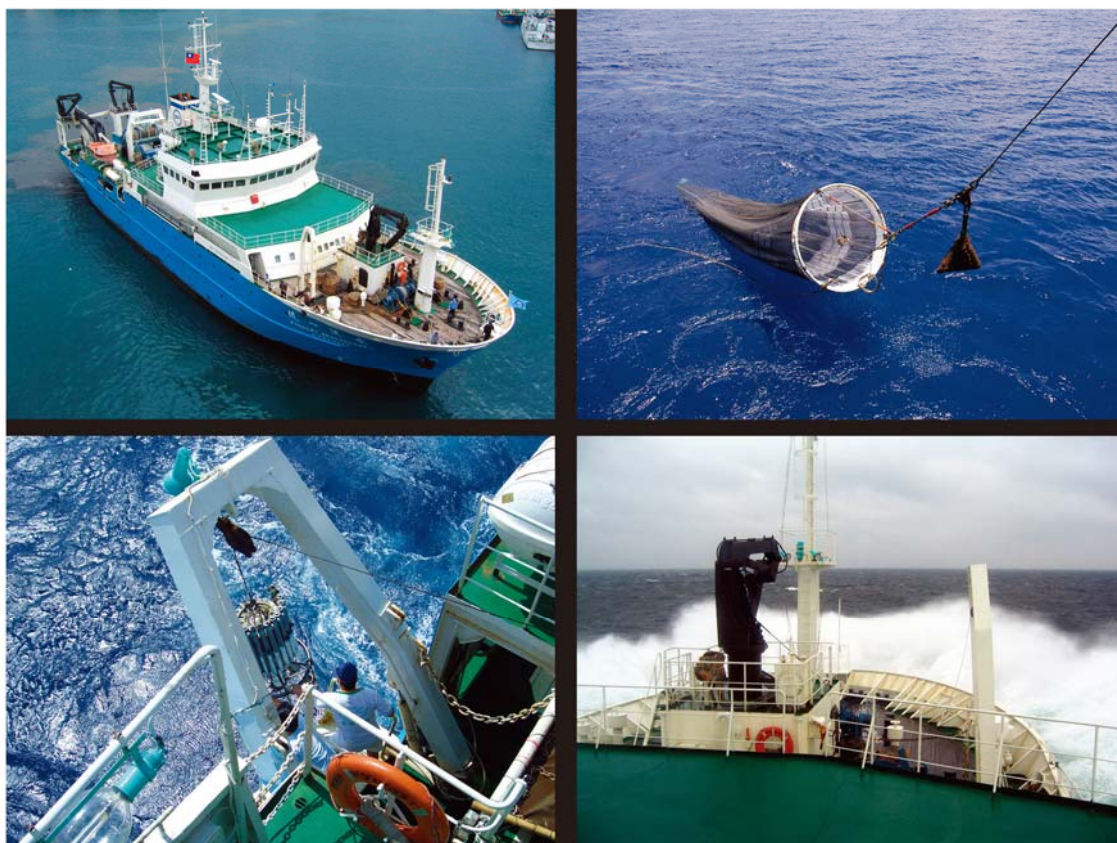




Cruise Report of TaiCOFI Surveys in 2020

2020年臺灣周邊海域漁場環境監測航次報告



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Fisheries Research Institute

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序

臺灣以海洋興國，周邊二百哩經濟海域內 43 萬平方公里的藍色國土，孕育著無限寬廣的機會，向海洋發展更見證了臺灣人民不畏艱苦的勤奮特性，而得天獨厚的海洋環境賜給我們豐富的漁業資源，各式新鮮美味的魚蝦蟹貝更是國人最優質的蛋白質來源。然而，臺灣沿近海漁業資源之利用已趨飽和，如何在人口增加的同時兼顧糧食需求的增加，謀求資源開發與生態保育間之平衡，將是我們未來最大的課題與挑戰。

漁業是一個古老的行業，但管理漁業資源卻需要最先進的科學。氣候變遷造成海水溫度升高，除了造成魚類棲地的改變，亦直接影響了魚群洄游的路徑與時間，改變了暖水性與冷水性魚種的分布界線，造成漁場的改變甚至消失，對漁業資源造成深遠的影響，而水溫、鹽度、基礎生產力等水團特性則是影響漁場、漁期變動的關鍵因子。為此，許多國家已致力於長期海洋環境及生物資源觀測資料庫之建置，以求有效監測海洋物理與化學環境，方能及時發現問題並提供解決對策，期能降低氣候變遷之衝擊。

長期海洋環境觀測是一個持續進行的過程，也是一連串的挑戰。本所自 2003 年起執行「臺灣周邊海域漁場環境監測計畫」，運用「水試一號」與「水試二號」試驗船及其配備的各項科儀設備，克服一切險阻於周邊海域大範圍蒐集溫鹽、營養鹽、葉綠素甲、基礎生產力及浮游動物等漁場環境資訊，迄今未曾間斷。本專刊記載彙錄同仁們辛苦工作的結晶，衷心希冀藉由本專刊之發行，將調查成果作為學術應用、漁業管理與接軌國際之橋梁，為我國漁業資源永續利用奠定良好之基礎。

所長

陳君如

謹誌

中華民國一一零年七月

Preface

Taiwan is an island and the ocean is our priceless property. The Exclusive Economic Zone (EEZ) of Taiwan covers 430 thousand square kilometers of ocean and unlimited opportunities. Consequently, the government promotes "Ocean rejuvenating" policy ideas and it fits well with the diligent nature of people in Taiwan. Our ocean is favorably endowed with all kind of fishery resources, which provide our compatriots the best high quality animal protein. However, the coastal resources are declining in recent years. Therefore, the balance between fishery development and conservation will be the biggest challenge in the future.

Fishery is an old business, but to manage it properly requires state of the art science. Climate change lead to rising water temperature, with the consequences of changing habitats, alteration of distribution boundary, and the oscillation of fishing grounds of aquatic resources. The effect of climate change is profound for fishery resources and water temperature, salinity and primary production of the water masses are the key factors that affect the variation of fishing grounds and fishing season. As a result, in order to monitor our ocean and to detect anomalies effectively and to find a way to mitigate the impact of climate change, many countries have devoted to establishing their long-term database for marine environment and aquatic living resources.

Long-term observation of the ocean is a continuous process with a series of challenges. Fisheries Research Institute implemented the Taiwan Cooperative Oceanic Fisheries Investigations (TaiCOFI) program to investigate in the hydrography and fisheries resources in the surrounding waters of Taiwan since 2003 and now a consecutive 18 years database of marine environment was established. With the publication of "Cruise report of TaiCOFI surveys in 2020", we hope this project to be helpful for fishery researchers and policy makers and to promote international academic exchange. Finally, we hope this project will contribute more to the society and lead fisheries in Taiwan toward sustainability.

Director General

June-ru Chen

Fisheries Research Institute

前言

近年來由於全球氣候變遷及海洋環境污染問題日益嚴重，許多國家已致力於海洋環境及生物資源之基礎探測與資料庫之建置。然以往我國有關海洋方面之研究計畫多侷限於局部海域之短期研究，觀測線或觀測點常隨計畫主題改變，缺乏長期而有系統性的調查資料，再者，多數計畫係以海洋物理化學為研究重點，漁業研究學者欲將這些資料應用在水產資源研究上，著實不易。

有鑑於此，水產試驗所於 2003 年起著手實施「臺灣周邊海域漁場環境監測」計畫，於周邊海域設置 62 個測站按季蒐集水溫、鹽度、營養鹽、葉綠素、浮游動物等漁場環境資訊，嘗試透過此全面性之調查來瞭解臺灣周邊海域長期水文、海況及漁場環境時空分布資訊，進而掌握影響臺灣周邊海域漁業資源變動的機制。多年來，承蒙各方提供寶貴之經驗與建議，不斷改進海洋探測科儀操作及採樣相關流程，在本所同仁與國內相關學術單位的共同努力下，無論在各項科儀操作效率、漁場環境調查技術或漁業生物研究上均已有成果。

本專刊彙集本所於 2020 年執行「臺灣周邊海域漁場環境監測」計畫（農委會科技計畫編號：109 農科-9.2.3-水-A4）之調查成果，計畫執行之海上採樣作業流程、各調查項目實驗室檢測流程、各航次出海採樣及樣本分析人員均有詳述於後，以圖示方式刊出臺灣周邊海域之水溫、鹽度、營養鹽、葉綠素、浮游動物及基礎生產力等漁場環境因子之調查成果以供各界參考。此外，本年度因試驗船機件老舊維修期程無法配合，故只執行夏季航次。本計畫內容涉及廣泛專業領域，雖戮力以赴亦難免有疏漏不周之處，希冀各界先進不吝賜教斧正。

Introduction

With the changing of climate and the growing of marine environmental pollutions in recent years, many countries have devoted to establishing their database for marine environment and aquatic living resources. However, in the past, marine research programs in Taiwan were mostly confined to a short time scale and of a limited region. Besides, transects or stations of surveys were usually changing with the changing of projects, resulted in a scarcity of long term and systematic observations of waters around Taiwan. Furthermore, most programs were aimed at marine chemistry and physics studies. It is hard for fishery scientists to incorporate that information into fishery stock assessment.

As a result, Fisheries Research Institute implemented (Taiwan Cooperative Oceanic Fisheries Investigations, TaiCOFI) program in 2003 to conduct quarterly cruises to collect water temperature, salinity, nutrients, chlorophyll-*a* and zooplankton measurements at 62 stations in the surrounding waters of Taiwan. Through this thorough investigation, we try to understand the coupling of physical, chemical and biological dynamics in the surrounding waters of Taiwan to figure out the factors associated with the fluctuation of fishery resources. For the past years, we really appreciated for the valuable advices from academic communities to improve our field sampling techniques and operation procedures of marine observation instrument. With the hardworking of our staff members and associated academic organizations, now we have preliminary achievements in the operating efficiency of marine observation instruments, fishing ground investigation techniques and fisheries biology research.

The data presented in this report were collected by TaiCOFI cruises in 2020. Standard procedures of field program and sample analysis are described in detail and the distribution of water temperature, salinity, nutrients, chlorophyll-*a*, zooplankton and primary production are illustrated in figures for each cruise. We only completed the summer cruise due to the maintenances of our research vessels. Finally, we will extend our special thanks for your advices to improve this cruise report.

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海上採樣作業流程

在臺灣周邊海域選定 62 個測站，利用水試一號試驗船及其裝備，按季節別於 2020 年 7 月，進行下列之工作項目：

1.CTD 溫鹽調查：

採用 Seabird SBE-911PLUS 溫鹽深儀(CTD)，每測站均投放至 1000 m (水深不足之測站則以實際水深少 10 m 為原則)，取得溫深鹽之連續資料。

2.分層採水：

利用 General Oceanics 之自動採水瓶，採取 5、25、50、75、100、150 m 等水層之海水各 2000 ml。

3.葉綠素甲測定：

取各層海水 1000 ml，利用 Millipore 濾紙過濾後，以-20℃冷凍保存，再攜回實驗室檢測。

4.營養鹽類測定：

分別收集各層海水 100 ml，以液態氮(-196℃)急速冷凍保存後，再攜回實驗室檢測。

5.浮游動物採集：

以 ORI 網下放至 200 m 深(水深不足之測站則以實際水深少 5 m 為原則)，以 1 m/s 速度上揚，取得之樣本以 5%福馬林海水溶液保存，再攜回實驗室測定生物量及分類。

Field observations

The survey was carried out in the waters surrounding Taiwan by Fishery Researcher I during quarterly cruise in July in 2020. The following procedures were conducted at each station.

1. Temperature and salinity:

CTD, Seabird SBE-911PLUS, was lowered from the surface to 1000 m (or 10 m above the bottom for shallow areas).

2. Water sampling for chlorophyll-*a* and nutrients:

The Rosette (GO-1015), mounted on the frame of CTD, were sequentially closed and collected 2 liter water sample at specific target depths (5, 25, 50, 75, 100, 150 m) as the CTD was raised.

3. Chlorophyll-*a* concentration measurement:

One liter of sea water samples were immediately filtered through Millipore filter papers and then put in -20°C refrigerator for chlorophyll-*a* concentration measurement in the laboratory.

4. Nutrients concentration measurement:

100 ml of sea water samples for each depth were collected and then put in liquid nitrogen (-196°C) for nutrients concentration measurement in the laboratory.

5. Sampling gear and methods for zooplankton:

The ORI net, with a 1.6 m diameter mouth opening, 6 m in length and 0.333 mm meshes, was towed obliquely to 200 m (for shallow areas, 5 m above the bottom) at each station. The net opening is fastened with a short 3-lead bridle connected to several meters of line which attached to the towing cable by a clamp. A General Oceanic flowmeter is suspended across the center of the net mouth to measure the amount of water filtered during each tow. The net was towed at a ship speed of 1.0 knots for about 10 minutes. After the net was on board, samples were pouring into the PVC bottle and preserved immediately in 5% formalin buffered with sodium borate.

樣本實驗檢測流程

壹、營養鹽、葉綠素及基礎生產力之測定流程

取各水層水樣急速凍結保存後，分析各水層之硝酸(nitrate)、磷酸(phosphate)、矽酸(silicate)等營養鹽，另外將濾畢各層海水之濾紙以丙酮溶解萃取出葉綠素分析其葉綠素甲濃度；利用光暗瓶溶解氧法，分析臺灣周邊海域之基礎生產力(primary productivity)。

1. 硝酸測定：

硝酸以 Wood-Armstrong-Ricgard 法測定，將過濾之試水通過銅-鎘還原管，使硝酸還原成亞硝酸，然後加入 Sulfanilamide 及 NED 溶液，於分光光度計上以 542 nm 測定吸光值並計算其濃度，另取同樣試水不經銅-鎘還原管，直接測定水中之亞硝酸濃度，將經過銅-鎘還原管之數值扣除水中亞硝酸之濃度後，依銅-鎘還原管之還原率計算水中硝酸之濃度。

2. 磷酸測定：

磷酸以 Molybdenum blue-Ascorbic acid 法測定，將過濾後之試水加入以 Ammonium molybdate、Sulfuric acid、Ascorbic acid 及 Potassium antimonyl-tartrate 所配製的還原溶液，待其成色後使用分光光度計以波長 885 nm 測定吸光值並計算待測物之濃度。

3. 矽酸測定：

矽酸以 Molybdosilicate 法測定，將過濾之試水先後添加 50% HCl、10% Ammonium molybdate 及 10% Oxalic acid 後，加入以 1-amino-2-naphthol-4-sulfonic acid、 Na_2SO_3 及 NaHSO_3 所配製的還原試劑，混合完成後使用分光光度計上以波長 815 nm 測定其吸光值，由各波長之吸光值並計算待測物之濃度。

4. 葉綠素甲測定：

葉綠素甲以 Trichromatic 法測定，將各水層過濾後的濾紙，分別加入丙酮研磨後，放入恆溫培養箱(4 °C) 24 小時之後，將樣品置於冷凍離心機 4 °C、轉速 3000 rpm 離心 15 秒後，分別取出上清液，使用分光光度計測其各波長之吸光值後由公式(Jeffrey and Humphrey, 1975)計算葉綠素甲濃度。

5. 基礎生產力測定：

將試水分別裝入錫箔紙包覆之暗色溶氧及透明瓶中，分別進行光度恆溫培養，經 24 小時後，測定溶氧瓶中水樣始末之溶氧差，換算成碳生產力即得。

6.浮游動物鑑種及計數流程：

單一測站浮游動物樣本數可能為 2000 個樣本之數倍之多。為促進實驗效率，每一測站之浮游生物樣品均透過 Folsom 分離器進行樣本分離至樣本數接近 2000 為止。分離後之樣本從樣本瓶倒入培養皿，並將培養皿擺上顯微鏡的載物臺計數及鑑種。將 30 大類鑑種後之浮游生物分別記錄每個類別的數量，再依每立方公尺水體的同類物種個體數(ind./m³)作為個別浮游生物種類豐度之指標。

Laboratory procedures

Seawater samples were collected at discrete depths (from 5 to 150 m) for inorganic nutrients (NO_3^- 、 PO_4^{3-} 、 SiO_2^{2-})、chlorophyll-*a* (chl-*a*) and primary productivity (PP) and then were analyzed with standard methods depending on variable chemical properties in the laboratory.

1. Nitrate

Nitrate (NO_3^-) was measured by reducing nitrate to nitrite (NO_2^-) and then determining the nitrite by employing the pink azo dye method. Sulfanilamide and NED solutions were added to seawater samples and then measured by using a spectrophotometer analyzer at 542 nm for final determination of concentrations.

2. Phosphate

Phosphate (PO_4^{3-}) was determined by the molybdenum blue method. Ammonium molybdate、Sulfuric acid、Ascorbic acid and Potassium antimonyl-tartrate mixed solutions at room temperature were added to seawater samples and then measured by using a spectrophotometer analyzer at 885 nm for final determination of concentrations.

3. Silicate

Silicate (SiO_2^{2-}) was measured by the Molybdenum blue method. Seawater samples were immediately acidified with 50% Hydrochloric acid、10% Ammonium molybdate and 10% Oxalic acid and then 1-amino-2-naphthol-4-sulfonic acid、 Na_2SO_3 and NaHSO_3 mixed solutions were added to the samples. For final determination of concentrations, samples were measured by using a spectrophotometer analyzer at 815 nm.

4. Chlorophyll-*a*

Chlorophyll-*a* (chl-*a*) was measured by the Trichromatic method. Pigments were extracted in cold acetone (90%) for 24 hours. The samples were centrifuged at 3000 rpm under 4°C for 15 seconds and then transfer the samples extracts from the centrifuge tube to the cuvette by careful pipeting. The final determination of chlorophyll-*a* samples were measured by using a spectrophotometer.

5. Primary productivity

Primary productivity (PP) were measured by the Dissolved Oxygen method. Seawater samples were cultured in the light and dark tanks for 24 hours and then measured by using a DO meter analyzer on board.

6. Zooplankton

Each plankton sample was repeatedly divided with a Folsom splitter until its subsample contained 2000 specimens of zooplankton. Zooplanktons were then sorted and classified into 30 categories. The number of each category was recorded and the abundance of each category was expressed as the number of individuals per cubic meter (ind./m^3).

計畫執行人員 Participating researchers

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各航次出海採樣人員 Cruise personnel

航次名	姓名	職稱
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	姓名	職稱	姓名	職稱
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	顏向鴻	三管	李堂炯	電信員
	李志堅	輪機員	陳冠宇	輪機員
	呂秉勳	輪機員	劉政哲	輪機員
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	李茂瑩	探測技正	丁一	漁航員
	楊幼祥	漁航員	丁元宏	漁航員
	胡秀雯	漁航員	何國銘	漁航員
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	施畢成	漁航員	陳賢榮	漁航員
	許俊為	漁航員	蔡長育	漁航員
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各航次參數分析人員

Personnel participating in the data analysis

分析項目	分析人員
海洋氣象觀測	嚴國維
CTD 溫鹽探測	嚴國維
營養鹽濃度分析	蘇博堃
葉綠素甲濃度分析	蘇博堃
浮游動物分類	潘佳怡、曾秀茹
基礎生產力	海洋大學鄭學淵研究室

略語表

Abbreviations

Date	作業日期
SMT	作業開始時間
Lati.	緯度(°N)
Long.	經度(°E)
Depth	深度(m)
SST	表層水溫(°C)
Air T.	氣溫(°C)
Air P.	氣壓(mb)
Wind D.	風向
Wind F.	風速(節)
O.N.D.	作業水深(m)
Fl. Ct.	濾水器讀數
V.W.S.	濾水體積(m ³)

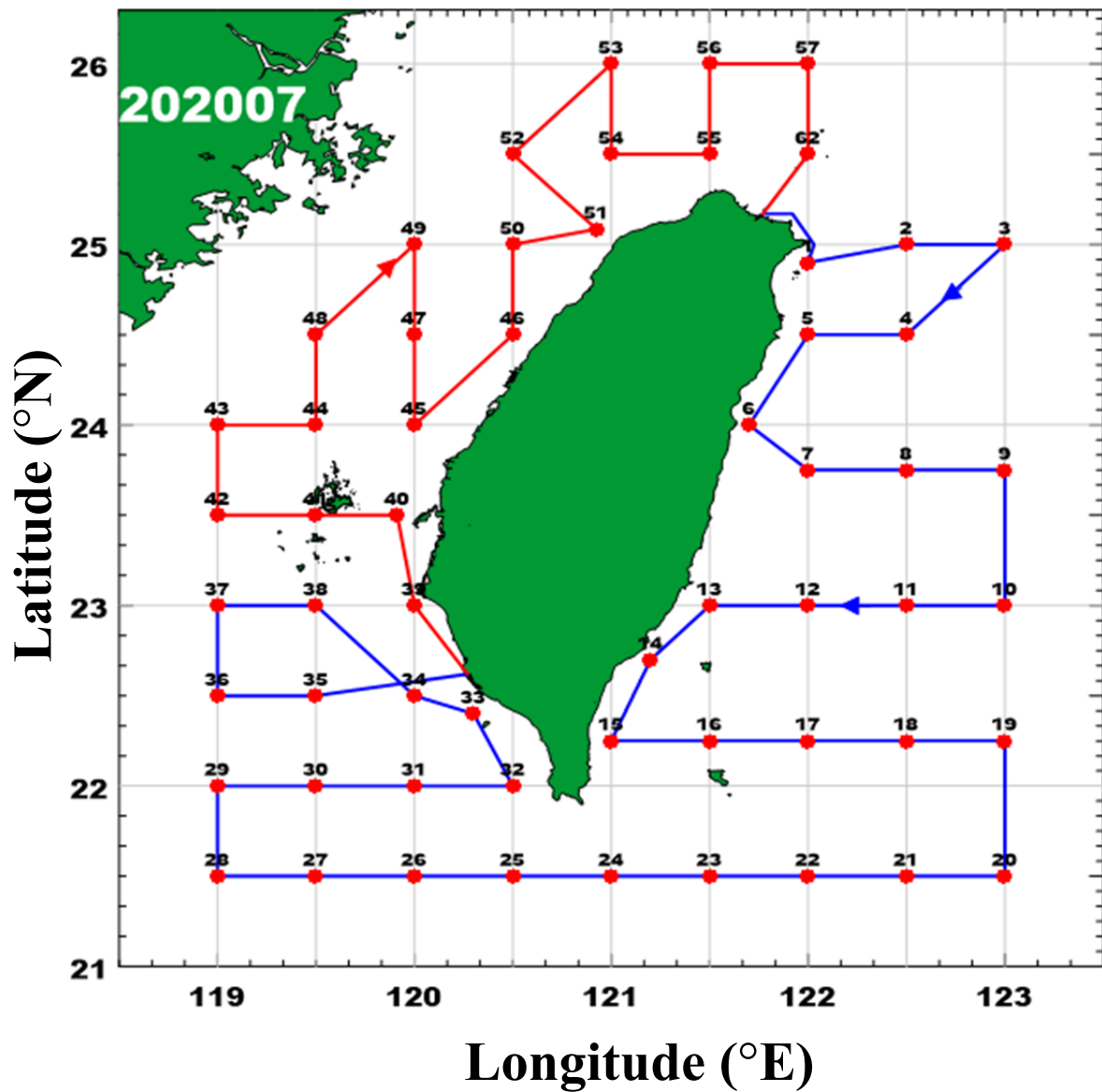


圖 1. 2020 年 7 月航次航跡圖 (1)藍實線為 6 月 30 日至 7 月 8 日航跡
(2)紅實線為 7 月 13-16 日航跡

Fig. 1. Stations and cruise tracks for TaiCOFI project in July 2020.

(1) solid blue line surveyed from June 30th to July 8th (2) solid red line surveyed from July 13th to 16th

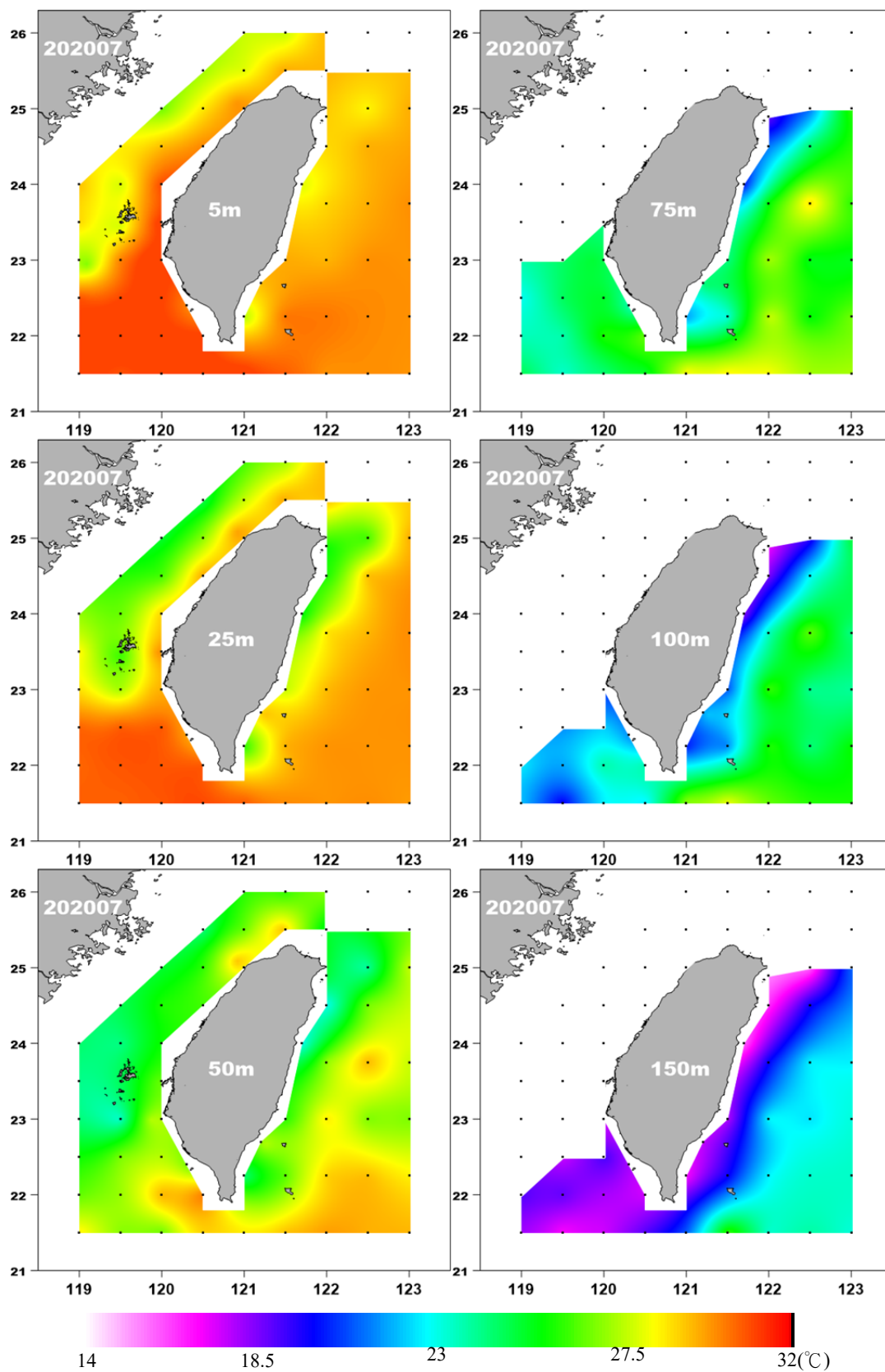


圖 2. 2020 年 7 月航次海面水溫分布
Fig. 2. Sea surface temperature in July 2020.

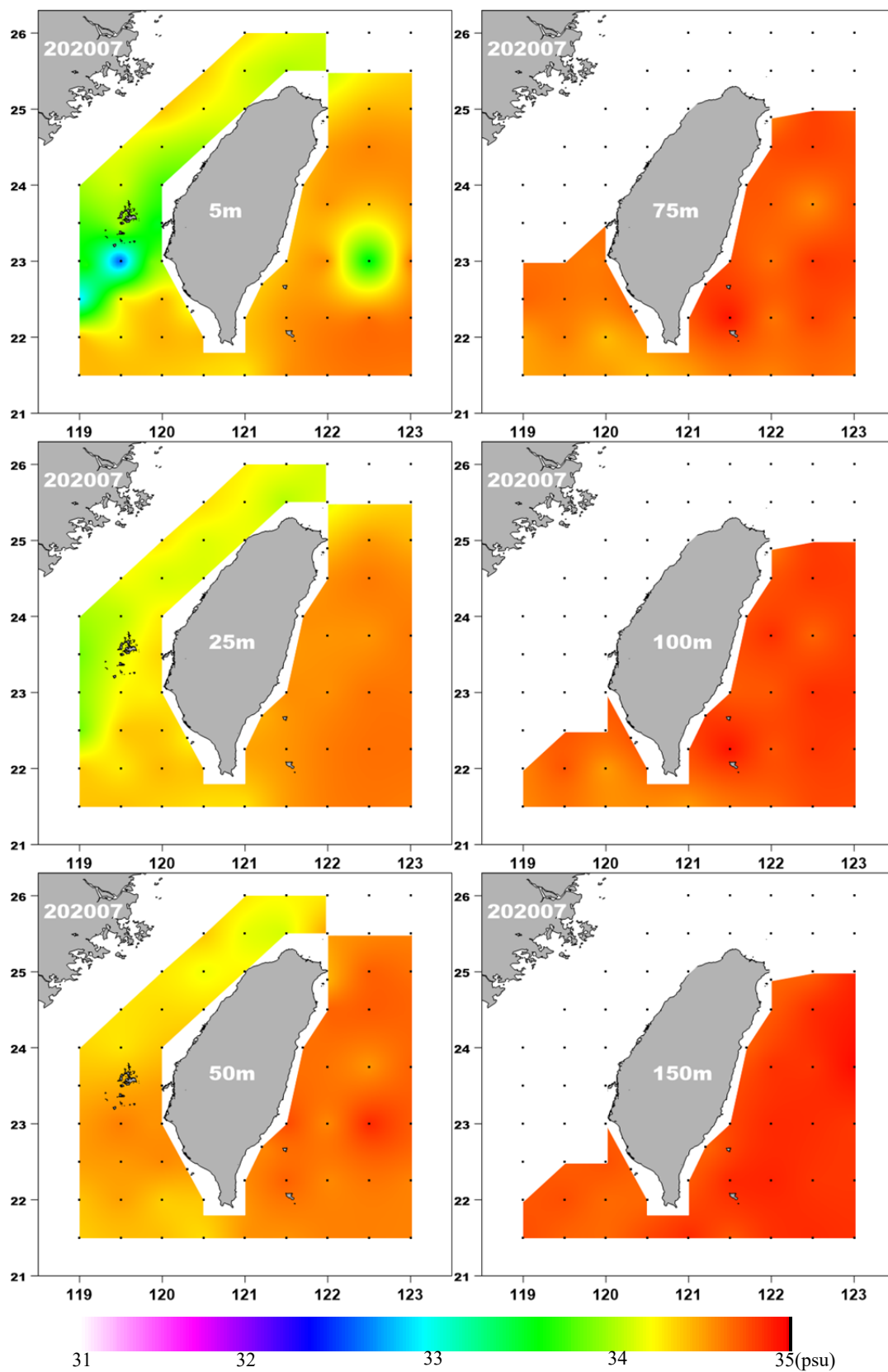


圖 3. 2020 年 7 月航次海面鹽度分布
Fig. 3. Sea surface salinity in July 2020.

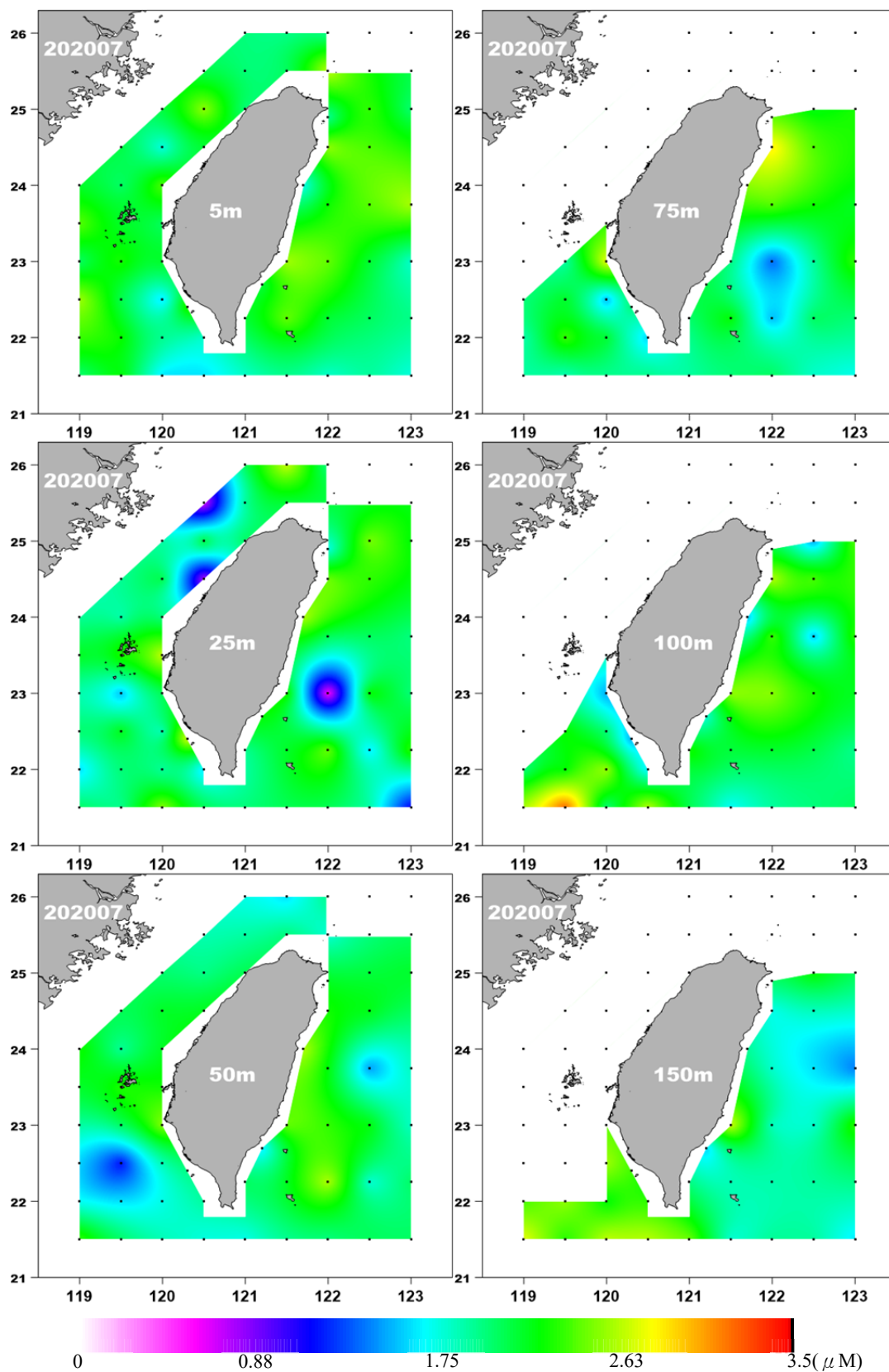


圖 4. 2020 年 7 月航次海面硝酸鹽(NO_3^-)濃度分布
 Fig. 4. Sea surface nitrate (NO_3^-) concentration in July 2020.

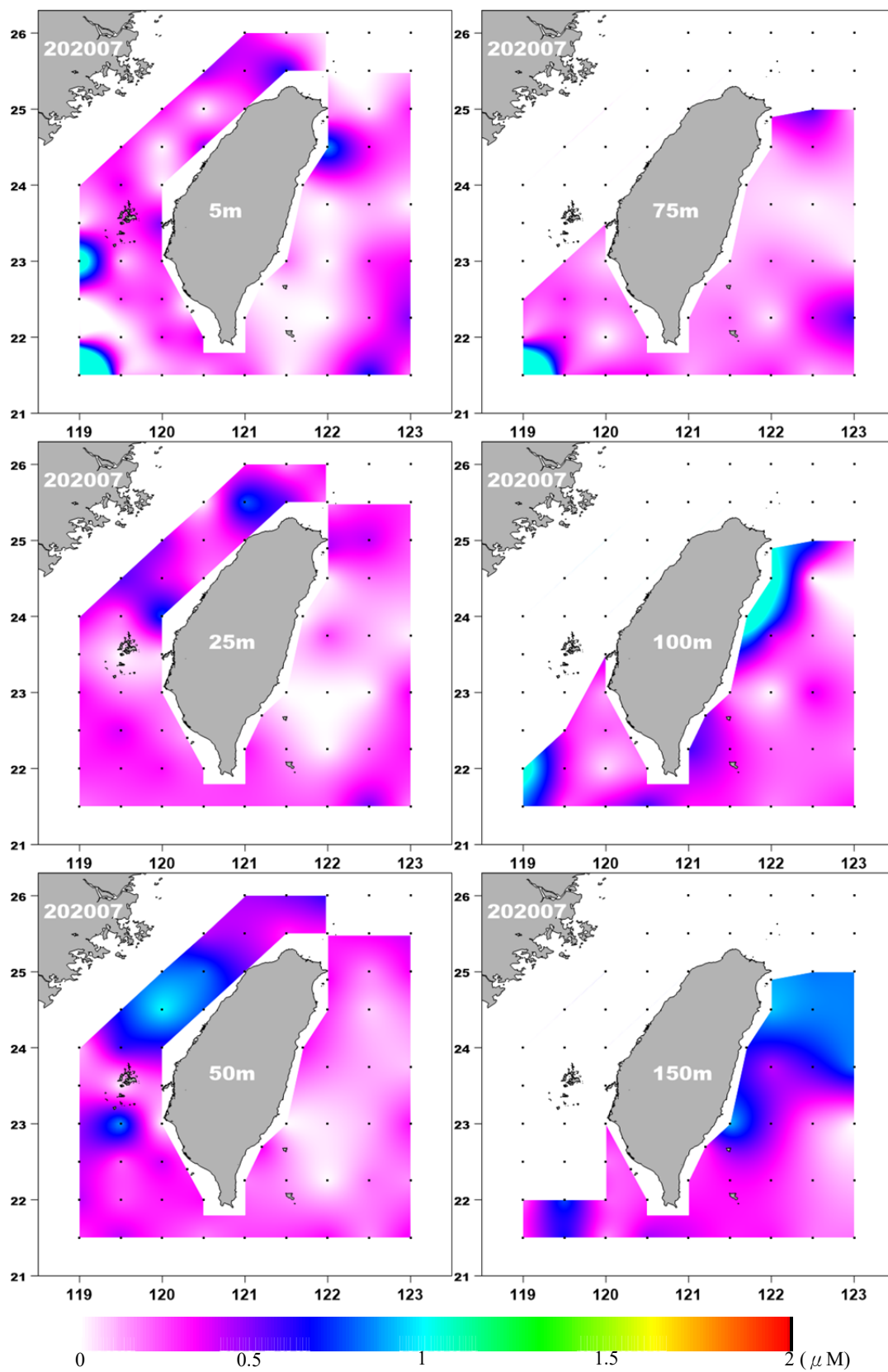


圖 5. 2020 年 7 月航次海面磷酸鹽(PO_4^{3-})濃度分布
 Fig. 5. Sea surface phosphate (PO_4^{3-}) concentration in July 2020.

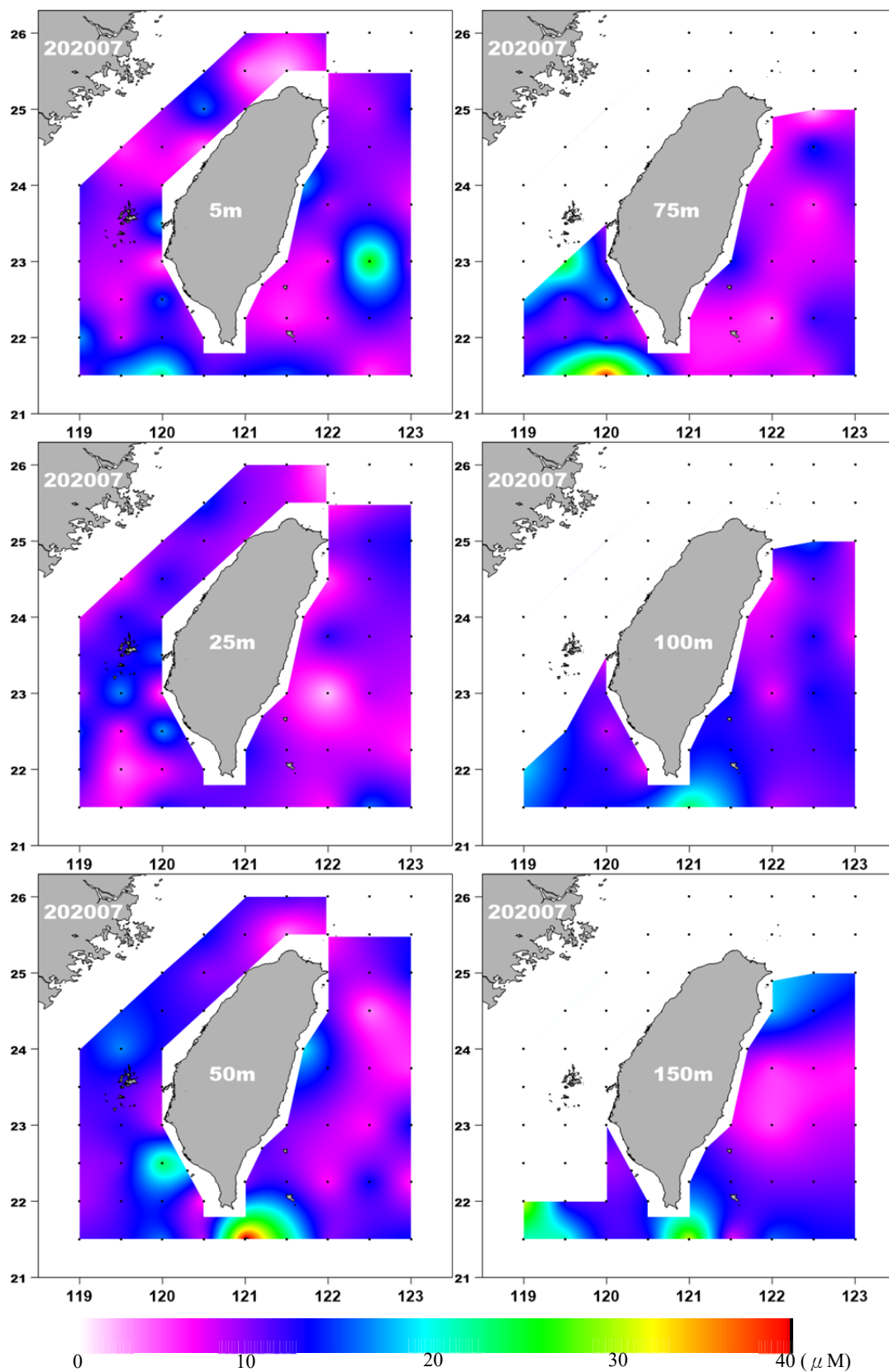


圖 6. 2020 年 7 月航次海面矽酸鹽(SiO_2^{2-})濃度分布
 Fig. 6. Sea surface silicate (SiO_2^{2-}) concentration in July 2020.

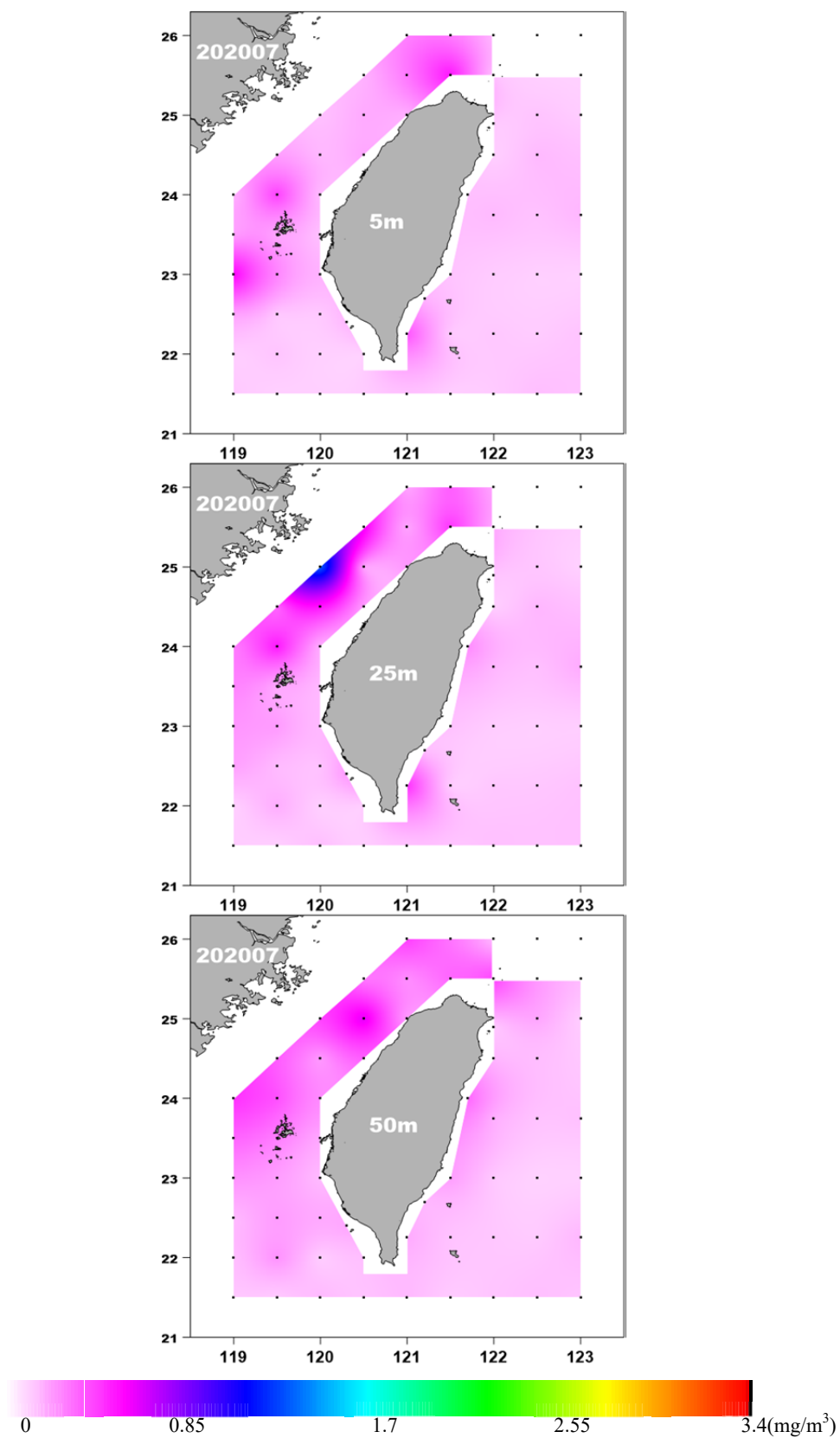


圖 7. 2020 年 7 月航次海面葉綠素甲(chl-a)分布
 Fig. 7. Sea surface chlorophyll-a in July 2020.

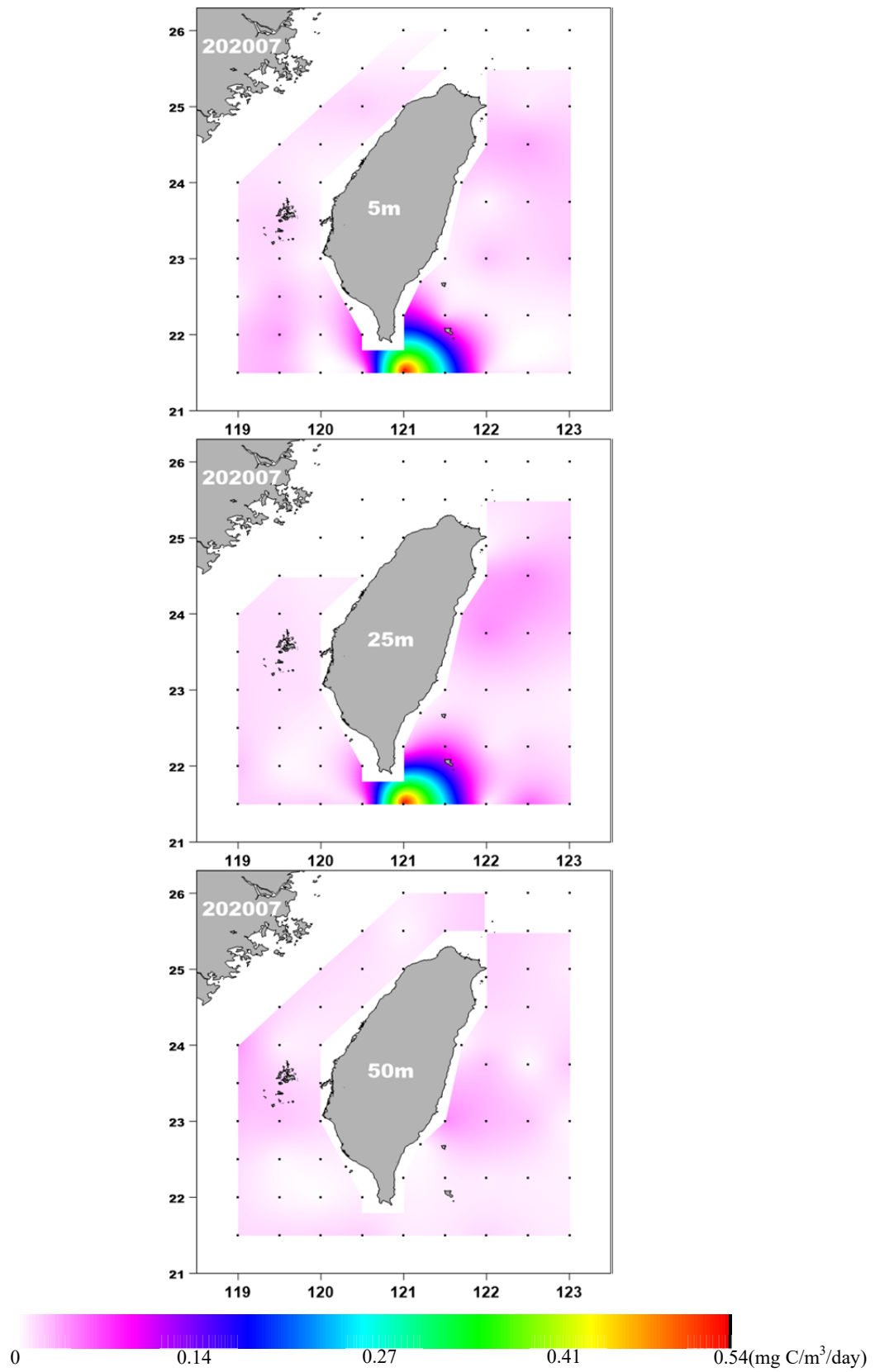


圖 8. 2020 年 7 月航次海面基礎生產力分布
 Fig. 8. Sea surface primary production in July 2020.

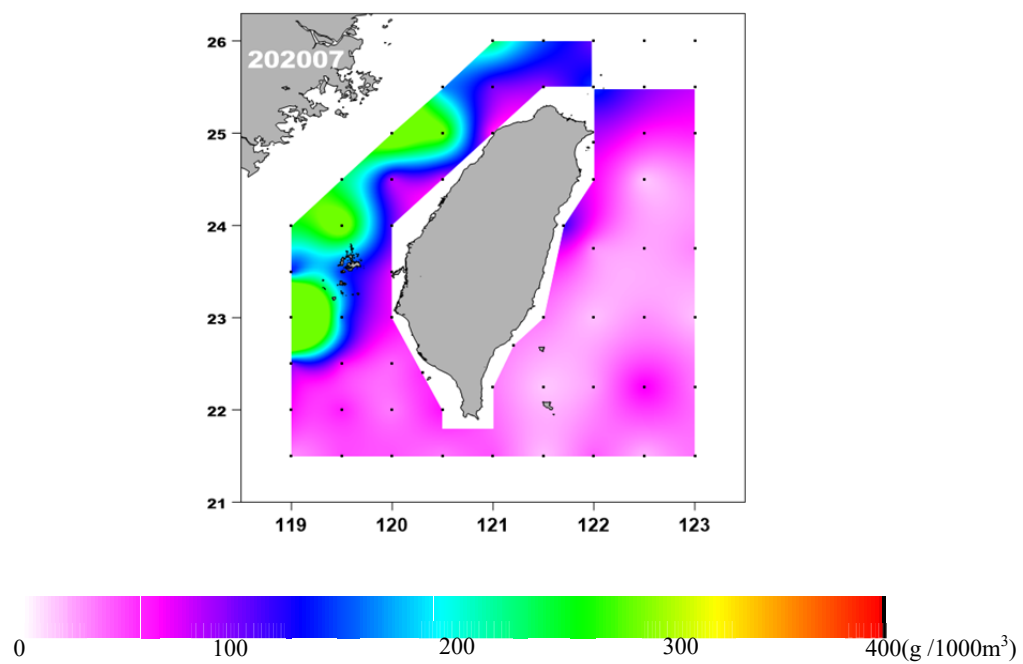


圖 9. 2020 年 7 月航次浮游動物生物量分布
 Fig. 9. Biomass of zooplankton in July 2020.

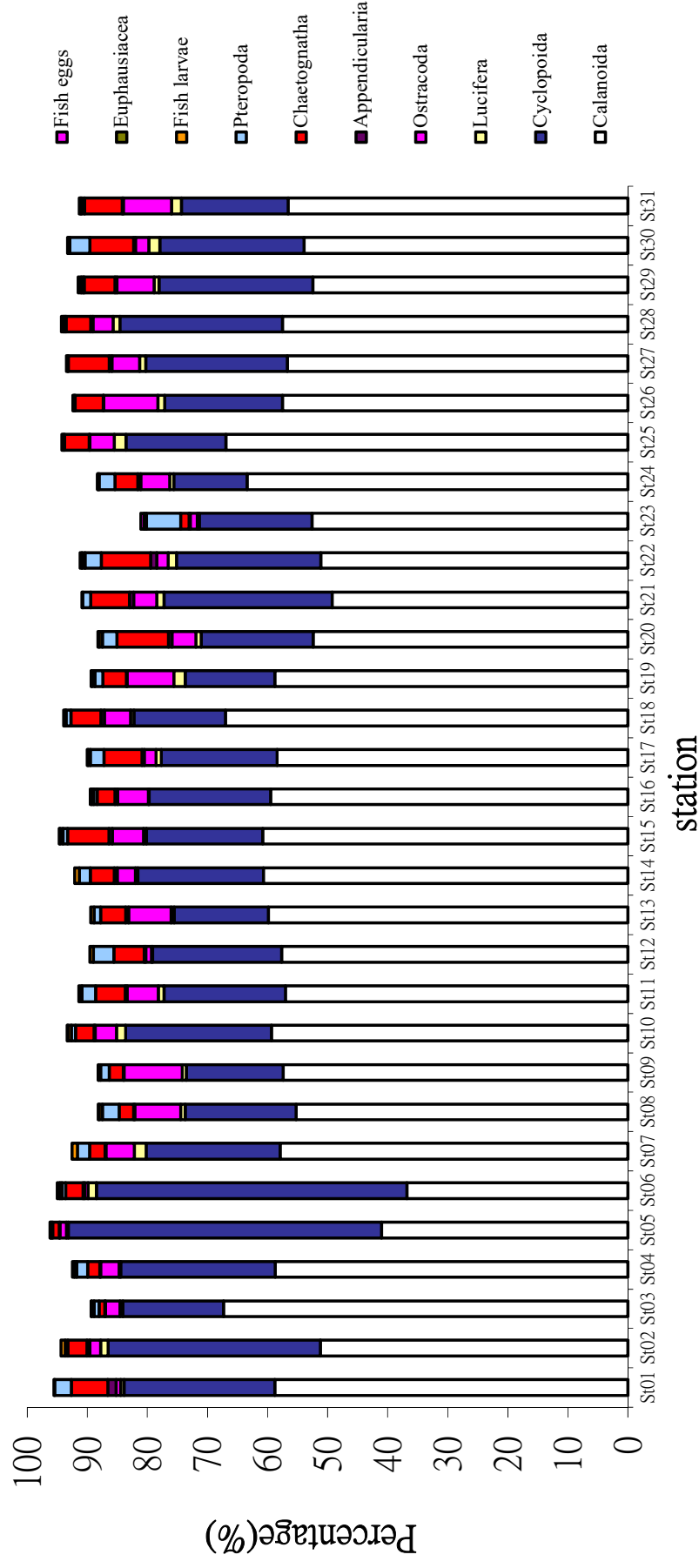


圖 10. 2020 年 7 月航次浮游動物優勢大類出現百分率
 Fig. 10. Composition of dominant zooplankton taxa in July 2020.

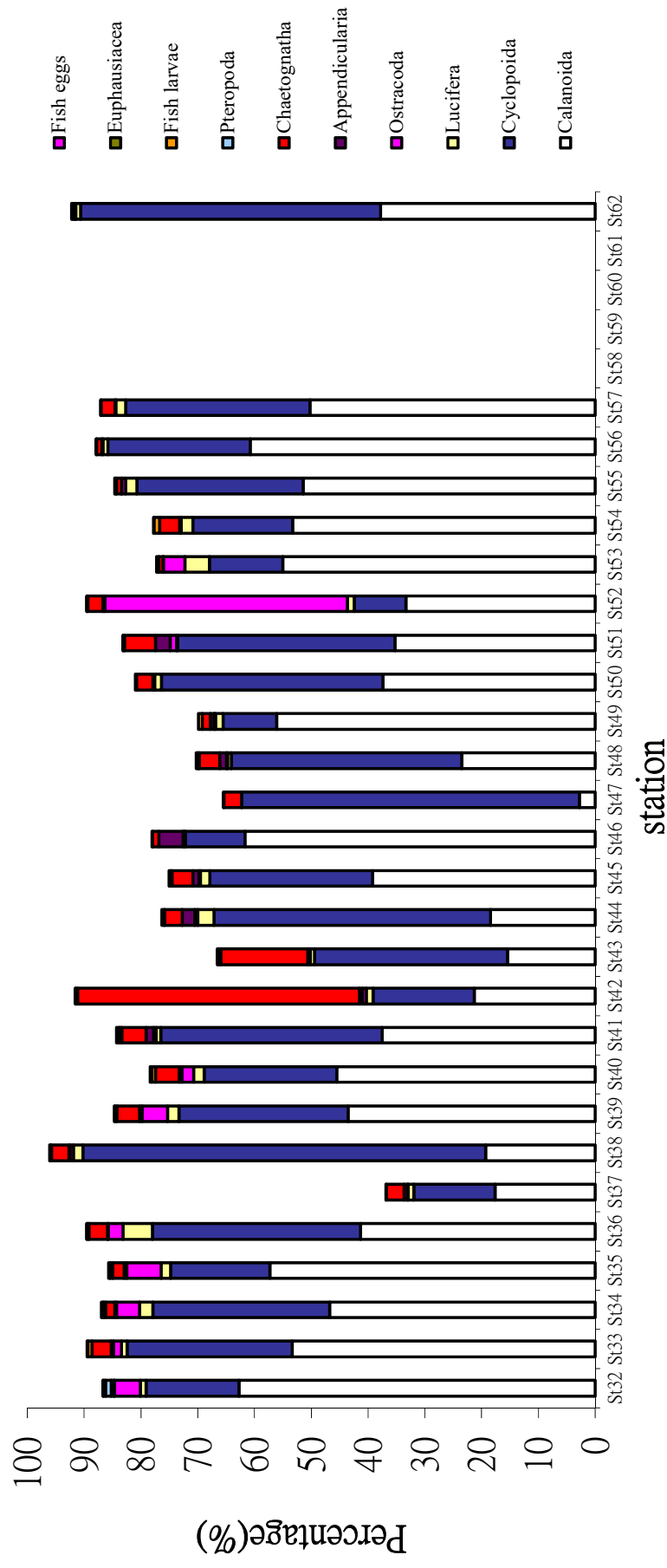


圖 11. 2020 年 7 月航次浮游動物優勢大類出現百分率(續)
 Fig. 11. Composition of dominant zooplankton taxa in July 2020 (continued).

表 1. 2020 年 7 月航次基礎觀測資料
Chart 1. Sea observation data in July 2020

Station	Date	SMT	Lati.	Long.	Depth	SST	Air T.	Air P.	Wind D.	Wind F.	O.N.D	Fl. Ct.	V.W.S.
St.01	20200630	1833	24.90	122.00	146	29.1	29.2	1006.5	137	0.5	120	787	472.2
St.02	20200630	2250	25.00	122.50	1439	29.4	29.4	1007.3	068	6.4	200	1313	787.8
St.03	20200701	0150	25.00	123.00	1653	29.7	30.1	1005.6	009	11.7	200	1314	788.4
St.04	20200701	0836	24.50	122.50	583	29.8	29.9	1008.1	067	9.7	200	829	497.4
St.05	20200701	1238	24.50	122.00	932	29.7	30.6	1007.9	097	5.6	200	1266	759.6
St.06	20200701	1646	24.00	121.70	717	29.4	29.3	1006.5	014	3.2	200	1254	752.4
St.07	20200701	2000	23.75	122.00	3050	29.7	30.0	1008.4	062	7.2	200	1132	679.2
St.08	20200701	2307	23.75	122.50	2997.2	29.8	30.0	1008.9	072	7.3	200	1269	761.4
St.09	20200702	0318	23.75	123.00	3649	29.8	30.0	1008.3	008	8.8	200	1190	714.0
St.10	20200702	0843	23.00	123.00	4113	30.1	30.9	1010.9	073	8.9	200	1229	737.4
St.11	20200702	1234	23.00	122.50	4116.8	30.2	31.2	1010.1	217	7.3	200	1316	789.6
St.12	20200702	1833	23.00	122.00	4920	30.0	29.9	1010.4	009	7.3	200	1396	837.6
St.13	20200702	2245	23.00	121.50	2114	30.1	30.1	1012.3	088	6.0	200	1434	860.4
St.14	20200703	0505	22.70	121.20	519	29.6	28.4	1011.7	070	1.7	200	1261	756.6
St.15	20200703	0917	22.25	121.00	1178	29.4	31.2	1013.7	112	0.5	200	1410	846.0
St.16	20200703	1319	22.25	121.50	834	30.3	31.2	1012.4	087	3.2	200	1273	763.8
St.17	20200703	1601	22.25	122.00	4577.6	30.2	31.4	1011.4	080	6.2	200	1157	694.2
St.18	20200703	1907	22.25	122.50	4846	30.2	30.2	1012.3	078	6.0	200	1345	807.0
St.19	20200703	2230	22.25	123.00	3623	30.1	30.1	1013.9	017	5.5	200	1472	883.2
St.20	20200704	0304	21.50	123.00	4755	30.1	29.8	1012.1	359	3.0	200	1644	986.4
St.21	20200704	0603	21.50	122.50	4119.6	30.0	30.8	1012.4	058	3.0	200	1205	723.0
St.22	20200704	0845	21.50	122.00	3458.4	30.1	31.3	1012.7	036	3.2	200	1080	648.0
St.23	20200704	1535	21.50	121.50	2079	30.6	31.7	1010.7	103	3.1	200	1150	690.0
St.24	20200704	1907	21.50	121.00	1001.2	30.5	30.4	1010.9	319	2.5	200	909	545.4
St.25	20200704	2310	21.50	120.50	1867	30.4	30.5	1012.0	078	3.7	200	1606	963.6
St.26	20200705	0242	21.50	120.00	2890	30.3	30.3	1010.0	087	3.5	200	1520	912.0
St.27	20200705	0602	21.50	119.50	2989	30.3	30.4	1010.0	216	3.4	200	1163	697.8
St.28	20200705	0902	21.50	119.00	2799	30.4	32.3	1011.4	097	0.9	200	1356	813.6
St.29	20200705	1227	22.00	119.00	1824	30.7	31.9	1010.2	050	3.9	200	984	590.4
St.30	20200705	1546	22.00	119.50	2411	30.9	33.6	1009.4	087	3.2	200	1377	826.2
St.31	20200705	1914	22.00	120.00	1129	30.7	30.9	1009.0	107	1.5	200	1002	601.2
St.32	20200705	2204	22.00	120.50	288.1	30.6	30.6	1009.7	124	1.5	200	1083	649.8
St.33	20200706	0125	22.40	120.30	130	30.1	30.0	1008.7	053	1.0	100	558	334.8
St.34	20200706	0354	22.50	120.00	571	30.3	30.4	1008.4	005	4.9	200	1128	676.8
St.35	20200708	0114	22.50	119.50	234	30.1	30.5	1010.8	114	4.5	200	1314	788.4
St.36	20200707	2225	22.50	119.00	86	29.8	30.4	1011.7	058	4.4	80	802	481.2
St.37	20200706	1206	23.00	119.00	27	29.4	30.7	1011.9	058	1.0	22	169	101.4
St.38	20200706	0848	23.00	119.50	75	30.2	30.0	1018.0	077	3.7	70	503	301.8
St.39	20200713	1756	23.00	120.00	127.2	30.7	31.5	1007.8	266	3.7	125	973	583.8
St.40	20200713	2155	23.50	120.00	123	30.4	29.7	1009.4	224	4.6	109	470	282.0
St.41	20200714	0054	23.50	119.50	38.4	29.6	28.2	1008.0	228	5.2	30	255	153.0
St.42	20200714	1231	23.50	119.00	51	29.6	29.3	1008.3	258	3.0	45	292	175.2
St.43	20200714	1540	24.00	119.00	58	29.7	31.9	1005.8	161	2.5	54	444	266.4
St.44	20200714	1916	24.00	119.50	62	28.8	28.6	1007.0	186	5.9	57	192	115.2
St.45	20200715	0813	24.00	120.00	34.8	30.1	30.4	1008.6	216	4.3	30	239	143.4
St.46	20200715	1145	24.50	120.50	49.2	30.0	30.2	1008.5	197	6.5	40	332	199.2
St.47	20200715	0513	24.50	120.00	60	29.3	28.8	1006.6	166	2.8	55	273	163.8
St.48	20200714	2200	24.50	119.50	52.4	29.1	28.3	1008.2	168	3.5	35	186	111.6
St.49	20200715	0157	25.00	120.00	52.4	28.7	27.6	1006.9	026	2.8	40	256	153.6
St.50	20200715	1545	25.00	120.50	77.6	29.7	30.1	1005.7	222	7.8	71	289	173.4
St.51	20200715	1748	25.00	121.00	74	29.7	29.7	1005.9	245	12.0	64	377	226.2
St.52	20200715	2132	25.50	120.50	65	29.0	28.4	1007.5	216	11.0	60	511	306.6
St.53	20200716	0129	26.00	121.00	78.8	29.4	28.6	1006.2	221	11.0	73	486	291.6
St.54	20200716	0508	25.50	121.00	88	29.4	29.0	1006.3	215	12.0	80	1127	676.2
St.55	20200716	0757	25.50	121.50	112	29.8	30.3	1007.3	235	13.0	100	827	496.2
St.56	20200716	1146	26.00	121.50	67	29.4	29.2	1007.2	223	11.0	50	649	389.4
St.57	20200716	1447	26.00	122.00	100	29.7	30.1	1005.8	231	15.0	95	852	511.2
St.58	-	-	-	-	-	-	-	-	-	-	-	-	-
St.59	-	-	-	-	-	-	-	-	-	-	-	-	-
St.60	-	-	-	-	-	-	-	-	-	-	-	-	-
St.61	-	-	-	-	-	-	-	-	-	-	-	-	-
St.62	20200716	1843	25.50	122.00	119	29.8	29.8	1007.5	085	7.7	110	732	439.2

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