
- 3.3.5. 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 subsequent monitoring periods during the impact phase. This signaled a further widespread of declining usage by the dolphins throughout the entire North Lantau region with no sign of recovery, even though most marine works associated with the HZMB

construction has been completed.

- 3.3.6. A two-way ANOVA with repeated measures of variance and unequal sample size was conducted to examine whether there were any significant differences in the average encounter rates between the baseline, transitional and the six impact phase periods. The two variables that were examined included the different periods and the two locations (i.e. NEL and NWL).
- 3.3.7. For the comparison between the different monitoring periods, the p-value for the differences in average dolphin encounter rates of STG and ANI were both 0.000000 and 0.000000 respectively. Even if the alpha value is set at 0.00001, significant differences were detected among the different periods in both dolphin encounter rates of STG and ANI.
- 3.4. *Group size*
- 3.4.1. Group size of Chinese White Dolphins ranged from singletons to seven individuals per group in North Lantau region during November 2018 – October 2019. The average dolphin group sizes from the 12-month impact phase monitoring period were compared with the ones deduced from baseline, transitional and first five years of impact phases, as shown in Table 3.

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

	Average Dolphin Group Size		
	Overall	Northeast Lantau	Northwest Lantau
<b>Impact Phase (2018-19)</b>	2.52 $\pm$ 1.45 (n = 27)	0.00	2.52 $\pm$ 1.45 (n = 27)
<b>Impact Phase (2017-18)</b>	3.12 $\pm$ 2.86 (n = 42)	0.00	3.12 $\pm$ 2.86 (n = 42)
<b>Impact Phase (2016-17)</b>	3.51 $\pm$ 2.68 (n = 43)	0.00	3.51 $\pm$ 2.68 (n = 43)
<b>Impact Phase (2015-16)</b>	3.73 $\pm$ 3.14 (n = 45)	1.00 (n = 1)	3.80 $\pm$ 3.14 (n = 44)
<b>Impact Phase (2014-15)</b>	4.24 $\pm$ 3.15 (n = 54)	1.00 (n = 1)	4.30 $\pm$ 3.15 (n = 53)
<b>Impact Phase (2013-14)</b>	3.76 $\pm$ 2.57 (n = 136)	5.00 $\pm$ 2.71 (n = 4)	3.73 $\pm$ 2.57 (n = 132)
<b>Transitional Phase (2012-13)</b>	3.37 $\pm$ 2.98 (n = 186)	2.64 $\pm$ 2.38 (n = 22)	3.47 $\pm$ 3.05 (n = 164)
<b>Baseline Phase (2011-12)</b>	3.32 $\pm$ 2.86 (n = 288)	2.80 $\pm$ 2.35 (n = 79)	3.52 $\pm$ 3.01 (n = 209)

- 3.4.2. The average dolphin group sizes in NWL waters (and also the entire North Lantau region) during the present impact phase monitoring period were the lowest among all six impact

phase monitoring periods as well as the baseline and transitional phases (Table 3).

- 3.4.3. Among the 27 dolphin groups sighted during the impact phase, 24 of them were composed of 1-4 individuals only, while there were three groups with more than 5 animals, including two groups with five animals each and one group of seven animals (Appendix II).
- 3.4.4. Distribution of dolphins with larger group sizes (i.e. five individuals or more per group) during the present impact phase is shown in Figure 3, with comparison to the ones in the first five years of impact phase, transitional phase and baseline phase. During the impact phase in 2018-19, distribution of the three larger dolphin groups were scattered in the northwestern portion of the NWL survey area with no particular concentration (Figure 3).
- 3.4.5. Throughout the six impact phases, distribution of these larger groups has been consistently confined to the northwestern portion of North Lantau region. Such limited distribution was drastically different from the baseline phase, when the larger dolphin groups were distributed more evenly in NWL waters with many of them also sighted in NEL waters (Figure 3).
- 3.5. *Habitat use*
- 3.5.1. During the present impact phase monitoring period in 2018-19, only 19 grids recorded dolphin densities and all of these grids were with low to moderately low densities (Figures 4a and 4b). Moreover, all grids near the HKLR03 and HKBCF reclamation sites as well as the entire alignment of TMCLKL did not record any presence of dolphins in the present 12-month impact monitoring period in 2018-19 (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 during the transitional phase and the subsequent six 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 complete absence of dolphin in this area during the present and previous three impact phase periods (Figure 5).
- 3.5.3. Moreover, dolphin usage of NWL waters has also declined dramatically during the recent monitoring periods (including the present one in 2018-19), with only slightly higher densities occurred near Lung Kwu Chau. This is in contrast to a more evenly spread usage in NWL during the baseline phase, transitional phase and the first year of impact phase monitoring (Figure 5). Apparently, there has been a more widespread decline of dolphin usage throughout the North Lantau waters in the past five years of the impact monitoring periods, to the lowest level in 2018-19.
- 3.6. *Mother-calf pairs*
- 3.6.1. During the present 12-month impact phase monitoring period, one unspotted juvenile (UJ) was sighted near the HKLR09 alignment at the southwestern corner of the NWL survey area (Figure 6). Notably, the extremely low occurrence of young calves have been persistent in recent impact phase monitoring periods between 2014-19, ranging from 0%

in 2015-16 and 2017-18 to 1.5% in 2018-19, when compared to the higher percentages during the first impact phase monitoring period of 2013-14 (5.7%), transitional phase (6.7%) and baseline phase (4.5%).

- 3.6.2. The very rare occurrence of young calves in North Lantau region in the past five 12-month periods was drastically different from the distribution patterns observed during the baseline and transitional phases when the young calves were sighted throughout NWL waters (Figure 6).
- 3.7. *Activities and associations with fishing boats*
- 3.7.1. A total of five dolphin sightings were associated with feeding activities during the 2018-19 impact phase monitoring period. Even though the percentage of sightings associated with feeding activities during the present impact phase period (18.5%) was similar to the impact phase period in 2016-17 (18.6%) and higher than the baseline period (12.8%), transitional period (8.6%) as well as the other impact phase periods (5.9-11.1%), it should be considered that the sample size in 2018-19 was much smaller than all other periods.
- 3.7.2. Only one dolphin sighting was associated with socializing activities in 2018-19. With the exception of 2016-17 monitoring period (with no sighting associated with socializing activity), the percentage of such sightings in 2018-19 (3.7%), was lower than all other impact monitoring periods (2017-18 (4.8%), 2015-16 (8.9%), 2014-15 (5.5%) and 2013-14 (5.9%)) as well as the transitional period (6.4%) and the baseline period (3.8%). Notably, none of the 27 dolphin groups was engaged in traveling or resting/milling activities in 2018-19.
- 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 five groups engaged in feeding activities were scattered near Black Point, to the north of Lung Kwu Chau and third runway expansion construction site, as well as near the HKLR09 alignment (Figure). On the other hand, the only group engaged in socializing activity was found to the north of Lung Kwu Chau at the mouth of Deep Bay.
- 3.7.4. The comparison in distribution of dolphins engaged in different activities during different monitoring phases revealed that feeding activities were more frequently sighted during the baseline and transitional periods along the Urmston Road, within the Sha Chau and Lung Kwu Chau Marine Park, to the west of the airport platform and around the Brothers Islands, while the socializing activities were more scattered throughout the North Lantau region for these periods (Figure 7). It is apparent that the “hotspots” where dolphins engaged in different activities were considerably different between the baseline, transitional and the six impact phase periods.
- 3.7.5. Notably, none of the 27 dolphin groups sighted during the impact phase monitoring period in 2018-19 was found to be associated with any operating fishing vessel. The extremely rare events of fishing boat associations by the dolphins during the six 12-month 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.



#### 3.8. *Summary of photo-identification works*

3.8.1. During the 12-month impact phase monitoring period in 2018-19, a total of 22 individuals sighted 49 times altogether were identified (see Appendix III). All of these re-sightings were made in NWL.

3.8.2. More than two-thirds of the 22 identified individuals were sighted only once or twice, but there were six individuals that were sighted more frequently during the 12-month period. For example, CH34, NL136, and NL182 were sighted 4-5 times, while NL123 and NL202 were sighted six and seven times respectively in 2018-19. Their relatively more frequent occurrences during the sixth year of impact phase monitoring indicated stronger reliance of NWL waters as part of their home ranges.

3.8.3. Notably, a total of four well-recognized females (i.e. NL33, NL202, WL98, WL145) were accompanied with their calves during their re-sightings, but the calves of NL33 and NL202 (i.e. NL322 and NL286 respectively) are older and already in their juvenile stage.

#### 3.9. *Individual range use*

3.9.1. Ranging patterns of the 22 individuals identified during the 12-month impact phase monitoring period in 2018-19 were determined by fixed kernel method, and are shown in Appendix IV.

3.9.2. Most identified dolphins sighted within this 12-month period were utilizing their ranges primarily in NWL, but eight individuals (NL293, NL331, WL98, WL145, WL218, WL243, WL273 and WL281) were sighted in NWL waters in 2018-19 but have primarily utilized WL waters in the past (Appendix IV). Moreover, 10 of the 27 individuals have occurred in both North and West Lantau waters based on the HKLR09 monitoring data collected concurrently during the same 12-month period in 2018-19. On the contrary, all identified dolphins have avoided the NEL waters, the area where many of them have utilized as their core areas of activities before the HZMB construction.

3.9.3. Temporal changes in range use of eight individual dolphins that have consistently occurred in baseline phase, transitional phase and all six periods of impact phases were examined in details (Appendix V). It is apparent that six of them have gradually shifted their range use away from their previously important habitat in NEL since 2013-14, and have been completely absent from there in the recent impact phase periods (Appendix V).

3.9.4. Moreover, some individual dolphins have gradually diminished their utilization of NWL waters during the TMCLKL impact phases, and at the same time some of them (e.g. NL33, NL123) have increased their utilization of WL waters (Appendix V).

3.9.5. On the contrary, two individuals (NL202 and NL286) did not record any change in their range use throughout different periods. Moreover, five individuals (e.g. CH34, NL98, NL286) have utilized Lantau waters less in recent years (Appendix V).

3.9.6. The abovementioned temporal changes in individual range use should be continuously monitored for the rest of the TMCLKL construction period, as 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 sixth 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 northern connection sub-sea tunnel section 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

- Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.
- Hung, S. K. 2018. Monitoring of marine mammals in Hong Kong waters: final report (2017-18). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 174 pp.
- Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.



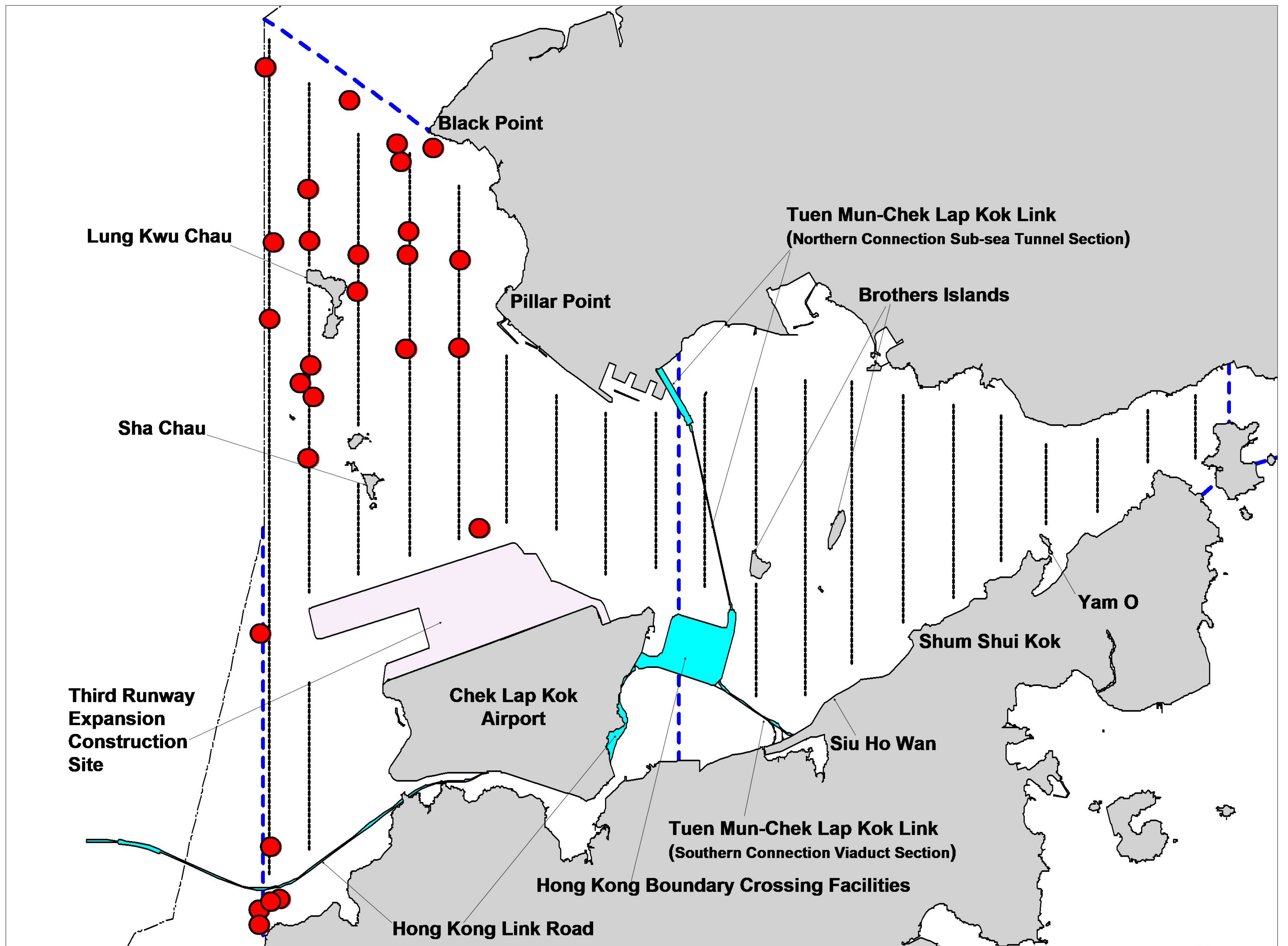


Figure 1. Distribution of Chinese white dolphin sightings in North Lantau region during the sixth year of TMCLKL construction works (November 2018 to October 2019), utilizing the HKLR03/TMCLKL08 monitoring data



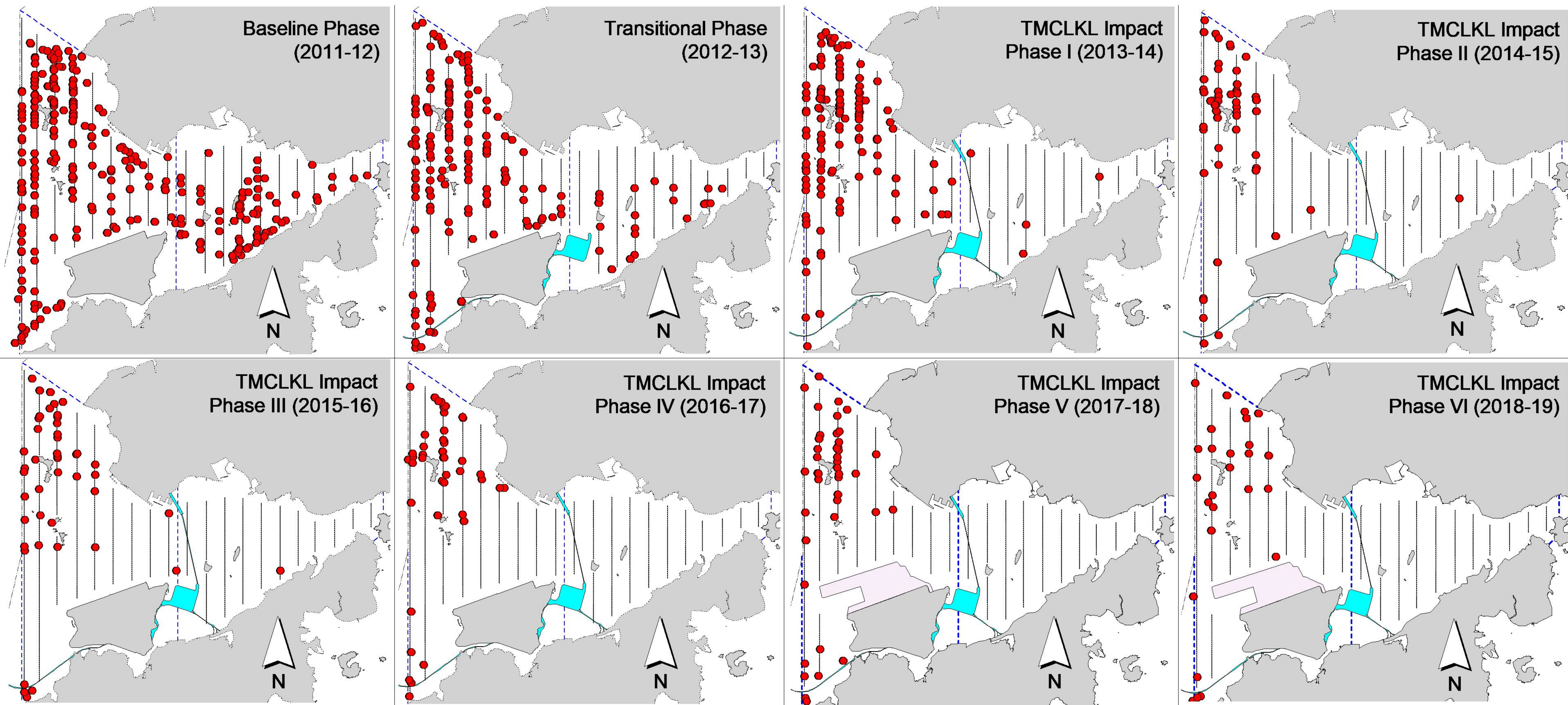


Figure 2. A comparison on distribution of Chinese white dolphin sightings in North Lantau region during the baseline (2011-12), transitional (2012-13) and six impact phases (2013-14, 2014-15, 2015-16, 2016-17, 2017-18 & 2018-19) of TMCLKL construction works



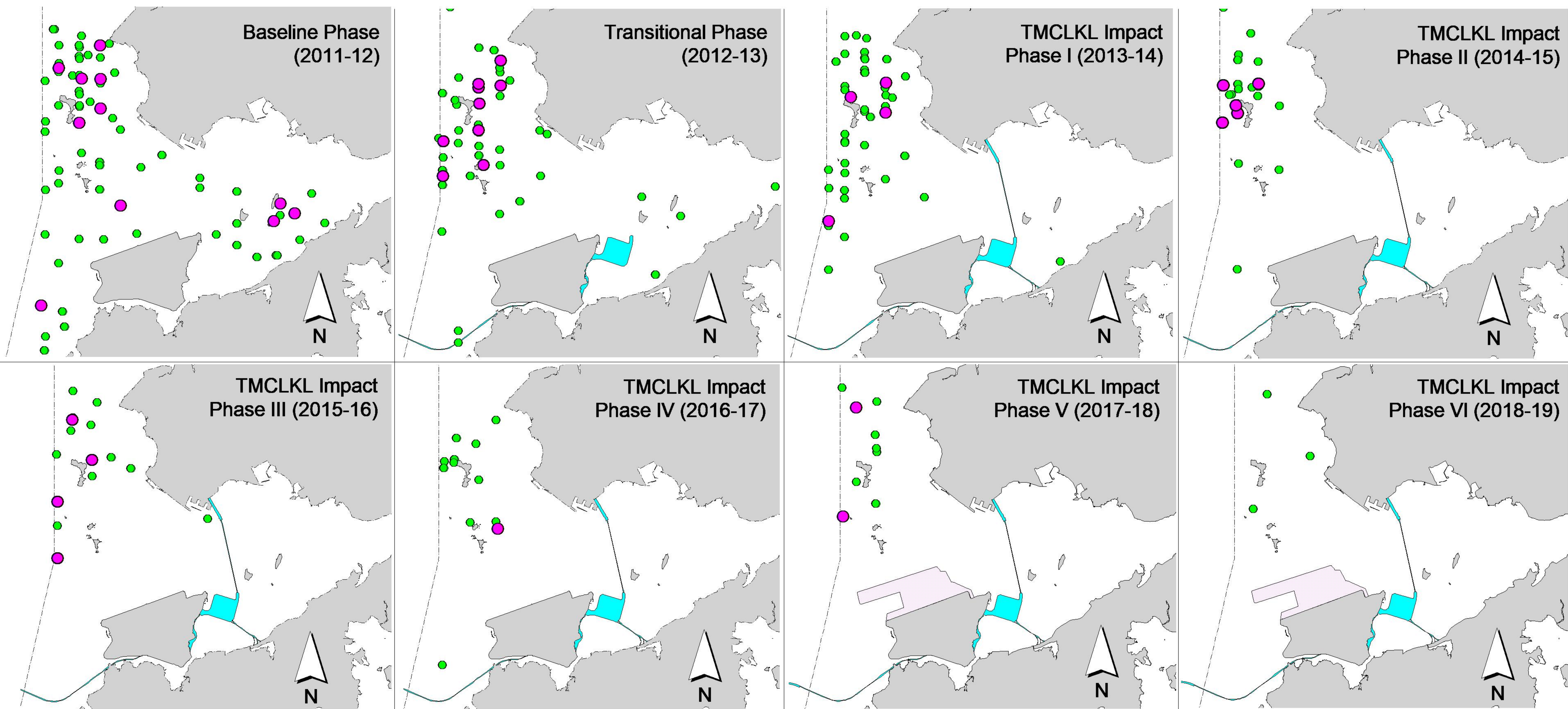


Figure 3. Distribution of dolphins with larger group sizes during different phases of TMCLKL construction works (green dots: group sizes of 5 or more; purple dots: group sizes of 10 or more)



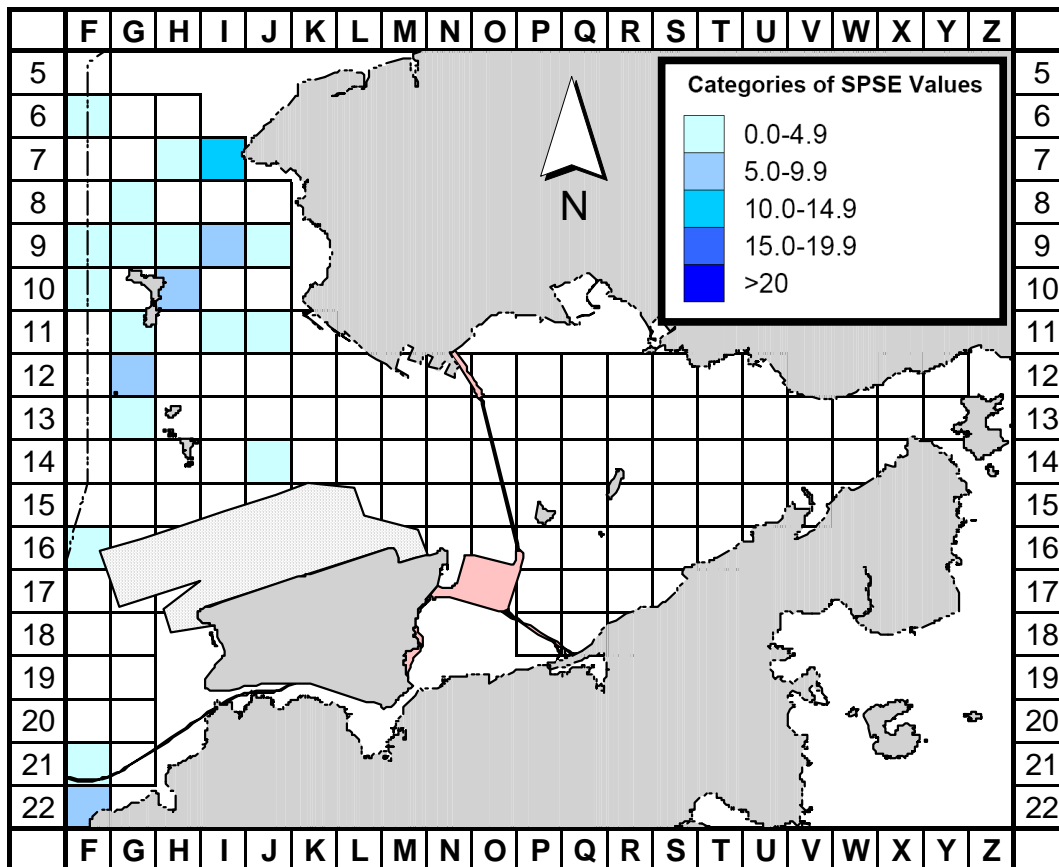


Figure 4a. Sighting density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northeast and Northwest Lantau survey areas, using data collected during HKLR03/TMCLKL08 impact monitoring period (Nov18 - Oct19) (SPSE = no. of on-effort sightings per 100 units of survey effort)

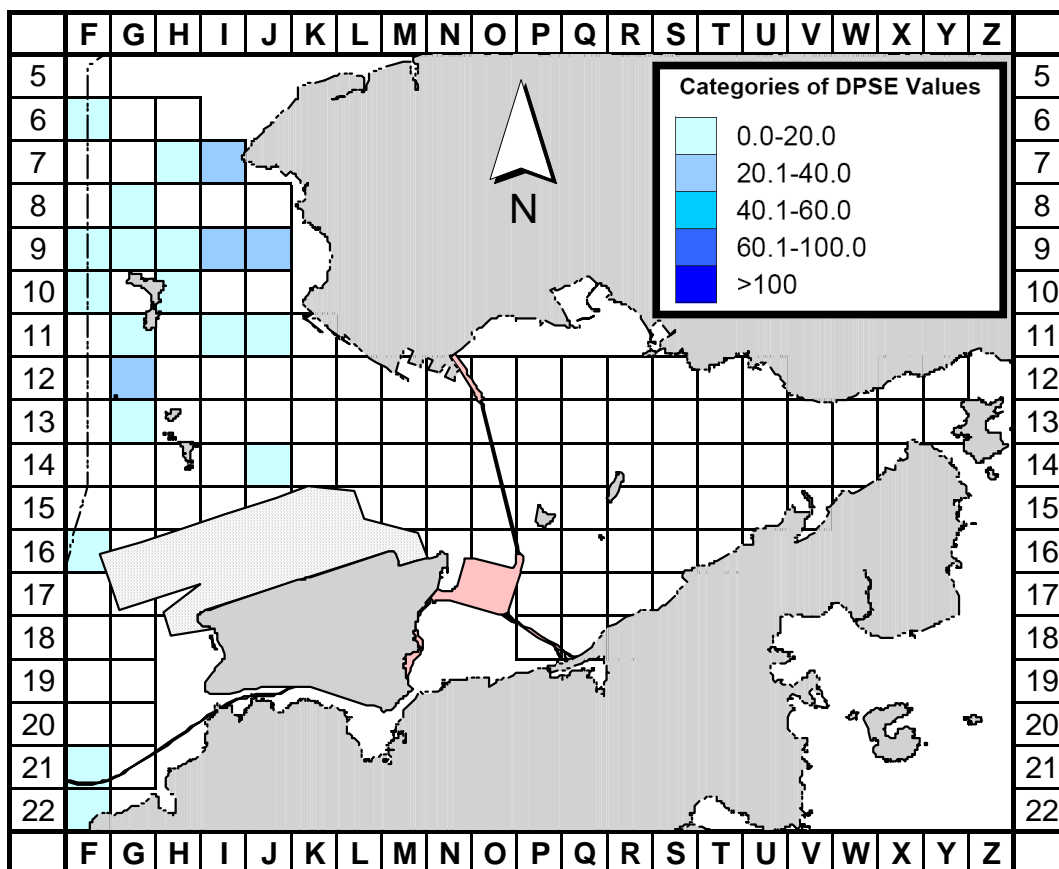


Figure 4b. Density of Chinese white dolphins with corrected survey effort per km<sup>2</sup> in Northeast and Northwest Lantau survey areas, using data collected during HKLR03/TMCLKL08 impact monitoring period (Nov18 -Oct19) (DPSE = no. of dolphins per 100 units of survey effort)

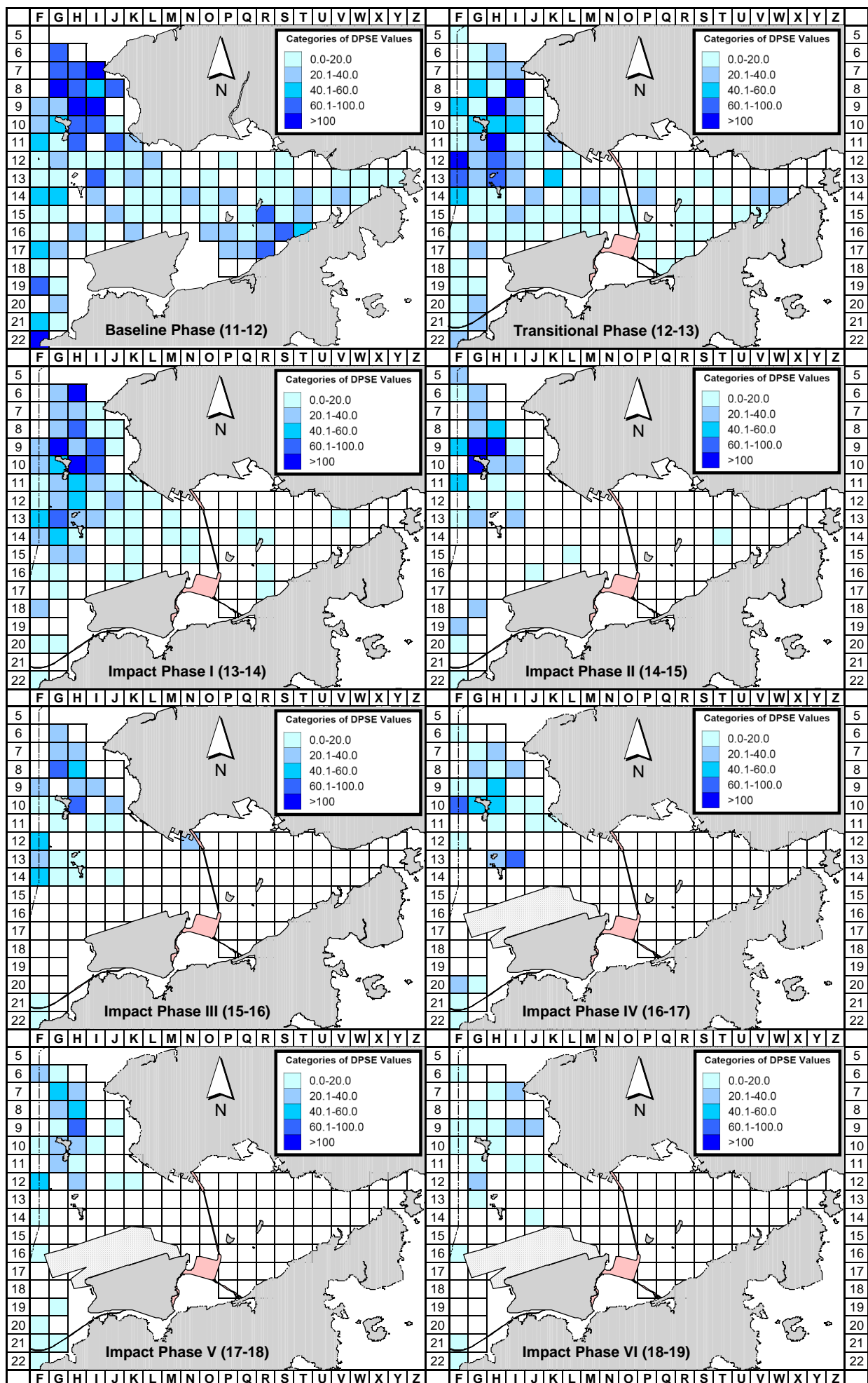


Figure 5. Comparison of density of Chinese white dolphins with corrected survey effort per  $\text{km}^2$  in NWL and NEL survey areas between the six impact phases of TMCLKL (2013-14, 2014-15, 2015-16, 2016-17, 2017-18 & 2018-19), transitional phase (2012-13) & baseline phase (Feb11-Jan12) monitoring periods (DPSE = no. of dolphins per 100 units of survey effort)



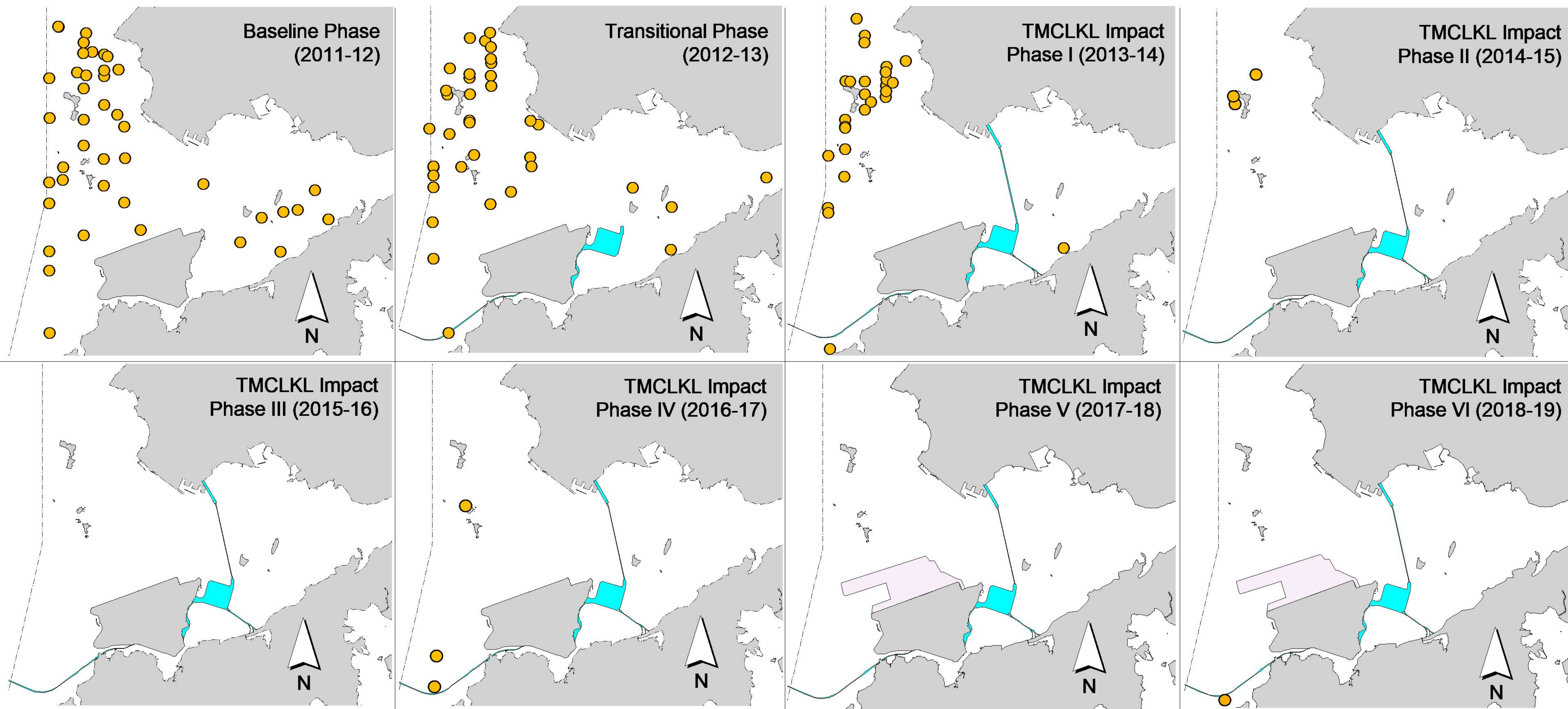


Figure 6. Distribution of young calves of Chinese white dolphins during different phases of TMCLKL construction works



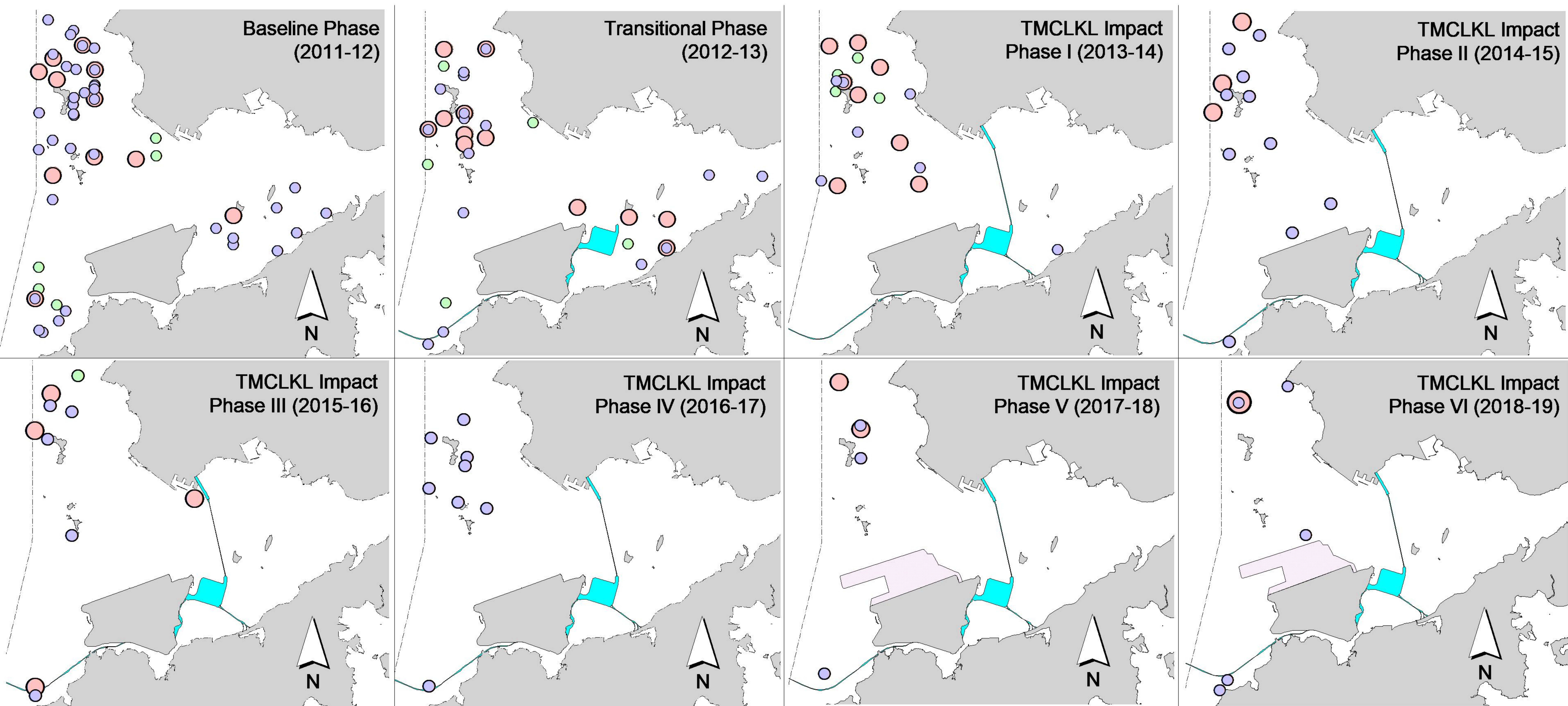


Figure 7. Distribution of dolphins engaged in feeding (purple dots), socializing (pink dots) and traveling (green dots) activities during different phases of TMCLKL construction works



## Appendix I. HKLR03/TMCLKL08 Survey Effort Database (Nov 2018-Oct 2019)

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

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
1-Nov-18	NE LANTAU	2	10.78	AUTUMN	STANDARD36826	HKLR	P
1-Nov-18	NE LANTAU	3	19.78	AUTUMN	STANDARD36826	HKLR	P
1-Nov-18	NE LANTAU	4	6.85	AUTUMN	STANDARD36826	HKLR	P
1-Nov-18	NE LANTAU	2	4.88	AUTUMN	STANDARD36826	HKLR	S
1-Nov-18	NE LANTAU	3	7.41	AUTUMN	STANDARD36826	HKLR	S
6-Nov-18	NW LANTAU	2	32.12	AUTUMN	STANDARD36826	HKLR	P
6-Nov-18	NW LANTAU	3	19.50	AUTUMN	STANDARD36826	HKLR	P
6-Nov-18	NW LANTAU	4	6.80	AUTUMN	STANDARD36826	HKLR	P
6-Nov-18	NW LANTAU	2	17.37	AUTUMN	STANDARD36826	HKLR	S
6-Nov-18	NW LANTAU	3	7.91	AUTUMN	STANDARD36826	HKLR	S
6-Nov-18	NW LANTAU	4	2.70	AUTUMN	STANDARD36826	HKLR	S
8-Nov-18	NW LANTAU	3	9.12	AUTUMN	STANDARD36826	HKLR	P
8-Nov-18	NW LANTAU	4	16.42	AUTUMN	STANDARD36826	HKLR	P
8-Nov-18	NW LANTAU	5	1.50	AUTUMN	STANDARD36826	HKLR	P
8-Nov-18	NW LANTAU	3	5.80	AUTUMN	STANDARD36826	HKLR	S
8-Nov-18	NW LANTAU	4	5.75	AUTUMN	STANDARD36826	HKLR	S
8-Nov-18	NW LANTAU	5	1.40	AUTUMN	STANDARD36826	HKLR	S
8-Nov-18	NE LANTAU	2	21.83	AUTUMN	STANDARD36826	HKLR	P
8-Nov-18	NE LANTAU	3	13.92	AUTUMN	STANDARD36826	HKLR	P
8-Nov-18	NE LANTAU	4	1.30	AUTUMN	STANDARD36826	HKLR	P
8-Nov-18	NE LANTAU	2	7.10	AUTUMN	STANDARD36826	HKLR	S
8-Nov-18	NE LANTAU	3	5.64	AUTUMN	STANDARD36826	HKLR	S
8-Nov-18	NE LANTAU	4	0.81	AUTUMN	STANDARD36826	HKLR	S
13-Nov-18	NW LANTAU	2	18.07	AUTUMN	STANDARD36826	HKLR	P
13-Nov-18	NW LANTAU	3	14.72	AUTUMN	STANDARD36826	HKLR	P
13-Nov-18	NW LANTAU	2	6.80	AUTUMN	STANDARD36826	HKLR	S
13-Nov-18	NW LANTAU	3	1.71	AUTUMN	STANDARD36826	HKLR	S
3-Dec-18	NW LANTAU	2	27.00	WINTER	STANDARD36826	HKLR	P
3-Dec-18	NW LANTAU	3	4.18	WINTER	STANDARD36826	HKLR	P
3-Dec-18	NW LANTAU	2	10.68	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NW LANTAU	3	19.43	WINTER	STANDARD36826	HKLR	P
5-Dec-18	NW LANTAU	4	9.90	WINTER	STANDARD36826	HKLR	P
5-Dec-18	NW LANTAU	3	6.57	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NW LANTAU	4	4.30	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NE LANTAU	2	8.60	WINTER	STANDARD36826	HKLR	P
5-Dec-18	NE LANTAU	3	26.18	WINTER	STANDARD36826	HKLR	P
5-Dec-18	NE LANTAU	4	1.10	WINTER	STANDARD36826	HKLR	P
5-Dec-18	NE LANTAU	2	6.60	WINTER	STANDARD36826	HKLR	S
5-Dec-18	NE LANTAU	3	6.22	WINTER	STANDARD36826	HKLR	S
10-Dec-18	NW LANTAU	2	13.34	WINTER	STANDARD36826	HKLR	P
10-Dec-18	NW LANTAU	3	22.85	WINTER	STANDARD36826	HKLR	P
10-Dec-18	NW LANTAU	2	8.98	WINTER	STANDARD36826	HKLR	S
10-Dec-18	NW LANTAU	3	1.73	WINTER	STANDARD36826	HKLR	S
12-Dec-18	NW LANTAU	2	7.60	WINTER	STANDARD36826	HKLR	P
12-Dec-18	NW LANTAU	3	10.12	WINTER	STANDARD36826	HKLR	P
12-Dec-18	NW LANTAU	4	7.55	WINTER	STANDARD36826	HKLR	P
12-Dec-18	NW LANTAU	2	2.10	WINTER	STANDARD36826	HKLR	S
12-Dec-18	NW LANTAU	3	6.10	WINTER	STANDARD36826	HKLR	S
12-Dec-18	NW LANTAU	4	2.53	WINTER	STANDARD36826	HKLR	S
12-Dec-18	NE LANTAU	2	33.02	WINTER	STANDARD36826	HKLR	P
12-Dec-18	NE LANTAU	3	2.59	WINTER	STANDARD36826	HKLR	P
12-Dec-18	NE LANTAU	2	12.69	WINTER	STANDARD36826	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
2-Jan-19	NW LANTAU	2	5.20	WINTER	STANDARD36826	HKLR	P
2-Jan-19	NW LANTAU	3	23.70	WINTER	STANDARD36826	HKLR	P
2-Jan-19	NW LANTAU	2	5.40	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NW LANTAU	3	3.96	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NW LANTAU	4	2.14	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NE LANTAU	2	17.54	WINTER	STANDARD36826	HKLR	P
2-Jan-19	NE LANTAU	3	17.80	WINTER	STANDARD36826	HKLR	P
2-Jan-19	NE LANTAU	2	8.76	WINTER	STANDARD36826	HKLR	S
2-Jan-19	NE LANTAU	3	5.80	WINTER	STANDARD36826	HKLR	S
3-Jan-19	NW LANTAU	2	31.36	WINTER	STANDARD36826	HKLR	P
3-Jan-19	NW LANTAU	2	11.88	WINTER	STANDARD36826	HKLR	S
7-Jan-19	NW LANTAU	2	21.80	WINTER	STANDARD36826	HKLR	P
7-Jan-19	NW LANTAU	3	10.90	WINTER	STANDARD36826	HKLR	P
7-Jan-19	NW LANTAU	2	2.20	WINTER	STANDARD36826	HKLR	S
7-Jan-19	NW LANTAU	3	9.60	WINTER	STANDARD36826	HKLR	S
7-Jan-19	NE LANTAU	2	35.83	WINTER	STANDARD36826	HKLR	P
7-Jan-19	NE LANTAU	2	12.07	WINTER	STANDARD36826	HKLR	S
14-Jan-19	NW LANTAU	2	26.88	WINTER	STANDARD36826	HKLR	P
14-Jan-19	NW LANTAU	2	13.92	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NW LANTAU	2	6.59	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NW LANTAU	3	20.70	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NW LANTAU	4	5.70	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NW LANTAU	1	1.06	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NW LANTAU	2	5.60	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NW LANTAU	3	4.30	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NE LANTAU	1	2.60	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NE LANTAU	2	33.86	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NE LANTAU	1	2.30	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NE LANTAU	2	10.14	WINTER	STANDARD36826	HKLR	S
14-Feb-19	NW LANTAU	2	11.58	WINTER	STANDARD36826	HKLR	P
14-Feb-19	NW LANTAU	3	12.95	WINTER	STANDARD36826	HKLR	P
14-Feb-19	NW LANTAU	4	3.30	WINTER	STANDARD36826	HKLR	P
14-Feb-19	NW LANTAU	2	1.76	WINTER	STANDARD36826	HKLR	S
14-Feb-19	NW LANTAU	3	7.76	WINTER	STANDARD36826	HKLR	S
20-Feb-19	NW LANTAU	2	15.35	WINTER	STANDARD36826	HKLR	P
20-Feb-19	NW LANTAU	3	12.38	WINTER	STANDARD36826	HKLR	P
20-Feb-19	NW LANTAU	2	7.25	WINTER	STANDARD36826	HKLR	S
20-Feb-19	NW LANTAU	3	5.06	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NW LANTAU	2	27.52	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NW LANTAU	3	5.53	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NW LANTAU	2	11.35	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NE LANTAU	1	4.41	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NE LANTAU	2	15.20	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NE LANTAU	1	6.35	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NE LANTAU	2	5.24	WINTER	STANDARD36826	HKLR	S
26-Feb-19	NE LANTAU	3	12.70	WINTER	STANDARD36826	HKLR	P
26-Feb-19	NE LANTAU	4	3.51	WINTER	STANDARD36826	HKLR	P
26-Feb-19	NE LANTAU	5	1.64	WINTER	STANDARD36826	HKLR	P
26-Feb-19	NE LANTAU	3	8.80	WINTER	STANDARD36826	HKLR	S
26-Feb-19	NE LANTAU	4	0.55	WINTER	STANDARD36826	HKLR	S
4-Mar-19	NW LANTAU	2	11.18	SPRING	STANDARD36826	HKLR	P
4-Mar-19	NW LANTAU	3	20.02	SPRING	STANDARD36826	HKLR	P
4-Mar-19	NW LANTAU	2	8.70	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NW LANTAU	3	2.90	SPRING	STANDARD36826	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-Mar-19	NE LANTAU	2	4.90	SPRING	STANDARD36826	HKLR	P
4-Mar-19	NE LANTAU	3	19.04	SPRING	STANDARD36826	HKLR	P
4-Mar-19	NE LANTAU	4	9.20	SPRING	STANDARD36826	HKLR	P
4-Mar-19	NE LANTAU	2	2.97	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NE LANTAU	3	6.69	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NE LANTAU	4	2.30	SPRING	STANDARD36826	HKLR	S
11-Mar-19	NW LANTAU	2	26.50	SPRING	STANDARD36826	HKLR	P
11-Mar-19	NW LANTAU	2	14.30	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NW LANTAU	1	2.59	SPRING	STANDARD36826	HKLR	P
13-Mar-19	NW LANTAU	2	21.23	SPRING	STANDARD36826	HKLR	P
13-Mar-19	NW LANTAU	3	7.50	SPRING	STANDARD36826	HKLR	P
13-Mar-19	NW LANTAU	1	3.40	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NW LANTAU	2	4.45	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NW LANTAU	3	4.60	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NE LANTAU	2	17.90	SPRING	STANDARD36826	HKLR	P
13-Mar-19	NE LANTAU	3	18.05	SPRING	STANDARD36826	HKLR	P
13-Mar-19	NE LANTAU	2	10.55	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NE LANTAU	3	1.90	SPRING	STANDARD36826	HKLR	S
18-Mar-19	NW LANTAU	2	19.21	SPRING	STANDARD36826	HKLR	P
18-Mar-19	NW LANTAU	3	8.19	SPRING	STANDARD36826	HKLR	P
18-Mar-19	NW LANTAU	2	9.25	SPRING	STANDARD36826	HKLR	S
18-Mar-19	NW LANTAU	3	1.55	SPRING	STANDARD36826	HKLR	S
10-Apr-19	NE LANTAU	1	4.30	SPRING	STANDARD36826	HKLR	P
10-Apr-19	NE LANTAU	2	32.38	SPRING	STANDARD36826	HKLR	P
10-Apr-19	NE LANTAU	2	13.15	SPRING	STANDARD36826	HKLR	S
10-Apr-19	NE LANTAU	3	0.77	SPRING	STANDARD36826	HKLR	S
10-Apr-19	NW LANTAU	2	4.14	SPRING	STANDARD36826	HKLR	P
10-Apr-19	NW LANTAU	3	21.86	SPRING	STANDARD36826	HKLR	P
10-Apr-19	NW LANTAU	4	1.50	SPRING	STANDARD36826	HKLR	P
10-Apr-19	NW LANTAU	2	3.74	SPRING	STANDARD36826	HKLR	S
10-Apr-19	NW LANTAU	3	8.86	SPRING	STANDARD36826	HKLR	S
15-Apr-19	NW LANTAU	2	2.50	SPRING	STANDARD36826	HKLR	P
15-Apr-19	NW LANTAU	3	17.18	SPRING	STANDARD36826	HKLR	P
15-Apr-19	NW LANTAU	4	13.38	SPRING	STANDARD36826	HKLR	P
15-Apr-19	NW LANTAU	2	3.37	SPRING	STANDARD36826	HKLR	S
15-Apr-19	NW LANTAU	3	5.37	SPRING	STANDARD36826	HKLR	S
15-Apr-19	NW LANTAU	4	2.10	SPRING	STANDARD36826	HKLR	S
23-Apr-19	NW LANTAU	2	20.00	SPRING	STANDARD36826	HKLR	P
23-Apr-19	NW LANTAU	3	8.13	SPRING	STANDARD36826	HKLR	P
23-Apr-19	NW LANTAU	2	8.17	SPRING	STANDARD36826	HKLR	S
23-Apr-19	NW LANTAU	3	2.90	SPRING	STANDARD36826	HKLR	S
23-Apr-19	NE LANTAU	2	34.43	SPRING	STANDARD36826	HKLR	P
23-Apr-19	NE LANTAU	3	2.70	SPRING	STANDARD36826	HKLR	P
23-Apr-19	NE LANTAU	2	13.81	SPRING	STANDARD36826	HKLR	S
25-Apr-19	NW LANTAU	2	20.27	SPRING	STANDARD36826	HKLR	P
25-Apr-19	NW LANTAU	3	12.70	SPRING	STANDARD36826	HKLR	P
25-Apr-19	NW LANTAU	2	13.23	SPRING	STANDARD36826	HKLR	S
2-May-19	NW LANTAU	2	22.59	SPRING	STANDARD36826	HKLR	P
2-May-19	NW LANTAU	3	4.80	SPRING	STANDARD36826	HKLR	P
2-May-19	NW LANTAU	2	9.51	SPRING	STANDARD36826	HKLR	S
2-May-19	NW LANTAU	3	2.80	SPRING	STANDARD36826	HKLR	S
2-May-19	NE LANTAU	2	22.54	SPRING	STANDARD36826	HKLR	P
2-May-19	NE LANTAU	3	13.82	SPRING	STANDARD36826	HKLR	P
2-May-19	NE LANTAU	2	12.74	SPRING	STANDARD36826	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
7-May-19	NW LANTAU	2	14.50	SPRING	STANDARD36826	HKLR	P
7-May-19	NW LANTAU	3	16.55	SPRING	STANDARD36826	HKLR	P
7-May-19	NW LANTAU	4	0.90	SPRING	STANDARD36826	HKLR	P
7-May-19	NW LANTAU	2	8.25	SPRING	STANDARD36826	HKLR	S
7-May-19	NW LANTAU	3	2.00	SPRING	STANDARD36826	HKLR	S
21-May-19	NE LANTAU	2	27.09	SPRING	STANDARD36826	HKLR	P
21-May-19	NE LANTAU	3	9.40	SPRING	STANDARD36826	HKLR	P
21-May-19	NE LANTAU	2	11.51	SPRING	STANDARD36826	HKLR	S
21-May-19	NE LANTAU	3	1.20	SPRING	STANDARD36826	HKLR	S
21-May-19	NW LANTAU	2	9.44	SPRING	STANDARD36826	HKLR	P
21-May-19	NW LANTAU	3	19.68	SPRING	STANDARD36826	HKLR	P
21-May-19	NW LANTAU	4	1.20	SPRING	STANDARD36826	HKLR	P
21-May-19	NW LANTAU	2	8.58	SPRING	STANDARD36826	HKLR	S
21-May-19	NW LANTAU	3	4.60	SPRING	STANDARD36826	HKLR	S
23-May-19	NW LANTAU	2	18.63	SPRING	STANDARD36826	HKLR	P
23-May-19	NW LANTAU	3	10.25	SPRING	STANDARD36826	HKLR	P
23-May-19	NW LANTAU	2	11.32	SPRING	STANDARD36826	HKLR	S
23-May-19	NW LANTAU	3	1.00	SPRING	STANDARD36826	HKLR	S
3-Jun-19	NW LANTAU	3	25.81	SUMMER	STANDARD36826	HKLR	P
3-Jun-19	NW LANTAU	4	1.66	SUMMER	STANDARD36826	HKLR	P
3-Jun-19	NW LANTAU	3	11.38	SUMMER	STANDARD36826	HKLR	S
3-Jun-19	NW LANTAU	4	0.55	SUMMER	STANDARD36826	HKLR	S
3-Jun-19	NE LANTAU	2	24.60	SUMMER	STANDARD36826	HKLR	P
3-Jun-19	NE LANTAU	3	11.37	SUMMER	STANDARD36826	HKLR	P
3-Jun-19	NE LANTAU	2	11.83	SUMMER	STANDARD36826	HKLR	S
3-Jun-19	NE LANTAU	3	2.10	SUMMER	STANDARD36826	HKLR	S
6-Jun-19	NW LANTAU	2	8.26	SUMMER	STANDARD36826	HKLR	P
6-Jun-19	NW LANTAU	3	19.60	SUMMER	STANDARD36826	HKLR	P
6-Jun-19	NW LANTAU	4	3.70	SUMMER	STANDARD36826	HKLR	P
6-Jun-19	NW LANTAU	2	5.99	SUMMER	STANDARD36826	HKLR	S
6-Jun-19	NW LANTAU	3	4.25	SUMMER	STANDARD36826	HKLR	S
10-Jun-19	NW LANTAU	3	17.00	SUMMER	STANDARD36826	HKLR	P
10-Jun-19	NW LANTAU	4	10.53	SUMMER	STANDARD36826	HKLR	P
10-Jun-19	NW LANTAU	5	0.60	SUMMER	STANDARD36826	HKLR	P
10-Jun-19	NW LANTAU	3	7.07	SUMMER	STANDARD36826	HKLR	S
10-Jun-19	NW LANTAU	4	4.80	SUMMER	STANDARD36826	HKLR	S
10-Jun-19	NE LANTAU	2	19.40	SUMMER	STANDARD36826	HKLR	P
10-Jun-19	NE LANTAU	3	15.46	SUMMER	STANDARD36826	HKLR	P
10-Jun-19	NE LANTAU	2	8.04	SUMMER	STANDARD36826	HKLR	S
10-Jun-19	NE LANTAU	3	5.72	SUMMER	STANDARD36826	HKLR	S
13-Jun-19	NW LANTAU	2	24.25	SUMMER	STANDARD36826	HKLR	P
13-Jun-19	NW LANTAU	3	8.10	SUMMER	STANDARD36826	HKLR	P
13-Jun-19	NW LANTAU	2	10.05	SUMMER	STANDARD36826	HKLR	S
16-Jul-19	NW LANTAU	2	22.62	SUMMER	STANDARD36826	HKLR	P
16-Jul-19	NW LANTAU	3	5.34	SUMMER	STANDARD36826	HKLR	P
16-Jul-19	NW LANTAU	2	9.44	SUMMER	STANDARD36826	HKLR	S
16-Jul-19	NW LANTAU	3	0.80	SUMMER	STANDARD36826	HKLR	S
18-Jul-19	NW LANTAU	0	4.07	SUMMER	STANDARD36826	HKLR	P
18-Jul-19	NW LANTAU	1	3.86	SUMMER	STANDARD36826	HKLR	P
18-Jul-19	NW LANTAU	2	24.87	SUMMER	STANDARD36826	HKLR	P
18-Jul-19	NW LANTAU	1	2.20	SUMMER	STANDARD36826	HKLR	S
18-Jul-19	NW LANTAU	2	8.80	SUMMER	STANDARD36826	HKLR	S
18-Jul-19	NE LANTAU	2	30.03	SUMMER	STANDARD36826	HKLR	P
18-Jul-19	NE LANTAU	3	5.56	SUMMER	STANDARD36826	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
18-Jul-19	NE LANTAU	2	11.89	SUMMER	STANDARD36826	HKLR	S
22-Jul-19	NW LANTAU	1	7.40	SUMMER	STANDARD36826	HKLR	P
22-Jul-19	NW LANTAU	2	19.85	SUMMER	STANDARD36826	HKLR	P
22-Jul-19	NW LANTAU	1	4.40	SUMMER	STANDARD36826	HKLR	S
22-Jul-19	NW LANTAU	2	7.65	SUMMER	STANDARD36826	HKLR	S
22-Jul-19	NE LANTAU	2	27.91	SUMMER	STANDARD36826	HKLR	P
22-Jul-19	NE LANTAU	3	5.70	SUMMER	STANDARD36826	HKLR	P
22-Jul-19	NE LANTAU	2	10.29	SUMMER	STANDARD36826	HKLR	S
22-Jul-19	NE LANTAU	3	2.80	SUMMER	STANDARD36826	HKLR	S
24-Jul-19	NW LANTAU	2	34.15	SUMMER	STANDARD36826	HKLR	P
24-Jul-19	NW LANTAU	3	9.95	SUMMER	STANDARD36826	HKLR	S
13-Aug-19	NE LANTAU	2	34.82	SUMMER	STANDARD36826	HKLR	P
13-Aug-19	NE LANTAU	3	2.90	SUMMER	STANDARD36826	HKLR	P
13-Aug-19	NE LANTAU	2	9.78	SUMMER	STANDARD36826	HKLR	S
13-Aug-19	NE LANTAU	3	1.90	SUMMER	STANDARD36826	HKLR	S
13-Aug-19	NW LANTAU	2	0.84	SUMMER	STANDARD36826	HKLR	P
13-Aug-19	NW LANTAU	3	24.00	SUMMER	STANDARD36826	HKLR	P
13-Aug-19	NW LANTAU	4	7.90	SUMMER	STANDARD36826	HKLR	P
13-Aug-19	NW LANTAU	2	0.90	SUMMER	STANDARD36826	HKLR	S
13-Aug-19	NW LANTAU	3	8.66	SUMMER	STANDARD36826	HKLR	S
13-Aug-19	NW LANTAU	4	1.40	SUMMER	STANDARD36826	HKLR	S
14-Aug-19	NW LANTAU	2	27.12	SUMMER	STANDARD36826	HKLR	P
14-Aug-19	NW LANTAU	2	14.88	SUMMER	STANDARD36826	HKLR	S
20-Aug-19	NW LANTAU	2	27.37	SUMMER	STANDARD36826	HKLR	P
20-Aug-19	NW LANTAU	3	5.80	SUMMER	STANDARD36826	HKLR	P
20-Aug-19	NW LANTAU	2	11.23	SUMMER	STANDARD36826	HKLR	S
26-Aug-19	NW LANTAU	2	17.21	SUMMER	STANDARD138716	HKLR	P
26-Aug-19	NW LANTAU	3	11.36	SUMMER	STANDARD138716	HKLR	P
26-Aug-19	NW LANTAU	2	6.10	SUMMER	STANDARD138716	HKLR	S
26-Aug-19	NW LANTAU	3	4.13	SUMMER	STANDARD138716	HKLR	S
26-Aug-19	NE LANTAU	1	4.21	SUMMER	STANDARD138716	HKLR	P
26-Aug-19	NE LANTAU	2	26.68	SUMMER	STANDARD138716	HKLR	P
26-Aug-19	NE LANTAU	3	0.27	SUMMER	STANDARD138716	HKLR	P
26-Aug-19	NE LANTAU	1	1.10	SUMMER	STANDARD138716	HKLR	S
26-Aug-19	NE LANTAU	2	4.11	SUMMER	STANDARD138716	HKLR	S
26-Aug-19	NE LANTAU	3	0.97	SUMMER	STANDARD138716	HKLR	S
29-Aug-19	NE LANTAU	2	2.61	SUMMER	STANDARD36826	HKLR	P
29-Aug-19	NE LANTAU	3	2.42	SUMMER	STANDARD36826	HKLR	P
29-Aug-19	NE LANTAU	2	1.90	SUMMER	STANDARD36826	HKLR	S
29-Aug-19	NE LANTAU	3	0.96	SUMMER	STANDARD36826	HKLR	S
4-Sep-19	NW LANTAU	2	21.38	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NW LANTAU	3	6.40	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NW LANTAU	2	9.12	AUTUMN	STANDARD36826	HKLR	S
4-Sep-19	NW LANTAU	3	2.52	AUTUMN	STANDARD36826	HKLR	S
4-Sep-19	NE LANTAU	2	16.70	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NE LANTAU	3	18.83	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NE LANTAU	2	7.75	AUTUMN	STANDARD36826	HKLR	S
4-Sep-19	NE LANTAU	3	5.12	AUTUMN	STANDARD36826	HKLR	S
11-Sep-19	NW LANTAU	1	1.60	AUTUMN	STANDARD36826	HKLR	P
11-Sep-19	NW LANTAU	2	29.50	AUTUMN	STANDARD36826	HKLR	P
11-Sep-19	NW LANTAU	3	2.10	AUTUMN	STANDARD36826	HKLR	P
11-Sep-19	NW LANTAU	1	1.40	AUTUMN	STANDARD36826	HKLR	S
11-Sep-19	NW LANTAU	2	8.99	AUTUMN	STANDARD36826	HKLR	S
17-Sep-19	NW LANTAU	2	8.96	AUTUMN	STANDARD36826	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
17-Sep-19	NW LANTAU	3	22.90	AUTUMN	STANDARD36826	HKLR	P
17-Sep-19	NW LANTAU	4	1.90	AUTUMN	STANDARD36826	HKLR	P
17-Sep-19	NW LANTAU	2	4.54	AUTUMN	STANDARD36826	HKLR	S
17-Sep-19	NW LANTAU	3	4.90	AUTUMN	STANDARD36826	HKLR	S
17-Sep-19	NW LANTAU	4	1.20	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NW LANTAU	2	19.22	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NW LANTAU	3	7.79	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NW LANTAU	2	9.84	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NW LANTAU	3	4.25	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NE LANTAU	1	11.30	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NE LANTAU	2	25.35	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NE LANTAU	1	3.61	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NE LANTAU	2	10.74	AUTUMN	STANDARD36826	HKLR	S
8-Oct-19	NW LANTAU	1	3.70	AUTUMN	STANDARD36826	TMCLKL	P
8-Oct-19	NW LANTAU	2	23.60	AUTUMN	STANDARD36826	TMCLKL	P
8-Oct-19	NW LANTAU	3	5.20	AUTUMN	STANDARD36826	TMCLKL	P
8-Oct-19	NW LANTAU	2	8.30	AUTUMN	STANDARD36826	TMCLKL	S
8-Oct-19	NW LANTAU	3	2.80	AUTUMN	STANDARD36826	TMCLKL	S
8-Oct-19	NE LANTAU	2	11.50	AUTUMN	STANDARD36826	TMCLKL	P
8-Oct-19	NE LANTAU	3	21.93	AUTUMN	STANDARD36826	TMCLKL	P
8-Oct-19	NE LANTAU	2	5.40	AUTUMN	STANDARD36826	TMCLKL	S
8-Oct-19	NE LANTAU	3	8.87	AUTUMN	STANDARD36826	TMCLKL	S
9-Oct-19	NW LANTAU	2	7.77	AUTUMN	STANDARD36826	TMCLKL	P
9-Oct-19	NW LANTAU	3	19.26	AUTUMN	STANDARD36826	TMCLKL	P
9-Oct-19	NW LANTAU	2	4.33	AUTUMN	STANDARD36826	TMCLKL	S
9-Oct-19	NW LANTAU	3	8.44	AUTUMN	STANDARD36826	TMCLKL	S
14-Oct-19	NW LANTAU	1	3.10	AUTUMN	STANDARD36826	TMCLKL	P
14-Oct-19	NW LANTAU	2	24.38	AUTUMN	STANDARD36826	TMCLKL	P
14-Oct-19	NW LANTAU	1	1.60	AUTUMN	STANDARD36826	TMCLKL	S
14-Oct-19	NW LANTAU	2	11.62	AUTUMN	STANDARD36826	TMCLKL	S
29-Oct-19	NW LANTAU	2	7.60	AUTUMN	STANDARD36826	TMCLKL	P
29-Oct-19	NW LANTAU	3	14.90	AUTUMN	STANDARD36826	TMCLKL	P
29-Oct-19	NW LANTAU	4	10.10	AUTUMN	STANDARD36826	TMCLKL	P
29-Oct-19	NW LANTAU	2	5.10	AUTUMN	STANDARD36826	TMCLKL	S
29-Oct-19	NW LANTAU	3	6.10	AUTUMN	STANDARD36826	TMCLKL	S
29-Oct-19	NE LANTAU	2	31.08	AUTUMN	STANDARD36826	TMCLKL	P
29-Oct-19	NE LANTAU	3	4.40	AUTUMN	STANDARD36826	TMCLKL	P
29-Oct-19	NE LANTAU	2	12.30	AUTUMN	STANDARD36826	TMCLKL	S

## Appendix II. HKLR03/TMCLKL08 Chinese White Dolphin Sighting Database (November 2018 - October 2019)

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

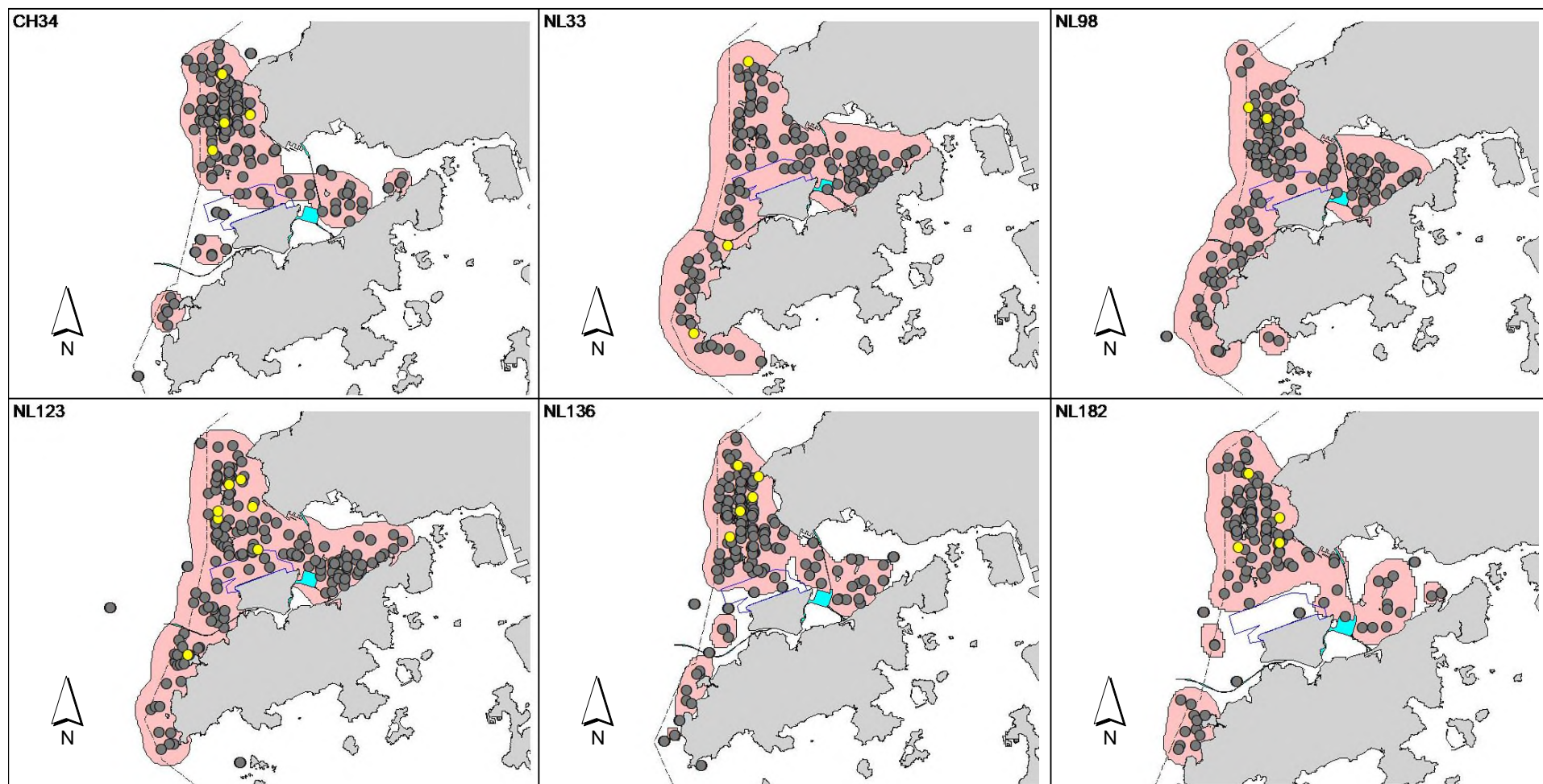
DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
6-Nov-18	1	1107	1	NW LANTAU	2	364	ON	HKLR	825486	807443	AUTUMN	NONE	P
6-Nov-18	2	1119	2	NW LANTAU	2	221	ON	HKLR	827280	807456	AUTUMN	NONE	P
6-Nov-18	3	1202	2	NW LANTAU	2	84	ON	HKLR	828546	805451	AUTUMN	NONE	P
3-Dec-18	1	1046	5	NW LANTAU	2	821	ON	HKLR	827178	808517	WINTER	NONE	P
3-Dec-18	2	1247	1	NW LANTAU	3	962	ON	HKLR	826056	804663	WINTER	NONE	P
3-Jan-19	1	1151	7	NW LANTAU	2	614	ON	HKLR	830239	806267	WINTER	NONE	P
3-Jan-19	2	1234	2	NW LANTAU	2	71	ON	HKLR	827529	804728	WINTER	NONE	P
14-Jan-19	1	1319	2	NW LANTAU	2	ND	OFF	HKLR	814949	804866	WINTER	NONE	
14-Jan-19	2	1336	3	NW LANTAU	2	ND	OFF	HKLR	814739	804443	WINTER	NONE	
1-Feb-19	1	1233	3	NW LANTAU	3	219	ON	HKLR	825495	808493	WINTER	NONE	P
14-Feb-19	1	1024	2	NW LANTAU	3	341	ON	HKLR	820043	804465	WINTER	NONE	S
14-Feb-19	2	1102	1	NW LANTAU	3	197	ON	HKLR	824826	805278	WINTER	NONE	P
14-Feb-19	3	1356	4	NW LANTAU	3	82	ON	HKLR	822050	808930	WINTER	NONE	S
20-Feb-19	1	1220	5	NW LANTAU	3	878	ON	HKLR	824548	805556	WINTER	NONE	P
25-Feb-19	1	1146	3	NW LANTAU	2	147	ON	HKLR	826584	806435	WINTER	NONE	P
13-Mar-19	1	1018	2	NW LANTAU	2	131	ON	HKLR	815946	804673	SPRING	NONE	P
13-Mar-19	2	1131	2	NW LANTAU	1	371	ON	HKLR	830873	804580	SPRING	NONE	P
18-Mar-19	1	1140	2	NW LANTAU	2	853	ON	HKLR	829406	807254	SPRING	NONE	S
23-Apr-19	1	1102	2	NW LANTAU	2	58	ON	HKLR	825168	805485	SPRING	NONE	P
7-May-19	1	1137	3	NW LANTAU	2	254	ON	HKLR	827293	806457	SPRING	NONE	P
3-Jun-19	1	1138	4	NW LANTAU	3	121	ON	HKLR	827734	807488	SUMMER	NONE	P
6-Jun-19	1	1312	1	NW LANTAU	3	77	ON	HKLR	814894	804681	SUMMER	NONE	P
16-Jul-19	1	1152	2	NW LANTAU	2	197	ON	HKLR	829052	807326	SUMMER	NONE	S
24-Jul-19	1	1330	1	NW LANTAU	2	ND	OFF	HKLR	814451	804453	SUMMER	NONE	
4-Sep-19	1	1046	2	NW LANTAU	2	311	ON	HKLR	823375	805440	AUTUMN	NONE	P
11-Sep-19	1	1058	3	NW LANTAU	2	430	ON	HKLR	829316	807975	AUTUMN	NONE	S
9-Oct-19	1	1221	1	NW LANTAU	3	57	ON	TMCLKL	827538	805469	AUTUMN	NONE	P

**Appendix III. Individual dolphins identified during HKLR03/TMCLKL08 monitoring surveys conducted in November 2018-October 2019**

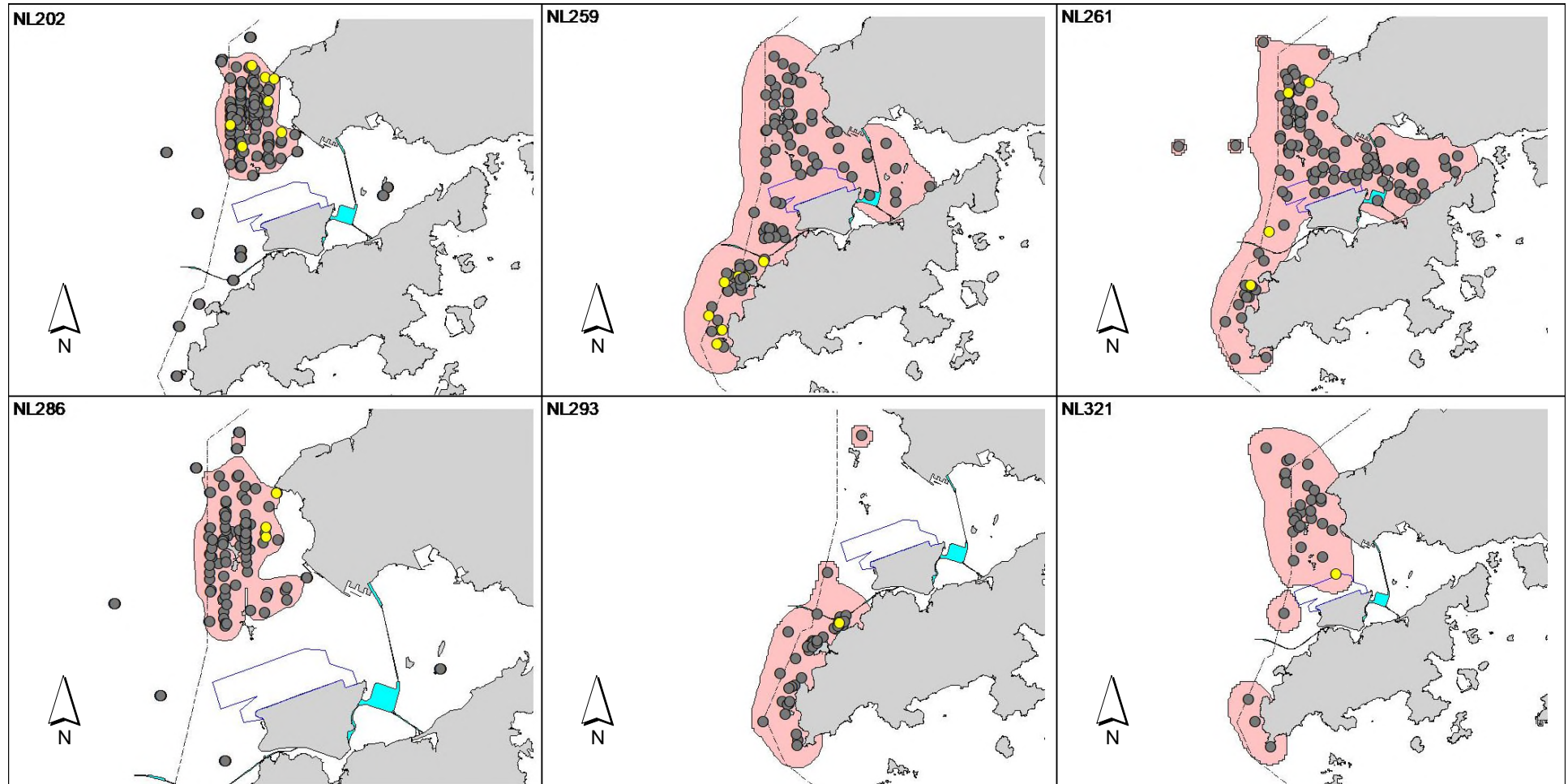
ID#	DATE	STG#	AREA
CH34	03/12/18	1	NW LANTAU
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	20/02/19	1	NW LANTAU
	25/02/19	1	NW LANTAU
NL33	03/01/19	1	NW LANTAU
	14/01/19	2	NW LANTAU
NL98	03/01/19	2	NW LANTAU
	25/02/19	1	NW LANTAU
NL123	01/02/19	1	NW LANTAU
	14/02/19	3	NW LANTAU
	20/02/19	1	NW LANTAU
	23/04/19	1	NW LANTAU
	07/05/19	1	NW LANTAU
	03/06/19	1	NW LANTAU
NL136	03/01/19	1	NW LANTAU
	20/02/19	1	NW LANTAU
	25/02/19	1	NW LANTAU
	03/06/19	1	NW LANTAU
	11/09/19	1	NW LANTAU
NL182	03/12/18	1	NW LANTAU
	03/01/19	1	NW LANTAU
	01/02/19	1	NW LANTAU
	23/04/19	1	NW LANTAU
NL202	03/12/18	2	NW LANTAU
	03/01/19	1	NW LANTAU
	01/02/19	1	NW LANTAU
	20/02/19	1	NW LANTAU
	18/03/19	1	NW LANTAU
	03/06/19	1	NW LANTAU
	11/09/19	1	NW LANTAU

ID#	DATE	STG#	AREA
NL259	14/01/19	2	NW LANTAU
NL261	06/11/18	3	NW LANTAU
	18/03/19	1	NW LANTAU
NL286	06/11/18	2	NW LANTAU
	03/06/19	1	NW LANTAU
	11/09/19	1	NW LANTAU
NL293	06/06/19	1	NW LANTAU
NL321	14/02/19	3	NW LANTAU
NL322	03/01/19	1	NW LANTAU
	14/01/19	2	NW LANTAU
NL328	06/11/18	3	NW LANTAU
NL331	14/02/19	1	NW LANTAU
WL17	14/02/19	3	NW LANTAU
WL98	14/01/19	1	NW LANTAU
WL145	13/03/19	1	NW LANTAU
WL218	24/07/19	1	NW LANTAU
WL243	14/02/19	1	NW LANTAU
WL273	03/01/19	1	NW LANTAU
WL281	20/02/19	1	NW LANTAU

Appendix IV. Ranging patterns (95% kernel ranges) of 22 individual dolphins that were sighted during the sixth year of TMCLKL construction works, utilizing the HKLR03/TMCLKL08 monitoring data with supplement of HKLR09 monitoring data in West Lantau (note: yellow dots indicates sightings made in November 2018 to October 2019)



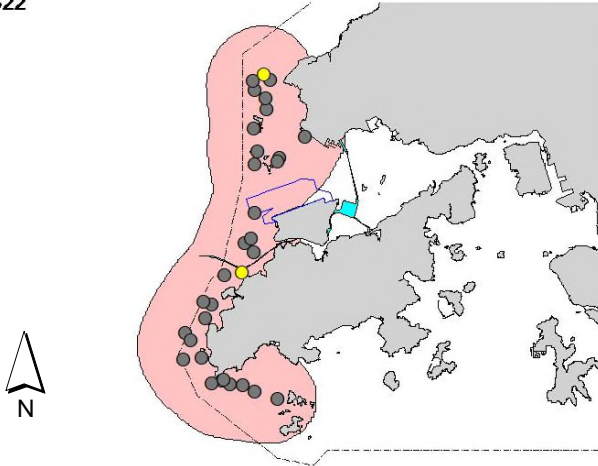
Appendix IV. (cont'd)



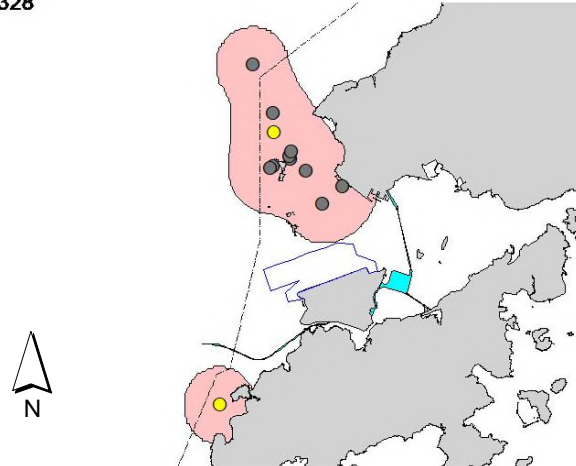


Appendix IV. (cont'd)

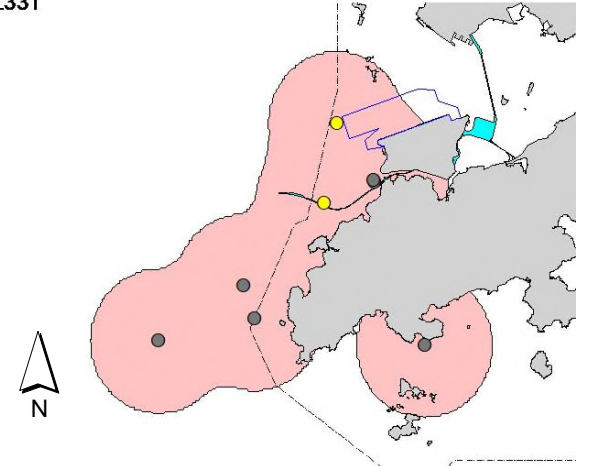
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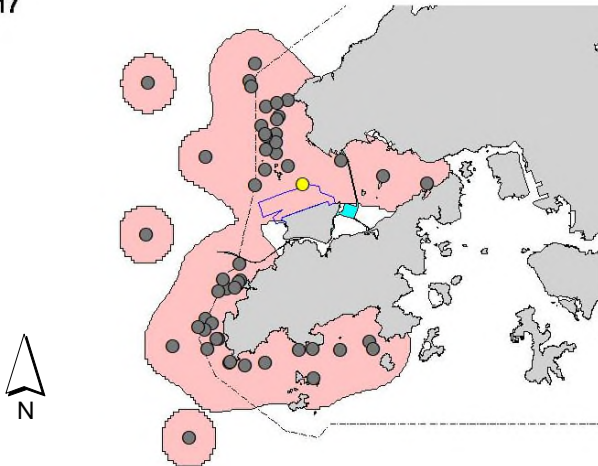
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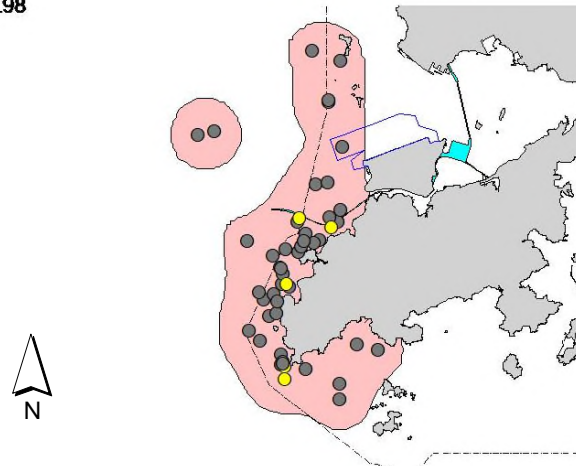
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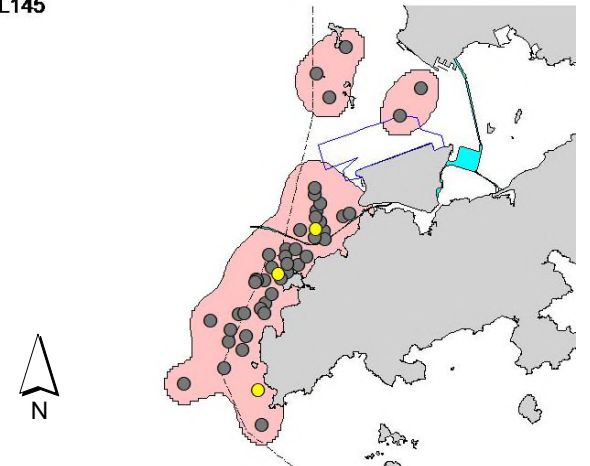
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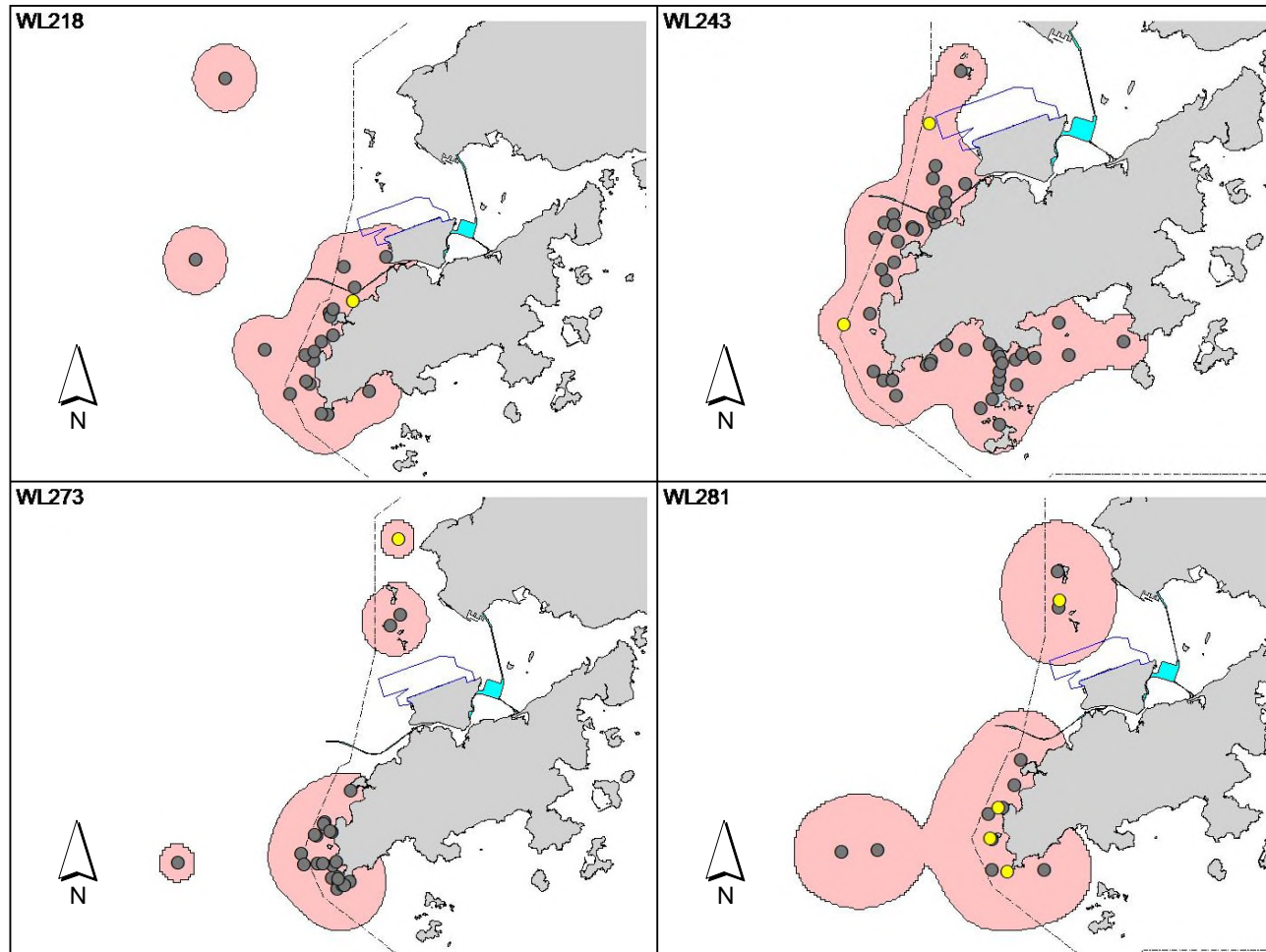
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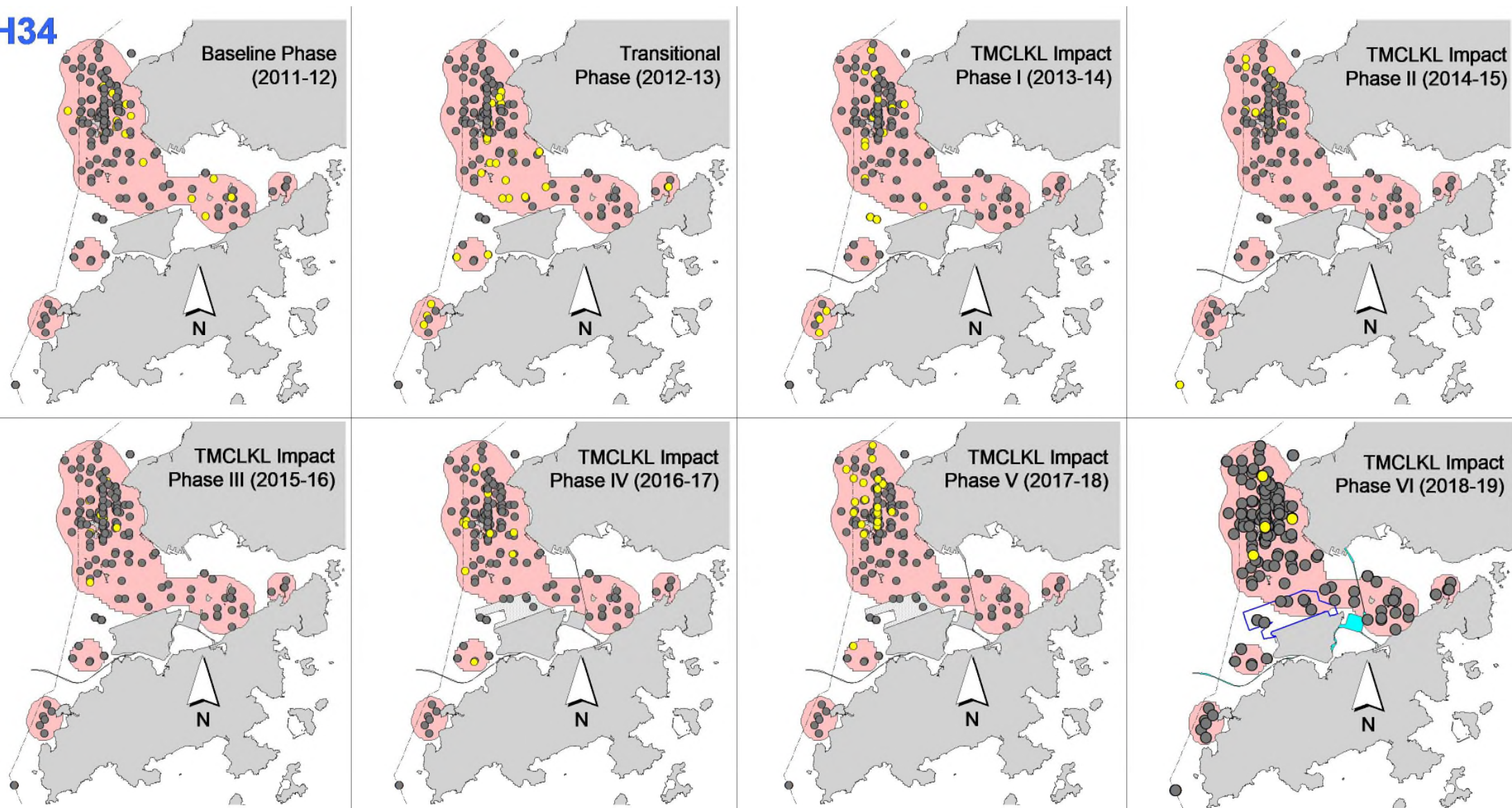
WL145



Appendix IV. (cont'd)

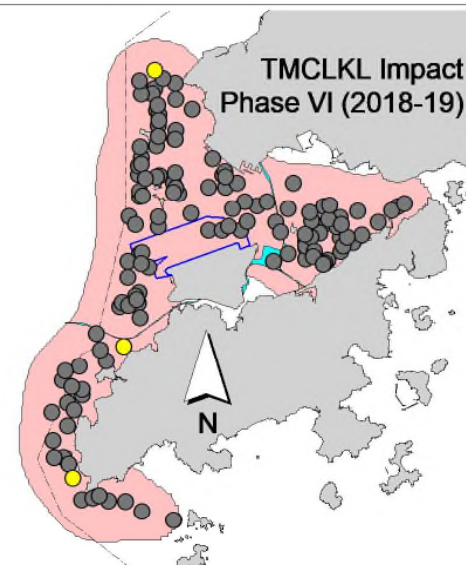
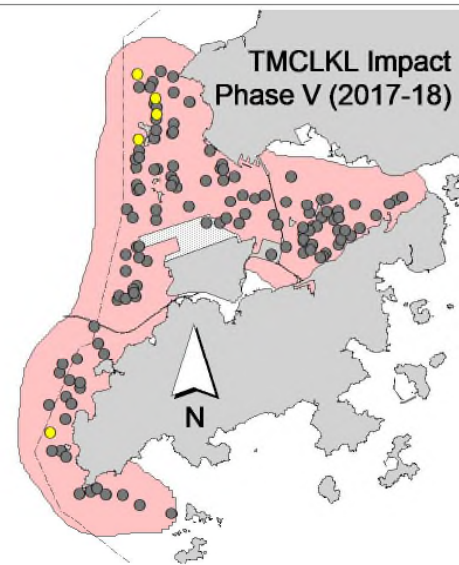
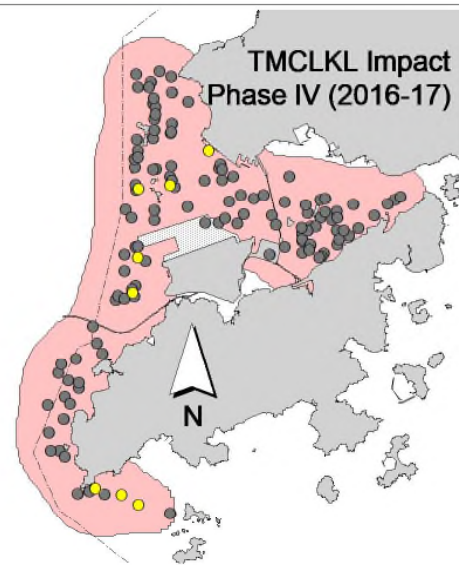
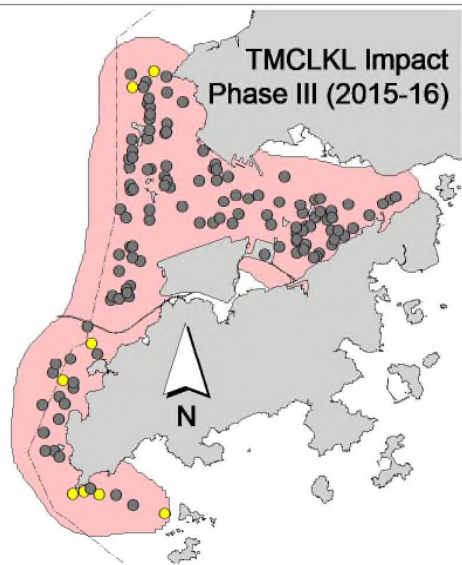
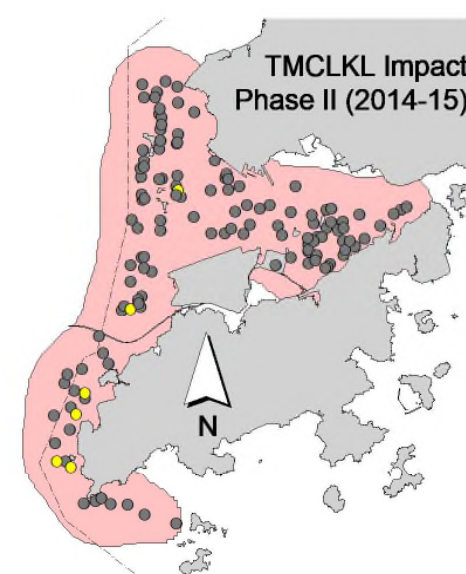
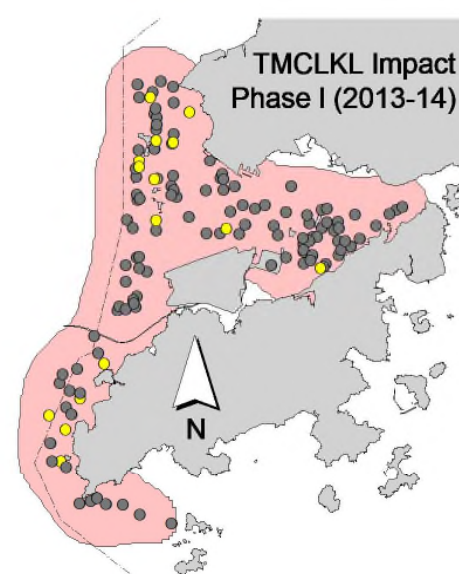
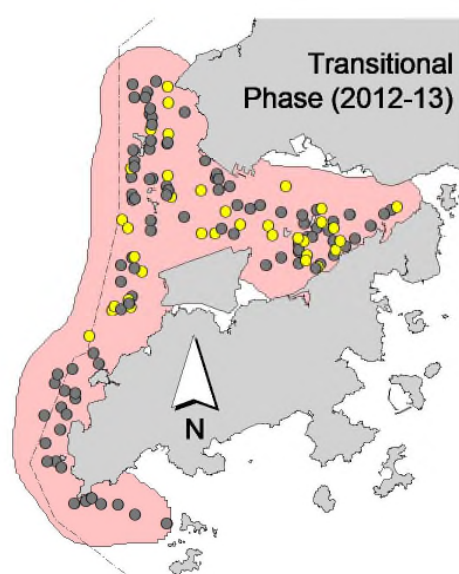
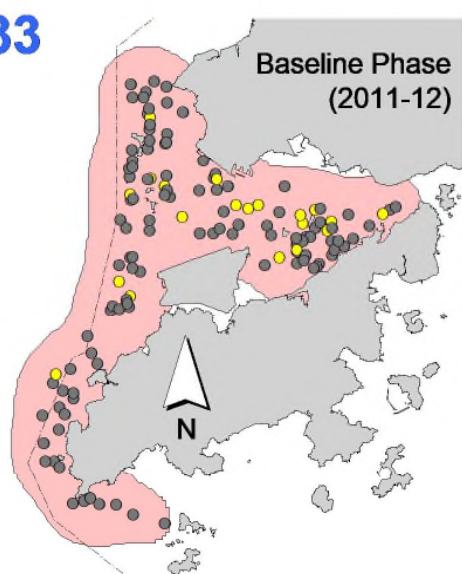


CH34

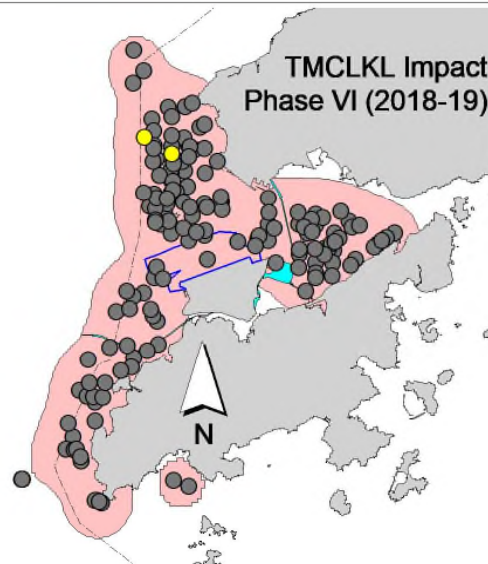
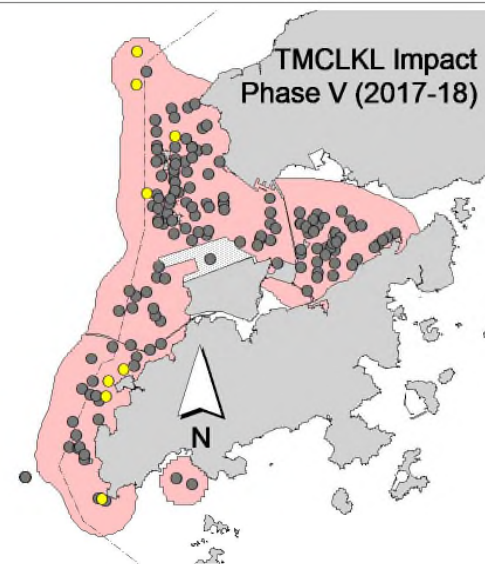
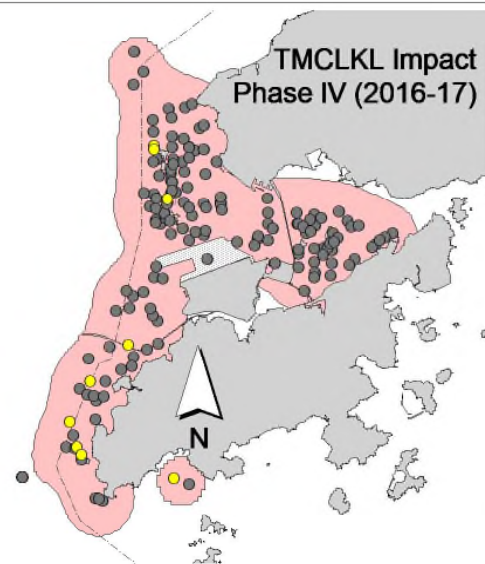
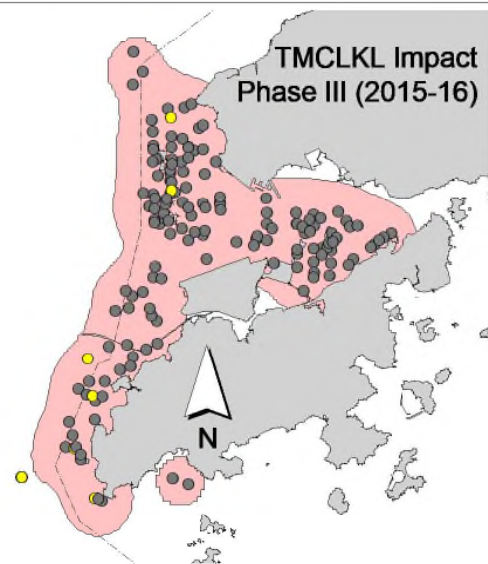
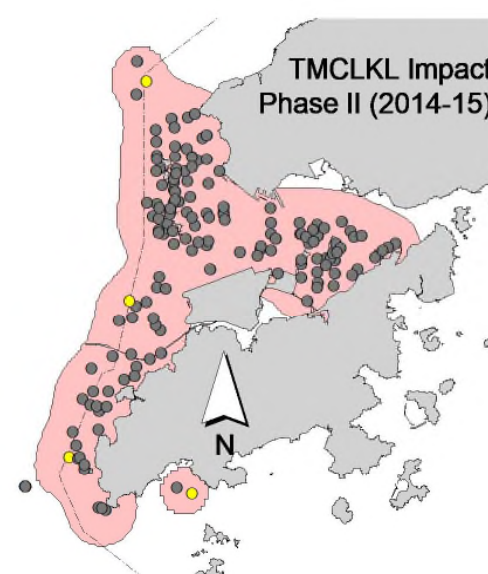
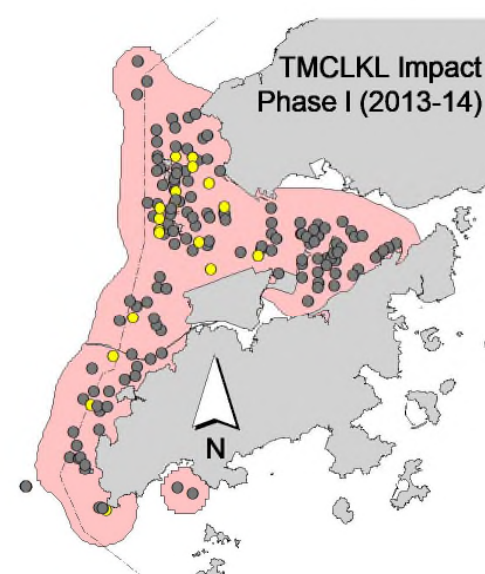
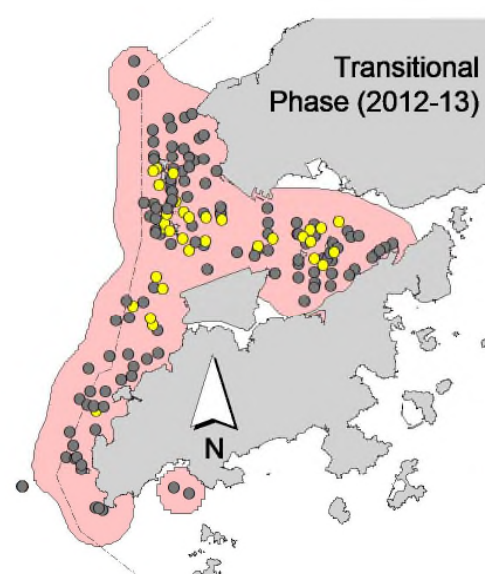
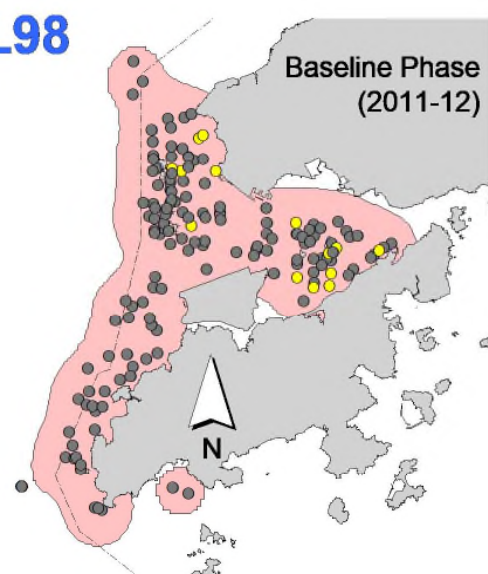


Appendix V. Temporal changes in range use patterns of eight individual dolphins during baseline, transitional & six impact phases of TMCLKL construction (note: yellow dots indicates sightings made in corresponding period)





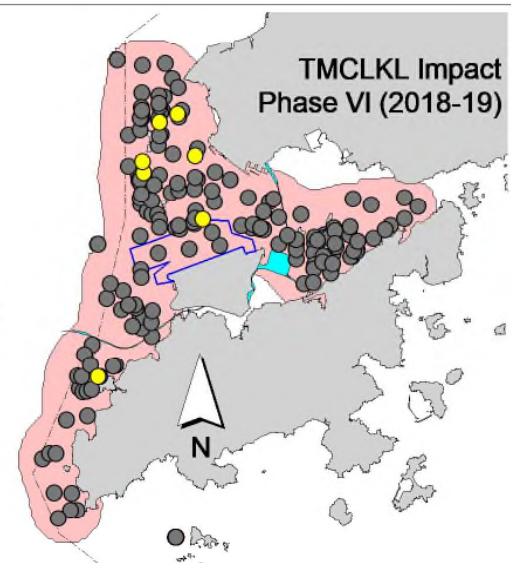
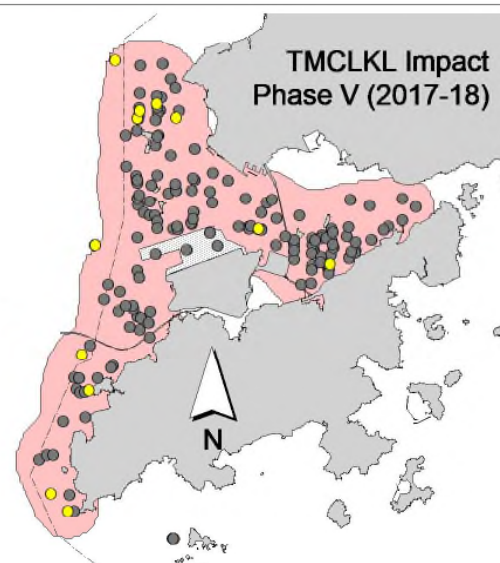
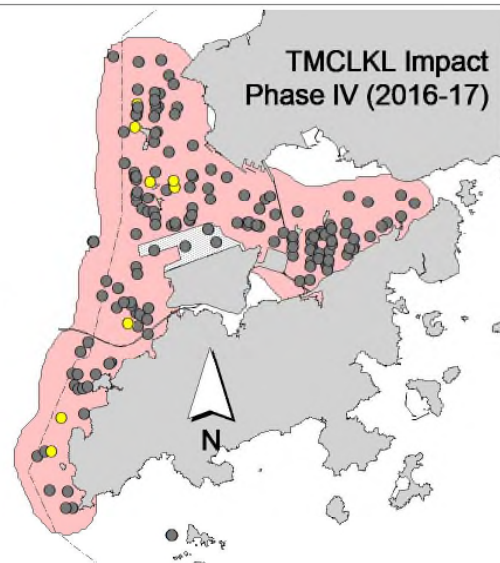
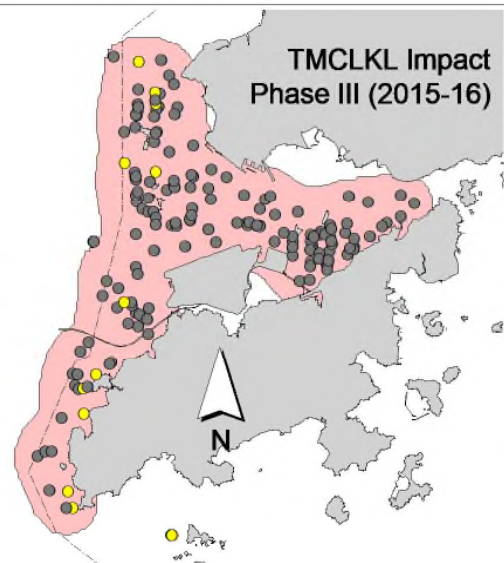
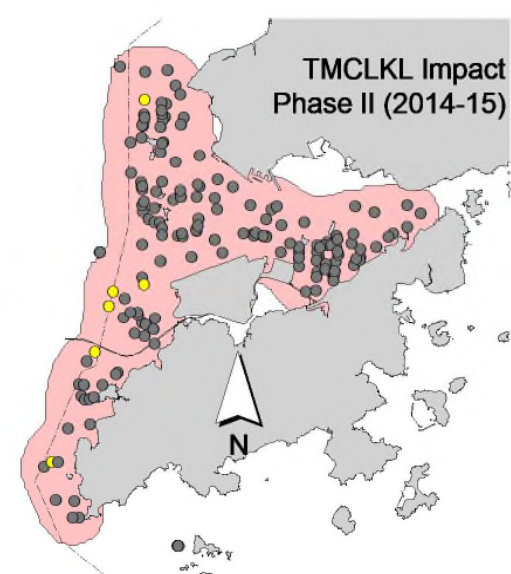
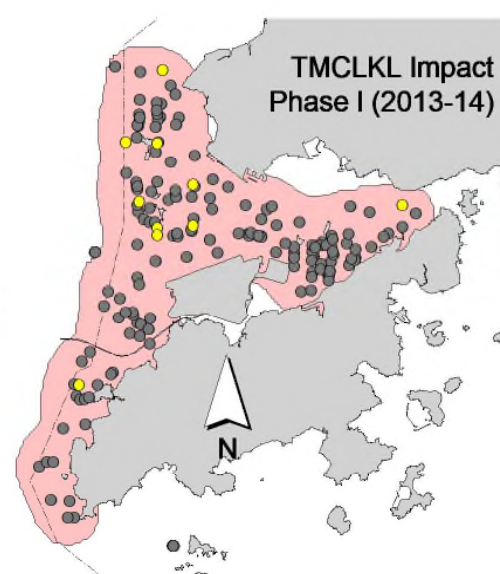
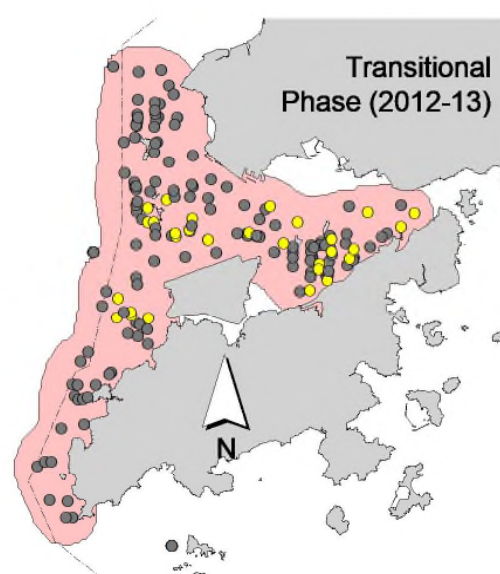
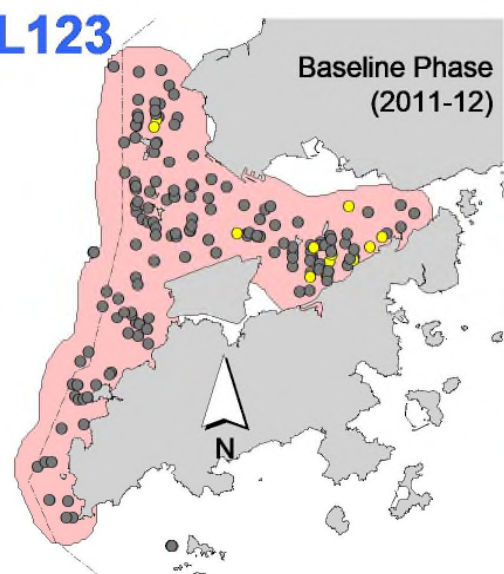
NL98



Appendix V. (cont'd)



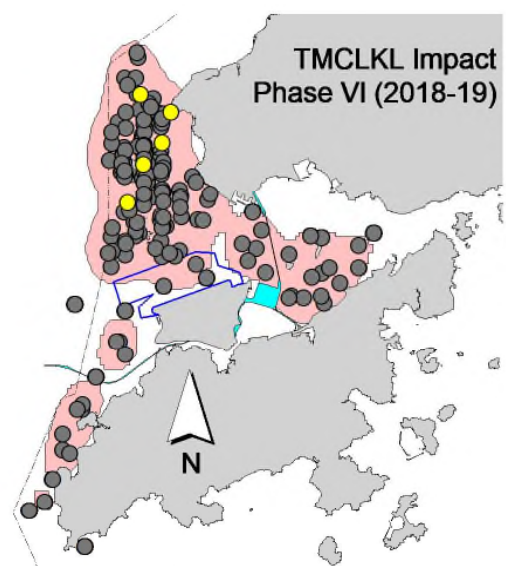
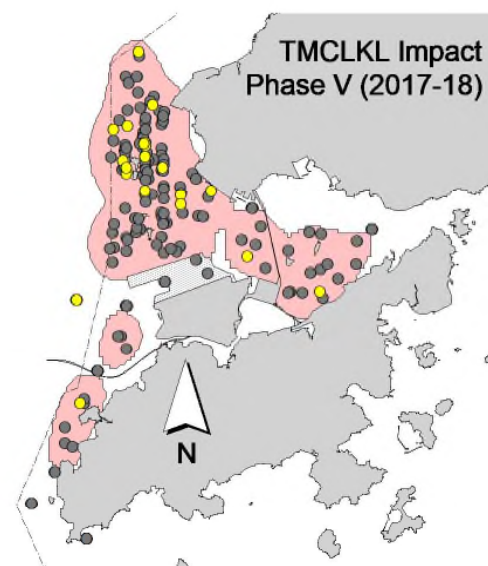
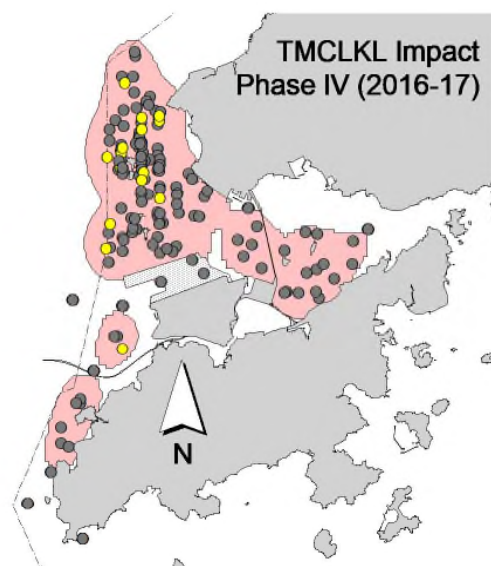
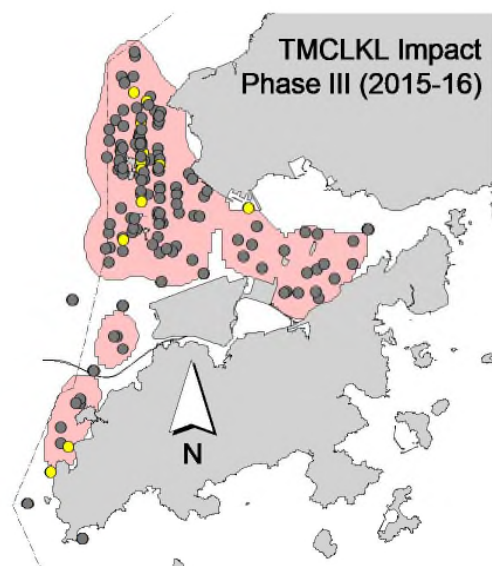
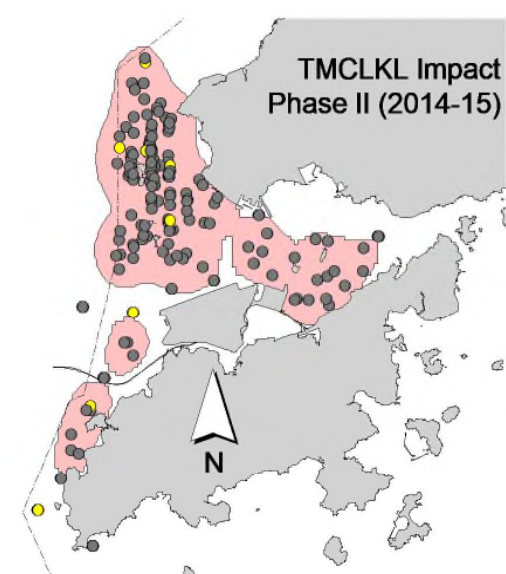
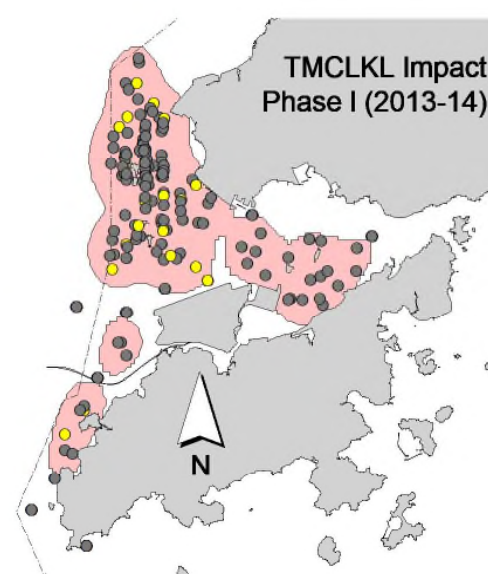
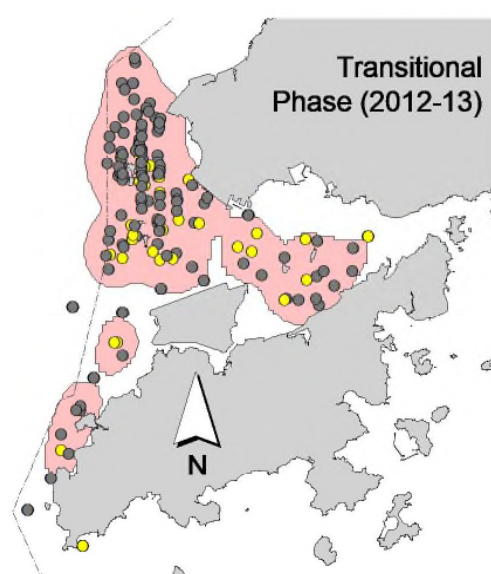
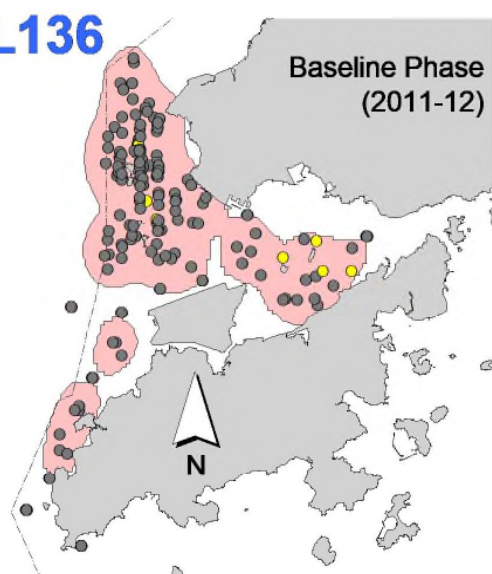
NL123



Appendix V. (cont'd)

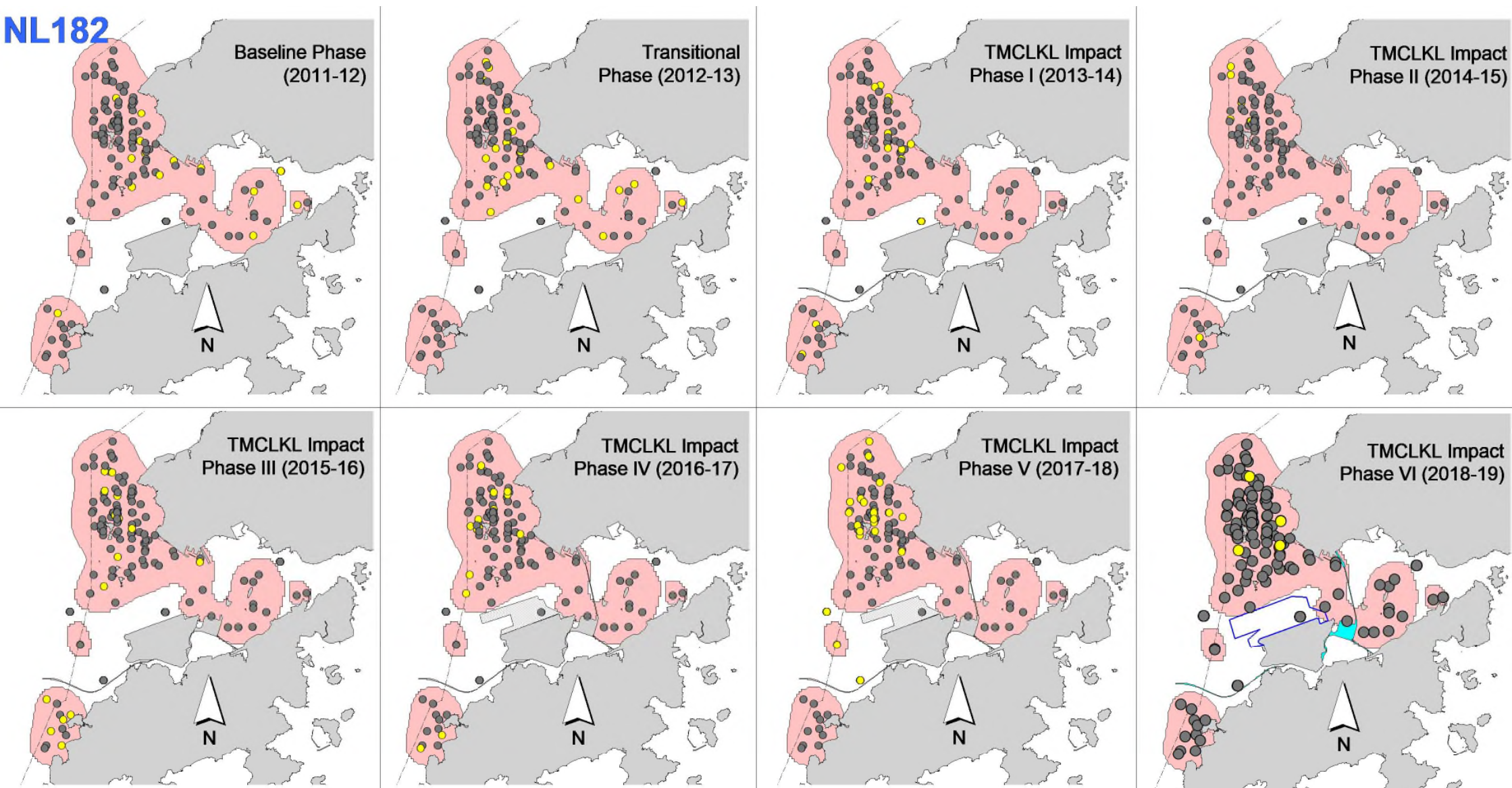


NL136



Appendix V. (cont'd)

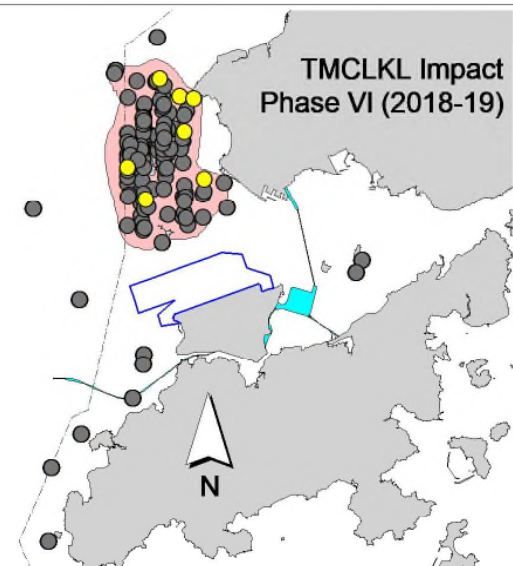
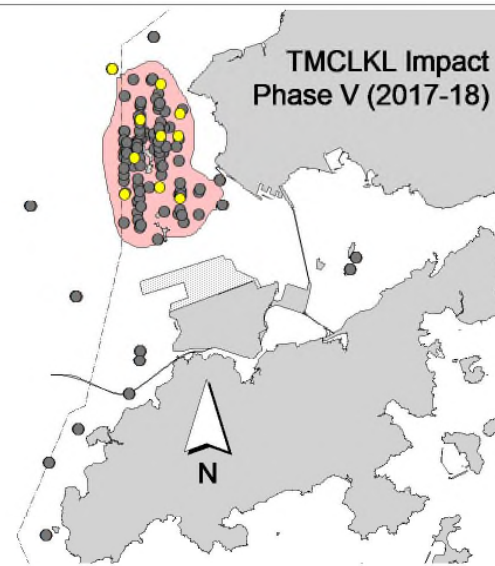
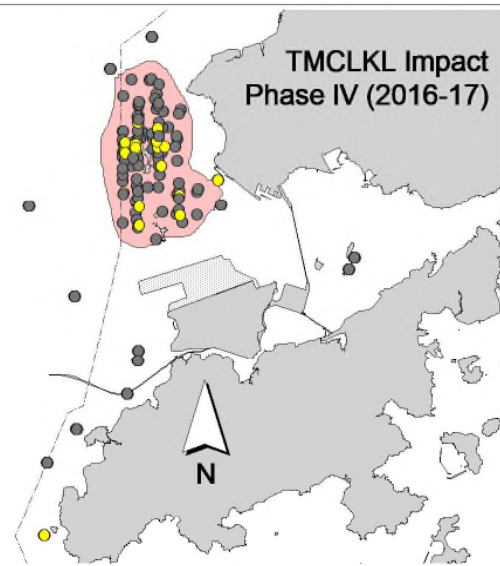
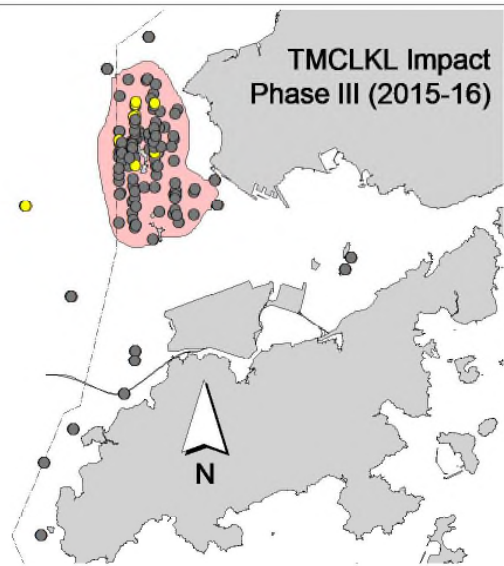
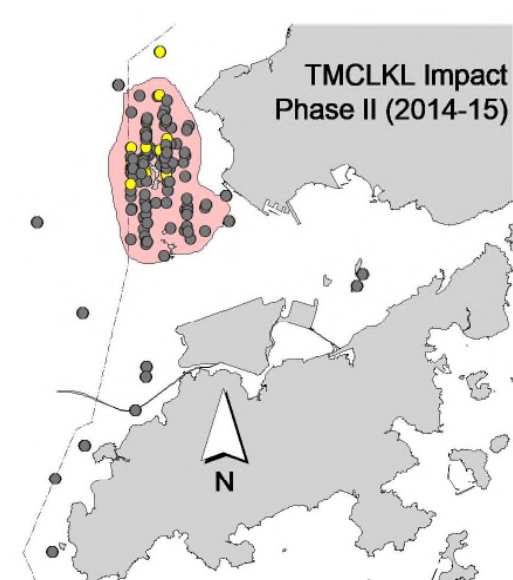
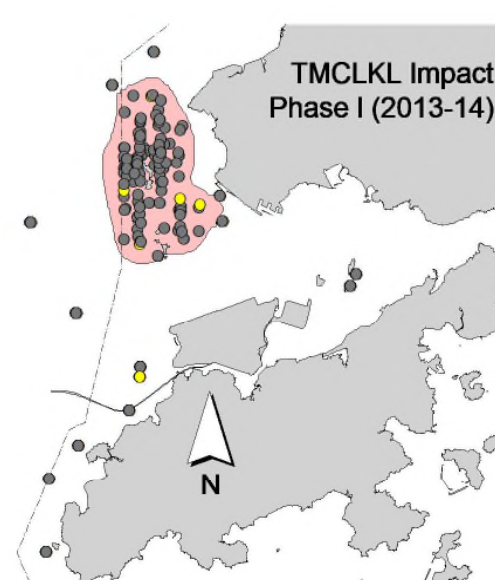
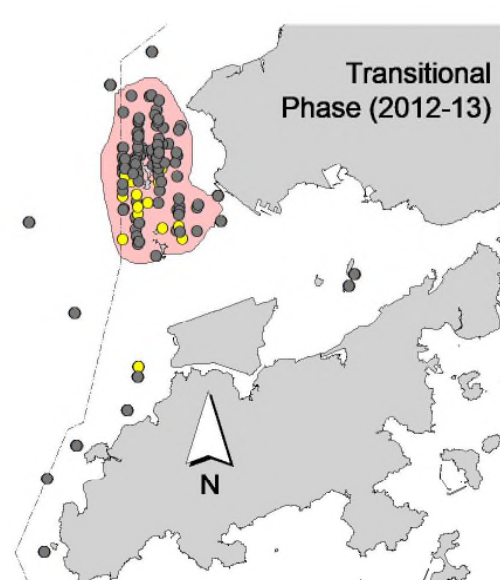
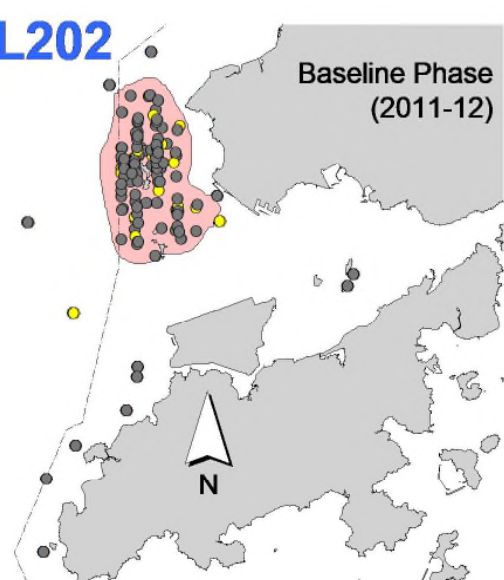
NL182



Appendix V. (cont'd)

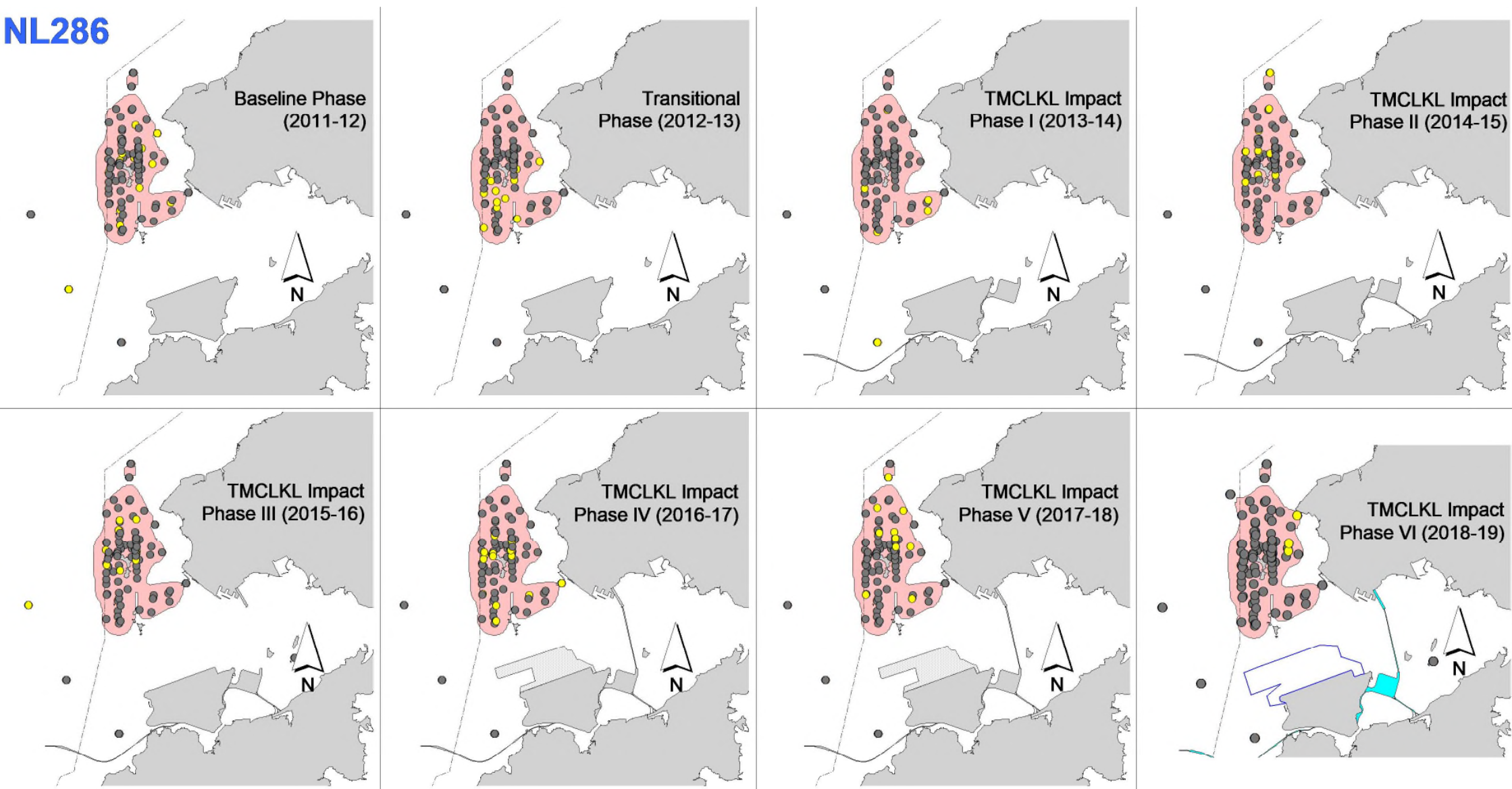


NL202



Appendix V. (cont'd)

NL286



Appendix V. (cont'd)