Environmental Monitoring of Yunlin Offshore Wind Farm

Construction & Operation Phase
Environmental Monitoring Report
(March 2024 - May 2024)

Final

Developer	:	Yunneng Wind Power Co., Ltd.
Monitored By	:	Unitech New Energy Engineering Co., Ltd.
Submission Date	:	December 2024

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Preface

I. Regulatory

The environment monitoring project is in accordance with the environmental monitoring plan in the finalized version of the "Yunlin Offshore Wind Farm Development Project Environmental Impact Statement" approved by Environment Protection Administration (EPA) on 21 June 2018 (#official letter 1070046931), the "Yunlin Offshore Wind Farm Development Project Comparison Table of Content Changed (Changing Monitoring Plan)" approved on 11th December 2018 (#official letter 1070100406) and "Yunlin Offshore Wind Farm Development Project Environmental Impact Statement- 1st Differential Analysis Report" (Variation on earthwork handling plan) approved on 3rd January 2020.

The "Yunlin Offshore Wind Farm Development Project" (the Project) actively participates in the Directions for Allocating Installed Capacity of Offshore Wind Potential Zones promulgated by BOE on January18, 2018, and plans to begin offshore construction in March 2020 in response to the offshore wind power energy policy of 520MW in 2020 and 5.5GW in 2025. On May 17, 2018, BOE notified via official letter #10704602861 that Yunlin wind farm has been awarded a place in the 2020-completion grid connection plan.

According to the pre-construction monitoring plan added after the preliminary meeting of the EPA task force during review of EIS on 27th July 2017, the bird ecological radar monitoring survey must begin 2 years prior to offshore construction. Therefore, the bird ecological radar monitoring survey for this project began in March 2017. It is stated in the change of monitoring plan in December 2018 that monitoring schedule is decided depending on starting date of offshore construction. Offshore environmental monitoring in pre-construction 2 years before construction has been completed in February 2020. The project will continue to conduct monitoring surveys during construction phase in compliance with the EIA approved monitoring plan. As some of the turbines have obtained electricity enterprise license since July 2023, the project has officially entered construction and operation phase. The project will continue to conduct monitoring surveys during operation phase in compliance with the EIA approved monitoring plan.

In addition, marine bat recording surveys at pre-construction, construction and operation phases of Yunlin Offshore Windfarm are planned following "Yunlin Offshore Windfarm Bird and Bat Survey Protocol" in accordance with Environmental and Social Action Plan item number 20 and IFC standards.

II. Monitoring Duration

Following the matters written in the EIA documentation of the "Yunlin Offshore Wind Farm Development Project" and the environmental monitoring required in review resolutions, Yunneng Wind Power Co., Ltd. has completed the environmental monitoring survey for onshore construction phase from January 2019 to March 2024. The environmental monitoring survey for offshore construction started in March 2020. The Project entered construction and operation phase since July 2023. The monitoring during operation phase is conducted from August 2023.

This environmental monitoring report is for the construction phase and the operation phases monitoring (March - May 2024).

III. Monitoring Unit

This monitoring project is compiled by Unitech Engineering Co., Ltd., which is also responsible for the writing of monitoring report, and the management and coordination of certified institutes, academic researchers and experts to carry out the environmental monitoring works. The units for each monitoring item in this quarter are listed as follows:

- i Water Quality, Air Quality, Noise Vibration and Construction Noise, electromagnetic field: SGS Group.
- ii Bird Ecology, Marine Ecology (intertidal, plankton, benthic organisms, underwater filming): Hong Yi Ecological Co. Ltd.
- iii Marine Ecology (fish larva and fish egg, fish, fishery resource): Sci Mar Co. Ltd.
- iv Cetacean Ecology (visual monitoring): Faith Future Co., Ltd.
- v Piling Noise Monitoring of each turbine: SGS Co., Ltd.
- vi Cetacean Ecology (underwater acoustic survey), Underwater noise: Yongyi Information Co., Ltd.

Chapter 1 Monitoring Overview

1.1 Construction Progress

Construction of the Project was divided into onshore and offshore portion; The onshore portion includes construction of onshore transmission facilities and the offshore portion includes construction of offshore wind farm and submarine cable.

I. Onshore construction

i Onshore booster stations

The civil engineering of Taixi and Sihu booster station have been completed in June 2020; operation license of Sihu booster station was obtained in July 2020, and operation license of Taixi booster station was obtained in November 2022. The restoration work for the substations was completed in March 2024.

ii Onshore cable

Civil construction of the cable between Taixi booster station and Taixi substation, and between Sihu booster station and Sihu substation have been completed in June 2020.

iii Output cable connecting to the booster stations

Construction on connection conduits for submarine cables at Taixi booster stations and Sihu booster station have been completed in June 2020.

II. Offshore construction

A total of 80 turbines are planned in the Project. Pilings of wind turbine foundations started in November 2020. Piling of the foundations of 64 turbines were completed by end of May 2024 as shown in Table 1.1-1.

1.2 Monitoring Status

The environmental monitoring results of the construction and operation phases (March - May 2024) are summarized as Table 1.2-1.

Table 1.1-1 Piling Schedule of the Turbine Foundation (1/2)

NO.	Foundation No.	Month of Piling
1.	YUN53	2020 November
2.	YUN80	2021 February
3.	YUN38	2021 February
4.	YUN76	2021 March
5.	YUN51	2021 April- May
6.	YUN52	2021 May
7.	YUN64	2021 June
8.	YUN79	2021 June
9.	YUN42	2021 June
10.	YUN78	2021 June
11.	YUN37	2021 July
12.	YUN43	2021 September
13.	YUN49	2021 September
14.	YUN57	2021 September
15.	YUN45	2021 October
16.	YUN63	2022 July
17.	YUN50	2022 August
18.	YUN73	2022 August
19.	YUN74	2022 August
20.	YUN72	2022 August
21.	YUN71	2022 September
22.	YUN77	2022 October
23.	YUN13	2023 April
24.	YUN21	2023 May
25.	YUN20	2023 May
26.	YUN62	2023 May
27.	YUN12	2023 May
28.	YUN11	2023 May

Table 1.1-1 Piling Schedule of the Turbine Foundation (2/2)

NO.	Foundation No.	Month of Piling
29.	YUN70	2023 June
30.	YUN61	2023 June
31.	YUN68	2023 June
32.	YUN69	2023 June
33.	YUN66	2023 July
34.	YUN32	2023 July
35.	YUN65	2023 July
36.	YUN58	2023 July
37.	YUN30	2023 August
38.	YUN39	2023 August
39.	YUN28	2023 August
40.	YUN27	2023 August
41.	YUN23	2023 September
42.	YUN19	2023 September
43.	YUN06A	2023 September
44.	YUN35	2023 September
45.	YUN34	2023 September
46.	YUN41	2024 March
47.	YUN48	2024 March
48.	YUN36	2024 April
49.	YUN05	2024 April
50.	YUN22	2024 April
51.	YUN07	2024 April
52.	YUN10	2024 April
53.	YUN18	2024 April
54.	YUN75	2024 April
55.	YUN26	2024 May
56	YUN40	2024 May

57.	YUN31	2024 May
58.	YUN02	2024 May
59.	YUN47	2024 May
60.	YUN04	2024 May
61.	YUN17	2024 May
62.	YUN03	2024 May
63.	YUN56A	2024 May
64.	YUN16	2024 May

Table 1.2-1 Environmental Monitoring Results (1/5)

Phase	Category	Monitoring Items	Summary of Monitoring Results	Response Action
Construction and Operation Phases	Marine Water Quality	Water temperature, pH value, BOD, Salinity, Dissolved Oxygen, Ammonia-N, Nutrients, Suspended Solid, Chlorophyll a, Coliform group	The marine water quality monitoring results for this quarter show that except for the mid-layer Ammonia-N level at S4 which exceeded the Type A Marine Environment Quality Standards (<0.3 mg/L), all other measured values at the other stations complied with the standard values.	The exceedance of the standard is likely due to the impact of domestic sewage on the nearshore water quality, rather than being caused by the construction activities of the Project. The Project will continue to monitor in order to understand the environmental changes in the marine area during the construction phase.

	Bird Ecology	Species, amount, habiting and flying activities, flying route, seasonal flock change etc. (including shore bird and water bird)	1.Offshore bird: 4 orders, 4 families, 9 species, and 23 individuals were recorded. 3 Rare and Valuable Species were recorded, including Little Tern, Crested Tern, and Bridled Tern. All species were recorded in flight. Overall, the average density of offshore bird is 0.253 individual/km². 2.Coastal bird survey: 11 orders, 30 families, 68 species, and 4,850 individuals were recorded. 11 orders, 27 families, and 63 species of birds were recorded at selected submarine cable landing route, 10 orders, 28 families, and 57 species were recorded at non-selected submarine cable landing route. For the selected submarine cable landing route, 3 Rare and Valuable Species (Little Tern, Crested Tern, and Black-Winged Kite) and 2 Other Conservation-Deserving Wildlife (Eurasian Curlew and Brown Shrike) were recorded. For the non-selected submarine cable landing route, 2 Rare and Valuable Species (Little Tern and Black-Winged Kite) were recorded.	No abnormal issues were found.

Table 1.2-1 Environmental Monitoring Results (2/5)

Phase	Category	Monitoring Items	Summary of Monitoring Results	Response Action
Construction and Operation Phases	Marine Ecology	Intertidal Ecology	1. Sessile Marine Algae Since sediment of all stations are sand, there is no spots for sessile marine algae to stick on, such as reef and huge rocks. No large sessile marine algae was recorded in this quarter. 2. Intertidal Benthic Organism 11 orders, 18 families, and 29 species were recorded. 8-25 species were found in each sampling station, with most species found in C3. As for abundance, 59-302 individuals were found in each station *Amphibalanus amphitrite* (282 individuals) contributes to 28.63% of the overall creatures, followed by Milky Fiddler Crab (93 individuals, 9.44%) and *Thais clavigera* (82 individuals, 8.32%).	No abnormal issues were found.

	Marine Ecology	Plankton, Zooplankton Juvenile Fish Egg and Fish Larva, Benthic Organism	1.Phytoplankton 5 phylum, 75 genus, and 146 species were recorded. The number of algae species at each station and in each water layer ranges from 23 to 72 species. The abundance ranges from 28,140 to 312,180 Cells/L, with the highest number of algae species recorded at S1 in the bottom water layer and the highest abundance at S4 in the surface water layer. The species with the highest abundance this time is *Chaetoceros Pseudocurvisetus* with 808,240 Cells/L, accounting for 44.55% of the total abundance, followed by *Trichodesmium Erythraeum* (604,420 Cells/L, 33.32%) and *Detonula Confervacea* (72,100 Cells/L, 3.97%). 2.Zooplankton 11 phylum and 32 genres were recorded. 20-27 genre were observed in each sampling station, with abundances ranging from 185,545-718,180 inds./1,000 m^3. The highest numbers of genre were recorded at S2, S4, and S5, with the highest abundance at S2. The most abundant species this time was Calanoid, with 693,948 inds./1,000 m^3, accounting for 32.20% of the total abundance, followed by Ostracods (684,715 inds./1,000m^3, 31.77%) and Siphonohore (128,677 inds./1,000 m^3, 5.97%). 3.Marine Benthic Organism 6 orders, 9 families, and 10 species were recorded. 2-5 species and 6-17 individuals were recorded at each station. The highest number of species was recorded at S1 and the highest quantity was recorded at S2. The most abundant species this time was Oppossum Shrimp with 19 individuals, accounting for 36.54 of the total quantity. The quantities of other species ranged from 1 to 7 individuals. 4.Fish Larva and Fish Egg 194 eggs and 130 fish larva were captured this quarter. In terms of composition, 10 families and 11 genre of fish eggs were identified. Silver Grunt from Haemulidae is the most dominant species, followed by *Moolgarda perusii* from Mugilidae, *Kumococius rodericensis* from Platycephalidae, *Stolephorus commersonnii* from Engraulidae, and *Mene maculate* from Menidae. 7 families and 8 genre of fish larva were identified. *Gerres limbatus* is the most dominant species and the rest of the species were identified with less than 10 individuals/100 m^3.	No abnormal issues were found.

Table 1.2-1 Environmental Monitoring Results (3/5)

Phase	Category	Monitoring Items	Summary of Monitoring Results	Response Action
Construction and Operation Phases	Marine Ecology	Fish	8 families, 9 species, and 59 individuals were captured this quarter, weighing 10.219 kg in total. The 7 species found at all three stations were *Ilisha melastoma*, Silver Grunt, *Acanthopagrus pacificus*, Fourfinger Threadfin, *Johnius distinctus*, Big-Head Pennah Croaker, and Silver Pomfret, indicating that these species are the most widely distributed this quarter. In terms of quantity, the most numerous was *Johnius distinctus*, with 18 individuals, accounting for 30.5% of all fish caught.	No abnormal issues were found.
		Underwater filming	No underwater filming survey is conducted in this quarter.	No abnormal issues were found.
	Cetacean Ecology	Underwater Acoustic Survey	The underwater acoustic measurements at YW-1 to YW-5 were scheduled from May 11 to May 12, 2024 for the Project. The total measurement time is 1 day (24 hours). 1. Whistles YW-1: 274 whistles were detected, overall whistle detecting duration is 2 hours, contact rate is 137 times/hr. YW-2: 720 whistles were detected, overall whistle detecting duration is 3 hours, contact rate is 240 times/hr. YW-3: 1,455 whistles were detected, overall whistle detecting duration is 15 hours, contact rate is 97 times/hr. YW-4: 1,077 whistles were detected, overall whistle detecting duration is 4 hours, contact rate is 269.25 times/hr. YW-5: 354 whistles were detected, overall whistle detecting duration is 9 hours, contact rate is 39.33 times/hr. 2. Clicks No clicks were detected from YW-1, YW-2, YW-4, and YW-5. At YW-3, clicks were detected at 18:00, with a total of 386 clicks, overall click detecting duration is 1 hour, contact rate is 386 times/hr.	No abnormal issues were found.
		Visual Monitoring	8 survey trips were completed this quarter. On-effort record is 388.3 km and 28.65 hours. No cetacean were recorded in the wind farm area. Sighting rate is 0.00%.	No abnormal issues were found.

Table 1.2-1 Environmental Monitoring Results (4/5)

Phase	Category	Monitoring Items	Summary of Monitoring Results	Response Action
Construction and Operation Phases	Underwater Noise	Underwater noise 20 Hz-20kHz. Spectrogram, 1-Hz band, 1/3 Octave band analysis	Due to the currents flowing through the device during tidal changes and the vessels frequently passing by the device, the main characteristic frequencies were 530Hz and 780 Hz.	No abnormal issues were found.

Table 1.2-1 Environmental Monitoring Results (5/5)

	Underwater piling noise		Piling for nineteen turbine foundations was carried out this quarter. The piling noise was measured by SGS, and the underwater noise results were below SPL_{peak} 190 dB re. 1μPa: 1. YUN-41 SPL_{peak}181.3 2. YUN-48 SPL_{peak}183.4 3. YUN-36 SPL_{peak}187.0 4. YUN-05 SPL_{peak}178.0 5. YUN-22 SPL_{peak}186.7 6. YUN-07 SPL_{peak}177.2 7. YUN-10 SPL_{peak}180.0 8. YUN-18 SPL_{peak}178.5 9. YUN-75 SPL_{peak}177.6 10. YUN-26 SPL_{peak}183.7 11. YUN-40 SPL_{peak}179.4 12. YUN-31 SPL_{peak}176.0 13. YUN-02 SPL_{peak}177.3 14. YUN-47 SPL_{peak}179.5 15. YUN-04 SPL_{peak}179.9 16. YUN-17 SPL_{peak}178.4 17. YUN-03 SPL_{peak}181.2 18. YUN-56A SPL_{peak}181.5 19. YUN-16 SPL_{peak}183.3	—

	Electromagnetic Field	Magnetic field (mG), electronic field	The magnetic field in Sihu booster station is 0.01 mG, and in the Taixi Substation, it is 3.68 mG. Both values comply with the recommended exposure limits for electrical substations, magnetic fields, and electromagnetic fields, which are 833 mG (60Hz magnetic field).	No survey was conducted in this quarter.

1.3 Summary of Monitoring Project

Monitoring items, locations, frequency and schedule are listed in Table 1.3-1 to Table 1.3-3. Monitoring methodologies of the environmental monitoring are shown in Table 1.3-4.

Table 1.3-1 Table of Construction and Operation Phases Environmental Monitoring (March-May 2024) (1/2)

Category	Monitoring Item	Location	Frequency	Conducted Time
Marine Water Quality	Water temperature, pH value, BOD, Salinity, Dissolved Oxygen, Ammonia-N, Nutrients, Suspended Solid, Chlorophyll a, Coliform group	5 points in wind farm area	Once per quarter	2024.04.19
Bird Ecology	Species, amount, habiting and flying activities, flying route, seasonal flock change etc. (including shore bird and water bird)	Wind farm area and coastal area near the landing points.	Seasonally in winter (Dec.-Feb.); monthly in migration season during spring (Mar.-May), summer (Jun.-Aug.), fall (Sep.-Nov.)	**Offshore** 2024.03.04 2024.04.22 2024.05.06 **Coastal** 2024.03.04-07 2024.04.08-11 2024.05.06-09
Marine Ecology	Intertidal Ecology	50 m of 2 sides of landing point	Once per quarter	2024.04.23
	Plankton, Fish larva and fish egg, Benthic Organism	5 points in the wind farm area	Once per quarter	2024.04.23
	Fish	3 survey lines	Once per quarter	2024.03.16
	Underwater filming	Turbine foundation and periphery	Once after the piling is completed	No survey is carried out in this quarter
Cetacean Ecology	Underwater Acoustic Survey	5 underwater acoustic monitoring stations in total.	Once per quarter (may be stopped if construction is stopped in winter)	2024.05.11-12
	Visual Monitoring	Wind Farm Area	30 trips in one year before offshore construction.	2024.03.16 2024.03.22 2024.04.16 2024.04.17 2024.05.24 2024.05.25 2024.05.26 2024.05.27

Table 1.3-1 Table of Construction and Operation Phases Environmental Monitoring (March-May 2024) (2/2)

Category	Monitoring Item	Location	Frequency	Conducted Time
Underwater Noise	Underwater noise 20 Hz-20kHz. Spectrogram, 1-Hz band, 1/3 Octave band analysis	2 stations at the boundary of turbines (data can be selected from underwater cetacean acoustic sampling stations.)	Once per quarter (may be stopped if construction is stopped in winter)	Data is from the underwater cetacean acoustic sampling stations YW-3 & YW-5 (2024.05.11-12)
Underwater Noise (Piling)	Underwater noise 20 Hz-20kHz. Spectrogram, 1-Hz band, 1/3 Octave band analysis	750m from the piling location	During the piling of each turbine	Pile driving for a total of 19 wind turbines was carried out this quarter.
Electromagnetic Field	Magnetic Field (mG)	1 station near the landing point	Once per year	No survey is carried out in this quarter

Table 1.3-2 Monitoring Method (1/3)

Category	Monitoring Item	Survey Methods
Marine Water Quality	Water temperature	NIEA W217
	pH value	NIEA W424
	BOD	NIEA W510
	Salinity	NIEA W447
	Dissolved Oxygen	NIEA W455
	Ammonia-N	NIEA W437
	Nitrate	NIEA W436
	Nitrite	NIEA W436
	Orthophosphate	NIEA W436
	Suspended Solid	NIEA W210
	Chlorophyll a	NIEA E509
	Coliform group	NIEA E202
Bird Ecology	Species, amount, habiting and flying activities, flying route, seasonal flock change etc. (including shore bird and water bird)	1.Offshore bird survey Offshore bird visual survey is conducted with line transect method (Camphuysen et al. 2004). Survey area includes the wind farm and 1 km around its periphery. Horizontally parallel transect lines (with parallel gaps that are 2.5 km wide) are set in the survey area. Vessels will sail with even speed (about 10 knot) on the transect lines. To make an even survey, vessels will depart from the opposite end of the transect lines in different surveys. 2.Coastal bird survey Counting method during high tides (Sutherland, 1996) is applied. Shore birds will scatter around the muddy plain of intertidal area for foraging during low tides, which makes counting task difficult. On the other hand, during high tides, shore birds will gather on bank or neighboring inlands for resting. Records and calculation will be easier in this period. Survey will be conducted on sunny day that is few days before/after middle or great tide and will be carried out within 3 hours before/after high tide.

Table 1.3-2 Monitoring Method (2/3)

Category	Monitoring Item	Survey Methods
Marine Ecology	Intertidal Ecology	Sampling of this item will be conducted in accordance with "Sampling of Epibiota in Hardground Sea Area Act"（NIEA E104.20C） and "Sampling of Benthic Organism in Softground Sea Area Act"（NIEA E103.20C） issued by MOENV.
	Plankton, Fish Egg and Fish Larva, Benthic Organism	1.Phytoplankton Survey will be conducted by referring to "Sampling method for Phytoplankton— water sampling"（NIEA E505.50C ） issued by MOENV. Standard water sampler will be applied for sampling. Water from different layers will be sampled at the regulated sampling depth in accordance with the technical regulation in sea ecology (MOENV 0960058664A). 2.Zooplankton Survey will be conducted by referring to "Sampling method for Phytoplankton— water sampling"（NIEA E701.20C） issued by MOENV. NORPAC net (mesh: 0.33 mm × 0.33 mm, length: 180 cm, diameter: 45cm) will be applied in the survey. Flow meter (HYDRO-BIOS mechanical German made flow meter) will be attached on its mouth to measure quantity of filtered water. 3.Fish Egg and Fish Larva NORPAC net (mesh: 0.33 mm × 0.33 mm, length: 180 cm, diameter: 100cm) will be applied in the survey. Flow meter will be attached on its mouth to measure quantity of filtered water. 4.Benthic Organism Survey will be conducted by referring to "Sampling of Benthic Organism in Softground Sea Area Act"（NIEA E103.20C ） issued by MOENV. In each sampling station, vessel speed is lower than 2 Nm. Bottom trawling will be conducted with benthic organism sampler (Naturalist's rectangular dredge, mesh: 5 mm× 5 mm, mouth width 45cm, mouth height: 18cm).
	Fish	Main sampling method of this project is gillnetting. Bottom gillnet is placed at each sampling station, with its direction generally parallel to the coastline. Coordinate of the correct sampling spots will be located by GPS. Later, net will be deployed along the sampling line for fixed spot sampling. Net will be retrieved 3 hours after the deployment. The samples will be frozen or refrigerated for storing. They will be brought back to laboratory for species identification, quantity and weight recording.

Table 1.3-2 Monitoring Method (3/3)

Category	Monitoring Item	Survey Methods
Marine Ecology	Underwater filming	A lighter observation class underwater vehicle (remotely operated underwater vehicles, hereinafter referred to as ROV) with a high-resolution camera will be used to photo the environment at the sample station. It will stay at two depths (the middle and bottom) for 15 minutes to observe the substrate conditions, fish species and quantity. In case of special phenomena (artificial structures or large marine debris, etc.), additional records will be made. After recording, the ROV will ascend to the stern platform, and personnel will retrieve the ROV. The images recorded will be brought back to the laboratory for identification and analysis.
Cetacean Ecology	Underwater Acoustic Survey	Buoy system is used for the measurement. Submersible underwater acoustic recorder SM2M (Wildlife Acoustics, U.S.A) and standard type hydrophone (sensitivity: - 170.2 dB re 1V/μPa, dynamic range: 20 Hz - 200 kHz) are applied for 24 hours continuous measurement.
	Visual Monitoring	Each survey is conducted by 3 to 6 observers. The observers will exchange observation location every 20 minutes. When cetacean is observed, they will record the initial location and relative direction of the cetacean, its distance with vessel and angle of vessel. Vessel will approach the cetacean group slowly to record the coordinates of cetacean. Estimate the number of cetaceans, observe the behaviors and collect related environmental factors.
Underwater Noise	Underwater noise 20 Hz-20kHz. Spectrogram, 1-Hz band, 1/3 Octave band analysis	Underwater noise data will be obtained in 2 stations at the boundary of turbines from the 5 underwater cetacean acoustic sampling stations. The survey will be carried out using Environmental Inspection Laboratory's survey method for underwater noise (NIEA P210.21B).
Air Quality	TSP	NIEA A102
	PM_{10}	NIEA A206
	$PM_{2.5}$	NIEA A205
	Wind Direction	Anemoscope
	Wind Speed	Anemometer
Noise Vibration	Noise	NIEA P201
	Vibration	NIEA P204
Terrestrial Ecology	Plant Ecology	Technical Guidance for Plant Ecological Assessment (Official Letter 0910020491 issued by MOENV on 28th March 2002)
	Animal Ecology	Technical Guidance for Animal Ecological Assessment (Official Letter 1000058665C issued by MOENV on 12th July 2011)
Electromagnetic field	Magnetic field (mG)	NIEA P202

1.4 Monitoring Locations

The locations of environmental monitoring are shown as in Figure 1.4-1 to Figure 1.4-9.

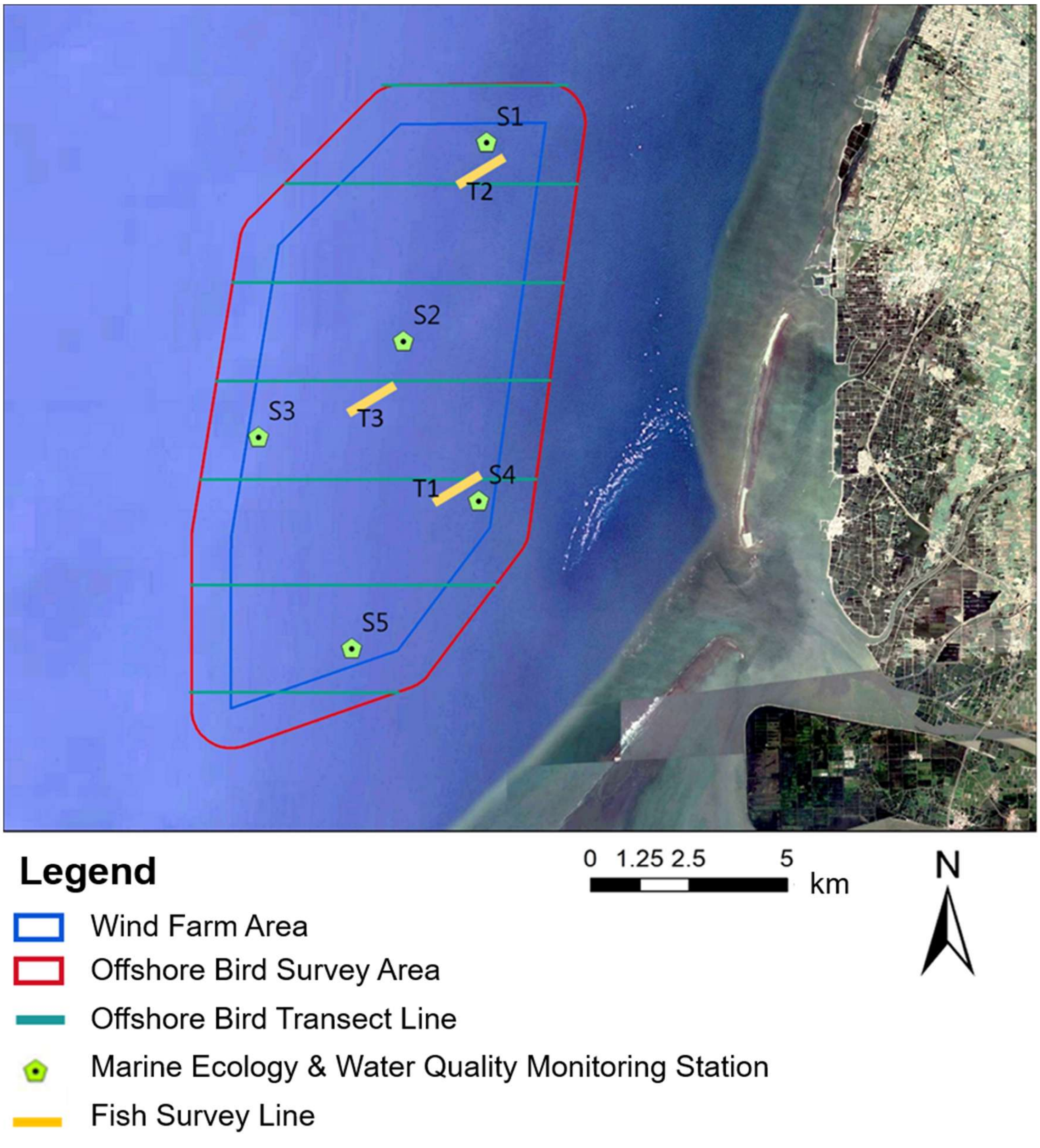


Figure 1.4-1 Location Map of Offshore Bird Ecology, Marine Ecology, Fish and Marine Water Quality Monitoring

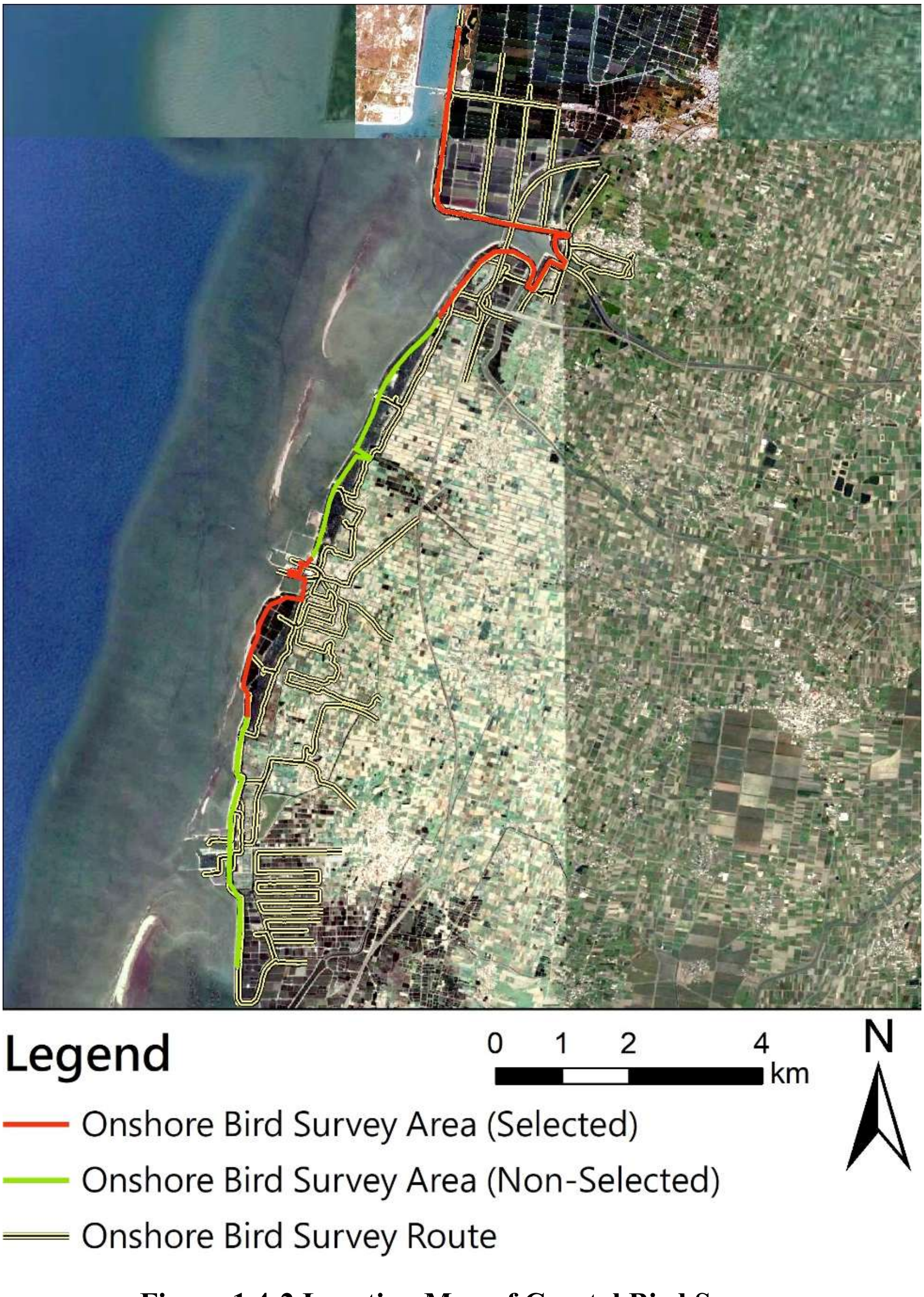
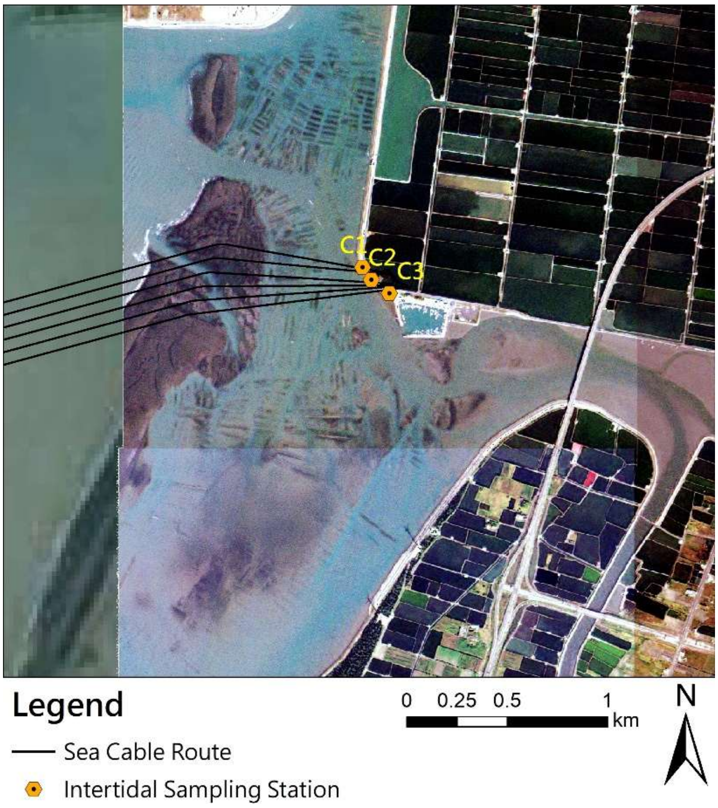


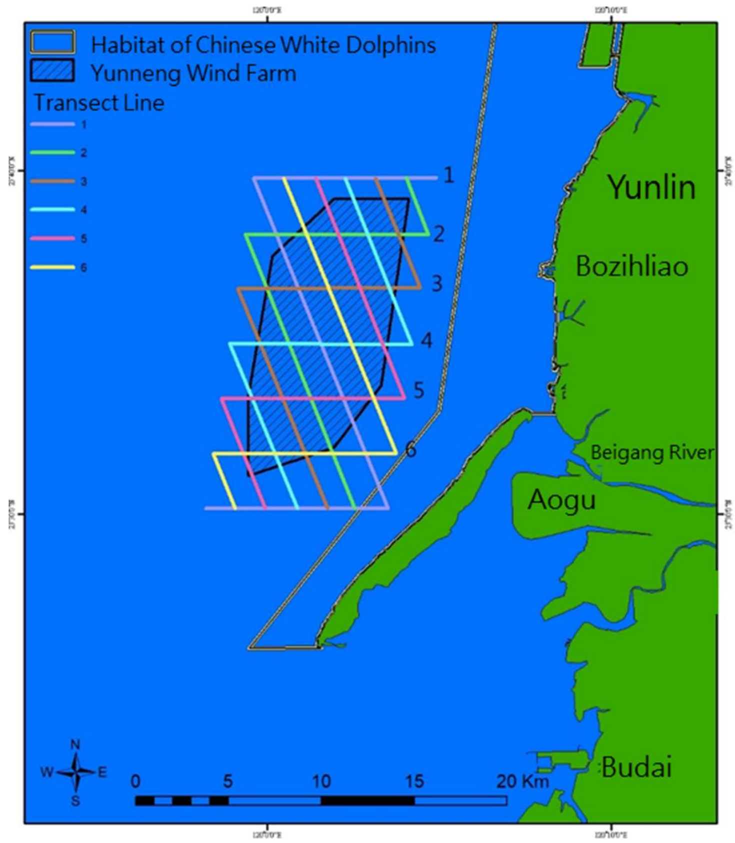
Figure 1.4-2 Location Map of Coastal Bird Survey



(1) Landing Point (Taixi)

(2) Landing Point (Sihu)

Figure 1.4-3 Location Map of Intertidal Ecological Monitoring



Remarks: Numbers indicate transect line conde of this survey.

Figure 1.4-4 Transect Lines of Cetacean Visual Survey

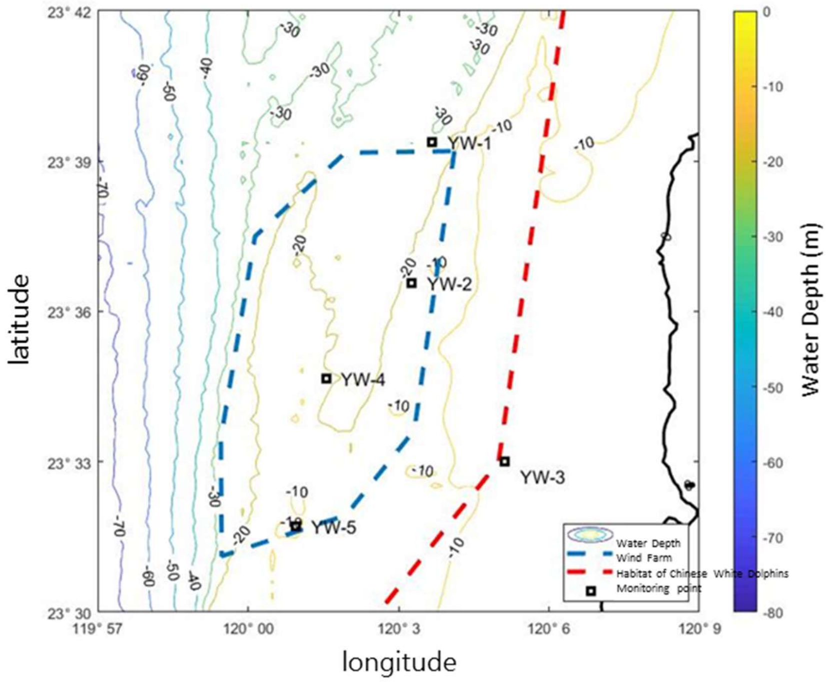
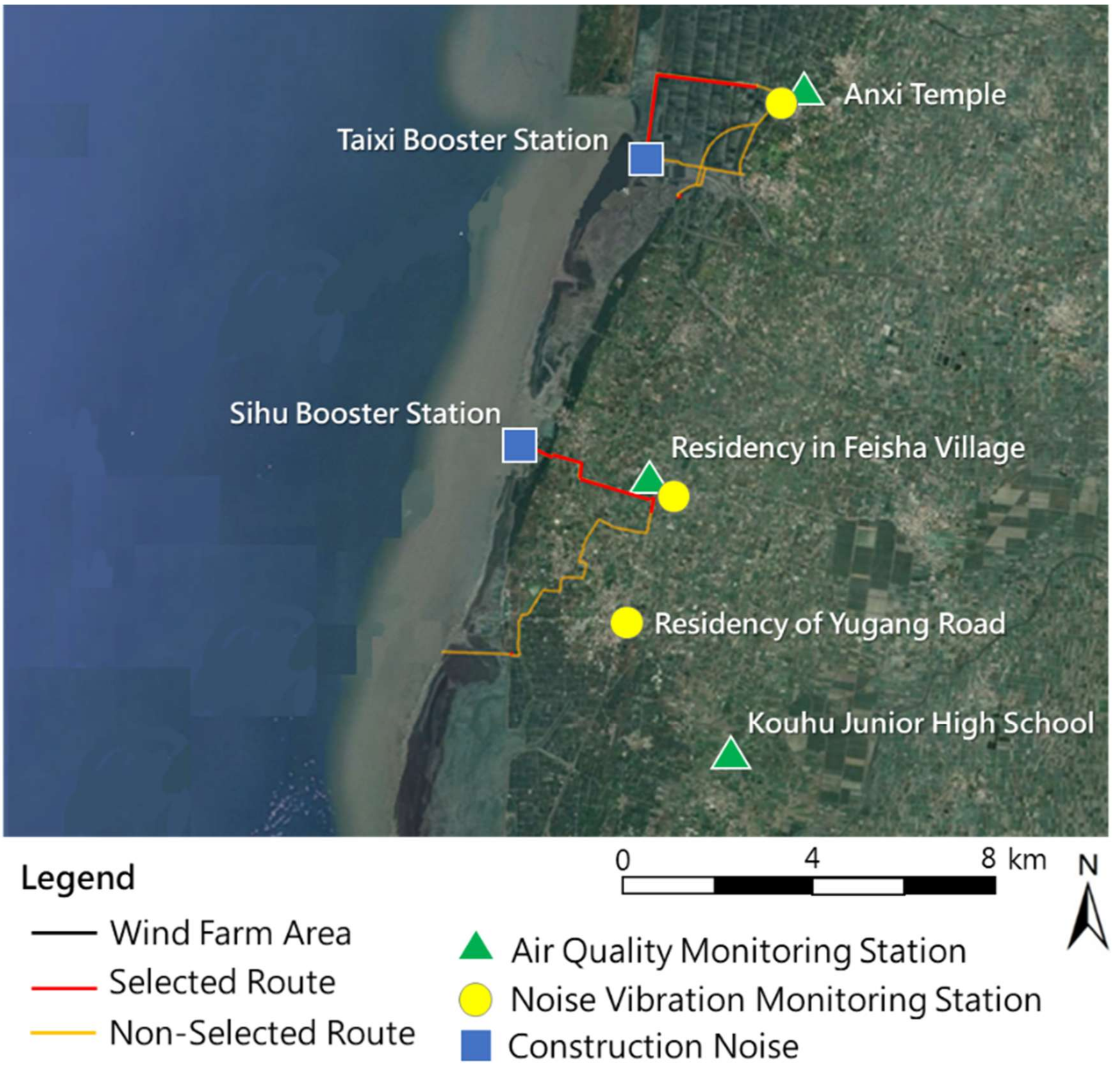


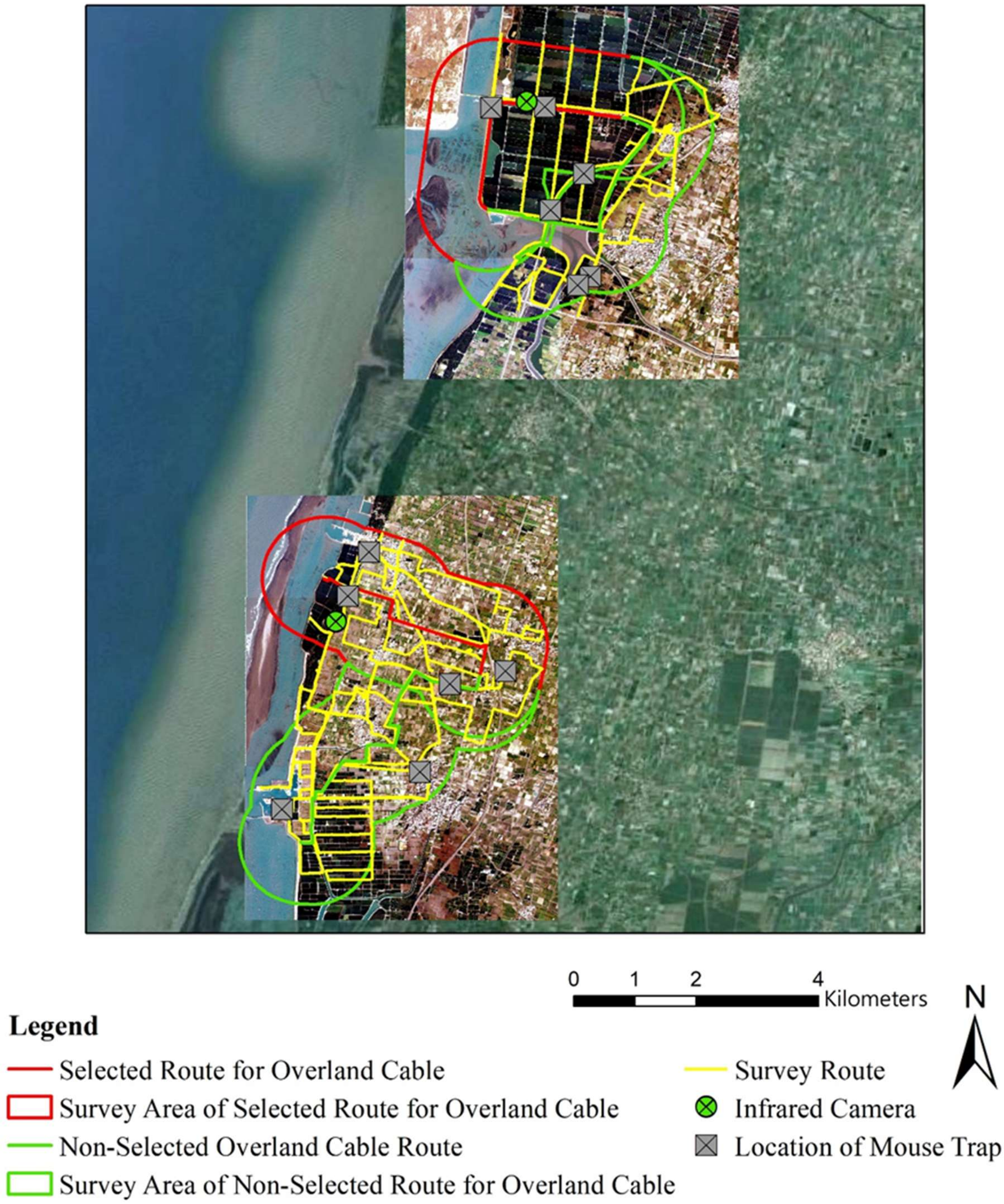
Figure 1.4-5 Schematic Diagram of Underwater Acoustic Measurement



Remark 1: 4 landing points are planned according to EIS, 2 landing points are selected ultimately.

Remark 2: Monitoring spot for air quality has been changed since January 2020 according to 1st EIS report (finalized for review in January 3, 2020), official letter #1080100460.

Figure 1.4-6 Location Map of Air Quality, Noise Vibration and Construction Noise Monitoring



Remarks: 4 landing points are planned according to EIS, 2 landing points are selected ultimately.

Figure 1.4-7 Location Map of Terrestrial Ecological Survey

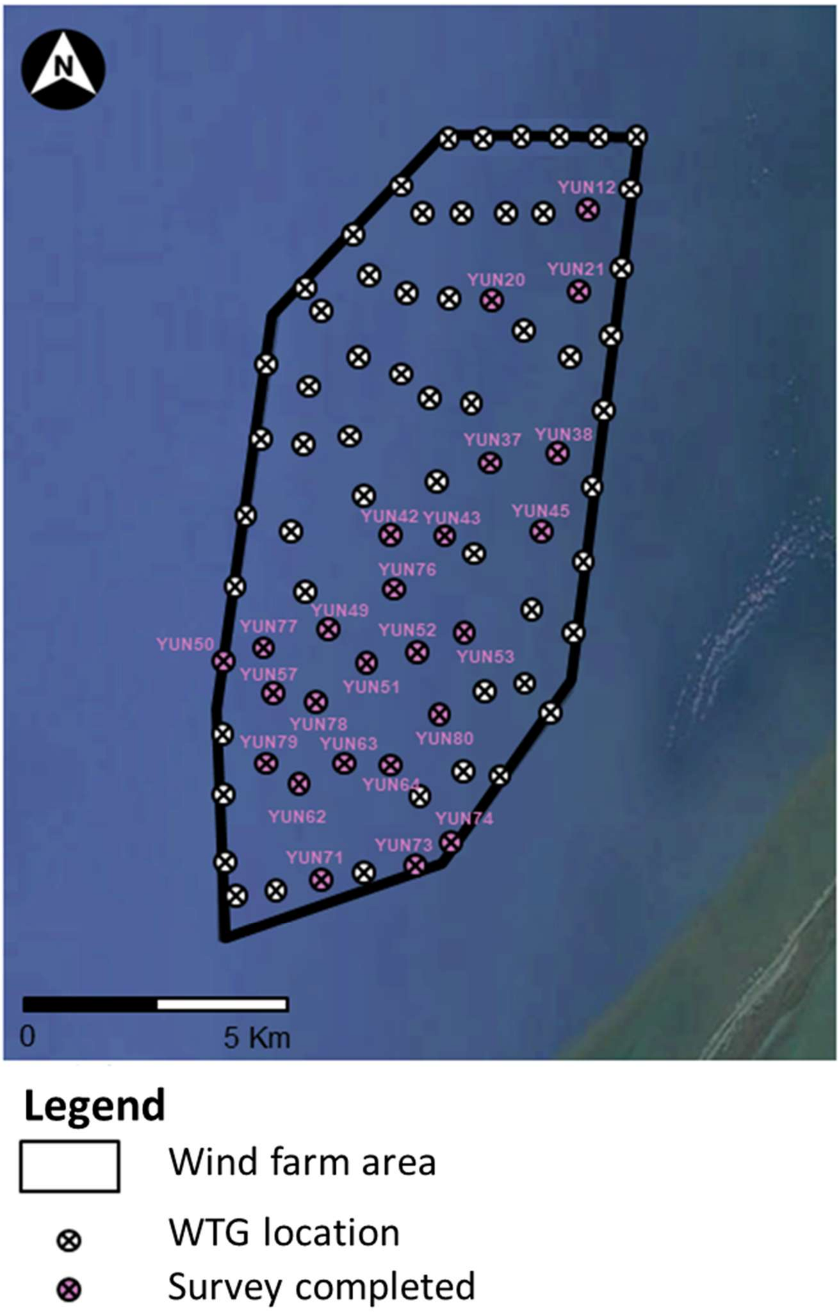


Figure 1.4-8 Wind Farm Area and Location for Underwater Filming

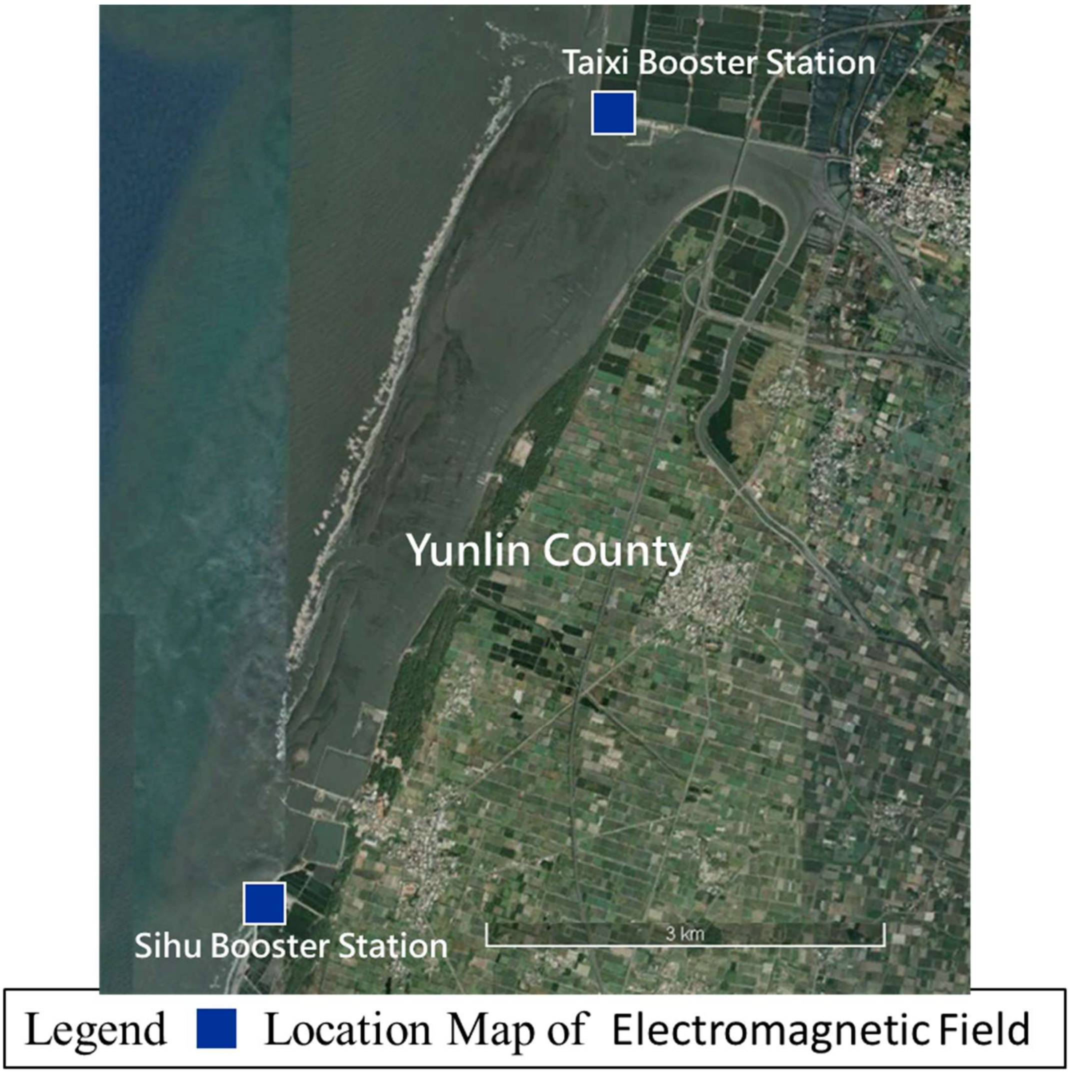


Figure 1.4-9 Location for Electromagnetic Field Survey

1.5 Quality Assurance/ Quality Control Measures

1.5.1 Quality Control/ Quality Assurance of In Situ Sampling

Number of transfers shall be kept to minimum during sampling and delivering processes. Personnel of sampling shall record in sampling log in details and oversee checking, packing and delivering the whole batch of samples. Sample bottles shall be kept in thermostat-container and it shall be sent in whole batch with sampling log to laboratory. They will be accepted by sample keeper. Procedures and notices during sampling and delivering process shall be referred to Table 1.5.1-1 to Table 1.5-5.

When samples are received by sample administrators, it shall be made sure if it is sealed. Thus, the sample bottles shall be examined to make sure it is not damaged, and water sample are not leaked. After examination, sign to take responsibility. The sample shall be kept in assigned refrigerators after recording date and time. Fill out monitoring chain log for further management and tracking of sampling.

Table 1.5.1-1 Procedures and Notices for Processes from Sampling to Delivering -Air Sampling

Sampling Procedure	Objective	Notice
In-Situ Record	To understand possible disturbance during in-situ sampling.	Record meteorological data, environmental factors of vicinity in details.
Stability/ Calibration	Ensure the representativeness of analysis data.	Equipment shall be flow calibrated before use.
Sampling	It shall be switched on in advance to operate while sampling to avoid errors caused by machines.	Before monitoring, switch on in advance until it reaches stable flow capacity. Then, it can be sampled for 24 hours.
Delivering Blank Samples	Ensure accuracy of analysis results, send a set of blank samples each time.	Understand the integrity of delivering process by delivering bank samples.
Storage/ Deliver	Avoid degradation of quality due to lengthy storage duration or improper delivery.	According to regulated preserving method by MOENV, deliver, preserve and pay attention to sealing.

Reference Data: Guidance of Environmental Sampling and Preservation (NIEA-PA102) issued by MOENV, Executive Yuan on 4th October 2004.

Table 1.5.1-2 Procedures and Notices for Processes from Sampling to Delivering-Noise Monitoring

Sampling Procedure	Objective	Notice
Inventory of Equipment	Ensure the integrity of equipment.	Fill in equipment logbook.
Determine the validity of sound-level calibration	Ensure the traceability of monitoring data standards.	Check equipment calibration data.
In Situ Erection	Complete the erection of equipment.	1. Monitoring is conducted according to selected sampling stations and erect equipment according to regulations. 2.Connect the noise dosimeter to power supply and adjust to 1.2m to 1.5m.
Electrical Calibration	Ensure the stability of equipment.	Use built-in electrical signal of NL-18, NL-31, NL-32, read reaction value by internal data acquisition system.
Setting of Equipment	Set data output mode according to project requirements.	A-Weighting is adopted in noise, Fast is adopted for dynamic response, 1 record is read per second.

Reference Data: Guidance of Environmental Sampling and Preservation (NIEA-PA102) issued by MOENV, Executive Yuan (Official Letter 0930072069B) on 4th October 2004.

Table 1.5.1-3 Procedures and Notices for Processes from Sampling to Delivering - Vibration Monitoring

Sampling Procedure	Objective	Notice
Inventory of Equipment	Ensure the integrity of equipment.	Fill in equipment logbook.
Determine the validity of sound-level calibration	Ensure the traceability of monitoring data standards.	Check equipment calibration data.
In Situ Erection	Complete the erection of equipment.	1.Monitoring is conducted at selected sampling points, it is erected according to regulated guidelines. 2.The vibration meter is connected to electricity supply and placed at solid and even surface.
Electrical Calibration	Ensure the stability of equipment.	Use built-in electrical signal of VM52A/53A, read reaction value by internal data acquisition system.
Equipment Setting	Set data output mode according to project requirements.	Direction is set as Z-axis.

Reference Data: Guidance of Environmental Sampling and Preservation (NIEA-PA102) issued by MOENV, Executive Yuan (Official Letter 0930072069B) on 4th October 2004.

Table 1.5.1-4 Procedures and Notices from Sampling to Delivering-Water Quality

Sampling Procedure	Objective	Notice
Cleaning of Sampling Equipment	Clean the water sampler to collect sample that is big enough to represent the water layer.	Wash the sampler with distilled water.
Sampling	Ensure to reduce interruption from chemicals to the least when collecting samples from the water channel.	Prevent bubbles when sampling for items that have higher sensitivity to air (e.g. dissolved oxygen).
Filter/Storage	Water shall be filtered before measuring dissolved materials. This process shall be conducted as soon as possible after the water sample is collected. This step is also deemed as a way to store the sample. Storing of the sample is applied to prevent water sample from deterioration (e.g. volatilization, reaction, adsorption, photolysis) before analysis.	Add proper storing reagent and use clean container to store the samples.
In-Situ Measurement	To ensure that collected sample is integrity, some of the index shall be analyzed as soon as possible after sampling, e.g. pH value, conductivity and water temperature.	Conductivity, pH value and water temperature shall be analyzed on site.
Storage/ Deliver	Avoid degradation of quality due to lengthy storage duration or improper delivery.	Deliver and preserve according to regulated preserving method by MOENV; pay attention to the completeness when sealing.

Reference Data: Guidance of Environmental Sampling and Preservation (NIEA-PA102) issued by MOENV, Executive Yuan (Official Letter 0930072069B) on 4th October 2004.

Table 1.5.1-5 Procedures and Notices from Sampling to Delivering-Electromagnetic Field

Sampling Procedure	Objective	Notice
Inventory of Equipment	Ensure the integrity of equipment.	Fill in equipment logbook.
Determine the validity of the calibration	Ensure the traceability of monitoring data standards.	Check equipment calibration data.
In Situ Erection	Complete the erection of equipment.	1. Monitoring is conducted at selected sampling points, it is erected according to regulated guidelines. 2. The measurement points are typically positioned at a height of 1 m above the ground or floor, with a maximum height not exceeding 2 m.
Electrical Calibration	Ensure the stability of equipment.	Use built-in electrical signal of NBF-550/EHP50F/ EFA-300, read reaction value by internal data acquisition system.
Equipment Setting	Set data output mode according to project requirements.	Measurements are conducted using a 3-axis probe for omnidirectional measurements, with monitoring data automatically stored, and a sampling interval not exceeding 10 seconds.

Reference Data: Guidance of Environmental Sampling and Preservation (NIEA-PA102) issued by MOENV, Executive Yuan (Official Letter 0930072069B) on 4th October 2004.

1.5.2 Quality Assurance/ Quality Control of Analysis

I. When testing personnel is conducting testing analysis, it shall be in accordance with the standard procedure of testing method.

II. Sample of quality management is analyzed (blank, repeated, check, add standard analysis etc.) according to quality management standards. Testing data was recorded in personal log in accordance with testing data standard format.

III. When testing data is in line with quality control, and it falls between range of upper limit and lower limit, the testing personnel shall deliver testing items records to personnel of quality control for reviewing.

IV. While conducting testing and analysis, it should be remarked that only required amount of water sample are taken out from the refrigerator. The remaining water samples shall be placed in the refrigerator for the next personnel. Sample logs shall be filled out.

1.5.3 Calibration Items and Frequency of Instrument

I. Instrument calibration in the environmental laboratory required by environmental testing is divided into external calibration and internal calibration. External calibration shall be assigned to calibration agencies which obtained ISO/IEC 17025 (CNS 17025); internal calibration shall be performed by laboratory or laboratory which obtained ISO/IEC 17025 (CNS 17025). As for maintenance of instrument, it shall be assigned to Original Equipment Manufacturer, authorized distributor or qualified maintenance provider. The maintenance period and related regulations of environmental testing instrument are listed as Table 1.5.3-1. Calibration and maintenance guidelines of environmental testing instrument shall be referred to NIEA PA108.

II. According to general frequency of calibration and frequency listed in Table 1.5.3-1, in the shortest or longest frequency of calibration or maintenance period, the instrument is assumed in good condition with appropriate maintenance and stability. The laboratory is qualified to use and check the instrument. When the instrument is under unfavorable conditions, the frequency of calibration and maintenance shall be shortened. If the instrument is suspected to have problem, calibration and maintenance shall be conducted promptly. Accuracy of some equipment, such as precision balance, will be affected after maintenance or moving; it shall be performed re-examination or recalibration.

III. Laboratory shall create calibration and maintenance plan (table) and checklist of annual calibration and maintenance of instrument or mechanism with same functions to conduct calibration (maintenance) or re-calibration (maintenance).

IV. Calibration or maintenance of instrument shall be recorded and filed, including dates, results and other discoveries.

V. All procedures of instrument calibration and maintenance shall be referred to the manual of each instrument. It shall be in line with regulations of calibration agencies which obtained ISO/IEC 17025 (CNS 17025).

Table 1.5.3-1 Schedule of Equipment Calibration and Maintenance (1/5)

Equipment	Testing Items	Frequency	Notice	Records	Tolerable Error
Thermometer	Calibration: Temperature	Per Annum	Deliver to calibration laboratory	External Calibration Record	-20℃±3℃ 0-50℃ ±0.5 ℃ 50-100℃ ±1 ℃ 100-200℃ ±2 ℃
		Six Months	Check of Freezing Point	Internal Calibration Record	
Working Thermometer	Calibration: Temperature	Before First Use	Multiple Point Calibration of Temperature	Internal Calibration Record	
		6 Months	Freezing point or single point calibration is conducted by thermometer.	Internal Calibration Record	
High Volume Sampler (TSP, PM_{10})	Check: Flow Capacity Calibration: Flow Capacity	Before and After Use	Inspection of Flow Capacity (Single Point Inspection)	Internal Calibration Record	TSP: ±7 % PM_{10}: ±5% PAH: ±7 %
		When start using the new machine	Flow Capacity Calibration (Multiple Point Calibration)	Internal Calibration Record	R>0.995; Errors of all calibration point shall range within ±5 % (TSP)
		During repair of motor and after maintenance or exchange of carbon brush			
		Repair adjustment or exchange of flow meter.			
		When calibration curve is deviated more than ±7%(TSP) or ±5%(PM10) during single point inspection.			
		Regular calibration for every 3 months or after operation of 360 hours (PM_{10})			
	Calibration: Timer	Per Annum	Compare with National Standard Time	Internal Calibration Record	Error of 24 hours shall not exceed 2 minutes (120 s)

Table 1.5.3-1 Schedule of Equipment Calibration and Maintenance (2/5)

Equipment	Testing Items	Frequency	Notice	Records	Tolerable Error
Flowmeter with Small Holes	Calibration: Flow Capacity	Per Annum	Calibrate at laboratory accords with national standards.	External Calibration Record	R > 0.999
PM10 Auto-Analyzer (β-ray)	Check: Flow Capacity	Every Working Day	Record flowing sample.	Record	± 10 %
	Check: Intensity of Radiation Source		Record intensity of radiation source of β-ray.	Record	Original Equipment Specification
	Calibration: Flow Capacity	Every 3 months	Flow calibration is conducted via standard flowmeter.	Internal Calibration Record	± 10 %
	Check: Intensity of Radiation Source		It is conducted via thin film referred by Original Equipment Manufacturer. Confirm radiation source intensity of β-ray.	Internal Calibration Record	Original Equipment Specification
	Calibration: Flow Capacity	New setting of instrument, after repair of failures	Flow capacity calibration is conducted via standard flowmeter.	Internal Calibration Record	± 10 %
	Check: Intensity of Radiation Source		It is conducted via thin film referred by Original Equipment Manufacturer. Confirm radiation source intensity of β-ray.	Internal Calibration Record	Original Equipment Specification
	Comparison: Accuracy	Suspected value of sampling stations/ measuring value	PM_{10} high volume sampling method is used for comparison test of data value.	Internal Calibration Record	Linear Regression: Slope＝1±0.1; Intercept 0±5μg/m³; R≧0.97
Anemometer (NIEA P201, P205, P206 Noise Measurement)	Calibration: Accuracy	Once per 2 years	Deliver to Central Weather Bureau or calibrate at laboratory accords with national standard	External Calibration Record	<1.0 m/s, at least a calibration point shall range between 4 and 6m/s.
Sound Calibrator	Calibration: Accuracy	Per Annum	Calibrate at laboratory accords with national standards.	External Calibration Record	±0.3 dB (1000 Hz)
Noise Audiometer	Confirmation: Accuracy	Before and After use	Confirm acoustic calibrators.	Internal Calibration Record	±0.7 dB, difference of absolute value shall not more than 0.3 dB

Table 1.5.3-1 Schedule of Equipment Calibration and Maintenance (3/5)

Equipment	Testing Items	Frequency	Notice	Records	Tolerable Error
Noise Audiometer	Inspection: Accuracy	Once per 2 years	Calibrate at laboratory accords with national standards.	External Calibration Record	±0.7 dB
	Low Frequency Check: Accuracy	Once per 2 years	Calibrate at laboratory accords with national standards.	External Calibration Record	±0.5 dB(Within 20-200Hz)
Standard Vibration Source	Calibration: Accuracy	Per Annum	Calibrate at calibration and measurement laboratory.	External Calibration Record	±1.0 dB
Vibrometer	Confirmation: Accuracy	Before and After Use	Confirm standard vibration source.	Internal Calibration Record	±1.0 dB
	Calibration: Accuracy	Once per 2 years	Calibrate at laboratory accords with national standards.	External Calibration Record	±1.0 dB
4-digit balance	Calibration: Correctness	Per Annum	Calibration and measurement laboratory to conduct repetitive and linear measurement and calibration	External Calibration Record	To the last digit that can be measured by the balance. E.g. 4-digit balance: ±0.0005g
		Every 6 Months	Repeatability check	Internal Calibration Record	±2SD
		Per Month	One point check	Internal Calibration Record	±3SD
		Before every using	Zero check	—	—
	Maintenance: Clearance without water	Everyday Per Month	Clearance of levelness and plate Clearance inside the plate	— —	—
pH meter	Calibration: Correctness	Every 3 Months	Calibration with thermo probe (same method as working thermometer)	Internal Calibration Record	±0.5 ℃
		Before & after use	First, calibrate with the first standard buffer solution (pH7) and use the second standard buffer solution (pH4 or pH10) to correct its slope. Measure the deviation, zero point potential and slope with the range covering prescribed 2 solutions; the values shall fall within acceptance range.	Internal Calibration Record	Deviation: ±0.05 Zero point potential: -25-25mV Slope: -61--56mV/pH
	Maintenance: Clearance	Before & after use	Wash the glass electrode	—	—

Table 1.5.3-1 Schedule of Equipment Calibration and Maintenance (4/5)

Equipment	Testing Items	Frequency	Notice	Records	Tolerable Error
Water Purification	Check: Resistivity	Everyday	Check resistivity presented on the panel	Record	General regulation: ≧16MΩ-cm(25℃) NIEA W313 regulation: ≧18MΩ-cm(25℃)
	Confirm: Resistivity	Every 6 Months	Test the resistivity of water to ensure that the value meets the requirement	Record	General regulation: ≦0.06μs/cm NIEA W313 regulation: ≦0.05μs/cm
	Maintenance: Clearance	Update according to device condition	Change filter/resin	Record	—
BOD Bottle	Calibration: Volume	Before 1st use	Calibration of all	Internal Calibration Record	According to CALP-PQ-008 requirement
		Per Annum	Calibration of 10%	Internal Calibration Record	
Oven	Calibration: Temperature	Before 1st use	Check temperature changes in calibration and measurement laboratory	External Calibration Record	±1℃
		Per Annum	Use thermal couple to check temperature changes in the used location in the oven in calibration and measurement laboratory	External Calibration Record	±1℃
	Maintenance: Temperature	When using	Check temperature with thermometer and record the temperature	Record	±1℃
Referencing Thermometer	Calibration: Temperature	Per Annum	Send to calibration laboratory	External Calibration Record	-20℃±3℃ 0-50℃ ±0.5 ℃ 50-100℃ ±1 ℃ 100-200℃ ±2 ℃
	Calibration: Temperature	Every 6 Months	Freezing point inspection	Internal Calibration Record	
Working Thermometer	Calibration: Temperature	Before 1st use	Calibration on multiple temperature	Internal Calibration Record	
		Every 6 Months	Freezing point/single point calibration by referencing thermometer	Internal Calibration Record	
Dissolved Oxygen Meter	Calibration: Correctness	Before using	Single point inspection	Internal Calibration Record	3%
	Calibration: Correctness		Electrode inspection	Record	—

Table 1.5.3-1 Schedule of Equipment Calibration and Maintenance (5/5)

Equipment	Testing Items	Frequency	Notice	Records	Tolerable Error
Dissolved Oxygen Meter	Confirm: Atmospheric pressure	Before using	Compare with standard atmospheric pressure meter	Internal Calibration Record	< 1%
	Calibration: Saturated dissolved oxygen		Full point calibration using saturated-water vapor air	Internal Calibration Record	Slope: 0.7-1.25 % Saturation between 100±3%
	Confirm: Zero dissolved oxygen	Per Month	Zero point calibration/confirm with zero dissolved oxygen solution.	Internal Calibration Record	< 0.1 mg/L
	Confirm: Correctness		Check with aerated-to-saturation water, whose dissolved oxygen is testified through iodometry	Internal Calibration Record	<0.2 mg/L
	Confirm: Temperature	Every 3 Months	Compare with standard thermometer	Internal Calibration Record	0-50℃±0.2℃
Conductivity Meter	Calibration: Correctness	Before using	Single point inspection (calibrate with 0.01N KCl)	Internal Calibration Record	±10 μmho/cm
	Calibration: Temperature	Per Annum	Calibration with thermo probe (same method as working thermometer)	Internal Calibration Record	±0.5℃
	Calibration: Correctness	Per Annum	Full scale inspection (0.1, 0.01, 0.001N)	Internal Calibration Record	0.1N: ±2% 0.01N: : ±2% 0.001N: ±5%
	Maintenance: clearance	Before & after use	Wash electrode	—	—
BOD Incubator	Confirm Maintenance: Temperature	Everyday	Record max/min temperature with high/low temperature thermometer	Record	±1 ℃
Spectrophotometer	Calibration: Correctness Stability Reproducibility	Before using	Prepare calibration curve (referring to sample)	Record	According to SOP requirement
		Every 3 Months	Calibration of accuracy of wavelength, absorbance, linearity, stray light, matching of cells	Internal Calibration Record	
		Per Annum	External calibration by manufacturer	External Calibration Record	
	Maintenance: Clearance	Before using	Clean fouling inside the tank	—	
Atomic Absorption Spectrometer	Calibration: Stability	Before using	Check the signal value through middle point of As or Hg's calibration curve	Internal Calibration Record	±20%
		Quarterly	Check absorbance with 5ppm Cu standard solution	External Calibration Record	Absorbance ≧ 0.55ABS
Electromagnetic measurement device	Calibration: Correctness	Every 2 years	Calibrate in the calibration lab	External Calibration Record	±10%

1.5.4 Testing Methods of Analysis Items

To ensure data quality of monitoring analysis, quality control goals for relevant monitoring analysis data are listed in Table 1.5.4-1.

Table 1.5.4-1 Quality Control Objectives of Sample Testing Data

Category	Items	Testing Method	Instrument Detection Limit
Air Quality	Suspended Particles (TSP)	NIEA A102	—
	Suspended Particles (PM_{10})	NIEA A208	0.0001 g
	Suspended Particles ($PM_{2.5}$)	NIEA A205	2 μg/m³
Noise	L_{eq}, L_{max}, L_{day}, L_{night}, $L_{midnight}$, $L_{x(5,10,50,90,95)}$	NIEA P201	30 dB(A)
Vibration	L_{veq}, L_{vmax}, L_{vday}, $L_{v\ midnight}$, $L_{vx(5,10,50,90,95)}$	NIEA P204	30 dB
Marine Water Quality	Temperature	NIEA W217	---
	pH value	NIEA W424	---
	BOD	NIEA W510	<1.0 mg/L
	Salinity	NIEA W447	---
	Dissolved Oxygen	NIEA W455	---
	Ammonia-N	NIEA W437	0.01 mg/L
	Nitrite	NIEA W436	0.001 mg/L
	Nitrate	NIEA W436	0.01 mg/L
	Orthophosphate	NIEA W427	0.003 mg/L
	Suspended Solid	NIEA W210	1.0 mg/L
	Chlorophyll a	NIEA E509	0.02 μg/L
	Coliform group	NIEA E202	10 CFU/100 mL
Electromagnetic field	Magnetic field	NIEA P202	0.001 V/m
	Electronic field		0.0001 mT

1.5.5 Data Processing Principles

Calculations of raw data and testing logbook are indicated in significant figure and it is carried over based on regulations.

I. Significant Figure

In the measurement of physic and chemistry, measured value is slightly different with actual value. The difference is called error. Maximum error of every observed value is called uncertainty or absolute uncertainty. For convenient calculation, omit uncertainty. The observed value is indicated by a combination of correct figure and an unconfirmed figure which is called significant figure method. The four fundamental operations of arithmetic are adopted by laboratory, the examples are listed as follows:

i Carry Over: Round off. Round up when the digit is more than 5. Round down when the digit is less than 5. When the front digit is an even number, round down automatically. When the front digit is an odd number, round up automatically.

E.g: 0.455 → 0.46

0.443 → 0.44

ii Observed value is indicated as significant figure

E.g: 0.0025 → 2-significant-digit

13.20 → 4-significant-digit

iii Indicate with exponent sign

E.g: 130000 → ? 1.30×10^5 → 3-significant-digit

1.3×10^5 → 2-significant-digit

iv Indicate with minimum significant digit in subtraction.

E.g: 120.05 + 10.1 + 56.323 = 186.473, indicate with 186.5.

v Indicate with minimum significant digit in division.

E.g: 2.4x0.452/100.0 = 0.0108 = 0.011 → 2-significant figure

vi Indicate with minimum significant digit in multiplication.

E.g: (1256x12.2) + 125 = 1.53×10^4 + 125 = 1.54 x 104

II. Data Processing and Confirmation

When inspection is completed, inspection records and working log shall be given to personnel of quality assurance. After confirm inspection data, compile preliminary report of inspection data. It shall be given to administrator to create a formal inspection report.

Administrators shall hand in the inspection report, inspection record tables and preliminary report of inspection to director of laboratory. A qualified report is a report with approval and stamp of director; Report number and sample number shall be listed on report.

1.5.6 Bird Ecology

I. Offshore Visual Survey

i Offshore bird visual survey is conducted with line transect method (Camphuysen et al. 2004). Survey area includes the wind farm and 1 km around its periphery. Horizontally parallel transect lines (with parallel gaps that are 2.5 km wide) are set in the survey area. Vessels will sail with even speed (about 10 knot) on the transect lines. To make an even survey, vessels will depart from opposite end of the transect lines in different surveys.

ii Sailing tracks will be recorded with GPS devices in each survey. Sailing information and sea states during the surveys will be recorded in record sheets.

iii At least 2 observers will be onboard, equipped with binocular and digital camera with at least 500mm equivalent focal length. Observers will conduct visual survey at the left and right sides of the vessel respectively. Distance of the visual survey is 300m from the sailing track (as shown in Figure 1.5.6-1).

iv When observing bird activities, observers should record the species, number, relative ages, feather (plumage & moult), behaviors, spotting time, distance (vertical distance from the sailing track), flying direction and flying altitude depending on in-site condition, as much as possible. Record forms and items refer to recording sheets used in German StUK4 technical directions (Aumüller et al., 2013). Distance of resting birds is indicated by levels. 5 levels are classified, including 0-50m, 50-100m, 100-200m, 200-300m, and above 300m. Altitude of flying birds is indicated by 7 levels, including 0-5m, 5-10m, 10-20m, 20-50m, 50-100m, 100-200m, and above 200m. Taking bird ecological features at the Taiwan marine area into consideration, counting intervals suggested by StUK4 technical induction as well as method that counts all observed birds will be adopted for number recording.

v Surveyed area will be calculated with the length of GPS tracks after each survey to estimate the bird density within the survey area.

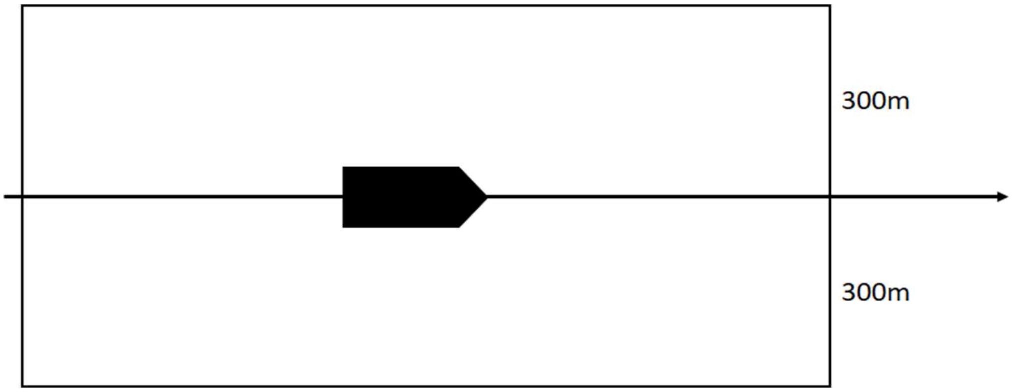


Figure 1.5.6-1 Sailing Tracks of Vessels of Line Transect Method

II. Coastal Visual Survey

i Counting method during high tides (Sutherland, 1996) is applied. Since shore birds will scatter around the muddy plain of intertidal area for foraging during low tides, which makes counting task difficult. On the other hand, during high tides, shore birds will gather in bank or neighboring inlands for resting. Records and calculation will be easier and more precise in this period.

ii Surveyor will walk with binoculars at a slow walking speed along the established road or path in the survey area and record the bird species witnessed or heard along the way. Besides recording bird species and calculate abundance, bird behaviors and habitats will be recorded as well.

1.5.7 Marine Ecology

Survey items in marine ecology include Phytoplankton, Zooplankton, Benthic organism, Fish Egg and Fish Larva. Survey items and methods are described as follows:

I. Intertidal Ecology

Sampling of this item will be conducted in accordance with “Sampling of Epibiota in Hardground Sea Area Act”（NIEA E104.20C） and “Sampling of Benthic Organism in Softground Sea Area Act”（NIEA E103.20C） issued by MOENV.

Sampling of this item will be conducted in accordance with “Sampling of Epibiota in Hardground Sea Area Act”（NIEA E104.20C） and “Sampling of Benthic Organism in Softground Sea Area Act”（NIEA E103.20C） issued by MOENV.

Surveys on benthic creatures that have high mobility (shrimps and crabs) will be conducted along the survey line. For surveys on epibiotic shrimps and crabs, a fixed-length survey line is set from supralittoral zone to infralittoral zone. Survey range is 1m extending from the survey line; species within the range will be recorded. For species cannot be identified on spot, it will be taken photo and refrigerated for identification once arrive at laboratory. For benthic creatures with low mobility (snails and shellfish), framing survey is adopted. A fixed-length survey line is set from supralittoral zone to infralittoral zone, a fixed number of sampling frames (1m × 1m) are placed along the sides of the survey line (the size of sampling area will be adjusted depending on on-site condition). Benthic snails and shellfish will be observed and collected along the fixed frame. Shovels will be applied for collecting samples 30cm under the earth. Captured individuals will be placed back after their species and number are identified on spot. For species cannot be identified, it will be taken photo and refrigerated for identification once arrive at laboratory.

II. Phytoplankton

i Species Composition and Abundance

Survey will be conducted in accordance with "Sampling Method of Phytoplankton – Water Extraction" (NIEA E505.50C) announced by MOENV. A standard water extraction equipment was used during sampling and the task was performed at specific sampling points and depths for the extraction of water samples at different water layer (as shown in Table 1.5.7-1), as regulated by the Technical Specification for Marine Ecology Assessment (Environment Protection Administration Document No. 0960058664A）. 1 L of water sample was gathered from each layer and placed in a PE plastic bottle and was instantly stabilized by adding neutral formalin with 5% final concentration. It is then kept away from sunlight and stored in ice, waiting to be taken back to the laboratory for species determination and counting.

ii Chlorophyll a

Survey will be conducted in accordance with "Determination of Chlorophylls a in Algae by Ethanol"（NIEA E508.00B） issued by MOENV. Regulated water sampler is applied for the sampling. Sampling water are taken in different layers according to technical regulation of marine ecology（MOENV official letter #0960058664A）, as shown in Table 4.3.2-2. 1 L of water is taken from each layer and is contained in PE wide-mouth bottle. Water sample will be stored temporarily in ice bucket or refrigerator（4 ℃）. It will then be concentrated and filtered onto the filter plate in 24 hours.

iii Primary Productivity

Regulated water sampler is applied for the sampling. Sampling water are taken in different layers according to technical regulation of marine ecology（MOENV official letter #0960058664A）, as shown in Table 1.5.7-1. Water collected will be contained in BOD bottles (1 light bottle and 1 dark bottle) respectively for cultivation. Be careful to prevent bubbles deriving when pouring the water. Place the sample into transparent cultivation box. Cultivation will last for 24 hours with circulating water and constant temperature. Dissolved oxygen before/after the cultivation will be measured to calculate the primary productivity（organic carbon value in 1L of water per day : μg C/L/d）.

Table 1.5.7-1 Depth Allocation for Sampling Spots

Water Depth	Sampling Layer	Min. Distance between bottom and neighboring layer
<5 m	surface, 3 m under water, bottom[Remark]	-
<10 m	surface, 3 m under water, bottom	3 m
<25 m	surface, 3 m under water, 10 m under water, bottom	5 m
<50 m	surface, 3 m under water, 10 m under water, 25 m under water, bottom	10 m
<100 m	surface, 3 m under water, 10 m under water, 25 m under water, 50 m under water, bottom	10 m

Remark: "Bottom" starts 2-5m from the seabed.

III. Zooplankton

Survey will be conducted in accordance with "Sampling method for Phytoplankton—water sampling"（NIEA E701.20C） issued by MOENV. NORPAC net (mesh: 0.33 mm × 0.33 mm, length: 180 cm, diameter: 45cm) will be applied in the survey. Flow meter (HYDRO-BIOS mechanical German made flow meter) will be attached on its mouth to measure quantity of filtered water.

Survey of Zooplankton is divided into facial horizontal and vertical sampling. Main survey method is vertical sampling; when water depth is under 7 m, horizontal sampling is adopted. For vertical sampling, NORPAC net, with weight attached at its bottom, will be sunk to 1m from the seabed. It will later be pulled up slowly (no faster than 3m/s) to the sea surface. For horizontal sampling, trawling will be conducted at area where water depth is under 7 m and vessel speed is under 3Nm. Mouth of the net is always kept under water surface. After sampling, use wash bottle to filter the sea water and to wash zooplankton into the sampling bottle attached at the bottom of the net. Add 5% Formalin liquid into the bottle. Refrigerate the sampling bottle for following processing and analyzing in the laboratory.

IV. Fish Egg and Fish Larva

NORPAC net (mesh: 0.33 mm × 0.33 mm, length: 180 cm, diameter: 100cm) will be applied in the survey. Flow meter will be attached on its mouth to measure quantity of filtered water. Flow meter (HYDRO-BIOS mechanical German made flow meter) will be attached on its mouth to measure quantity of filtered water. For horizontal sampling, trawling will be conducted with vessel speed under 3Nm. Mouth of the net is always kept under water surface (about 2 m under water surface). After sampling, use wash bottle to filter the sea water and to wash zooplankton into the sampling bottle attached at the bottom of the net. Add 95% alcohol into the bottle. Refrigerate the sampling bottle for following processing and analyzing in the laboratory.

V. Benthic Organism

Survey will be conducted in accordance with "Sampling of Benthic Organism in Softground Sea Area Act"（NIEA E103.20C） issued by MOENV. In each sampling station, vessel speed is lower than 2 Nm. Bottom trawling will be conducted with benthic organism sampler (Naturalist's rectangular dredge, mesh: 5 mm× 5 mm, mouth width 45cm, mouth height: 18cm). After retrieving the net, wash off the mud with sifting screen, identify and record captured samples and place them back. For species cannot be identified, it will be taken photo, stored in 5% Formalin liquid and refrigerated for identification once arrive at laboratory.

VI. Fish

Main sampling method of this project is gillnetting. Bottom gillnet is placed at each sampling station, with its direction generally parallel to the coastline. Coordinate of the correct sampling spots will be located by GPS. Then, nets will be deployed along the survey line for fixed spot sampling operation. Later, the nets will be retrieved 3 hours after deployment. Samples will be frozen or refrigerated for storing. They will be brought back to laboratory for species identification, quantity and weight record.

VII. Underwater Filming

A lighter observation class underwater vehicle (remotely operated underwater vehicles, hereinafter referred to as ROV) with a high-resolution camera will be used to photo the environment at the sample station. It will stay at two depths (the middle and bottom) for 15 minutes to observe the substrate conditions, fish species and quantity. In case of special phenomena (artificial structures or large marine debris, etc.), additional records will be made. After recording, the ROV will ascend to the stern platform, and personnel will retrieve the ROV. The images recorded will be brought back to the laboratory for identification and analysis.

1.5.8 Cetacean Ecology

I. Underwater Acoustic Survey

i Recording Instrument

The measurement of underwater noise in this Project applies bottom-anchored acoustic measuring system (Figure 1.5.8-1). icListen HF SC2-ETH from Ocean Sonics is applied (Sensitivity=-170.2 dB re V/µPa) for a 24-hour continuous measurement. The sampling frequency of the device is between 20Hz-20kHz, which covers the lower frequency sounds such as operation of turbine, vessel noise, wind and rain, fish sounds and the middle-high noise such as dolphin whistles and impulse of dolphin's echolocation.

When carrying out underwater acoustic measurement, the static platform of the device (including buoy, suspension system, weight and signal cable) will be set up. Depth of the hydrophone is between half of the water depth to 2m above the sea bed. The Platform is deployed subjecting to the direction of the sea current. After the buoy drifts away from the vessel to the designed distance and becomes steady, the recording begins. When making sure the recording is finished, the platform will be retrieved to the deck. Hydrophone will be taken out from the protection frame, and the data inside the device will be put into computer.

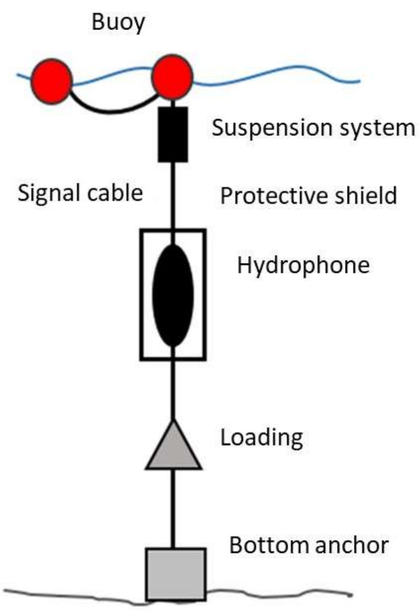


Figure 1.5.8-1 Deployment of the Device

ii Analysis of Ambient Noise

Underwater acoustic device can record the sound changes in the marine area, such as the natural sound (wave, tide) or activity sounds of marine animals (cetacean, fish). Unknown loud noises, such as vessel noises or sounds derived from human activities, can be recorded by the underwater acoustic device. The WAV files recorded by the device will undergo Fast Fourier Transform (FFT), and the results will be represented by 1/3 Octave band. The obtained result is used for analysis of underwater ambient noise sound level.

iii Detection of Cetacean Sound

Cetacean sound include whistles, used for communication and social behavior between groups or individuals, and clicks used for environmental geomorphology detection and locating prey, as shown in Figure 1.5.8-2. Whistles have narrow bandwidth and certain time length, while clicks have wider bandwidth and are impulse sounds with very short time length. In addition, cetacean also have different kinds of whistles, and the whistles can be identified from the recordings. Clicks have wider bandwidth and higher frequency (usually higher than 10kHz). Cetacean will emit a sequence of clicks to detect the distance with other objects via the echoes.

The recording device covers frequency from 20Hz-20kHz. 1/3 octave band filter will be used for analysis in this Project. The specific range of cetacean sounds (2.5k-10k) will be analyzed via spectrum and signal filter. As shown in Figure 1.5.8-2, the features of sound between 2.5k to 10k are relatively obvious. Therefore, 2.5k to 10k is selected from the overall/all frequency spectrum (20Hz-20kHz) for identification of marine animal sounds (cetacean or fish), and the nature of the ambient noise in the wind farm can be analyzed.

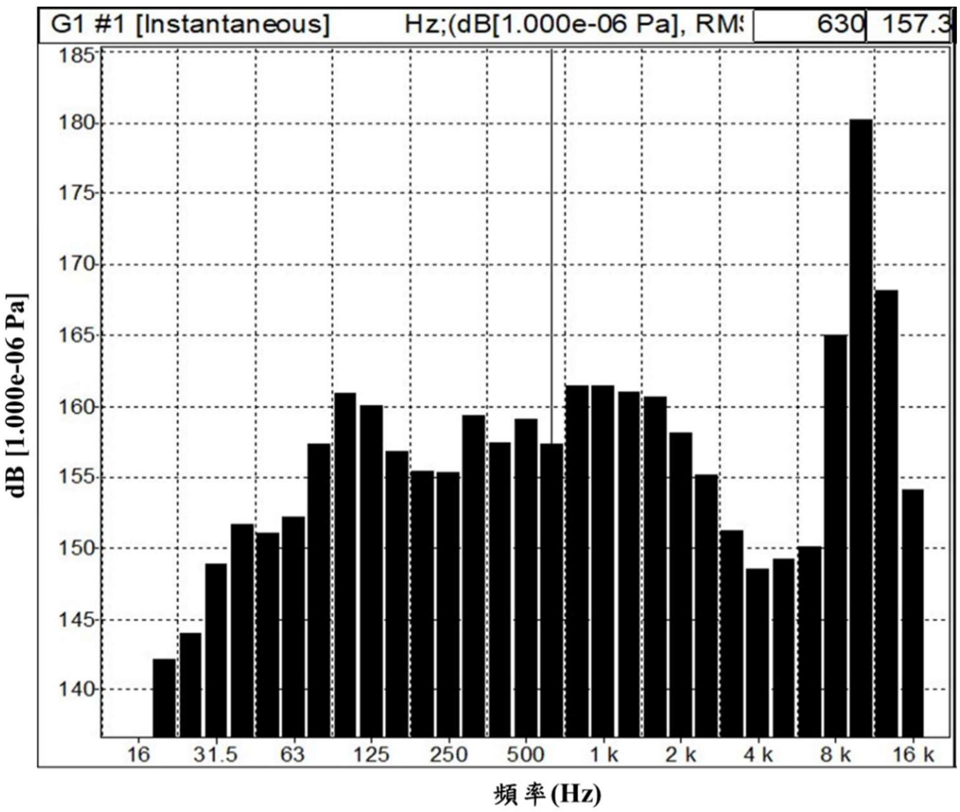


Figure 1.5.8-2 Cetacean Whistles and Clicks

1. Detection of Whistles

   Whistles have narrow bandwidth and certain time length. Its frequency might vary over time and the sound varies widely (Van Parijs & Corkeron, 2001; Sims et al., 2012; Lin, 2013). Therefore, whistle detection codes of this project included: signal analysis, noise removal, and selection of energy and bandwidth.

   With respect to signal analysis, Window function of Hamming is used via *Short Time Fourier Transform* (STFT) to obtain spectrogram as in Figure 1.5.8-2. After background noise signals are removed, potential whistles are filtered according to energy variance. The filtering is done through interpreting the spectrum. First, signals indicating detected sounds on the spectrum will be marked as black dots. Later, connect the black dots into a line and compare its frequency (height) and duration (length) with the setting value. If it meets the setting value, it will be identified as whistles. This algorithm does not require specific sound plate to detect sound with whistle characteristics. It is a non-specific automatic detector.

   Sounds of dolphins frequently seen in the western sea area of Taiwan are in the middle-frequency, which range between 3k -9k Hz. For example, Chinese white dolphin and bottlenose dolphin. Therefore, the range 2.5k-10k Hz were adopted as the range of analysis. Figure 1.5.8-5 shows the detection result for an hour. If there is no whistle, presented figure will be blank; if whistle is detected within that hour, the location shall be marked as blue dots and personnel could inspect time and frequency of blue dots in the spectrogram to confirm whether they are dolphin whistles or not and filter out non-whistle noises.

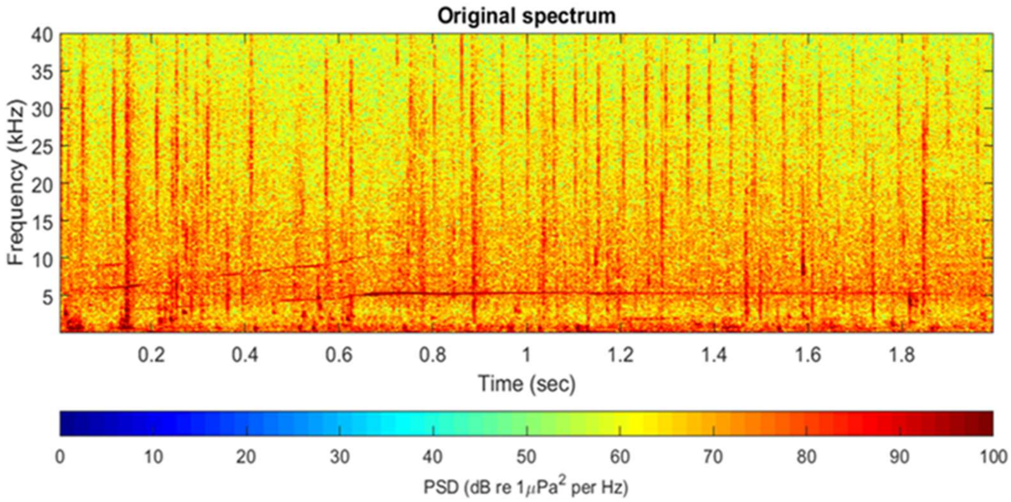


Figure 1.5.8-3 Spectrogram Obtained Via STFT

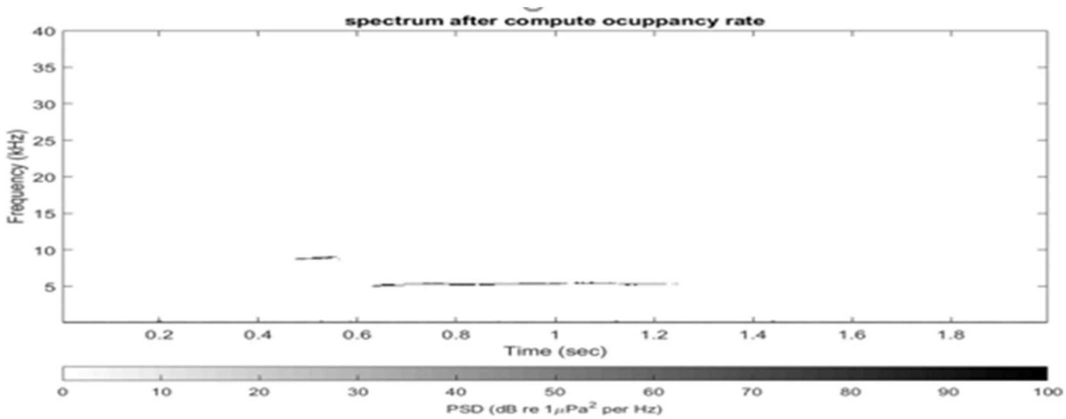


Figure 1.5.8-4 Black Dots Distribution Figure after Hamming Window Function

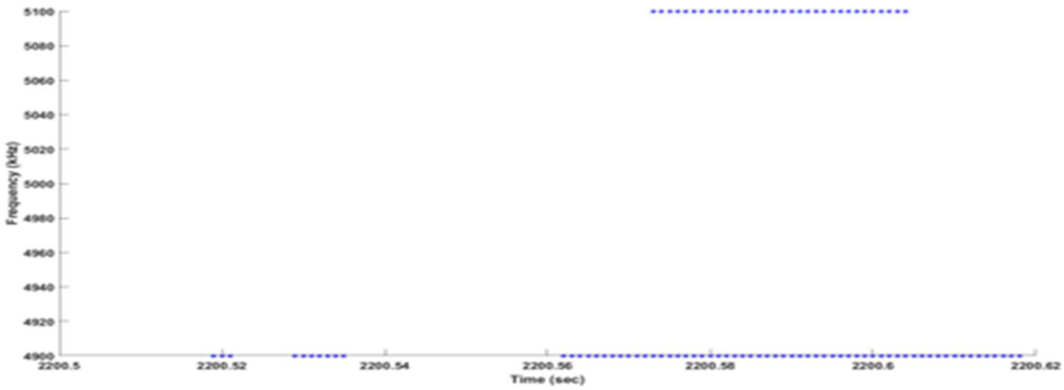


Figure 1.5.8-5 Schematic Diagram of Detection Program Results (Detection Range is 3k to 9k Hz)

2. Detection of Click

As click is impulse sounds with wider bandwidth, it’s called Click Train (Figure 1.5.8-6). The interval of pulses is defined as ICI (Inter-Click Interval). The ratio of ICI1 and ICI2 in Figure 1.5.8-6 is ICI ratio (=ICI2/ICI1); if the ratio is smaller than 1/2 or greater than 2, it is considered a different Click Train. The method of click detection in this project is to identify potential Click Train by energy, then select Click Trains with ICI >1ms and contain only 6-500 pulses.

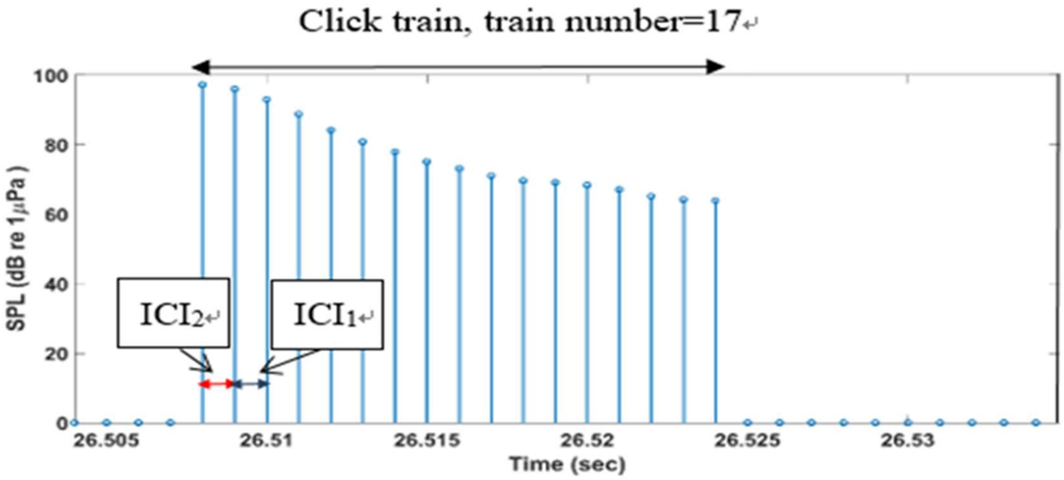


Figure 1.5.8-6 Schematic Diagram of Click

II. Visual Survey

i Survey Methodology

1. Before departure of survey, select 2 navigation channels and the order of survey sequence. The navigation channels for departure and return are different. During navigation, handheld GPS map GPS map 64ST (Garmin Corp., Taiwan) is used for positioning and recording navigation trajectories.

2. Every survey is conducted by at least 3 observers. 1 experienced leading observer leads at least 2 observers. The leader should have rich survey experiences for years. All surveyors shall be trained, for example, an internal lecture for cetacean surveys or 4 hours of offshore safety trainings for marine researchers held by the Fishery Administration.

3. 2 observers are in charge of observation at left and right sides of the vessel and a 3rd observer is responsible for sea surface at the front and sides of the vessel. They observe sea surface for sightings of cetacean with bare eyes or binoculars. Observers shall rotate every 20 minutes to avoid mental fatigue from staring at the same area. Observers will take turns to the position recording water quality for about 20 minutes after taking shifts at 3 observing positions (about 1 hour) for a short rest to maintain physical strength.

4. During survey, when vessel is on designed navigation channel, wave level is less than 4 and visibility is above 500m, it is considered as “on-effort”; When vessel is between harbor and navigation channel, or the weather condition is too bad for conducting valid cetacean observation, it is considered “off-effort”. Although off-effort is not incorporated into analysis of standardized visibility rate, it’s still valuable data if cetacean is observed/sighted. Navigation time is the total time spent from departure to return to harbor, including on-effort and off-effort. During survey, the vessel speed is maintained at 6-9 knots (NM/ hour). The vessel will stop every 10 minutes for sampling surface seawater, measuring sea surface temperature and salinity with YSI 30 thermosalinograph and recording environmental factors (water depth, surface seawater temperature, salinity and weather factors such as waves, visibility, etc).

5. When cetaceans are observed, location, angle, distance from vessel and vessel angle of the initial discovery were recorded. If possible, approach slowly and record the coordinates of the closer location, estimate the population number, observe its behavior, collect related environmental factors and fill out cetacean observation form. Also, use camera or video

recorder for cetacean imagery in order to create individual identification image database. If the cetaceans do not show obvious avoidance behavior, follow them continuously and record their behavior and location. If the followed cetaceans are out of sight for more than 10 minutes, return to the navigation channel and go on searching for the next herd.

ii Data Analysis

1. Survey result is obtained by analyzing sighting rate, spatial distribution, environmental factors and herd structure of all cetaceans and Chinese White Dolphin. There are 3 types of sighting rate calculations: (1) mileage sighting rate (2) hour sighting rate (3) trip sighting rate. The former 2 types are calculated by dividing on-effort observed number of cetacean herds by on-effort mileage/on-effort hour to standardize sighting rate (number of cetacean herds/ 100km, number of cetacean herds/10 hours). Trip sighting rate is from dividing number of trips with cetacean observation by number of all trips.

2. According to the coordinates of sightings, Spatial distribution positioning is conducted using Geographic Information Systems (GIS). Based on the distance between wind farm perimeter and the survey vessel, software ArcGIS10 helps to understand the relationship between different distance intervals and the spatial distribution of cetaceans.

3. Water surface behaviors of dolphins are divided into four genres: “Travelling, Foraging, Socializing, and Milling.” Definitions from Parra (2006) are as followed:

   (1) “Travelling” herds have a consistent and almost fixed swimming direction. They dive with regular gaps and smaller angles.

   (2) “Foraging” herds may present scattering and inconsistent swimming directions. Dolphins will have big diving angle and raise their tails; no regulation shown in travelling is found. In addition, sudden speeding up or behaviors that indicate foraging (slapping water surface with tail, biting fish with mouth, diving, etc.) are frequently observed.

   (3) “Socializing” herds have a difficult-to-predict diving mode. Physical contacts or even bumps are frequently seen between individuals. A considerable number of activities beyond water surface are observed.

   (4) “Milling” herds have slower activities on water surface and moves only in a small sea area. Individuals are close with each other, yet without obvious physical contacts. They have a more regular diving mode with smaller angle. The group stays near the surface of water

most of the time. The behavior is similar to resting.

(5) Observed behaviors cannot be classified into prescribed genres will be marked as “Others,” with possible inference on the behaviors.

1.5.9 Underwater Noise

Data analysis for underwater noise will be conducted with data from 2 stations located in the periphery of the wind turbine. The 2 stations are chosen from the 5 survey stations for cetacean ecological underwater acoustics. Clearly identifiable noise sources (tidal changes, sea currents, vessel noise, marine creatures, etc.) are also included in the overall ambient noise, and the distribution of these underwater noise will be indicated with Percentile level (unit is dB). L_x indicates that the noise value exceeds $L_{eq,T}$ for x% of the total measuring duration. L_{90}= value obtained for more than 90% of the survey duration (equivalent to the ambient sound value during the measuring period); L_{50}= value obtained for more than 50% of the survey duration (equivalent to the average ambient sound value during the measuring period); L_5= value obtained for more than 5% of the survey duration (equivalent to the high-value noise sources during the measuring period).

The sound frequency being measured is set at above 51.2k. The recorded sound will be given to Matlab for Fast Fourier Transform (FFT). The sound pressure level (SPL) of 1Hz bandwidth is calculated. Since level of octave bands is the sum of all energy within the frequency, the SPL of 1/3 octave band is higher than 1Hz band used for underwater acoustic survey.

The measurement is done using the underwater noise measuring system that meets the requirement 18406 International Organization for Standardization (ISO). For the underwater noise analysis, the octave band filter system that meets the requirement 61260-1 in International Electrotechnical Commission (IEC) is used. Central frequency of 1/3 octave band is shown as Table 1.5.9-1.

Table 1.5.9-1 Central Frequency of 1/3 Octave Band

Frequency (Hz)		
1/3 Octave		
Lower limit	Center frequency	Upper limit
14.1	16.0	17.8
17.8	20.0	22.4
22.4	25.0	28.2
28.2	31.5	35.5
35.5	40.0	44.7
44.7	50.0	56.2
56.2	63.0	70.8
70.8	80.0	89.2
89.2	100.0	112.0
112.0	125.0	141.0
141.0	160.0	178.0
178.0	200.0	224.0
224.0	250.0	282.0
282.0	315.0	355.0
355.0	400.0	447.0
447.0	500.0	562.0
562.0	630.0	708.0
708.0	800.0	891.0
891.0	1,000.0	1,122.0
1,122.0	1,250.0	1,413.0
1,413.0	1,600.0	1,778.0
1,778.0	2,000.0	2,239.0
2,239.0	2,500.0	2,818.0
2,818.0	3,150.0	3,548.0
3,548.0	4,000.0	4,467.0
4,467.0	5,000.0	5,623.0
5,623.0	6,300.0	7,079.0
7,079.0	8,000.0	8,913.0
8,913.0	10,000.0	11,220.0
11,220.0	12,500.0	14,130.0
14,130.0	16,000.0	17,780.0
17,780.0	20,000.0	22,390.0

1.5.10 Fishery Resource Survey

Information on the fishing season, fishing grounds, type of harvests, and the operation status fishing vessels in the Yunlin County will be compiled. These data will be analyzed and collected in the report along with the onsite survey data, annual fishery reports and local fishing harvests.

1.5.11 Terrestrial Ecological Survey

The area, methodology, content and report writing of ecological survey are conducted in accordance with "Technical Guidance for Animal Ecological Assessment" official letter 1000058665C of MOENV issued on 12th July 2011 and "Technical Guidance for Plant Ecological Assessment" official letter 0910020491 of MOENV issued on 28th March 2002.

Terrestrial ecological survey was conducted at roads and surrounding environment. Terrestrial survey focused on plant, mammal, bird, amphibian, species of reptile and butterfly, number, diversity, dominant species, protected species and rare and valuable species.

To ensure accuracy and integrity of data quality objective and implementation results, a comprehensive quality control project was drafted. A quality control investigation panel was established to review the adaptability and efficiency of quality control in order to implement correct measures and achieve objective of quality assurance. The flow chart of quality assurance is listed in Figure 1.5.11-1.

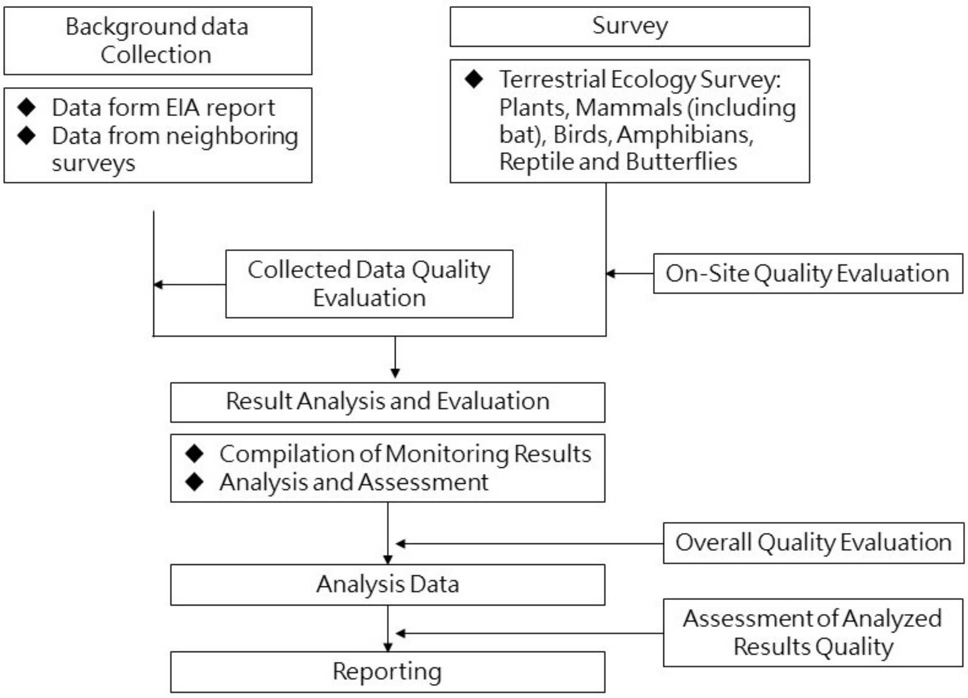


Figure 1.5.11-1 Flow Chart of QA and QC of Terrestrial Ecological Survey

I. Preparations Before Survey

i Single-person operation is prohibited. This is to avoid absence of assistance when emergencies occur.

ii Before survey, related matters are informed (including confirmation of coordinates and working items).

iii Before survey, examination of instrument is conducted; and make sure spare instrument is Prepared. If the instrument is damaged, it shall be examined and restocked in advance of survey.

iv A day prior to survey, survey location and weather shall be confirmed. If the weather condition is poor, the survey must be postponed ensuring the safety of personnel and reducing the occurrence of emergency.

II. In Situ Quality Review

Integrity of in-situ working record is the main basis of future tracking. When abnormal monitoring value occurs, interpretation is based on records or images of sampling conditions, weather conditions, etc. The auditing team will strictly review and assess on-site records reserved. Contents are listed as follows:

i Fill out sampling station records every time and use camera to record the environmental conditions at the time. In special circumstances, report to relevant personnel with specific description.

ii Ensure sampling equipment and survey tools are in good condition and calibrated.

iii Examine the equipment before use and replace with a spare one if damaged.

iv Make sure relevant regulation is followed during in situ sampling to avoid errors from sampling personnel.

v Make sure sampling locations are selected according to the designed ones in this project.

vi Properly record the environmental conditions on site. If any abnormal situation happens, record and conduct preliminary assessment of its potential impact on future monitoring works.

vii In terrestrial animal surveys, relieve the sampled animals on the spot after taking photos and records. If species identification not possible on site, take photos and record its characteristic for identification back in lab.

III. Collected Data for Quality Check

Collected data includes survey data of previous years. Monitoring results shall be used directly for compilation and report. Quality check is described as follows:

- i Ensure collected information is intact.
- ii Ensure obtained information is raw data. If it is secondary data (analyzed and compiled data), consider the necessity of redoing the survey for collecting raw data.
- iii Ensure the documents are well-printed with no missing pages.

IV. Overall Quality Checking

Overall quality checking items included compilation of new data and data over years, the checking content is shown as follows:

- i In the process of compilation, when original data is transcribed to another document, no discrepancies are occurred due to human error.
- ii While compiling data, the measuring units of monitoring items are unified.
- iii Content of compiled data shall be thoroughly checked to make sure there is no missing part.
- iv Compiled data shall be conducted with preliminary examination and discrepancies of report shall be pointed out.
- v When the data is archived, format (including unit) shall be consistent for further data analysis, report writing and reducing data error.
- vi After compiling data, data with greatest discrepancies shall be pointed out and reviewed. After making sure the data is correct, it shall be labelled for further interpretation by report writer.
- vii All data shall be checked and reviewed by 2 people and above, all the data shall be kept in duplicate.
- viii Except for self-checking, the report shall be checked by 2 people and above to avoid errors in content due to carelessness.

Chapter 2 Analysis of Monitoring Results

2.1 Construction and Operation Phases Monitoring

2.1.1 Marine Water Quality

Survey on marine water quality was conducted at open sea near Yunlin County on April 19, 2024. Water samples are collected from surface, middle and bottom layers in S1 to S5. Monitoring items in marine water quality include pH value, Water temperature, Dissolved Oxygen, Salinity, Coliform group, Chlorophyll a, BOD, Ammonia-N, Suspended Solid, Nutrients (Nitrate, Nitrite, Orthophosphate, Silicate). Monitoring result is shown as Table 2.1.1-1. For raw monitoring data please refer to Appendix 4.1, for survey location please refer to Figure 1.4-1.

According to Marine Environment Quality Standard, Article 8 issued by MOENV, Executive Yuan (MOENV official letter #1070012375) on February 13, 2018, this survey station shall follow Water Quality Standard of Marine Waterbody (Class A). Monitoring result and comparison with Water Quality Standard of Marine Waterbody (Class A) are described as follows:

I. Water Temperature

Result of the survey is as follows: Water temperature is between 27.1-28.2°C.

II. pH Value

Result of the survey is as follows: pH value is between 8.1-8.2, which complies with Water Quality Standard of Marine Waterbody (Class A) (pH value 7.5-8.5).

III. BOD

Result of the survey is as follows: Value of BOD is <1.0 mg/L. Survey result complies to Water Quality Standard for A type Marine Water (<2.0 mg/L).

IV. Salinity

Result of the survey is as follows: Salinity is between 33.1-33.4 psu.

V. Dissolved Oxygen

Result of the survey is as follows: Dissolved oxygen value is between 6.3-6.8 mg/L, which complies to Water Quality Standard of Marine Waterbody (Class A) (> 5.0mg/L).

VI. Ammonia-N

Result of the survey is as follows: Ammonia-N is between 0.10-0.70 mg/L. Except for the mid-layer Ammonia-N level at S4 which exceeded the Type A Marine Environment Quality Standards, all other measured values at the other stations complied with the standard value (<0.3 mg/L).

VII. Nutrients

i Nitrate

Result of the survey is as follows: Nitrate is < 0.05.

ii Nitrite

Result of the survey is as follows: Nitrite is N.D.

iii Orthophosphate

Result of the survey is as follows: Orthophosphate is between 0.005-0.015 mg/L.

VIII. Suspended Solid

Result of the survey is as follows: Suspended solid is between 9.0-26.3 mg/L.

IX. Chlorophyll A

Result of the survey is as follows: Value of Chlorophyll a is between 0.07-0.88 μg/L. All values are within normal range in marine area.

X. Coliform group

Result of the survey is as follows: Values of Coliform group is between <10-50 CFU/100 mL. Coliform group in all stations comply with the Water Quality Standard of Marine Waterbody (Class A) (1,000 CFU/100 mL).

In summary, the marine water quality monitoring results for this quarter show that except for the mid-layer Ammonia-N level at S4 which exceeded the Type A Marine Environment Quality Standards (<0.3 mg/L), all other measured values at the other stations complied with the standard values. The exceedance is likely due to the impact of domestic sewage on the nearshore water quality, combined with sediment accumulation from Bozailiao Fishing Harbor to Waisanding Sand Bar, resulting in poor water exchange in the area. Heavy rainfall may flush accumulated pollutants into the sea, thereby affecting the water quality of the adjacent marine areas.

Table 2.1.1-1 Marine Water Quality Monitoring Result of this Quarter

Monitoring Date		2024.04.19															Water Quality Standard of Marine Waterbody (Class A)
Station		S1			S2			S3			S4			S5			
Item	Unit	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bott om	
Water temperature	℃	27.8	27.4	27.1	27.8	27.5	27.1	27.7	27.4	27.1	28.0	27.7	27.4	28.2	27.6	27.2	－
pH value	－	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	7.5-8.5
BOD	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0
Salinity	Psu	33.3	33.4	33.4	33.2	33.3	33.3	33.1	33.2	33.3	33.4	33.4	33.4	33.3	33.4	33.4	－
Dissolved Oxygen	mg/L	6.6	6.5	6.3	6.6	6.5	6.4	6.6	6.4	6.3	6.7	6.6	6.4	6.8	6.7	6.5	>5.0
Ammonia-N	mg/L	0.17	0.15	0.21	0.19	0.16	0.15	0.20	0.10	0.17	0.30	0.70*	0.15	0.12	0.10	0.12	<0.3
Nitrate	mg/L	<0.05 (0.035)	<0.05 (0.037)	<0.05 (0.047)	<0.05 (0.030)	<0.05 (0.031)	<0.05 (0.033)	<0.05 (0.023)	<0.05 (0.022)	<0.05 (0.038)	<0.05 (0.025)	<0.05 (0.023)	<0.05 (0.047)	<0.05 (0.025)	<0.05 (0.025)	<0.0 5 (0.030)	－
Nitrite	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	－
Orthophosphate	mg/L	0.011	0.011	0.014	0.007	0.007	0.015	<0.005 (0.003)	<0.005 (0.004)	0.010	0.008	0.007	0.014	0.006	0.006	0.008	－
Suspended Solid	mg/L	22.1	16.8	26.3	21.3	16.7	22.9	13.6	17.4	15.6	22.9	18.2	23.8	9.0	13.7	16.0	－
Chlorophyll a	μg/L	0.87	0.88	0.09	0.20	0.24	0.16	0.12	0.14	0.07	0.58	0.22	0.48	0.56	0.27	0.31	－
Coliform group	CFU/100mL	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	50	40	<10	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.

Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

2.1.2 Bird Ecology

The offshore bird survey within the wind farm area and the coastal bird survey at the coast near the submarine cable landing point are conducted every month in this quarter (March-May 2024). Survey area is shown as Figure 1.4-1 and 1.4-2. Survey records are explained as follows:

I. Offshore Bird Visual Survey

i Recorded Species

4 orders, 4 families, 9 species, and 23 individuals were recorded this quarter. Among the recorded species,, Bridled Tern was the most numerous with 9 individuals, accounting for 39.13% of the total. The quantities of other species ranged from 1 to 3 individuals. The species are detailed in Table 2.1.2-1, with all recorded species observed in flight. 3 Rare and Valuable Species, including Little Tern, Crested Tern, and Bridled Tern were recorded. The distribution is detailed in Figure 2.1.2-1.

Table 2.1.2-1 Resource Table of Offshore Bird Survey

Order	Family	Chinese Name	Scientific Name	Protected Level[1]	Migratory Habit[2]	Spring			Total
						March	April	May	
Charadriiformes	Laridae	小燕鷗	*Sternula albifrons*	II	Resident, Summer			1	1
		鳳頭燕鷗	*Thalasseus bergii*	II	Summer			1	1
		裏海燕鷗	*Hydroprogne caspia*		Winter	1			1
		白眉燕鷗	*Onychoprion anaethetus*	II	Summer			9	9
		燕鷗	*Sterna hirundo*		Passage			1	1
		銀鷗	*Larus argentatus*		Winter	3			3
Procellariiformes	Procellariidae	大水薙鳥	*Calonectris leucomelas*		Sea	3			3
Suliformes	Phalacrocoracidae	鸕鷀	*Phalacrocorax carbo*		Winter	3			3
Pelecaniformes	Ardeidae	大白鷺	*Ardea alba*		Resident, Winter	1			1
Total（Individual）						11	0	12	23

Note 1: Protected Level "II" means rare and valuable wildlife.
Note 2: Migratory Habits: "Resident" indicates resident bird, "Winter" means winter migrants, "Summer" means summer migrants, and "Sea" means seabirds

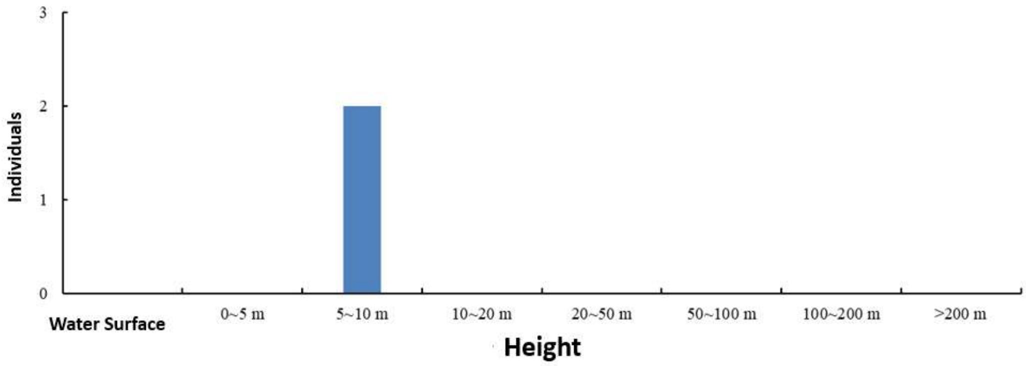
ii Recorded Flying Altitude

All flying altitudes recorded in this quarter are all between 0-50 m. All species were recorded in flight. Details are shown in Table 2.1.2-2 and Figure 2.1.2-1.

Table 2.1.2-2 Flying Altitude of Birds recorded in Offshore Survey

Order	Family	Chinese Name	Activity Height[N]							
			Surface	0-5 m	5-10 m	10-20 m	20-50 m	50-100 m	100-200 m	>200 m
Charadriiformes	Laridae	小燕鷗		1						
		鳳頭燕鷗		1						
		裏海燕鷗			1					
		白眉燕鷗		4	5					
		燕鷗					1			
		銀鷗			3					
Procellariiformes	Procellariidae	大水薙鳥			3					
Suliformes	Phalacrocoracidae	鸕鷀			3					
Pelecaniformes	Ardeidae	大白鷺			1					
Total (Individual /km^2)			0	6	16	0	1	0	0	0

Note: The range of the activity altitude include the upper limit but not the lower limit.



Note: The upper limit is also included.

Figure 2.1.2-1 Altitude Distribution of Birds in Offshore Survey

iii Density Derived from Visual Bird Survey

Visual transect line surveys of the Project are 50.58 km, Visual survey encompasses 30.35 km^2. Therefore, in this quarter, the density of birds is 0.253 individual/km^2, as shown in Table 2.1.2-3.

Table 2.1.2-3 Density of Birds in Offshore Visual Survey

Order	Family	Chinese Name	Spring			Average Density[note]
			March	April	May	
Charadriiformes	Laridae	小燕鷗			0.033	0.011
		鳳頭燕鷗			0.033	0.011
		裏海燕鷗	0.033			0.011
		白眉燕鷗			0.297	0.099
		燕鷗			0.033	0.011
		銀鷗	0.099			0.033
Procellariiformes	Procellariidae	大水薙鳥	0.099			0.033
Suliformes	Phalacrocoracidae	鸕鷀	0.099			0.033
Pelecaniformes	Ardeidae	大白鷺	0.033			0.011
Total (Individual /km^2)			0.363	0.000	0.396	0.253

Remark: Density: individual numbers recorded/ visual area

II. Coastal Bird Survey

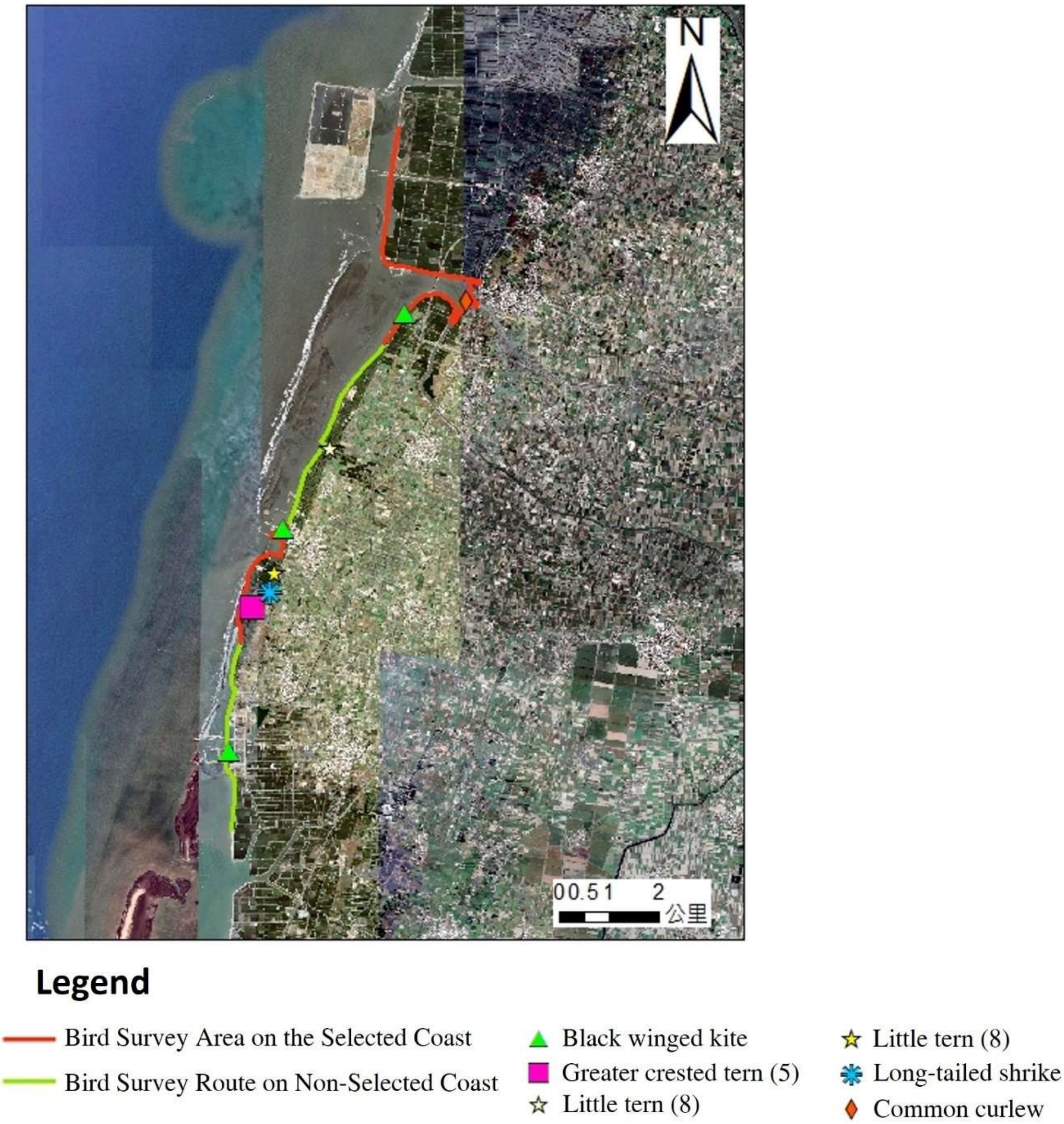
i Species Composition

11 orders, 30 families, and 68 species were recorded in the coastal bird survey in this quarter. 11 orders, 27 families, and 63 species were recorded at the coast of selected submarine cable landing point; 10 orders, 28 families, and 57 species were recorded at the coast of non-selected submarine cable landing point. For species records please refer to Table 2.1.2-4.

ii Endemics and Protected Species

1 endemic species in Taiwan, Taiwan Scimitar-Babbler and 7 endemic subspecies, including House Swift, Black Drongo, Tawny Prinia, Light-Vented Bulbul, Vinous-Throated Parrotbill, Black-Naped Blue Monarch, and Grey Treepie were recorded this quarter. Endemic (sub) species account for 11.76% of all observed species. 3 rare and valuable species, including Little Tern, Crested Tern, and Black-Winged Kite and 2 other conservating-deserving wildlife, including Far Eastern Curlew and Brown Shrike were recorded (Figure 2.1.2-3).

On the coast of selected submarine cable landing point, 6 endemic sub-species (House Swift, Black Drongo, Tawny Prinia, Light-Vented Bulbul, Black-Naped Blue Monarch, and Grey Treepie) were recorded. Endemic (sub) species account for 9.52% of all observed species. 3 rare and valuable species including Little Tern, Crested Tern, and Black-Winged Kite and 2 other conservating-deserving wildlife, including Far Eastern Curlew and Brown Shrike were recorded. Little Tern, Black-Winged Kite, and Crested Term were recorded in flight. The Black-Winged Kite was also recorded perching. Brown Shrike and Far Eastern Curlew were observed perching.



Remark: Number inside the parentheses indicates individuals recorded.

Figure 2.1.2-2 Distribution of Protected Offshore Bird Species

Table 2.1.2-4 Resource Table of Coastal Bird Survey

Order	Family	Chinese Name	Scientific Name	Endemism[1]	Protected Level[2]	Migratory Habit[3]	EIS[4] Spring 201603-201605	Construction and Operation Monitoring												Total
								2024.03				2024.04				2024.05				
								Selected		Non-Selected		Selected		Non-Selected		Selected		Non-Selected		
								Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	
Anseriformes	Anatidae	赤頸鴨	*Mareca penelope*			Winter		28				25								53
		小水鴨	*Anas crecca*			Winter		17												17
		綠頭鴨	*Anas platyrhynchos*			Winter, introduced	*													-[5]
Charadriiformes	Recurvirostridae	反嘴鴴	*Recurvirostra avosetta*			Winter						6	17		22	13				58
		高蹺鴴	*Himantopus himantopus*			Resident, Winter	*	15	12	15	14	20	21	13	20	15	7	8	14	174
	Scolopacidae	青足鷸	*Tringa nebularia*			Winter	*	8	8		20	12	6	6	10	12	4		3	89
		赤足鷸	*Tringa totanus*			Winter	*	6	5			2	2	2	7	11	3		5	43
		黑腹濱鷸	*Calidris alpina*			Winter	*	14	10		12	14	9	10	17					86
		小青足鷸	*Tringa stagnatilis*			Winter, Passage	*	7			6	2	2		1				4	22
		鷹斑鷸	*Tringa glareola*			Winter, Passage	*		8			6	8		4	10			7	43
		磯鷸	*Actitis hypoleucos*			Winter	*	4	5	3	5	2	1	2	2	2	2	3	5	36
		紅胸濱鷸	*Calidris ruficollis*			Winter	*									5			2	7
		尖尾濱鷸	*Calidris acuminata*			Passage										9				9
		寬嘴鷸	*Calidris falcinellus*			Passage	*													-
		彎嘴濱鷸	*Calidris ferruginea*			Winter, Passage	*									10				10
		翻石鷸	*Arenaria interpres*			Winter, Passage	*													-
		大杓鷸	*Numenius arquata*		III	Winter	*	13												13
		反嘴鷸	*Xenus cinereus*			Passage										1				1
	Laridae	紅嘴鷗	*Chroicocephalus ridibundus*			Winter		21				6			4					31
		黑腹燕鷗	*Chlidonias hybrida*			Winter, Passage	*	28	13		11	18	5	3	14	36	17	11	16	172
		裏海燕鷗	*Hydroprogne caspia*			Winter	*	17				8								25
		小燕鷗	*Sternula albifrons*		II	Resident, Summer	*										10	8		18
		鳳頭燕鷗	*Thalasseus bergii*		II	Summer	*										5			5
	Charadriidae	東方環頸鴴	*Charadrius alexandrinus*			Resident, Winter	*	11	11		6	10	6	11	17	26	12	10	12	132
		小環頸鴴	*Charadrius dubius*			Resident, Winter		5			5				4	5				19
		太平洋金斑鴴	*Pluvialis fulva*			Winter	*					5			18	5		7		35
		鐵嘴鴴	*Charadrius leschenaultii*			Winter, Passage	*					4								4
		蒙古鴴	*Charadrius mongolus*			Winter, Passage	*													-
		灰斑鴴	*Pluvialis squatarola*			Winter	*													-

Order	Family	Chinese Name	Scientific Name	Endemism[1]	Protected Level[2]	Migratory Habit[3]	EIS[4] Spring 201603-201605	Construction and Operation Monitoring												Total
								2024.03				2024.04				2024.05				
								Selected		Non-Selected		Selected		Non-Selected		Selected		Non-Selected		
								Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	Taixi	Sihu	
Columbiformes	Columbidae	紅鳩	*Streptopelia tranquebarica*			Resident		24	25	36	21	25	19	22	15	22	15	18	10	252
		珠頸斑鳩	*Spilopelia chinensis*			Resident		5	8	8	7	5	9	10	11	13	6	7	3	92
		野鴿	*Columba livia*			Introduced		24	17	18	18	20	30	16	20	17	7	14	6	207
Pelecaniformes	Ardeidae	小白鷺	*Egretta garzetta*			Resident, Summer, Winter, Passage	*	9	8	16	10	15	22	11	10	27	10	15	17	170
		夜鷺	*Nycticorax nycticorax*			Resident, Winter, Passage	*	10	5		10	9	15	6	7	4	4	5	7	82
		黃頭鷺	*Bubulcus ibis*			, Summer, Winter, Passage,	*		10	17	11		12	14	13	7	9	10	10	113
		蒼鷺	*Ardea cinerea*			Winter	*	9	6	7	6	2	4	4	6					44
		大白鷺	*Ardea alba*			Resident, Summer, Winter	*	16	15		12	18	14	9	15	4	7	15	4	129
		中白鷺	*Ardea intermedia*			Summer, Winter	*	3		4	4				2	5	5		2	25
	Threskiornithidae	埃及聖䴉	*Threskiornis aethiopicus*			Introduced	*													-
Gruiformes	Rallidae	紅冠水雞	*Gallinula chloropus*			Resident	*			3	4	6	7	7	6		3	3	5	44
		白腹秧雞	*Amaurornis phoenicurus*			Resident	*								3		1		2	6
Podicipediformes	Podicipedidae	小鷿鷉	*Tachybaptus ruficollis*			Resident, Winter	*	6	7	10	6	13		4		5		5	6	62
Accipitriformes	Accipitridae	黑翅鳶	*Elanus caeruleus*		II	Resident	*					1	1						1	3
	Pandionidae	魚鷹	*Pandion haliaetus*		II	Winter	*													-
Apodiformes	Apodidae	小雨燕	*Apus nipalensis*	Sub		Resident				14				11	13	10	10		7	65
Suliformes	Phalacrocoracidae	鸕鷀	*Phalacrocorax carbo*			Winter		42	30			19		9						100
Coraciiformes	Alcedinidae	翠鳥	*Alcedo atthis*			Resident, Passage	*		2	4				4	2	2		1	1	16
Passeriformes	Sturnidae	白尾八哥	*Acridotheres javanicus*			Introduced		17		25	9	22	10	30	16	24	9	14	17	193
		家八哥	*Acridotheres tristis*			Introduced		22	15	21	16	13	13	17	17	11	8	13	7	173
		灰頭椋鳥	*Sturnia malabarica*			Introduced		16	20	18	13	9	4	10	13					103
	Laniidae	紅尾伯勞	*Lanius cristatus*		III	Winter, Passage											1			1
		棕背伯勞	*Lanius schach*			Resident		3												3
	Dicruridae	大卷尾	*Dicrurus macrocercus*	Sub		Resident, Passage		9	10	12	7	4	3	5	7	8	4	6	4	79
	Cisticolidae	褐頭鷦鶯	*Prinia inornata*	Sub		Resident		7	7	8	7	5	5	6	6	8	5	3	9	76
		灰頭鷦鶯	*Prinia flaviventris*			Resident		5		5	5	3	2	3	3	1	3	3	5	38
		棕扇尾鶯	*Cisticola juncidis*			Resident		3	2									2		7
	Passeridae	麻雀	*Passer montanus*			Resident		34	33	55	42	69	49	47	35	24	17	32	10	447

Order	Family	Chinese Name	Scientific Name	Endemism[1]	Protected Level[2]	Migratory Habit[3]	EIS[4] Spring 201603-201605	Construction and Operation Monitoring 2024.03 Selected Taixi	2024.03 Selected Sihu	2024.03 Non-Selected Taixi	2024.03 Non-Selected Sihu	2024.04 Selected Taixi	2024.04 Selected Sihu	2024.04 Non-Selected Taixi	2024.04 Non-Selected Sihu	2024.05 Selected Taixi	2024.05 Selected Sihu	2024.05 Non-Selected Taixi	2024.05 Non-Selected Sihu	Total
	Hirundinidae	洋燕	*Hirundo tahitica*			Resident		20	17	11	16	10	8	5	10	15	16	12	4	144
		赤腰燕	*Cecropis striolata*			Resident		17	12	14	17	17	22	14	23					136
		家燕	*Hirundo rustica*			Summer, Winter, Passage		20	14	16	18	32	9	9	16	16	10	9	9	178
		棕沙燕	*Riparia chinensis*			Resident			9			9	7	6		9				40
	Zosteropidae	斯氏繡眼	*Zosterops simplex*			Resident		11	10	17	17	8	15	5	9	24	14	14	11	155
	Pycnonotidae	白頭翁	*Pycnonotus sinensis*	Sub		Resident		18	26	36	19	19	19	10	7	14	9	26	10	213
	Estrildidae	斑文鳥	*Lonchura punctulata*			Resident		11	14	33	15	21	41	21	12		12	4	5	189
		白喉文鳥	*Euodice malabarica*			Introduced												4		4
	Muscicapidae	鵲鴝	*Copsychus saularis*			Introduced			3	4	2	4	2	1	1		3	5	3	28
	Emberizidae	灰頭黑臉鵐	*Emberiza spodocephala*			Winter								6						6
	Timaliidae	小彎嘴	*Pomatorhinus musicus*	Endemic		Resident												6	5	11
	Alaudidae	小雲雀	*Alauda gulgula*			Resident		8						2		5	3			18
	Paradoxornithidae	粉紅鸚嘴	*Sinosuthora webbiana*	Sub		Resident				8	10				6			5	5	34
	Motacillidae	東方黃鶺鴒	*Motacilla tschutschensis*			Winter, Passage					2		2	3						7
		白鶺鴒	*Motacilla alba*			Resident, Winter			4		4	2	1	1	4		2		5	23
		灰鶺鴒	*Motacilla cinerea*			Winter													4	4
	Monarchidae	黑枕藍鶲	*Hypothymis azurea*	Sub		Resident								1			5	3	5	14
	Corvidae	樹鵲	*Dendrocitta formosae*	Sub		Resident				5	7						2			14
			Total（Individual）					563	401	443	414	520	422	376	448	435	260	301	267	4,850
			Diversity Index（H'）					3.50	3.34	3.11	3.42	3.39	3.23	3.36	3.51	3.37	3.38	3.25	3.51	
			Evenness Index（J'）					0.95	0.95	0.92	0.95	0.91	0.89	0.91	0.94	0.93	0.94	0.93	0.95	

Note 1: Endemism: “Endemic” means the endemic species in Taiwan and “Sub” means the endemic subspecies in Taiwan.
Note 2: Protected Level: “II” means rare and valuable species and “III” means other conservation-deserving wildlife.
Note 3: Migratory Habits: “Resident” means resident birds, “Winter” means winter migrants, “Summer” means summer migrants, “Passage” means transit bird, and “Introduced” means introduced species.
Note 4: EIS: “*” indicates that the species was recorded during the same quarter in the EIS stage
Note 5: “-” means it can’t be calculated.

iii Migratory Habit

Based on the survey in this quarter, 22 species owned the natures of resident, accounting for 32.35% of the documented species; 26 species owned the nature of migrant (including passage) (38.24%). 6 species owned the natures of introduced species (8.82%). 10 species obtain the nature of both resident and migrant (including passage) (14.71%). 2 species owned the nature of both resident and passage (2.94%). 2 species owned the nature of passage and introduced species (2.94%).

iv Dominant Species

A total of 4,850 individuals were recorded in the survey. Among which, Sparrow constituted the majority with 447 individuals, accounting for 9.22%. Red Collared-Dove came in second (252 individuals, 5.20%), followed by Light-Vented Bulbul (213 individuals, 4.39%).

For coast of selected submarine cable landing point, 2,601 individuals are observed. Among which, Sparrow constituted the majority with 226 individuals, accounting for 8.69, followed by Red Collared-Dove (130 individuals, 5.00%) and Whiskered Tern (117 individuals, 4.50%).

For coast of non-selected submarine cable landing point, 2,249 individuals are observed. Among which, Sparrow constituted the majority with 221 individuals, accounting for 9.83%, followed by Red-Collared Dove (122 individuals, 5.42%) and Javan Myna (111 individuals, 4.94%).

v Analysis of Indexes

For coast of selected submarine cable landing point, *H'* is between 3.23-3.50; *J'* is 0.89-0.95; for coast of non- selected submarine cable landing point, *H'* is between 3.11-3.51, *J'* is between 0.91-0.95. *H'* index indicates a rich species composition in both areas. In the selected cable landing route in Taixi, *J'* index indicates that species composition is even and is not greatly affected by the dominant species. As the survey area is mostly consisted of coasts, fish farms, intertidal area and dry farmlands. The recorded species are mostly resident and migratory birds. Various kinds of water birds are observed gathering and foraging at coastal area.

2.1.3 Marine Ecology

Intertidal ecology survey is conducted in 50 m at both sides of north and south landing routes (C1-C6) on April 2, 2024, in this quarter. Plankton, fish egg and fish larva, benthic organism survey are conducted at 5 survey points (S1-S5) in the wind farm area on April 23, 2024. 3 fish survey lines (T1-T3) are conducted in the wind farm area on March 16, 2023. Survey area is shown as Figure 1.4-1 to Figure 1.4-3 and Figure 1.4-8. Survey results are explained as follows:

I. Intertidal Ecology Survey

i Sessile marine algae

Since sediment of all stations are sand, there is no spots for sessile marine algae to stick on, such as reef and huge rocks. No large sessile marine algae was recorded in this quarter.

ii Intertidal Benthic Organism

1. Species Composition

11 orders, 18 families, and 29 species were recorded (as shown in Table 2.1.3-1). Species in each sampling station is between 8-25, with C3 contributing the most species; abundance in each sampling station is between 59-302 species, with C3 contributing the most abundance.

2. Dominant Species

985 individuals are recorded. *Amphibalanus Amphitrite* consist the majority, with 282 individuals recorded, accounting for 28.63% of all the individuals. It was followed by Milky Fiddler Crab (93 individuals, 9.44%) and *Thais Clavigera* (82 individuals, 8.32%), indicating that abundance of the species are relatively higher in this intertidal survey. Among all benthic organisms, 5 species (*Littoraria scabra, Granulilittorina exigua, Nodilittorina pyramidalis, Amphibalanus Amphitrite,* and *Thais Clavigera*) have the highest observation frequency. They were recorded in all stations (100.00%) and are species that are frequently spotted in the marine area.

3. Analysis of Indexes

H' is between 1.69-2.77, *J'* is between 0.75-0.89. *H'* indicates a rich species composition in all stations. *J'* indicates that except for C4, where the abundance distribution is uneven due to the influence of dominant species (*Amphibalanus Amphitrite*) and thus has a low evenness index, the species distribution at the other stations is more uniform. The influence of dominant species is less apparent at these stations, resulting in higher evenness indices.

Table 2.1.3-1 Resource Table of Intertidal Benthic Organism

Order	Family	Chinese Name	Scientific Name	Endemism	Protected Level	EIS[1] 105.02	2024.04 C1	C2	C3	C4	C5	C6	Total	RA（%）[2]	OR（%）
Decapoda	Varunidae	平背蜞	*Gaetice depressus*					4	6				10	1.02	33.33
		肉球近方蟹	*Hemigrapsus sanguineus*						2				2	0.20	16.67
	Dotillidae	雙扇股窗蟹	*Scopimera bitympana*					7	19	16	18	18	78	7.92	83.33
	Ocypodidae	北方丑招潮蟹	*Gelasimus borealis*				2		11				13	1.32	33.33
		角眼沙蟹	*Ocypode ceratophthalmus*							9	3	5	17	1.73	50.00
		乳白南方招潮蟹	*Austruca lactea*				28	17	48				93	9.44	50.00
		斯氏沙蟹	*Ocypode stimpsoni*									2	2	0.20	16.67
	Mictyridae	短指和尚蟹	*Mictyris brevidactylus*				6	5	12				23	2.34	50.00
	Sesarmidae	斑點擬相手蟹	*Parasesarma pictum*			3			4				4	0.41	16.67
	Matutidae	頑強黎明蟹	*Matuta victor*							1			1	0.10	16.67
Mesogastropoda	Littorinidae	波紋玉黍螺	*Littoraria undulata*						4	15	4	8	31	3.15	66.67
		粗紋玉黍螺	*Littoraria scabra*			65	13	4	10	6	4	6	43	4.37	100.00
		細粒玉黍螺	*Nodilittorina radiata*			7	4	5	8	3	2	4	26	2.64	100.00
		顆粒玉黍螺	*Echinolittorina trochoides*			10	10	6	5	10	4	13	48	4.87	100.00
Archeogastropoda	Neritidae	高腰蜑螺	*Nerita striata*				3		6				9	0.91	33.33
		漁舟蜑螺	*Nerita albicilla*			6	13	5	17				35	3.55	50.00
		玉女蜑螺	*Nerita polita*			2							-[3]	-	-
		平頂蜑螺	*Nerita planospira*			2							-	-	-
		大圓蜑螺	*Nerita chamaeleon*					3	3				6	0.61	33.33
	Lottiidae	花青螺	*Notoacmea schrenckii schrenckii*				9	13	13				35	3.55	50.00
		射線青螺	*Patelloida striata*				4	7					11	1.12	33.33
		高青螺	*Notoacmea concinna*			22							-	-	-
	Trochidae	草蓆鐘螺	*Monodonta labio*			22	14	23	14				51	5.18	50.00
	Patellidae	花笠螺	*Cellana toreuma*			7							-	-	-
Actiniaria	Diadumenidae	縱條磯海葵	*Diadumene lineata*				3	2	11	3			19	1.93	66.67
Sessilia	Balanidae	紋藤壺	*Amphibalanus amphitrite*			196	45	36	63	68	21	49	282	28.63	100.00
Isopoda	Ligiidae	奇異海蟑螂	*Ligia exotica*					5	3				8	0.81	33.33
Mytiloida	Mytilidae	綠殼菜蛤	*Perna viridis*			5							-	-	-
Neogastropoda	Muricidae	蚵岩螺	*Thais clavigera*			29	16	20	19	13	3	11	82	8.32	100.00
Pteriida	Ostreidae	刺牡蠣	*Saccostrea kegaki*					5	8				13	1.32	33.33
		葡萄牙牡蠣	*Crassostrea angulata*				4	5	3				12	1.22	50.00
		黑齒牡蠣	*Saccostrea mordax*			163							-	-	-
Phyllodocida	Nereididae	沙蠶	Gen. spp. (Nereididae)				4	3	3				10	1.02	50.00
Spionida	Chaetopteridae	燐蟲	*Chaetopterus* spp.					3	6	2			11	1.12	50.00
Amphipoda	Talitridae	扁跳蝦	*Platorchestia* spp.					6	4				10	1.02	33.33
			Total（Individual）				178	184	302	146	59	116	985		
			Diversity Index (H')				2.39	2.70	2.77	1.79	1.69	1.78			
			Evenness Index (J')				0.86	0.89	0.86	0.75	0.82	0.81			

Remark 1: “*” indicates the species was recorded in the EIS stage (November 2016).
Remark 2: RA refers to Relative Abundance (%), OR refers to Occurrence Rate (%), “-” indicates the value is incalculable.

II. Phytoplankton

i Species Composition

5 phylum, 75 Genus and 146 species were recorded (as shown in Table 2.1.3-2). Species of algae in each water layer are between 23-72. Abundance in each station/water layer is between 28,140-312,180 Cells/L, with the bottom layer at S1 obtaining the most species, the surface layer at S4 obtaining the most abundance.

ii Dominant Species

A total of 1,814,240 Cells/L was recorded this quarter. *Chaetoceros Pseudocurvis*etus has the highest 808,240 Cells/L, which accounts for 44.55%. It is followed by *Trichodesmium erythraeum* (604,420 Cells/L, 33.32%) and *Detonula Confervacea* (72,100 Cells/L, 3.97%), indicating that abundance of these species are relatively higher. Observation frequency of *Chaetoceros Pseudocurvis*etus, *Pleurosigma normanii,* and *Rhaphoneidaceae* is the highest (100.00%), indicating these species are the most common algae species in the marine area.

iii Analysis of Indexes

In each sampling station, *H'* is between 0.19-3.08; *J'* is between 0.06-0.74. The bottom layer of S3 was affected by the dominant algal species, Trichodesmium erythraeum, and the diversity index was the lowest among all stations. The uneven distribution of abundance among various algae species resulted in the lowest diversity index. 10m under the water surface at station S1 recorded more algal species and the abundance of algal species was evenly distributed, so the diversity index was the highest among all stations.

iv Concentration of Chlorophyll a

In each sampling station and sea level, concentration of Chlorophyll A was between 0.55-1.81 μg/L. Results indicate that the water surface at sampling station S4 had the highest concentration of Chlorophyll A, and the surface layer at sampling station S3 had the lowest level of concentration.

v Primary Productivity

In each sampling station and sea level, primary productivity was between 30.90~143.93 μgC/L/d. Results indicate that the bottom layer at sampling station S4 had the highest primary productivity, and the surface layer at sampling station S3 had the lowest primary productivity.

III. Zooplankton

i Species Composition

11 phyla and 32 genres were recorded, as shown in Table 2.1.3-3. 20-27 genres are observed in each sampling station, with S2, S4, and S5 recorded the most genres. Abundance in each station is between 185,545-718,180 inds./1,000 m^3, with S2 recording the highest abundance.

ii Dominant Species

A total of 2,154,996 inds./1,000m^3 was recorded this quarter. Calanoid has the highest relative abundance (693,948 inds./1,000 m^3, 32.20%), followed by Ostracoda (684,715 inds./1,000 m^3, 31.77%) and Siphonophorae (128,677 inds./1,000m^3, 5.97%), indicating that abundance of these species are relatively higher. The 17 genres, including Foraminifer, Hydromedusa, Siphonophorae, Amphipoda, Calanoid, Cladoceran, Cyclop, Decapod Larvae, Mysidacea, Ostracoda, Polychaetes, Sipuncula Larvae, Heterogastropoda, Other Gastropod, Pteropoda, Chaetognaths, and Urodeles (100.00%), indicating that these genres are the common zooplankton in this survey.

iii Analysis of Indexes

H' is between 1.73-2.10; *J'* is between 0.53-0.64. The species abundance is high. *J'* shows that composition in S2 is the lowest as being affected by the dominant species, Ostracods and Calanoid. The abundance distribution is uneven, resulting in the lowest index.

IV. Benthic Organism

i Species Composition

6 orders, 9 families, 10 species were recorded. The list of species is shown as Table 2.1.3-4. Each sampling station recorded 2-5 species and 6-17 individuals, with S1 recording the highest number of species and S2 recording the highest quantity.

ii Dominant Species

A total of 52 individuals were recorded. Opossum Shrimp was recorded with the most individuals (19 individuals, 36.54%). Other species were recorded with 1-7 individuals. Corbula Fortisulcata was recorded with the highest frequency (60.00%), followed by Nassariidae, Katelysia Hiantina, Sinaechinocyamus mai, and Opossum Shrimp (40.00%), indicating that the 5 species were the common species in the area.

iii Analysis of Indexes

H' is between 0.64-1.51, and *J'* is between 0.81-0.98. Overall, the species composition in S1 is rich, and the *H'* is higher. No dominant species is recorded in other stations and the *J'* is high.

Table 2.1.3-2 Resource Table of Marine Plankton

Phylum	Genus	Chinese Name	Scientific Name	EIS[1] 105.02	2024.04 S1				S2				S3				S4			S5				Total	RA[2] （%）	OR[2] （%）
					0 M	3 M	10 M	Bottom	0 M	3 M	10 M	Bottom	0 M	3 M	10 M	Bottom	0 M	3 M	Bottom	0 M	3 M	10 M	Bottom			
Cyanobacteria	*Chroococcus*	膨脹色球藻	*Chroococcus turgidus*				20	12,480		20				20	20									12,560	0.69	26.32
	Richelia	胞內植生藻	*Richelia intracellularis*																				340	340	0.02	5.26
	Trichodesmium	紅海束毛藻	*Trichodesmium erythraeum*		18,720	44,820	880		23,200	7,800	25,600	14,400	25,000	85,800	34,400	75,400	49,800	6,400	42,600	42,400	49,400	21,800	36,000	604,420	33.32	94.74
Pyrrophyta	*Dinophysiales*	具尾鰭藻	*Dinophysis caudata*					20																20	0.00	5.26
	Diplopsalis	透鏡翼甲藻	*Diplopsalis lenticula*		60	140	60	200	20		180	60					40	40	60					860	0.05	52.63
	Gonyaulax	雙刺膝溝藻	*Gonyaulax diegensis*														40							40	0.00	5.26
	Gymnodinium	光環裸甲藻	*Gymnodinium aureolum*															20						20	0.00	5.26
		豐富裸甲藻	*Gymnodinium uberrimum*		40	40	40	40	40	20		20					60	40	40	20			20	420	0.02	63.16
	Lingulodinium	多邊舌甲藻	*Lingulodinium polyedra*							20	20													40	0.00	10.53
	Peridiniales	多甲藻	*Peridinium* spp.	*																				-[3]	-	-
	Phalacroma	禿頂藻 1	*Phalacroma* sp.1	*																				-	-	-
	Prorocentrales	具齒原甲藻	*Prorocentrum dentatum*	*																				-	-	-
		利瑪原甲藻	*Prorocentrum lima*																	20				20	0.00	5.26
		閃光原甲藻	*Prorocentrum micans*	*	80		100	80	20			20					20	20						340	0.02	36.84
	Protoperidinium	叉分原多甲藻	*Protoperidinium divergens*																20		20			40	0.00	10.53
		鈍形原多甲藻	*Protoperidinium obtusum*						20	20														40	0.00	10.53
		海洋原多甲藻	*Protoperidinium oceanicum*								60	20												80	0.00	10.53
		卵形原多甲藻	*Protoperidinium ovum*																20					20	0.00	5.26
		灰甲原多甲藻	*Protoperidinium pellucidum*									20			20		40	20	20				20	140	0.01	31.58
		五角原多甲藻	*Protoperidinium pentagonum*															40						40	0.00	5.26
		斯氏原多甲藻	*Protoperidinium steinii*		20															40				80	0.00	15.79
		賽裸原多甲藻	*Protoperidinium subinerme*														40	20	20					80	0.00	15.79
	Ceratium	歧分角藻	*Tripos carriensis*												20									20	0.00	5.26
		叉角藻	*Tripos furca*	*	60	40	20	40	20								60		20	20				280	0.02	42.11
		三叉角藻	*Tripos trichoceros*			20					20						20							60	0.00	15.79
		角藻 1	*Tripos* sp.1	*																				-	-	-
Haptophyta	*Umbilicosphaera*	希布格臍球藻	*Umbilicosphaera sibogae*		1,620	1,840	4,460																	7,920	0.44	15.79
		臍球藻 1	*Umbilicosphaera* sp.1	*																				-	-	-
Bacillariophyceae	*Achnanthes*	短柄曲殼藻	*Achnanthes brevipes*	*																				-	-	-
		波緣曲殼藻	*Achnanthes crenulata*		20																			20	0.00	5.26
		曲殼藻 1	*Achnanthes* sp.1	*																				-	-	-
	Actinocyclus	愛氏輻環藻	*Actinocyclus ehrenbergii*	*																				-	-	-
	Actinoptychus	華美輻裥藻	*Actinoptychus splendens*																	40			20	60	0.00	10.53
		中等輻裥藻	*Actinoptychus vulgaris*					20																20	0.00	5.26
		輻裥藻 1	*Actinoptychus* sp.1	*																				-	-	-
	Amphora	雙眉藻 1	*Amphora* sp.1	*																				-	-	-
	Asterionella	日本星杆藻	*Asterionella japonica*	*	1,460	640	660	1,520	580	140	6,640	760		700		240	5,700		680	520	880	3,780	6,060	30,960	1.71	84.21
	Asterolampra	南方星芒藻	*Asterolampra marylandica*								20												20	40	0.00	10.53
		星芒藻 1	*Asterolampra* sp.1	*																				-	-	-
	Asteromphalus	星臍藻 1	*Asteromphalus* sp.1	*																				-	-	-
	Azpeitia	結節心孔藻	*Azpeitia nodulifera*			20																		20	0.00	5.26
	Bacillaria	派格棍形藻	*Bacillaria paxillifera*			320	560	1,300	320	120	2,340	500	200		220					900	800	280	1,460	9,320	0.51	68.42
	Bacteriastrum	優美輻杆藻	*Bacteriastrum delicatulum*					120	4,400	200	3,760	2,660		220		200	11,260	460	3,120	520	220	1,100	1,160	29,400	1.62	73.68
		長輻杆藻	*Bacteriastrum elongatum*					80																80	0.00	5.26
		輻杆藻	*Bacteriastrum* spp.	*																				-	-	-
	Bellerochea	鐘形中鼓藻	*Bellerochea horologicalis*					60		240								100		120	40	80	180	820	0.05	36.84
		錘狀中鼓藻	*Bellerochea malleus*			120		160	80	480	500	540		80	60	180		140	180	300	100	1,160	580	4,660	0.26	78.95
	Biddulphia	活動盒形藻	*Biddulphia mobiliensis*	*	40	40	20	20			20	40	20		20	20	40				20	40		340	0.02	63.16
		菱狀盒形藻	*Biddulphia rhombus*			20	80	100	60		60	60				20			20	20	40		20	500	0.03	57.89
		高盒形藻	*Biddulphia rigia*								20		20		20						20	20		100	0.01	26.32
		中華盒形藻	*Biddulphia sinensis*	*										20					20					40	0.00	10.53

Phylum	Genus	Chinese Name	Scientific Name	EIS[1] 105.02	2024.04																			Total	RA[2] (%)	OR[2] (%)
					S1				S2				S3				S4			S5						
					0 M	3 M	10 M	Bottom	0 M	3 M	10 M	Bottom	0 M	3 M	10 M	Bottom	0 M	3 M	Bottom	0 M	3 M	10 M	Bottom			
		盒形藻	*Biddulphia* spp.	*																				-	-	-
	Caloneis	線形美壁藻	*Caloneis linearis*			40																		40	0.00	5.26
	Campylosira	舟形鞍鏈藻	*Campylosira cymbelliformis*	*	140	300	100	300	120	180	460	240					180			580		360	100	3,060	0.17	63.16
	Cerataulus	顆粒角狀藻	*Cerataulus granulatus*		220	220	240	280	40	200	180	180				80	120	200	200	80	60	80	100	2,480	0.14	84.21
	Chaetoceros	二叉角毛藻	*Chaetoceros bifurcatus*							920														920	0.05	5.26
		緊擠角毛藻	*Chaetoceros coarctatus*								160	360		20					40	180				760	0.04	26.32
		扁面角毛藻	*Chaetoceros compressus*		40		620	660	540		440	1,500		580			3,620		1,800	660	420	760	1,220	12,860	0.71	68.42
		扭角毛藻	*Chaetoceros convolutus*				20												20					40	0.00	10.53
		旋鏈角毛藻	*Chaetoceros curvisetus*	*																				-	-	-
		並基角毛藻	*Chaetoceros decipiens*						700		80		60				120	1,340						2,300	0.13	26.32
		齒角毛藻	*Chaetoceros denticulatus*				340											80	140		60	140		760	0.04	26.32
		雙突角毛藻	*Chaetoceros didymus*				220	320	360		260	440			160						200	280		2,240	0.12	42.11
		異角角毛藻	*Chaetoceros diversus*									120												120	0.01	5.26
		勞氏角毛藻	*Chaetoceros lorenzianus*		900	760	1,480	1,800	3,340	1,880	5,240	5,040		160	240		11,980	1,320	6,640	1,460	1,480	1,600	1,340	46,660	2.57	89.47
		牟氏角毛藻	*Chaetoceros muelleri*				40																	40	0.00	5.26
		奇異角毛藻	*Chaetoceros paradoxus*		1,120	180								320			6,140		640	680	260	1,080	1,920	12,340	0.68	47.37
		懸垂角毛藻	*Chaetoceros pendulus*											20										20	0.00	5.26
		秘魯角毛藻	*Chaetoceros peruvianus*				20	20	20		20	20	20											120	0.01	31.58
		擬旋鏈角毛藻	*Chaetoceros pseudocurvisetus*		1,360	1,600	4,000	5,720	60,740	39,000	102,440	91,280	2,040	2,040	840	660	194,780	55,980	124,280	38,840	20,940	34,760	26,940	808,240	44.55	100.00
		嘴狀角毛藻	*Chaetoceros rostratus*									100					40	80						220	0.01	15.79
		聚生角毛藻	*Chaetoceros socialis*		380	420	460	940																2,200	0.12	21.05
		圓柱角毛藻	*Chaetoceros teres*						1,280	560	2,260	1,180				100	3,500	820	2,040	140	1,460	1,020	120	14,480	0.80	63.16
		角毛藻	*Chaetoceros* spp.	*																				-	-	-
	Corethron	小環毛藻	*Corethron criophilum*	*					20															20	0.00	5.26
	Coscinodiscus	中心圓篩藻	*Coscinodiscus centralis*																	20				20	0.00	5.26
		輻射圓篩藻	*Coscinodiscus radiatus*												20									20	0.00	5.26
		洛氏圓篩藻	*Coscinodiscus rothii*							20	20	20	20	20	20	20	20	60		20	20	60	60	380	0.02	68.42
		圓篩藻	*Coscinodiscus* spp.	*																				-	-	-
	Cymbella	近緣橋彎藻	*Cymbella affinis*		60	140		20	20	20	20		20	80			20				20			420	0.02	52.63
		新月橋彎藻	*Cymbella cymbiformis*			20				20														40	0.00	10.53
		新細角橋彎藻	*Cymbella neoleptoceros*			60				20											20			100	0.01	15.79
		橋彎藻1	*Cymbella* sp.1	*																				-	-	-
	Detonula	絲狀短棘藻	*Detonula confervacea*	*	1,020	120	340	420	10,720	2,500	12,000	7,440	140	260			16,280	3,500	9,460	3,220	840	2,380	1,460	72,100	3.97	89.47
	Diatoma	延長等片藻	*Diatoma elongatum*																	40				40	0.00	5.26
	Diploneis	蜂腰雙壁藻	*Diploneis bombus*	*	60		20	80		40	40	20						20		20		20		320	0.02	47.37
		斷紋雙壁藻	*Diploneis interrupta*					20		20														40	0.00	10.53
		雙壁藻1	*Diploneis* sp.1	*																				-	-	-
	Ditylum	布氏雙尾藻	*Ditylum brightwellii*	*																				-	-	-
		太陽雙尾藻	*Ditylum sol*					20									20		20			20		80	0.00	21.05
	Entomoneis	翼繭形藻	*Entomoneis alata*	*	60	60	120	80	20			20					40		20	20			20	460	0.03	52.63
	Eucampia	長角彎角藻	*Eucampia cornuta*	*					20		140						960		260			40	40	1,460	0.08	31.58
		格魯彎角藻	*Eucampia groenlandica*					160				160					280		840					1,440	0.08	21.05
		短角彎角藻	*Eucampia zodiacus*	*																				-	-	-
	Fallacia	宮島琴弦藻	*Fallacia miyajimensis*		20		20																	40	0.00	10.53
		侏儒琴弦藻	*Fallacia pygmaea*																20					20	0.00	5.26
	Fragilaria	大洋脆杆藻	*Fragilaria oceanica*				140																	140	0.01	5.26
		脆杆藻1	*Fragilaria* sp.1	*																				-	-	-
	Gomphonema	細紋異極藻	*Gomphonema affine*						20			20												40	0.00	10.53
		微細異極藻	*Gomphonema parvulum*																20					20	0.00	5.26
		異極藻1	*Gomphonema* sp.1	*																				-	-	-
	Grammatophora	海生斑條藻	*Grammatophora marina*							20					20									40	0.00	10.53
	Guinardia	柔弱幾內亞藻	*Guinardia delicatula*					220	160								420			180		160		1,140	0.06	26.32
		薄壁幾內亞藻	*Guinardia flaccida*		3,900	2,880	1,760	1,600	520	160	240	240					880	80	160	180				12,600	0.69	63.16

Phylum	Genus	Chinese Name	Scientific Name	EIS[1] 105.02	2024.04 S1 0 M	S1 3 M	S1 10 M	S1 Bottom	S2 0 M	S2 3 M	S2 10 M	S2 Bottom	S3 0 M	S3 3 M	S3 10 M	S3 Bottom	S4 0 M	S4 3 M	S4 Bottom	S5 0 M	S5 3 M	S5 10 M	S5 Bottom	Total	RA[2] (%)	OR[2] (%)
		斯氏幾內亞藻	*Guinardia striata*		820	360	180	300				280					220		360	260			260	3,040	0.17	47.37
		幾內亞藻 1	*Guinardia* sp.1	*																				-	-	-
	Gyrosigma	異色布紋藻	*Gyrosigma eximium*																				20	20	0.00	5.26
	Halamphora	咖啡形鹽生雙眉藻	*Halamphora coffeiformis*			20																		20	0.00	5.26
	Hantzschia	雙尖菱板藻	*Hantzschia amphioxys*			20	20	20		20											40	20		140	0.01	31.58
	Helicotheca	泰晤士旋鞘藻	*Helicotheca tamesis*			60		60	180		40	20		20		40		160	100			40		720	0.04	52.63
	Hemiaulus	膜質半管藻	*Hemiaulus membranaceus*		380	340	180	660	40		160	80			60				320	20		100	20	2,360	0.13	63.16
		中華半管藻	*Hemiaulus sinensis*		3,260	4,300	2,980	4,320	840		80	1,000	60		80		780	220	400	220	60	280	120	19,000	1.05	84.21
		半管藻 1	*Hemiaulus* sp.1	*																				-	-	-
	Lauderia	環紋勞德藻	*Lauderia annulata*		1,420	680	920	1,040	400		120		40				520	180	260	180				5,760	0.32	57.89
	Leptocylindrus	小細柱藻	*Leptocylindrus minimus*					440																440	0.02	5.26
	Lithodesmium	波狀石絲藻	*Lithodesmium undulatum*		60	40	20	60	20	20	20		40						20		20			320	0.02	52.63
	Mastogloia	長喙胸隔藻	*Mastogloia rostrata*										20											20	0.00	5.26
	Melosira	變異直鏈藻	*Melosira varians*	*																				-	-	-
	Meuniera	膜狀繆氏藻	*Meuniera membranacea*		40	60	80	120												20				320	0.02	26.32
	Navicula	系帶舟形藻	*Navicula cincta*		60	60	40	60	40	20	20			40	20	20	20	40		20		20		480	0.03	73.68
		放射舟形藻	*Navicula radiosa*		60	20		20		20	20				20	20		40	60					280	0.02	47.37
		紡錘舟形藻	*Navicula rostellata*			60																		60	0.00	5.26
		舟形藻	*Navicula* spp.	*																				-	-	-
	Nitzschia	針狀菱形藻	*Nitzschia acicularis*			20																		20	0.00	5.26
		兩棲菱形藻	*Nitzschia amphibia*																		20			20	0.00	5.26
		長菱形藻	*Nitzschia longissima*		180	200	220	80																680	0.04	21.05
		洛倫菱形藻	*Nitzschia lorenziana*		60	280	300	120	20		60	20		20			20							900	0.05	47.37
		鈍頭菱形藻	*Nitzschia obtusa*			60	60			20								20						160	0.01	21.05
		直菱形藻	*Nitzschia recta*																			20		20	0.00	5.26
		反轉菱形藻	*Nitzschia reversa*		40		20	20																80	0.00	15.79
		菱形藻	*Nitzschia* spp.	*																				-	-	-
	Odontella	長耳齒狀藻	*Odontella aurita*		20	20	20	60	20		60	40	20		40	20	80	20	20	20	40	140		640	0.04	84.21
		長角齒狀藻	*Odontella longicruris*	*	60			80		80		160		40			40		40	40		120	240	900	0.05	52.63
	Paralia	具槽帕拉藻	*Paralia sulcata*	*	180														140					320	0.02	10.53
	Pinnularia	細條羽紋藻	*Pinnularia microstauron*			20																		20	0.00	5.26
		羽紋藻 1	*Pinnularia* sp.1	*																				-	-	-
	Plagiogramma	範氏斜斑藻	*Plagiogramma vanheurckii*		20	40		40																100	0.01	15.79
	Plagiolemma	扭斜膜藻	*Plagiolemma distortum*				20										20							40	0.00	10.53
	Plagiotropis	鱗翅斜脊藻	*Plagiotropis lepidoptera*		100	80	60	200	20		20		20		20			60	60	40				680	0.04	57.89
	Planktoniella	漂流藻 1	*Planktoniella* sp.1	*																				-	-	-
	Pleurosigma	膨脹斜紋藻	*Pleurosigma inflatum*		20		20													20				60	0.00	15.79
		諾馬斜紋藻	*Pleurosigma normanii*		260	340	320	420	140	40	120	160	60	140	20	20	280	120	300	140	80	120	80	3,160	0.17	100.00
		斜紋藻	*Pleurosigma* spp.	*																				-	-	-
	Proboscia	翼象鼻藻	*Proboscia alata*		300	220	580	460	700	80	820	440	60	80		20	420	220	200	120	100	20	120	4,960	0.27	94.74
	Psammodictyon	琴式矽網藻	*Psammodictyon panduriforme*			20	20	20								20		20		20				120	0.01	31.58
	Pseudo-nitzschia	柔弱擬菱形藻	*Pseudo-nitzschia delicatissima*		260	160	80	500																1,000	0.06	21.05
		成列擬菱形藻	*Pseudo-nitzschia seriata*				380	1,040										280		240				1,940	0.11	21.05
	Rhaphoneis	雙角縫舟藻	*Rhaphoneis amphiceros*	*																				-	-	-
		縫舟藻 1	*Rhaphoneis* sp.1		20	20	100	160			100	40						20	20					480	0.03	42.11
		縫舟藻 2	*Rhaphoneis* sp.2		1,760	1,840	2,840	3,420	1,240	460	580	1,260	100	80	220	240	660	500	1,060	140	40	120	60	16,620	0.92	100.00
	Rhizosolenia	距端根管藻	*Rhizosolenia calcar-avis*		40	40	20	20			40	80	20	40		20			20					340	0.02	52.63
		假根管藻	*Rhizosolenia fallax*		140	20	60	140	460	160	120	20		20			480	420	460	60		120	40	2,720	0.15	78.95
		鈍棘根管藻半刺變型	*Rhizosolenia hebetata* f. *semispina*																40		40	60	20	160	0.01	21.05
		透明根管藻	*Rhizosolenia hyalina*				140	260		20							100		20					540	0.03	26.32
		覆瓦根管藻	*Rhizosolenia imbricata*		280	280	120	60	1,080	80	720	560	20	320	60		1,080	500	1,260	500	100	160	40	7,220	0.40	94.74
		剛毛根管藻	*Rhizosolenia setigera*			80	60	20	20	80	120	80					160	180	240	60				1,100	0.06	57.89

Phylum	Genus	Chinese Name	Scientific Name	EIS[1] 105.02	2024.04 S1				S2				S3				S4			S5				Total	RA[2] (%)	OR[2] (%)
					0 M	3 M	10 M	Bottom	0 M	3 M	10 M	Bottom	0 M	3 M	10 M	Bottom	0 M	3 M	Bottom	0 M	3 M	10 M	Bottom			
		筆尖形根管藻	*Rhizosolenia styliformis*											60		40	20	20	20				80	240	0.01	31.58
		根管藻	*Rhizosolenia* spp.	*																				-	-	-
	Roperia	方格羅氏藻	*Roperia tesselata*		120	140	120	200	140	100	400	220		20	20		40	100	300	20	100	160	240	2,440	0.13	89.47
	Sellaphora	鞍型藻 1	*Sellaphora* sp.1					20																20	0.00	5.26
	Stephanopyxis	掌狀冠蓋藻	*Stephanopyxis palmeriana*					300										20						320	0.02	10.53
		塔形冠蓋藻	*Stephanopyxis turris*		400	420	620	760	20										40	60		20		2,340	0.13	42.11
	Surirella	錢氏雙菱藻	*Surirella recedens*																		20			20	0.00	5.26
	Tabularia	伽氏平片藻	*Tabularia gaillonii*	*																				-	-	-
	Thalassionema	伕恩海線藻	*Thalassionema frauenfeldii*	*	1,020	640	320	720	260		140	220					40	60	180	180	60	460	40	4,340	0.24	73.68
		菱形海線藻	*Thalassionema nitzschioides*	*		400						80		80					80			100		740	0.04	26.32
	Thalassiosira	優美海鏈藻	*Thalassiosira delicatula*															40						40	0.00	5.26
		離心列海鏈藻	*Thalassiosira eccentrica*		40	20	20	100	20				20							20	20	40	20	320	0.02	52.63
		鼓脹海鏈藻	*Thalassiosira gravida*		80	60	580	60			120	60				20	80	40	120	20	80		20	1,340	0.07	68.42
		細長列海鏈藻	*Thalassiosira leptopus*					20		20	40		40	20		20	80	20	40	40	40	20	40	440	0.02	68.42
		蔓軟海鏈藻	*Thalassiosira mala*			240											440							680	0.04	10.53
		細弱海鏈藻	*Thalassiosira subtilis*		6,520				20								20	2,260		20		7,180		16,020	0.88	31.58
		柔弱海鏈藻	*Thalassiosira tenera*		120	100	120		60	20		20	20		20		40	20					40	580	0.03	57.89
		海鏈藻	*Thalassiosira* spp.	*																				-	-	-
	Thalassiothrix	長海毛藻	*Thalassiothrix longissima*	*																				-	-	-
		地中海海毛藻	*Thalassiothrix mediterranea*		20	20																		40	0.00	10.53
	Trachyneis	粗糙粗紋藻	*Trachyneis aspera*														20				20			40	0.00	10.53
		計時粗紋藻	*Trachyneis clepsydra*			40	20		40	20											40			160	0.01	26.32
	Triceratium	蜂窩三角藻	*Triceratium favus*		20																			20	0.00	5.26
	Ulnaria	肘狀肘形藻	*Ulnaria ulna*	*	100	140	40	20							20	40								360	0.02	31.58
Ochrophyta	*Dictyocha*	小等刺矽鞭藻	*Dictyocha fibula*	*	40	40	100	60	40	60	20	20	60		20					20	20		20	520	0.03	68.42
	Distephanus	六異刺矽鞭藻	*Distephanus speculum*	*																				-	-	-
		八刺異刺矽鞭藻	*Distephanus polyactis*			20	40		20													20		100	0.01	21.05
		Total（Cells/L）			49,720	66,900	28,680	45,380	113,240	55,940	167,180	132,340	28,140	91,320	36,700	77,460	312,180	76,380	199,600	93,740	78,260	80,360	80,720	1,814,240		
		Chl a（μg/L）			1.51	1.68	0.62	1.58	1.45	1.32	1.70	1.65	0.55	0.70	0.60	1.67	1.81	1.40	1.77	1.43	1.60	1.49	1.53			
		PP（μgC/L/d）		-	119.12	122.05	37.87	125.32	104.91	105.28	139.90	117.86	30.90	43.03	36.61	123.31	134.58	107.46	143.93	111.97	113.34	118.88	107.90			
		Diversity Index（*H'*）			2.49	1.66	3.08	2.89	1.63	1.24	1.48	1.34	0.53	0.37	0.38	0.19	1.43	1.24	1.34	1.38	1.14	1.82	1.59			
		Evenness Index（*J'*）			0.61	0.39	0.74	0.68	0.41	0.33	0.37	0.34	0.17	0.11	0.12	0.06	0.36	0.32	0.33	0.35	0.31	0.48	0.43			

Note 1: “*” indicates the species was recorded in EIS stage

Note 2: “-” indicates incalculable data.

Note3: RA= Relative Abundance,%; OR= Occurrence Rate,%

Table 2.1.3-3 Resource Table for Marine Zooplankton

Phylum	Taxa	English Name	EIS[1] 2016.02	2024.04 S1	S2	S3	S4	S5	Total	RA（%）[2]	OR（%）
Protozoa	Foraminifer	Foraminifera	*	17,251	46,131	15,188	27,139	10,425	116,134	5.39	100.00
	Noctiluca	Noctiluca		8,782					8,782	0.41	20.00
	Radiozoa	Radiolaria	*		739	411	5,501	2,028	8,679	0.40	80.00
Ctenophora	Ctenophora	Ctenophora			1,108		1,101	869	3,078	0.14	60.00
Cnidaria	Hydroidomedusa	Hydroida	*	3,137	5,905	1,232	13,570	6,371	30,215	1.40	100.00
	Scyphozoa	Scyphomedusae			739		367		1,106	0.05	40.00
	Siphonophorae	Siphonophora	*	69,942	38,750	6,568	7,335	6,082	128,677	5.97	100.00
Arthropoda	Amphipoda	Amphipoda	*	6,901	7,012	821	3,668	1,738	20,140	0.93	100.00
	Crustacea	Barnacle larvae	*		1,477	1,642	5,868	1,448	10,435	0.48	80.00
	Calanoid	Calanoida	*	94,406	260,915	68,140	196,935	73,552	693,948	32.20	100.00
	Cladocera	Cladocera	*	628	2,953	821	2,934	2,028	9,364	0.43	100.00
	Copepoda nauplius	Copepoda nauplius	*		370			580	950	0.04	40.00
	Cyclopida	Cyclopoida	*	2,823	10,334	5,747	13,936	13,321	46,161	2.14	100.00
	Decapoda Larvae	Decapoda larvae	*	6,587	17,715	7,800	59,044	17,085	108,231	5.02	100.00
	Euphausiidae	Euphausiacea	*						-[3]	-	-
	Harpacticoida	Harpacticoida	*	314	1,477	411		1,159	3,361	0.16	80.00
	Isopoda	Isopod			370				370	0.02	20.00
	Lucifer	Luciferidae					367	290	657	0.03	40.00
	Mysida	Mysidacea	*	314	4,060	821	1,101	290	6,586	0.31	100.00
	Ostracoda	Ostracoda	*	112,910	264,237	52,132	152,927	102,509	684,715	31.77	100.00
Nemertina	Nemertea	Nemertea larvae			370				370	0.02	20.00
Annelida	Polychaeta	Polychaeta	*	1,882	10,334	2,463	17,970	4,344	36,993	1.72	100.00
Sipuncula	Sipuncula larvae	Sipuncula larvae		5,646	8,858	3,695	7,702	1,738	27,639	1.28	100.00
Mollusca	Bivalvia	Bivalve larvae	*		370		1,101		1,471	0.07	40.00
	Heterogastropoda	Heteropoda	*	941	739	1,232	2,201	869	5,982	0.28	100.00
	Other gastropod	Other Gastropoda	*	10,037	6,274	6,979	16,503	3,186	42,979	1.99	100.00
	Pteropoda	Pteropoda	*	628	370	821	734	1,448	4,001	0.19	100.00
Chaetognatha	Chaetognaths	Chaetognatha	*	11,605	22,512	6,568	67,112	19,112	126,909	5.89	100.00
Echinodermata	Echinodermata	Echinodermata larvae	*		2,584	411	3,301	1,448	7,744	0.36	80.00
Chordata	urodeles	Appendicularia	*	941	1,477	821	4,401	2,607	10,247	0.48	100.00
	Fish Eggs	Fish eggs	*				1,101	1,448	2,549	0.12	40.00
	Fish Larva	Fish larvae	*	314			1,834	580	2,728	0.13	60.00
	Thaliacea	Thaliacea	*			821	367	2,607	3,795	0.18	60.00
Total（inds./1,000 m^3）				355,989	718,180	185,545	616,120	279,162	2,154,996		
Diversity Index（*H′*）				1.88	1.73	1.96	2.10	2.06			
Evenness Index（*J′*）				0.63	0.53	0.63	0.64	0.62			

Note 1: “*” indicates the species was recorded in EIS stage

Note 2: “-” indicates incalculable data.
Note3: RA= Relative Abundance,%; OR= Occurrence Rate,%.

Table 2.1.3-4 Resource Table for Marine Benthic Organism

Order	Family	Chinese Name	Scientific Name/ English Name	Endemism	Protected Level	EIS[1] 2016.02	2024.04 S1	S2	S3	S4	S5	Total	RA（%）[2]	OR（%）
Decapoda	Diogenidae	活額寄居蟹	Gen. spp. (Diogenidae)				1					1	1.92	20.00
		寄居蟹	*Diogenes* spp.			*						-[3]	-	-
	Penaeidae	哈氏仿對蝦	*Parapenaeopsis hardwickii*			*						-	-	-
			Gen. spp. (Penaeidae)				3					3	5.77	20.00
		鬚赤蝦	*Metapenaeopsis barbata*							2		2	3.85	20.00
	Crangonidae	褐蝦	Gen. spp. (Crangonidae)							2		2	3.85	20.00
Mesogastropoda	Cerithioidea	中華蟹守螺	*Rhinoclavis sinensis*			*						-	-	-
Eunicida	Nereididae	沙蠶	Gen. spp. (Nereididae)			*						-	-	-
Neogastropoda	Nassariidae	織紋螺	*Niotha* spp.				2	2				4	7.69	40.00
Veneroida	Mactridae	日本馬珂蛤	*Mactra nipponica*			*						-	-	-
	Veneridae	黃文蛤	*Pitarina sulfureum*			*						-	-	-
		簾蛤	Gen. spp. (Veneridae)				1			3		4	7.69	40.00
	Tellinidae	櫻蛤	Gen. spp. (Tellinidae)								4	4	7.69	20.00
Clypeasteroida	Dendrasteridae	馬氏扣海膽	*Sinaechinocyamus mai*					3	4			7	13.46	40.00
Myoida	Corbulidae	臺灣抱蛤	*Corbula taiwanensis*				2	2			2	6	11.54	60.00
Mysidacea	Mysidae	糠蝦	Gen. spp. (Mysidae)					10	9			19	36.54	40.00
			Total（Individual）				9	17	13	7	6	52		
			Diversity Index（*H'*）				1.52	1.12	0.62	1.08	0.64			
			Evenness Index（*J'*）				0.95	0.81	0.89	0.98	0.92			

Note 1: “*” indicates the species was recorded in EIS stage (2016 February)

Note 2: “-” indicates incalculable data.

Note3: RA= Relative Abundance,%; OR= Occurrence Rate,%.

V. Fish Egg and Larva

i Species Composition

194 eggs were captured in this quarter. 10 families and 11 species of fish egg were identified. Among them, Silver Grunt from Haemulidae is the most dominant species, followed by Moolgarda perusii from Mugilidae, Kumococius rodericensis from Platycephalidae, Stolephorus commersonnii from Engraulidae, and Mene Maculata from Menidae (Table 2.1.3-5). Other species were below 30 egg/100 m^3. A total of 130 fish larvae were captured. 7 families and 8 species of fish larva were identified. Gerres limbatus from Gerreidae is the most dominant species, followed by Sardinella gibbose from Clupeidae and Sillago asiatica. The other species were under 10 ind./100 m^3 (as shown in Table 2.1.3-6).

Table 2.1.3-5 Fish Egg Composition and Abundance Collected in this Quarter

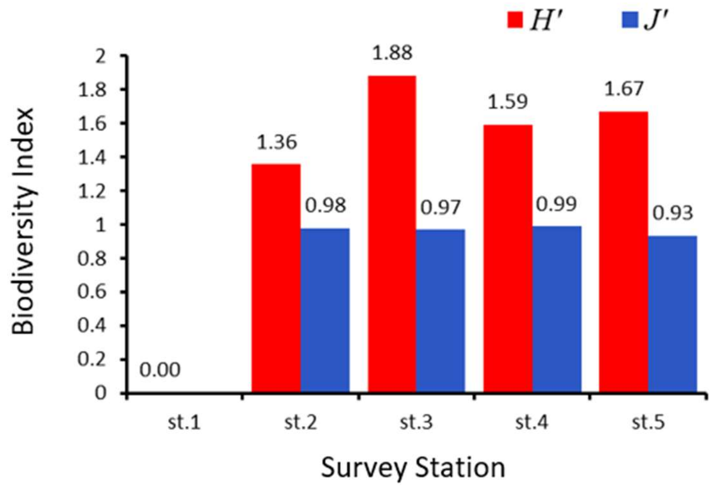
Taxa\Station	Chinese name	st.1	st.2	st.3	st.4	st.5	Total
Engraulidae							
Stolephorus commersonnii	康氏側帶小公魚	3	5	3	4		15
Thryssa kammalensis	赤鼻稜鯷	14					14
Mugilidae							
Chelon affinis	前鱗龜鮻				2		2
Sparidae							
Evynnis cardinalis	紅鋤齒鯛	2	3	5	9	4	23
Trichiuridae							
Trichiurus sp.	帶魚屬	3	2				5
Abundance (egg/100 m^3)		**22**	**10**	**8**	**15**	**4**	**59**
Genre		3	3	2	3	1	4
Family		4	3	2	3	1	5
Fish Egg actually collected(egg)		**16**	**7**	**6**	**11**	**4**	**44**

Table 2.1.3-6 Fish Larva Composition and Abundance Collected in this Quarter

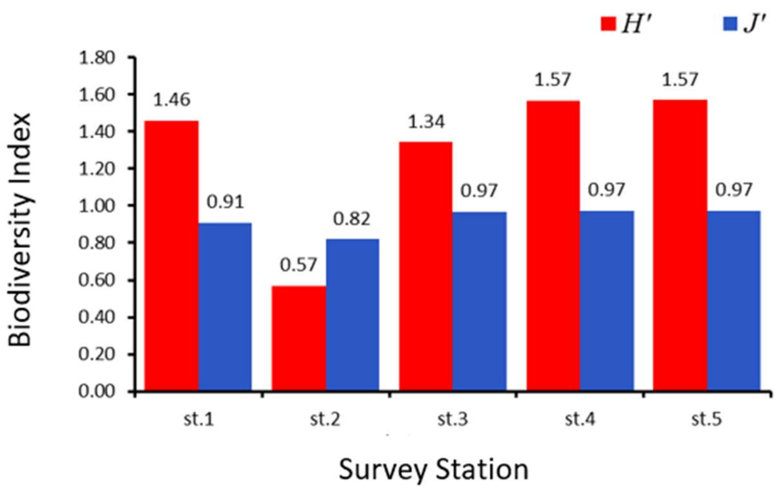
Taxa\Station	Chinese name	st.1	st.2	st.3	st.4	st.5	Total
Engraulidae							
Encrasicholina punctifer	銀灰半稜鯷	2					2
Mugilidae							
Chelon affinis	前鱗龜鮻					1	1
Mullidae							
Upeneus japonicus	日本緋鯉	4	2	3	3	5	17
Sparidae							
Evynnis cardinalis	紅鋤齒鯛			2			2
Abundance (ind./100 m^3)		**6**	**2**	**5**	**3**	**6**	**22**
Genre		2	1	2	1	2	4
Family			1	2	1	2	4
Fish Larva actually collected			**1**	**3**	**2**	**6**	**16**

ii Index Analysis

H' and *J'* index analysis of fish eggs and larvae in each sampling station is as shown in Figure 2.1.3-1. Shannon-Wiener diversity index (H') is a composite reflection of the number of species and the proportion of each species in the cluster, while Pielou's evenness (J') is a calculation of the degree to which each species is evenly distributed in the cluster (value is between 0 and 1, greater value indicates the greater evenness). For fish eggs, 1 egg was collected in S1, so *J'* is 0, and *H'* is incalculable. For the other stations, the *H'* is between 1.36-1.88, *J'* is between 0.93-0.99. S3 has the highest *H'* index (*H'* =1.88), and S2 has the lowest *H'* index (*H'* =1.36). As for fish larva, *J'* is between 0.57-1.5 and *H'* is between 0.82-0.97. S4 has the highest *H'* index (*H'* =1.57), and S2 has the lowest *H'* index (*H'* =0.57).



(a) Fish Egg



(b) Fish Larva

Figure 2.1.3-1 Diversity Index (*H'*) and Evenness Index (*J'*) of Fish Egg and Fish Larva in each Sampling Station

VI. Fish

i Species Composition

In this quarter, 8 families, 9 species, and 59 individuals of fish were captured in three sampling stations, amounting to 10.219 kg (Table 2.1.3-7).

In sampling station T1, 7 families, 8 species, and 20 individuals of fish were captured, amounting to 3.38 kg. Johnius Distinctus had the most individuals caught (6 individuals), followed by Big-Head Pennah Croaker (4 individuals). Ilisha Melastoma, Silver Grunt, Fourfinger Threadfin, and Silver Pomfret (2 individuals respectively) and Sea Catfish and Pacific Seabream (1 individual respectively) were also recorded.

In sampling station T2, 7 families, 8 species, and 21 individuals of fish were captured, amounting to 3.389 kg. Johnius Distinctus had the most individuals caught (9 individuals), followed by Silver Grunt and Silver Pomfret (3 individuals) and Big-Head Pennah Croaker (2 individuals). Ilisha Melastoma, Hamilton's Thryssa, Pacific Seabream, and Fourfinger Threadfin (1 individual respectively) were also recorded.

In sampling station T3, 6 families, 7 species, and 18 individuals of fish were captured, amounting to 3.45 kg. Fourfinger Threadfin had the most individuals caught (5 individuals), followed by Silver Pomfret (4 individuals) and Johnius Distinctus (3 individuals). Ilisha Melastoma and Big-Head Pennah Croaker (2 individuals respectively) and Silver Grunt and Pacific Seabream were also recorded.

ii Dominant Species

Regarding fish species, Johnius distinctus is the dominant species with 18 individuals (30.5%), followed by Silver Pomfret (9 individuals, 15.3%) and Fourfinger Threadfin and Big-head Pennah croaker (8 individuals, 13.6%), respectively. Silver Grunt came in the fourth place (6 individuals, 10.2%). Ilisha Melastoma ranked fifth place (5 individuals, 8.5%). The other 3 species (Hamilton's Thryssa, Pacific Seabream, and Big-Head Pennah Croaker) were captured with 1-3 individuals.

In this quarter, 7 species (Silver Grunt, Pacific Seabream, Fourfinger Threadfin, Johnius Distinctus, Big-Head Pennah Croaker, Ilisha Melastoma, and Silver Pomfret) were recorded in all three stations, indicating the species have the widest range of distribution. 2 species, including Hamilton's Thryssa, and Sea Catfish were only recorded in 1 station.

iii Analysis of Indexes

H' recorded for sampling station T1 was 1.901, *J'* was 0.92;

H' recorded for sampling station T2 was 1.72, *J'* was 0.83;

H' recorded for sampling station T3 was 1.80, *J'* was 0.92.

The three sampling stations in succession of *H'* index is T1> T3> T2.

The three sampling stations in succession of *J'* index is T3> T1> T2.

T2 has the lowest index the two index *H'* and *J'*.

iv Comprehensive Discussion

In terms of market economic value of the captured fish species, out of the 9 species recorded at the three stations, 6 species including Silver Grunt, Pacific Seabream, Fourfinger Threadfin, Johnius Distinctus, Big-Head Pennah Croaker, and Silver Pomfret have higher market economic value. 3 species (Ilisha Melastoma, Hamilton's Thryssa, and Sea Catfish) are food fish but less popular in the market, they are either sold with low price or dealt with as trash fish or even thrown away. If analyzed by species composition, the species with higher commercial values account for 66.7%. If analyzed by amount captured, the species with higher commercial values account for 88.1%.

With regard to the correlation between fish species and marine habitat: the substrate of the marine environment in Yunlin County is mainly mud and sand, and no artificial reef was placed in the waters. The substrate is relatively homogeneous. Local fishers said that there is a severely-disintegrated ship wreck near the shore around the wind farm site, and it is known that the wreck can serve as artificial reef. The survey in 2021 Q1 (January 14) also found traces of reef substrate fish species, such as Kyphosus cinerascens. This shows that there are a few fish species near the wind farm area prefer reef substrate. However, mud and sand substrates are still the most preferred marine environment in Yunlin wind farm area. Out of the 9 species captured in this quarter, 7 species were mud/sand substrate species, and 2 species were reef/sand substrate species. In terms of the proportion of fish species, sediment-bottom species account for 77.8% of all fish species. In terms of the number of captures, sediment-bottom species represent 84.7 % of the total catches. The survey result suggests that local fish species mainly prefer mud/sand substrate, with some species prefer reef/sand substrate. The sampling result of this quarter also shows that the species composition is quite consistent with the geographical location and the substrate in Yunlin.

VII. Underwater Filming

No underwater filming was conducted in this quarter.

Table 2.1.3-7 Composition of Fish Captured in Sampling Stations in this Quarter

Sampling Date				2024.3.16			2024.3.16			2024.3.16			
Station				T1			T2			T3			
Family	Scientific Name	Chinese Name	Habitation	No.	TL	BW	No.	TL	BW	No.	TL	BW	Total
Pristigasteridae	*Ilisha melastoma*	黑口鰳	Sand	2	15~16	230	1	17	117	2	16~17	236	5
Engraulidae	*Thryssa hamiltonii*	漢氏稜鯷	Sand				1	14	53				1
Ariidae	*Arius maculatus*	斑海鯰	Sand	1	37	420							1
Haemulidae	*Pomadasys kaakan*	星雞魚	Reef/Sand	2	39~46	1078	3	43~45	1570	1	47	620	6
Sparidae	*Acanthopagrus pacificus*	太平洋棘鯛	Reef/Sand	1	27	390	1	29	423	1	35	570	3
Polynemidae	*Eleutheronema rhadinum*	多鱗四指馬鮁	Sand	2	23~24	379	1	27	216	5	26~31	1260	8
Sciaenidae	*Johnius distinctus*	鱗鰭叫姑魚	Sand	6	17~22	416	9	16~24	590	3	15~20	239	18
Sciaenidae	*Pennahia macrocephalus*	大頭白姑魚	Sand	4	14~16	255	2	15~16	135	2	14~15	120	8
Stromateidae	*Pampus cinereus*	灰鯧	Sand	2	16~17	212	3	14~16	285	4	16~17	405	9
Weight						3380			3389			3450	10219
Species No.				8			8			7			9
Individual No.				20			21			18			59
Diversity Index (*H′*)				1.9037			1.723			1.7981			
Uniformity Index (*J′*)				0.91548			0.82856			0.92404			

Note: No. indicates individual; TL indicates total length (cm); BW indicates weight (g)

2.1.4 Underwater Acoustic Survey of Cetacean Ecology

There are 5 measuring locations in this survey (YW-1-YW-5). Valid data collected in the locations will be analyzed. Underwater acoustic survey was carried out from May 11-12, 2024. The measurement lasted for 1 day (24 hours). The analysis durations are as Table 2.1.4-1, with explanation provided below. Deployment locations as shown in Figure 1.4-5.

Table 2.1.4-1 Duration of the Underwater Acoustic Data Analyzed in this Quarter

Measuring location	Duration of the data analyzed
YW-1	May 11-12, 2024
YW-2	May 11-12, 2024
YW-3	May 11-12, 2024
YW-4	May 11-12, 2024
YW-5	May 11-12, 2024

I. Analysis of Underwater Ambient Noise

Underwater acoustic equipment is able to record change of surrounding sounds, such as natural ambient noise (wave, tide, etc), sound of creatures (cetaceans, fish, etc), etc. Intermittent unknown high-level sound sources such as vessel noise or human activities can all be recorded if occurred. The Wav files recorded by the acoustic device undergoes FFT, and the result is presented in 1Hz and 1/3 Octave band. Characteristics and changes of the underwater ambient noise in the Project area were learned via spectrogram and cumulative probability distribution diagram of ambient noise.

i Analysis of Underwater Time/frequency

The spectrograms of ambient noise time-frequency analysis for each measuring locations are shown in Figure 2.1.4-1 to Figure 2.1.4-5. From the spectrum, it can be found that the underwater noise was affected by vessel noises and the tidal period. In other words, when the tides changes during high tides or low tides, the flowing noise will be derived from the sea current. The analysis of the spectrum shows that noise mostly distributed in mid to low frequency.

ii Cumulative Probability Distribution of Ambient Noise

The cumulative probability distributions of ambient noise at each measuring location are shown in Figure 2.1.4-1 to Figure 2.1.4-5. The percentages of each curve indicate the cumulative probability that is lower than the noise value; 5% purple curve and 95% red curve represent the lower and upper limits of the range of ambient noise. L_5 and L_{90} are the upper limit and lower limit of the ambient noise, and L_{50} is the median.

Survey was conducted for 24 hours in YW-1, YW-2, YW-3, YW-4 and YW-5. Measuring results show peaks in low frequency. This is mainly contributed by the currents flowing through the device and the vessels around the wind farm.

Dolphins frequently seen in the western sea area of Taiwan include Chinese white dolphin and bottlenose dolphin. Sounds of these dolphins are in the middle-frequency, which range between 3k -9k Hz. Therefore, the Project adopts the background noise value from 2.5k to 10k Hz as the threshold for detection of cetacean sounds. Cumulative probability of noise with the frequency domain is shown as Table 2.1.4-2 to Table 2.1.4-6.

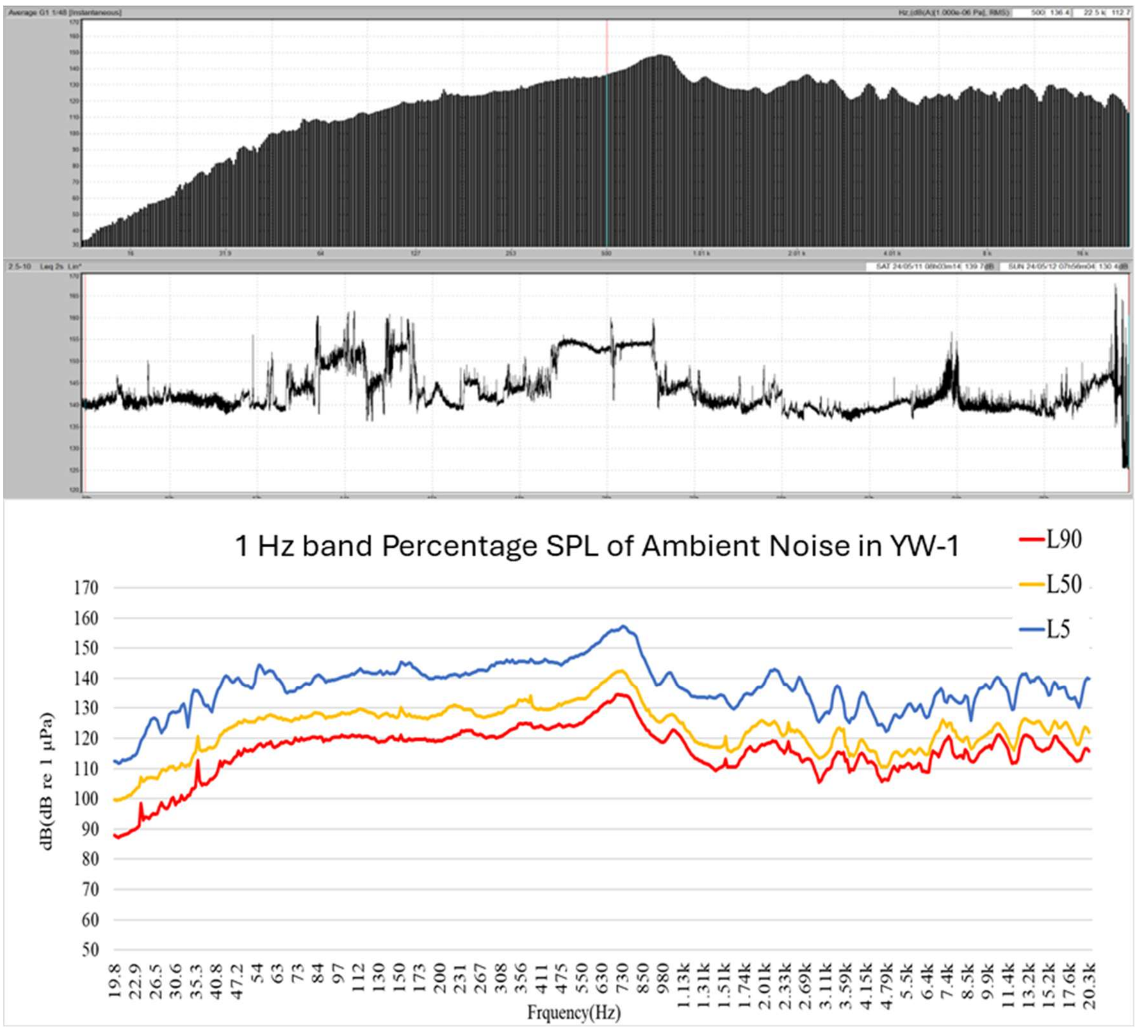


Figure 2.1.4-1 Time Domain Figure, Spectrum, and 1 Hz band Percentage SPL of the Ambient Noise in YW-1

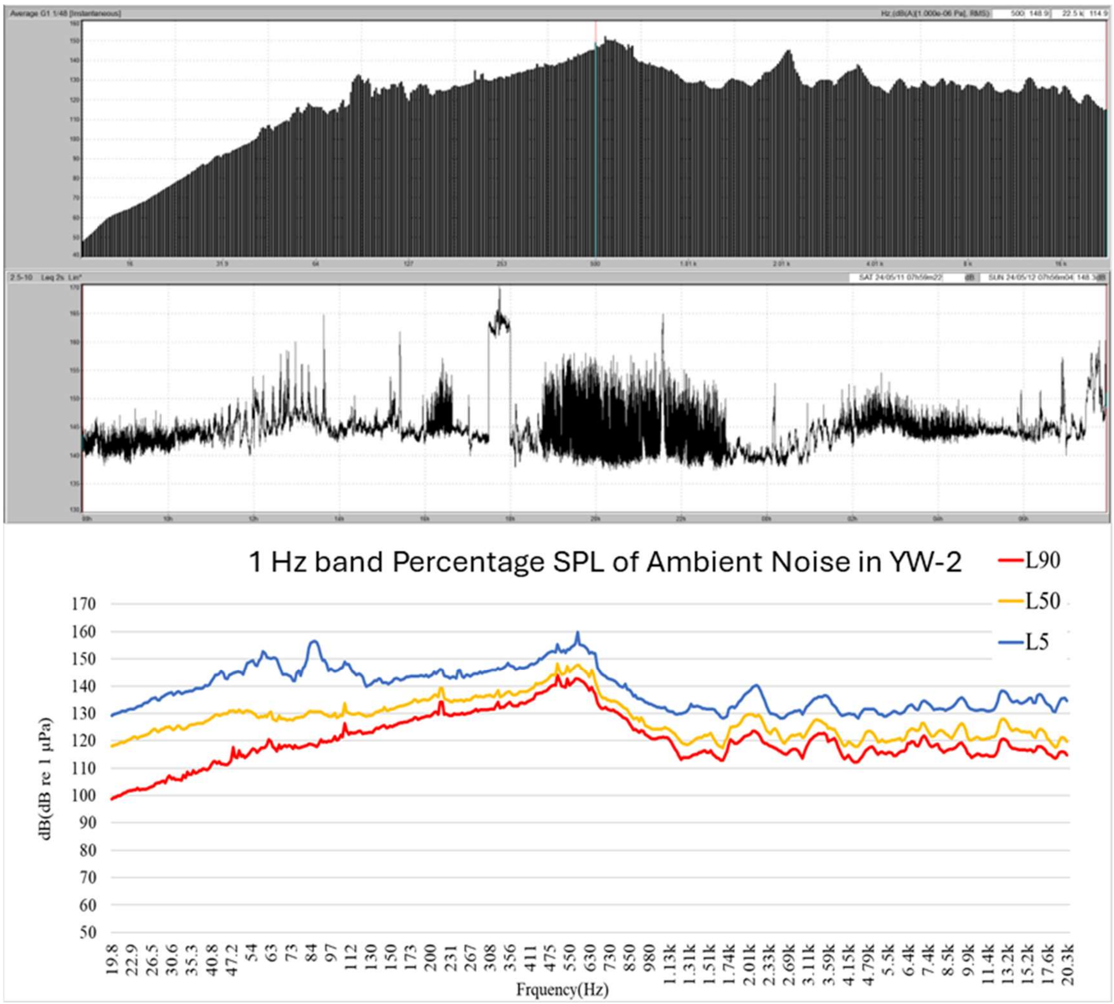


Figure 2.1.4-2 Time Domain Figure, Spectrum, and 1 Hz band Percentage SPL of the Ambient Noise in YW-2

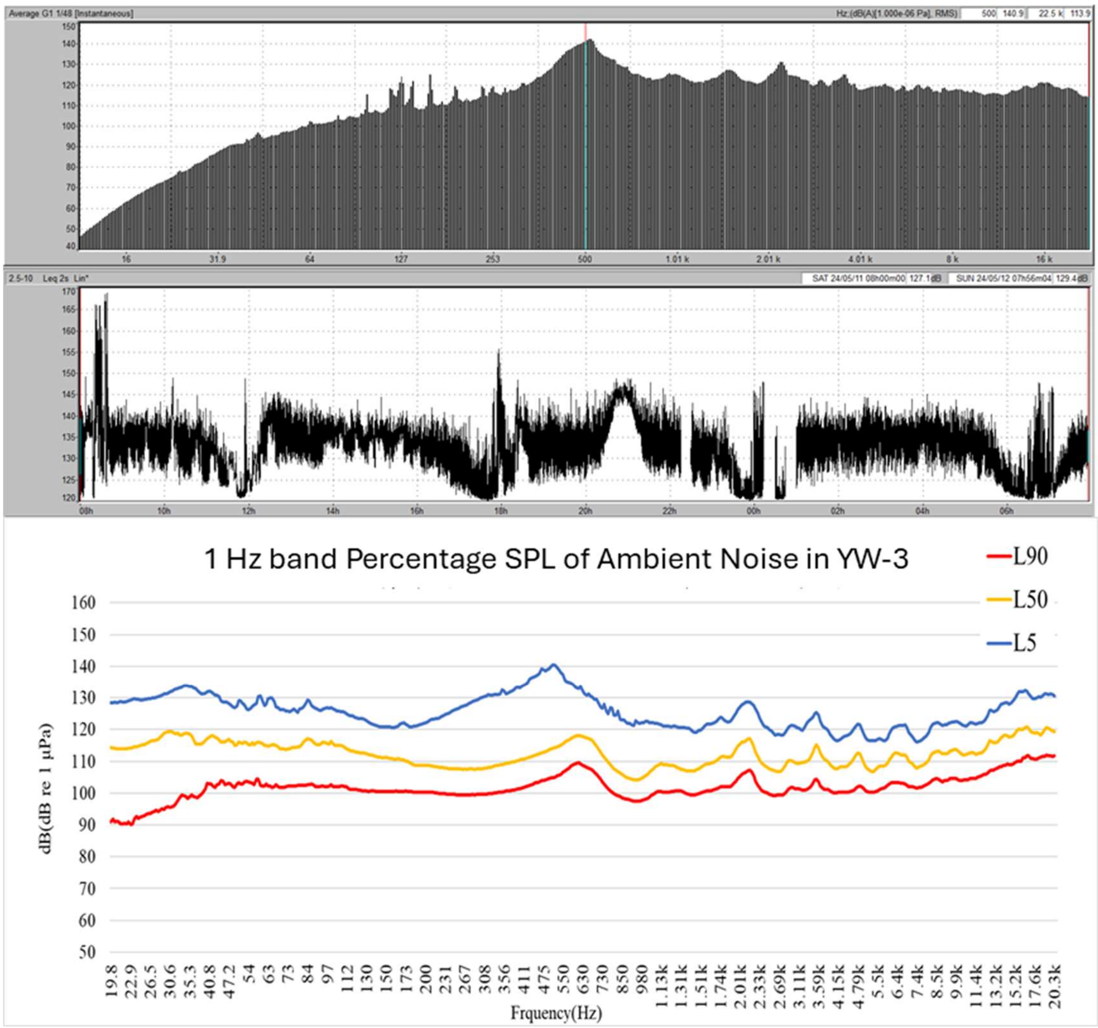


Figure 2.1.4-3 Time Domain Figure, Spectrum, and 1 Hz band Percentage SPL of the Ambient Noise in YW-3

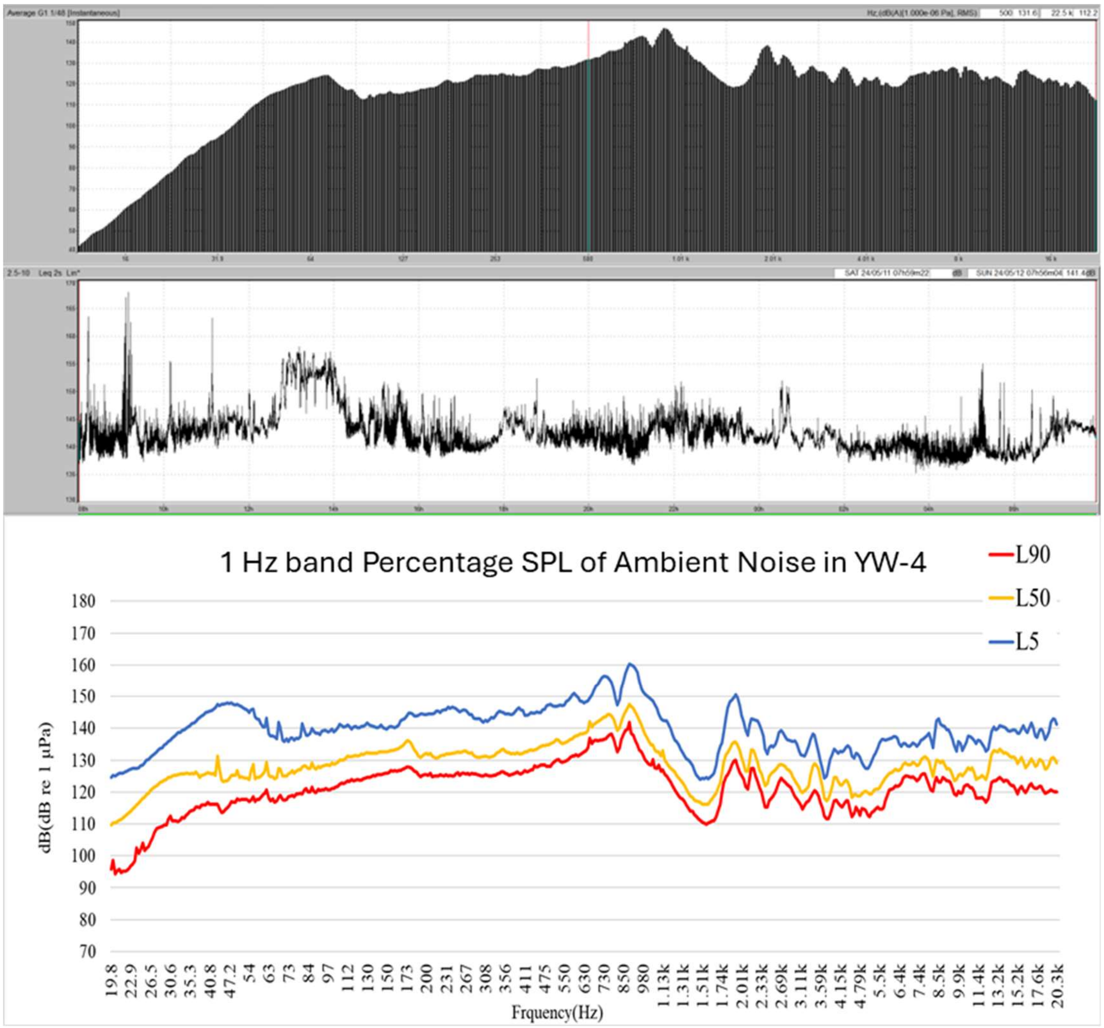


Figure 2.1.4-4 Time Domain Figure, Spectrum, and 1 Hz band Percentage SPL of the Ambient Noise in YW-4

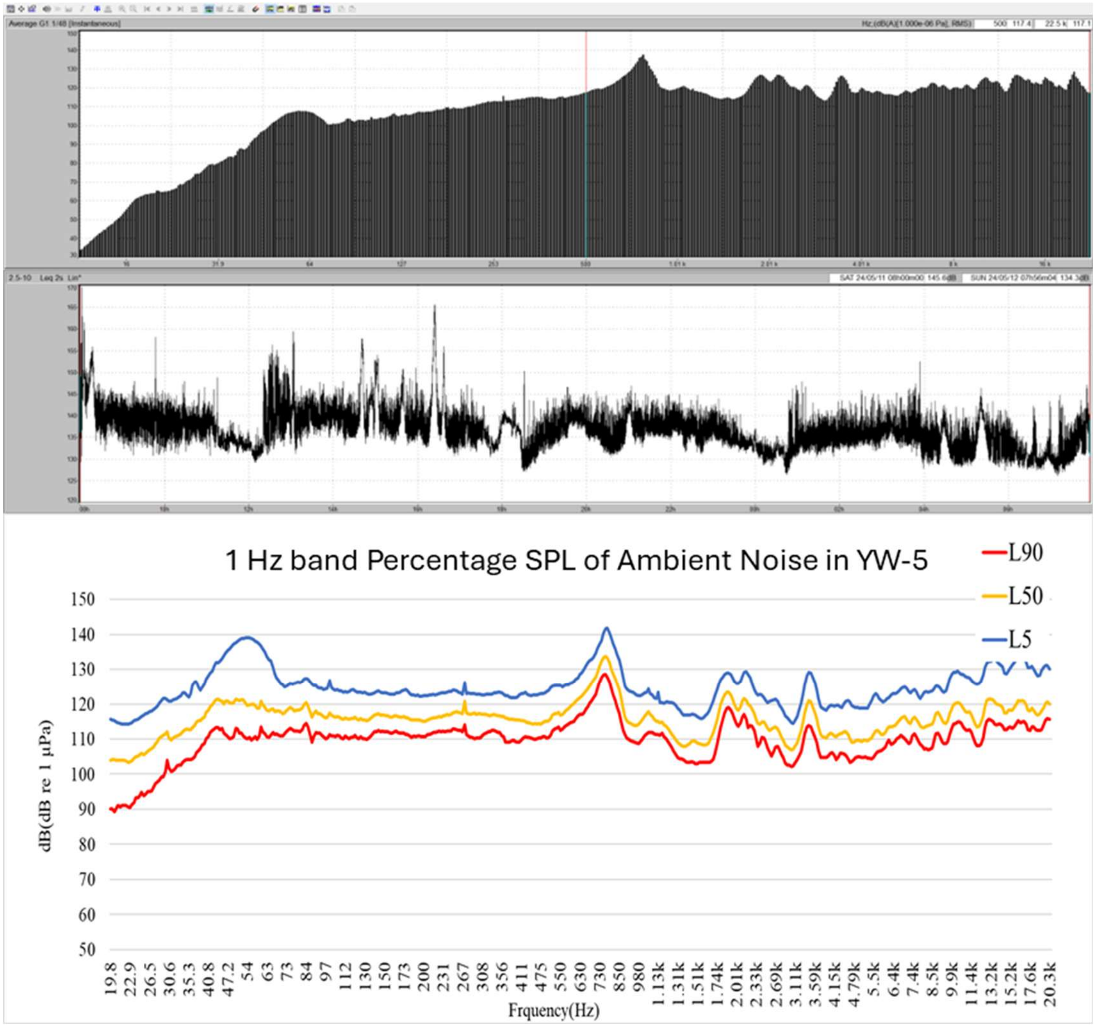


Figure 2.1.4-5 Time Domain Figure, Spectrum, and 1 Hz band Percentage SPL of the Ambient Noise in YW-5

Table 2.1.4-2 Distribution of the Cumulative Probability of the Ambient Noise between 2.5k-10k Hz in YW-1

Unit: dB re 1μPa

Frequency(Hz) / percentage(%)	2.5k	3.15k	4k	5k	6.3k	8k	10k
L_5	149.8	144.8	142.8	139.0	143.5	144.6	149.6
L_{50}	134.7	131.7	129.5	126.2	132.1	134.8	134.5
L_{90}	130.0	125.8	125.7	122.6	127.2	131.2	130.8

Table 2.1.4-3 Distribution of the Cumulative Probability of the Ambient Noise between 2.5k-10k Hz in YW-2

Unit: dB re 1μPa

Frequency(Hz) / percentage(%)	2.5k	3.15k	4k	5k	6.3k	8k	10k
L_5	142.2	146.4	143.5	142.7	143.4	144.1	144.8
L_{50}	135.4	137.8	133.8	134.1	135.4	135.8	135.3
L_{90}	132.6	133.3	130.4	129.4	131.5	131.4	129.0

Table 2.1.4-4 Distribution of the Cumulative Probability of the Ambient Noise between 2.5k-10k Hz in YW-3

Unit: dB re 1μPa

Frequency(Hz) / percentage(%)	2.5k	3.15k	4k	5k	6.3k	8k	10k
L_5	133.6	134.0	131.5	130.9	131.6	131.6	133.8
L_{50}	121.7	123.5	122.5	122.1	123.5	123.5	125.2
L_{90}	113.3	114.3	113.3	113.3	115.1	115.5	116.6

Table 2.1.4-5 Distribution of the Cumulative Probability of the Ambient Noise between 2.5k-10k Hz in YW-4

Unit: dB re 1μPa

Frequency(Hz) / percentage(%)	2.5k	3.15k	4k	5k	6.3k	8k	10k
L_5	129.4	130.9	126.1	127.6	127.1	128.4	128.1
L_{50}	122.0	122.1	117.5	118.0	117.5	118.1	118.4
L_{90}	114.2	114.8	112.6	113.3	114.1	115.0	115.9

Table 2.1.4-6 Distribution of the Cumulative Probability of the Ambient Noise between 2.5k-10k Hz in YW-5

Unit: dB re 1μPa

Frequency(Hz) / percentage(%)	2.5k	3.15k	4k	5k	6.3k	8k	10k
L_5	134.1	135.8	132.9	132.2	135.2	135.6	139.5
L_{50}	127.0	127.8	125.2	122.8	126.3	127.4	130.5
L_{90}	122.7	121.5	119.6	117.6	121.9	122.5	125.3

II. Analysis on Cetacean Sound

Dolphin sounds include whistles, which are used for communication and social behavior between groups or individuals, and clicks, which are used for environment detecting and prey locating. These sounds underwent spectrum analysis and signal filtering to identify the sounds of the marine animals (cetacean or fish). Analysis results are as follow.

i Detection of Whistles

In this quarter, measurement was carried out for 24 hours in YW-1 to YW-5. The spectrum and signal filtering (2.5k-10k) analysis per second at each sampling station (Table 2.1.4-7) show that whistles were detected in YW-1 to YW-5. YW-1:

274 whistles were detected, Overall whistle detecting duration is 2 hours, contact rate is 137 times/hr. YW-2: 720 whistles were detected, Overall whistle detecting duration is 3 hours, contact rate is 240 times/hr. YW-3: 1,455 whistles were detected, Overall whistle detecting duration is 15 hours, contact rate is 97 times/hr. YW-4: 1,077 whistles were detected, Overall whistle detecting duration is 4 hours, contact rate is 269.25 times/hr. YW-5: 354 whistles were detected, Overall whistle detecting duration is 9 hours, contact rate is 39.33 times/hr. The whistle distribution regarding daytime/nighttime are shown as Figure 2.1.4-6 to Figure 2.1.4-7. Overall, YW-1, YW-2, and YW-4 sporadically distributed from 4AM to 5AM, 10AM, and 2 PM to 5:00 PM. YW-3 sporadically distributed from 4 AM to 5 AM and 8 AM to 9 PM. YW-5 distributed from 1 AM to 7 AM, 7 PM to 8 PM, and 10 PM to 11 PM.

As for tidal change (High tide is presented as 0, 1 hour before high tide as -1, 1 hour after high tide as +1, and so on), Whistles were detected at 5 hours after high tide (5) and 6 hours after high tide (6) at YW-1~YW-5. Overall, no obvious difference in whistle distribution was found regarding tidal changes.

Table 2.1.4-7 Results of Whistles in each Sampling Stations

Stations	Valid days	Whistles detected	Hours recorded	Hours recorded /24 hours Ratio [1]	Contact Rate (time/hour)[2]
YW-1	1	274	2	0.083	137.00
YW-2		719	3	0.125	240.00
YW-3		1,455	15	0.625	97.00
YW-4		1,077	4	0.167	269.25
YW-5		354	9	0.375	39.33

Note 1: “Hours recorded” refers to the hours with whistles detected.
Note 2: “Hours recorded /24 hours Ratio” refers to hours with whistles detected/24 hours.
Note 3: “Contact rate” refers to whistles detected/ hours with whistles detected.

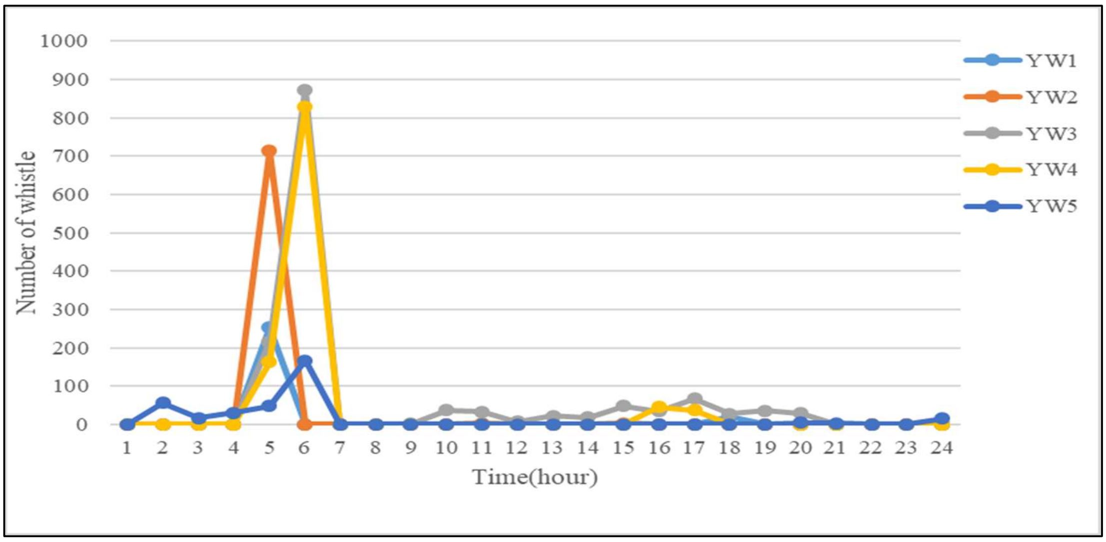
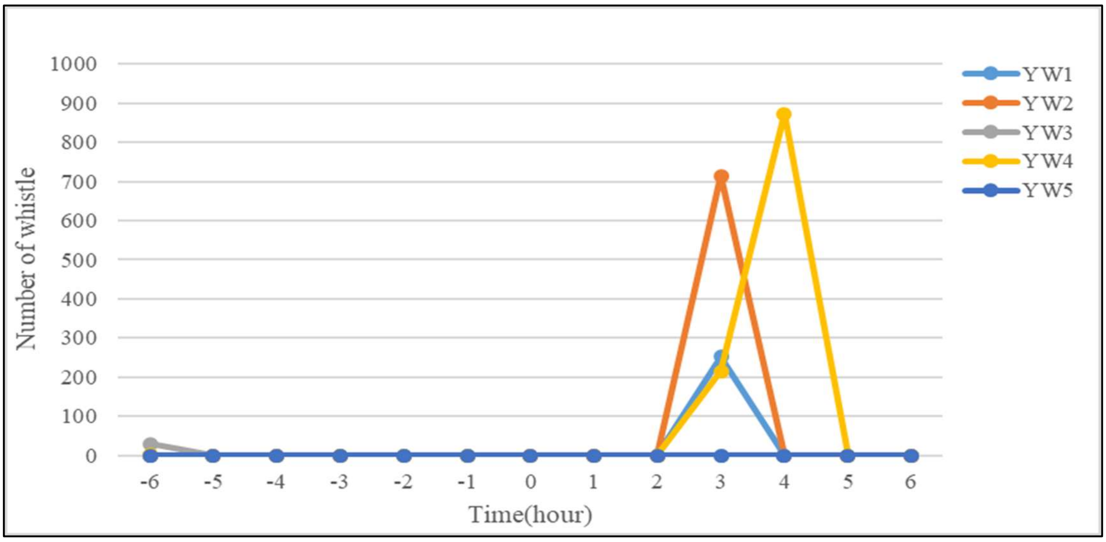


Figure 2.1.4-6 Time Distribution of Whistles Detected at Each Locations



Remarks: High tide is presented as 0, 1 hour before high tide as -1, 1 hour after high tide as +1, and so on.

Figure 2.1.4-7 Tide Time Distribution of Whistles Detected at Each Locations

ii Detection of Clicks

In this quarter, measurement was carried out for 24 hours in YW-1 to YW-5. The spectrum and signal filtering (10k-20k) analysis per second at each sampling station (Table 2.1.4-8) show no clicks were detected at YW-1-TW-2 and YW-4-TW-5 and clicks were detected at YW-3 at 18:00, with 386 times and detecting duration of 1 hour, resulting in the contact rate of 386 times/hr. Day-night and tidal distributions are shown in Figure 2.1.4-8 and Figure 2.1.4-9, indicating no significant day-night patterns overall.

As for tidal change (High tide is presented as 0, 1 hour before high tide as -1, 1 hour after high tide as +1, and so on), YW-3 did not detect any clicks 6 hours before high tide (-6) and 6 hours after high tide (6). The overall trend this quarter shows no tidal distribution pattern.

Table 2.1.4-8 Click Detection in Each Station

Stations	Valid days	Clicks detected	Hours recorded	Hours recorded /24 hours Ratio [1]	Contact Rate (time/hour)[2]
YW-1	1	0	0	0	0
YW-2		0	0	0	0
YW-3		386	1	0.042	386
YW-4		0	0	0	0
YW-5		0	0	0	0

Note 1: "Hours recorded" refers to the hours with clicks detected.
Note 2: "Hour/ clicks Ratio" refers to hours with clicks detected/24 hours.
Note 3: "Contact rate" refers to detection time/(Hour/clicks Ratio x 24 hours)

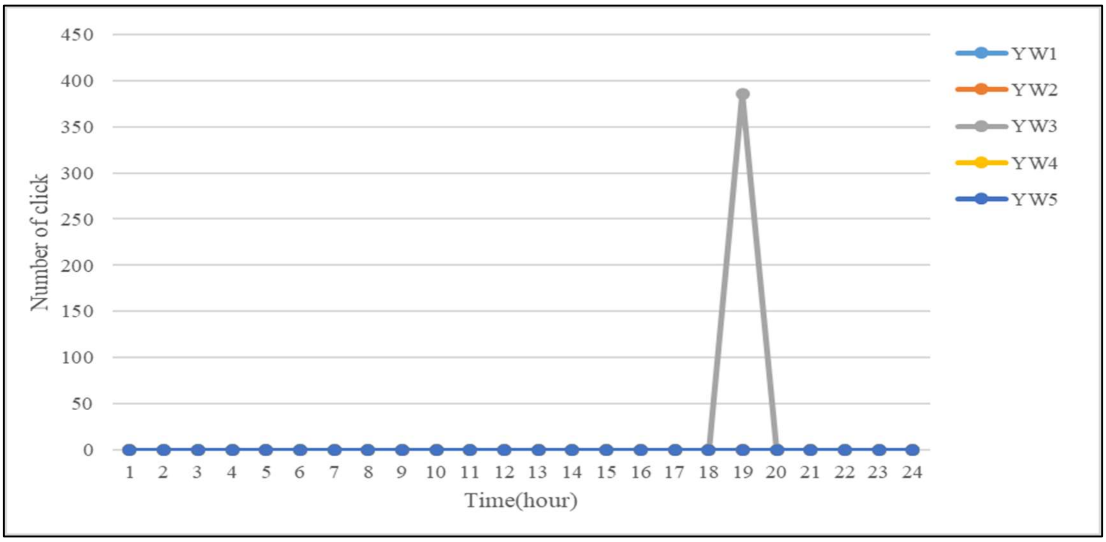
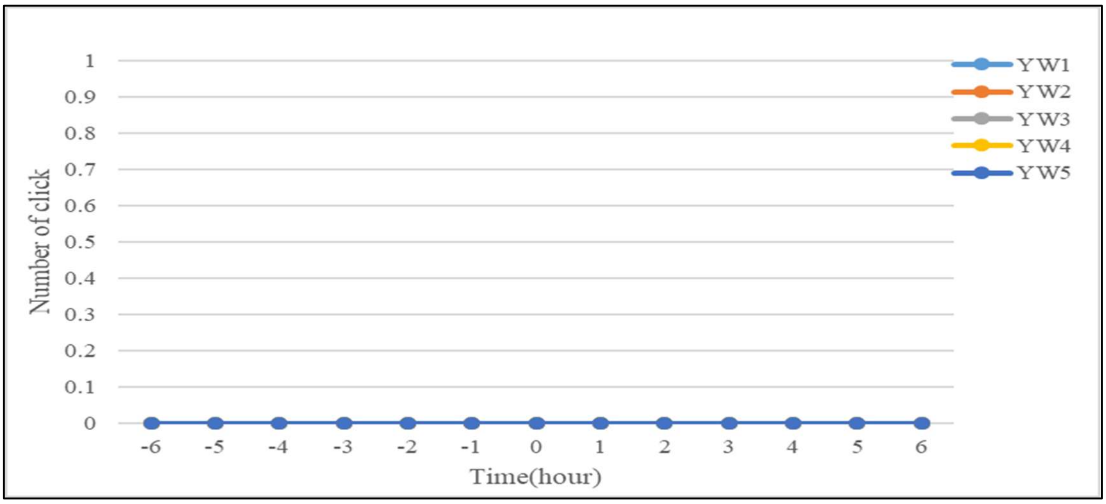


Figure 2.1.4-8 Time Distribution of Clicks Detected at Each Locations



Remarks: High tide is presented as 0, 1 hour before high tide as -1, 1 hour after high tide as +1, and so on.

Figure 2.1.4-9 Tide Time Distribution of Clicks Detected at Each Locations

iii Bioacoustics Detection

This season, through program identification, the sound of cetaceans was detected at a total of 5 monitoring points: YW-1, YW-2, YW-3, YW-4, and YW-5. According to the analysis, within the 24-hour measurement data at these 5 monitoring points, cetacean whistles were observed for several hours at each point (see Figure 2.1.4-10 to 2.1.4-14). Additionally, clicks were detected at YW-3 (Figure 2.1.4-15).

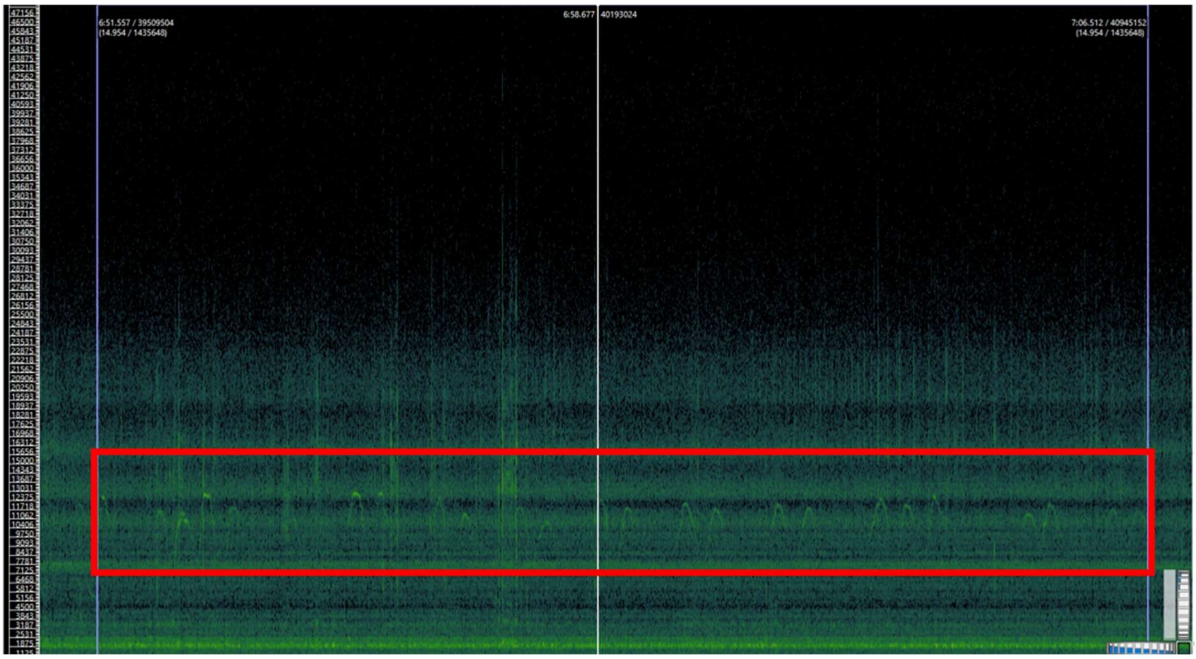


Figure 2.1.4-10 Cetacean Whistles in YW-1

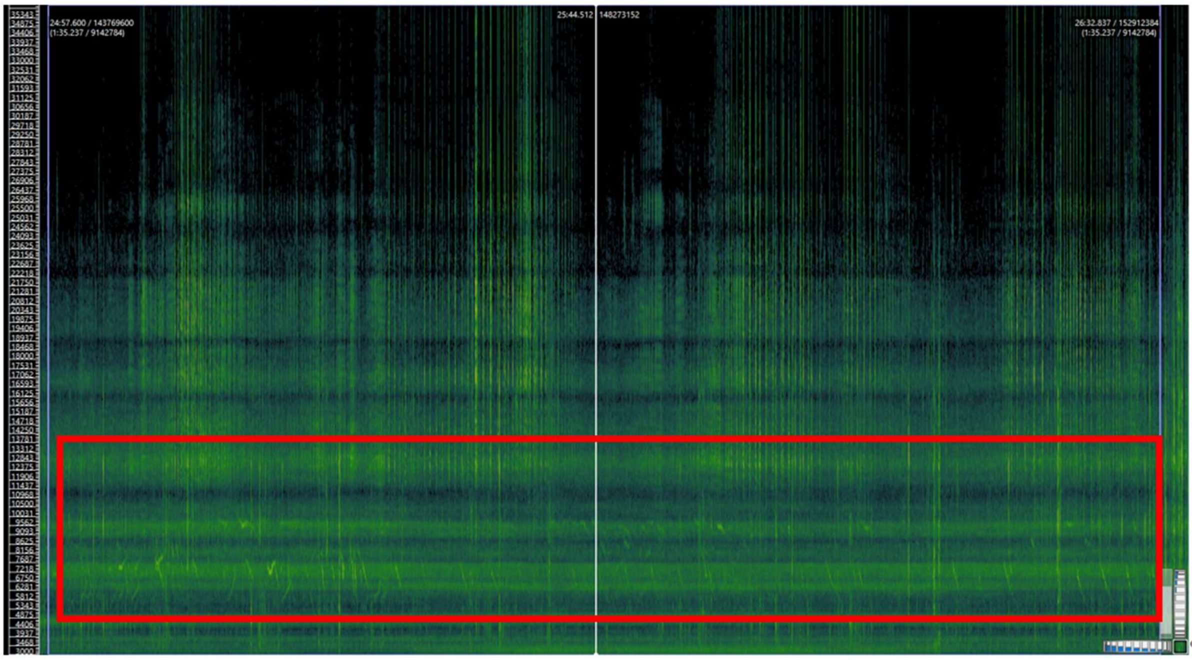


Figure 2.1.4-11 Cetacean Whistles in YW-2

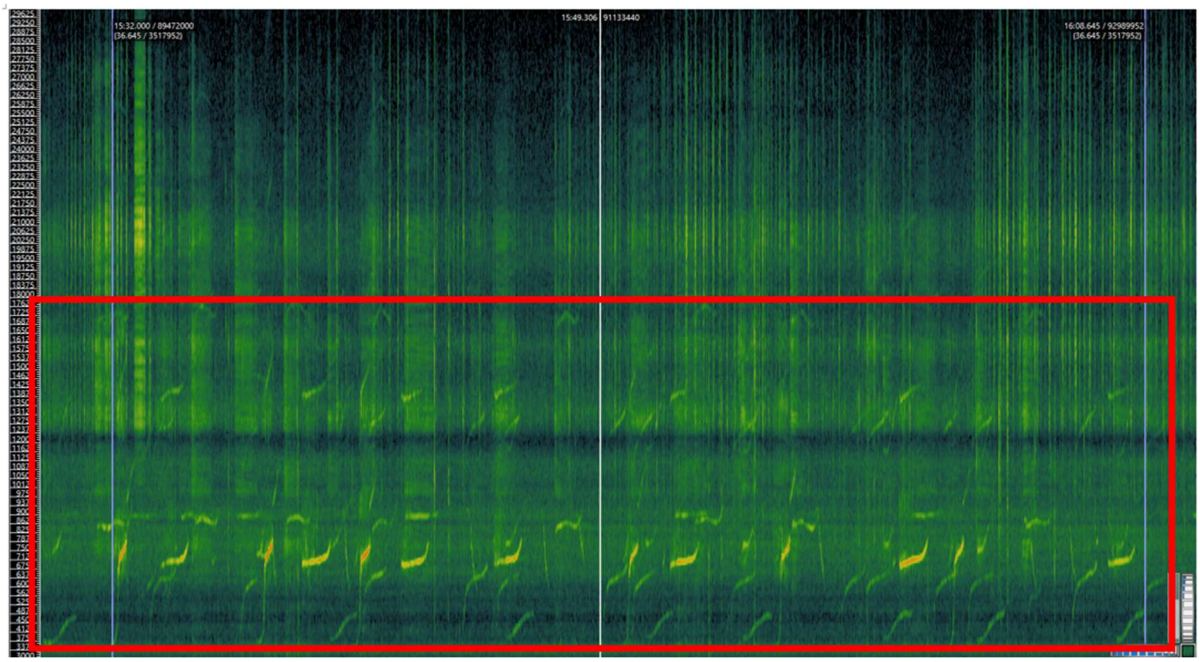


Figure 2.1.4-12 Cetacean Whistles in YW-3

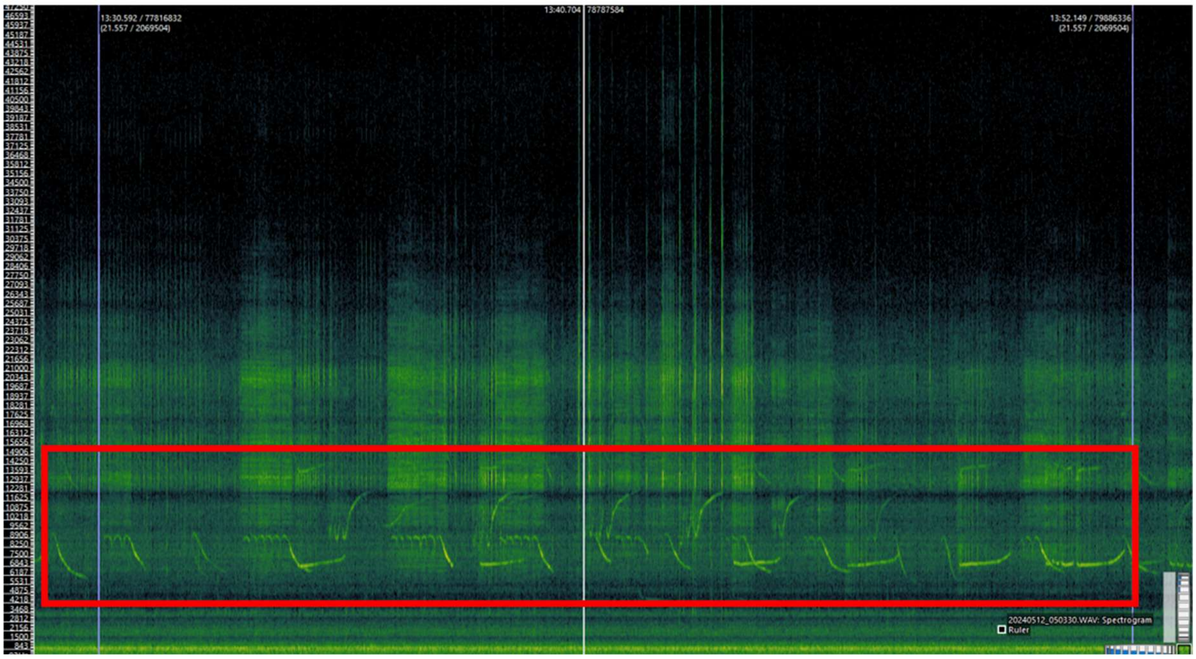


Figure 2.1.4-13 Cetacean Whistles in YW-4

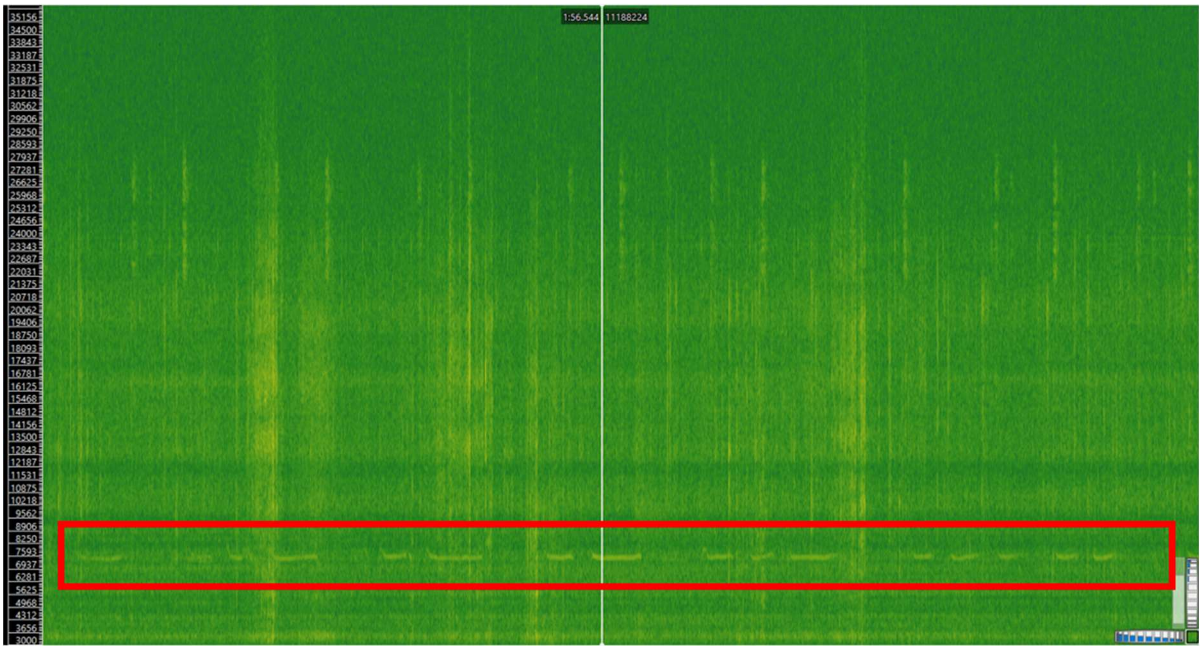


Figure 2.1.4-14 Cetacean Whistles in YW-5

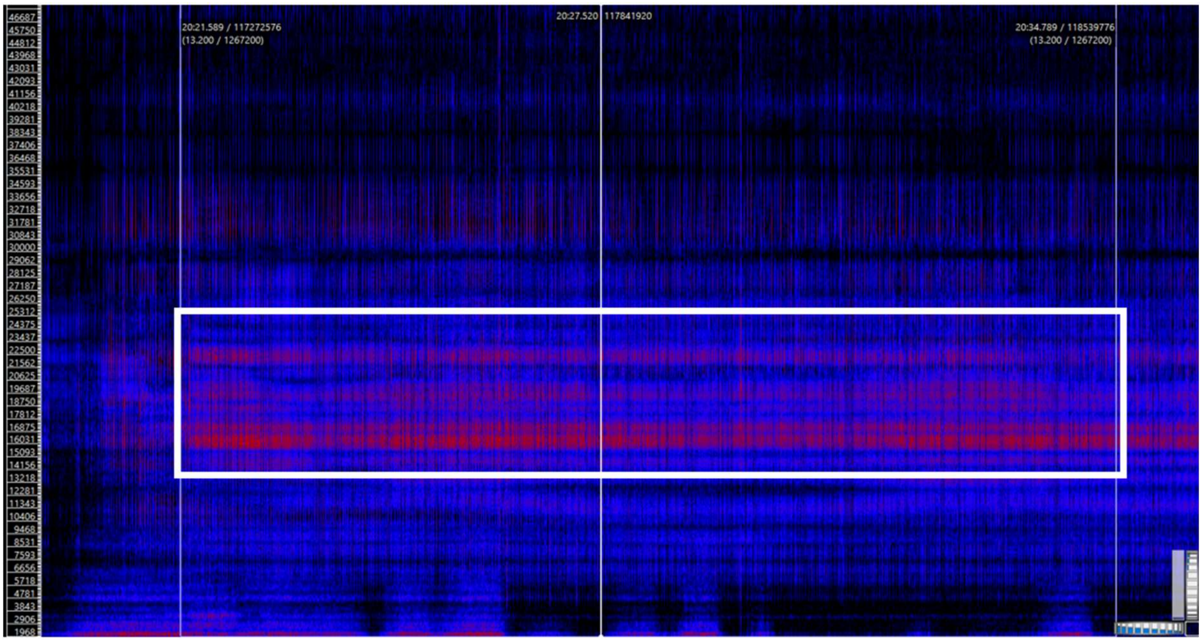


Figure 2.1.4-15 Cetacean Clicks in YW-3

III. Comprehensive Discussion

During the underwater noise measurement, the devices were affected by the sea current, vessel traffics, and fluctuations in flow velocity during tides. The fluid noise characteristics primarily exhibit in the mid to low frequencies.

As for the sounds of marine animals: The survey was carried out for 24 continuous hours at the five stations (YW-1 to YW-5). The spectrum and signal filtering per second at each sampling station were analyzed to ensure the monitoring results. Few hours of cetacean whistles were detected in YW-1 to YW-5. Clicks were only observed from YW-3 at 18:00.

2.1.5 Visual Monitoring of Cetacean Ecology

8 surveys were completed this quarter (February 2024 - May 2024), including 2 in March, 2 in April, and 4 in May. Total survey record are 44.60 hours and 860.0 km, with 28.65 hours and 388.3 km on transect lines. Please refer to Table 2.1.5-1 for details. No cetacean was observed in this quarter, sighting rate is 0. The trajectory of the marine survey route is shown in Appendix 4.2.

Table 2.1.5-1 Table of Cetacean Visual Survey of this Quarter

Trips	Survey Date	Transect[R1] Line	Total Hours (hour)	Total Mileage	On-Effort Hours (hours)	On-Effort Mileage	Sighting Rate (herd

		Departure	Return		(km)		(km)	(individual))
1	March 16	3	5	6.11	109.0	4.23	55.0	0
2	March 22	4	2	5.38	111.0	3.10	42.8	0
3	April 16	6	3	5.64	108.0	4.00	54.8	0
4	April 17	5	2	5.72	111.0	3.42	46.5	0
5	May 24	2	4	5.11	102.0	3.14	41.9	0
6	May 25	4	6	5.12	105.0	3.04	42.2	0
7	May 26	5	4	5.32	99.3	3.48	47.3	0
8	May 27	1	2	6.19	115.0	4.24	57.8	0
Total	8 Trip	-		44.59	860.3	28.65	388.3	0

Remark: Number of transect line (departure and return) indicates the numbered planned cetacean transect line survey route.

2.1.6 Underwater Noise

2 sampling stations for cetacean acoustic survey (YW-3 and YW-5) are selected for underwater noise analysis. The duration of the data analyzed in this quarter is shown as Table 2.1.6-1. Items of analysis include spectrogram of underwater noise time frequency between 20Hz-20kHz; 1-Hz band; 1/3 octave band. The description of results are as follows:

Table 2.1.6-1 Duration of the Underwater Acoustic Data Analyzed in this Quarter

Measuring Points	Duration of data Analyzed
YW-3	May 11-12, 2024
YW-5	May 11-12, 2024

I. Ambient Noise Analysis

Underwater acoustic equipment is able to record change of surrounding sounds, such as natural ambient noise (wave, tide, etc.), sound of creatures (cetaceans, fish, etc.), etc. Intermittent unknown high-level sound sources such as vessel noise or human activities can all be recorded if occurred. The Wav files recorded by the acoustic device undergoes FFT, and the result is presented in 1Hz and 1/3 Octave band. Characteristics and changes of the underwater ambient noise in the Project area were learned via spectrogram and cumulative probability distribution diagram of ambient noise. Real time monitoring results is shown as Appendix 4.7.

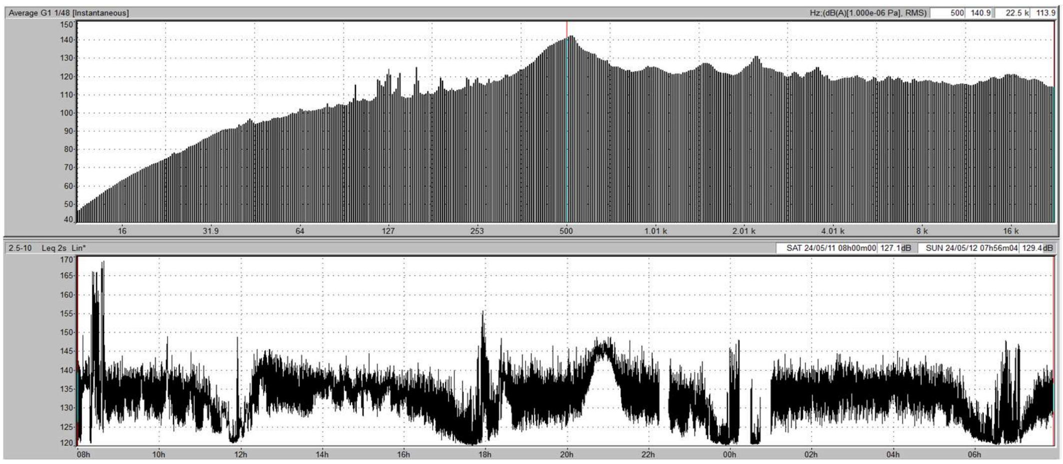
i Time Frequency Analysis

The spectrogram of time frequency analysis for ambient noise at YW-3 and YW-5 (Figure 2.1.6-1) is displayed using figures of noise level energy. In the measurement, the value of underwater noise was affected by tidal changes. The noise was caused by the flowing noise of sea currents and the busy vessel traffic in the periphery. The main characteristic frequencies were 530 Hz and 780 Hz.

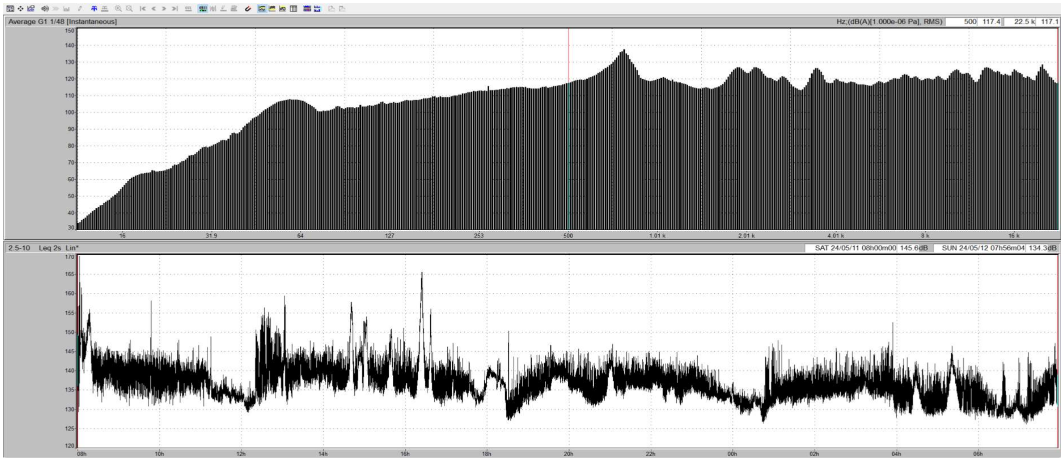
ii 1-Hz Band Analysis

Fluctuation trends of underwater background noise is shown using noise cumulative possibility distribution of underwater noise with 1-Hz bandwidth (Figure 2.1.6-2). The percentages of each curve indicate the cumulative probability that is lower than the noise value. L_5 and L_{90} are the upper limit and lower limit of the ambient noise, and L_{50} is the median. The range of fluctuation for noise between 20Hz and 20kHz is as shown in Table 2.1.6-2 and 2.1.6-3.

The results show that the noise curves for YW-3 and YW-5 exhibited significant peaks at 530 Hz and 780 Hz, attributed to fluid noise generated by tidal currents passing through the deployment system and frequent vessel traffic. Additionally, YW-3 and YW-5 showed notable peaks at 19.8 Hz-97 Hz and 64 Hz, caused by fluid noise and tidal currents flowing through the instrument buoy system during high and low tides.

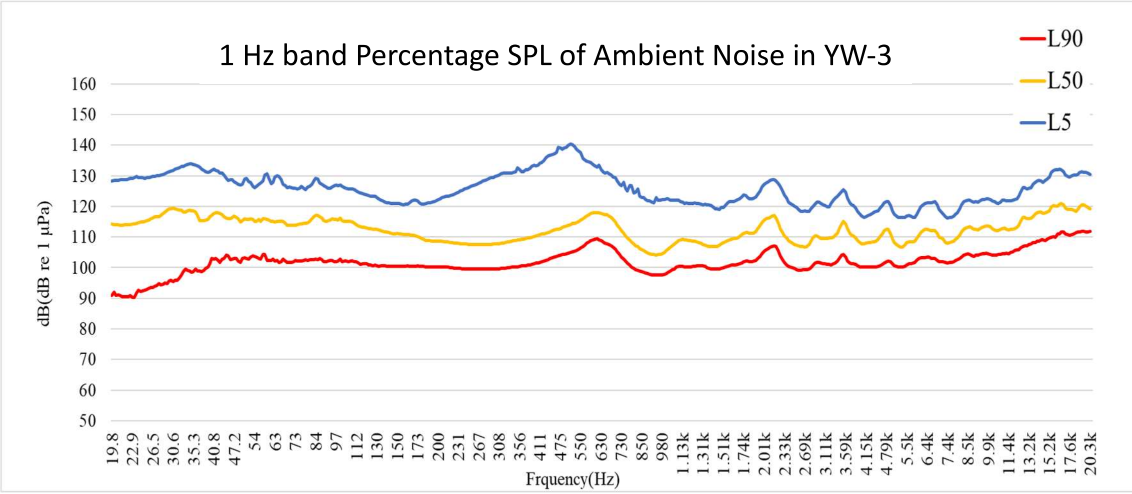


Time Domain and Spectrum of Ambient noise in YW-3

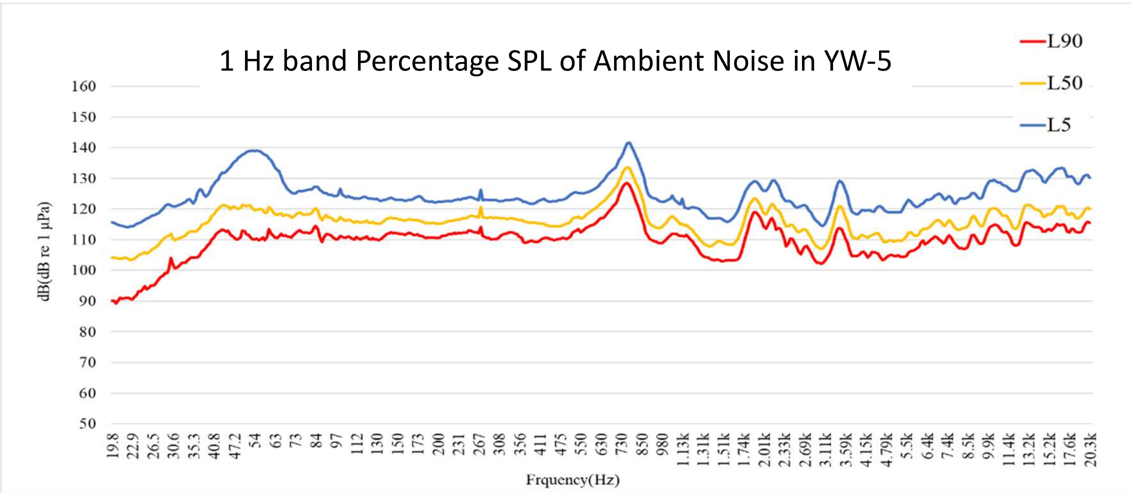


Time Domain and Spectrum of Ambient noise in YW-5

Figure 2.1.6-1 Time Domain and Spectrum of Ambient noise in YW-3 and YW-5



SPL of the Ambient Noise in YW-3



SPL of the Ambient Noise in YW-5

Figure 2.1.6-2 1- Hz band SPL of the Ambient Noise in YW-3 and YW-5

Table 2.1.6-2 SPL of Noise in YW-3 in this Quarter

Unit: 1-Hz SPL(dB re 1μPa)

Frequency (Hz)	20	100	500	1000	5000	10000	15000	20000
L_5	92.9	99.3	101.1	109.2	83.2	81.7	78.5	76.7
L_{50}	80.8	88.3	79.3	79.5	75.1	72.9	70.2	68.1
L_{90}	68.2	73.5	69.3	68.8	69.2	67.2	65.0	63.0

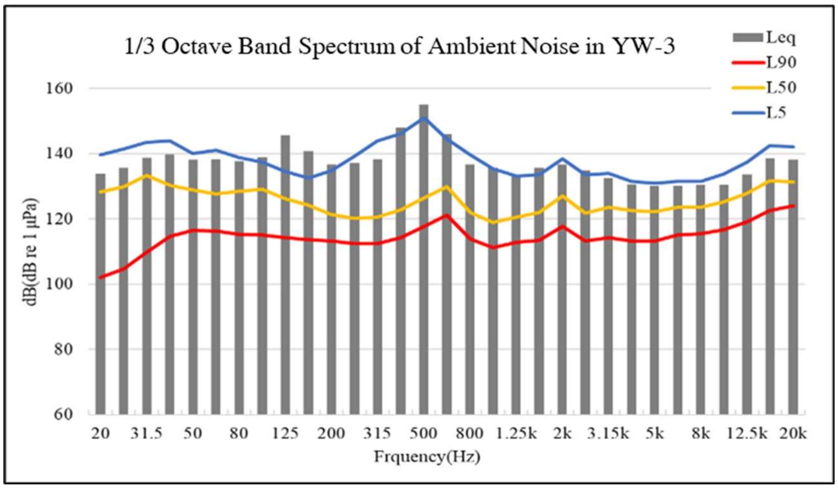
Table 2.1.6-3 SPL of Noise in YW-5 in this Quarter

Unit: 1-Hz SPL(dB re 1μPa)

Frequency (Hz)	20	100	500	1000	5000	10000	15000	20000
L_5	115.5	126.7	124.0	122.7	118.9	129.1	129.6	131.0
L_{50}	104.2	117.4	115.3	115.6	109.5	119.9	118.2	120.5
L_{90}	90.1	111.2	110.5	110.0	104.9	114.2	113.3	115.9

iii 1/3 Octave band Analysis

1/3 octave band analysis uses the hourly records of background noise in each spot to calculate the mean of energy in each of the 31 frequency band ranges of 1/3 octave band between 20Hz and 20kHz. Because each frequency band includes 24 data (hour). Presenting the 5%, 50%, and 95% statistics of each frequency band with percentages helps in the determination of fluctuation in each frequency band (details as shown in Figure 2.1.6-3). Each band level is shown in Table 2.1.6-4 and Table 2.1.6-5.



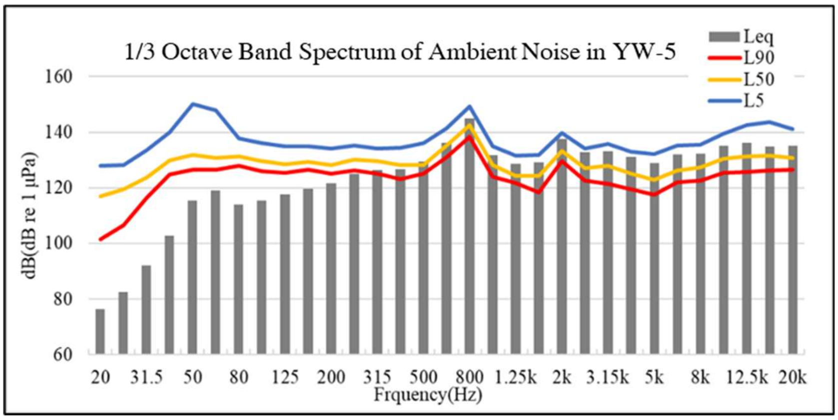


Figure 2.1.6-3 1/3 Octave band Spectrum of YW-3 and YW-5

Table 2.1.6-4 1/3 Octave Band of YW-3 in this Quarter

Unit: dB re 1μPa

Frequency(Hz) / Percentage(%)	20	25	31.5	40	50	63	80	100
L_{eq}	133.9	135.7	138.7	139.8	138.2	138.4	137.8	139.0
L_5	139.7	141.5	143.6	143.9	140.1	141.1	138.8	137.4
L_{50}	128.2	129.8	133.3	130.3	128.9	127.6	128.4	129.1
L_{90}	102.1	104.7	109.7	114.7	116.5	116.2	115.2	115.0
Frequency(Hz) / Percentage(%)	125	160	200	250	315	400	500	630
L_{eq}	145.7	140.7	136.6	137.1	138.4	148.0	155.0	146.0
L_5	134.6	132.5	134.8	139.3	144.0	146.2	151.0	144.5
L_{50}	126.3	124.3	121.4	120.2	120.6	122.8	126.4	129.9
L_{90}	114.2	113.6	113.3	112.4	112.5	114.2	117.7	121.2
Frequency(Hz) / Percentage(%)	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k
L_{eq}	136.7	135.7	133.7	135.7	136.6	134.8	132.4	130.7
L_5	139.6	135.3	133.1	133.5	138.5	133.6	134.0	131.5
L_{50}	122.0	118.9	120.6	121.9	127.1	121.7	123.5	122.5
L_{90}	113.9	111.2	112.8	113.4	117.7	113.3	114.3	113.3
Frequency(Hz) / Percentage(%)	5k	6.3k	8k	10k	12.5k	16k	20k	
L_{eq}	130.1	130.2	130.3	130.4	133.6	138.6	138.1	
L_5	130.9	131.6	131.6	133.8	137.5	142.5	142.1	
L_{50}	122.1	123.5	123.5	125.2	127.9	131.8	131.3	
L_{90}	113.3	115.1	115.5	116.6	119.2	122.5	123.9	

Table 2.1.6-5 1/3 Octave Band of YW-5 in this Quarter

Unit: dB re 1μPa

Percentage(%) \ Frequency(Hz)	20	25	31.5	40	50	63	80	100
L_{eq}	76.3	82.6	92.1	102.8	115.4	119.0	114.0	115.4
L_5	127.9	128.1	133.5	140.0	150.0	147.9	137.7	136.0
L_{50}	117.0	119.6	123.8	129.9	132.0	130.6	131.3	129.7
L_{90}	101.5	106.7	116.4	124.8	126.4	126.6	127.8	126.0
Percentage(%) \ Frequency(Hz)	125	160	200	250	315	400	500	630
L_{eq}	117.6	119.7	121.7	125.0	126.5	126.7	129.6	136.2
L_5	134.9	134.9	134.1	135.2	134.2	134.5	136.1	141.3
L_{50}	128.5	129.2	128.2	130.2	129.6	128.1	128.2	135.2
L_{90}	125.4	126.5	125.2	126.2	125.2	123.2	125.2	131.0
Percentage(%) \ Frequency(Hz)	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k
L_{eq}	144.8	131.8	128.7	129.2	137.5	132.8	133.2	131.2
L_5	149.4	135.0	131.7	131.9	139.6	134.1	135.8	132.9
L_{50}	142.4	128.2	124.3	124.3	133.4	127.0	127.8	125.2
L_{90}	138.2	123.9	121.7	118.5	129.5	122.7	121.5	119.6
Percentage(%) \ Frequency(Hz)	5k	6.3k	8k	10k	12.5k	16k	20k	
L_{eq}	128.9	132.1	132.2	135.0	136.1	134.9	135.0	
L_5	132.2	135.2	135.6	139.5	142.5	143.7	141.2	
L_{50}	122.8	126.3	127.4	130.5	131.2	131.5	130.6	
L_{90}	117.6	121.9	122.5	125.3	125.7	126.3	126.4	

II. Comprehensive Analysis

In this quarter, the flowing noise was mostly observed in low frequency, as shown in the spectrum 2.1.6-1. This is contributed by the sea currents flowing through the monitoring device during tidal changes and the busy vessel traffic in the monitoring period.

The result of 1-Hz band analysis is presented as 1/3 octave band, through which the noise frequency band in each sampling station can be identified. If compare value in YW-3 and YW-5 in Figure 2.1.6-3, YW-3 and YW-5 show significant peaks at 500 Hz and 800 Hz, respectively. This is mainly due to the fluid noise generated by the tidal currents passing through the deployment system and the frequent traffic of vessels during the ebb and flow of the tides. Furthermore, the noise measurement results from these two points show that the overall noise level measurement results are similar, and the trends are generally consistent.

2.1.7 Underwater Piling Noise

During the pile driving of each wind turbine, underwater noise measurements were conducted at a location 750m east of the piling site. This quarter, a total of 19 wind turbines underwent pile driving for the underwater foundation. The underwater noise measurements were carried out by SGS Taiwan Ltd., and the results are detailed in Table 2.1.7-1.

Table 2.1.7-1 Underwater Noise Measurements During Piling

Wind Turbine No.	SPL_{peak}(dB re 1μPa)	SPL_{peak} Standard Value (dB re 1μPa)
YUN41	181.3	190
YUN48	183.4	
YUN36	187.0	
YUN05	178.0	
YUN22	186.7	
YUN07	177.2	
YUN10	180.0	
YUN18	178.5	
YUN75	177.6	
YUN26	183.7	
YUN40	179.4	
YUN31	176.0	
YUN02	177.3	
YUN47	179.5	
YUN04	179.9	
YUN17	178.4	
YUN03	181.2	
YUN56A	181.5	
YUN16	183.3	

2.1.8 Electromagnetic Field

No electromagnetic field monitoring was conducted this quarter.

Chapter 3 Review and Recommendations

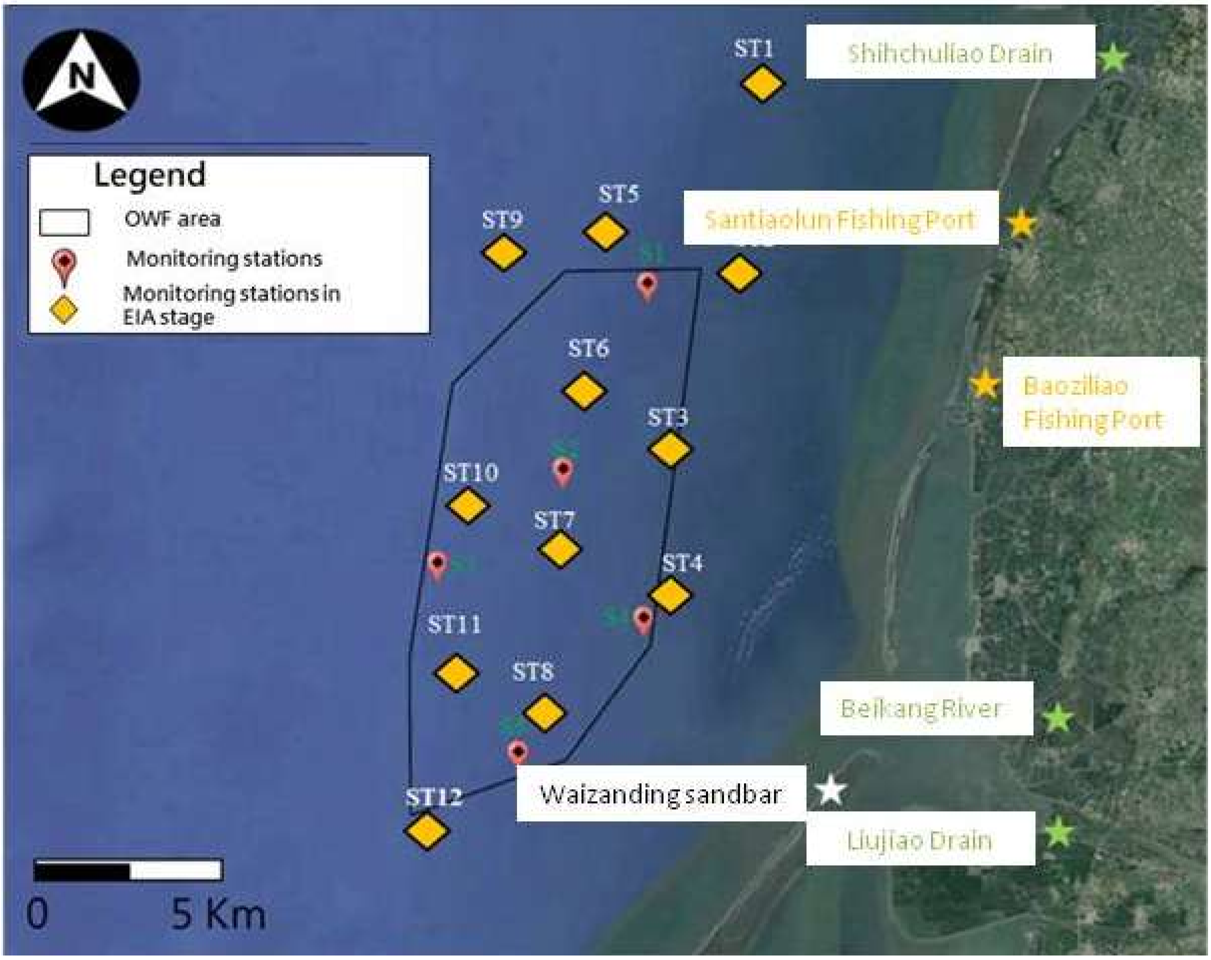
3.1 Review of Monitoring Results and Response Plan

3.1.1 Comprehensive Review and Analysis of Monitoring Results

I. Marine Water Quality

12 sampling stations were applied for marine water quality survey during the EIA period (July 2016), but as the wind farm area has been reduced, during the EIA review period, the original allocation of sampling stations are no longer apropos of the principles in conducting uniform sampling of marine water quality in the wind farm area finally approved. As such the 5 marine water quality measuring points have been adjusted in accordance with the environmental monitoring plan. Past marine water quality monitoring results were only able to be compared to EIA period measurements in nearby sampling stations for reference, as shown in Figure 3.1.1-1. Marine water quality survey results during the EIA period all comply with Marine Environmental Quality Standard for A type Marine Area.

This quarter, the marine water quality monitoring results showed that except for the mid-layer Ammonia-N at S4, which exceeded the Class A Marine Environmental Quality Standard (<0.3 mg/L), all other stations comply with the standards. For historical surveys, except for the value of Coliform group in the surface layer of S2 in 2022 Q1 and the middle layer of S5 in 2020 Q1, all other values comply with the standards. In the first quarter of 2024, the mid-layer Ammonia-N at S4 (sampled on April 19, 2024) exceeded the Class A Marine Environmental Quality Standard, all other measured items complied with the standards. As the piling has not started in 2020 Q1 and there was no exceedance during following piling operations, it is inferred that the exceedance is the background value. It is inferred that the exceedance may be due to the near-shore industrial activities, such as the sewage coming from the animal husbandry. In addition, the siltation from Bozailiao Fishing Port to Waizanding sandbar results in a poor exchange effect of seawater in the area. The pollution may be washed into the sea during heavy rains, which may affect the water quality of the neighboring waters. It can also be inferred that the marine water quality in the wind farm area exceeded the Ammonia-N standard in the first quarter of 2024 due to the aforementioned conditions. Previous marine water quality monitoring results are as shown in Table 3.1.1-1.



Note: The exceedance of E. coli was observed on April 30 20202 and May 25 2022.

Figure 3.1.1-1 Monitoring Locations for Marine Water Quality in the EIS stage and Current Stage

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (1/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S1	EIA 2016 July (ST2)	Surface	29.5	8.3	0.8	33.6	6.4	ND	—	—	ND	5.1	—	<10
		Middle	29.3	8.3	0.8	33.5	6.4	ND	—	—	ND	8.3	—	<10
		Bottom	29.3	8.3	0.8	33.5	6.3	0.02	—	—	ND	16.5	—	<10
	2020 Q1 (2020.03-05)	Surface	25.4	8.2	<1.0	33.5	5.4	ND	ND	ND	0.028	4.2	<0.1	<10
		Middle	25.1	8.2	<1.0	33.5	5.3	ND	ND	ND	0.015	6.4	0.7	<10
		Bottom	24.9	8.2	<1.0	33.6	5.2	ND	ND	<0.01	<0.015	4.2	<0.1	35
	2020 Q2 (2020.06-08)	Surface	28.8	8.2	<1.0	32.8	5.2	<0.05	<0.05	<0.01	0.049	6.6	1.2	<10
		Middle	28.7	8.2	<1.0	32.8	5.1	<0.05	<0.05	<0.01	0.049	6.4	0.6	<10
		Bottom	28.6	8.2	<1.0	32.7	5.1	<0.05	<0.05	<0.01	0.046	6.5	1.0	<10
	2020 Q3 (2020.09-11)	Surface	30.1	8.1	<1.0	33.1	6.1	<0.05	<0.05	0.01	0.043	6.4	1.5	25
		Middle	29.8	8.1	<1.0	33.1	6.0	ND	<0.05	0.01	0.046	6.7	1.5	<10
		Bottom	29.5	8.1	<1.0	33.2	5.8	<0.05	<0.05	0.01	0.052	6.3	1.8	<10
	2020 Q4 (2020.12-2021.02)	Surface	21.1	8.3	<1.0	34.0	7.4	ND	<0.05	0.01	0.028	16.2	1.5	15
		Middle	21.0	8.3	<1.0	34.0	7.2	ND	<0.05	<0.01	0.031	16.4	1.2	10
		Bottom	20.8	8.2	<1.0	34.0	7.1	ND	<0.05	<0.01	0.028	15.4	1.8	25
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (2/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S1	2021 Q1 (2020.03-2021.05)	Surface	26.2	8.2	<1.0	33.4	6.7	ND	ND	<0.01	<0.015	7.6	0.6	100
		Middle	25.8	8.2	<1.0	33.5	6.6	ND	<0.05	<0.01	<0.015	11.5	0.3	<10
		Bottom	25.4	8.3	<1.0	33.6	6.6	ND	<0.05	<0.01	<0.015	11.4	0.3	<10
	2021 Q2 (2020.06-2021.08)	Surface	30.2	8.2	<1.0	33.4	7.1	ND	<0.05	<0.01	0.025	7.8	1.5	150
		Middle	30.1	8.2	<1.0	33.3	6.9	ND	<0.05	<0.01	0.018	6.2	0.9	150
		Bottom	29.9	8.2	<1.0	33.3	6.5	ND	<0.05	<0.01	0.021	7.7	0.9	300
	2021 Q3 (2020.09-2021.11)	Surface	30.2	8.2	<1.0	33.5	6.2	ND	<0.05	<0.01	<0.015	3.7	2.7	<10
		Middle	30.1	8.2	<1.0	33.5	6.2	ND	<0.05	<0.01	<0.015	3.8	2.7	<10
		Bottom	29.9	8.2	<1.0	33.6	6.2	ND	<0.05	<0.01	0.018	4.0	2.7	<10
	2021 Q4 (2021.12-2022.02)	Surface	21.4	8.2	<1.0	33.6	6.8	ND	0.05	<0.01	0.029	9.0	<0.1	300
		Middle	21.3	8.2	<1.0	33.6	6.7	ND	0.05	<0.01	0.034	10.0	<0.1	<10
		Bottom	21.2	8.2	<1.0	33.6	6.5	ND	0.05	<0.01	0.031	9.6	0.6	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (3/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S1	2022 Q1 (2022.03-2022.05)	Surface	25.9	8.2	<1.0	32.9	6.7	ND	<0.04	ND	<0.015	3.4	1.8	130
		Middle	25.7	8.2	<1.0	32.9	6.5	ND	<0.04	ND	<0.015	4.4	3.0	50
		Bottom	25.5	8.2	<1.0	33.0	6.4	ND	<0.04	ND	<0.015	2.7	3.0	85
	2022 Q2 (2022.06-08)	Surface	29.1	8.2	<1.0	32.6	6.2	<0.10	<0.04	ND	<0.015	4.5	0.9	<10
		Middle	28.9	8.2	<1.0	32.6	6.1	ND	<0.04	ND	<0.015	4.6	0.9	<10
		Bottom	28.8	8.2	<1.0	32.6	6.1	<0.10	<0.04	ND	<0.015	4.4	0.6	<10
	2022 Q3 (2022.09-11)	Surface	28.9	8.2	<1.0	32.1	6.4	<0.10	0.06	0.03	ND	27.0	0.5	70
		Middle	28.7	8.2	<1.0	32.2	6.3	<0.10	0.06	0.02	ND	3.4	0.5	110
		Bottom	28.4	8.2	<1.0	32.3	6.2	<0.10	0.06	0.02	<0.005	7.6	0.5	25
	2022 Q4 (2022.11-2023.02)	Surface	24.8	8.3	<1.0	34.0	6.8	<0.10	<0.04	<0.01	<0.015	4.6	0.9	210
		Middle	24.8	8.3	<1.0	34.0	6.8	<0.10	<0.04	<0.01	<0.015	4.6	<0.1	<10
		Bottom	24.7	8.3	<1.0	34.0	6.8	<0.10	<0.04	<0.01	<0.015	3.0	0.3	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A)

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (4/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S1	2023 Q1 (2023.03-05)	Surface	25.9	8.3	<1.0	32.1	6.6	0.07	<0.05	ND	<0.005	13.9	1.11	35
		Middle	25.6	8.3	<1.0	32.1	6.4	0.08	<0.05	ND	<0.005	11.8	1.46	40
		Bottom	25.3	8.3	<1.0	32.2	6.2	0.07	<0.05	ND	ND	4.8	0.87	35
	2023 Q2 (2023.06-08)	Surface	30.5	8.2	<1.0	32.5	6.4	0.08	<0.05	ND	0.007	7	2.44	10
		Middle	30.2	8.2	<1.0	32.6	6.2	0.06	<0.05	ND	0.007	13.3	2.63	50
		Bottom	29.8	8.2	<1.0	32.8	6.1	0.06	<0.05	ND	0.006	11	0.98	30
	2023 Q3 (2023.09-11)	Surface	26.9	8.2	<1.0	33.5	6.1	0.15	<0.05	0.01	<0.005	11.3	0.18	<10
		Middle	26.9	8.2	<1.0	33.5	6.0	0.15	0.05	ND	<0.005	10.3	0.25	<10
		Bottom	26.7	8.2	<1.0	33.5	5.8	0.19	<0.05	0.01	<0.005	10.0	0.19	<10
	2023 Q4 (2023.12-2024.02)	Surface	25.5	8.2	<1.0	33.3	5.8	0.05	<0.05	<0.01	<0.005	5.6	0.33	<10
		Middle	25.5	8.2	<1.0	33.3	5.8	0.09	<0.05	ND	<0.005	5.4	0.34	<10
		Bottom	25.4	8.2	<1.0	33.3	5.6	0.05	0.05	<0.01	<0.005	6.2	0.23	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A)

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (5/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/ 100mL
S1	2024 Q1 (2024.03-05)	Surface	27.8	8.2	<1.0	33.3	6.6	0.17	<0.05	ND	0.011	22.1	0.87	<10
		Middle	27.4	8.2	<1.0	33.4	6.5	0.15	<0.05	ND	0.011	16.8	0.88	<10
		Bottom	27.1	8.1	<1.0	33.4	6.3	0.21	<0.05	ND	0.014	26.3	0.09	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5~8.5	<2.0	—	>5.0	<0.3	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.

Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Remark 3: Due to the slightly different spatial distribution of survey points between EIS and environmental monitoring stages, the results of the EIS point ST8 were compared with those of the closer environmental monitoring point S5.

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (6/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S2	EIA 2016 July (ST6)	Surface	29.9	8.2	0.6	33.5	6.6	ND	—	—	ND	2.9	—	<10
		Middle	29.7	8.2	0.6	33.6	6.5	ND	—	—	ND	2.7	—	<10
		Bottom	29.5	8.2	0.5	33.6	6.5	ND	—	—	ND	3.5	—	<10
	2020 Q1 (2020.03-05)	Surface	25.6	8.2	<1.0	33.5	5.5	ND	ND	<0.01	<0.015	11.4	0.6	25
		Middle	25.3	8.2	<1.0	33.7	5.3	ND	ND	ND	0.034	3.4	0.6	<10
		Bottom	25.0	8.2	<1.0	33.7	5.2	ND	ND	<0.01	0.015	7.3	<0.1	<10
	2020 Q2 (2020.06-08)	Surface	28.7	8.2	<1.0	32.8	5.2	<0.05	<0.05	<0.01	0.049	6.4	0.6	<10
		Middle	28.7	8.2	<1.0	32.9	5.1	<0.05	<0.05	<0.01	0.049	6.4	0.6	<10
		Bottom	28.6	8.2	<1.0	32.9	5.0	<0.05	<0.05	<0.01	0.052	7.6	0.5	<10
	2020 Q3 (2020.09-11)	Surface	29.9	8.1	<1.0	33.4	6.0	ND	<0.05	0.01	0.034	10.0	1.8	<10
		Middle	29.6	8.1	<1.0	33.3	5.8	ND	<0.05	0.01	0.037	12.1	1.5	15
		Bottom	29.4	8.2	<1.0	33.4	5.7	ND	<0.05	0.01	0.049	5.2	1.5	<10
	2020 Q4 (2020.12-2021.02)	Surface	22.1	8.3	<1.0	34.0	7.5	ND	<0.05	ND	0.015	7.6	1.2	40
		Middle	22.0	8.3	<1.0	34.0	7.2	ND	<0.05	ND	0.018	7.4	1.5	25
		Bottom	21.8	8.2	<1.0	34.0	7.2	ND	<0.05	ND	0.018	10.0	1.5	15
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (7/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S2	2021 Q1 (2020.03-2021.05)	Surface	24.7	8.3	<1.0	33.6	6.5	ND	<0.05	<0.01	0.018	7.6	0.3	<10
		Middle	24.6	8.3	<1.0	33.6	6.5	ND	<0.05	<0.01	0.021	7.1	<0.1	<10
		Bottom	24.2	8.3	<1.0	33.6	6.4	ND	<0.05	<0.01	0.018	7.0	0.9	<10
	2021 Q2 (2020.06-2021.08)	Surface	30.1	8.2	<1.0	33.5	7.0	ND	ND	<0.01	<0.015	2.6	0.3	<10
		Middle	30.0	8.2	<1.0	33.4	6.8	ND	ND	<0.01	<0.015	2.6	0.6	<10
		Bottom	29.9	8.2	<1.0	33.4	6.5	ND	<0.05	<0.01	<0.015	2.6	0.6	<10
	2021 Q3 (2020.09-2021.11)	Surface	30.1	8.2	<1.0	33.3	6.3	<0.05	<0.05	<0.01	0.028	4.9	3.0	<10
		Middle	30.0	8.2	<1.0	33.3	6.2	ND	<0.05	<0.01	0.031	4.6	3.8	<10
		Bottom	29.9	8.2	<1.0	33.3	6.2	ND	<0.05	<0.01	0.028	5.0	4.2	<10
	2021 Q4 (2021.12-2022.02)	Surface	21.4	8.2	<1.0	33.7	6.7	ND	<0.05	<0.01	0.033	13.4	1.2	<10
		Middle	21.3	8.2	<1.0	33.7	6.6	ND	<0.05	<0.01	0.030	12.2	0.6	<10
		Bottom	21.2	8.2	<1.0	33.7	6.5	ND	<0.05	<0.01	0.026	12.6	0.3	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (8/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S2	2022 Q1 (2022.03-2022.05)	Surface	26.1	8.2	<1.0	33.2	6.6	<0.10	ND	ND	ND	2.6	1.5	1300
		Middle	25.9	8.2	<1.0	33.2	6.4	<0.10	ND	ND	ND	2.6	1.5	30
		Bottom	25.7	8.2	<1.0	33.3	6.3	<0.10	ND	ND	<0.015	2.6	1.5	30
	2022 Q2 (2022.06-08)	Surface	29.0	8.2	<1.0	32.5	6.1	ND	ND	ND	0.000	4.2	0.6	<10
		Middle	28.8	8.2	<1.0	32.5	6.1	ND	<0.04	ND	0.000	4.4	0.6	<10
		Bottom	28.6	8.2	<1.0	32.5	6.0	ND	ND	ND	<0.015	3.7	0.6	<10
	2022 Q3 (2022.09-11)	Surface	29.0	8.2	<1.0	32.2	6.4	<0.10	0.07	0.08	<0.015	16.8	2.2	30
		Middle	28.7	8.2	<1.0	32.3	6.3	<0.10	0.06	0.08	<0.015	6.6	1.9	10
		Bottom	28.5	8.2	<1.0	32.3	6.1	<0.10	0.05	0.07	<0.015	20.4	1.9	<10
	2022 Q4 (2022.11-2023.02)	Surface	24.8	8.3	<1.0	34.1	6.7	ND	<0.04	<0.01	<0.015	6.6	0.9	65
		Middle	24.8	8.3	<1.0	34.1	6.7	<0.10	<0.04	<0.01	<0.015	11.1	0.9	<10
		Bottom	24.7	8.3	<1.0	34.1	6.8	<0.10	<0.04	<0.01	<0.015	11.3	1.2	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (9/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S2	2023 Q1 (2023.03-2023.05)	Surface	25.8	8.3	<1.0	32.0	6.6	<0.05	<0.05	ND	<0.005	13.6	1.13	45
		Middle	25.3	8.3	<1.0	32.1	6.4	0.05	<0.05	ND	<0.005	11.9	1.02	45
		Bottom	25.0	8.3	<1.0	32.2	6.2	<0.05	<0.05	ND	ND	4.7	0.97	80
	2023 Q2 (2023.06-2023.08)	Surface	29.8	8.2	<1.0	32.6	6.4	0.08	<0.05	ND	<0.005	8.3	0.57	<10
		Middle	29.5	8.2	<1.0	32.7	6.3	0.11	<0.05	ND	0.006	16.8	0.78	180
		Bottom	29.2	8.2	<1.0	32.9	6.2	0.12	<0.05	ND	<0.005	14.6	0.90	35
	2023 Q3 (2023.09-11)	Surface	26.9	8.2	<1.0	33.5	6.2	0.15	<0.05	ND	<0.005	6.6	0.22	<10
		Middle	26.8	8.2	<1.0	33.5	6.0	0.12	0.05	ND	<0.005	9.0	0.18	<10
		Bottom	26.6	8.2	<1.0	33.5	5.8	0.12	<0.05	0.01	<0.005	8.2	0.26	<10
	2023 Q4 (2023.12-2024.02)	Surface	25.7	8.2	<1.0	33.4	5.8	0.05	<0.05	ND	<0.005	6.9	0.28	<10
		Middle	25.7	8.2	<1.0	33.4	5.7	<0.05	<0.05	ND	<0.005	6.7	0.26	<10
		Bottom	25.5	8.2	<1.0	33.4	5.6	0.05	<0.05	<0.01	<0.005	7.2	0.17	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (10/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL
S2	2024 Q1 (2024.03-05)	Surface	27.8	8.2	<1.0	33.2	6.6	0.19	<0.05	ND	0.007	21.3	0.20	<10
		Middle	27.5	8.1	<1.0	33.3	6.5	0.16	<0.05	ND	0.007	16.7	0.24	<10
		Bottom	27.1	8.1	<1.0	33.3	6.4	0.15	<0.05	ND	0.015	22.9	0.16	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5~8.5	<2.0	—	>5.0	<0.3	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.

Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Remark 3: Due to the slightly different spatial distribution of survey points between EIS and environmental monitoring stages, the results of the EIS point ST8 were compared with those of the closer environmental monitoring point S5.

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (11/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S3	EIA 2016 July (ST11)	Surface	30.1	8.3	0.6	33.2	6.8	ND	—	—	0.030	4.3	—	<10
		Middle	29.8	8.2	0.7	33.2	6.7	ND	—	—	0.025	2.8	—	<10
		Bottom	29.7	8.3	0.6	33.4	6.8	ND	—	—	ND	4.0	—	<10
	2020 Q1 (2020.03-05)	Surface	26.1	8.2	<1.0	33.5	5.5	ND	ND	ND	<0.015	3.1	<0.1	160
		Middle	25.7	8.2	<1.0	33.5	5.4	ND	ND	ND	0.018	4.2	<0.1	250
		Bottom	25.5	8.2	<1.0	33.6	5.2	ND	ND	ND	<0.015	3.0	<0.1	130
	2020 Q2 (2020.06-08)	Surface	28.5	8.2	<1.0	33.3	5.6	<0.05	<0.05	<0.05	0.031	7.8	0.6	<10
		Middle	28.4	8.2	<1.0	33.4	5.5	<0.05	<0.05	<0.05	0.034	9.2	1.1	<10
		Bottom	28.3	8.2	<1.0	33.3	5.5	<0.05	<0.05	<0.05	0.034	6.2	0.6	<10
	2020 Q3 (2020.09-11)	Surface	29.8	8.1	<1.0	33.7	6.2	ND	<0.05	0.01	0.025	4.2	1.2	15
		Middle	29.6	8.2	<1.0	33.7	5.9	ND	<0.05	<0.01	0.021	4.8	0.9	25
		Bottom	29.3	8.2	<1.0	33.7	5.6	ND	<0.05	0.01	0.034	1.8	0.6	<10
	2020 Q4 (2020.12-2021.02)	Surface	22.0	8.3	<1.0	34.0	7.5	ND	ND	ND	0.031	5.6	1.8	<10
		Middle	21.8	8.3	<1.0	34.0	7.4	ND	0.01	ND	<0.015	7.2	1.2	<10
		Bottom	21.5	8.2	<1.0	34.0	7.3	ND	<0.05	ND	<0.015	9.6	1.8	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (12/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S3	2021 Q1 (2020.03-2021.05)	Surface	26.6	8.3	<1.0	33.6	6.6	ND	ND	<0.01	0.015	4.4	0.3	<10
		Middle	26.4	8.3	<1.0	33.6	6.5	ND	ND	<0.01	0.018	3.9	<0.1	<10
		Bottom	26.2	8.3	<1.0	33.7	6.4	<0.05	ND	<0.01	<0.015	4.0	<0.1	<10
	2021 Q2 (2020.06-2021.08)	Surface	30.1	8.2	<1.0	33.3	7.8	ND	<0.05	<0.01	<0.015	2.8	0.6	35
		Middle	29.9	8.2	<1.0	33.3	7.3	<0.05	<0.05	<0.01	<0.015	3.0	0.3	15
		Bottom	29.7	8.2	<1.0	33.3	7.0	<0.05	<0.05	<0.01	<0.015	2.9	0.3	10
	2021 Q3 (2020.09-2021.11)	Surface	30.1	8.2	<1.0	33.8	6.2	ND	<0.05	<0.01	<0.015	2.1	0.3	<10
		Middle	29.9	8.2	<1.0	33.8	6.2	ND	<0.05	<0.01	<0.015	2.4	1.2	<10
		Bottom	29.7	8.2	<1.0	33.9	6.2	ND	<0.05	<0.01	<0.015	2.4	0.6	<10
	2021 Q4 (2021.12-2022.02)	Surface	23.0	8.2	<1.0	33.7	6.8	ND	<0.05	<0.01	0.030	14.2	1.5	400
		Middle	22.8	8.2	<1.0	33.7	6.6	ND	<0.05	<0.01	0.033	13.1	1.2	200
		Bottom	22.8	8.2	<1.0	33.7	6.5	ND	<0.05	<0.01	0.025	14.0	1.2	350
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (13/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S3	2022 Q1 (2022.03-2022.05)	Surface	25.7	8.2	<1.0	33.3	6.6	<0.10	ND	ND	<0.015	3.5	2.4	45
		Middle	25.5	8.2	<1.0	33.4	6.5	<0.10	ND	ND	ND	4.4	1.8	40
		Bottom	25.3	8.2	<1.0	33.3	6.3	<0.10	ND	ND	ND	2.8	1.2	30
	2022 Q2 (2022.06-08)	Surface	29.0	8.3	<1.0	32.5	6.1	ND	ND	ND	<0.015	4.4	0.3	75
		Middle	28.7	8.2	<1.0	32.5	6.1	<0.10	ND	ND	0.016	4.8	0.3	140
		Bottom	28.5	8.2	<1.0	32.6	6.0	ND	ND	ND	<0.015	4.6	0.6	130
	2022 Q3 (2022.09-11)	Surface	29.4	8.2	<1.0	32.1	6.4	ND	0.06	0.02	ND	19.6	0.3	35
		Middle	29.1	8.2	<1.0	32.2	6.2	ND	<0.04	0.02	ND	13.6	0.2	<10
		Bottom	28.8	8.2	<1.0	32.3	6.1	<0.10	<0.04	0.02	ND	25.1	0.3	20
	2022 Q4 (2022.11-2023.02)	Surface	25.1	8.3	<1.0	34.1	6.7	<0.10	ND	ND	<0.015	<1.0	<0.1	<10
		Middle	25.1	8.3	<1.0	34.1	6.8	<0.10	ND	ND	<0.015	2.6	0.3	95
		Bottom	25.0	8.3	<1.0	34.1	6.8	<0.10	ND	ND	<0.015	3.4	0.3	35
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A)

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (14/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL
S3	2023 Q1 (2023.03-2023.05)	Surface	25.6	8.3	<1.0	32.2	6.6	<0.05	<0.05	ND	ND	14.0	1.04	55
		Middle	25.2	8.3	<1.0	32.2	6.4	<0.05	<0.05	ND	<0.005	14.6	1.08	40
		Bottom	24.8	8.3	<1.0	32.3	6.3	ND	<0.05	ND	<0.005	5.1	0.85	90
	2023 Q2 (2023.06-2023.08)	Surface	30.5	8.2	<1.0	32.5	6.5	<0.05	<0.05	ND	<0.005	3.2	0.34	<10
		Middle	29.9	8.2	<1.0	32.6	6.4	0.05	<0.05	ND	<0.005	3.6	0.16	65
		Bottom	29.5	8.2	<1.0	32.8	6.2	0.06	<0.05	ND	0.006	7.2	0.29	15
	2023 Q3 (2023.09-11)	Surface	27.4	8.0	<1.0	33.5	6.1	0.11	<0.05	ND	ND	5.1	0.19	<10
		Middle	27.3	8.2	<1.0	33.5	5.9	0.12	<0.05	0.01	ND	4.6	0.09	<10
		Bottom	27.0	8.2	<1.0	33.5	5.8	0.07	<0.05	0.01	<0.005	4.8	0.21	<10
	2023 Q4 (2023.12-2024.02)	Surface	25.8	8.2	<1.0	33.4	5.8	0.06	<0.05	ND	<0.005	8.1	0.23	<10
		Middle	25.8	8.2	<1.0	33.4	5.7	0.05	<0.05	ND	<0.005	11.5	0.17	<10
		Bottom	25.6	8.2	<1.0	33.4	5.5	0.09	<0.05	ND	<0.005	7.7	0.14	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A)

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (15/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/ 100mL
S3	2024 Q1 (2024.03-05)	Surface	27.7	8.1	<1.0	33.1	6.6	0.20	<0.05	ND	<0.005	13.6	0.12	<10
		Middle	27.4	8.1	<1.0	33.2	6.4	0.10	<0.05	ND	<0.005	17.4	0.14	<10
		Bottom	27.1	8.2	<1.0	33.3	6.3	0.17	<0.05	ND	0.01	15.6	0.07	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5~8.5	<2.0	—	>5.0	<0.3	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.

Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Remark 3: Due to the slightly different spatial distribution of survey points between EIS and environmental monitoring stages, the results of the EIS point ST8 were compared with those of the closer environmental monitoring point S5.

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (16/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S4	EIA 2016 July (ST4)	Surface	29.4	8.2	0.8	33.5	6.4	ND	—	—	ND	7.4	—	<10
		Middle	29.3	8.2	0.7	33.4	6.5	ND	—	—	ND	4.5	—	<10
		Bottom	29.3	8.3	0.7	33.4	6.5	ND	—	—	ND	4.8	—	<10
	2020 Q1 (2020.03-05)	Surface	24.9	8.2	<1.0	33.5	5.6	ND	ND	ND	<0.015	5.1	0.7	400
		Middle	24.7	8.2	<1.0	33.6	5.3	ND	ND	ND	<0.015	4.0	<0.1	<10
		Bottom	24.4	8.2	<1.0	33.6	5.1	ND	ND	ND	<0.015	4.4	1.5	<10
	2020 Q2 (2020.06-08)	Surface	28.4	8.1	<1.0	33.1	5.8	<0.05	<0.01	<0.05	0.043	9.4	0.6	<10
		Middle	28.3	8.1	<1.0	33.0	5.7	<0.05	<0.01	<0.05	0.046	14.6	1.3	150
		Bottom	28.3	8.2	<1.0	33.0	5.5	<0.05	<0.01	<0.05	0.049	11.6	0.6	<10
	2020 Q3 (2020.09-11)	Surface	29.7	8.1	<1.0	33.2	6.1	ND	0.05	0.01	0.046	10.2	1.8	<10
		Middle	29.5	8.1	<1.0	33.2	5.9	ND	<0.05	0.01	0.061	13.6	2.1	<10
		Bottom	29.4	8.1	<1.0	33.1	5.7	ND	0.05	0.01	0.046	12.2	2.1	<10
	2020 Q4 (2020.12-2021.02)	Surface	20.9	8.3	<1.0	34.0	7.5	ND	0.06	0.01	0.061	12.2	1.5	<10
		Middle	20.7	8.3	<1.0	33.9	7.4	ND	0.06	0.01	0.049	12.4	1.8	<10
		Bottom	20.6	8.2	<1.0	34.0	7.2	ND	0.06	0.01	0.052	13.0	1.8	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (17/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S4	2021 Q1 (2020.03-2021.05)	Surface	25.2	8.2	<1.0	33.5	6.8	<0.05	ND	<0.01	0.018	5.6	0.6	<10
		Middle	25.2	8.3	<1.0	33.5	6.7	<0.05	<0.05	<0.01	0.025	5.4	0.6	<10
		Bottom	25.0	8.3	<1.0	33.6	6.5	ND	<0.05	<0.01	0.025	5.6	0.3	<10
	2021 Q2 (2020.06-2021.08)	Surface	30.8	8.2	<1.0	33.3	6.7	<0.05	ND	<0.01	<0.015	9.3	1.5	<10
		Middle	30.9	8.2	<1.0	33.2	6.5	ND	ND	<0.01	<0.015	9.0	2.4	<10
		Bottom	30.7	8.2	<1.0	33.2	6.7	ND	ND	<0.01	<0.015	9.8	2.4	<10
	2021 Q3 (2020.09-2021.11)	Surface	30.8	8.2	<1.0	33.6	6.3	ND	<0.05	<0.01	0.018	2.6	2.4	<10
		Middle	30.9	8.2	<1.0	33.6	6.2	ND	<0.05	<0.01	0.015	2.2	2.1	<10
		Bottom	30.7	8.2	<1.0	33.6	6.2	<0.05	<0.05	<0.01	<0.015	3.4	2.1	<10
	2021 Q4 (2021.12-2022.02)	Surface	18.6	8.2	<1.0	32.7	6.6	ND	0.14	0.01	0.065	34.3	0.6	<10
		Middle	18.6	8.2	<1.0	32.7	6.4	ND	0.14	0.01	0.071	34.9	0.3	350
		Bottom	18.6	8.2	<1.0	32.7	6.4	ND	0.15	0.01	0.075	33.9	0.3	300
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (18/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S4	2022 Q1 (2022.03-2022.05)	Surface	25.5	8.2	<1.0	33.2	6.5	<0.10	ND	ND	ND	1.8	1.5	25
		Middle	25.3	8.2	<1.0	33.3	6.4	0.11	<0.04	ND	ND	2.6	2.1	25
		Bottom	25.0	8.2	<1.0	33.4	6.3	<0.10	<0.04	<0.01	<0.015	2.2	2.1	25
	2022 Q2 (2022.06-08)	Surface	28.9	8.2	<1.0	32.5	6.1	ND	<0.04	ND	0.021	4.6	1.5	900
		Middle	28.8	8.2	<1.0	32.5	6.1	ND	<0.04	ND	0.024	4.3	1.5	<10
		Bottom	28.6	8.2	<1.0	32.5	6.0	ND	ND	ND	0.027	11.5	1.8	<10
	2022 Q3 (2022.09-11)	Surface	28.6	8.2	<1.0	31.6	6.4	ND	0.04	0.02	ND	2.2	0.7	25
		Middle	28.4	8.2	<1.0	31.7	6.2	ND	<0.04	0.02	ND	8.2	0.4	<10
		Bottom	28.2	8.2	<1.0	31.7	6.1	ND	<0.04	0.02	ND	20.2	0.4	20
	2022 Q4 (2022.11-2023.02)	Surface	23.8	8.2	<1.0	34.0	6.9	<0.10	<0.04	ND	<0.015	2.6	0.3	40
		Middle	23.8	8.2	<1.0	34.0	6.9	<0.10	<0.04	ND	<0.015	<1.0	0.3	75
		Bottom	23.7	8.2	<1.0	34.0	6.9	<0.10	ND	ND	<0.015	1.7	0.6	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (19/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S4	2023 Q1 (2023.03-2023.05)	Surface	25.7	8.3	<1.0	32.0	6.4	<0.05	<0.05	ND	<0.005	4.8	0.76	70
		Middle	25.5	8.3	<1.0	32.1	6.2	ND	<0.05	ND	<0.005	14.4	1.63	90
		Bottom	25.3	8.3	<1.0	32.1	6.1	<0.05	<0.05	ND	0.006	12.2	0.93	70
	2023 Q2 (2023.06-2023.08)	Surface	30.9	8.2	<1.0	32.7	6.1	0.07	<0.05	ND	0.011	13.1	2.30	<10
		Middle	30.7	8.2	<1.0	32.8	5.8	0.07	<0.05	ND	0.013	36.3	2.77	15
		Bottom	30.5	8.2	<1.0	32.7	5.7	0.10	<0.05	ND	0.014	38.4	1.75	15
	2023 Q3 (2023.09-11)	Surface	26.8	8.2	<1.0	33.3	6.1	0.07	<0.05	0.01	0.007	25.4	0.09	<10
		Middle	26.8	8.2	<1.0	33.3	5.9	0.12	0.06	0.01	0.007	22.8	0.15	<10
		Bottom	26.7	8.2	<1.0	33.3	5.8	0.14	0.06	0.01	0.007	25.0	0.24	<10
	2023 Q4 (2023.12-2024.02)	Surface	25.5	8.2	<1.0	33.3	6.1	<0.05	<0.05	ND	<0.005	6.1	0.34	<10
		Middle	25.5	8.2	<1.0	33.3	6.0	ND	<0.05	ND	<0.005	5.4	0.23	<10
		Bottom	25.3	8.2	<1.0	33.3	5.9	<0.05	<0.05	ND	<0.005	6.4	0.22	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (20/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S4	2024 Q1 (2024.03-05)	Surface	28.0	8.2	<1.0	33.4	6.7	0.30	<0.05	ND	0.008	22.9	0.58	<10
		Middle	27.7	8.2	<1.0	33.4	6.6	0.70*	<0.05	ND	0.007	18.2	0.22	10
		Bottom	27.4	8.2	<1.0	33.4	6.4	0.15	<0.05	ND	0.014	23.8	0.48	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5~8.5	<2.0	—	>5.0	<0.3	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.

Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Remark 3: Due to the slightly different spatial distribution of survey points between EIS and environmental monitoring stages, the results of the EIS point ST8 were compared with those of the closer environmental monitoring point S5.

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (21/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S5	EIA 2016 July (ST8)	Surface	30.1	8.2	0.6	33.4	6.6	ND	—	—	ND	2.8	—	<10
		Middle	29.8	8.3	0.6	33.2	6.6	ND	—	—	ND	3.0	—	<10
		Bottom	29.7	8.3	0.6	33.2	6.5	ND	—	—	ND	4.4	—	<10
	2020 Q1 (2020.03-05)	Surface	26.1	8.0	<1.0	33.6	5.4	ND	ND	ND	0.021	3.2	0.7	750
		Middle	25.8	8.0	<1.0	33.7	5.2	ND	ND	ND	0.031	4.6	0.7	1,200*
		Bottom	25.2	8.0	<1.0	33.7	5.1	ND	ND	ND	0.018	2.6	<0.1	670
	2020 Q2 (2020.06-08)	Surface	28.6	8.0	<1.0	33.3	6.1	<0.05	<0.01	<0.05	0.040	9.8	0.5	<10
		Middle	28.5	8.0	<1.0	33.3	6.0	<0.05	<0.01	<0.05	0.043	9.0	<0.1	<10
		Bottom	28.5	8.1	<1.0	33.2	5.9	<0.05	<0.01	<0.05	0.040	9.8	0.5	<10
	2020 Q3 (2020.09-11)	Surface	29.9	8.1	<1.0	33.6	6.2	ND	<0.05	<0.01	0.043	14.4	1.2	10
		Middle	29.7	8.2	<1.0	33.7	6.0	ND	<0.05	<0.01	0.031	18.4	1.2	<10
		Bottom	29.4	8.1	<1.0	33.6	5.8	ND	<0.05	<0.01	0.031	15.2	1.5	10
	2020 Q4 (2020.12-2021.02)	Surface	22.3	8.3	<1.0	34.0	7.4	ND	<0.05	<0.01	0.018	11.0	1.8	<10
		Middle	22.1	8.3	<1.0	34.0	7.3	ND	<0.05	<0.01	0.018	24.6	2.4	<10
		Bottom	21.9	8.2	<1.0	34.0	7.2	ND	<0.05	<0.01	0.018	14.0	2.4	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (22/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S5	2021 Q1 (2020.03-2021.05)	Surface	25.4	8.3	<1.0	33.6	6.7	ND	<0.05	<0.01	0.025	8.2	0.9	<10
		Middle	25.2	8.3	<1.0	33.5	6.6	ND	<0.05	<0.01	0.025	8.0	0.6	<10
		Bottom	25.0	8.3	<1.0	33.6	6.6	ND	<0.05	<0.01	0.018	7.4	<0.1	130
	2021 Q2 (2020.06-2021.08)	Surface	31.0	8.2	<1.0	33.2	6.7	ND	ND	<0.01	<0.015	2.6	1.5	<10
		Middle	31.0	8.2	<1.0	33.2	6.6	ND	ND	<0.01	<0.015	2.6	1.5	<10
		Bottom	30.8	8.2	<1.0	33.2	6.6	ND	ND	<0.01	<0.015	2.7	1.5	<10
	2021 Q3 (2020.09-2021.11)	Surface	31.0	8.2	<1.0	33.7	6.3	ND	<0.05	<0.01	0.015	3.6	2.4	10
		Middle	31.0	8.2	<1.0	33.7	6.2	ND	<0.05	<0.01	0.015	3.0	3.0	<10
		Bottom	30.8	8.2	<1.0	33.7	6.2	ND	<0.05	<0.01	<0.015	3.1	2.4	100
	2021 Q4 (2021.12-2022.02)	Surface	20.5	8.2	<1.0	33.2	6.6	ND	0.09	<0.01	0.058	27.0	1.8	650
		Middle	20.4	8.2	<1.0	33.2	6.5	ND	0.10	<0.01	0.057	28.3	0.6	500
		Bottom	20.4	8.2	<1.0	33.2	6.4	ND	0.10	<0.01	0.052	26.0	0.9	500
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (23/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S5	2022 Q1 (2022.03-2022.05)	Surface	25.5	8.2	<1.0	33.2	6.5	<0.10	ND	ND	0.022	5.6	4.4	<10
		Middle	25.4	8.1	<1.0	33.2	6.4	<0.10	<0.04	<0.01	0.026	8.2	4.2	<10
		Bottom	25.3	8.1	<1.0	33.3	6.3	<0.10	<0.04	<0.01	0.026	8.6	6.8	<10
	2022 Q2 (2022.06-08)	Surface	28.9	8.2	<1.0	32.5	6.2	ND	<0.04	ND	0.016	4.5	0.6	<10
		Middle	28.7	8.2	<1.0	32.6	6.1	<0.10	<0.04	ND	0.017	4.8	0.6	<10
		Bottom	28.6	8.2	<1.0	32.6	6.1	<0.10	<0.04	ND	<0.015	4.7	0.3	<10
	2022 Q3 (2022.09-11)	Surface	29.0	8.2	<1.0	31.8	6.4	<0.10	0.05	0.02	<0.015	4.6	1.3	<10
		Middle	28.7	8.2	<1.0	31.9	6.2	<0.10	0.04	0.02	<0.015	14.6	1.3	45
		Bottom	28.5	8.2	<1.0	31.9	6.1	<0.10	0.05	0.02	<0.015	5.4	1.3	60
	2022 Q4 (2022.11-2023.02)	Surface	23.9	8.2	<1.0	34.1	6.9	<0.10	<0.04	<0.01	<0.015	2.8	0.3	50
		Middle	23.9	8.2	<1.0	34.1	6.9	<0.10	<0.04	<0.01	<0.015	3.0	0.6	30
		Bottom	23.8	8.2	<1.0	34.1	6.9	<0.10	<0.04	<0.01	<0.015	3.0	0.3	15
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Remark 1: "＜" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.
Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (24/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/100mL
S5	2023 Q1 (2023.03-2023.05)	Surface	25.5	8.3	<1.0	31.7	6.5	<0.05	<0.05	ND	<0.005	13.9	4.11	85
		Middle	25.2	8.3	<1.0	31.8	6.3	0.08	<0.05	ND	<0.005	15.8	2.45	95
		Bottom	24.9	8.3	<1.0	31.8	6.2	0.05	0.05	ND	<0.005	13.2	2.80	70
	2023 Q2 (2023.06-2023.08)	Surface	30.4	8.1	<1.0	32.5	6.2	0.09	<0.05	ND	0.014	6.6	0.68	<10
		Middle	30	8.1	<1.0	32.6	6.1	0.11	<0.05	ND	0.008	12.9	0.43	45
		Bottom	29.7	8.2	<1.0	32.7	6	0.08	<0.05	ND	0.012	10.8	0.88	<10
	2023 Q3 (2023.09-11)	Surface	26.9	8.2	<1.0	33.4	6.1	0.10	<0.05	ND	<0.005	11.2	0.20	<10
		Middle	26.9	8.2	<1.0	33.4	5.9	0.10	<0.05	0.01	<0.005	10.2	0.18	<10
		Bottom	26.4	8.2	<1.0	33.4	5.8	0.08	<0.05	0.01	<0.005	9.9	0.22	<10
	2023 Q4 (2023.12-2024.02)	Surface	25.4	8.2	<1.0	33.4	5.9	<0.05	<0.05	ND	<0.005	8.2	0.34	<10
		Middle	25.4	8.2	<1.0	33.4	5.7	<0.05	<0.05	ND	<0.005	7.0	0.33	<10
		Bottom	25.2	8.2	<1.0	33.4	5.7	0.08	<0.05	ND	<0.005	7.2	0.20	<10
Marine Environmental Quality Standard for A type Marine Area			—	7.5-8.5	<2.0	—	>5.0	<3.0	—	—	—	—	—	< 1,000

Table 3.1.1-1 Analysis of Previous Marine Water Quality Monitoring (25/25)

Monitoring Spot	Monitoring Date	Item	Water temperature	pH	BOD	Salinity	Dissolved Oxygen	Ammonia-N	Nitrite Nitrogen	Nitrite Nitrogen	Orthophosphate	Suspended Solid	Chlorophyll a	Coliform group
		Unit	℃	—	mg/L	psu	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	μg/L	CFU/ 100mL
S5	2024 Q1 (113.03~05)	Surface	28.2	8.2	<1.0	33.3	6.8	0.12	<0.05	ND	0.006	9.0	0.56	50
		Middle	27.6	8.2	<1.0	33.4	6.7	0.10	<0.05	ND	0.006	13.7	0.27	40
		Bottom	27.2	8.2	<1.0	33.4	6.5	0.12	<0.05	ND	0.008	16.0	0.31	<10
Water Quality Standard of Marine Waterbody (Class A)			—	7.5~8.5	<2.0	—	>5.0	<0.3	—	—	—	—	—	< 1,000

Remark 1: "<" indicates the value is lower than limit of quantification; "ND" indicates the value is lower than limit of device detection.

Remark 2: "*" indicates the value exceeds Water Quality Standard of Marine Waterbody (Class A).

Remark 3: Due to the slightly different spatial distribution of survey points between EIS and environmental monitoring stages, the results of the EIS point ST8 were compared with those of the closer environmental monitoring point S5.

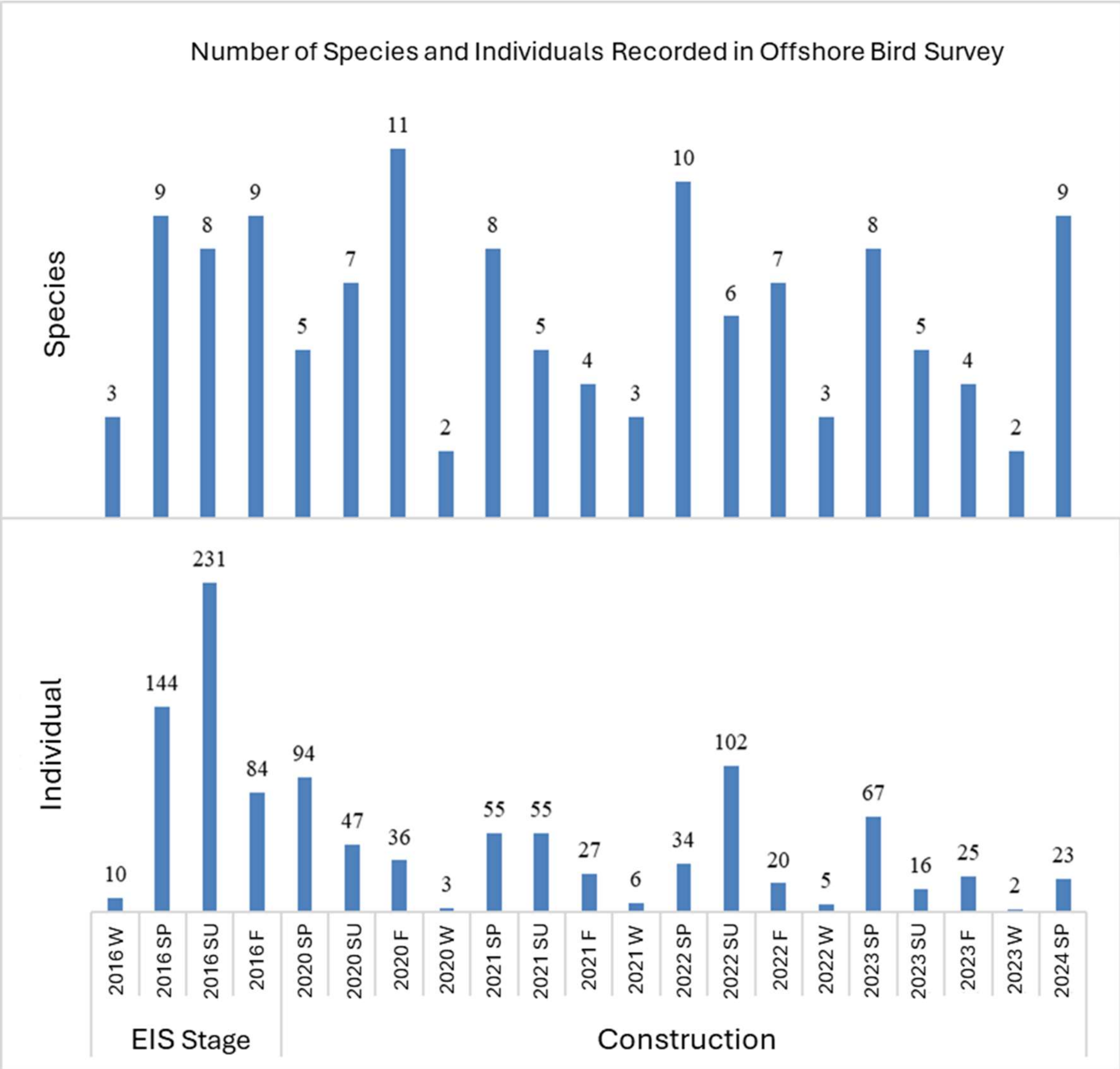
II. Bird Ecology

i Offshore Bird Ecology

In the same quarter in the EIS stage (2016 March-May), excluding Rock Pigeon, 3 orders, 5 families, and 8 species were recorded. In addition, 2 unidentified species, an unknown Gull and unknown Shearwater were also recorded. In comparison, 7 species (Little Tern, Sterna Caspia, Tern, European Herring Gull, Streaked Shearwater, Cormorant, and Great Egret) were added in this quarter, and 6 species (Lesser Black-Backed Gull, Whiskered Tern, Pomarine Jaeger, Red-Necked Phalarope, Bulwer's Petrel, and Barn Swallow) were not recorded in this quarter. There dominant species is Crested Tern in EIS stage and Bridled Tern in this quarter.

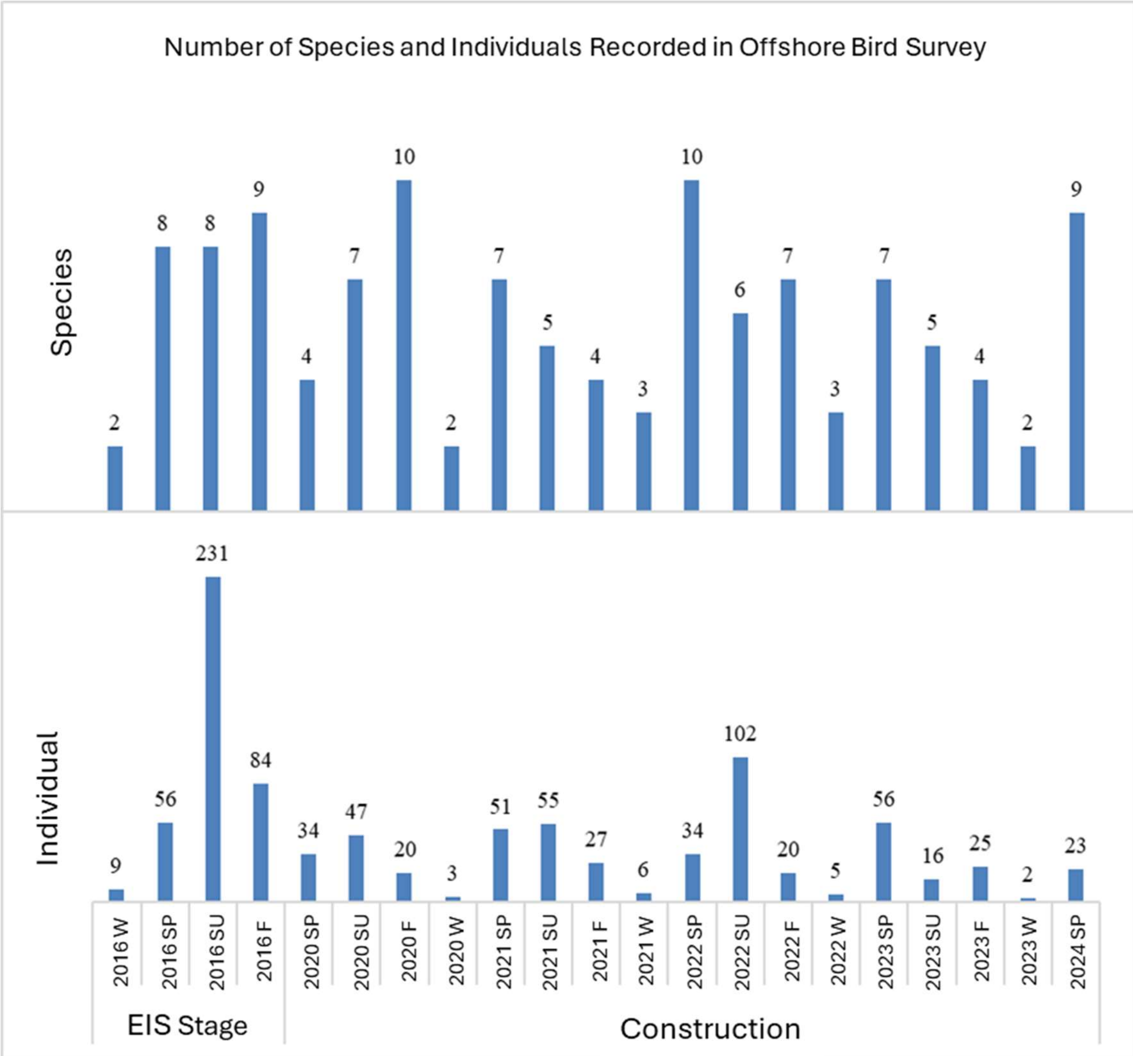
As per historical records, 2-11 coastal bird species were documented during the offshore construction and operation phases in each quarter, and the number is between 2-102 individuals. The species composition was primarily composed of migratory birds. In 2020, the highest number of records was in spring; in 2021, the highest numbers were recorded in spring and summer; in 2022, the highest number of records was in summer; and in 2023, the highest number of records was in spring. Due to the cold weather in winter affecting bird activity frequency, the number of records was lower in winter each year. The overview of offshore bird species and individuals documented in the surveys are listed as Table 3.1.1-2 and Figure 3.1.1-2.

In addition, wild pigeons, presumed to be racing pigeons, were recorded in the winter 2015, spring 2016, spring and fall 2020, spring 2021, and spring 2023. After excluding the wild pigeons recorded in the surveys, 2-10 species and 2-102 individuals were recorded in the historical offshore bird surveys. The historical offshore bird survey data is shown as Figure 3.1.1-3 and Table 3.1.1-3.



Note: In the EIS and construction stage, 1 survey was carried out in winter, and 3 in spring, summer, and fall.

Figure 3.1.1-2 Species and Number of Offshore Birds Recorded in the Historical Surveys



Note: In the EIS and construction stage, 1 survey was carried out in winter, and 3 in spring, summer, and fall.

Figure 3.1.1-3 Species and Number of Coastal Birds Recorded in the Historical Surveys (Wild Pigeons were Excluded)

Table 3.1.1-2 Species and Number of Offshore Birds

Quarter		Species	Individual	Density
EIA	2015 Winter	3	10	-
	2016 Spring	9	145	
	2016 Summer	8	231	
	2016 Fall	9	84	
Construction	2020 Spring	5	94	1.033
	2020 Summer	7	47	0.516
	2020 Fall	11	36	0.791
	2020 Winter	2	3	0.099
	2021 Spring	8	55	0.604
	2021 Summer	5	55	0.604
	2021 Fall	4	27	0.297
	2021 Winter	3	6	0.198
	2022 Spring	10	34	0.373
	2022 Summer	6	102	1.120
	2022 Fall	7	20	0.220
	2022 Winter	3	5	0.165
	2023 Spring	8	67	0.737
	2023 Summer	5	16	0.351
	2023 Fall	4	25	0.275
	2023 winter	2	2	0.066
	2024 spring	9	23	0.253

Note: Offshore bird density is one of the analyses in the construction phase monitoring.

Table 3.1.1-3 Species and Number of Offshore Birds (Wild Pigeons Excluded)

Quarter		Species	Individual	Density
EIA	2015 Winter	2	9	-
	2016 Spring	8	56	
	2016 Summer	8	231	
	2016 Fall	9	84	
Construction	2020 Spring	4	34	0.923
	2020 Summer	7	47	0.373
	2020 Fall	10	20	0.527
	2020 Winter	2	3	0.099
	2021 Spring	7	51	0.560
	2021 Summer	5	55	0.604
	2021 Fall	4	27	0.297
	2021 Winter	3	6	0.198
	2022 Spring	10	34	0.373
	2022 Summer	6	102	1.120
	2022 Fall	7	20	0.220
	2022 Winter	3	5	0.165
	2023 Spring	7	56	0.737
	2023 Summer	5	16	0.351
	2023 fall	4	25	0.275
	2023 winter	2	2	0.066
	2024 spring	9	23	0.253

Note: Offshore bird density is one of the analyses in the construction phase monitoring.

ii Coastal Bird Ecology

The landing point for submarine cable was not yet decided during the EIS period, as such survey area during said period was the coastline of Yunlin County. That area does not completely align with the current monitoring location for landing point of submarine cable in environmental monitoring plan. During the EIS period in the same quarter (2016 March-May) a total of 7 orders, 12 families, and 35 species were recorded. 40 species were newly recorded in this quarter comparing to the EIS period, including Anas Penelope, Green-Winged Teal, Pied Avocet, Sharp-Tailed Sandpiper, Black-Headed Gull, Little Ringed Plover, Red-Collared Dove, Spotted Dove, Rock Pigeon, House Swift, Cormorant, Javan Myna, Common Myna, Chestnut-Tailed Starling, Brown Shrike, Long-Tail Shrike, Black Drongo, Tawny Prinia, Yellow-Bellied Prinia, Zitting Cisticola, Sparrow, Pacific Swallow, Striated Swallow, Barn Swallow, Plain Martin, Swinhoe's White-Eye, Light-Vented Bulbul, Scaly-Breasted Munia, Indian Silverbill, Oriental Magpie Robin, Black-Faced Bunting, Taiwan Scimitar-Babbler, Oriental Skylark, Vinous-Throated Parrotbill, Yellow Wagtail, White Wagtail, Grey Wagtail, Black-Naped Blue Monarch, and Gray Treepie. 7 species were not recorded in this quarter, including Mallard, Broad-Billed Sandpiper, Ruddy Turnstone, Lesser Sand-Plover, Grey Plover, African Sacred Ibis, and Osprey. The species newly recorded in this quarter are mostly residents that have stronger adaptability to human activities.

As per historical records, 52-88 coastal bird species were documented during the offshore construction and operation phases in each quarter, and the number is between 1,183-5,156 individuals. 26-48 bird species and 239-1,161 individuals were recorded on the Taixi selected landing cable route, 24-46 bird species and 183-527 individuals were recorded on the Sihu selected landing cable route. 24-51 bird species and 225-645 individuals were recorded on the Taixi non-selected landing cable route, 29-52 bird species and 227-448 individuals were recorded on the Sihu non-selected landing cable route.

For coastal birds, no obvious difference was found in species and individuals regarding seasons.

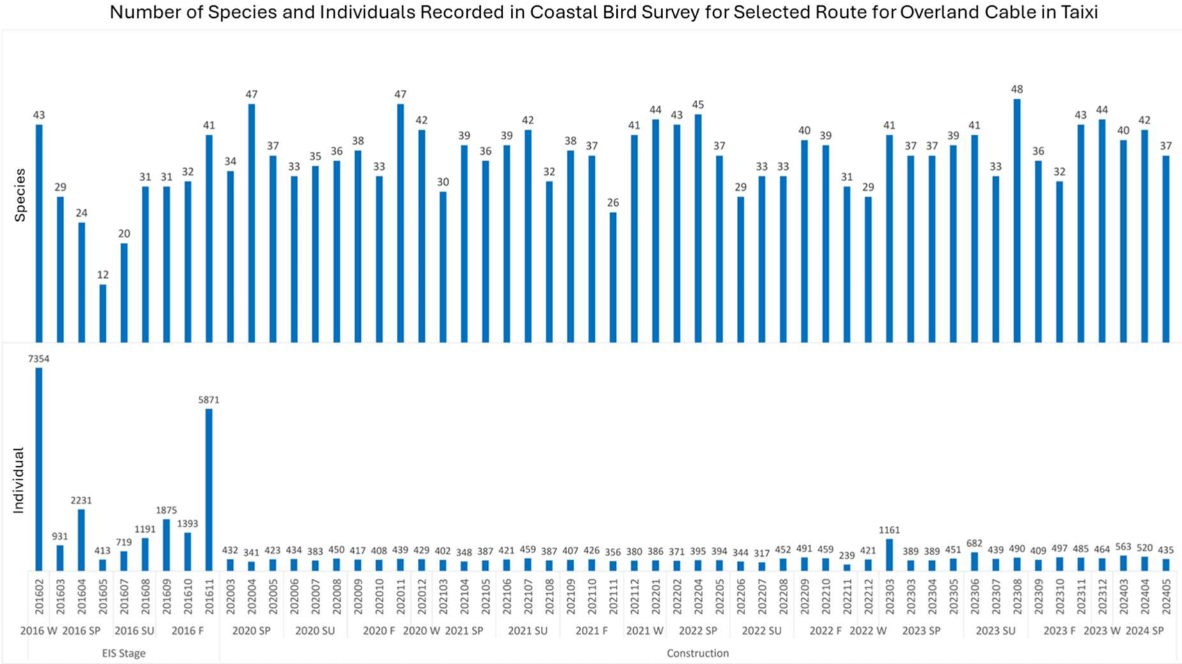
For Taixi selected landing cable route, 2023 March recorded the most individuals. For species and individuals, no obvious seasonal difference is found.

For Sihu selected landing cable route, 2021 October recorded the most individuals. For species and individuals, no obvious seasonal difference is found.

For Taixi non-selected landing cable route, November 2020, January and March 2022, and August 2023 recorded higher number of species, no obvious difference was found in the rest of the seasons. For the number of individuals recorded, March 2020 and March 2021 recorded higher counts, with no significant seasonal differences in other periods.

For Sihu non-selected landing cable route, January and March 2022 recorded the most species, no obvious difference was found in the rest of the seasons. For species, no seasonal difference is found.

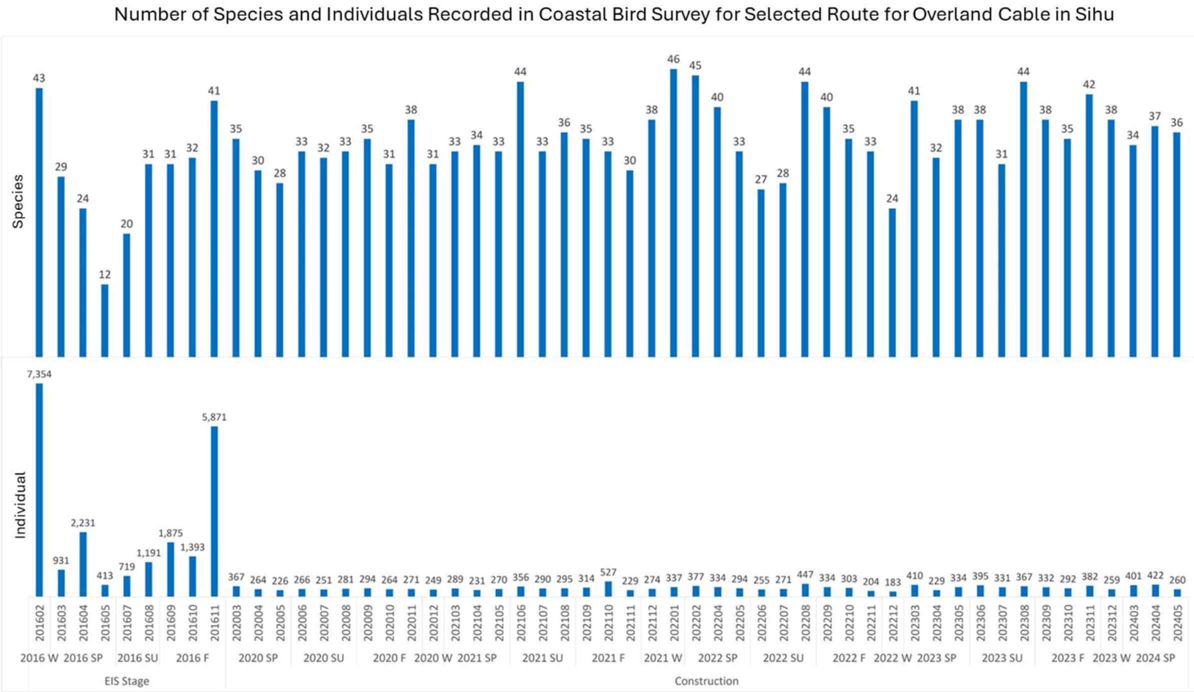
The overview of coastal bird species and individuals documented in the surveys are listed as Figure 3.1.1-4 and Table 3.1.1-4.



Note: In the EIS stage, 1 survey was carried out in winter, 3 in spring, 2 in summer, and 3 in fall. In the construction phase, 3 surveys were carried out respectively in spring, summer and fall; 1 survey was carried out in winter. Selected/non-selected route is not identified in the EIA stage.

Note: SP: spring, SU: summer, F: fall, W: winter.

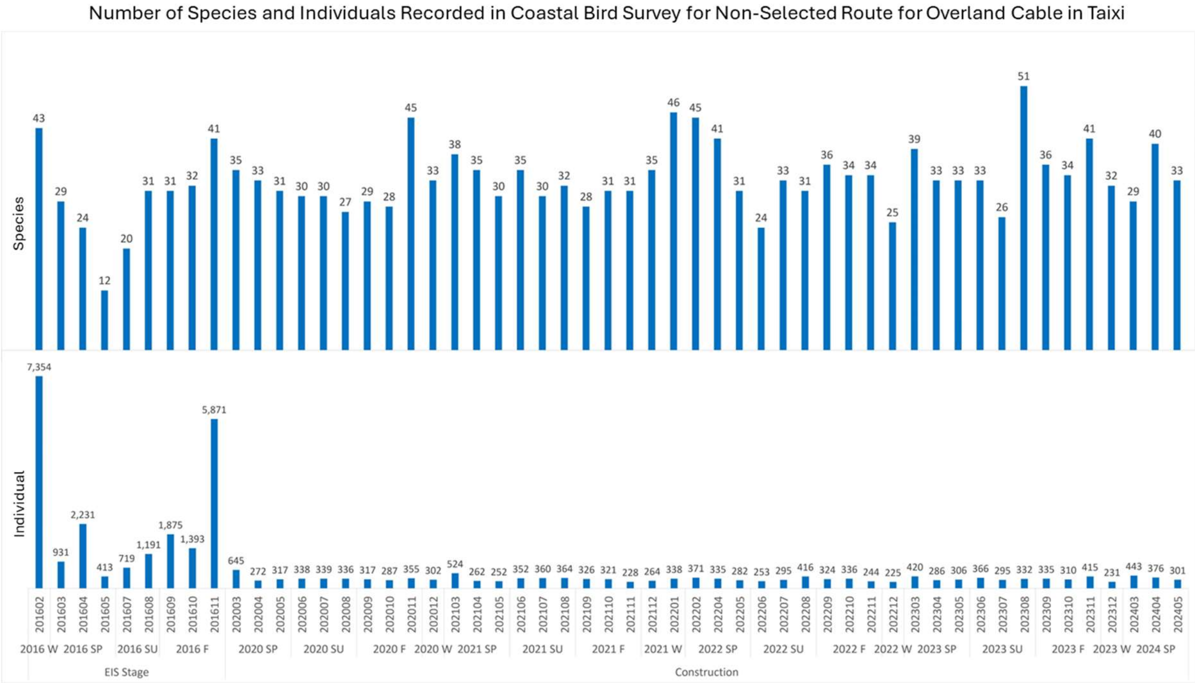
Figure 3.1.1-4.1 Species and Number of Coastal Birds Recorded in the Historical Surveys (Selected Route in Taixi)



Note: In the EIS stage, 1 survey was carried out in winter, 3 in spring, 2 in summer, and 3 in fall. In the construction phase, 3 surveys were carried out respectively in spring, summer and fall; 1 survey was carried out in winter. Selected/non-selected route is not identified in the EIA stage.

Note: SP: spring, SU: summer, F: fall, W: winter.

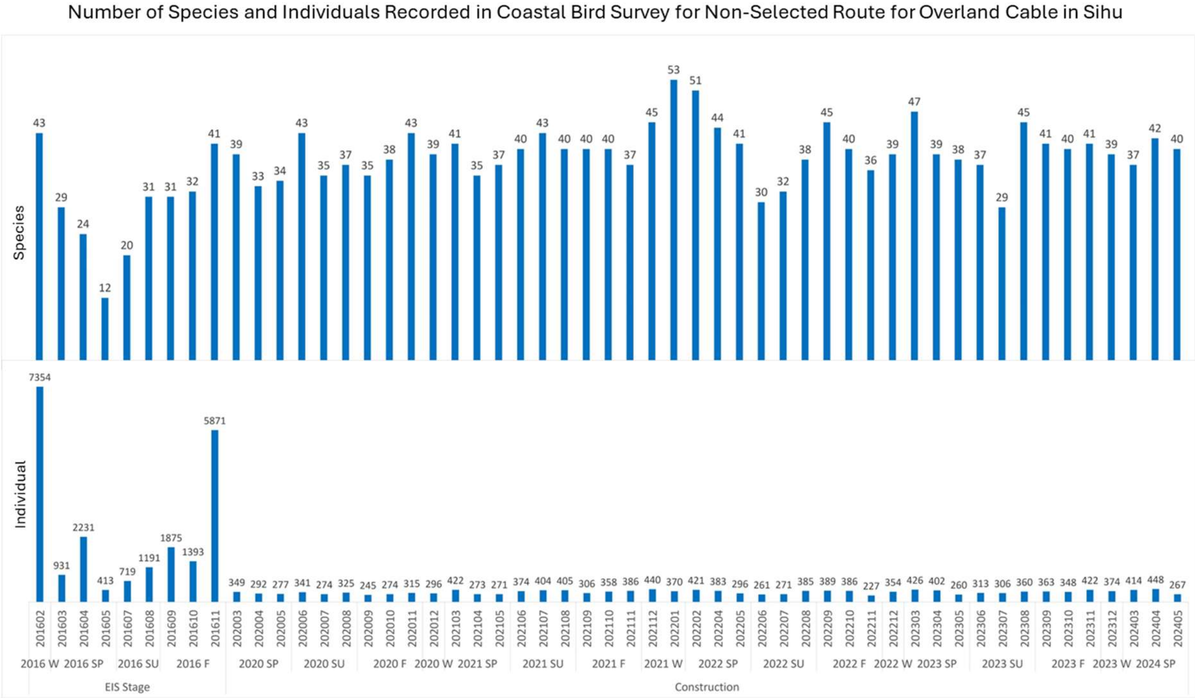
Figure 3.1.1-4.2 Species and Number of Coastal Birds Recorded in the Historical Surveys (Selected Route in Sihu)



Note: In the EIS stage, 1 survey was carried out in winter, 3 in spring, 2 in summer, and 3 in fall. In the construction phase, 3 surveys were carried out respectively in spring, summer and fall; 1 survey was carried out in winter. Selected/non-selected route is not identified in the EIA stage.

Note: SP: spring, SU: summer, F: fall, W: winter.

Figure 3.1.1-4.3 Species and Number of Coastal Birds Recorded in the Historical Surveys (Non-selected Route in Taixi)



Note: In the EIS stage, 1 survey was carried out in winter, 3 in spring, 2 in summer, and 3 in fall. In the construction phase, 3 surveys were carried out respectively in spring, summer and fall; 1 survey was carried out in winter. Selected/non-selected route is not identified in the EIA stage.

Note: SP: spring, SU: summer, F: fall, W: winter.

Figure 3.1.1-4.4 Species and Number of Coastal Birds Recorded in the Historical Surveys (Non-selected Route in Sihu)

Table 3.1.1-4.1 Species and Number of Coastal Birds (Selected Route in Taixi)

Quarter			Species	Number
EIA	2016 Winter	2016/02	44	7,354
	2016 Spring	2016/03	29	931
		2016/04	24	2,231
		2016/05	12	413
	2016 Summer	2016/07	20	719
		2016/08	31	1,191
	2016 Fall	2016/09	31	1,875
		2016/10	32	1,393
		2016/11	42	5,874
Construction	2020 Spring	2020/03	33	432
		2020/04	47	341
		2020/05	37	423
	2020 Summer	2020/06	33	434
		2020/07	35	383
		2020/08	36	450
	2020 Fall	2020/09	38	417
		2020/10	33	408
		2020/11	47	439
	2020 Winter	2020/12	42	429
	2021 Spring	2021/03	30	402
		2021/04	39	348
		2021/05	36	387
	2021 Summer	2021/06	39	421
		2021/07	42	459
		2021/08	32	387
	2021 Fall	2021/09	38	407
		2021/10	37	426
		2021/11	26	356
	2021 Winter	2021/12	41	380
		2022/1	44	386
	2022 Spring	2022/3	43	371
		2022/4	45	395
		2022/5	37	394
	2022 Summer	2022/6	29	344
		2022/7	33	317
		2022/8	33	452
	2022 Fall	2022/9	40	491
		2022/10	39	459
		2022/11	31	239
	2022 Winter	2022/12	29	421
	2023 Spring	2023/3	41	1,161
		2023/4	37	389
		2023/5	39	451
	2023 Summer	2023/06	41	682
		2023/07	33	439
		2023/08	48	490
	2023 Fall	202309	48	490
		202310	36	409
		202311	43	485
	2023 Winter	202312	44	464
	2024 Spring	202403	40	563
		202404	42	520
		202405	37	435

Table 3.1.1-4.2 Species and Number of Coastal Birds (Selected Route in Sihu)

Quarter			Species	Number
EIA	2016 Winter	2016/02	44	7,354
	2016 Spring	2016/03	29	931
		2016/04	24	2,231
		2016/05	12	413
	2016 Summer	2016/07	20	719
		2016/08	31	1,191
	2016 Fall	2016/09	31	1,875
		2016/10	32	1,393
		2016/11	42	5,874
Construction	2020 Spring	2020/03	35	367
		2020/04	30	264
		2020/05	28	226
	2020 Summer	2020/06	33	266
		2020/07	32	251
		2020/08	33	281
	2020 Fall	2020/09	35	294
		2020/10	31	264
		2020/11	38	271
	2020 Winter	2020/12	31	249
	2021 Spring	2021/03	33	289
		2021/04	34	231
		2021/05	33	270
	2021 Summer	2021/06	44	356
		2021/07	33	290
		2021/08	36	295
	2021 Fall	2021/09	35	314
		2021/10	33	527
		2021/11	30	229
	2021 Winter	2021/12	38	274
		2022/1	46	337
	2022 Spring	2022/3	45	377
		2022/4	40	334
		2022/5	33	294
	2022 Summer	2022/6	27	255
		2022/7	28	271
		2022/8	44	447
	2022 Fall	2022/9	40	334
		2022/10	35	303
		2022/11	33	204
	2022 Winter	2022/12	24	183
	2023 Spring	2023/3	41	410
		2023/4	32	229
		2023/5	38	334
	2023 Summer	2023/06	38	395
		2023/07	31	331
		2023/08	44	367
	2023 Fall	202309	38	332
		202310	35	292
		202311	42	382
	2023 Winter	202312	38	259
	2024 Spring	202403	34	401
		202404	37	422
		202405	36	260

Table 3.1.1-4.3 Species and Number of Coastal Birds (Non-selected Route in Taixi)

Quarter			Species	Number
EIA	2016 Winter	2016/02	44	7,354
	2016 Spring	2016/03	29	931
		2016/04	24	2,231
		2016/05	12	413
	2016 Summer	2016/07	20	719
		2016/08	31	1,191
	2016 Fall	2016/09	31	1,875
		2016/10	32	1,393
		2016/11	42	5,874
Construction	2020 Spring	2020/03	34	645
		2020/04	33	272
		2020/05	31	317
	2020 Summer	2020/06	30	338
		2020/07	30	339
		2020/08	27	336
	2020 Fall	2020/09	29	317
		2020/10	28	287
		2020/11	45	355
	2020 Winter	2020/12	33	302
	2021 Spring	2021/03	38	524
		2021/04	35	262
		2021/05	30	252
	2021 Summer	2021/06	35	352
		2021/07	30	360
		2021/08	32	364
	2021 Fall	2021/09	28	326
		2021/10	31	321
		2021/11	31	228
	2021 Winter	2021/12	35	264
		2022/1	46	338
	2022 Spring	2022/3	45	371
		2022/4	41	335
		2022/5	31	282
	2022 Summer	2022/6	24	253
		2022/7	33	295
		2022/8	31	416
	2022 Fall	2022/9	36	324
		2022/10	34	336
		2022/11	34	244
	2022 Winter	2022/12	25	225
	2023 Spring	2023/3	39	420
		2023/4	33	298
		2023/5	33	306
	2023 Summer	2023/06	33	366
		2023/07	26	295
		2023/08	51	332
	2023 Fall	202309	36	335
		202310	34	310
		202311	41	415
	2023 Winter	202312	32	231
	2024 Spring	202403	29	443
		202404	40	376
		202405	33	301

Table 3.1.1-4.3 Species and Number of Coastal Birds (Non-selected Route in Sihu)

Quarter			Species	Number
EIA	2016 Winter	2016/02	44	7,354
	2016 Spring	2016/03	29	931
		2016/04	24	2,231
		2016/05	12	413
	2016 Summer	2016/07	20	719
		2016/08	31	1,191
	2016 Fall	2016/09	31	1,875
		2016/10	32	1,393
		2016/11	42	5,874
Construction	2020 Spring	2020/03	39	349
		2020/04	33	292
		2020/05	33	277
	2020 Summer	2020/06	43	341
		2020/07	35	274
		2020/08	37	325
	2020 Fall	2020/09	35	245
		2020/10	38	274
		2020/11	43	315
	2020 Winter	2020/12	39	296
	2021 Spring	2021/03	41	422
		2021/04	35	273
		2021/05	37	271
	2021 Summer	2021/06	40	374
		2021/07	42	404
		2021/08	40	405
	2021 Fall	2021/09	40	306
		2021/10	40	358
		2021/11	37	386
	2021 Winter	2021/12	44	440
		2022/1	52	370
	2022 Spring	2022/3	51	421
		2022/4	44	383
		2022/5	41	296
	2022 Summer	2022/6	30	261
		2022/7	32	271
		2022/8	38	385
	2022 Fall	2022/9	45	389
		2022/10	40	386
		2022/11	36	227
	2022 Winter	2022/12	39	354
	2023 Spring	2023/3	47	426
		2023/4	39	402
		2023/5	38	260
	2023 Summer	2023/06	37	313
		2023/07	29	306
		2023/08	45	360
	2023 Fall	202309	41	363
		202310	40	348
		202311	41	422
	2023 Winter	202312	39	374
	2024 Spring	202403	37	414
		202404	42	448
		202405	40	267

iii Difference in Coastal Birds and Offshore Birds

Based on the monitoring results from the offshore construction and operation phases (March 2020 to May 2024, 17 quarters), 14 orders, 40 families and 127 species were recorded in coastal bird surveys; 6 orders, 11 families and 24 species were recorded in offshore bird surveys (excluding wild pigeons).

1. Coastal bird

The survey route covers fish farms, grassland and trees that shelter many non-water birds. Therefore, besides water birds, more Passeriformes and Columbiformes were documented.

2. Bird species only documented in the offshore surveys

9 species, Bridled tern, Tern, Roseate tern, Stercorarius pomarinus, Long-tailed jaeger, Red-necked phalarope, Bulwer's Petrel, Streaked Shearwater and Wedge-tailed shearwater were only documented in the offshore surveys. 5 species, Stercorarius pomarinus, Long-tailed jaeger, Bulwer's Petrel, Streaked Shearwater and Wedge-tailed shearwater were sea birds and are usually seen in the marine area around Taiwan.

3. Bird species documented in both coastal and offshore surveys

15 species were documented in both surveys, including Kentish Plover, Little Tern, Greater Crested Tern, Sterna Caspia, Black-Bellied Tern, Black-Headed Gull, European Herring Gull, Red-Necked Stint, Barn Swallow, Light-Vented Bulbul, Cormorant, Cattle Egret, Great Egret, Brown-Headed Thrush, and Osprey. The 11 water birds species (species that exclude Barn Swallow and Light-Vented Bulbul) are mostly migratory birds. They were documented mainly during the migratory seasons and may possibly flying through the wind farm.

III. Marine Ecology

A landing point for submarine cable was not yet decided during the EIS period, as such the intertidal survey points at the time were distributed across the coast of Yunlin County. This is different from the 50m perimeter on both sides of the landing point for the submarine cable in the current environment monitoring plans. In addition, 12 sampling stations were applied for marine ecological survey during the EIS period, but as the wind farm area has been reduced, during the EIS review period, the original allocation of sampling stations are no longer apropos of the principles in conducting uniform sampling of marine water quality in the wind farm area finally approved. Monitoring stations will be reallocated according to the environmental monitoring plan (as shown in Figure 3.1.1-1). Previous marine ecological survey results can only be compared with nearby stations in EIS period.

i Intertidal Ecology

In the same quarter of the EIS period (February 2016), 7 orders, 10 families and 14 species were recorded. 44-143 individuals were recorded in each station. In comparison with EIS period surveys, 21 species were newly recorded this quarter, including Gaetice Depressus, Hemigrapsus Sanguineus, Scopimera Bitympana Shen, Northern Calling Fiddler Crab, Ocypode Ceratophthalma, Milky Fiddler Crab, Ocypode Stimpsoni, Mictyris Brevidactylus, Matuta Victor, Littoraria Undulata, Nerita Striata, Nerita Chamaeleon, Schrenck's Limpet, Patelloida Striata, Orange-Striped Green Sea Anemone, Ligia Exotica, Saccostrea Kegaki, Portuguese Oyster, Nereis, Chaetopterid Worm, and Amphipod. 6 species were not recorded in this quarter, including Polished Nerite, Nerita Planospira, Green Mussel, Nipponacmea Concinna, Copper Limpets, and Saccostrea Mordax. Saccostrea Mordax was the dominant species during the EIS period and this quarter.

As per historical records, 26-42 coastal bird species were documented during the monitoring of offshore construction and operation phases in each quarter, and the number is between 868-1,737 individuals. For intertidal ecology, least species and individuals were recorded in 2023 Q1. The tide level of the low tide in this survey was relatively higher among the historical surveys, so less species were observed. Therefore, less species were documented in this quarter. The species and number of intertidal organisms in the historical surveys are listed as Figure 3.1.1-5 and Table 3.1.1-5.

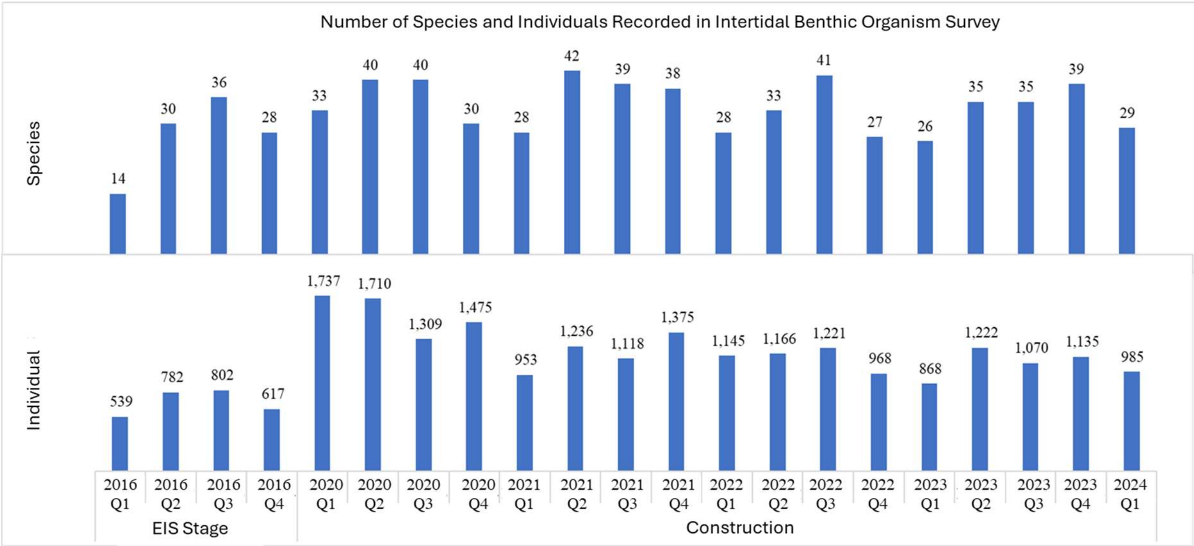


Figure 3.1.1-5 Species and Number of Intertidal Ecology Recorded in the Historical Surveys

Table 3.1.1-5 Species and Number of Intertidal Benthic Organism

Quarter		Species	Number
EIA	2016 Q1	14	539
	2016 Q2	30	782
	2016 Q3	36	808
	2016 Q4	27	624
Construction	2020 Q1	34	1,794
	2020 Q2	40	1,710
	2020 Q3	40	1,309
	2020 Q4	30	1,489
	2021 Q1	29	987
	2021 Q2	43	1,240
	2021 Q3	40	1,122
	2021 Q4	39	1,378
	2022 Q1	28	1,145
	2022 Q2	33	1,166
	2022 Q3	41	1,221
	2022 Q4	27	968
	2023 Q1	25	847
	2023 Q2	35	1,222
	2023 Q3	35	1,070
	2023 Q4	39	1,135
	2024 Q1	29	985

ii Phytoplankton

In the same quarter of the EIS period (February 2016), 4 phylum, 45 genus, and 54 species were recorded. Abundance in each station/water layer is between 14,917-40,800 Cells/L. This quarter, compared to the EIS period, 38 genera were newly added, including Chroococcus, Richelia, Trichodesmium, Dinophysis, Diplopsalis, Gonyaulax, Gymnodinium, Genus Lingulodinium, Protoperidinium, Arthrocardia, Bacillaria, Bellerochea, Caloneis, Cerataulus, Diatoma, Oscillatoria, Grammatophora, Gyrosigma acuminatum, Halamphora coffeiformis, Hantzschia, Helicotheca, Lauderia, Leptocylindrus, Lithodesmium, Mastogloia, Muelleria, Pleurosigma, Plagioselmis, Pleurosigma, Proboscia, Psammodictyon, Pseudonitzschia, Romeria, Sellaphora, Stephanopyxis, Surirella Spiralis, Trachyneis, and Triceratium. 8 genera were not recorded this quarter, including Peridinium, Phalacroma, Actinocyclus, Amphora, Asteromphalus, Melosira, Planktoniella Schutt, and Placoma. During the same quarter of the EIS period, *Thalassiosira* spp. was the most dominant algal species. However, the dominant species this quarter is Chaetoceros pseudocurvisetus.

As per the historical data in the offshore construction and operation phases, the species of phytoplankton is between 84-192; and the number is between 62,108-1,814,240 Cells/L. The number of recorded phytoplankton species was the highest in the fourth quarter of 2022 and the lowest in the fourth quarter of 2021. In terms of abundance, the highest record was in this quarter (the first quarter of 2024) and the lowest was in the third quarter of 2020.

The monitoring results showed that the abundance in the construction phase was higher than that in the EIS stage. This may be due to the fact that phytoplankton are susceptible to short-term environmental changes such as currents, water, nutrients, water temperature and sunlight. This results in a greater variation in abundance, so the survey results may vary significantly from site to site. The abundance of this quarter was the highest during the construction phase, influenced by the dominant algal genera, Chaetoceros pseudocurvisetus and Trichodesmium Erythraeum. These two algal species typically appear in clusters, which easily affects the variation in abundance. Continuous monitoring will be carried out to determine if the variations stabilize over time. The species and number of Phytoplankton in the historical surveys are listed as Figure 3.1.1-6 and Table 3.1.1-6.

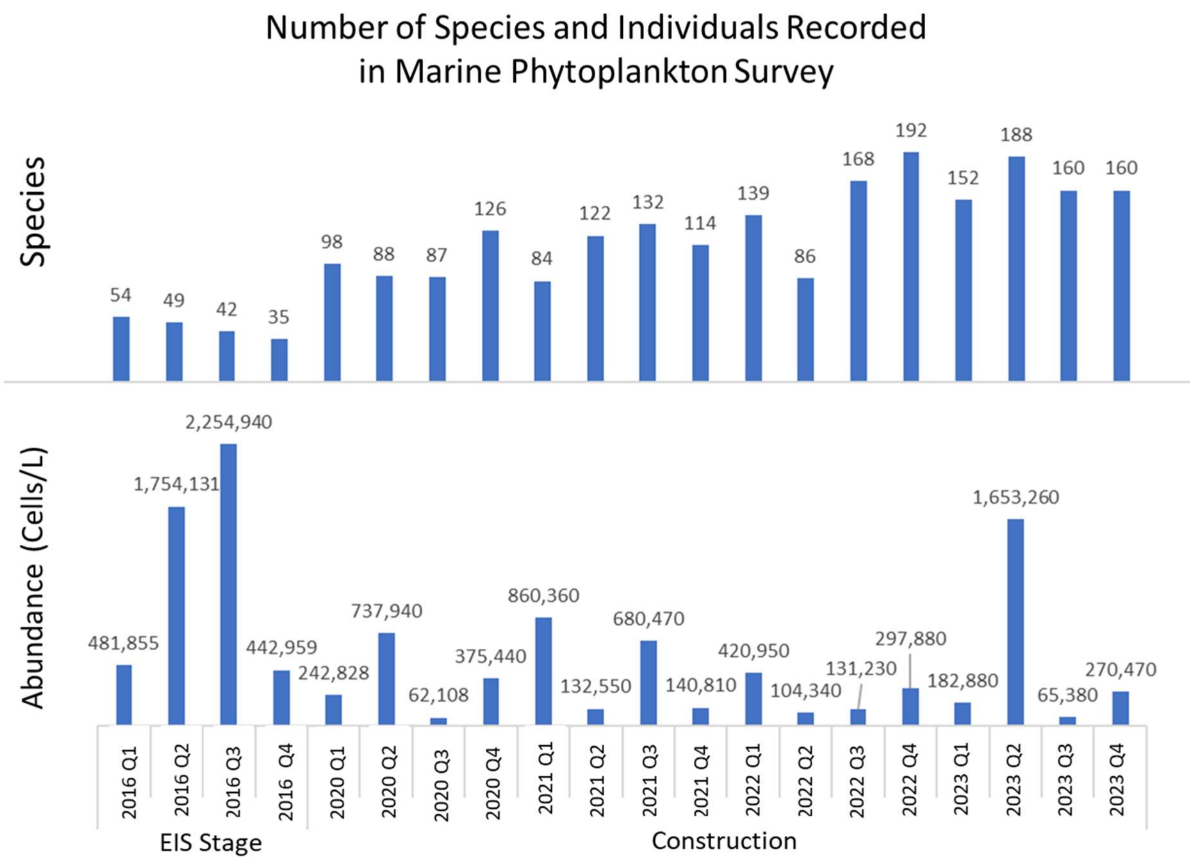


Figure 3.1.1-6 Species and Number of Phytoplankton Recorded in the Historical Surveys

Table 3.1.1-6 Species and Number of Phytoplankton in the Marine Area

Quarter		Species	Number
EIA	2016 Q1	54	481,855
	2016 Q2	49	1,754,131
	2016 Q3	42	2,254,940
	2016 Q4	35	442,959
Construction	2020 Q1	98	242,828
	2020 Q2	88	737,940
	2020 Q3	87	62,108
	2020 Q4	126	375,440
	2021 Q1	84	860,360
	2021 Q2	122	132,550
	2021 Q3	132	680,470
	2021 Q4	114	140,810
	2022 Q1	139	420,950
	2022 Q2	86	104,340
	2022 Q3	168	131,230
	2022 Q4	192	297,880
	2023 Q1	152	182,880
	2023 Q2	188	1,653,260
	2023 Q3	160	65,380
	2023 Q4	160	270,470
	2024 Q1	146	1,814,240

iii Zooplankton

In the same quarter of the EIS period (February 2016), 8 phylum and 26 genres were recorded. Abundance in each station/water layer is between 4,194,797-243,386,736 Cells/L. In comparison with EIS period surveys, 7 Genre were newly recorded this quarter, which are Noctiluca, Comb Jellies, Scyphomedusa, Isopoda, Lucifer, Nemertea Larvae, and Sipuncula Larvae. 1 genre, Euphausia, was not recorded in this survey. The monitoring results showed that the abundance in the EIS stage was higher than that in the construction stage. This may be due to the fact that Phytoplankton are susceptible to short-term environmental changes such as currents, water, nutrients, water temperature and sunlight. This results in a greater variation in abundance, so the survey results may vary significantly from site to site. In order to ensure this tendency is normal, we compared the survey data of other wind farms, and same tendency is found. Species recorded in both quarters are normal zooplankton, with Caudata and Calanoida as the dominant species.

As per the historical data in the offshore construction and operation phases, the genre of Zooplankton is between 12~36; and the number is between 130,645~12,920,105 inds./1,000 m^3. The surveys in 2020 Q2 recorded the most abundance of zooplankton, and 2023 Q3 recorded the least abundance of zooplankton. The species and number of Phytoplankton in the historical surveys are listed as Figure 3.1.1-7 and Table 3.1.1-7.

iv Benthic Organism in the Marine Area

In the same quarter of the EIS period (February 2016), 4 orders, 6 families, and 6 species were recorded. 1-6 individuals were recorded in each station. In comparison with EIS period surveys, 9 species were newly recorded this quarter, including: Diogenidae, Whiskered Velvet Shrimp, Crangon Crangon, Nassariidae, Veneridae, Tellina, Sinaechinocyamus Mai, Corbula Fortisulcata, and Opossum Shrimp. 5 species that were not recorded this quarter include Hermit Crab, Rhinoclavis Sinensis, Nereis, Mactra Nipponica, and Pitar Sulfureum. During the EIS period, there were no dominant species in the same quarter. However, Opossum Shrimp was the dominant species this quarter.

As per the historical data in the offshore construction and operation phases, the species of Benthic Organism is between 4-16; and the abundance is between 7-52. The surveys in 2020 summer recorded the most abundance of Benthic Organism. Benthic Organism only move within a certain area, and the sampling area of bottom trawling is limited. The species and number of Benthic Organism in the historical surveys are listed as Figure 3.1.1-8 and Table 3.1.1-8.

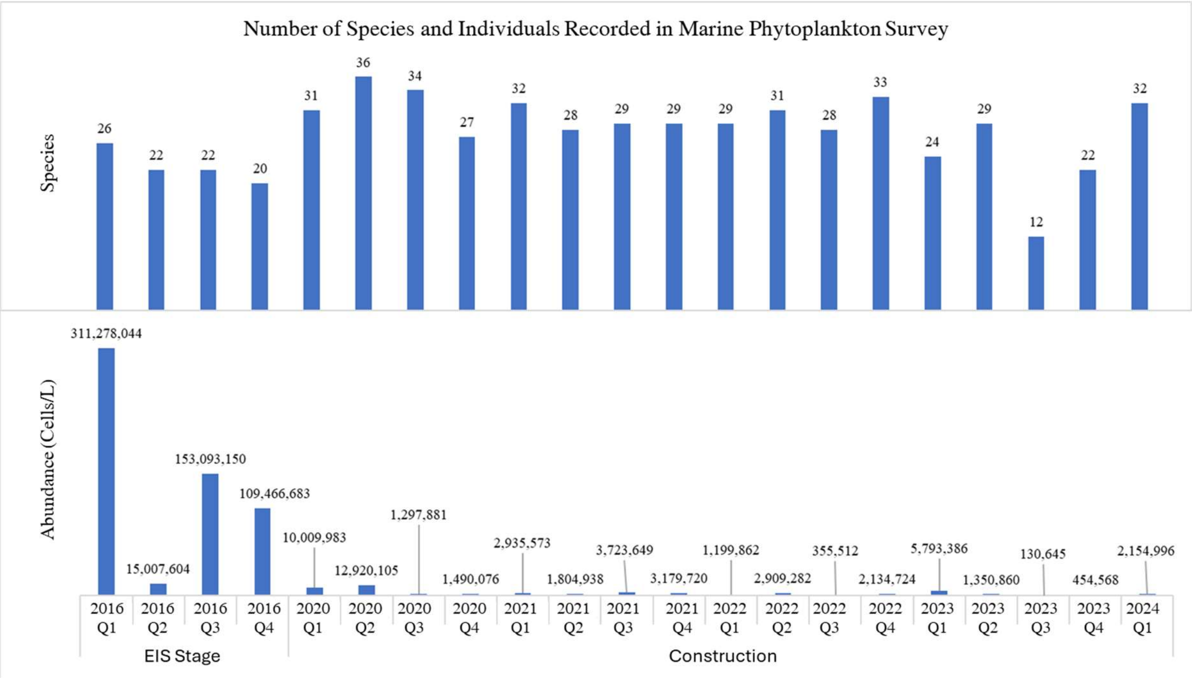


Figure 3.1.1-7 Species and Number of Zooplankton Recorded in the Historical Surveys

Table 3.1.1-7 Species and Number of Zooplankton in the Marine Area

Quarter		Species	Number
EIA	2016 Q1	26	311,278,044
	2016 Q2	22	15,007,604
	2016 Q3	22	153,093,150
	2016 Q4	20	109,466,683
Construction	2020 Q1	31	10,009,983
	2020 Q2	36	12,920,105
	2020 Q3	34	1,297,881
	2020 Q4	27	1,490,076
	2021 Q1	32	2,935,573
	2021 Q2	28	1,804,938
	2021 Q3	29	3,723,649
	2021 Q4	29	3,179,720
	2022 Q1	29	1,199,862
	2022 Q2	31	2,909,282
	2022 Q3	28	355,512
	2022 Q4	33	2,134,724
	2023 Q1	24	5,793,386
	2023 Q2	29	1,350,860
	2023 Q3	12	130,645
	2023 Q4	22	454,568
	2024 Q1	32	2,154,996

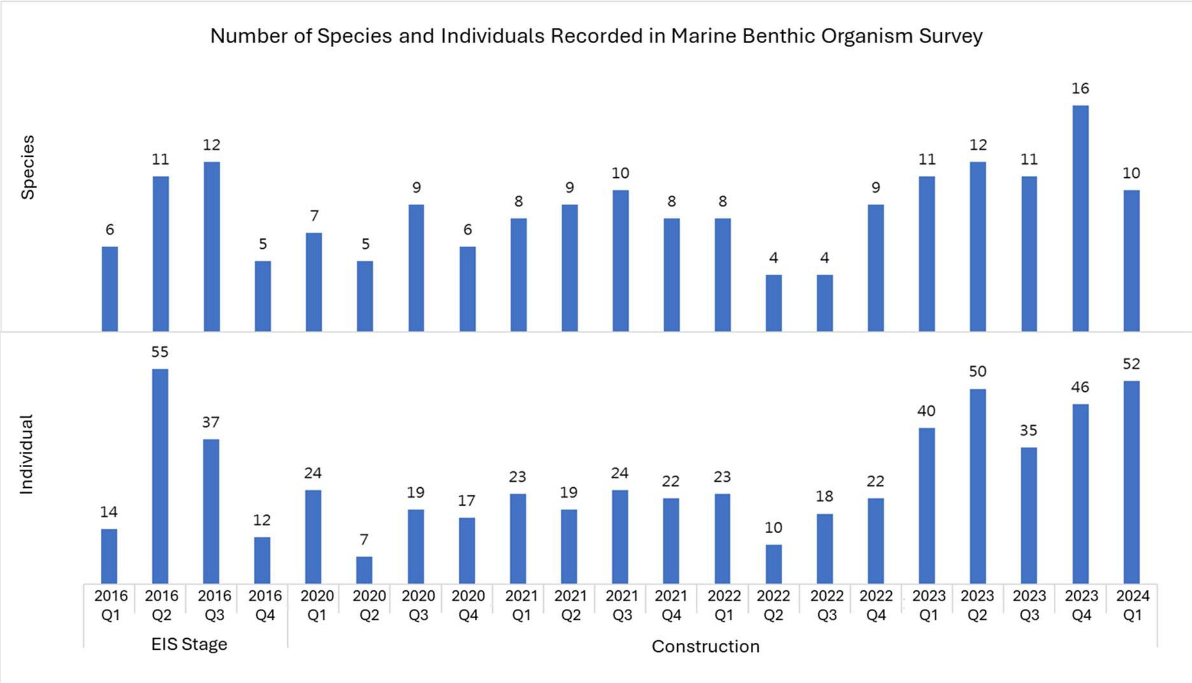


Figure 3.1.1-8 Species and Number of Benthic Organism Recorded in the Historical Surveys

Table 3.1.1-8 Species and Number of Benthic Organism in the Marine Area

Quarter		Species	Number
EIA	2016 Q1	6	14
	2016 Q2	11	55
	2016 Q3	12	37
	2016 Q4	5	12
Construction	2020 Q1	7	24
	2020 Q2	5	7
	2020 Q3	6	14
	2020 Q4	6	17
	2021 Q1	8	23
	2021 Q2	9	19
	2021 Q3	10	24
	2021 Q4	8	22
	2022 Q1	8	23
	2022 Q2	4	10
	2022 Q3	4	18
	2022 Q4	9	22
	2023 Q1	11	40
	2023 Q2	12	50
	2023 Q3	11	35
	2023 Q4	16	46
	2024 Q1	10	52

v Fish

1. Adult Fish

To prevent overlapping with the “Important Habitat of Chinese White Dolphin,” the monitoring locations in the EIS stage and in current stage are different (as shown in Figure 3.1.1-9). As the survey vessel has to keep a safety distance with the working vessels and the turbine foundations, the length of the net and time of capturing are different in the construction phase. The length of the net has been changed from 1,200m to 300m, and the time of capturing has been changed from 3 hours to 1 hour. Also, the sampling water depth is changed from 19m, 18m, 23m (T1, T2, T3) in 2016 to 18m, 22m, 15m (T1, T2, T3) in 2020. These variations have led to the difference in the survey results in the EIS stage and in the offshore construction phase.

The species composition of fish in Taiwan marine area has obvious seasonal change. Therefore, if we want to compare the species composition or changes in the dominant species in different years, we should compare the catches of the same season in different years. This survey result can be compared to the winter surveys in 3 years, which are winter in 2016 (application phase), 2020 to 2021 (construction phase).

As the sampling condition from 2020 to 2022 are identical, the survey results can be compared in a precise manner (Table 3.1.1-9). 225 individuals were recorded in 2016 spring, 58 individuals in 2020 spring, 8 individuals in 2021 spring, 54 in 2022 spring, and 35 in 2023 spring. In this quarter, 59 individuals were recorded. The individuals caught in this survey is less than that caught in summer 2016. It is mainly caused by the length of the net (300m), which is shorter than that used in 2016 (1200m). Also, the net stayed in the water for only 1 hour, which is shorter than the 2016 survey (3 hours). Therefore, the on-effort is only 1/12 (1/4x1/3) of the 2016 survey. 1/12 of the harvest in 2016 (225 individuals) is 18.8 individuals. It is inferred that more individuals were caught in this year (59 individuals) comparing to 2016 spring (18.8 individuals).

This quarter, compared to the survey results from 2016, 2020, 2021, 2022, and 2023, 1 species, Pacific Seabream was added. However, 32 species were not recorded, including White-Spotted Catshark, Spadenose Shark, Chinese Numbfish, Rhynchobatus Immaculatus, Angel Fish, Rhinobatos Schlegelii, Yellow-Spotted Fanray, Bennett's Stingray, Neotrygon Kuhlii, Pale-Edged Stingray, Long-Fin Herring, Japanese Gizzard Shad, Bali Sardinella, Sea Catfish, Giant Catfish, Saurida Elongata, Saurida Undosquamis, Saurida Wanieso, Triplecross Lizardfish, Red Eye Liza, Chelidonichthys Kumu, Crocodile Flathead, Grammoplites Scaber, Sillago Sihama, Common Dolphinfish, Diamond Trevally, Carangoides

Hedlandensis, Megalaspis Cordyla, Black Pomfret, Talang Queenfish, Doublespotted Queenfish, Mene Maculata, Leiognathus Equulus, Secutor Ruconius, Lobotes Surinamensis, Plectorhinchus Flavomaculatus, Silveer Grunt, Saddle Grunt, Acanthopagrus Latus, Acanthopagrus Pacificus, Fourfinger Threadfin, Sixfinger Threadfin, Blackmouth Croaker, Reeve's Croaker, Belanger's Croaker, Bearded Croaker, Johnius Distinctus, J. Trewavasae, Big-Head Pennah Croaker, Pennahia Pawak, Snubnose Chub, Drepane Punctata, Ichthyscopus Lebeck, Ephippus Orbis, Orbicular Batfish, Tiera Batfish, Scatophagus Argus, Black-Spot Surgeonfish, Trichiurus Japonicus, Silverfish, Spaniard, Spotted Spanish Mackerel, Psenes Cyanophrys, Silver Pomfret, Deep Flounder, One-Spot Flounder, Fringefin Zebra Sole, Tonguefish, Twoline Tonguesole, Bloch's Tonguesole, and Triacanthus Biaculeatus. The individuals caught in this survey is less than that caught in spring 2016. It is mainly caused by the length of the net (300m), which is shorter than that used in 2016 (1,200m). Also, the net stayed in the water for only 1 hour, which is shorter than the 2016 survey (3 hours). The other cause contributing to this phenomenon is the sampling location. The sampling location in 2016 was closer to shore, while the location in this survey is further. Generally speaking, density of fish population is higher in the marine area closer to shore.

In addition, regarding fish species recorded in this quarter were also recorded in 2016, 2020, 2021 2022, and 2023 spring, no species were recorded in the spring of all 6 years. Commonly seen non-seasonal travelling species such as Spotted Catfish and Big-Head Pennah Croaker were recorded in 3 of the 5 years (2021, 2022 and 2023). This shows that in the same season, the species composition of fish in the Yunlin OWF is similar even in different years. In addition to factors such as season and month, interviews with local fishers also suggested that fish catch and species captured are affected by marine conditions such as temperature, tides, sea currents, and turbidity.

Overall, the fish species recorded in the wind farm area since the beginning of the EIA survey and up to this season were mostly economic fish common in the west coast of Taiwan, indicating that the changes in fish catches and species composition are closely related to local fishery economic activities. Therefore, long-term studies on the species composition and fish catch in the sample area are needed to understand the changes in local fishery resources and their possible causes.

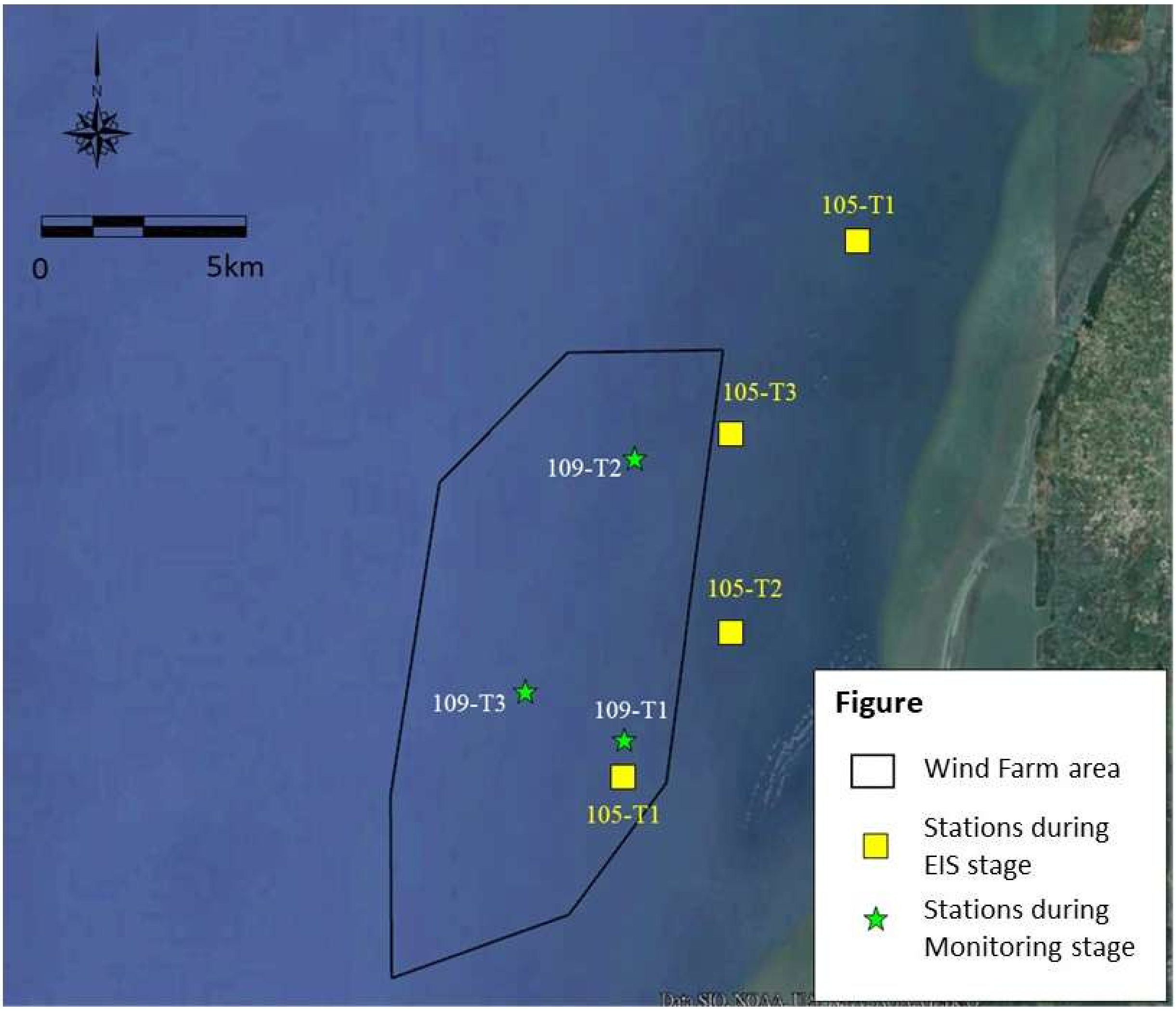


Figure 3.1.1-9 Sampling Stations of Fish Survey in the EIS stage and the Construction phase

Table 3.1.1-9 Historical Surveys on Adult Fish (Spring)

Year			2016	2020	2021	2022	2023	2024
Sampling Date			2016.3.4	2020.5.7	2021.3.11	2022.3.10	2023.3.9	2024.3.16
Family	Scientific Name	Chinese Name	No.	No.	No.	No.	No.	No.
Hemiscylliidae	*Chiloscyllium plagiosum*	條紋狗鯊					1	
Carcharhinidae	*Scoliodon laticaudus*	寬尾斜齒鯊		1				
Narcinidae	*Narcine lingula*	舌形雙鰭電鱝				1		
Rhynchobatidae	*Rhynchobatus immaculatus*	無斑龍紋鱝					1	
Rhinobatidae	*Rhinobatos hynnicephalus*	斑紋琵琶鱝		2				
Rhinobatidae	*Rhinobatos schlegelii*	薛氏琵琶鱝					1	
Platyrhinidae	*Platyrhina tangi*	湯氏黃點鯆		2			3	
Dasyatidae	*Hemitrygon bennettii*	黃魟				1		
Dasyatidae	*Neotrygon kuhlii*	古氏新魟		3			2	
Dasyatidae	*Telatrygon zugei*	尖嘴魟		3				
Pristigasteridae	*Ilisha elongata*	長鰳	1					
Pristigasteridae	*Ilisha melastoma*	黑口鰳		1		1		5
Engraulidae	*Thryssa hamiltonii*	漢氏稜鯷				20		1
Clupeidae	*Nematalosa japonica*	日本海鰶			1			
Ariidae	*Arius maculatus*	斑海鯰		1	4	2	1	1
Synodontidae	*Saurida elongata*	長體蛇鯔					10	
Synodontidae	*Saurida wanieso*	鱷蛇鯔		3				
Triglidae	*Chelidonichthys kumu*	黑角魚				1		
Platycephalidae	*Cociella crocodilus*	點斑鱷牛尾魚					1	
Platycephalidae	*Grammoplites scaber*	橫帶棘線牛尾魚		2			2	
Carangidae	*Carangoides hedlandensis*	海蘭德若鰺				1		
Carangidae	*Megalaspis cordyla*	大甲鰺	9					
Carangidae	*Scomberoides commersonnianus*	大口逆鉤鰺				1		
Haemulidae	*Pomadasys kaakan*	星雞魚					4	6
Sparidae	*Acanthopagrus pacificus*	太平洋棘鯛						3
Polynemidae	*Eleutheronema rhadinum*	多鱗四指馬鮁				5		8
Polynemidae	*Polydactylus sextarius*	六指多指馬鮁	34					
Sciaenidae	*Atrobucca nibe*	黑鰔	22					
Sciaenidae	*Chrysochir aureus*	黃金鰭鰔	2				1	
Sciaenidae	*Johnius distinctus*	鱗鰭叫姑魚	132			1	3	18
Sciaenidae	*Pennahia macrocephalus*	大頭白姑魚	20	1	2	16		8
Sciaenidae	*Pennahia pawak*	斑鰭白姑魚		16				
Uranoscopidae	*Ichthyscopus lebeck*	披肩騰		3				
Ephippidae	*Ephippus orbis*	圓白鯧		20				
Nomeidae	*Psenes cyanophrys*	玻璃玉鯧			1			
Stromateidae	*Pampus cinereus*	灰鯧				2		9
Paralichthyidae	*Pseudorhombus oligodon*	少牙斑鮃					1	
Soleidae	*Zebrias zebra*	條鰨					1	
Cynoglossidae	*Cynoglossus arel*	大鱗舌鰨				1		
Cynoglossidae	*Cynoglossus bilineatus*	雙線舌鰨					3	
Triacanthidae	*Triacanthus biaculeatus*	雙棘三棘魨				1		
Tetraodontidae	*Takifugu niphobles*	黑點多紀魨	5					
Individual			225	58	8	54	35	59
Species			8	13	4	14	15	9

2. Fish Egg and Fish Larva

Spring survey result during the offshore construction and operation phases is compared to the spring survey conducted in the EIS stage. As there were 12 survey stations in the EIS stage but only 5 in this survey, the sampling frequency of the two surveys are very different. Therefore, only the species with higher abundance were compared, as shown in Table 3.1.1-10.

In March 2016 (spring), 608 eggs and 27 fish larva were collected. For the composition, 10 families and 14 genre and 1 unknown genre were identified (total abundance 813 egg/100 m^3), with White Seabream as the dominant species, followed by Bombay Duck, Japanese Anchovy, Hamilton's Thryssa, and Bloch's Tonguesole. For fish larva, 8 families and 9 genre were identified (total abundance 39 ind./100 m^3). However, Acanthopagrus pacificus was the most abundant species, followed by Clupeidae sp., with the species dominance being relatively apparent.

In April 2020 (spring), 15 eggs and 92 fish larva were collected. For the composition, 5 families and 5 genre were identified (total abundance 55 egg/100 m^3), with Secutor Ruconius as the dominant species, followed by Grouper and Bombay Duck. Species dominance was evident. For fish larva, 18 families and 24 genre and 1 unknown genre were identified (total abundance 423 ind./100 m^3), with Needleskin Queenfish as the most dominant, followed by Bensasi Goatfish, Jarbua Terapon, and Skinnycheek Lanternfish.

In May 2021 (Spring), 62 eggs and 3 fish larva were collected. For the egg composition, 7 families and 8 genre were identified (total abundance 44 egg/100 m^3), with Mene Maculata as the most dominant species, followed by Kawakawa. For fish larva, 3 families and 3 genre (total abundance 3 ind./100 m^3), including Shrimp Scad, Oil Fish, and Upeneus Japonicus.

In April 2022 (spring), 63 eggs and 75 fish larva were collected. For the egg composition, 4 family and 4 genre and 1 unknown genre were identified (total abundance 57 egg/100 m^3), with Tonguefish as the most dominant species, followed by Crocodile Flathead. For fish larva, 15 families and 16 genre (total abundance 80 ind./100 m^3), including Slender Whipfin Mojarra, Chelon Macrolepis, and Gobiidae.

In April 2023 (spring), 32 eggs and 4 fish larva were collected. For the composition, 5 family and 5 genre and 1 unknown genre were identified (total abundance 28 egg/100 m^3), with Dussumier's Anchovy as the most dominant species, followed by Orange Spotted Grouper. For fish larva, 2 families and 2 genre were identified (total abundance 4 ind./100 $m^{3)}$, including Chelon Macrolepis and Sillago asiatica.

In April 2024 (spring), 194 eggs and 130 fish larva were collected. For the composition, 10 families and 11 genre were identified (total abundance 270 egg/100 m^3), with Silver Grunt as the dominant species, followed by Moolgarda perusii and Kumococius rodericensis. For fish larva, 7 families and 8 genre were identified (total abundance 163 ind./100 $m^{3)}$, with Gerres limbatus as the most dominant species, followed by Sardinella gibbose and Sillago asiatica.

Compared to the environmental assessment phase, there is a downward trend in the number of fish eggs or species, while the abundance of larvae in this season has increased. However, the number of species is also decreasing. This result may be influenced by the differences in sampling months and the reduced number of sampling stations. Additionally, sampling errors may contribute to the variability in the abundance of fish eggs and larvae, as they are often distributed in patch similar to planktonic organisms, making their capture highly variable. Furthermore, changes in the aggregation structure and spatial distribution of larvae are influenced by short-term factors such as local variations in ocean currents, upwelling events, or unstable currents. Additionally, the data accumulated over only four years may reflect short-term trends, and longer-term monitoring is needed to confirm these trends. When comparing the results from the winter seasons during the environmental assessment period with the current construction phase, there are no species that were repeatedly captured in both fish eggs and larvae, and the dominant species are also different.

Table 3.1.1-10 Composition and Abundance of Fish Egg in Historical Spring Surveys (1/2)

Taxa\Station	Chinese Name	2016/05	2020/04	2021/05	2022/04	2023/04	2024/04
Ammodytidae							
Ammodytidae sp.	玉筋魚科			1			
Carangidae							
Megalaspis cordyla	大甲鰺			3			
Scomberoides tol	托爾逆鈎鰺			1			9
Clupeidae							
Dussumieria elopsoides	黃帶圓腹鯡	7					
Nematalosa japonica	日本海鰶	2					
Sardinella gibbosa	隆背小沙丁魚	18					
Coryphaenidae							
Coryphaena hippurus	鬼頭刀			3		1	
Cynoglossidae							
Paraplagusia blochii	布氏鬚鰨	29			26		
Engraulidae							
Engraulis japonicus	日本鯷	98					
Stolephorus commersonnii	康氏側帶小公魚						32
Thryssa dussumieri	杜氏稜鯷					13	
Thryssa hamiltonii	漢氏稜鯷	31	4				
Thryssa kammalensis	赤鼻稜鯷	3					
Haemulidae							
Pomadasys kaakan	星雞魚	29					94
Pomadasys maculatus	斑雞魚				5		
Leiognathidae							
Secutor ruconius	仰口鰏		21				
Menidae							
Mene maculata	眼眶魚			18			30
Mugilidae							
Chelon macrolepis	大鱗龜鮻				2		11
Liza haematocheila	龜鮻	1					
Moolgarda perusii	佩氏莫鯔						44
Moolgarda sp.	莫鯔屬			1			
Muraenidae							
Gymnothorax sp.	裸胸鯙屬		4				
Muraenidae sp.	鯙科			1			
Echidna polyzona	多環蝮鯙						2

Table 3.1.1-10 Composition and Abundance of Fish Egg in Historical Spring Surveys (2/2)

Taxa\Station	Chinese Name	2016/05	2020/04	2021/05	2022/04	2023/04	2024/04
Ophichthidae							
Brachysomophis cirrocheilos	鬚唇短體蛇鰻	2					
Platycephalidae							
Cociella crocodila	點斑鱷牛尾魚				23		
Kumococius rodericensis	凹鰭牛尾魚						41
Platycephalus indicus	印度牛尾魚	4					
Psettodidae							
Psettodes erumei	大口鰜						2
Scombridae							
Euthynnus affinis	巴鰹			16			
Sarda orientalis	東方齒鰆					2	
Serranidae							
Epinephelus coioides	點帶石斑魚		18			11	
Diploprion bifasciatum	雙帶鱸						2
Sparidae							
Acanthopagrus berda	灰鰭棘鯛	395					
Synodontidae							
Harpadon nehereus	印度鐮齒魚	162	8				
Trachinocephalus myops	準大頭狗母魚						3
Trichiuridae							
Trichiurus lepturus	白帶魚	8					
Trichiurus sp.	帶魚屬					1	
unknown							
unknown	unknown	24			1		
Total		**813**	**55**	**44**	**57**	**28**	**270**
No. of Families		9	5	7	4	5	10
No. of Taxa		14	5	8	4	5	11
Actual No. of Fish Eggs Collected		**551**	**15**	**62**	**63**	**32**	**194**

Table 3.1.1-11 Composition and Abundance of Fish Larva in Historical Winter Surveys (1/2)

Taxa\Station	Chinese name	2016/11	2021/01	2022/02	2023/02	2024/01
Ambassidae						
Ambassis sp.	雙邊魚屬			12		
Blenniidae						
Omobranchus sp.	肩鰓鳚屬	2				
Parablennius yatabei	八部副鳚				1	
Bregmacerotidae						
Bregmacerotidae sp.	海鰗鰍科	1				
Carangidae						
Scomberoides tol	托爾逆鉤鰺				2	
Engraulidae						
Encrasicholina heteroloba	異葉半稜鯷	2				
Encrasicholina punctifer	銀灰半稜鯷					2
Latidae						
Lates calcarifer	尖吻鱸	1				
Mugilidae						
Chelon affinis	前鱗龜鮻					1
Chelon sp.	龜鮻屬				5	
Mullidae						
Upeneus japonicus	日本緋鯉	1		7		17
Myctophidae						
Diaphus sp.	眼眶魚屬		2			
Paralichthyidae						
Pseudorhombus arsius	大齒斑鮃			2		
Pentacerotidae						
Histiopterus typus	帆鰭魚	1				
Pomacentridae						
Neopomacentrus cyanomos	藍黑新雀鯛			3		
Sciaenidae						
Chrysochir aureus	黃金鰭(魚或)	2				
Scorpaenidae						
Scorpaenidae sp.	鮋科	1				
Sillaginidae						
Sillago sihama	多鱗沙鮻	3		3	2	
Sparidae						
Acanthopagrus sp.	棘鯛屬		2			
Acanthopagrus taiwanensis	臺灣棘鯛			2		

Table 3.1.1-11 Composition and Abundance of Fish Larva in Historical winter Surveys (2/2)

Taxa\Station	Chinese name	2016/11	2021/01	2022/02	2023/02	2024/01
Evynnis cardinalis	紅鋤齒鯛					
Synodontidae			1			2
Trachinocephalus myops	準大頭狗母魚	1				
Terapontidae						
Pelates quadrilineatus	四帶牙鯻	1				
Terapon jarbua	花身鯻	3				
Abundance (ind./100m^3)		**19**	**5**	**29**	**10**	**22**
Taxa		11	2	6	4	4
Genre		12	3	6	4	4
Actual eggs collected		**20**	**5**	**13**	**8**	**16**

vi Underwater filming

Underwater filming was conducted via ROV since 2022 May. So far, 3 surveys were conducted. Since the marine area in western Taiwan is mostly sand substrate, which makes the filming difficult. The turbine foundation and the scouring protection may increase the biodiversity. However, as conducted during or right after the scouring protection construction, no species were recorded in the first survey. In the third survey, the weather was not ideal, and only few filming records were obtained. Historical survey results are shown as Table 3.1.1-12.

In the first survey (May 10-12 2022, 9 WTG), 2 orders, 12 families and 16 species were recorded. The species resource table is shown as Table 3.1.1-12. A group of Stromateidae swam by in the first survey, therefore YUN64 recorded the most Stromateidae. In the first survey, no species were recorded in YUN38, 1-9 species were recorded in the rest of the locations. YUN37 and YUN53 recorded the most species.

In the second survey (August 17-18 2022, 6 WTG), 2 orders, 2 families and 2 species were recorded. The species resource table is shown as Table 3.1.1-12. No species were recorded in YUN49, YUN57, YUN78 and YUN79, 1 species were recorded in the rest of the locations.

In the third survey (February 12-13 2023, 5 WTG), 2 orders, 2 families and 2 species were recorded. The species resource table is shown as Table 3.1.1-12. No species were recorded in YUN50, YUN71, YUN 73 and YUN77. 2 species were recorded at the bottom layer of YUN63.

In the fourth survey (September 19-20 2023, 5 WTG), 1 orders, 4 families and 4 species were recorded. The species resource table is shown as Table 3.1.1-12. 1 *Plectorhinchus cinctus*, 6 *Abudefduf vaigiensis*, 8 *Pterocaesio digramma* were observed in the middle layer and 1 Apogonidae were observed in the bottom layer of YUN20; 7 *Pterocaesio digramma* were observed in the middle layer of YUN62. No species were recorded in YUN12, YUN21 and YUN74.

Conclusion: During the piling and assembly processes, frequent human and vessel activities may cause marine organisms to flee, which is considered a normal response. Once precursor species stabilize and grow, they will gradually attract fish for foraging. In the operation phase, the aggregation effect of artificial fish reefs will lead to higher numbers and species diversity around the turbine foundations compared to areas outside the wind farm. However, it is important to note that various human activities may potentially impact the ecology, necessitating ongoing long-term monitoring to understand the project's effects on the ecological environment.

Table 3.1.1-12 Fish Species Composition in the Historical Underwater Filming Surveys

Foundation NO.				YUN37		YUN38		YUN42		YUN51		YUN52		YUN53		YUN64		YUN76		YUN80		YUN43		YUN45		YUN49		YUN57		YUN78		YUN79	
Foundation Completed on				2021.07.10		2021.02.21		2021.06.16		2021.05.04		2021.05.29		2020.11.19		2021.06.09		2021.03.16		2021.02.07		2021.09.18		2021.10.05		2021.09.22		2021.09.30		2021.06.25		2021.06.13	
Underwater filming conducted on				2022.05.10-12																		2022.08.17-18											
Order	Family	Chinese name	Scientific name	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom
Decapoda	Penaeidae	對蝦科	Gen. sp. (Penaeidae)																		5												
Perciformes	Haemulidae	石鱸科	Gen. sp. (Haemulidae)		1				1		2	2			2																		
		花尾胡椒鯛	Plectorhinchus cinctus		1																												
		密點少棘胡椒鯛	Diagramma pictum		7																				1								
	Sphyraenidae	金梭魚科	Gen. sp. (Sphyraenidae)		5										1				2														
	Nemipteridae	伏氏眶棘鱸	*Scolopsis vosmeri*		2								1		1																		
	Siganidae	褐臭肚魚	*Siganus fuscescens*		2																												
	Lutjanidae	勒氏笛鯛	*Lutjanus russellii*		1																												
	Pomacentridae	藍黑新雀鯛	*Neopomacentrus cyanomos*												1																		
	Labridae	裂唇魚	*Labroides dimidiatus*												3																		
		藍豬齒魚	*Choerodon azurio*									2			1																		

Table 3.1.1-12 Fish Species Composition in the Historical Underwater Filming Surveys

Foundation NO.				YUN37		YUN38		YUN42		YUN51		YUN52		YUN53		YUN64		YUN76		YUN80		YUN43		YUN45		YUN49		YUN57		YUN78		YUN79	
Foundation Completed on				2021.07.10		2021.02.21		2021.06.16		2021.05.04		2021.05.29		2020.11.19		2021.06.09		2021.03.16		2021.02.07		2021.09.18		2021.10.05		2021.09.22		2021.09.30		2021.06.25		2021.06.13	
Underwater filming conducted on				2022.05.10-12																		2022.08.17-18											
Order	Family	Chinese name	Scientific name	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom
Perciformes	Serranidae	鮨科	Gen. sp. (Serranidae)						1						1																		
		點帶石斑魚	*Epinephelus coioides*		1				2						2																		
	Stromateidae	鯧科	Gen. sp. (Stromateidae)													6	10																
	Blenniidae	鳚科	Gen. sp. (Blenniidae)		1																												
	Gobiidae	鰕虎科	Gen. sp. (Gobiidae)										4		2																		
Myliobatiformes	Dasyatidae	魟	*Hemitrygon* sp.																				1										
Total				0	21	0	0	0	4	0	2	4	5	0	14	6	10	0	2	0	5	0	1	0	1	0	0	0	0	0	0	0	0

Table 3.1.1-12 Fish Species Composition in the Historical Underwater Filming Surveys

Foundation NO.				YUN50		YUN63		YUN71		YUN73		YUN77	
Foundation Completed on				2022.08.08		2022.07.02		2022.09.18		2022.08.16		2022.10.03	
Underwater filming conducted on				2023.02.12-13									
Order	Family	Chinese name	Scientific name	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom
Perciformes	Haemulidae	花尾胡椒鯛	*Plectorhinchus cinctus*				2						
	Oplegnathidae	條石鯛	*Oplegnathus fasciatus*				1						
Total				0	0	0	3	0	0	0	0	0	0

Table 3.1.1-12 Fish Species Composition in the Historical Underwater Filming Surveys

Foundation NO.				YUN12		YUN20		YUN21		YUN62		YUN74	
Foundation Completed on				2023.05.22		2023.05.14		2023.05.05		2023.05.18		2022.08.23	
Underwater filming conducted on				2023.09.19~20									
Order	Family	Chinese name	Scientific name	middle	bottom	middle	bottom	middle	bottom	middle	bottom	middle	bottom
Perciformes	Haemulidae	花尾胡椒鯛	*Plectorhinchus cinctus*			1							
	Pomacentridae	條紋豆娘魚	*Abudefduf vaigiensis*			6							
	Caesionidae	雙帶鱗鰭烏尾鮗	*Pterocaesio digramma*			8				7			
	Apogonidae	天竺鯛科	Gen. sp. (Apogonidae)				1						
Total						15	1			7			

IV. Underwater Acoustic Survey of Cetacean Ecology

The underwater acoustic survey was conducted from March 2019 to February 2020, and the survey was completed in all seasons of the year before the offshore construction in March 2020. The Project has entered the construction and operation phases in July 2023. Survey result in every quarter is shown as Table 3.1.1-13 to Table 3.1.1-14 and Figure 3.1.1-10. Day/night distribution of the detections is shown as Figure 3.1.1-11 and Figure 3.1.1-12. The analysis is as follows.

i Number detected in each station/quarter

1. Whistles

In terms of the overall annual analysis in 2018, Q2 (June to August) had more detections, followed by Q1 (March to May) and Q4 (December to February), while Q3 (September to November) had relatively fewer whistle detections. It is inferred that cetacean activities are relatively higher in summer, followed by spring and winter.

If we compare the whistles at each location, YW-1, YW-2, and YW-3 have more whistles, while YW-4 and YW-5 have the least whistles, indicating that there are more cetaceans in the north than in the south, and more near shore than far shore.

In terms of the overall annual analysis in 2019, Q2 (June to August) had more detections, followed by Q1 (March to May) and Q4 (December to February), while Q3 (September to November) had relatively fewer whistle detections. It is inferred that cetacean activities are relatively higher in summer, followed by spring and winter.

If we compare the whistles at each location, YW-1, YW-2, and YW-3 have more whistles, while YW-4 and YW-5 have the least whistles, indicating that there are more cetaceans in the north than in the south, and more near shore than far shore.

In terms of the overall annual analysis in 2020, Q4 (December to February) had more detections, followed by Q3 (September to November), while no whistle was detected in Q1 (March to May) and Q2 (June to August). It is inferred that cetacean activities are relatively higher in winter, followed by fall.

If we compare the whistles at each location, YW-4 have more whistles, followed by YW-3 and YW-1, while YW-2, have the least whistles, indicating that there are more cetaceans in the center and the north parts, and more in the far shore than near shore.

In terms of the overall annual analysis in 2021, YW-3 and YW-4 have more whistles. YW-4 had more detection, and YW-1, YW-2 and YW-5 had no detection. In Q2 (June-August), whistles were detected in YW-3, but no whistles were detected in YW-1, YW-2, YW-4 and YW-5. In Q3 (September-November), no whistle is detected in YW-1 to YW-5. This indicates that there are more cetaceans in the middle of the wind farm, and more near shore than far shore.

In terms of the overall annual analysis in 2022, Q4 (December-February) had more detection, followed by Q1 (March-May) and Q2 (June-August). No whistles were detected in Q3 (September-November). This indicates that winter may have the highest cetacean activities.

If we compare the whistles at each location, YW-4 and YW-5 have more whistles, while YW-3 has the least whistles, indicating that there are more cetaceans in the center part, and more in the far shore than near shore.

In 2023 Q1 (March-May), no whistle was detected. In Q2 (June-August), whistles were detected in YW-1, No whistles were detected in YW-2 to YW-5. In Q3 (September-November), whistles were detected in YW-5, No whistles were detected in YW-1 to YW-4. In Q4 (December-February), YW-1 to YW-5 had more detections. The overall analysis suggests that the cetacean activity in this area is highest during winter.

In the first quarter (March-May) of 2024, whistles were detected at YW-1-YW-5.

2. Clicks

In terms of the overall analysis results in 2019, Q4 (December to February) had more detections, followed by Q1 (March to May), while Q2 and Q3 (June to November) had fewer detections of clicks. From the detection data, it seems that the cetaceans are mainly foraging or surveying the environment in these waters in winter. If we compare the surveying points, YW-3 has the most clicks and YW-4 has the least clicks.

In terms of the overall analysis results in 2020, Q4 (December to February) had more detections, followed by Q1 (March to May), while Q2 and Q3 (June to November) had fewer detections of clicks. From the detection data, it seems that the cetaceans are mainly foraging or surveying the environment in these waters in winter. If we compare the surveying points, YW-3 has the most clicks and YW-4 has the least clicks.

In terms of the overall analysis results in 2021, Q4 (December to February) had more detections, followed by Q2 (June to August) and Q3 (September to November), while Q1(March to May) had fewer detections of clicks.

From the detection data, it seems that the cetaceans are mainly foraging or surveying the environment in these waters in winter, followed by summer. If we compare the surveying points, YW-4 has the most clicks, followed by YW-5, YW-3, while YW-1 has the least clicks.

In terms of the overall analysis results in 2022, Q4 (December to February) had more detections, followed by Q2 (June to August), while Q3 (September to November) had fewer detections of clicks. From the detection data, it seems that the cetaceans are mainly foraging or surveying the environment in these waters in winter, followed by summer. If we compare the surveying points, YW-4 has the most clicks, while YW-1 has the least clicks. This indicates that winter may have the highest cetacean activities, including foraging and environmental detection.

In 2023 Q1 (March-May), no click was detected. In Q2 (June-August), no whistles were detected in all stations. In Q3 (September to November). In Q3 (September-November), clicks were detected in YW-5, No whistles were detected in YW-1 to YW-4. In Q4 (December-February), YW-1 to YW-5 had more detections. The overall analysis suggests that the cetacean activity in this area is highest during winter. Based on the detection data from Q1 to Q4, it appears that YW-5 has the highest occurrence of clicks, followed by YW-4. Through the detection data, it is evident that cetacean are primarily active in this area during the winter season, likely for foraging or environmental exploration purposes.

In the first quarter (March-May) of 2024, clicks were only detected at YW-3.

ii Day/night distribution

1. Whistles

In 2019, for YW-1 in the four quarters, the whistles mainly distributed in the daytime; for YW-2 station in Q1 and Q2, whistles were mainly detected the daytime; for the Q3 and Q4, no obvious day and night distribution is observed. For YW-3, 4, 5, no obvious day and night difference is found for whistle distribution.

In 2020, for YW-1 in Q1 and Q2, no obvious day and night difference is found for whistle distribution and the whistles mainly distributed in the daytime in Q3 and Q4. No obvious difference in daytime/nighttime was found in YW-2, 4, 5. Whistles detected in YW-3 were mostly in daytime.

In 2021, no obvious difference in daytime/nighttime was found in Q1 and Q2. Whistles were detected in YW-3 in Q3, and the whistles mainly distributed in nighttime. In Q4, whistles were detected in YW-1 to YW-4, and the whistles mainly distributed in nighttime. No obvious daytime/nighttime distribution is found.

In 2022, no obvious difference in daytime/nighttime was found in Q2-Q3, in Q1, whistles were detected mostly in daytime in YW-3. In Q4, whistles were detected in all stations, and the whistles were detected mostly in nighttime. No obvious difference in daytime/nighttime was found.

In 2023 Q1 (March-May), no whistle was detected. No obvious difference in daytime/nighttime was found. In Q2 (June-August), whistles were detected in YW-1, No whistles were detected in YW-2 to YW-5. Most whistles were recorded in nighttime. In Q3 (September-November), whistles were detected in YW-5, No whistles were detected in YW-1 to YW-4. No obvious difference in daytime/nighttime was found. In Q4, whistles were detected in YW-1 to YW-5. At YW-1, YW-2, YW-4, and YW-5, whistles were primarily recorded during the evening and nighttime, while at YW-1 and YW-2, whistles were also detected during midday.

In the first quarter of 2024, whistles were detected at YW-1 to YW-5, which were primarily recorded during daytime.

2. Clicks

In 2019, for YW-1, 3, 4, 5, no obvious difference in day and night distribution was observed; clicks in YW-2 mainly distributed in the daytime. The number of detections in the rest of the season is low, no obvious difference in day and night distribution is observed.

In 2020, YW-1 to YW-5 did not observe obvious difference in day and night distribution.

In 2021, no click is detected in YW-1 to YW-5 in Q1. In Q2, no obvious daytime/nighttime distribution is found from YW-1 to YW-3, and clicks in YW-4 and YW-5 mostly distributed in daytime. In Q3 2021, clicks were detected in YW-3 but not in YW-1, YW-2, YW-4 and YW-5. No obvious daytime/nighttime distribution is found.

In 2022 Q3, no click was detected in all stations. In Q4, clicks were detected in all stations and mostly in nighttime. No obvious daytime/nighttime distribution is found.

In 2023 Q1 (March-May), no click was detected. In Q2 (June-August), no clicks were detected in all stations, with no differences in day/night distribution. In Q3 (September-November), clicks at the YW-5 station were primarily recorded during daytime. In Q4, clicks at YW-4 and YW-5 were mainly detected during the evening and nighttime. In addition, the YW-4 and YW-5 stations recorded clicking sounds 6 hours before high tide. This season, the overall trend for cetaceans shows that their activity is mainly distributed 2 to 4 hours before high tide and 3 to 6 hours after high tide.

In the first quarter of 2024, clicks were only detected at YW-3, which were primarily recorded during daytime.

Based on previous years of cetacean underwater acoustic data, YW-3 is probably the area where cetaceans are more active or foraging more often than other areas. YW-4, on the other hand, is the least active area. Cetaceans travelling around (whistles) mainly in the spring and summer, and they forage (clicks) more frequent in the winter. The daytime and nighttime activities of cetaceans are mainly during the daytime and there is no significant difference of distribution regarding tidal change.

Table 3.1.1-13 Whistle Detection in each Quarter (1/3)

Quarter		Station	Detected days	Detected times	Hours recorded/ per day Ratio note 1	Contact rate note2 (time/hour)
1 year before offshore construction	2019 Q1	YW-1	14.00	8,045	6.208	54.00
		YW-2		1,675	3.208	21.76
		YW-3		7,064	9.792	30.06
		YW-4		116	0.792	6.10
		YW-5		2,652	4.583	24.11
	2019 Q2	YW-1	14.00	19,974	8.625	96.49
		YW-2	8.71	11,828	3.625	135.95
		YW-3	14.00	14,776	9.958	61.83
		YW-4	7.96	5,873	3.875	63.15
		YW-5	14.00	14,685	7.708	79.38
	2019 Q3	YW-1	14.00	2,011	8.708	9.62
		YW-2	10.08	1,594	5.458	12.17
		YW-3	14.00	5,431	9.000	25.14
		YW-4	7.67	1,716	1.583	45.17
		YW-5	14.00	516	2.125	10.12
	2019 Q4	YW-1	15.00	2,418	8.625	11.68
		YW-2		13,560	14.208	39.77
		YW-3		8,369	3.458	100.84
		YW-4		1,739	6.083	11.91
		YW-5		3,538	3.708	39.76

Note 1: “Hours recorded/ per day Ratio” refers to hours with whistles detected/24 hours.

Note 2: “Contact rate” refers to whistles detected/ hours with whistles detected.

Table 3.1.1-13 Whistle Detection in each Quarter (2/3)

Quarter		Station	Detected days	Detected times	Hours recorded/ per day Ratio note 1	Contact rate note2 (time/hour)
offshore construction	2020 Q1	YW-1	14.00	3,569	3.583	41.50
		YW-2		1,600	4.917	13.56
		YW-3		854	3.000	11.86
		YW-4		1,044	3.458	12.58
		YW-5		2,089	3.875	22.46
	2020 Q2	YW-1	14.00	1,931	6.790	11.85
		YW-2		1,951	8.130	10.00
		YW-3		1,010	5.920	7.11
		YW-4		1,144	6.330	7.53
		YW-5		1,249	6.040	8.62
	2020 Q3	YW-1	1.00	6	0.125	2.00
		YW-2		5	0.083	2.50
		YW-3		5	0.167	1.25
		YW-4		8	0.250	1.33
		YW-5		6	0.167	1.50
	2020 Q4	YW-1	1.00	74	0.167	18.50
		YW-2		30	0.458	2.73
		YW-3		10	0.292	1.43
		YW-4		5	0.125	1.67
		YW-5	6.79	752	1.625	19.28
	2021 Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2021Q2	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2021Q3	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		51	0.042	50.60
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2021 Q4	YW-1	1.00	42	0.042	41.67
		YW-2		20	0.042	19.84
		YW-3		4	0.042	3.97
		YW-4		283	0.042	280.75
		YW-5		0	0.000	0.00

Note 1: "Hours recorded/ per day Ratio" refers to hours with whistles detected/24 hours.
Note 2: "Contact rate" refers to whistles detected/ hours with whistles detected.

Table 3.1.1-13 Whistle Detection in each Quarter (3/3)

Quarter		Station	Detected days	Detected times	Hours recorded/ per day Ratio note 1	Contact rate note2 (t ime/hour)
offshore construction	2022 Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		27	0.042	27.00
		YW-4		5322	0.125	1,774.00
		YW-5		0	0.000	0.00
	2022 Q2	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		9	0.042	9.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2022 Q3	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2022 Q4	YW-1	1.00	488	0.458	44.36
		YW-2		50	0.125	16.67
		YW-3		141	0.208	28.20
		YW-4		123	0.250	20.50
		YW-5		871	0.167	217.75
	2023 Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
Offshore Construction and Operation Phases	2023 Q2	YW-1	1.00	539	0.208	107.80
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2023 Q3	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		1	1.000	0.04
	2023 Q4	YW-1	1.00	3,419	0.292	488.43
		YW-2		5,698	0.458	518.00
		YW-3		98	0.250	16.33
		YW-4		4,697	0.375	521.89
		YW-5		174	0.500	14.50
	2024 Q1	YW-1	1.00	274	0.083	137.00
		YW-2		719	0.125	239.67
		YW-3		1,455	0.625	97.00
		YW-4		1,077	0.167	269.25
		YW-5		354	0.375	39.33

Note 1: “Hours recorded/ per day Ratio” refers to hours with whistles detected/24 hours.
Note 2: “Contact rate” refers to whistles detected/ hours with whistles detected.

Table 3.1.1-14 Clicks Detection in each Quarter

Quarter		Station	Detected days	Detected times	Hours recorded/ per day Ratio note 1	Contact rate note2 (times/hour)
1 year before offshore construction	108 Q1	YW-1	14.00	2,447	10.500	9.71
		YW-2		3,122	2.000	65.04
		YW-3		6,235	10.208	25.45
		YW-4		357	4.167	3.57
		YW-5		7,456	12.958	23.97
	108 Q2	YW-1	14.00	366	4.667	3.27
		YW-2	8.71	236	2.875	3.41
		YW-3	14.00	3,770	9.833	15.98
		YW-4	7.96	35	0.875	1.66
		YW-5	14.00	69	1.750	1.64
	108 Q3	YW-1	14.00	1,108	7.042	6.56
		YW-2	10.08	121	1.958	2.57
		YW-3	14.00	1,445	8.625	6.98
		YW-4	7.67	237	0.917	10.77
		YW-5	14.00	434	3.667	4.93
	108 Q4	YW-1	15.00	620	1.333	19.38
		YW-2		3,940	9.417	17.43
		YW-3		17,053	5.208	136.43
		YW-4		1,099	2.708	16.91
		YW-5		8,241	12.167	28.22
offshore construction	2020 Q1	YW-1	14.00	123	2.625	1.95
		YW-2		2,927	9.792	12.46
		YW-3		524	4.417	4.94
		YW-4		121	2.330	2.16
		YW-5		0	0.000	0.00
	2020 Q2	YW-1	14.00	77	1.670	1.92
		YW-2		44	1.170	1.57
		YW-3		101	1.500	2.81
		YW-4		51	0.670	3.17
		YW-5		273	2.630	4.33
	2020 Q3	YW-1	1.00	0	0.000	0.00
		YW-2		4	0.083	2.00
		YW-3		0	0.000	0.00
		YW-4		6	0.130	2.00
		YW-5		0	0.000	0.00
	2020 Q4	YW-1	1.00	32	0.042	32.00
		YW-2		12	0.042	12.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5	6.79	886	0.292	126.43

Note 1: “Hours recorded/ per day Ratio” refers to hours with whistles detected/24 hours.
Note 2: “Contact rate” refers to whistles detected/ hours with whistles detected.

Table 3.1.1-14 Clicks Detection in each Quarter (Cont.)

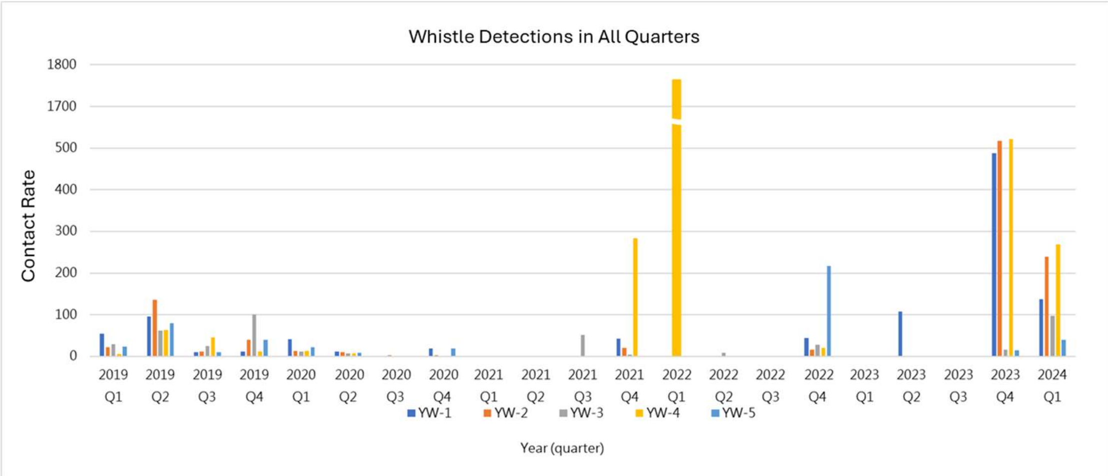
Quarter		Station	Detected days	Detected times	Hours recorded/ per day Ratio note 1	Contact rate note2 (times/hour)
offshore construction	2021 Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2021 Q2	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		180	0.083	7.50
		YW-5		165	0.083	6.88
	2021 Q3	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		109	0.042	108.13
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2021 Q4	YW-1	1.00	12	0.042	12.0
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		348	0.042	348.0
		YW-5		0	0.000	0.00
	2022 Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		23	0.042	23
		YW-4		93	0.042	93
		YW-5		0	0.000	0.00
	2022 Q2	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		259	0.042	259
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2022 Q3	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2022 Q4	YW-1	1.00	69	0.083	34.50
		YW-2		236	0.042	236.00
		YW-3		93	0.042	93.00
		YW-4		326	0.125	108.67
		YW-5		297	0.083	148.50

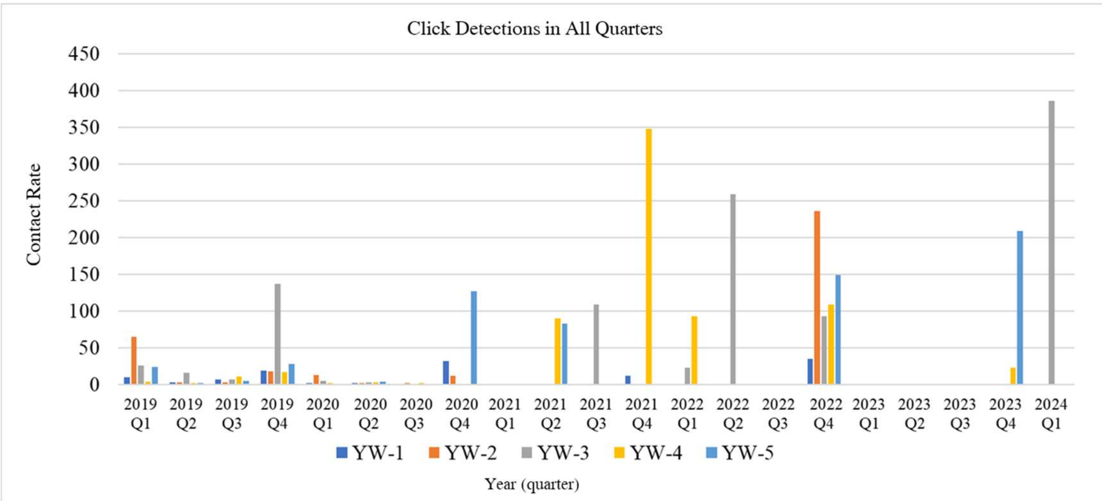
Note 1: "Hours recorded/ per day Ratio" refers to hours with whistles detected/24 hours.
Note 2: "Contact rate" refers to whistles detected/ hours with whistles detected.

Table 3.1.1-14 Clicks Detection in each Quarter(Cont.)

Quarter		Station	Detected days	Detected times	Hours recorded/ per day Ratio note 1	Contact rate note2 (times/hour)
Offshore Construction	2023Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
Offshore Construction and Operation Phases	2023Q2	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00
	2023Q3	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		0	0.000	0.00
		YW-5		1	1.000	0.04
	2023 Q4	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		0	0.000	0.00
		YW-4		68	0.125	22.67
		YW-5		209	0.042	209.00
	2024 Q1	YW-1	1.00	0	0.000	0.00
		YW-2		0	0.000	0.00
		YW-3		386	0.042	386.00
		YW-4		0	0.000	0.00
		YW-5		0	0.000	0.00

Note 1: “Hours recorded/ per day Ratio” refers to hours with whistles detected/24 hours.
Note 2: “Contact rate” refers to whistles detected/ hours with whistles detected.





"Contact rate" indicates total detection times/ (valid days×24 hours)

Figure 3.1.1-10 Statics of Whistles and Clicks in Historical Surveys

<table>
<tr><th colspan="4">Whistles</th></tr>
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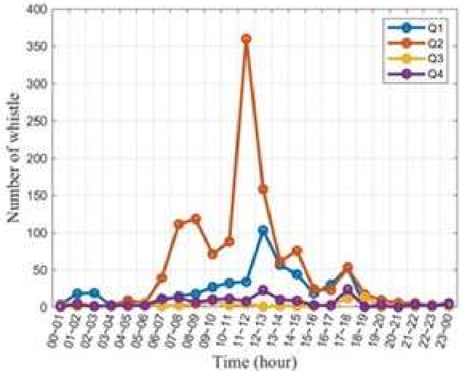
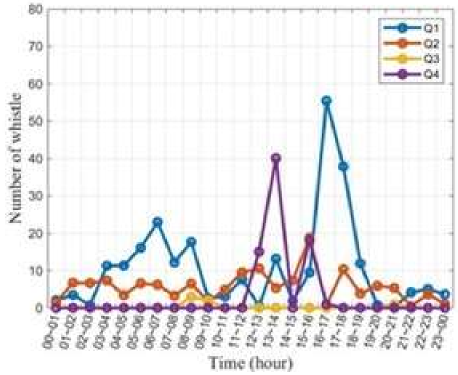
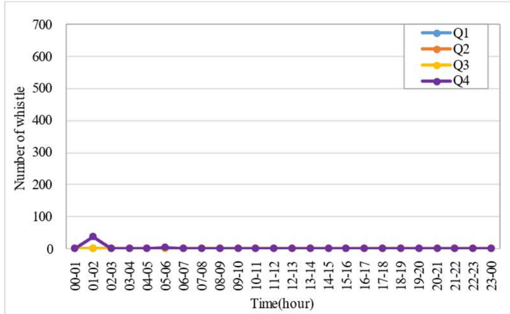
<tr><td rowspan="4">YW-1</td><td>
</td><td>
</td><td>
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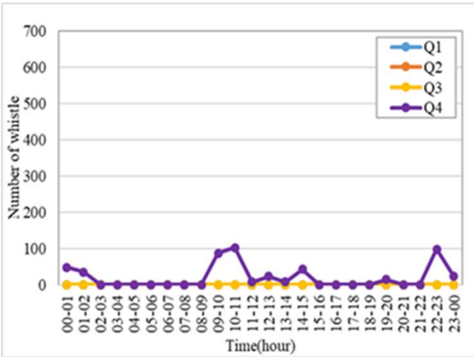
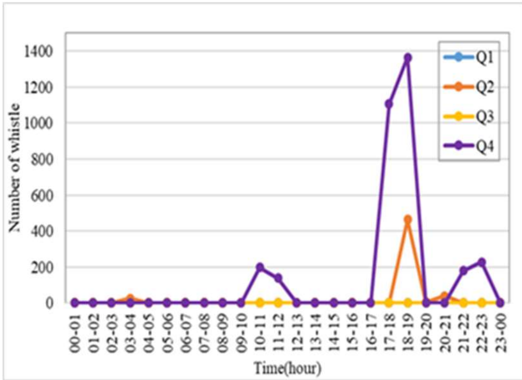
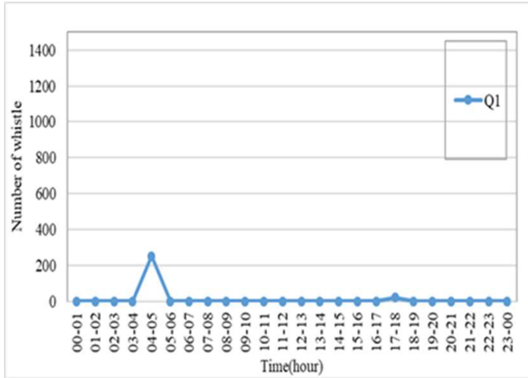
<tr><td>2022</td><td>2023</td><td>2024</td></tr>
<tr><td>
</td><td>
</td><td>
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Figure 3.1.1-11 Hourly Distribution of Whistle Detections in Historical Surveys(1/5)

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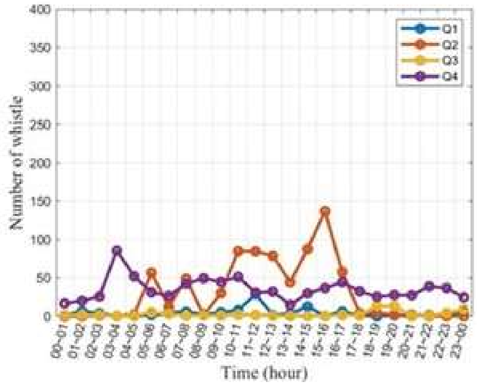
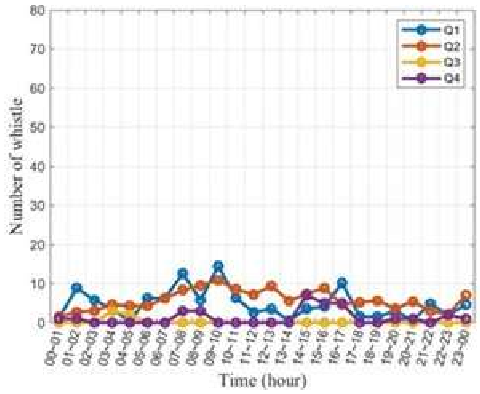
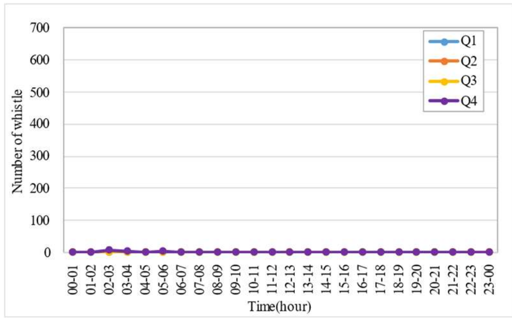
<tr><td rowspan="4">YW-2</td><td>
</td><td>
</td><td>
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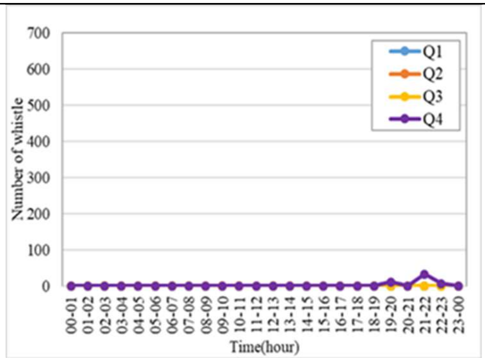
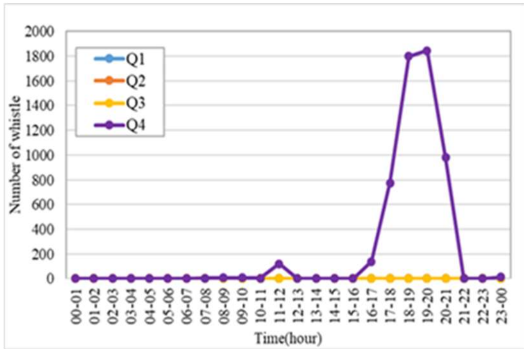
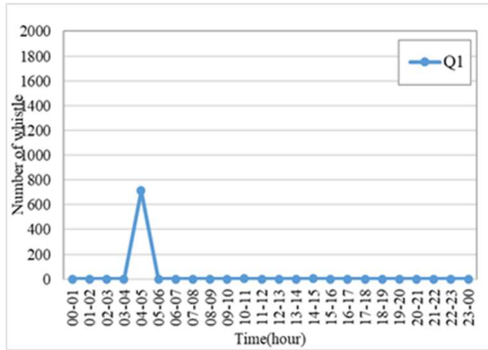
<tr><td>
</td><td>
</td><td>
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Figure 3.1.1-11 Hourly Distribution of Whistle Detections in Historical Surveys(2/5)

Whistles			
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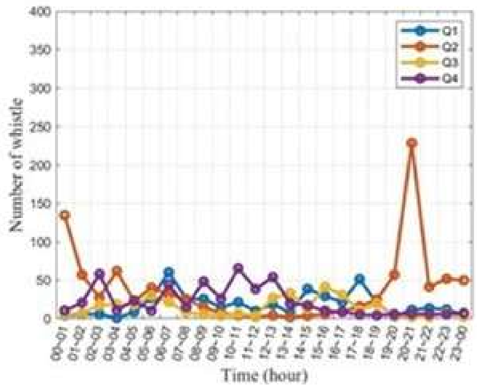
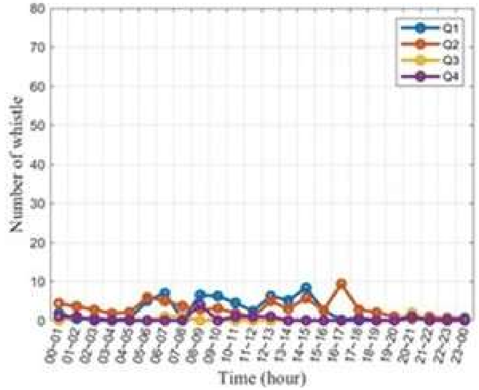
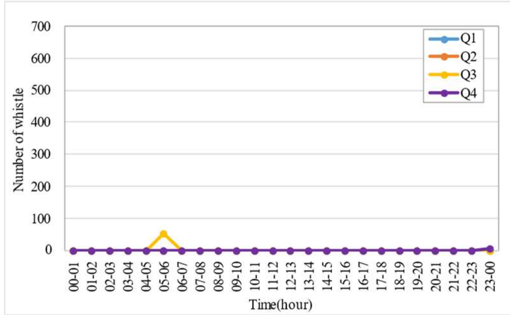
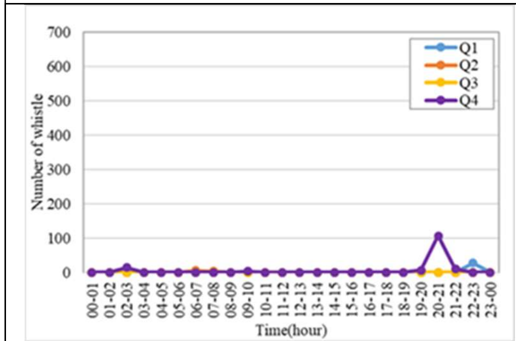
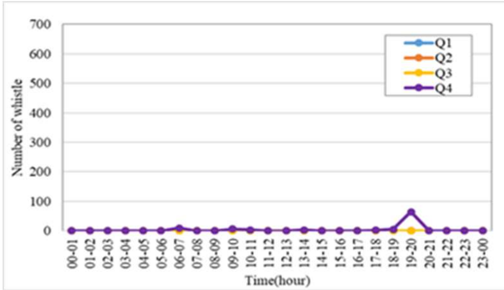
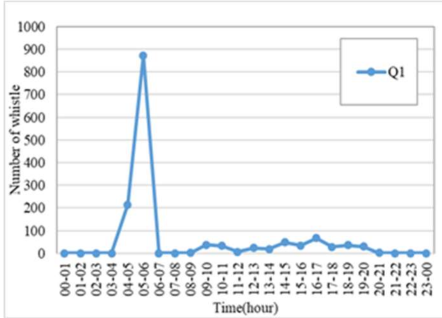
YW-3			
	2022	2023	2024
			

Figure 3.1.1-11 Hourly Distribution of Whistle Detections in Historical Surveys(3/5)

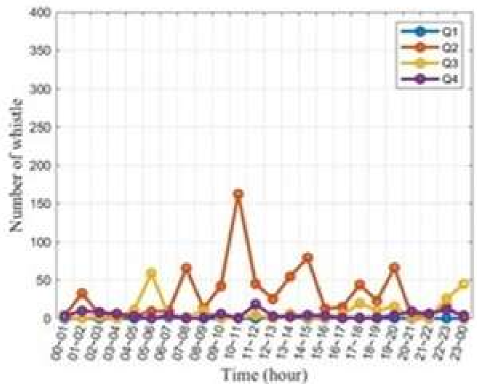
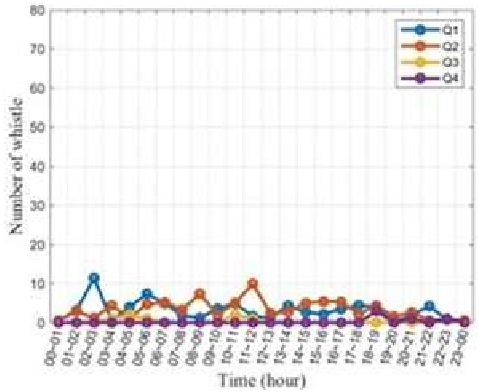
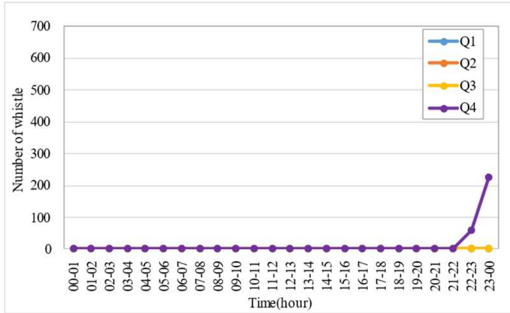
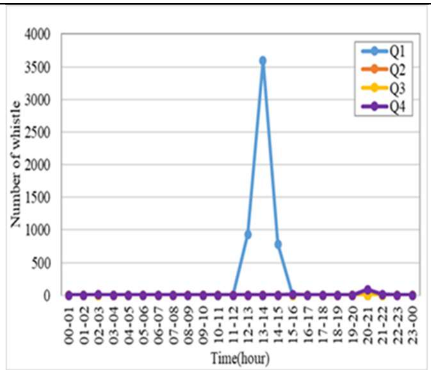
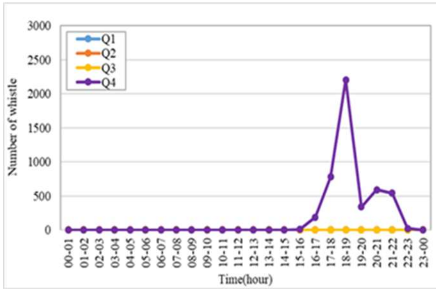
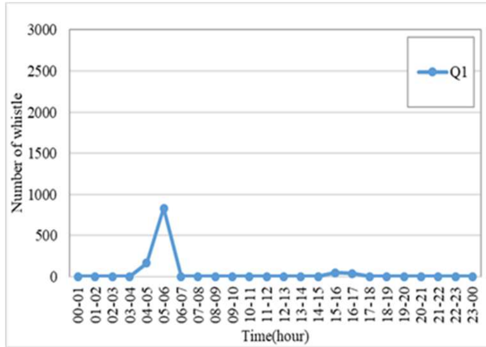
Whistles			
	2019	2020	2021
YW-4			
	2022	2023	2024
			

Figure 3.1.1-11 Hourly Distribution of Whistle Detections in Historical Surveys(4/5)

Whistles			
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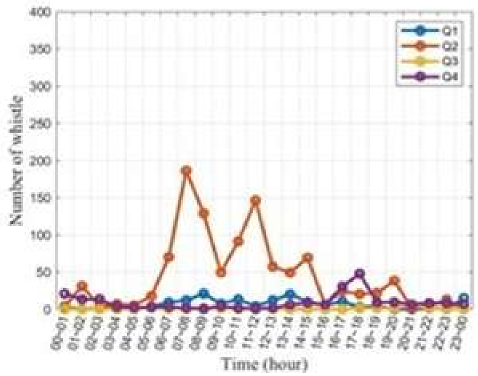
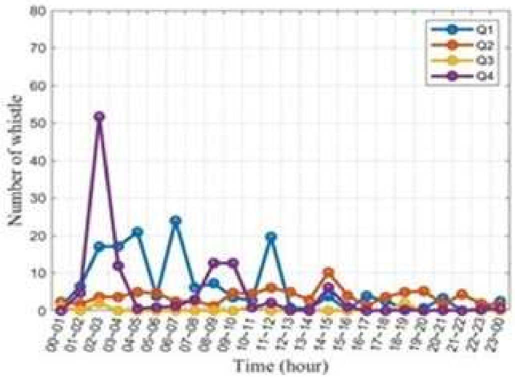
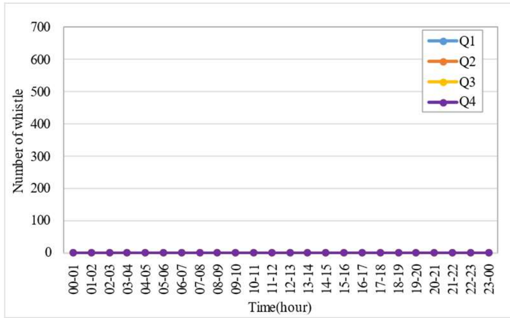
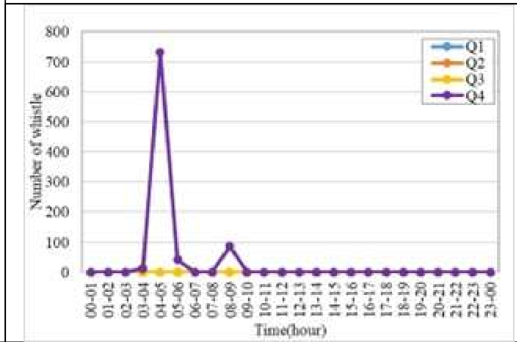
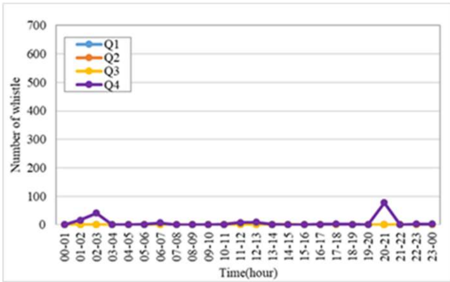
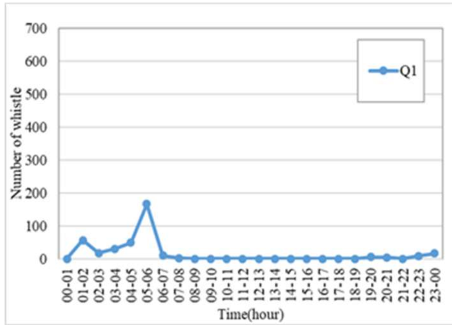
YW-5			
	2022	2023	2024
			

Figure 3.1.1-11 Hourly Distribution of Whistle Detections in Historical Surveys(5/5)

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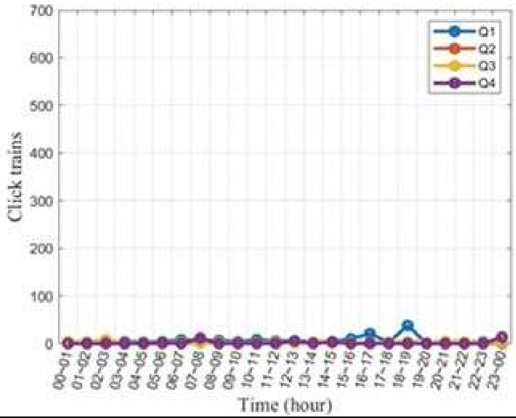
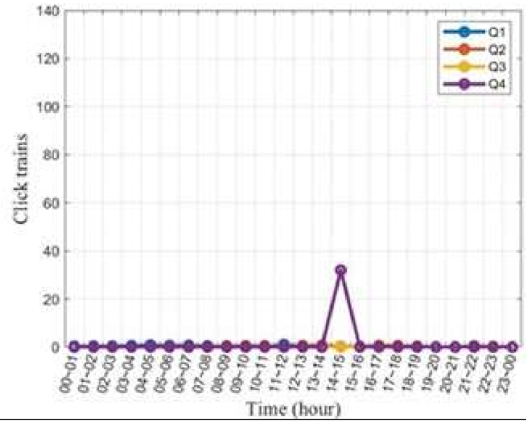
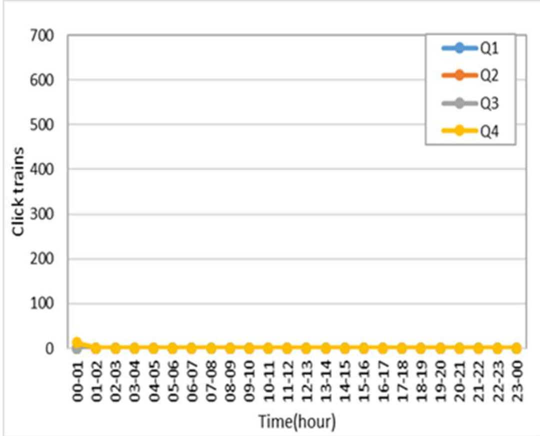
<tr><td rowspan="4">YW-1</td><td>
</td><td>
</td><td>
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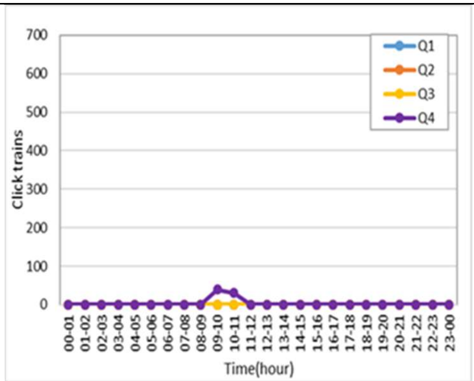
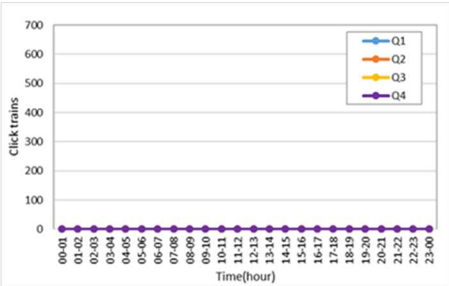
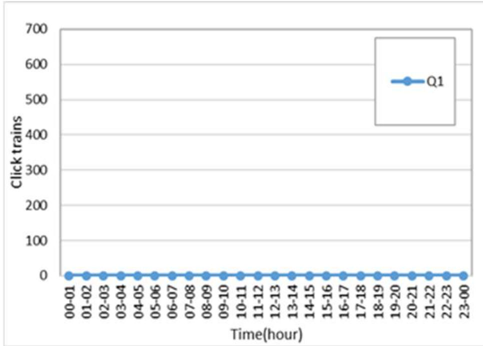
<tr><td>
</td><td>
</td><td>
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Figure 3.1.1-12 Hourly Distribution of clicks Detections in Historical Surveys(1/5)

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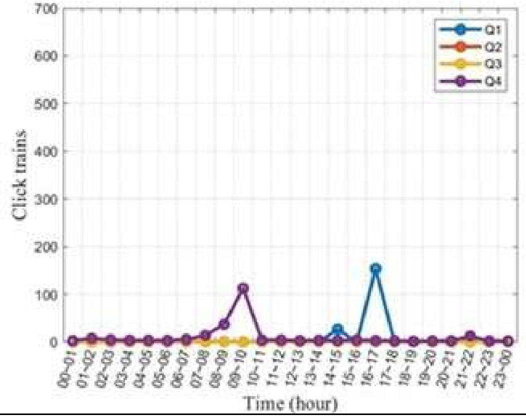
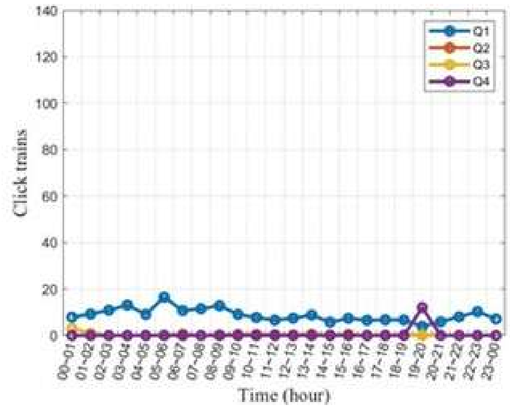
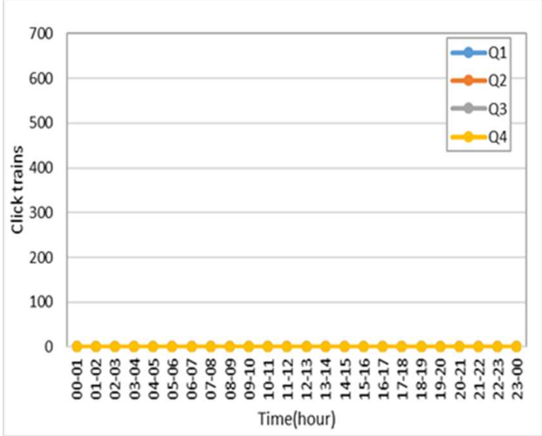
<tr><td rowspan="4">YW-2</td><td>
</td><td>
</td><td>
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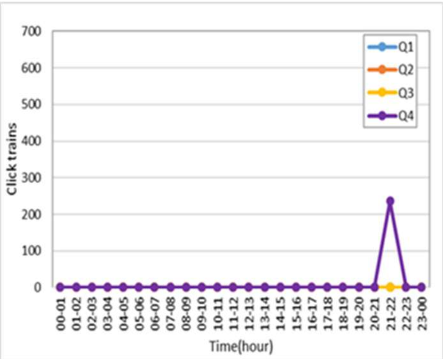
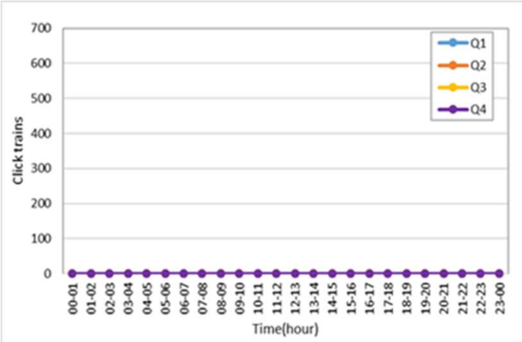
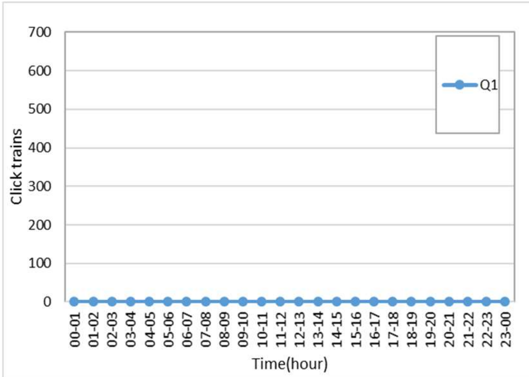
<tr><td>
</td><td>
</td><td>
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Figure 3.1.1-12 Hourly Distribution of clicks Detections in Historical Surveys(2/5)

<table>
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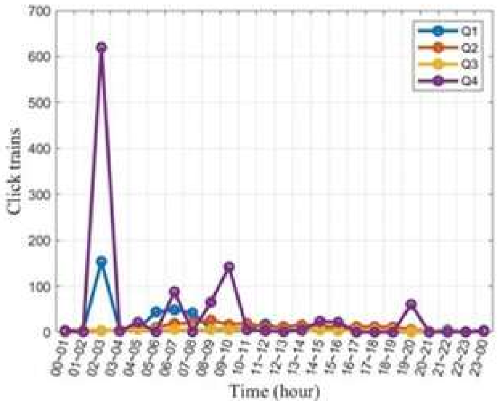
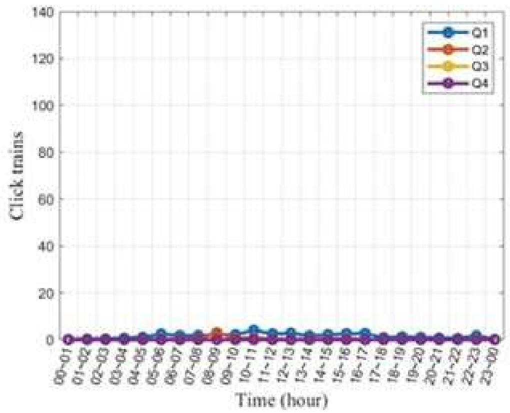
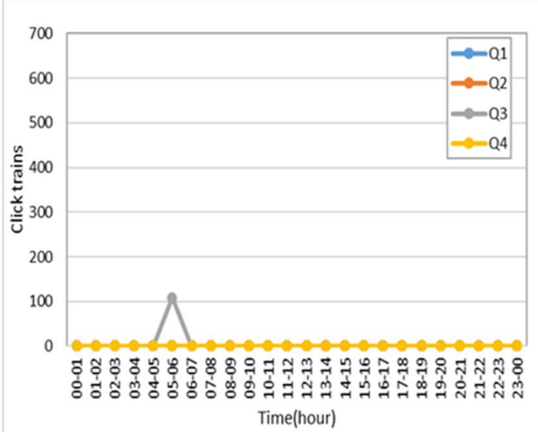
<tr><td rowspan="4">YW-3</td><td>
</td><td>
</td><td>
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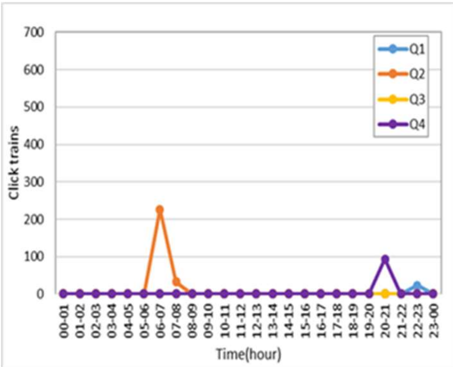
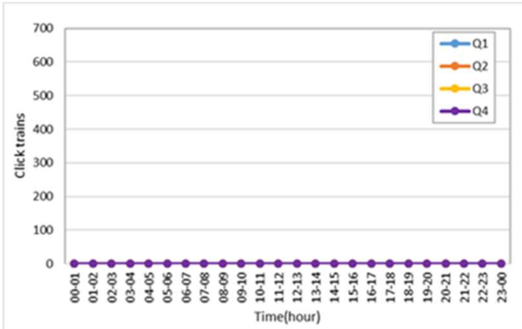
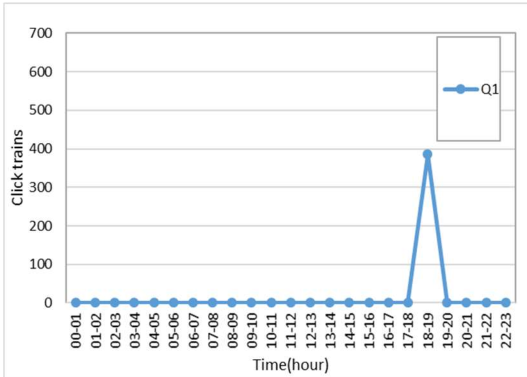
<tr><td>
</td><td>
</td><td>
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Figure 3.1.1-12 Hourly Distribution of clicks Detections in Historical Surveys (3/5)

<table>
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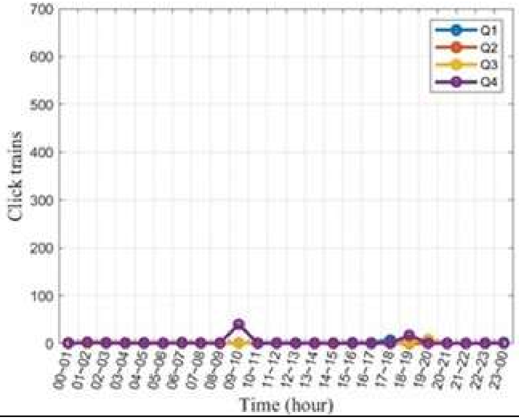
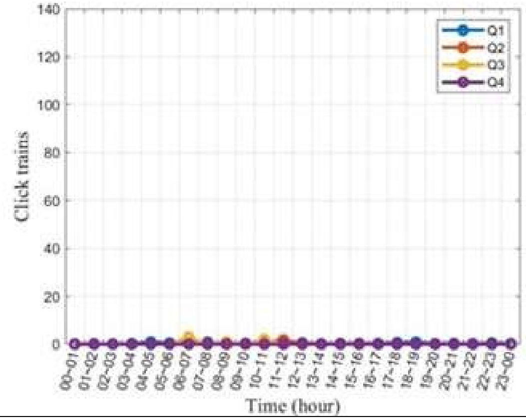
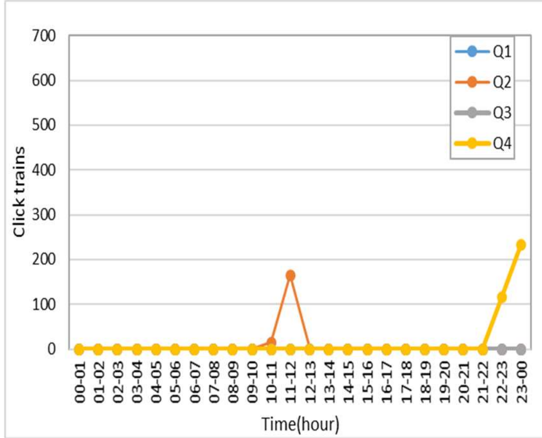
<tr><td rowspan="4">YW-4</td><td>
</td><td>
</td><td>
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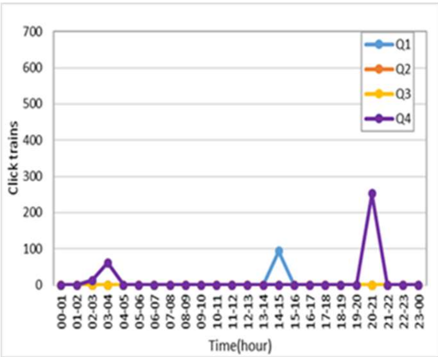
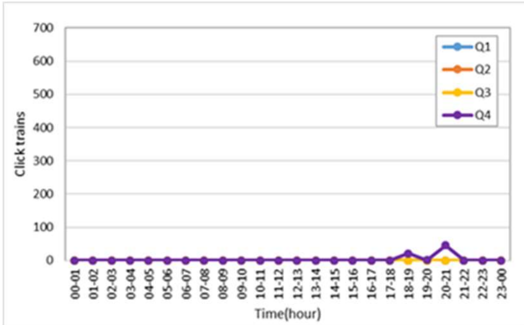
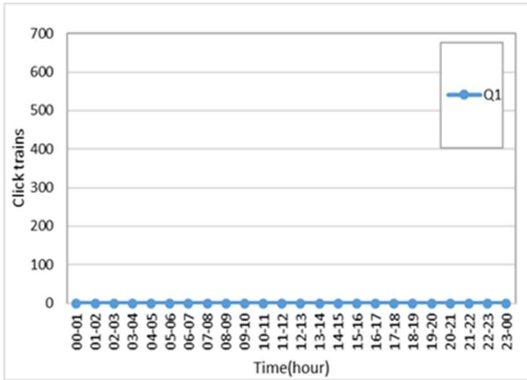
<tr><td>
</td><td>
</td><td>
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Figure 3.1.1-12 Hourly Distribution of clicks Detections in Historical Surveys(4/5)

<table>
<tr><td colspan="4">Clicks</td></tr>
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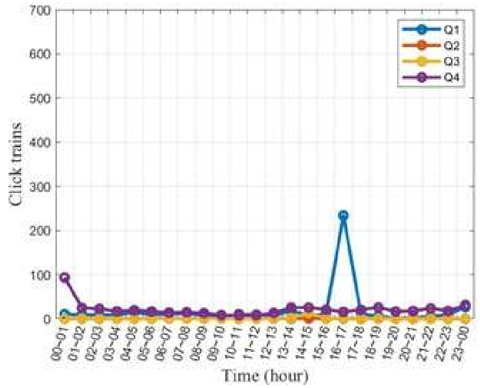
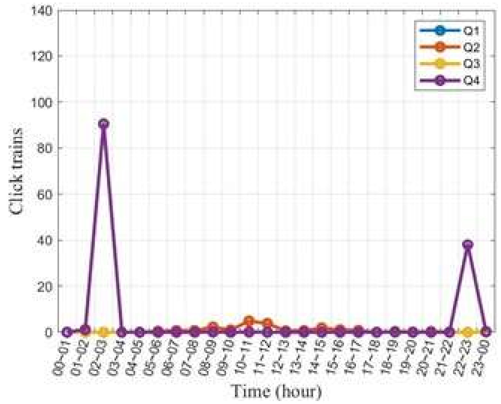
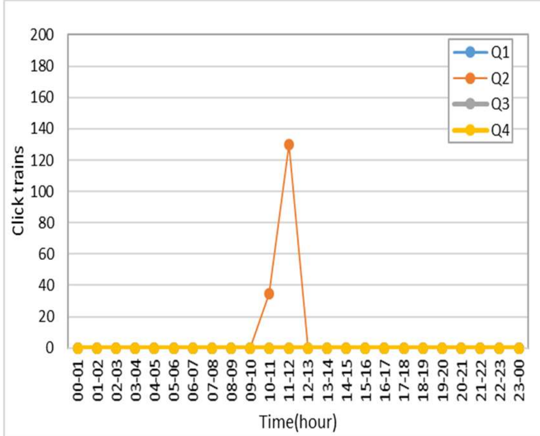
<tr><td rowspan="4">YW-5</td><td></td><td></td><td></td></tr>
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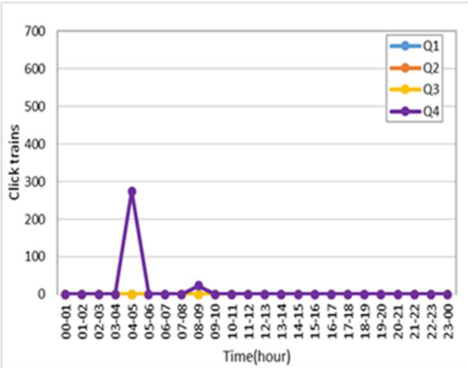
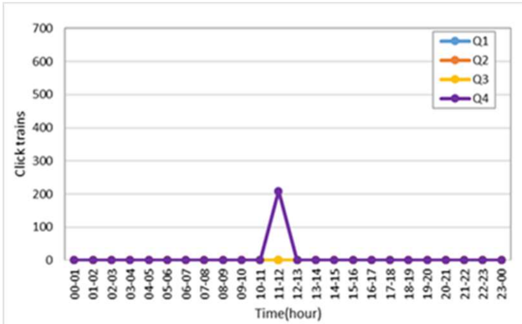
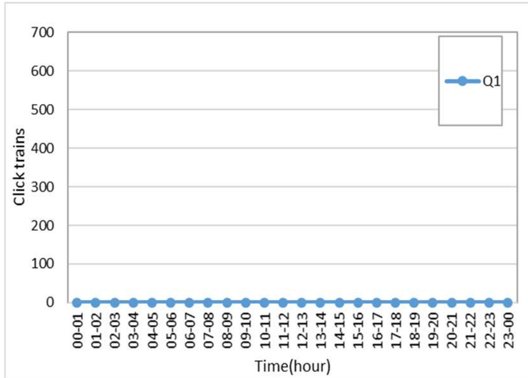
<tr><td></td><td></td><td></td></tr>
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Figure 3.1.1-12 Hourly Distribution of clicks Detections in Historical Surveys(5/5)

V. Underwater Noise

YW-3 is located near the cetacean protection area at a water depth of about 8 m. YW-3 is located near the Chinese White Dolphin Wildlife Habitat at a water depth of about 8m. YW-5 is located at the southern boundary of the wind farm at a water depth of about 18 m. Underwater noise monitoring and analysis have been completed throughout the four quarters in 2020, 2021, 2022, and 2023. The underwater noise analysis for the first quarter of 2024 has been completed. The survey times are shown in Table 3.1.1-15.

Table 3.1.1-15 Duration of Underwater Noise Analysis in each Quarter (1/2)

Item	Location	Survey duration
2020 Q1	YW-3	2020.4.21-2020.5.4
	YW-5	2020.4.21-2020.5.4
2020 Q2	YW-3	2020.7.1-2020.7.14
	YW-5	2020.7.1-2020.7.14
2020 Q3	YW-3	2020.11.19-2020.11.20
	YW-5	2020.11.19-2020.11.20
2020 Q4	YW-3	2021.2.21-2021.2.22
	YW-5	2021.2.21-2021.2.28
2021 Q1	YW-3	2021.5.23-2021.5.24
	YW-5	2021.5.24-2021.5.25
2021 Q2	YW-3	2021.8.25-2021.8.26
	YW-5	2021.8.26-2021.8.27
2021 Q3	YW-3	2021.11.05-2021.11.06
	YW-5	2021.11.05-2021.11.06
2021 Q4	YW-3	2022.02.27-2022.02.28
	YW-5	2022.02.27-2022.02.28
2022 Q1	YW-3	2022.05.11-2022.05.12
	YW-5	2022.05.11-2022.05.12
2022 Q2	YW-3	2022.08.17-2022.08.18
	YW-5	2022.08.17-2022.08.18
2022 Q3	YW-3	2022.09.15-2022.09.16
	YW-5	2022.09.15-2022.09.16
2022 Q4	YW-3	2023.02.12-2023.02.13
	YW-5	2023.02.17-2023.02.18

Table 3.1.1-15 Duration of Underwater Noise Analysis in each Quarter (2/2)

Item	Location	Survey duration
2023 Q1	YW-3	2023.05.06-2023.05.07
	YW-5	2023.05.06-2023.05.07
2023 Q2	YW-3	2023.07.19-2023.07.20
	YW-5	2023.07.19-2023.07.20
2023 Q3	YW-3	2023.09.19-2023.09.20
	YW-5	2023.09.19-2023.09.20
2023 Q4	YW-3	2024.02.14~2024.02.15
	YW-5	2024.01.31~2024.02.01
2024 Q1	YW-3	113.05.11-113.05.12
	YW-5	113.05.11-113.05.12

i Ambient noise analysis

In 2020, the average noise level of YW-3 and YW-5 was 109.4 dB and 110.5dB in Q1, 124.1 dB and 125.7 dB in Q2, 139.1dB and 127.6 dB in Q3, 126.9 dB and138.0 dB in Q4.

In 2021, the average noise level of YW-3 and YW-5 was 148.0 dB and 146.7 dB in Q1, 132.7 dB and 136.9dB in Q2, 134.0 dB and 152.1 dB in Q3 and 132.0dB and 128.4dB in Q4. The noise peaks were mainly dominated by the low frequency band below 1 kHz. (Table 3.1.1-16).

In 2022, the average noise level of YW-3 and YW-5were 137.9 dB and 126.1dB in Q1. The average noise level of YW-3 was 135.4 dB and 126.0dB in YW-5 in Q2. The average noise level of YW-3 was 130.6 dB and 138.7dB in YW-5 in Q3. The average noise level of YW-3 was 130.4 dB and138.5dB in YW-5 in Q4.

In 2023, the average noise level of YW-3 and YW-5 were 116.0 dB and 130.0dB in Q1, 133.2 dB and 125.5dB in Q2, 129.8dB and 125.6dB in Q3, 145.9 dB and 157.2dB in Q4.

In 2024, the average noise level of YW-3 and YW-5 were 157.6 dB and 153.4 dB in Q1.

ii 1/3 Octave band analysis

The 1/3 Octave band level of each season varied from 5% to 95% of the total sound pressure level is shown as Table 3.1.1-16 and Figure 3.1.1-13.

For YW-3, in 2020, the value is 101.7-123.4 dB in Q1, 113.4-134.6 dB in Q2, 121.8-150.2 dB in Q3, 123.1-131.8 dB in Q4. In 2021, the value is between 129.3-157.9dB in Q1, 115.2-138.5dB in Q2, 108.6-134.6 dB in Q3 and 107.8-138.4dB in Q4. In 2022, the value is between 110.2-136.6 dB in Q1, 106.9-137.9dB in Q2, 114.9-136.5 in Q3, and 107.8-125.8dB in Q4. In 2023, the value is between 102.5-121.6dB in Q1, 110.1-169.9dB in Q2 and 93.5~147.7dB in Q3, 132.4~161.5dB in Q4.

For YW-5, in 2020, the value is 104.3-121.3dB in Q1, 114.0-136.5 dB in Q2, 116.1-142.9 dB in Q3 and 128.7-147.0 dB in Q4. In 2021, the value is between 123.3-151.4dB in Q1, 120.2-143.1dB in Q2, and 114.1-154.9 dB in Q3 and 112.9-130.8dB in Q4. In 2022, the value is between 106.2-133.3 dB in Q1 and 111.8-131.2 dB in Q2, 134.5-140.8 dB in Q3, and 106.7-142.1 dB in Q4. In 2023, the value is between 123.1-133.8 dB in Q1, 94.9-148.1dB in Q2 and 97.9~165.1dB in Q3, 129.7~168.4 dB in Q4.

The results show that in 2020, the total SPL (20-20kHz) of underwater noise has increased from 110 dB to over130 dB from Q2 to Q4. The sound pressure has increase from 127dB to above 140.0dB. It may probably because the area around the wind farm is about to enter the construction phase and the surrounding sea area is under control. In 2022, the total SPL (20-20kHz) in YW-3 is 110.2-136.6 dB; the total SPL (20-20kHz) in YW-5 is 106.2-133.3dB. In 2022, the total SPL (20-20kHz) in YW-3 is 116-145.6 dB; the total SPL (20-20kHz) in YW-5 is 125.5-157.2dB. For the total SPL (20-20kHz) in Q1 2024, the value at YW-3 ranged from 133.8 dB to 162.6 dB and at YW-5, the value ranged from 145 dB and 158.1 dB.

For the underwater ambient noise, the underwater sound signal changes in time and frequency is very complex. As the environmental noise, vessel noise, and biological noise all have temporal and geographical changes, the sound length and frequency range is also wide.

Table 3.1.1-16 Frequency Band of the Ambient Noise in each Quarter (dB re 1μPa) (1/2)

Year	Site	Frequency Band	Mean	L_{90}	L_{50}	L_{5}
2020 Q1	YW-3	20-20000 Hz	109.4	101.7	108.2	123.4
		3000-9000 Hz	90.4	82.9	90.9	99.9
	YW-5	20-20000 Hz	110.5	104.3	110.4	121.3
		3000-9000 Hz	90.7	83.8	90.9	99.2
2020 Q2	YW-3	20-20000 Hz	124.1	113.4	125.5	134.6
		3000-9000 Hz	97.6	90.3	97.7	107.0
	YW-5	20-20000 Hz	125.7	114.0	127.0	136.5
		3000-9000 Hz	98.7	90.3	98.7	109.9
2020 Q3	YW-3	20-20000 Hz	139.1	121.8	142.5	150.2
		3000-9000 Hz	103.9	96.6	103.9	111.1
	YW-5	20-20000 Hz	127.6	116.1	130.2	142.9
		3000-9000 Hz	102.8	93.5	102.8	111.6
2020 Q4	YW-3	20-20000 Hz	126.9	123.1	127.1	131.8
		3000-9000 Hz	113.1	107.7	114.0	118.9
	YW-5	20-20000 Hz	138.0	128.7	138.4	147.0
		3000-9000 Hz	112.9	107.9	112.8	118.7
2021 Q1	YW-3	20-20000 Hz	148.0	129.3	150.4	157.9
		3000-9000 Hz	138.2	133.0	136.1	142.1
	YW-5	20-20000 Hz	146.7	123.3	144.6	151.4
		3000-9000 Hz	140.7	131.8	134.7	148.5
2021 Q2	YW-3	20-20000 Hz	132.7	115.2	127.8	138.5
		3000-9000 Hz	110.1	92.4	100.7	116.8
	YW-5	20-20000 Hz	136.9	120.2	130.6	143.1
		3000-9000 Hz	109.3	92.4	103.9	114.7
2021 Q3	YW-3	20-20000 Hz	134.0	108.6	126.6	134.6
		3000-9000 Hz	102.4	82.4	90.3	108.6
	YW-5	20-20000 Hz	152.1	114.1	132.9	154.9
		3000-9000 Hz	113.1	89.5	98.3	110.4
2021 Q4	YW-3	20-20000 Hz	132.0	107.8	122.0	138.4
		2500-10000 Hz	100.2	89.1	94.7	104.9
	YW-5	20-20000 Hz	128.4	112.9	123.4	130.8
		2500-10000 Hz	106.5	88.6	93.8	111.1

Note: Piling operations were carried out on 2020.11.19-2021.02.21, which overlap with the underwater noise survey period in 2020 Q3 and Q4.

Table 3.1.1-16 Frequency Band of the Ambient Noise in each Quarter (dB re 1μPa) (2/2)

Year	Site	Frequency Band	Mean	L_{90}	L_{50}	L_5
2022 Q1	YW-3	20-20000 Hz	137.9	110.2	119.8	136.6
		2500-10000 Hz	104.4	86.2	92.4	112.0
	YW-5	20-20000 Hz	126.1	106.2	118.4	133.3
		2500-10000 Hz	106.5	88.6	93.8	111.1
2022 Q2	YW-3	20-20000 Hz	135.4	106.9	124.3	137.9
		2500-10000 Hz	130.2	89.8	116.1	134.3
	YW-5	20-20000 Hz	126.0	111.8	124.7	131.2
		2500-10000 Hz	106.5	88.6	93.8	111.1
2022 Q3	YW-3	20-20000 Hz	130.6	114.9	124.8	136.5
		2500-10000 Hz	115.5	97.3	104.6	122.4
	YW-5	20-20000 Hz	138.7	134.5	138.7	140.8
		2500-10000 Hz	124.5	120.9	123.9	127.1
2022 Q4	YW-3	20-20000 Hz	130.4	107.8	115.0	125.8
		2500-10000 Hz	105.7	80.9	86.7	106.5
	YW-5	20-20000 Hz	138.	106.7	120.4	142.1
		2500-10000 Hz	99.6	91.6	95.6	103.1
2023 Q1	YW-3	20-20000 Hz	116.0	102.5	111.4	121.6
		2500-10000 Hz	93.7	86.4	90.6	96.8
	YW-5	20-20000 Hz	130.0	123.1	129	133.8
		2500-10000 Hz	115.3	105.9	112.1	119.6
2023 Q2	YW-3	20-20000 Hz	133.2	119.3	126.1	138.1
		2500-10000 Hz	114.4	92.8	99.1	122.6
	YW-5	20-20000 Hz	125.5	106.5	119.2	132.2
		2500-10000 Hz	111.2	88.0	95.1	120.1
2023 Q3	YW-3	20-20000 Hz	129.8	101.2	119.8	137.4
		2500-10000 Hz	115.2	89.7	94.6	123.5
	YW-5	20-20000 Hz	125.6	109.9	117.4	128.2
		2500-10000 Hz	103.9	91.1	96.6	109.2
2023 Q4	YW-3	20-20000 Hz	145.9	137.6	143.1	150.7
		2500-10000 Hz	127.1	121.4	122.9	130.7
	YW-5	20-20000 Hz	157.2	137.2	153.4	163.1
		2500-10000 Hz	131.9	122.9	127.9	136.5
2024 Q1	YW-3	20-20000 Hz	157.6	133.8	144.6	162.6
		2500-10000 Hz	139.5	123.3	132.0	141.0
	YW-5	20-20000 Hz	153.4	145.0	149.2	158.1
		2500-10000 Hz	131.9	122.9	127.9	136.5

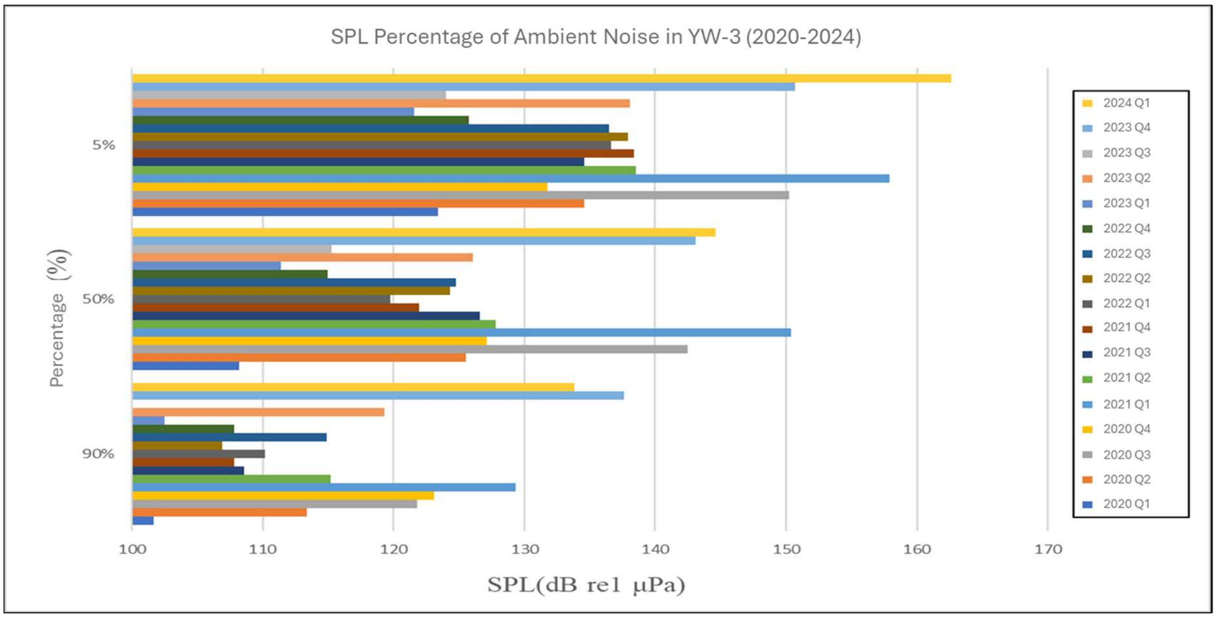
Note: Piling operations were carried out on 2020.11.19-2021.02.21, which overlap with the underwater noise survey period in 2020 Q3 and Q4.

Table 3.1.1-17 Statics of Total SPL in Yunlin Offshore Wind Farm (20-20k Hz)

Quarter	Location	L_{90}	L_{50}	L_5
2020 Q1	YW-3	101.7	108.2	123.4
	YW-5	104.3	110.4	121.3
2020 Q2	YW-3	113.4	125.5	134.6
	YW-5	114.0	127.0	136.5
2020 Q3	YW-3	121.8	142.5	150.2
	YW-5	116.1	130.2	142.9
2020 Q4	YW-3	123.1	127.1	131.8
	YW-5	128.7	138.4	147.0
2021 Q1	YW-3	129.3	150.4	157.9
	YW-5	123.3	144.6	151.4
2021 Q2	YW-3	115.2	127.8	138.5
	YW-5	120.2	130.6	143.1
2021 Q3	YW-3	108.6	126.6	134.6
	YW-5	114.1	132.9	154.9
2021 Q4	YW-3	107.8	122.0	138.4
	YW-5	112.9	123.4	130.8
2022 Q1	YW-3	110.2	119.8	136.6
	YW-5	106.2	118.4	133.3
2022 Q2	YW-3	106.9	124.3	137.9
	YW-5	111.8	124.7	131.2
2022 Q3	YW-3	114.9	124.8	136.5
	YW-5	134.5	138.7	140.8
2022 Q4	YW-3	107.8	115.0	125.8
	YW-5	106.7	120.4	142.1
2023 Q1	YW-3	102.5	111.4	121.6
	YW-5	123.1	129.0	133.8
2023 Q2	YW-3	119.3	126.1	138.1
	YW-5	106.5	119.2	132.2
2023 Q3	YW-3	101.2	119.8	137.4
	YW-5	109.9	117.4	128.2
2023 Q4	YW-3	137.6	143.1	150.7
	YW-5	137.2	153.4	163.1
2024 Q1	YW-3	133.8	144.6	162.6
	YW-5	145.0	149.2	158.1

Note1: Unit: dB re 1μPa

Note2: Piling operations were carried out on 2020.11.19-2021.02.21, which overlap with the underwater noise survey period in 2020 Q3 and Q4.



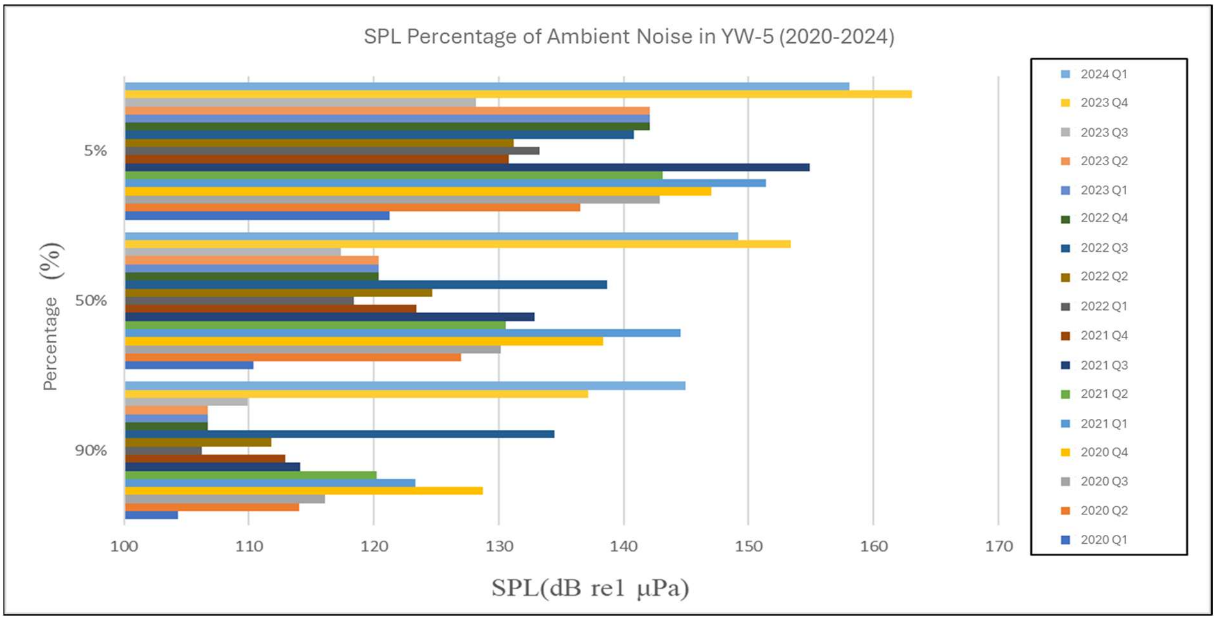


Figure 3.1.1-13 Percentage of SPL of the Ambient Noise in YUN OWF in the Historical Surveys

VI. Visual Monitoring of Cetacean Ecology

30 surveys were conducted between March 2016 and March 2017. A total of 7 herds of cetacean were monitored (Figure 3.1.1-14), including 2 herds of Chinese-white dolphins, 3 herds of finless porpoises, 1 herd of bottle-nosed dolphins and 1 individual of unknown cetacean. The sighting rate is 0.30herds/100km, 0.43 herds/10 hrs. and 0.23 herds/survey.

Visual monitoring of cetacean ecology started from March 2017, 30 survey trips annually were conducted until February 2020, with 175.84 total survey hours, 3,496.2 km in total mileage, 111.43 on-effort hours, 1,773.7 km in on-effort mileage, as shown in Table 3.1.1-18.

In addition, visual monitoring of cetacean ecology during the offshore construction has started since March 2020. 30 trips were conducted in this quarter (September-November 2020), with 172.67 total survey hours, 3,475 km in total mileage, 116.73 on-effort hours and 1624.5 km in on-effort mileage.

Visual monitoring of cetacean ecology during the offshore construction was carried out since March 2021. Until February 2022, 30 trips were conducted in this quarter, with 170.22 total survey hours, 3,565 km in total mileage, 107.54 on-effort hours and 1,554.0 km in on-effort mileage.

Visual monitoring of cetacean ecology during the offshore construction was carried out since March 2022. Until February 2023, 30 trips were conducted, with 175.57 total survey hours, 3539.0 km in total mileage, 116.65 on-effort hours and 1712.0 km on-effort mileage. The visual monitoring was continued since March 2023. Until end of February 2024, 30 trips were conducted, with 170.34 total survey hours, 3,448.0 km in total mileage, 108.31 on-effort hours and 1,630.0 km on-effort mileage, as shown in Table 3.1.1-18.

In the overall 158 trips conducted for cetacean visual monitoring from prior to the commencement of offshore construction through the offshore construction and operation phases, 11 pods of cetacean were sighted in 9 trips, including 3 herds of Yangtze Finless Porpoise, 4 bottle-nosed dolphins and 4 herds of unknown cetacean (sighting is too short to identify its species). The environmental factors of each previous sighting locations are as shown in Table 3.1.1-19, sighting location and traveling route is as shown in Figure 3.1.1-15 to 3.1.1-19.

i On effort sighting

1. First Sighting (2019.04.25)

   2 individuals of bottlenose dolphins as a herd were spotted at the north boundary of the wind farm on 25th April. (They were listed as unknown cetaceans at first, yet after several discussions with NTU Cetacean Laboratory, they are considered as bottlenose dolphins with a high possibility

and is therefore explained in this report) They disappeared once being spotted. Due to the short sighting, no further information was provided in identifying their species and behaviors. Environmental factors on the location of the vessel when the cetaceans were observed were listed as followed: water depth: 27.5 m, water temperature 27.5℃, salinity 34.6 ‰, pH =8.22.

2. Second Sighting (2019.05.25)

4 Yangtze Finless Porpoise (judging through their appearance) were spotted around the south-east boundary of the wind farm on May 25. The herd did not jump very high from the surface and disappeared immediately. Their activities indicated that they were foraging. Environmental factors on the location of the vessel when the cetaceans were observed were listed as followed: water depth: 14.8 m, water temperature 27.3℃, salinity 33.4 ‰, pH =8.18.

3. Third Sighting (2019.09.09)

A group of 4 Yangtze Finless Porpoise were spotted in the survey on September 9 at Northeast boundary of the wind farm. It is inferred that they were foraging. Device for water quality was out of order on the day, therefore only water depth was recorded during the sighting event. Water depth of the vessel location when cetaceans were sighted is 8.4 m. Tracks of the cetaceans were lost immediately in both trips, resulting in difficulties in collecting further information and records.

4. Fourth Sighting (2020.01.03)

8 bottlenose dolphins were spotted within wind farm area on January 3. Their behaviors suggested they are foraging. Environmental factors of the vessel location are as followed: water depth: 22.4 m, water temperature 20 ℃, salinity: 33.3 ‰, pH value pH 8.49.

5. Fifth Sighting (2021.02.05)

1 cetacean were spotted within wind farm area on February 5. The species cannot be identified as the cetacean disappeared once it is spotted. It is inferred that it was travelling. Environmental factors of the vessel location are as followed: water depth: 27.4 m, water temperature 19.2 ℃, salinity: 34.0 ‰, pH value pH 8.15.

6. Sixth Sighting (2021.02.05)

1 bottlenose dolphins were spotted within wind farm area on February 5. Their behaviors suggested they are foraging. Environmental factors of the vessel location are as followed: water depth: 22.1 m, water temperature 20.0℃, salinity: 34.1 ‰, pH value pH 8.16.

7. Seventh Sighting (2021.03.15)

3 unknown cetacean were spotted within wind farm area on March 15. The species cannot be identified as the cetacean disappeared once spotted. It is inferred that they were travelling. Environmental factors of the vessel location are as followed: water depth: 27.4 m, water temperature 19.2 °C, salinity: 34.0 psu, pH value pH 8.2.

8. Eighth Sighting (2023.01.14)

3 herds of dolphins were sighted on January 14 in this quarter. Details are as follows:

1st sighting: On the transect line at 8:36, a dorsal fin of cetacean was sighted about 700m to the left of the bow. The cetacean species cannot be confirmed as the sighting was brief and no distinctive features were identified.

2nd sighting: At 8:53, a dorsal fin of cetacean was sighted about 500m to the left of the bow. The vessel stopped to search the cetacean. The surveyors sighted the cetacean on the left stern, which then dived and disappeared. The cetacean species cannot be confirmed as the sighting was brief.

3rd sighting: At 10:30, dorsal fins of cetaceans were sighted on the left of the bow. The cetaceans were confirmed to be bottlenose dolphins after a closer check. The herd composed of 11-20 individuals, with 2 mother-child pairs. The young individuals jumped out of the water. Their diving period were identical with short intervals, and the swimming direction was northward. After 20 minutes of observation, the diving periods lengthened, and some individuals were not sighted after diving. After confirming that photos, sighting records, disappearing spot of cetacean were properly taken, the vessel left the cetacean and resumed the transect line survey. Environmental factors of the vessel location are as followed: water depth: 27.4 m, water temperature 19.2 °C, salinity: 34.0 psu, pH value pH 8.2.

9. Ninth Sighting (2023.09.20)

On September 20, at around 8:55 a.m., one black dorsal finless cetacean was spotted in the water about 200 meters away from the vessel along the wind farm transect line, and was identified as a Yangtze Finless Porpoise. The vessel proceeded in the direction of the cetacean, and it was not observed for 10 minutes.

ii Off effort sighting

1. 1st Off Effort Sighting (2020.05.08)

3 Chinese white dolphins were spotted at non effort sighting outside of Budai Port on May 8. Their behaviors suggested they are foraging. Environmental factors of the vessel location are as followed: water depth: 7.9m, water temperature 28.5℃, salinity: 33.7 ‰, pH value pH 8.18.

2. 2nd Off Effort Sighting (2021.02.21)

3 Chinese white dolphins were spotted on the way to the wind farm on February 21. Their behaviors suggested they are travelling. Environmental factors of the vessel location are as followed: water depth: 5.9m, water temperature 19.5℃, salinity: 32.7 ‰, pH value pH 8.16.

6 surveys were conducted this quarter. On effort sighting rate is 0. Comparing with historical records in Q2, cetaceans were only sighted in 2016 and 2017, sighting rate is 0.70 herd/100km. No cetacean was sighted in the rest of the years. Among the four years, cetaceans were only observed in 1 year, indicating that cetacean activities were relatively rare in the area during Q2. Details are shown in Table 3.1.1-18.

3. 3rd Off Effort Sighting (2023.10.19)

2 Chinese White Dolphins were observed coming out of the water about 30 meters away from the vessel on the way to the wind farm on October 19, at 9:30 a.m. They dived deeply after the vessel approached, and then came out of the water at the stern of the vessel. They moved at a slow speed and in an irregular direction, so the pattern cannot be identified.

4. 4th Off Effort Sighting (2024.2.14)

7 Chinese White Dolphins (including 3 mother-child pairs) were observed coming out of the water about 30 meters away from the vessel on the way to the wind farm on February 14, at 9:27 a.m. The individuals were swimming closely together, exhibiting slow and frequent changes in direction, indicative of typical foraging behavior such as diving with raised tails. Therefore, it was concluded that the group was engaged in milling behavior, circling and lingering in the area.

5. 5th Off Effort Sighting (2024.2.14)

8 Chinese White Dolphins (including 1 mother-child pair) were observed during the return journey to the harbor, at approximately 11 o'clock direction from the vessel on February 14, at 3:07 a.m. The location was close to the previous sighting position, but the composition of the group had changed. This group consisted of only one mother-child pair, and the dolphins appeared scattered. They exhibited varied swimming directions and speeds, frequently

diving with raised tails. During the observation, there were several instances of full-body breaches above the water surface. However, due to the lack of obvious physical interactions between individuals, it was inferred that the behavior observed was primarily related to foraging, occasionally accompanied by social interactions.

8 surveys were carried out in this quarter, and the sighting rate is 0.00%. If compared to the surveys in the EIS stage (2016/2017) and survey results in 2019, 2021, and 2023 Sighting rates in Q1 and Q4 is higher. It can be inferred that more cetacean activities can be found in the wind farm area in Q1 and Q4. Details are shown in Table 3.1.1-20.

It is discovered that sighting rate in this marine area varies a lot. Possible explanations are: 1. The natural variability of cetacean activities is highly unsteady, 2. Cetacean is rare in the Project area. Therefore, accumulation of more long-term survey data is necessary in order to reflect the actual activity frequency. Cetaceans are animals with high mobility. Also, their food do not scatter evenly in the marine area. Therefore, cetaceans will move in a great scale for foraging or mating in order to accomplish required mission in life. This is especially true when it comes to non-offshore/ open sea cetaceans, whose active range are even wider. As a result, chance of encountering cetacean is very small. In addition, cetacean activities are mainly underwater; their breathing time on water surface is so short that observers may not notice instantly. Therefore, cetacean sightings during offshore surveys are very rare.

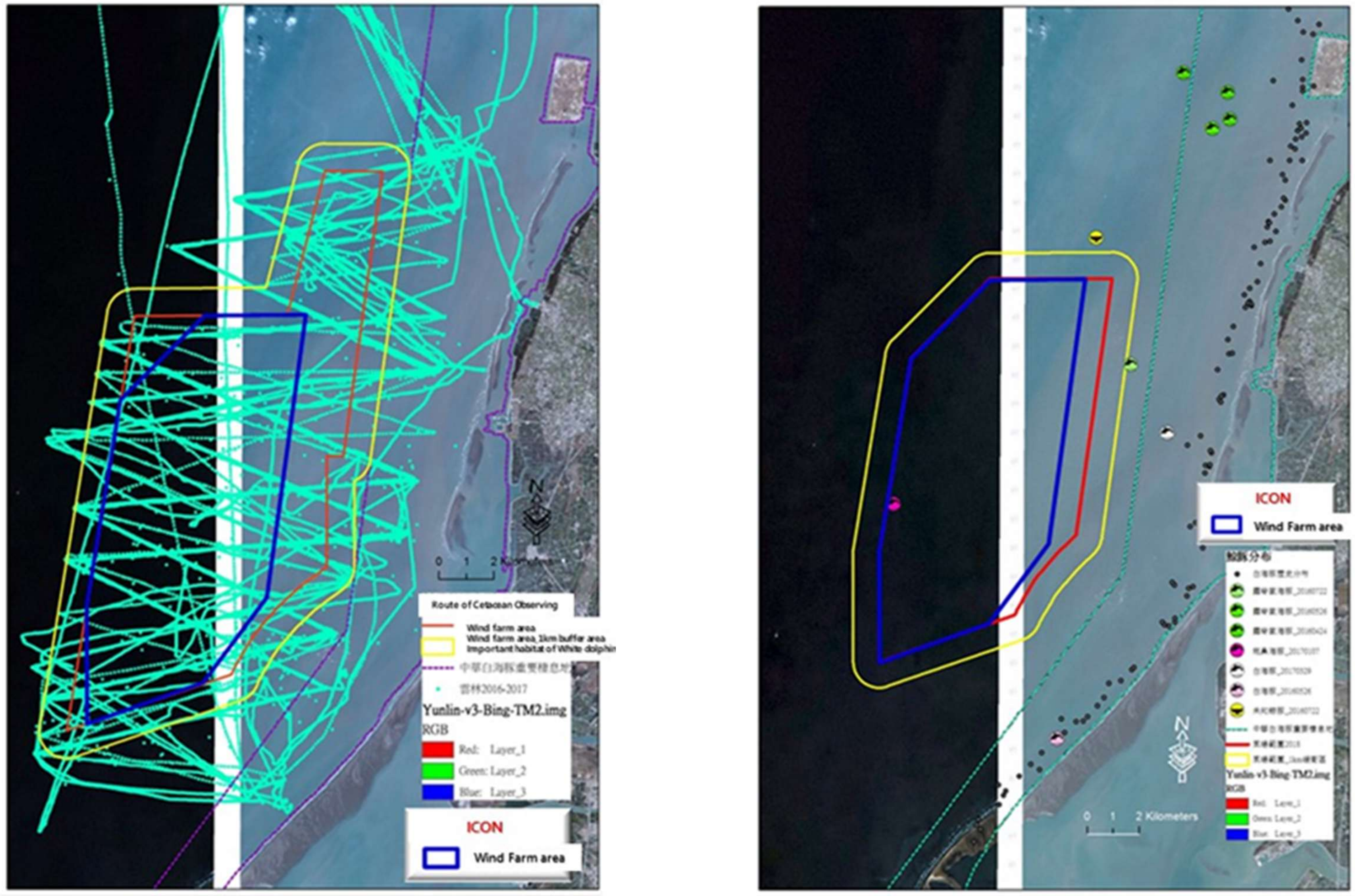


Figure 3.1.1-14 Transect Lines and Results of Cetacean Surveys during EIS Stage (March 2016 to March 2017)

Table 3.1.1-18 Previous Cetacean Visual Survey (1/5)

Trips		Survey Date	Transect[R1] Line		Total Hours (hour)	Total Mileage (km)	On-Effort Hours (hours)	On-Effort Mileage (km)	Sighting Rate (herd)
			Departure	Return					
2019 Q1	1	25th April	6	5	6.08	108.0	4.38	58.4	1
	2	14th May	1	2	5.98	116.0	4.55	67.3	0
	3	15th May	4	3	4.95	107.0	3.80	58.1	0
	4	25th May	6	5	6.08	110.0	4.33	57.9	1
	subtotal	4 trips	--	--	23.09	441.0	17.06	241.7	2
2019 Q2	1	25th June	2	3	5.11	105.0	3.42	56.1	0
	2	26th June[R2]	3	4	4.40	90.9	1.76	28.2	0
	3	15th July	3	4	5.04	105.0	3.62	57.5	0
	4	16th July	5	3	4.94	106.0	3.51	57.0	0
	5	23rd July	3	1	6.06	119.0	4.20	66.7	0
	6	24th July	6	4	4.74	107.0	3.46	57.3	0
	7	25th July	3	5	5.11	105.0	3.63	57.1	0
	8	26th July	6	2	5.20	2,020.0	3.72	57.3	0
	9	22nd August	1	2	5.60	116.0	4.08	67.3	0
	10	23rd August	3	4	5.04	104.0	3.53	57.7	0
	11	27th August	5	6	5.07	106.0	3.44	57.3	0
	12	28th August	1	4	6.40	108.0	4.05	66.0	0
	subtotal	12 trips	--	--	62.70	1,280.9	42.41	685.5	--
2019 Q3	1	9th September	2	5	5.38	119.0	3.16	55.5	1
	2	10th September	3	6	4.82	2,020.0	3.25	56.4	0
	3	11th September	1	2	6.06	122.0	4.18	65.7	0
	4	2nd October	5	6	5.68	111.0	3.54	57.5	0
	5	3rd October	4	3	5.00	103.0	3.66	57.4	0
	6	4th October	1	2	5.82	115.0	4.37	66.6	0
	7	5th October	5	6	6.73	2,020.0	3.74	57.2	0
	subtotal	7 trips	--	--	39.49	788.0	25.90	416.3	1
2019 Q4	1	10th December	4	1	6.44	136.0	3.83	68.8	0
	2	16th December	2	1	9.60	188.3	3.60	66.7	0
	3	14th December	6	1	9.83	209.0	4.06	66.9	0
	4	29th December	5	6	6.89	117.0	3.33	55.7	0
	5	3rd January	4	3	6.39	117.0	3.31	56.8	1
	6	25th February	4	5	5.50	108.0	3.80	57.7	0
	7	26th February	2	5	5.90	111.0	4.12	57.6	0
	Subtotal	7 trips	--	--	50.55	986.3	26.05	430.2	1
Total		30 trips	--	--	175.84	3,496.2	111.43	1,773.7	4

Remark1: Number of transect line (departure and return) indicates the numbered planned cetacean transect line survey route as shown in Figure 1.4-2.

Remark2” Due to a weather change on 26th June, strengthening wind and wave resulted in combers that covered more than 50% of the visible range of sea surface; it also affected sailing safety. Therefore, the sailing ended in advance. Besides, on-effort mileage (28.2 km) has reached half of the scheduled value (57 km), and is therefore included in the calculation of standard siting rate.

Table 3.1.1-18 Previous Cetacean Visual Survey (2/5)

Trips		Survey Date	Transect[R1] Line		Total Hours (hour)	Total Mileage (km)	On-Effort Hours (hours)	On-Effort Mileage (km)	On-effort Sighting (herd (individual))	Off-effort Sighting (herd (individual))
			Departure	Return						
2020 Q1	1	April 17	1	2	5.89	116.0	4.69	66.7	0	0
	2	May 1	2	5	5.57	109.0	4.18	57.5	0	0
	3	May 2	4	3	5.47	103.0	4.16	57.2	0	0
	4	May 5	3	1	6.07	120.0	4.77	67.8	0	0
	5	May 8	6	4	5.68	114.0	3.93	57.0	0	1(3)
	6	May 9	5	6	5.47	109.0	4.21	57.8	0	0
	Subtotal	6 trips	--	--	34.15	671.0	25.94	364.0	--	1
2020 Q2	1	June 01	4	5	5.94	106.0	4.31	57.4	0	0
	2	June 02	3	6	5.55	108.0	4.08	56.5	0	0
	3	June 11	1	2	6.41	116.0	5.00	66.6	0	0
	4	June 12	2	3	6.07	112.0	4.38	57.2	0	0
	5	July 21	6	1	6.17	125.0	4.60	65.6	0	0
	6	July 22	5	4	5.57	109.0	4.14	56.5	0	0
	7	July 29	1	6	6.58	125.0	4.89	65.9	0	0
	8	July 30	5	1	6.21	123.0	4.56	66.1	0	0
	9	August 17	2	5	5.57	114.0	3.99	56.7	0	0
	10	August 18	4	3	5.37	111.0	4.05	57.2	0	0
	Subtotal	10 trips	--	--	59.44	1,149.0	44.00	605.7	--	--
2020 Q3	1	September 7	6	4	5.87	111.0	4.36	56.9	0	0
	2	September 8	3	2	5.48	108.0	3.92	56.7	0	0
	3	November 17	5	6	5.28	112.0	3.58	50.9	0	0
	4	November 18	3	1	6.85	126.0	4.53	61.3	0	0
	5	November 19	1	4	5.80	125.0	4.05	59.6	0	0
	6	November 20	6	5	5.14	117.0	3.05	44.9	0	0
	Subtotal	6 trips	--	--	34.42	699.0	23.49	330.3	--	--
2020 Q4	1	Jan 13	2	3	4.87	101.0	1.56	22.4	0	0
	2	Jan 14	4	2	5.72	119.0	3.09	42.4	0	0
	3	Jan 15	5	6	5.99	119.0	3.33	47.5	0	0
	4	Jan 31	2	5	4.91	124.0	2.22	32.1	0	0
	5	Feb 1	4	3	5.70	115.0	3.69	52.0	0	0
	6	Feb 5	3	2	5.86	129.0	2.79	39.2	2(1, 1)	0
	7	Feb 6	1	4	6.17	131.0	3.49	46.2	0	0
	8	Feb 21	6	3	5.44	118.0	3.13	42.7	0	1(1)
	Subtotal	8 trips	--	--	44.66	956.0	23.30	324.5	2	1
Total (2020)		30 trips	--	--	172.67	3,475.0	116.73	1,624.5	2	2

Remark: Number of transect line (departure and return) indicates the numbered planned cetacean transect line survey route as shown in Figure 1.4-2.

Table 3.1.1-18 Previous Cetacean Visual Survey (3/5)

Trips		Survey Date	Transect Line [R1] Departure	Return	Total Hours (hour)	Total Mileage (km)	On-Effort Hours (hours)	On-Effort Mileage (km)	On-effort Sighting (herd (individual)	Off-effort Sighting (herd (individual)
2021 Q1	1	March 15	5	2	6.12	130.0	3.35	46.6	1(3)	0
	2	March 16	1	4	6.10	130.0	3.81	52.8	0	0
	3	March 29	6	1	5.74	135.0	3.59	50.9	0	0
	4	March 30	3	6	5.28	114.0	3.42	50.0	0	0
	5	April 12	2	5	5.20	121.0	3.11	45.3	0	0
	6	April 13	4	3	5.41	115.0	3.80	52.8	0	0
	7	April 28	5	4	5.49	118.0	3.20	43.8	0	0
	8	May 13	1	5	5.95	131.0	3.66	51.3	0	0
	9	May 28	2	6	5.55	122.0	3.23	44.5	0	0
	10	May 29	4	3	5.95	118.0	3.61	48.7	0	0
	Subtotal	10 trips	--	--	56.71	1,234.0	34.78	486.7	1	--
2021 Q2	1	June 10	3	1	5.95	132.0	3.90	55.0	0	0
	2	June 11	6	2	5.14	121.0	3.16	44.3	0	0
	3	July 5	1	5	6.26	126.0	4.46	62.9	0	0
	4	July 12	5	2	5.22	120.0	3.12	44.3	0	0
	5	July 13	6	1	6.04	128.0	4.24	59.7	0	0
	6	July 14	3	4	5.55	115.0	3.80	51.8	0	0
	7	August 17	4	3	6.65	105.0	3.27	48.2	0	0
	8	August 18	2	6	5.33	118.0	3.30	50.0	0	0
	9	August 27	5	3	4.85	121.0	2.76	39.0	0	0
	10	August 28	2	5	5.24	115.0	3.69	54.7	0	0
	Subtotal	10 trips	--	--	56.23	1,201.0	35.70	509.9	--	--
2021 Q3	1	September 6	3	4	5.17	112.0	3.35	49.9	0	0
	2	September 7	6	2	5.76	120.0	3.44	48.5	0	0
	3	September 22	4	1	5.67	125.0	3.65	53.8	0	0
	4	September 23	1	6	5.62	127.0	3.67	55.5	0	0
	5	November 5	4	5	5.55	111.0	3.72	54.2	0	0
	6	November 6	5	4	5.16	112.0	3.48	50.5	0	0
	Subtotal	6 trips	--	--	32.93	707.0	21.31	312.4	--	--
2021 Q4	1	December 16	1	6	6.03	128.0	4.42	65.9	0	0
	2	February 26	6	2	6.82	113.0	3.62	56.9	0	0
	3	February 28	2	3	11.49	182.0	3.41	56.9	0	0
	4	February 28	3	1			4.30	65.3	0	0
	Subtotal	4 trips	--	--	24.34	423.0	15.75	245	--	--
Total(2021)		30 trips	--	--	170.22	3,565.0	107.54	1,544.0	1	--

Remark1: Number of transect line (departure and return) indicates the numbered planned cetacean transect line survey route as shown in Figure 1.4-2.

Remark2: 1 herd of unknown cetacean was observed on March 15th. The species cannot be identified as sighting duration is too short.

Table 3.1.1-18 Previous Cetacean Visual Survey (4/5)

Trips		Survey Date	Transect Line R1		Total Hours (hour)	Total Mileage (km)	On-Effort Hours (hours)	On-Effort Mileage (km)	On-effort Sighting (herd (individual)	Off-effort Sighting (herd (individual)
			Departure	Return						
2022 Q1	1	March 01	3	6	5.51	117.0	3.77	55.1	0	0
	2	March 17	2	5	5.51	117.0	3.81	57.2	0	0
	3	March 25	4	2	5.79	112.0	3.87	56.7	0	0
	4	April 21	6	3	6.64	120.0	4.36	58.1	0	0
	5	April 27	5	1	5.88	125.0	4.45	65.6	0	0
	6	May 11	1	4	5.92	123.0	4.10	60.2	0	0
	7	May 12	4	5	5.50	114.0	3.73	55.0	0	0
	Subtotal	7 trips	--	--	40.55	828.0	28.09	407.9	--	--
2022 Q2	1	June 03	2	4	5.38	116.0	3.85	57.3	0	0
	2	June 04	6	3	5.61	118.0	3.94	58.6	0	0
	3	June 12	3	1	5.67	119.0	4.27	65.7	0	0
	4	June 13	5	2	6.58	121.0	4.18	57.9	0	0
	5	June 14	1	6	6.34	128.0	4.36	65.7	0	0
	6	June 23	5	3	5.18	115.0	3.54	53.5	0	0
	7	June 24	1	5	5.69	121.0	3.66	56.5	0	0
	8	July 09	4	6	5.57	121.0	3.17	47.5	0	0
	9	July 10	3	1	6.07	124.0	4.30	64.8	0	0
	10	July 13	2	4	5.44	116.0	3.65	57.0	0	0
	11	July 30	6	2	6.09	120.0	3.69	50.2	0	0
	12	August 16	3	5	5.51	112.0	3.63	52.2	0	0
	13	August 17	4	1	6.26	121.0	4.29	63.9	0	0
	14	August 18	6	4	5.78	111.0	3.99	56.6	0	0
	15	August 21	5	6	5.73	107.0	3.75	53.4	0	0
	16	August 22	1	2	5.75	120.0	3.65	54.7	0	0
	Subtotal	16 trips	--	--	92.65	2,718.0	61.92	915.5	--	--
2022 Q3	1	September 15	2	3	5.09	113.0	2.84	42.1	0	0
	2	September 19	4	1	7.01	120.0	4.30	63.6	0	0
	3	October 02	6	2	5.57	114.0	3.63	51.9	0	0
	Subtotal	3 trips	--	--	17.67	347.0	10.77	157.6	--	--
2022 Q4	1	January 12	5	3	5.53	111.0	3.79	56.6	0	0
	2	January 13	3	6	5.81	118.0	3.67	53.6	0	0
	3	January 14	1	4	7.57	131.0	4.52	64.2	3(14)	0
	4	February 1	2	5	5.80	114.0	3.91	56.6	0	0
	Subtotal	4 trips	--	--	15.88	474.0	15.89	231.0	3	0
Total		30 trips	--	--	166.75	4,367.0	116.67	1,712.0	6	--

Remark1: Number of transect line (departure and return) indicates the numbered planned cetacean transect line survey route as shown in Figure 1.4-2.

Table 3.1.1-18 Previous Cetacean Visual Survey (5/5)

Trips		Survey Date	Transect Line [R1]		Total Hours (hour)	Total Mileage (km)	On-Effort Hours (hours)	On-Effort Mileage (km)	On-effort Sighting (herd (individual)	Off-effort Sighting (herd (individual)
			Departure	Return						
2023 Q1	1	March 8	3	5	5.10	108.0	3.16	47.3	0	0
	2	March 21	4	2	5.50	116.0	3.55	54.7	0	0
	3	March 23	6	3	5.80	117.0	3.62	49.7	0	0
	4	April 18	5	2	5.17	116.0	3.22	50.2	0	0
	5	May 4	5	1	5.68	122.0	4.03	63.2	0	0
	6	May 6	2	4	5.39	112.0	3.54	45.8	0	0
	7	May 17	1	4	5.44	122.0	2.40	58.1	0	0
	8	May 26	2	6	5.53	120.0	2.40	52.1	0	0
	Subtotal	8 trips	--	--	43.61	933.0	25.92	421.1	--	--
2023 Q2	1	June 7	3	6	5.99	121.0	3.76	54.0	0	0
	2	June 26	2	1	6.34	123.0	4.37	64.1	0	0
	3	June 27	6	2	5.15	116.0	3.17	48.4	0	0
	4	June 28	4	3	5.45	110.0	3.62	54.4	0	0
	5	July 11	1	6	6.41	126.0	4.13	59.6	0	0
	6	July 12	5	6	5.08	109.0	3.19	49.7	0	0
	7	July 13	4	5	5.54	109.0	3.31	51.2	0	0
	8	July 20	3	4	6.03	111.0	3.22	46.5	0	0
	9	August 22	6	1	6.11	124.0	3.85	58.6	0	0
	10	August 23	5	6	5.22	109.0	2.88	43.4	0	0
	11	August 24	2	1	5.72	117.0	3.79	58.9	0	0
	12	August 29	6	4	5.29	108.0	3.23	50.1	0	0
	Subtotal	12 trips	--	--	68.33	1,383	42.53	638.9	--	--
2023 Q3	1	September 18	6	3	5.42	108.0	3.44	53.7	0	0
	2	September 19	1	4	5.74	119.0	3.87	60.5	0	0
	3	September 20	1	5	5.94	120.0	3.65	56.6	1(1)	0
	4	September 21	3	1	5.65	118.0	3.71	58.0	0	0
	5	October 19	4	2	5.34	110.0	3.42	52.7	0	1(2)
	6	October 20	3	5	5.63	107.0	3.68	56.5	0	0
	Subtotal	6 trips	--	--	33.73	682.0	21.77	338.0	--	--
2023 Q4	1	December 9	1	2	5.78	118.0	4.15	64.8	0	0
	2	December 15	5	3	5.46	107.0	3.49	55.2	0	0
	3	February 1	4	5	6.28	110.0	4.01	55.2	0	0
	4	February 14	2	3	7.16	115.0	4.07	56.3	0	2(7,8)
	Subtotal	4 trips	--	--	24.68	450.0	15.72	231.5	--	--
Total		30 trips	--	--	170.34	3,448.0	108.31	1,630.0	1(1)	0

Table 3.1.1-18 Previous Cetacean Visual Survey (6/6)

Trips		Survey Date	Transect Line [R1]		Total Hours (hour)	Total Mileage (km)	On-Effort Hours (hours)	On-Effort Mileage (km)	On-effort Sighting (herd (individual)	Off-effort Sighting (herd (individual)
			Departure	Return						
2024 Q1	1	March 16	3	5	6.11	109.0	4.23	55.0	0	0
	2	March 22	4	2	5.38	111.0	3.10	42.8	0	0
	3	April 16	6	3	5.64	108.0	4.00	54.8	0	0
	4	April 17	5	2	5.72	111.0	3.42	46.5	0	0
	5	May 24	2	4	5.11	102.0	3.14	41.9	0	0
	6	May 25	4	6	5.12	105.0	3.04	42.2	0	0
	7	May 26	5	4	5.32	99.3	3.48	47.3	0	0
	8	May 27	1	2	6.19	115.0	4.24	57.8	0	0
	Subtotal	8 Trips	--	--	44.59	860.3	28.65	388.3	--	--

Table 3.1.1-19 Previous Records of Environment Factors on Cetacean Spotting Points

On effort sighting						
Survey date	Cetacean Species	Water Depth(m)	Water Temperature (℃)	Salinity (‰)	pH	turbidity (NTU) Activities
2019.04.25	Bottlenose Dolphin	27.5	27.5	34.6	8.22	--
2019.05.25	Yangtze Finless Porpoise	14.8	27.3	33.4	8.18	Foraging
2019.09.09	Yangtze Finless Porpoise	8.4	--	--	--	Foraging
2020.01.03	Bottlenose Dolphin	22.4	20.0	33.3	8.49	Travelling
2020.02.05	Unknown cetacean	27.4	19.2	34.0	8.15	Travelling
2020.02.05	Bottlenose Dolphin	22.1	20.0	34.1	8.16	Foraging
2021.03.15	Unknown cetacean	27.4	19.2	34.0	8.20	Travelling
2023.01.14	Unknown cetacean[3]	--	--	--	--	Travelling
2023.01.14	Unknown cetacean[3]	23.8	23.0	33.2	8.10	Travelling
2023.01.14	Bottlenose Dolphin	24.9	22.6	33.1	8.13	Travelling
2023.09.20	Yangtze Finless Porpoise	12.3	28.8	32.5	8.29	Travelling
Off effort sighting						
Survey date	Cetacean Species	Water Depth(m)	Water Temperature (℃)	Salinity (‰)	pH	turbidity (NTU) Activities
2020.05.08	Chinese white dolphin	7.9	28.5	33.7	8.20	Foraging
2021.02.21	Chinese white dolphin	5.9	19.5	32.7	8.16	Travelling
2023.07.11	Chinese white dolphin	8.3	30.6	34.2	8.15	Travelling
2023.07.20	Chinese white dolphin	8.1	31.5	32.9	8.08	Travelling
2023.10.19	Chinese white dolphin	6.5	26.6	32.6	8.01	Travelling
2024.02.14	Chinese white dolphin	6.0	19.4	--[4]	8.15	Milling
2024.02.14	Chinese white dolphin	7.5	19.4	33.2	8.03	Foraging, Travelling

Remark1: Due to the short sighting, no further information was provided in identifying their species and behaviors.

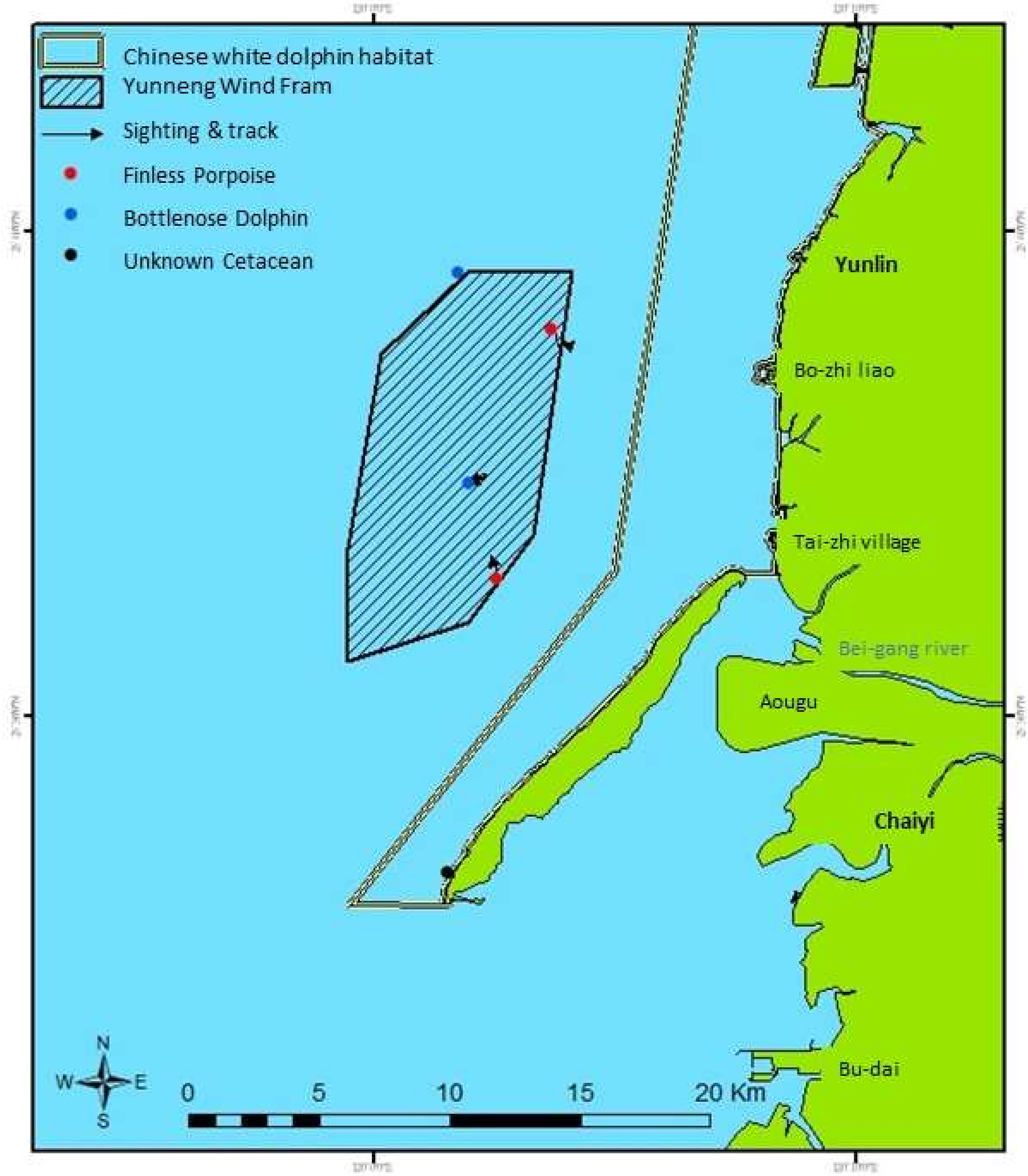
Remark2: Device for water quality was out of order on 9/9, therefore only water depth was recorded.

Remark3: Species cannot be identified as the sighting is too short.

Remark4: On February 14, the salinity data could not be successfully measured due to a sudden malfunction of the water quality instrument.

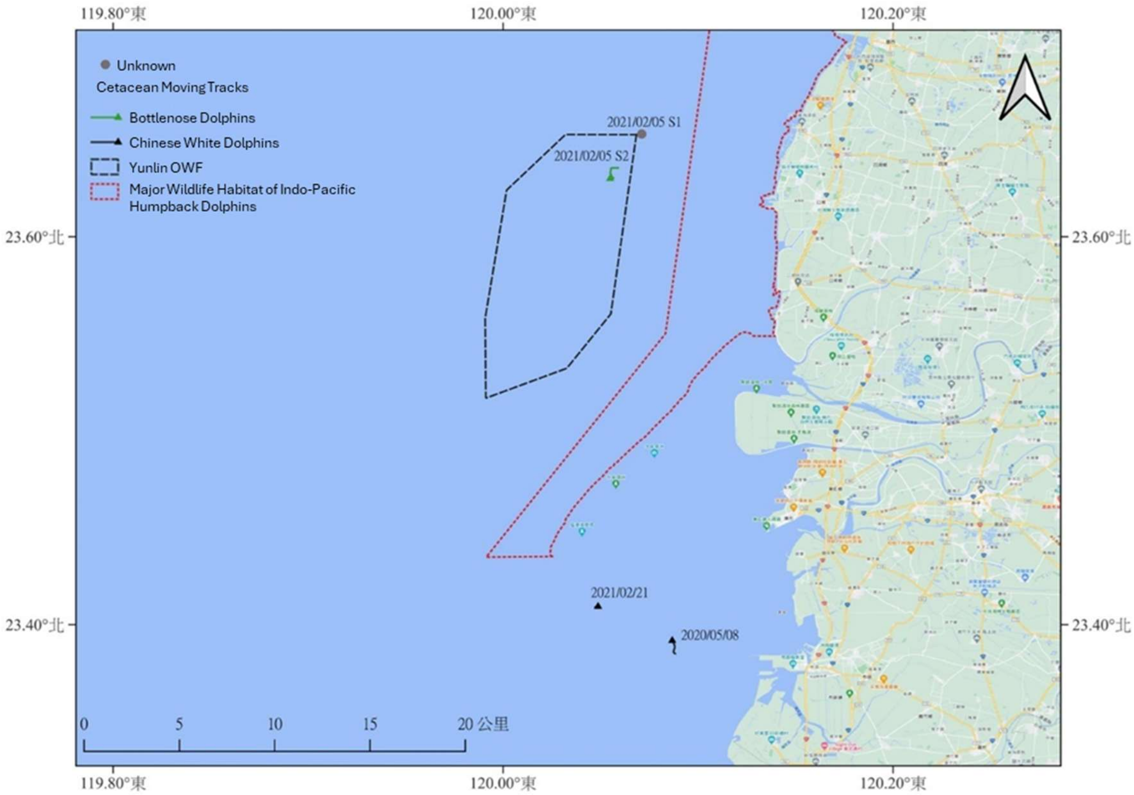
Table 3.1.1-20 Comparison of Sighting Rates in Previous Quarters

Year	Quarter	Trips	On-effort sighting	On-Effort Mileage (km)	On-Effort hour (hr)	On-effort Sighting (on-effort/100km)
2016/2017 (EIA)	Q1	8	4	569.8	44.62	0.70
	Q2	9	2	785.6	53.40	0.26
	Q3	7	0	511.8	32.68	0
	Q4	6	1	479.4	31.78	0.21
2019	Q1	4	2	241.7	17.06	0.83
	Q2	12	0	685.5	42.41	0
	Q3	7	1	416.3	25.90	0.24
	Q4	7	1	430.4	24.65	0.23
2020	Q1	6	0	364.0	25.94	0
	Q2	10	0	605.7	43.99	0
	Q3	6	0	330.3	23.49	0
	Q4	8	2	324.5	23.30	0.62
2021	Q1	10	1	486.7	34.78	0.21
	Q2	10	0	509.9	35.70	0
	Q3	6	0	312.4	21.31	0
	Q4	4	0	245.0	15.75	0
2022	Q1	7	0	407.9	28.09	0
	Q2	16	0	915.5	61.91	0
	Q3	3	0	157.6	10.77	0
	Q4	4	3	231.0	15.89	1.30
2023	Q1	8	0	421.1	25.91	0.00
	Q2	12	0	638.9	42.53	0.00
	Q3	6	1	338.0	21.77	0.46
	Q4	4	0	231.5	15.71	0.00
2024	Q1	8	0	388.3	28.65	0.00



Note: A herd of 2 dolphins (bottle nose dolphin) are spotted at the north boundary of wind farm on April 25, 2019. A herd of 4 Yangtze Finless Porpoise at the southeast boundary of wind farm on May 25, 2020. A herd of 4 Yangtze Finless Porpoise at the Northeast boundary of wind farm on September 9. A herd of 8 bottle nose dolphins are spotted in the wind farm area on January 3, 2020.

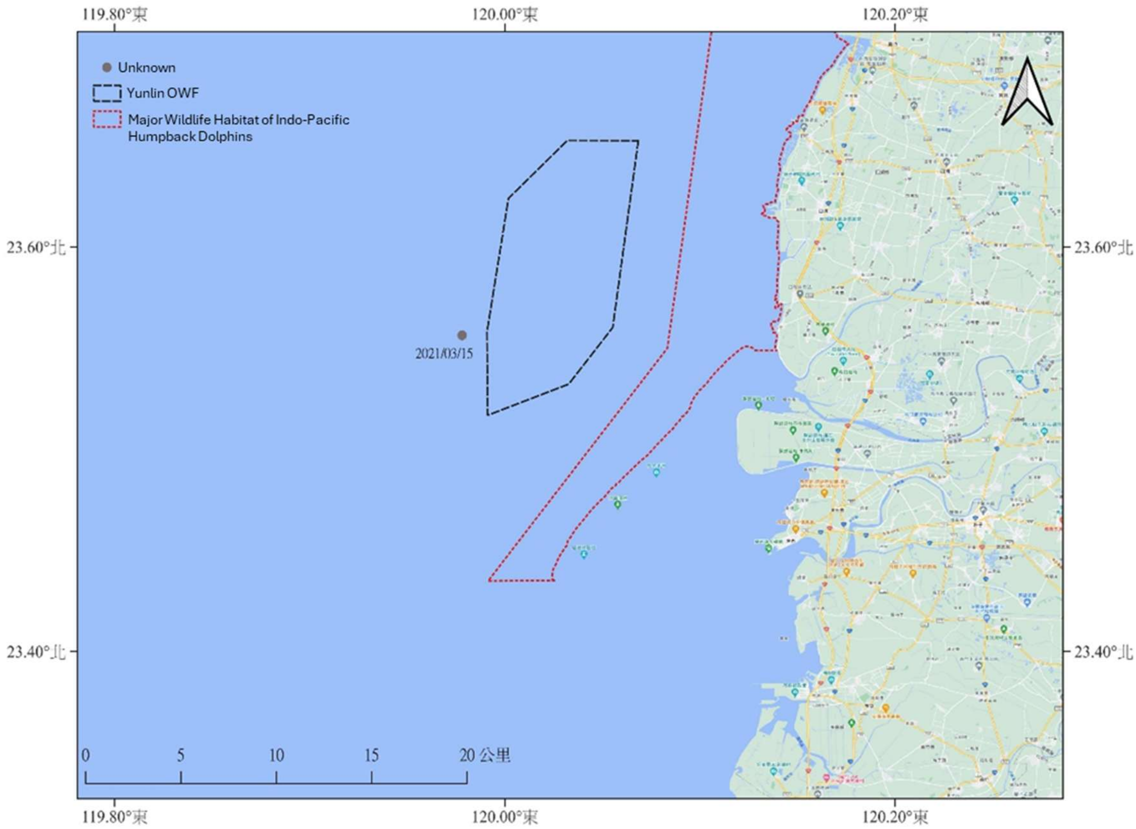
Figure 3.1.1-15 The Spotted Location of The Cetacean from Visual Survey and its Moving Tracks in 2019



Remark1: A herd of 3 Chinese white dolphins were spotted on off-effort route (outside of Budai Port) on May 8, 2020.

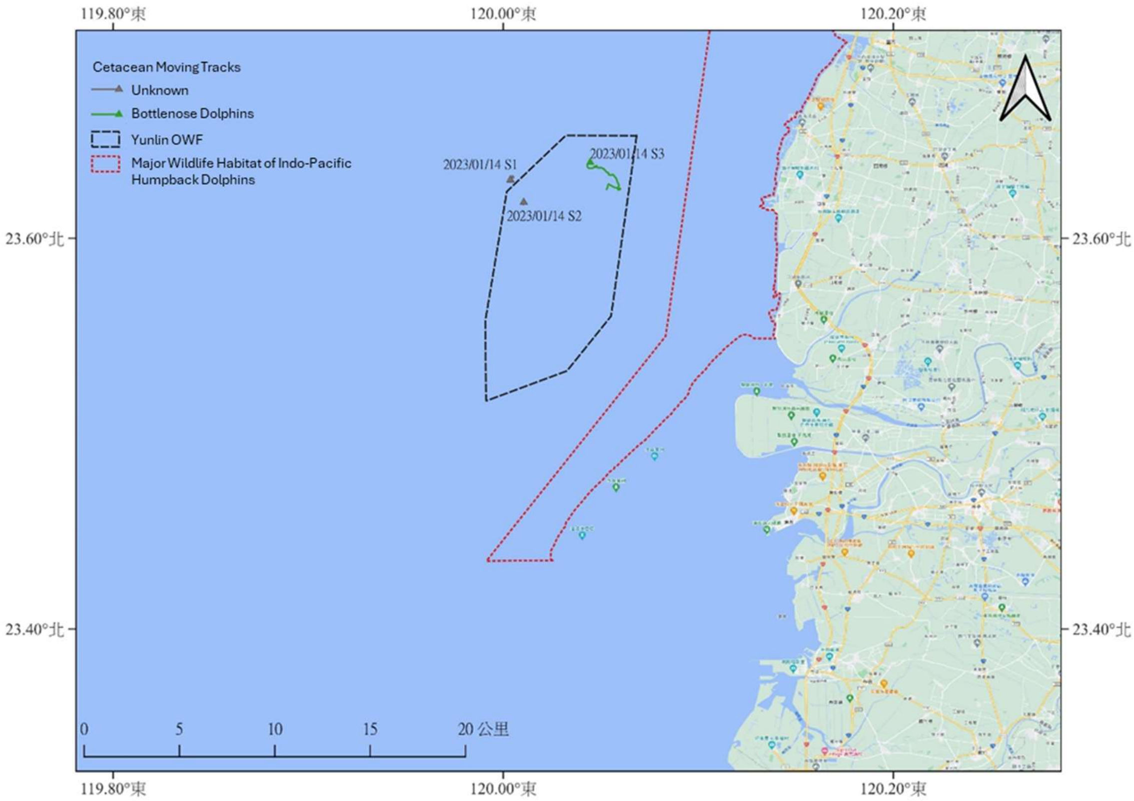
Remark2: Due to the short sighting, no further track information was provided.

Figure 3.1.1-16 The Spotted Location of The Cetacean from Visual Survey and its Moving Tracks in 2020



Remark: Due to the short sighting, no further track information was provided.

Figure 3.1.1-17 The Spotted Location of The Cetacean from Visual Survey and its Moving Tracks in 2021



Remark: Due to the short sighting, no further track information was provided.

Figure 3.1.1-18 The Spotted Location of The Cetacean from Visual Survey and its Moving Tracks in 2022

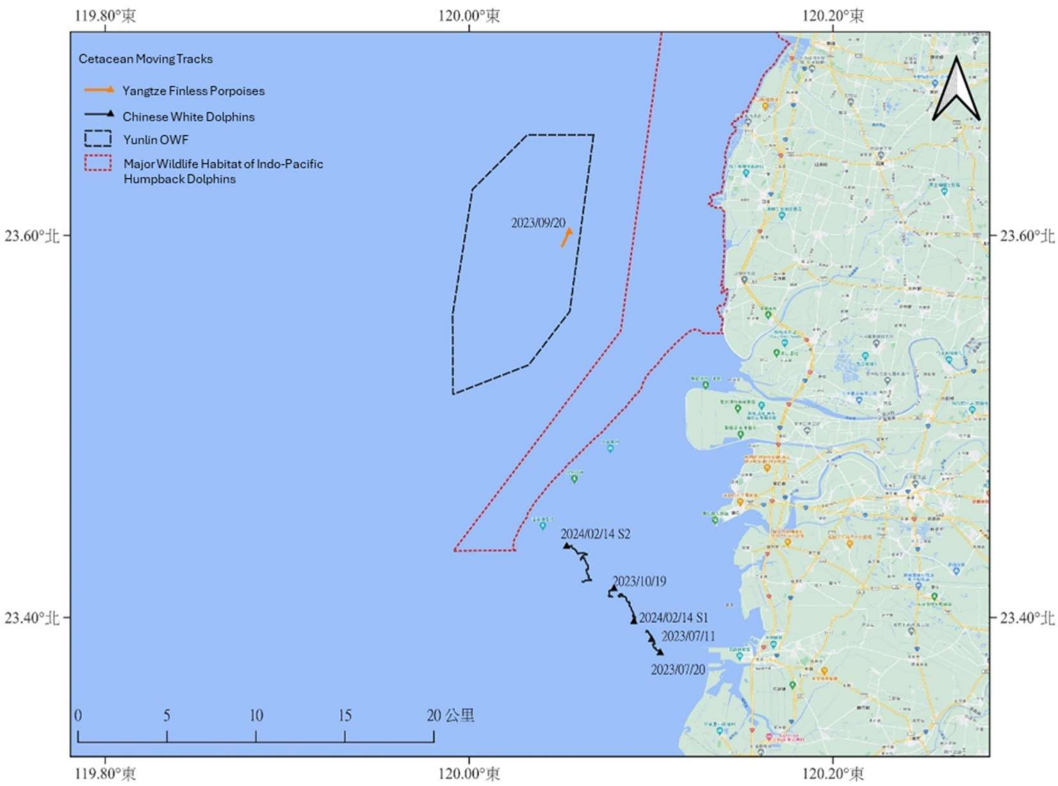


Figure 3.1.1-19 The Spotted Location of The Cetacean from Visual Survey and its Moving Tracks in 2023

VII. Electromagnetic Field

The historical monitoring result is shown as Table 3.1.1-30. In all surveys conducted in this Project, all results comply with the value suggested by the Induction for Limiting Exposure of Time-varying electronic field, Magnetic Field and Electromagnetic Field.

Table 3.1.1-30 Monitoring Result of Electromagnetic Field

Sampling station	Sihu booster station
	magnetic field (mG)
2023.08.28	0.294
Suggested value	833

Remark: Refer to Induction for Limiting Exposure of Time-varying electronic field, Magnetic Field and Electromagnetic Field, 2021.01.21. Amendment is made under Official No. 1090004463, which comes into effect 6 months after its issuance.

3.1.2 Abnormal Environmental Monitoring results and Response Actions

I. Abnormal issues in the last quarter are listed in Table 3.1.2-1.

Table 3.1.2-1 Abnormal Issues and Response Actions of Previous Quarter

Abnormal Issues	Response Actions	Work Effectiveness
None	None	None

II. Abnormal issue was found in the environmental monitoring results of this quarter, details are listed in Table 3.1.2-2.

Table 3.1.2-2 Abnormal Issues and Response Actions of This Quarter

Abnormal Issues	Response Actions
The water quality monitoring shows that the Ammonia-N level in the mid-layer at S4 exceeded the standard.	The marine water quality monitoring results for this quarter show that the mid-layer Ammonia-N level at S4 exceeded the Type A Marine Environment Quality Standards (<0.3 mg/L). The exceedance is likely due to the impact of domestic sewage and animal excrement on the nearshore water quality, combined with sediment accumulation from Bozailiao Fishing Harbor to Waisanding Sand Bar, resulting in poor water exchange in the area. Heavy rainfall may flush accumulated pollutants into the sea, thereby affecting the water quality of the adjacent marine areas.

3.2 Recommendations

No recommendation for the environmental program. This project will implement relevant monitoring tasks as stated in the program.

Literature

I. General

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2. 允能風力發電股份有限公司籌備處, 民國 107 年 12 月, 「雲林離岸風力發電廠興建計畫變更內容對照表(變更監測計畫)」(定稿本).
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