

# 西濱地區工程開發 與生態資源保育



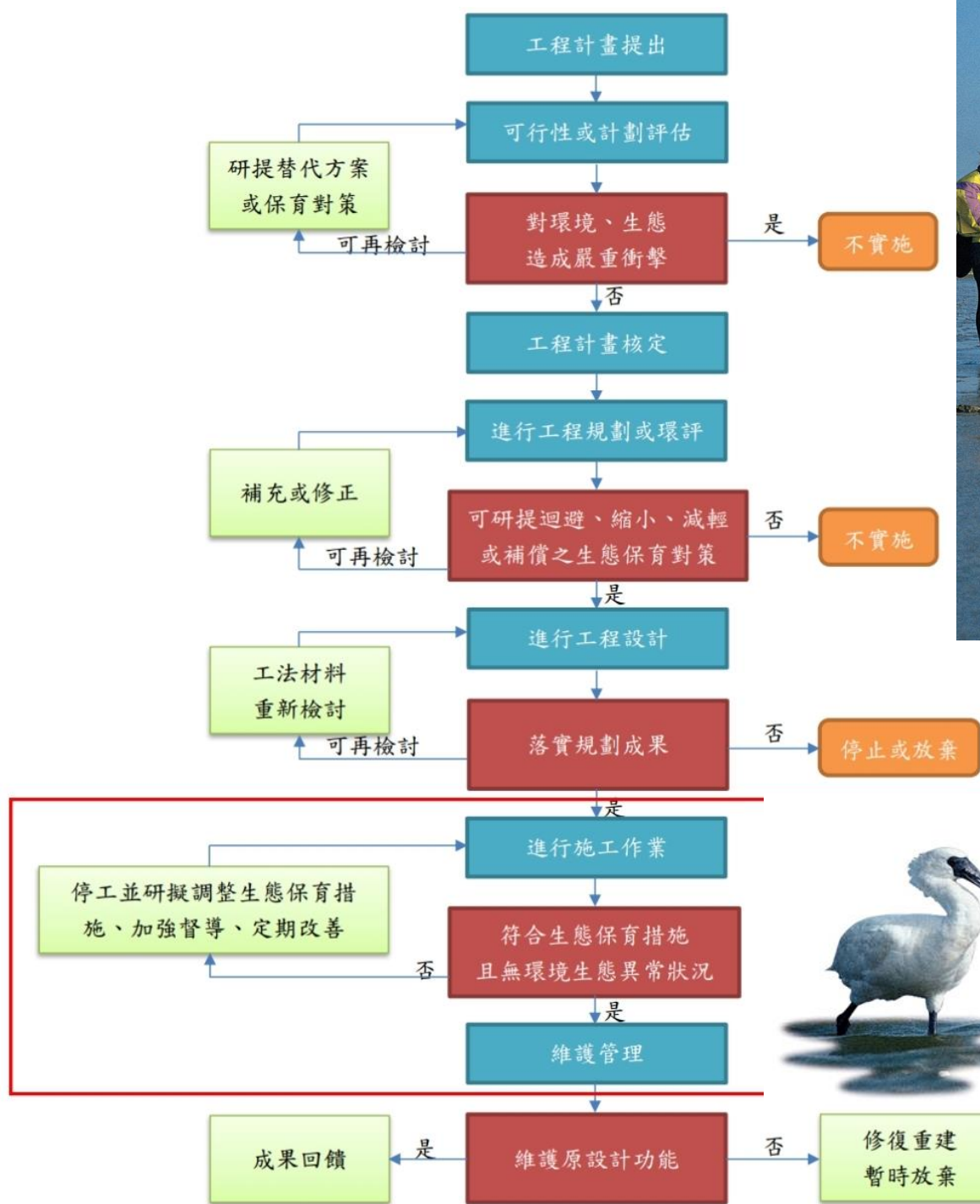
61 西濱快速公路  
West Coast Expressway



生態系經營組  
劉靜榆

農業部生物多樣性研究所  
Taiwan Biodiversity Research Institute





# 1. 不可替代性

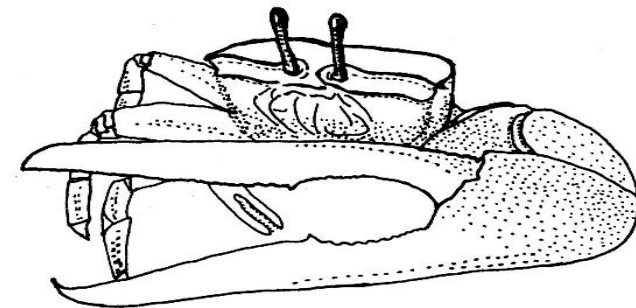




# 1992-1993保護區替代方案



- 台南縣政府研擬「台南縣七股鄉黑面琵鷺保護區設置計畫」，將頂頭額沙洲(275 ha)規劃為保護區，作為黑面琵鷺保護區之替代方案



- 從頂頭額沙洲至新浮崙沙洲外側規劃新築一道海堤，保護區面積約302ha。



1994



副本

裝訂線

臺灣省特有生物研究保育中心(函)

限年存保  
號 檔

速別 最速件 密等 解審條件 附件 抽存後解審 年 月 日 自動解審

受文者 本中心棲地生態組

位單文行 正本 行政院環境保護署

副本 本中心棲地生態組

文 發 日期 中華民國八十二年八月卅日  
附 號 字 82特生棲字第一七六三號  
件 附 號 字

社 示 擬 辦

主旨：有關臺南縣政府七股工業區開發計畫環境影響評估之相關資料，本中心意見詳如說明，請查照。

說明：

- 一、復 貴署八十二年八月二十日環署綜字第四〇三七八號函。
- 二、現有記錄中黑面琵鷺最大族群數量在曾文溪口，因此本棲地之保護無疑對該族群攸關重大，黑面琵鷺係一具社會行爲之鳥類，對棲地之選擇相當固定。

三、黑面琵鷺所選擇之棲地爲曾文溪口北岸七股海堤內二號及三號閘門間之浮覆地，由於河堤所圍圍之面積寬廣，具良好之隔離作用，且視野遼闊，適合膽怯之水鳥棲息，大部份的時間牠們停留在此，每天會到附近魚塭或淺水塘中覓食一、兩次，偶而亦於海堤內之潮溝覓食，主要食用魚類。

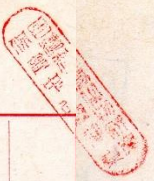
四、有關臺南縣政府原擬保護區設置替代方案之頂頭額沙洲，經本中心一年來的調查，並與黑面琵鷺原棲地環境比較，兩處差異極大，底棲動物相亦有顯著的差異。

五、臺南縣政府所擬另一棲地改善計畫之新浮崙沙洲，雖微環境與生物相類似，唯缺少足夠之安全距離。又曾文溪口以往由於堆積旺盛，形成河口間海岸凸出之廣大沖積平原，但自曾文水庫完工後，由於河川輸沙量減小，河口堆積現象減弱，反而受河水入海之沖刷而造成此處之海水深度逐漸增加，河口之新浮崙沙洲面積始逐漸縮減，尤以沙洲南半部爲甚，海堤之築建是否可行宜再評估。

六、工業區的設立需考慮工程進行中，所形成之挖、填方造成底部的污染物攪動，以及工業區污染問題對整個潮間帶生態系造成的衝擊。

七、有關黑面琵鷺保護區之劃設範圍，除需考慮牠們主要之棲息地及覓食區外，保有相當程度之緩衝區是相當必要的。

82.8.3.000



是相當必要的。



主任 顏仁德





行政院環境保護署(函)

5 限年存保  
號 號

說明：	主旨：有關「七股工業區開發計畫環境影響評估複審後意見」與「台南縣七股鄉黑面琵鷺保護區設置計畫」案，復如說明，請 查照。	行 文 單 位		受文者	連 別	最 速 件	密 等	解 密 條 件	公 布 後 解 密 附 件 抽 存 後 解 密	年 月 日 自 動 解 密
		正 本	副 本							
		批 示	行 政 院 農 委 會、經 濟 部 工 業 局 台 灣 省 農 林 廳 台 灣 省 特 有 生 物 保 育 研 究 中 心、本 署 綜 計 處							
		擬 辦								
			文 件	發 行						
			附 件	號 字	期 日					
			如 說 明 七	環 署 綜 字 第 四 九 八 四 六 號	中 華 民 國 八 十 二 年 十 月 十 三 日					

副 本

裝 訂 線

一、復 貴縣八十二年七月二十八日八二府建工字第一一四三九五號函。

二、曾文溪口黑面琵鷺保護區劃設問題攸關工業區開發範圍及對鳥類生態之衝擊，因此保護區之功能應先經野生動物保育主管機關確定，再據以辦理工業區計畫環境影響評估審查。

三、貴縣所提保護區設置計畫，相關機關主要意見如次：

(一)行政院農業委員會八十二年九月廿三日農林字第二一四三六一六A號函：  
貴縣所提之保護區及現行黑面琵鷺棲息地應先行觀察評估，若該保護區能為黑面琵鷺有效利用，農委會則同意該計畫；反之，應將現行黑面琵鷺之棲息地劃為保護區。

(二)台灣省政府農林廳八十二年九月八日八二農植字第六二一九〇號函及台灣

82.10.14 生收第 2138 號



省特有生物研究保育中心八十二年八月卅日特生棲字第一七六三號函：

1. 黑面琵鷺係一具社會行為之鳥類，對棲地之選擇相當固定。

2. 貴縣所提保護區頂頭額沙洲部分，經台灣省特有生物研究保育中心一年來的調查，與黑面琵鷺原棲地環境差異極大，底棲動物相亦有顯著差異。新浮崙沙洲雖微環境與生物相類似，惟缺少足夠之安全距離。此外該處近年來沖刷加遽，沙洲面積逐漸縮減，海堤興建之可行性應再評估。

因此是否適合黑面琵鷺棲息，且黑面琵鷺能否移棲該處，不無疑問。

四、有關「環境影響評估複審後意見」部分：

(一) 以海洋放流管排放廢水是否可行，不應僅引用其他地區案例下結論，必需有實測海潮流、地形、風力等相關資料，配合現有水質、生態資料進行評

估。

(二) 規劃之放流管在落潮期間，冬季乾旱時，排放水可能流向曾文溪口，甚至逆流流入曾文溪，此將對河口生態造成衝擊。

(三) 有關海岸地形變化部分，因海岸結構興建必會產生海岸變遷，因此應有數值分析及水工試驗結果，以供評斷。

四目前黑面琵鷺覓食地點以曾文溪北岸河川伏覆地為多該伏覆地規劃則為工業區借土來源。因此對黑面琵鷺覓食之影響，亦應納入評估。

因此部分與原報告書內容多有前後矛盾或數十倍的差異，如恆流流速、漲潮與落潮流速……等，建請全盤修正。

五、未來保

立

功能如經主

編

可，工業區計畫環境影響評估內容應

配合修正各項環境資料並應有持續調查、監測及分析。

六計畫區內現行養殖十分發達，應詳加評估對附近魚塭及海面養殖之影響，並擬具相關因應對策。

七檢附行政院農委會、台灣省農林廳、台灣省特有生物研究保育中心審查意見

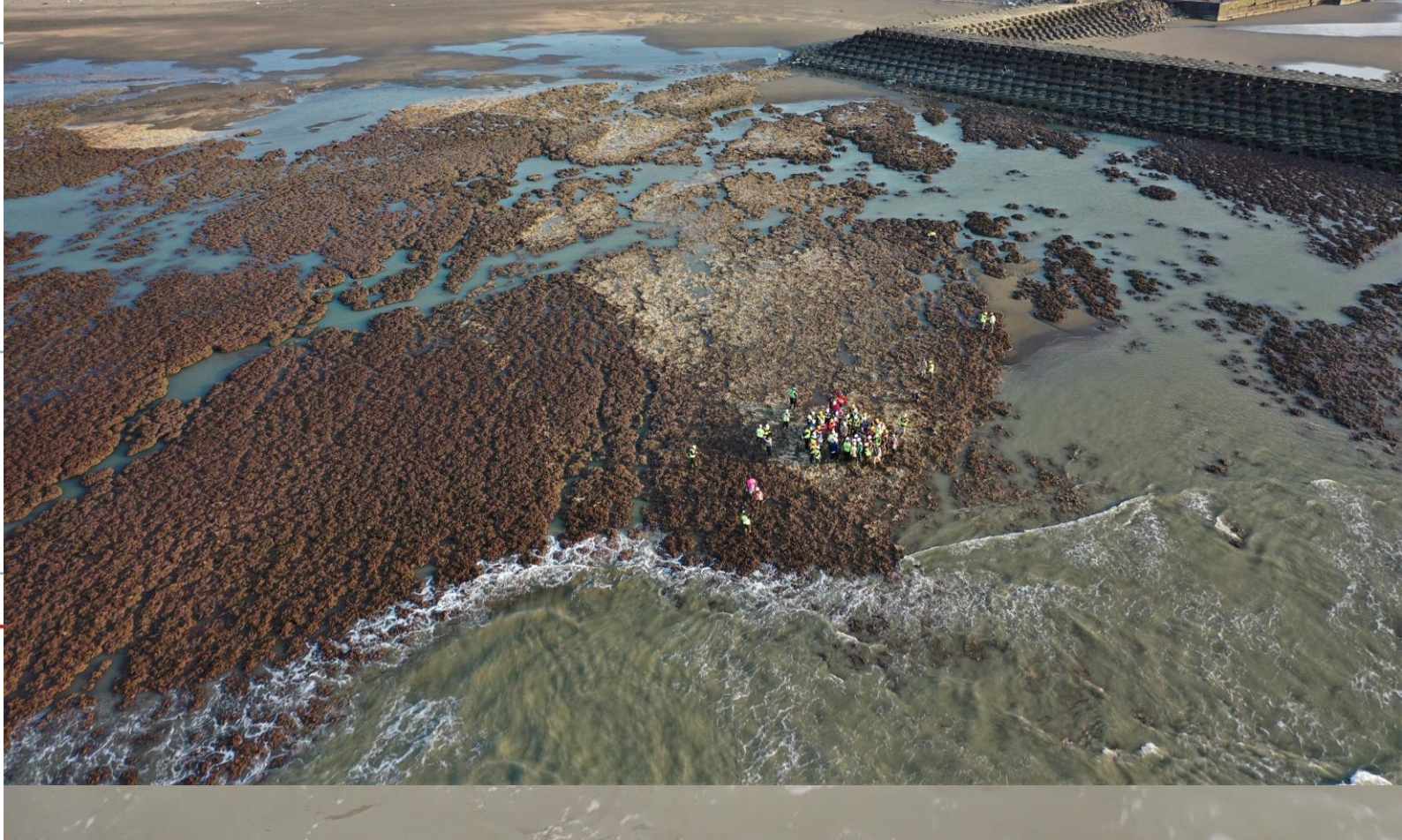
影本乙份。

署長

張隆盛



中油在2020年就有兩次施工船的擱淺，造成藻礁和柴山多杯孔珊瑚嚴重的損傷，實已觸犯野生動物保育法中傷害一級保育類動物的法條。





所調查的區域就是臺北八里海岸及桃園內海(新街溪口至老街溪口之間)

# 1986年德國學者Hans-Erich Reineck與鄭穎敏教授以德文發表一篇有關藻礁剖面的學術報告

Senckenberg am Meer 424.

## Geologie und Biologie von Kalkalgen- und Geröllwatten auf Taiwan.

### I. Die Watten bei Neihai und Pali, NW-Küste von Taiwan.

Mit 4 Abbildungen, 2 Tabellen und 2 Tafeln.

HANS-ERICH REINECK & YING MIN CHENG.

#### Kurzfassung.

[REINECK, H.-E. & CHENG, Y.M. (1986): Geologie und Biologie von Kalkalgen- und Geröllwatten auf Taiwan. I. Die Watten bei Neihai und Pali, NW-Küste von Taiwan. — Senckenbergiana marit., 17 (4/6): 187-199, 4 Abb., 2 Tab., 2 Taf.; Frankfurt a. M.]

Es wurden zwei sandige Watten untersucht, die teilweise mit Geröllen bedeckt sind.

Die Gerölle des Watts bei Neihai werden durch Flüsse herangeschafft. Abrollung und Zurundung der Gerölle auf dem Watt sind besser als die der Flußgerölle. Die Seeseite des Watts bei Neihai wird von einem Algenriff eingenommen. Einzelne Gerölle sind in das Riff eingewachsen. Viele liegen in Riffurchen und als breite Zone landseitig vom Riff, d. h. jeweils an Stellen, die vor Seegang etwas geschützt sind. Die meisten Gerölle aber sind als Strandwall aufgeschichtet.

Die Gerölle des Watts bei Pali stammen von einer Ufererosion. Die größeren Gerölle > 20 cm liegen als breite Zone an der Niedrigwasserlinie. Eine Sandzone mit einzelnen eingesandeten Geröllen trennt die Zone der größeren Gerölle von einem Geröllstreifen an der Hochwasserlinie. Als Zeichen seltener Mobilisation sind die großen Gerölle und jene, die im Riffschutz liegen, bewachsen, die kleineren nicht bewachsen.

#### Abstract.

[REINECK, H.-E. & CHENG, M. Y. (1986): Geology and biology of calcareous algal reefs and boulder deposits on tidal flats of Taiwan. I. Tidal flats of Neihai and Pali, NW-coast of Taiwan. — Senckenbergiana marit., 17 (4/6): 187-199, 4 figs., 2 tabs., 2 pls.; Frankfurt a. M.]

Two pebble covered sandy tidal flats located on the NW-coast of Taiwan are described.

Anschriften der Verfasser: Prof. Dr. H.-E. REINECK, Forschungsinstitut Senckenberg, Abteilung für Meeresgeologie und Meeresbiologie, Schleusenstraße 39A, D-2940 Wilhelmshaven. — Prof. Dr. YING MIN CHENG, National Taiwan University, Department of Geology, Taipei (107), Taiwan, Republic of China.

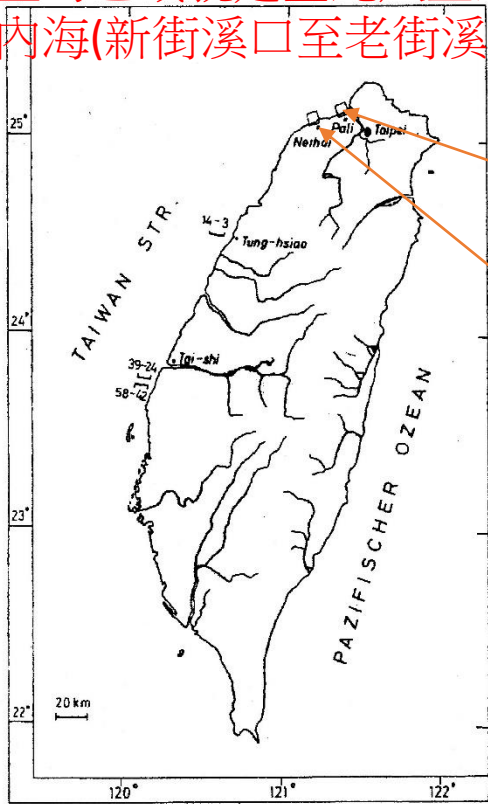


Abb. 1. Karte von Taiwan. — Die untersuchten Watten liegen bei Neihai und Pali (Quadrat).

Fig. 1. Map of Taiwan. — Investigated tidal flats (squares) near Neihai and Pali.

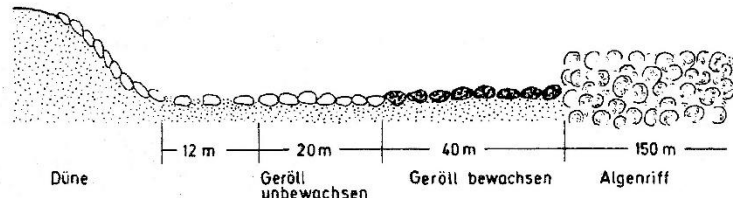


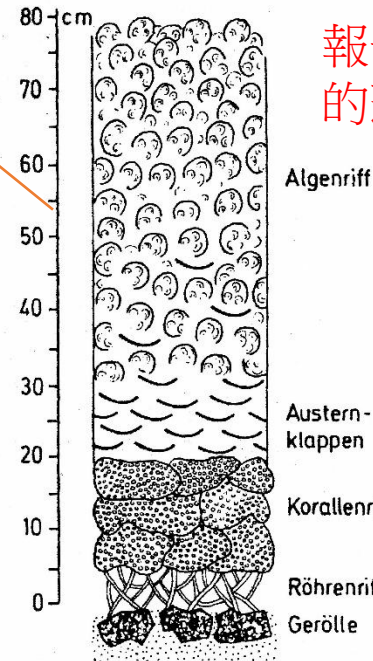
Abb. 2. Wattenprofil bei Neihai, Taiwan. — Mit bewachsenen und unbewachsenen Geröllen, dem Geröllstrandwall und dem seeseitigen Algenriff.

Fig. 2. Cross section of the tidal flat near Neihai, Taiwan. — Sea to the right. To the left pebbles paved dunes. Zone of scattered pebbles, uncovered and covered pebbles, and algal reef.

八里海岸沒有藻礁

Mächtigkeit in cm	Algenriff mit fleckenweisen bis 10 cm mächtigen Austernklappenhorizonten an der Basis
35 - 50	Korallenriff
10 - 15	Röhrenriff
5	

darunter organogene Gerölle wie abgerollte Korallenblöcke. Die Basis des Riffs liegt ca 15 cm unter der Sandoberfläche. An mehreren Stellen wurde das Riff seitlich aufgemeißelt, um die Basis studieren zu können.



報告中將桃園內海的藻礁繪成剖面圖

Abb. 4. Profil eines Kalkalgenriffs mit Korallenbruchstücken an der Basis. — Neihai, Taiwan.

Fig. 4. Vertical profile of the algal reef: fragmental corals at the base followed by carbonate tubes, corals, oyster shells, and algal reef the upper part. — Neihai, Taiwan.

Es muß angenommen werden, daß das Korallenriff gehoben wurde, bis es in das Eulitoral, d. h. den Auftauchbereich kam und dort abstarb (Taf. 1 Fig. 4). Es war stark zerfurcht, was sich in der Morphologie des heutigen Algenriffs durchpaust (Taf. 1 Fig. 3). Dieser Hartgrund bot nun einer reichen Austernbesiedlung günstigen Platz. Unter dem Algenriff wurden keine Gerölle gefunden. Mit einer gleichzeitigen Anhebung im Hinterland bekamen die Flüsse neue Reliefenergie. Sie brachten Sand mit, der teilweise die Furchen ausfüllte und vielfach an der Basis des Algenriffs zu finden ist. Die Gerölle sind erst in späterer Zeit der Hebung in das Gebiet gebracht worden. Dort wurden sie vornehmlich am Ufer, aber auch in der ferneren Zone angereichert. Im Riffgebiet gibt es gleichfalls Gerölle, die in den Furchen oberflächlich eingesandet sind, oder die in einzelnen Fällen in Unregelmäßigkeiten des Riffs fielen und dort einwuchsen (Taf. 1 Fig. 3).



## 2018年 7月 3日專案小組會議結論退回日的事業主管機關

9/12環保署召開環評大會，部分委員退席，宣告流會。

9/26 環保署署長李應元親自主持大會，中油報告，開放各方表達意見，未做出實質決議。

10/3環保署召開環評大會，因環評委員出席數不足，宣告流會。

10/5行政院院長賴清德立法院院會備詢時提出深澳換觀塘

10/8環保署副署長詹順貴請辭獲准（9月13日提出書面辭呈）

10/8 環保署決議 觀塘環評案7票贊成通過

- 環保署長李應元於下午3點裁決進行內部表決，環評委員10人出席
- 扣除會議主席，7票贊成，2票無效、1人未投，觀塘環評案通過

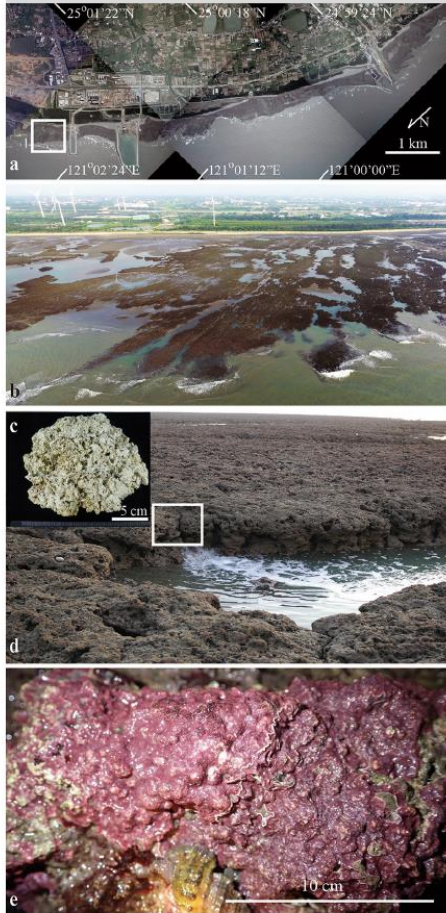


# 2017年特生中心劉靜榆、中央研究院陳昭倫等發表大潭藻礁為世界重要保育棲地

## Reef sites



### Unprecedented calcareous algal reefs in northern Taiwan merit high conservation priority



Crustose coralline algae (CCA) concretions, or reefs, are mainly found below 10 m in temperate waters (Ballesteros 2006) and rarely in subtropical and tropical oceans. However, a massive CCA reef occurs on tidal flats extending continuously along the coastline of Taoyuan City, Northwest Taiwan (25°07'00.11"N, 121°14'22.23"E to 24°59'19.34"N, 121°00'47.00"E) (Fig. 1a). It is approximately 27 km long and a maximum of 450 m wide with a large tidal range of 4 m (Fig. 1b; Electronic supplementary video). Carbon-14 dating indicates that the reef dates from around 7500 BP; it consists of some sediment-tolerant corals, such as *Cyphastrea* and *Dipsastraea* (Dai et al. 2009). From 4400 BP to the present, CCA genera, such as *Mesophyllum*, *Phymatolithon*, and *Harveyolithon*, have contributed to the present algal reef through constant growth as stacked layers over the surface of the reef (Fig. 1c). The Taoyuan CCA reef performs similar ecosystem functions to those of coral reefs. However, long-term industrial pollution and continuous habitat destruction by land reclamation for an industrial park (Liou 2017) and windmill constructions (Fig. 1b) threaten the future of this reef system. The discovery of a newly described endemic coral species, *Polycanthus chaishanensis*, two undescribed species of CCA (Fig. 1e), and changes in the composition of layers over time highlight the merit of prioritizing conservation of this unique ecosystem in Taiwan.

**Acknowledgements** We thank Zhi-Rong Kuo for aerial photography, Yie-Jia Chen, Shashank Keshavmurthy, Ya-Yi Huang, and the Taoyuan NGOs Alliance for fieldwork, Collin Lin for English editing.

#### References

- Ballesteros E (2006) Mediterranean coralligenous assemblages: a synthesis of present knowledge. *Oceanogr Mar Biol Annu Rev* 44:123–195  
Dai CF, Wang SW, Chang JS, Jeng AI (2009) Handbook for ecological tours of Guanyin algae reef. CPC Corporation, Taiwan  
Liou CY (2017) Heavy metal pollution in algal reef coasts of northwest Taiwan. *Taiwan Journal of Biodiversity* 19:49–95

**Electronic supplementary material** The online version of this article (doi:10.1007/s00338-017-1619-0) contains supplementary material, which is available to authorized users.

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Endemic Species Research Institute, Jiji, Nantou 552, Taiwan

**Fig. 1** a Aerial view of the southern part of the Taoyuan crustose coralline algal (CCA) reef (grey) along the coastline, image by Aerial Survey Office, Forestry Bureau. The white square is b CCA reef during low tide with windmills in the

# 2018年海洋大學林秀美等發表台灣大潭藻礁無節珊瑚藻之多樣性 - 1新屬及3新種

Journal of Applied Phycology (2018) 30:3455–3469  
https://doi.org/10.1007/s10811-018-1620-1

8TH ASIAN PACIFIC PHYCOLOGICAL FORUM



## Species diversity and molecular phylogeny of non-geniculate coralline algae (Corallinophycidae, Rhodophyta) from Taoyuan algal reefs in northern Taiwan, including *Crustaphytum* gen. nov. and three new species

Li-Chia Liu<sup>1</sup> · Showe-Mei Lin<sup>1</sup> · Annalisa Caragnano<sup>2</sup> · Claude Payri<sup>2</sup>

Received: 31 January 2018 / Revised and accepted: 29 August 2018 / Published online: 12 September 2018  
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#### Abstract

In Taiwan the algal reefs in Taoyuan County are the largest, composed of recent and fossil non-geniculate coralline algae. However, their diversity and phylogenetics in the region have never been documented. In this study, we analyzed the phylogenetic relationships of the non-geniculate coralline algae species collected from Taoyuan algal reefs and related non-geniculate species from other places in Taiwan and around the world based on *psbA* and SSU sequences. The molecular analyses revealed that at least 12 non-geniculate coralline species belonging in six evolutionary clades (*Harveyolithon*, *Lithophyllum*, *Pneophyllum*, *Crustaphytum* gen. nov., and *Phymatolithon*, *Sporolithon*) occur in Taoyuan algal reefs. Eleven of these species do not match any described species and one (*Lithophyllum margaritae*) is a new record for the marine flora of Taiwan. We also describe a new genus (*Crustaphytum* gen. nov.) and three new non-geniculate coralline species (*Crustaphytum pacificum* sp. nov., *Harveyolithon rosea* sp. nov., and *Phymatolithon margoundulatus* sp. nov.) for the most dominant and commonly seen species revealed by the molecular analyses. Among the latter three species, *P. margoundulatus* is only found in Taoyuan County and is the most dominant species there, comprising over 30% of the total cover, whereas *C. pacificum* has the widest distribution in the western Pacific Ocean (Taiwan and New Caledonia). *Harveyolithon rosea* is a common species occurring in both algal reefs and rocky shores in the northern Taiwan. The other undescribed CCA species will be published when more specimens with reproductive structures are collected.

**Keywords** *Crustaphytum pacificum* gen. and sp. nov. · *Harveyolithon rosea* sp. nov. · *Phymatolithon margoundulatus* sp. nov. · *psbA* · Red algae · SSU · Taiwan



# 2019年中央研究院陳昭倫等發表柴山多杯孔珊瑚於大潭藻礁之族群量為世界重要棲地亟需保育

## Lonely giant on the sand: unexpected massive Taiwanese coral, *Polycyathus chaishanensis* in the Datan algal reef demands a conservation focus

Chao-Yang KUO<sup>1</sup>, Aichi CHUNG<sup>1</sup>, Shashank KESHAVMURTHY<sup>1</sup>, Ya-Yi HUANG<sup>1</sup>,  
Sung-Yin YANG<sup>1</sup>, and Chaolun Allen CHEN<sup>\*1,2,3</sup>

<sup>1</sup> Biodiversity Research Center, Academia Sinica, Nangang, Taipei 115, Taiwan

<sup>2</sup> Institute of Oceanography, National Taiwan University, Taipei 115, Taiwan

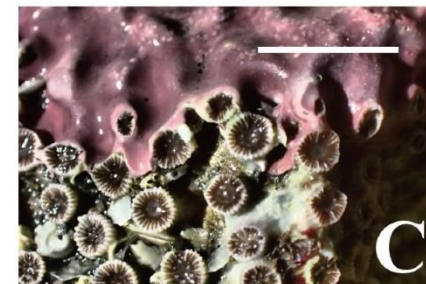
<sup>3</sup> Department of Life Science, Tunghai University, Taichung 407, Taiwan

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Communicated by Tsuyoshi WATANABE (Environment and Conservation Editor)

**Keywords** Datan algal reef, Crustose coralline algal (CCA), Taiwanese coral, Endangered species, Conservation



**Fig. 1** *Polycyathus chaishanensis* in the Datan algal reef, Taoyuan, Taiwan. (A) close-up view of small colony of *P. chaishanensis* with tentacles and polyps extended. Scale bar=1 cm; (B) a massive *P. chaishanensis* colony with surrounding smaller colonies at 200 cm below average sea level, photo at low tide. Scale bar=10 cm; (C) contracted live coral polyps overgrown by CCA. Scale bar=1 cm



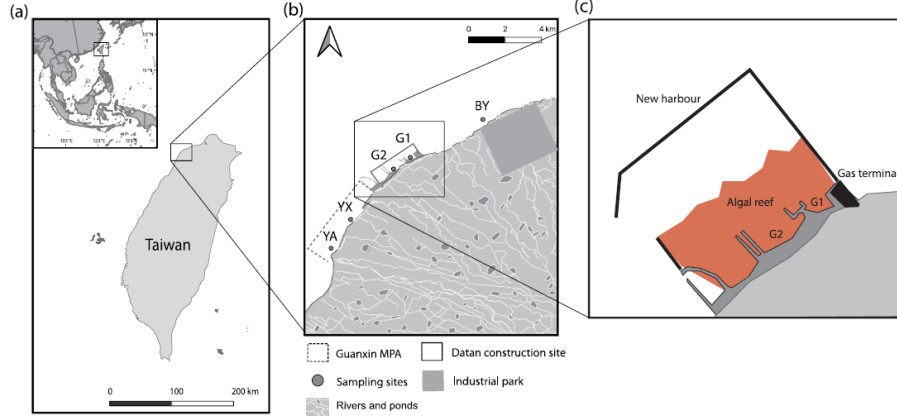
# 2020年東海大學溫國彰教授團隊發表魚類調查

Received: 7 October 2019 | Revised: 2 June 2020 | Accepted: 21 August 2020  
DOI: 10.1002/aqc.3477

## RESEARCH ARTICLE

WILEY

### • 大潭藻礁魚類多樣性高



**FIGURE 1** Location of (a) Taoyuan Algal Reef in northwestern Taiwan; (b) the five sampling sites used in this study: BY (Baiyu), G1 (Datan G1), G2 (Datan G2), YX (Yongxin) and YA (Yongan); (c) proposed location for the construction of a natural gas receiving terminal and harbour wall at Datan. MPA, Marine Protected Area

## Coastal development threatens Datan area supporting greatest fish diversity at Taoyuan Algal Reef, northwestern Taiwan

Joseph Heard<sup>1,2</sup> | Wei-Chen Tung<sup>1</sup> | Yu-De Pei<sup>1,2</sup> | Tzu-Hao Lin<sup>3</sup> | Chien-Hsiang Lin<sup>3,4</sup> | Tomonari Akamatsu<sup>5</sup> | Colin K. C. Wen<sup>1,3</sup>

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### Funding information

Forestry Bureau, Council of Agriculture and Executive Yuan, Grant/Award Number: 107-2.2.6-1.1--001-01

### Abstract

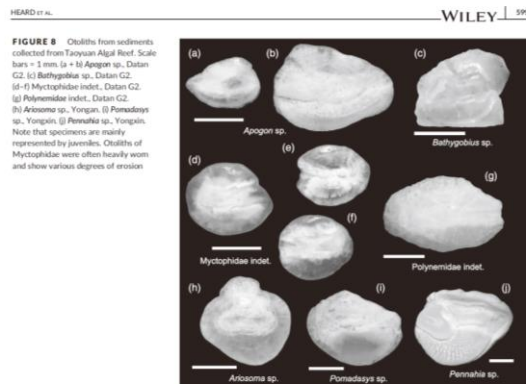
1. Taoyuan Algal Reef is a biodiverse coralline algal reef in north-west Taiwan, that is currently threatened by coastal development and industrial waste runoff.

2. As the reef lies in an exposed area that is frequently disturbed by monsoons, it is difficult to survey using traditional methods. Knowledge of the reef is therefore limited, and has until recently, long been regarded as a barren environment.

3. However, recent studies have revealed that the reef is inhabited by a diverse array of organisms, particularly at Datan, where a natural gas receiving terminal is planned for construction. Due to challenging environmental conditions, otolith assemblage and soundscape analyses were used to supplement traditional sampling methods including clove oil, netting, and pole-and-line fishing in order to assess the diversity of the fish community at Taoyuan Algal Reef.

4. Several fish species that had not been recorded by previous surveys were observed. Fish diversity and the average size of commercially targeted species were greatest at Datan G2. Predatory reef fishes such as groupers (Serranidae) and snappers (Lutjanidae), as well as several small endangered scalloped hammerhead sharks *Sphyrna lewini* were recorded at G2, where otolith assemblage analysis also indicated increased predatory activity. However, fewer individuals and species were recorded from tidal pools across all sites compared to previous

### • 大潭藻礁耳石魚類多樣性高



**FIGURE 8** Otoliths from sediments collected from Taoyuan Algal Reef. Scale bars = 1 mm. (a) Apogon sp., Datan G2, (b) Baetrygnus sp., Datan G2, (c) Myctophidae indet., Datan G2, (d) Polynemidae indet., Datan G2, (e) Arisoma sp., Yongxin, (f) Pomadasys sp., Yongxin, (g) Penaeus sp., Yongxin. Note that specimens are mainly represented by juveniles. Otoliths of Myctophidae were often heavily worn and show various degrees of erosion



# 2021年中研院陳國勤等 發表蝦蛄幼生調查

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SENCKENBERG

ORIGINAL PAPER



## To the light side: molecular diversity and morphology of stomatopod larvae and juveniles (Crustacea: Malacostraca: Stomatopoda) from crustose coralline algal reefs in Taiwan

Kingsley J. H. Wong<sup>1,2</sup> · Yao-Feng Tsao<sup>1</sup> · Pei-Chen Tsai<sup>1</sup> · Wei-Peng Hsieh<sup>1</sup> · Han-Ru Li<sup>1</sup> · Ryuji J. Machida<sup>1</sup> · Benny K. K. Chan<sup>1</sup>

Received: 6 July 2020 / Revised: 29 November 2020 / Accepted: 3 December 2020  
© Senckenberg Gesellschaft für Naturforschung 2021

### Abstract

Biology of planktonic stomatopod larvae has long remained poorly understood and often considered “black boxes” in life history studies. From coralline crustose algal (CCA) reefs at Datan, Taoyuan, Taiwan, using light traps recently designed, we collected considerable number of stomatopod larvae and juveniles. Applying DNA barcoding techniques using mitochondrial cytochrome oxidase I (COI) and 16S ribosomal RNA (16S rRNA) gene sequences, 14 morphotypes were revealed to represent 12 distinct species, seven of which identified to species level by comparing against reference sequences available from online source (GenBank), whereas the other five do not cluster with any known sequences. All stomatopod larvae and juveniles were described and illustrated. We report *Manningia pilaensis* (De Man, 1888) and *Levisquilla jurichi* (Makarov, 1979) as new records of the stomatopod fauna of Taiwan and confirm the validity of *Lysiosquillina maculata* (Fabricius, 1793). Based on material we acquired from light traps, which include propelagic antizoea larvae (of *L. maculata*), and also postlarval and juvenile forms (of various squillid species), both positively phototactic, indicating the current understanding of negative-positive-negative phototactic tendency from early planktonic to postlarval stages through the development of stomatopod larvae, might not be as distinct as previously described.

**Keywords** Mantis shrimp larvae · Datan algal reef · Light trap · DNA barcoding · COI · 16S rRNA · New record

### Introduction

Stomatopod larvae and juveniles are morphologically very distinct among zooplankton. Compared to larvae of other crustacean groups, little is known about biology of those stomatopods, and the subject remains poorly understood in life history studies. Stomatopods experience a bipartite lifecycle through development, passing through multiple planktonic larval stages before maturing into juveniles and adults, eventually settling on benthic habitats. Upon hatching from egg masses brooded by the female parent, juveniles

undergo a brief propelagic phase, taking shelter in mother’s burrow, and then ascending into the water column to join with the zooplankton. The number of pelagic stages varies from one to nine depending on species (Ahyong et al. 2014; also see Greenwood and Williams 1984; Hamano and Matsuura 1987), after which individuals settle as postlarvae (form resembling adults). The morphology of planktonic larvae differs between superfamilies, with lysiosquillids (Lysiosquilloidea) first hatching into antizoea larvae, wanting of raptorial appendages, instead relying on yolk for nutrition. The gonodactyloids (Gonodactyloidea), parasquilloids (Parasquilloidea), and eurysquilloids (Eurysquilloidea) devel-

用燈光誘捕器採集大潭藻礁的浮游動物，同時利用DNA條碼技術分析發現12種蝦蛄，其中兩種為台灣新紀錄種。

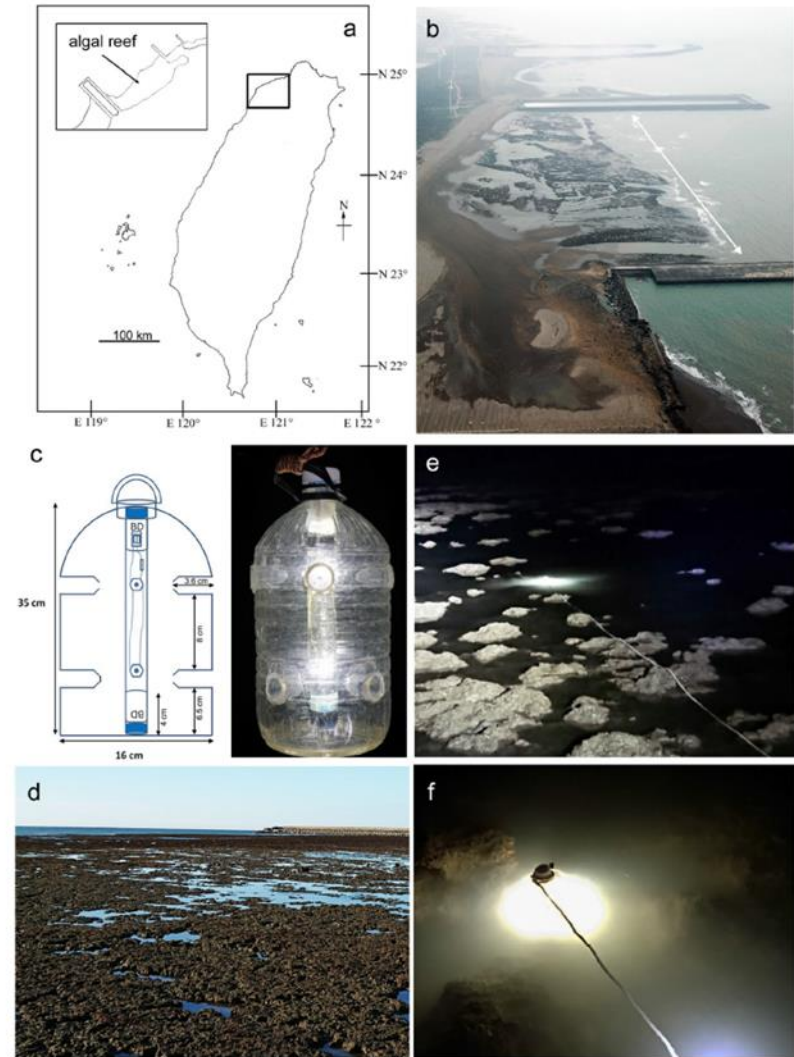
*Manningia pilaensis* (De Man, 1888),  
*Levisquilla jurichi* (Makarov, 1979)

另外，還有5種是在資料庫中找不到基因序列，但是型態上可以歸類到指蝦蛄科、矮蝦蛄科和蝦蛄科的未知種

Marine Biodiversity (2021) 51:20

Page 5 of 31 20

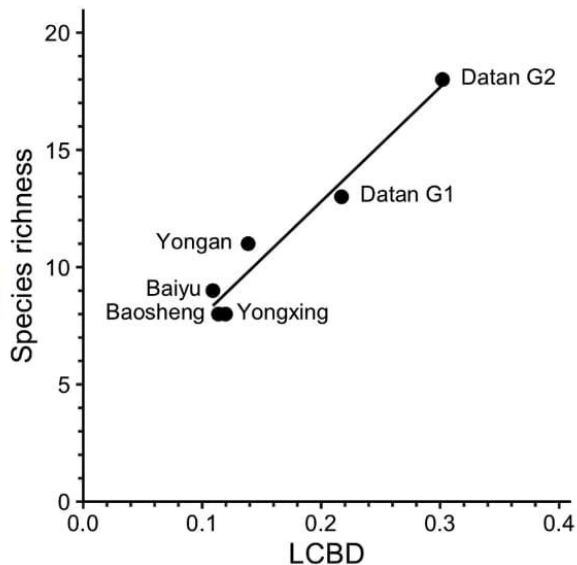
Fig. 1 a Map of collection site at Datan, Taoyuan; b aerial view of the CCA reef (indicated by the white double arrows) (photograph taken by Chu yu-wei, Juvenile Art Center); c light trap designed in Chan et al. (2016) for collecting stomatopod larvae; d the CCA reef exposed during low tides; e, f light traps deployed subtidal region in CCA reef at night





# Multiple Environmental Factors Increase the Niche Complexity and Species Diversity of Brachyuran Crabs in an Intertidal Algal Reef Ecosystem in Northwestern Taiwan

2021年東海大學林惠真教授團隊發表蟹類調查



Relationship between the species richness and local contribution to beta diversity (LCBD) indexes among the six sites in the algal reef habitat.

Kun-Chang Li 李坤璋  
Hung-Chang Liu 劉烘昌  
Hui-Chen Lin 林惠真

November 2021 Zoological Studies 60(73)  
DOI:10.6620/ZS.2021.60-73

## Multiple Environmental Factors Increase the Niche Complexity and Species Diversity of Brachyuran Crabs in an Intertidal Algal Reef Ecosystem in Northwestern Taiwan

Kun-Chang Li<sup>1</sup>, Hung-Chang Liu<sup>2</sup>, and Hui-Chen Lin<sup>1,3,\*</sup>

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<sup>2</sup>Taiwan Academy of Ecology, 52, Yonghua St., Changhua City, Changhua County 500007, Taiwan. E-mail: labuanlum@gmail.com (Liu)

<sup>3</sup>Center for Ecology and Environment, Tunghai University, 1727, Sec.4, Taiwan Boulevard, Xitun District, Taichung City 407224, Taiwan. \*Correspondence: E-mail: hclin@thu.edu.tw (Lin)

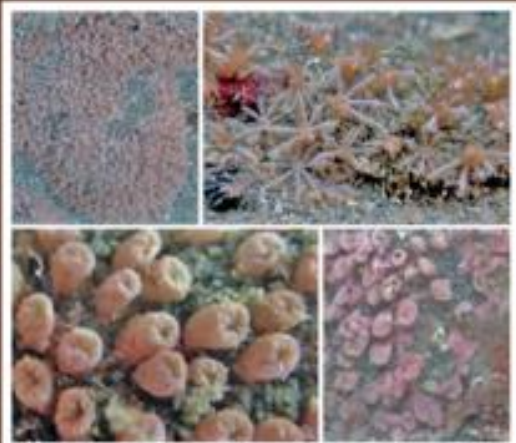
Received 6 August 2021 / Accepted 6 October 2021 / Published 19 November 2021  
Communicated by Berry K.K. Chan

Algal reefs are one of the world's rare and poorly understood ecosystems. They are mainly distributed in the Mediterranean Sea, but one notable exception—an intertidal algal reef ecosystem in northwestern Taiwan—stretches for 27 km along the coast of Taoyuan, making it probably the largest algal reef coast found in shallow water. Despite the reef's rarity and striking characteristics, the coastal land that it is part of has undergone a series of developments and is now surrounded by industrial parks. Brachyuran crabs are one of the most abundant and visible groups of organisms in the intertidal zone. In the present study, we investigated the brachyuran crab community in this reef to provide a more detailed record of brachyuran crab species compositions in this intertidal algal reef ecosystem and illustrate the characteristics of this understudied ecosystem by comparing its species diversity and abundance with three natural variables—sampling time, tidal level, and season—in a wildlife refuge and north of the refuge. Two methods were used in the study: a qualitative method (to determine the species richness) and a quantitative method (to estimate the population density). We identified a total of 52 brachyuran species from 13 families in the habitats. The highest species richness was found in Datan G2, north of the wildlife refuge. The crab species composition in this algal reef is different from its compositions in coral and rocky reefs. Our analysis indicated that the species abundance is affected by multiple factors, and a single investigation is not enough to reflect the true population density of brachyuran crabs on this reef. In addition, we found that the sites outside the wildlife refuge were in much better condition than those in the wildlife refuge, and should therefore be included in the wildlife refuge. In particular, Datan, located north of the wildlife refuge, had the highest species richness, and the area's species composition was different from that of the nearby wildlife refuge. Thus, we strongly recommend that a) the Datan area be protected to maintain this high crab diversity and b) further research be performed to better understand brachyuran crab biology in the intertidal algal reef ecosystem.

**Key words:** Algal reef ecosystem, Anthropogenic disturbance, Brachyuran crabs, Coralligenous reef, Taoyuan algal reef.



[Cnidaria • 2022] *Erythropodium taoyuanensis* • A New Species of Anthothelid Octocoral (Cnidaria, Alcyonacea) discovered on An Algal Reef of Taiwan



*Erythropodium taoyuanensis*

Tu & Dai, 2022

DOI: [10.1111/csp.12572](https://doi.org/10.1111/csp.12572)

**Abstract**

A molecular phylogenetic analysis of 132 octocoral species reveals a close relationship between specimens collected from the intertidal pools of the Datan Algal Reef, Taoyuan, Taiwan, and *Erythropodium caribborum* (Duchassaing & Michelotti, 1866), but the two species have distinct morphological features. On the basis of morphological differences in polyps and sclerites, we identify and describe a new *Erythropodium* species: *E. taoyuanensis* sp. nov. The distinct identifying features of *E. taoyuanensis* sp. nov. include the upright contractile polyps from thin encrusting membranes and abundant 6-radial sclerites. Using an integrative approach, we present the findings of morphological comparisons and molecular phylogenetic analyses to demonstrate that *E. taoyuanensis* sp. nov. is distinct from other *Erythropodium* species. Our study contributes to the knowledge of octocoral biodiversity in marginal habitats.

**Keywords:** 28S rDNA, Anthothelidae, cox2-1GR-cox1, molecular phylogeny, msh1, northwestern Pacific, *Sclezozonia*



← Chang-feng Dai

 **Chang-feng Dai** ...  
2020年11月10日 · 🌐

這種在桃園觀塘藻礁發現的八放珊瑚，經查很可能是羽珊瑚科(Clavulariidae)中的 *Inconstantia* 屬的新種，屬名按照字面翻譯是“無常軟珊瑚”，也許將來應命名為“藻礁無常軟珊瑚”或“觀塘無常軟珊瑚”，以代表或者紀錄觀塘藻礁歷經的世事無常；但縱然人生無常，世事無常，我們仍希望環境和生態能永續下去，讓生命在面對無常時，仍有一絲調適的機會。



 讚  回應  分享

2022年戴昌鳳發表新種 *Erythropodium taoyuanensis* (桃園紅足軟珊瑚)



# 1. 不可替代性

## (1) 生態人文資源獨特性：

- 進行生態資源盤點，包括保育類或特有種，整體棲地獨特性
- 進行古蹟或遺址盤點

### 殼狀珊瑚藻多樣性群聚結構組成

資料來源：東海大學劉少倫教授團隊



### 大潭殼狀珊瑚藻有5新屬及21新種

- 太平洋殼植藻 (*Crustaphytum pacificum*)
- 殼植藻 (*Crustaphytum* sp.)
- 殼植藻 (*Crustaphytum* sp. 1)
- 殼植藻 (*Crustaphytum* sp. 2)
- 網石枝藻 (*Lithothamnion* sp. 1)
- 網石枝藻 (*Lithothamnion* sp. 2)
- 網石枝藻 (*Lithothamnion* sp. 3)
- 波浪線膨石藻 (*Phymatolithon margoundulatus*)
- 膨石藻 (*Phymatolithon* sp. 1)
- 膨石藻 (*Phymatolithon* sp. 2)
- 膨石藻 (*Phymatolithon* sp. 3)
- 膨石藻 (*Phymatolithon* sp. 4)
- 膨石藻 (*Phymatolithon* sp. 5)
- 孢石藻 (*Sporolithon* sp. 1)
- 孢石藻 (*Sporolithon* sp. 2)
- 孔水石藻 (*Porolithon onkodes*)
- 張伯倫藻 (*Chamberlainium* sp.)
- 哈氏石藻 (*Harveylithon* sp.)
- 哈氏石藻 (*Harveylithon* sp. 1)
- 哈氏石藻 (*Harveylithon* sp. 2)
- 哈氏石藻 (*Harveylithon* sp. 3)
- 哈氏石藻 (*Harveylithon* sp. 4)
- 瑪格莉特石葉藻 (*Lithophyllum margaritae*)
- 石葉藻 (*Lithophyllum* sp. 1)

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### MOLECULAR ECOLOGY

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# MOLECULAR ECOLOGY



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農業部生物多樣性研究所  
Taiwan Biodiversity Research Institute









這幾個月的施工，不但巨大沉箱造成底泥的擾動，還因為填充的細泥大量溢出，造成在潮間帶，已經定位確認、原本活力旺盛的一級保育類柴山多杯孔珊瑚，被細泥覆蓋而亡。

工程從外地運來的填方(細泥)，和原本生態系的漂砂不一樣，所以沒有辦法靠著暴雨或是強浪來清除

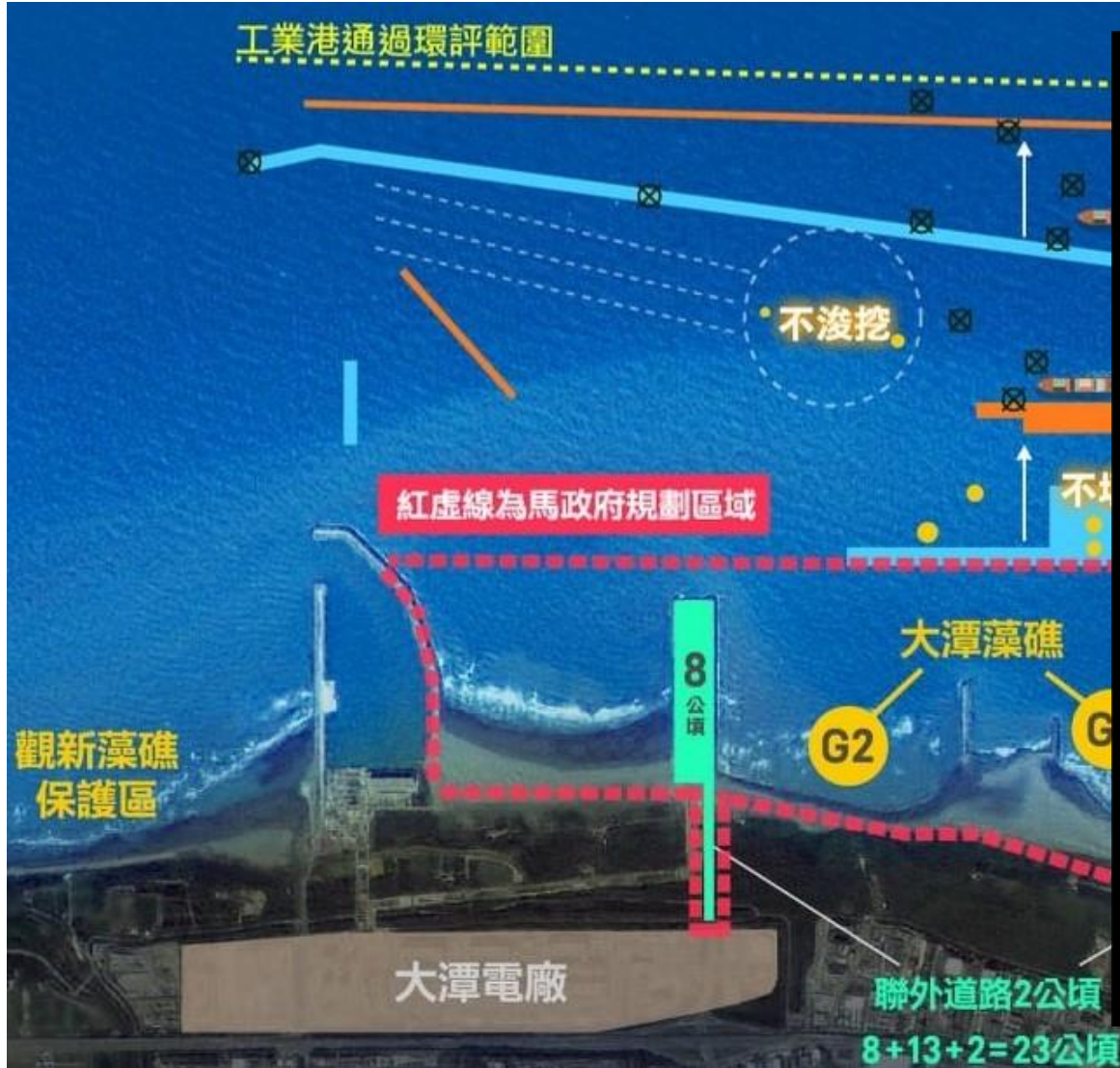




現在已知正在施工的棧橋的範圍，是活的藻礁和一級保育類柴山多杯孔珊瑚的主要棲地



## (2) 施工必要性及替代方案-迴避





## 2. 效益

### (1)生態系服務（生態重要性）

A.生態多樣性

B.降低海水酸化

C.永續食物庫

D.環境教育

### (2)各項經濟產值

兩座儲槽容量16萬公秉

中油目標「儲槽38座」拚2030年完工

一接高雄永安9座、二接台中港12座、

三接觀塘2座、四接協和2座、

五接台中5座、六接麥寮4座、

七接洲際4座。

C/2020 f3 彗星



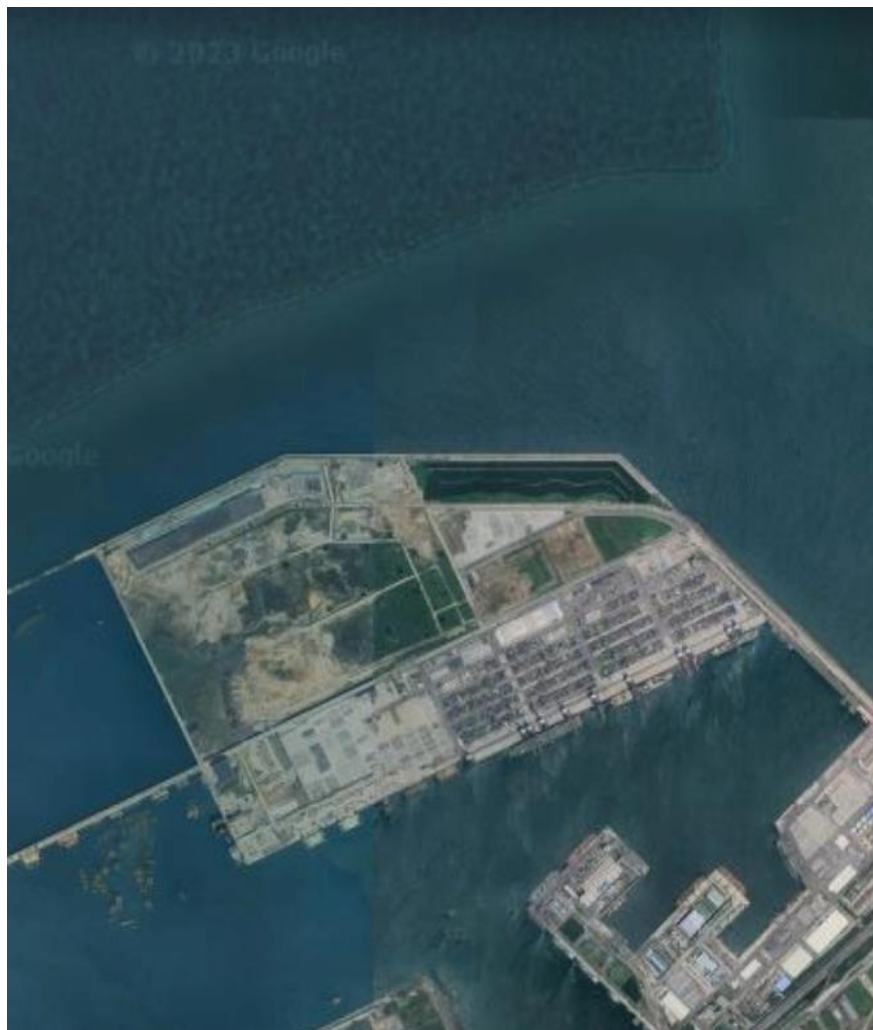
2020.7.23 20:15:37 桃園市觀音區大潭藻礁 (EIET 夜間觀察)



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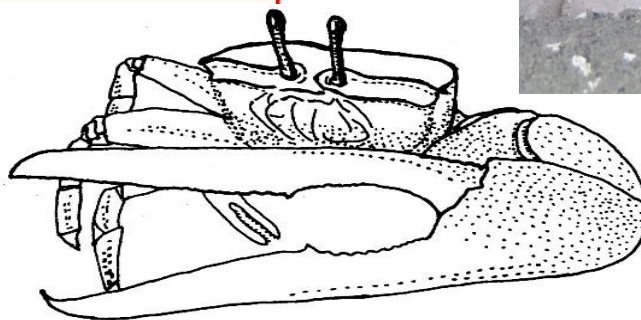
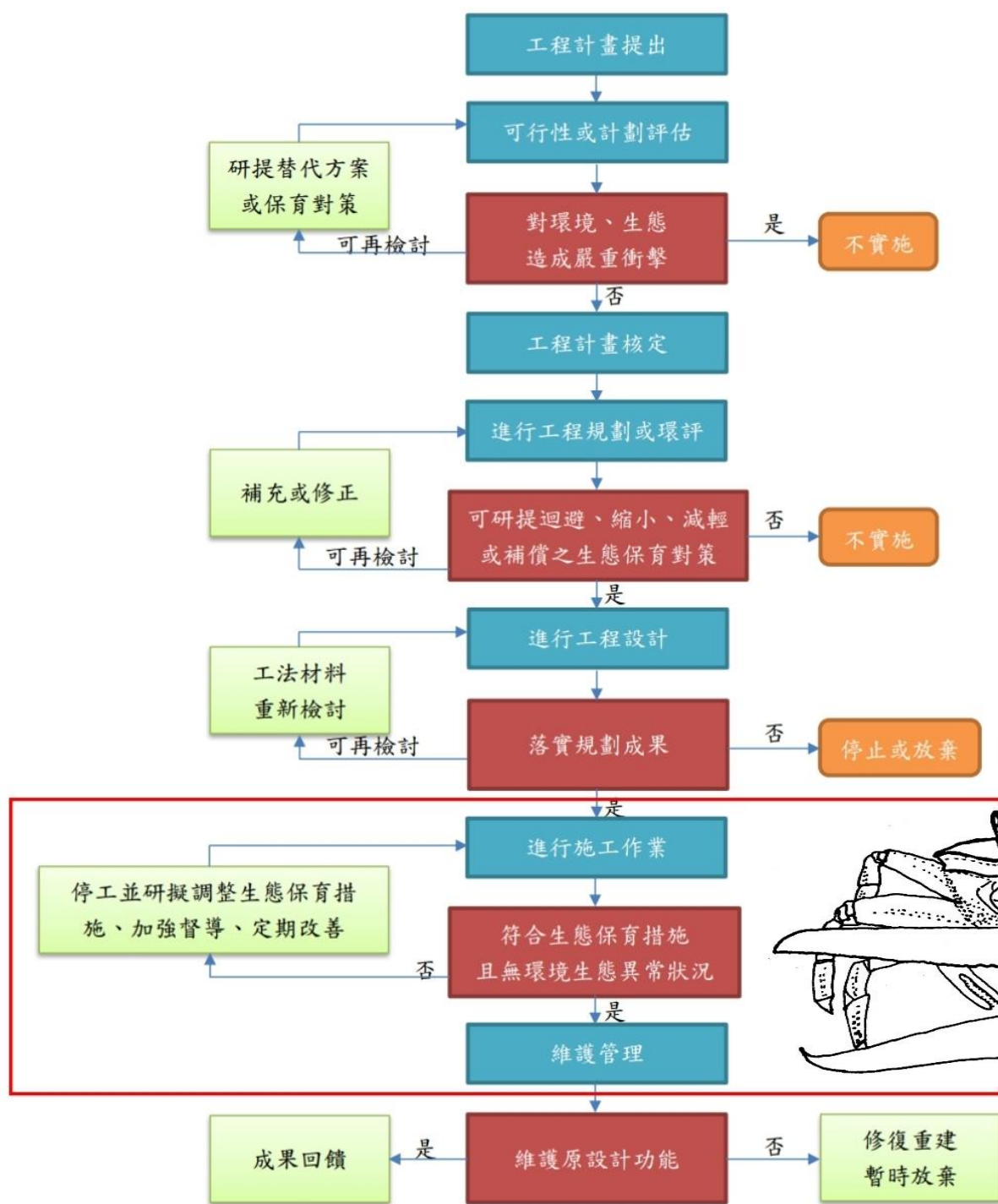
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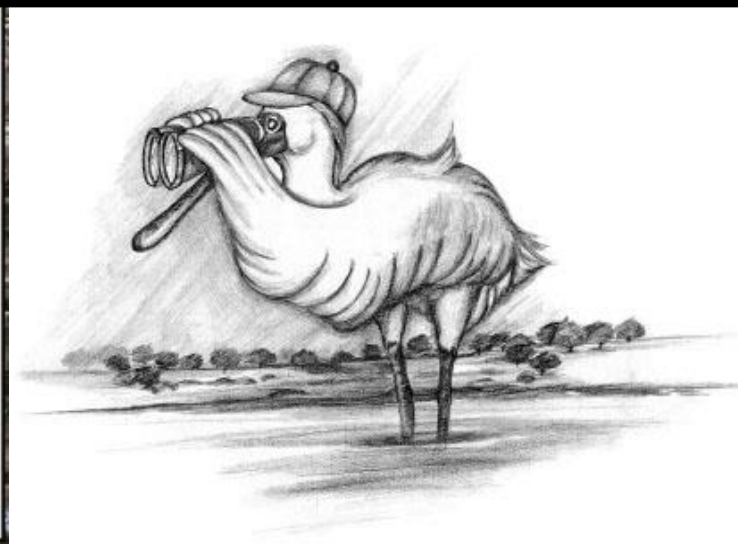
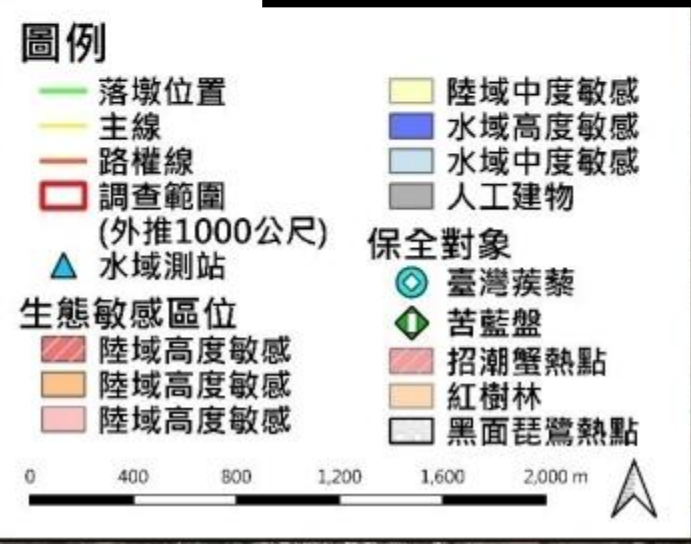
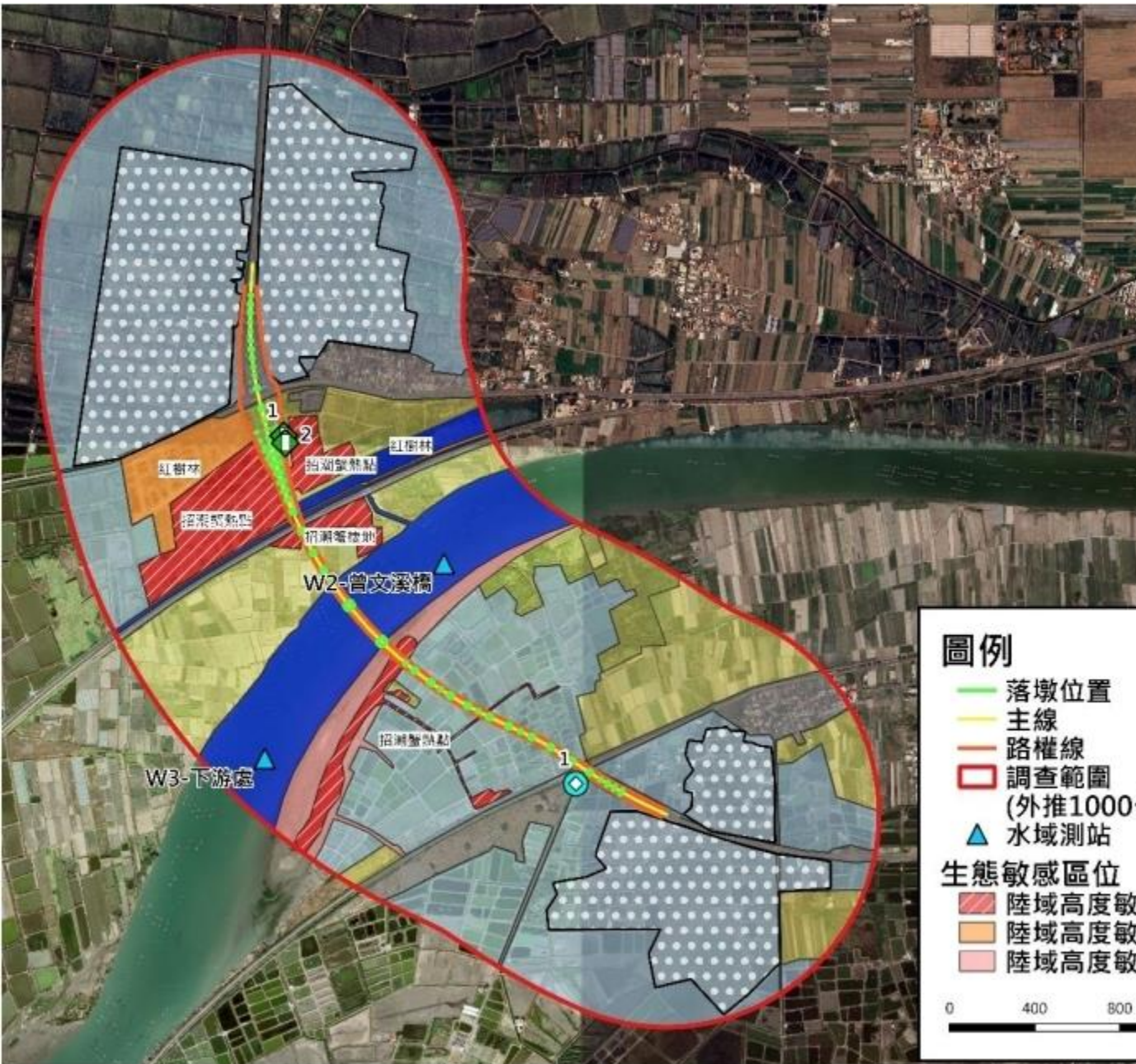




兇狠圓軸蟹 (*Cardisoma carnifex*)









# 特有種很神奇嗎？

- 特有種代表此種生物只有分佈在台灣，若在台灣族群受到嚴重的破壞而消失，就代表這個物種在世界上消失。
- 海洋生物繁殖過程透過洋流的帶動，通常會遷移很遠的地方，會成為特有種的情形極為罕見，在繁殖機制及棲息地的需求一定有其特殊條件。

## 台灣生物多樣性研究 Taiwan Journal of Biodiversity

第14卷第1,2期 中華民國 101年 4月

Vol. 14, No. 1-2 April 2012





# 台灣生物多樣性研究

第 24 卷第三期  
Vol.24, No.3

Taiwan Journal of Biodiversity

中華民國 111 年 6 月  
Jun 2022

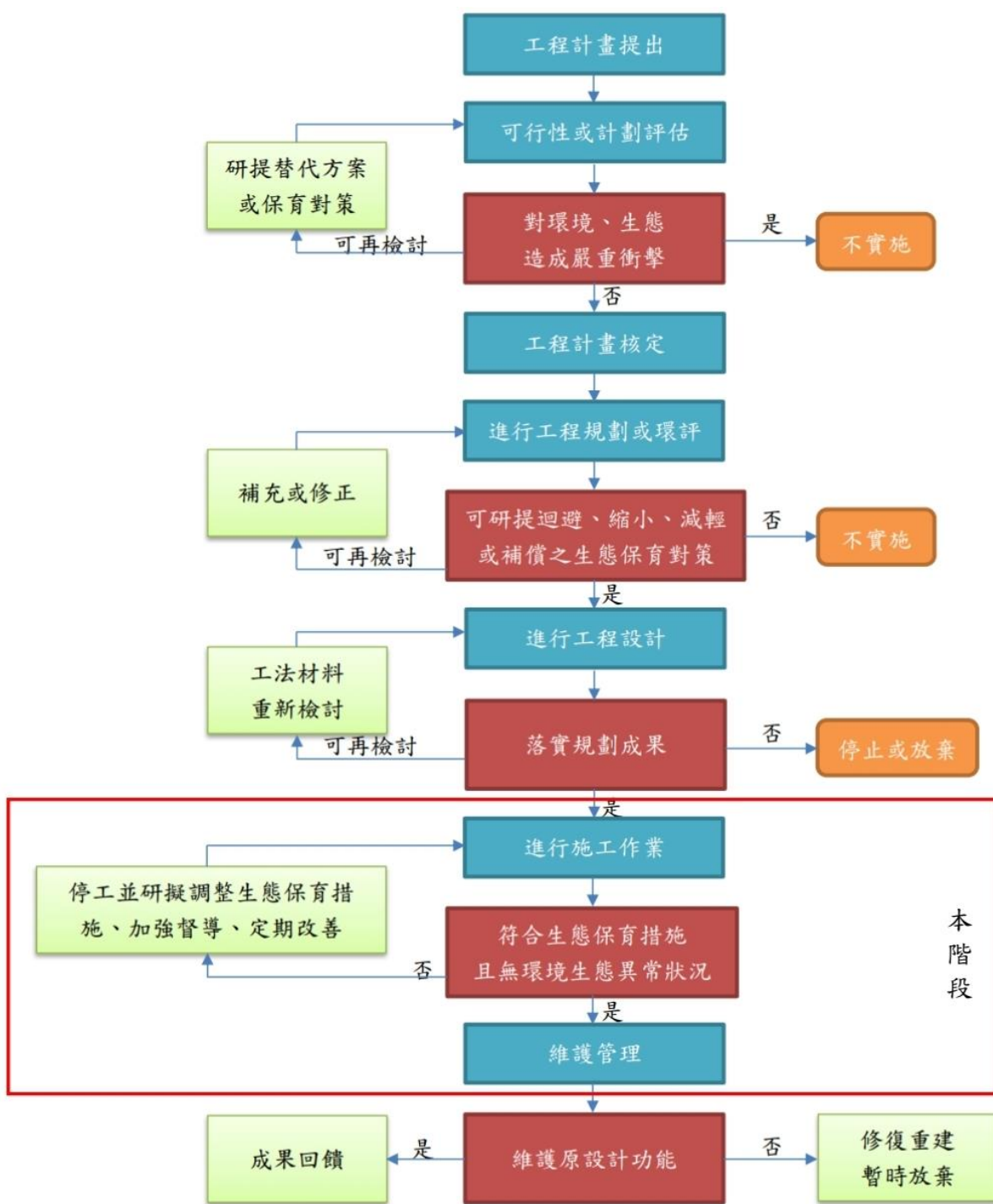


Google earth

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700 m





## 主要工程包括

- 場鑄逐跨工法預力箱型梁橋，橋寬 16.5~33.0公尺，總長1,104公尺
- 場鑄懸臂工法預力箱型梁橋(主線為脊背橋，上構預力箱型梁橋，橋寬 35.4~36公尺，總長530公尺)
- 擋土牆等附屬工程。

開工日期 111 年 12 月 04 日，工期 2,000 日曆天，  
 預定竣工日期 117 年 05 月 25 日。



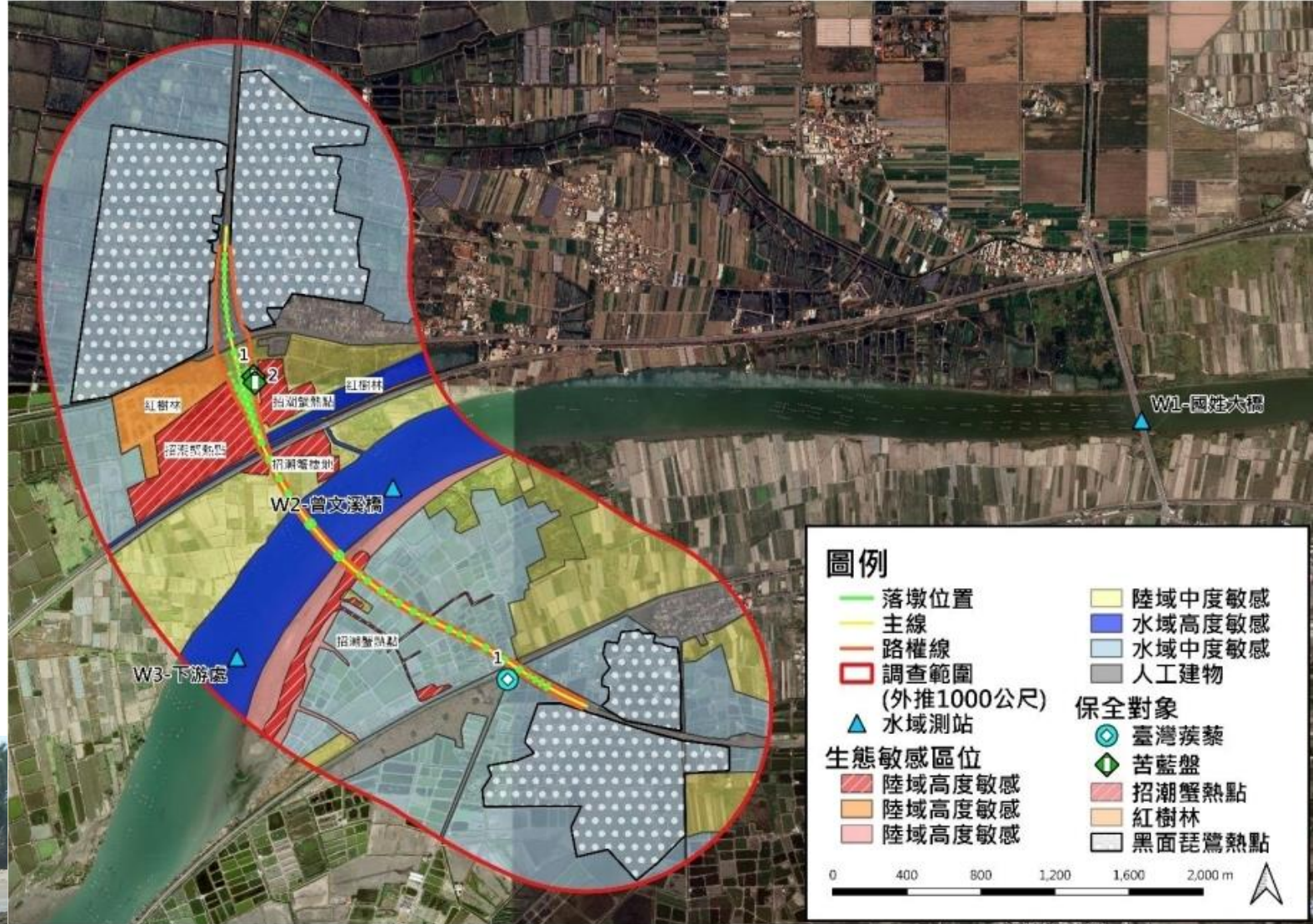


# 3. 生態復原可行性

(1) 衝擊減輕

(2) 復原方式

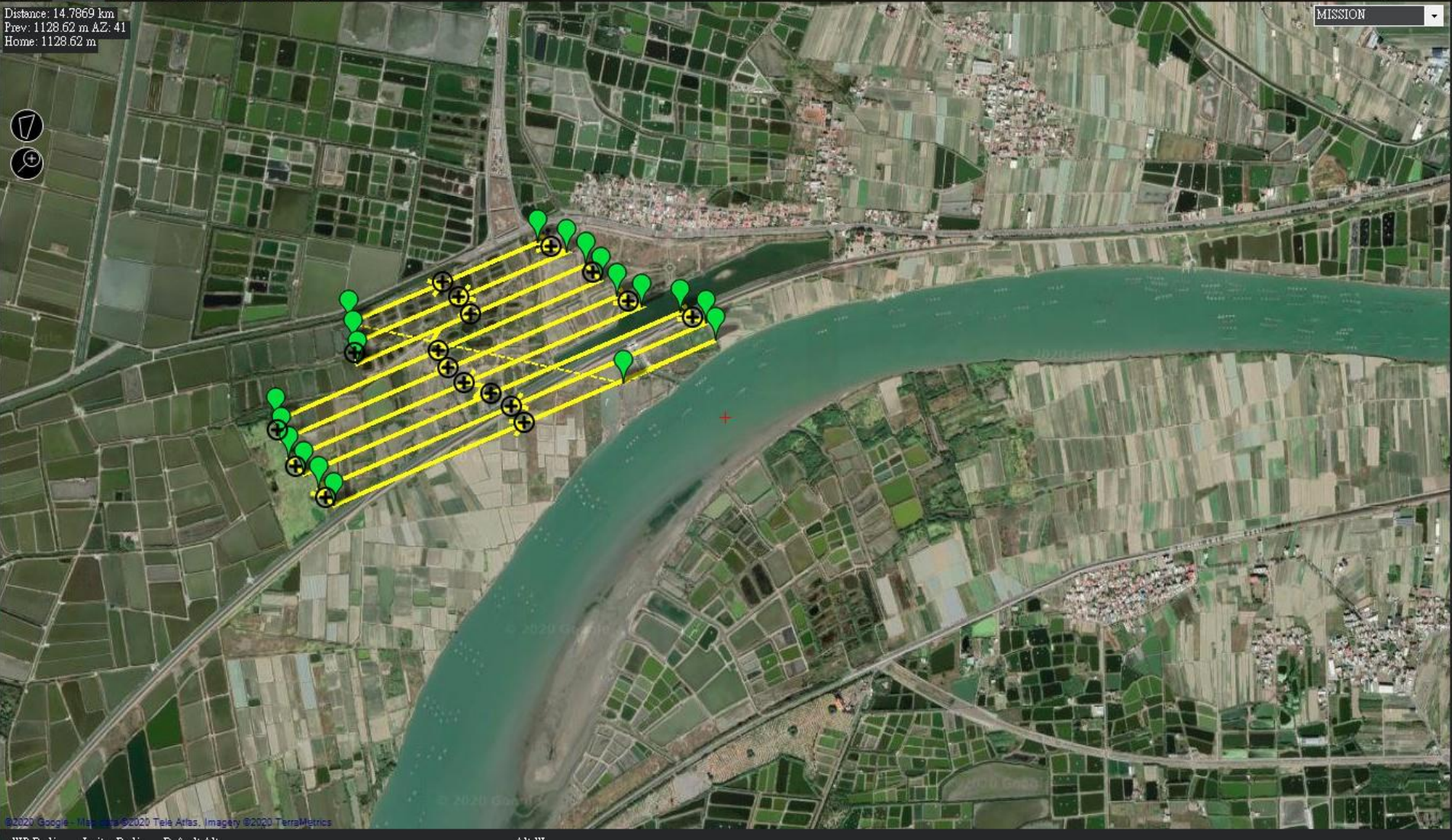
(3) 生態補償



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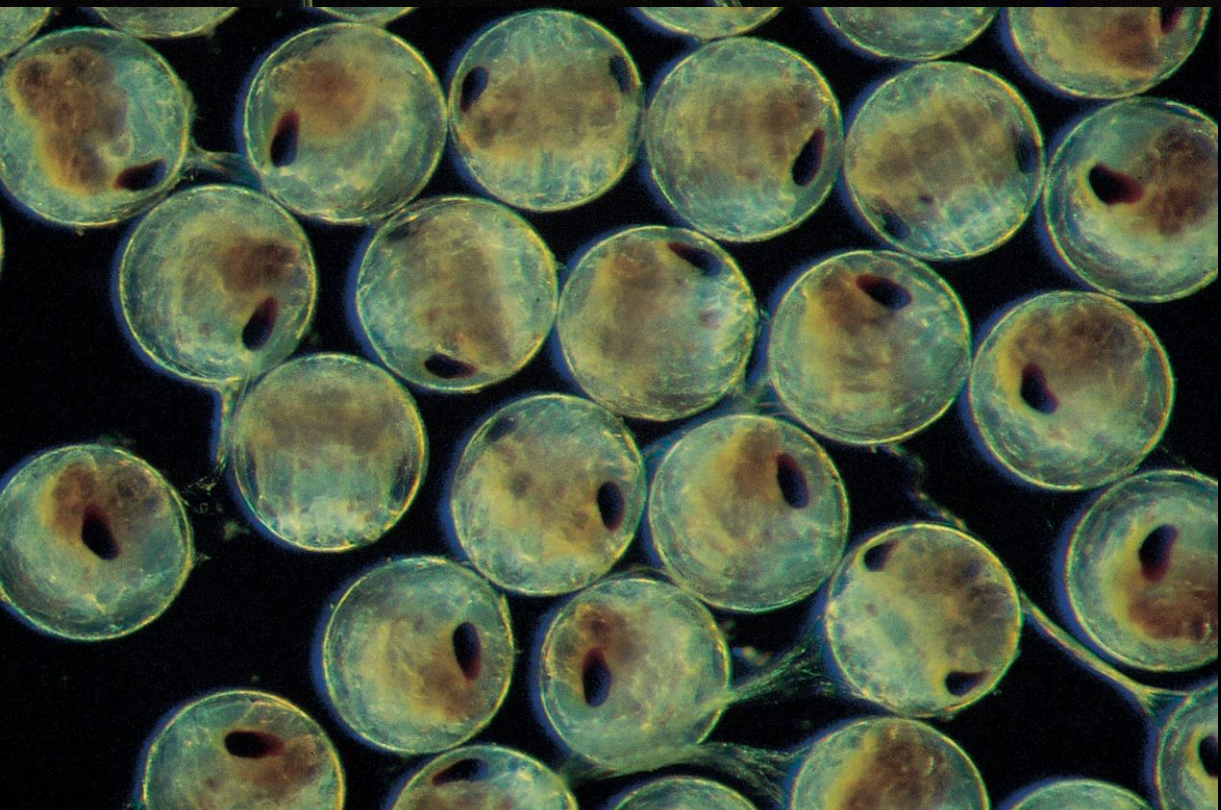
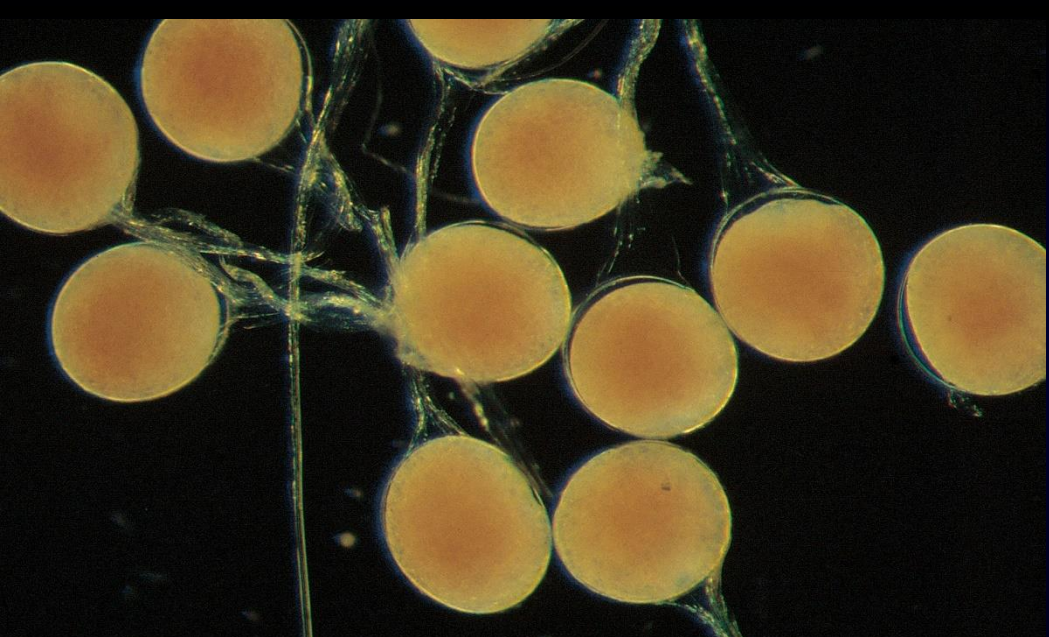
Distance: 14.7869 km  
Prev: 1128.62 m A.Z: 41  
Home: 1128.62 m



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# 對於掌握台灣旱招潮幼生的動態的目的及方法為何？

- 雖然已有許多學者投入台灣旱招潮的研究，但其幼生甚少於野外捕獲，尚難掌握台灣旱招潮於水域中之動態。
- 執行環境DNA指紋分析，但該技術應用於潮間帶仍然是探索階段。
- 台灣旱招潮的繁殖高峰集中在夏季，因此依據先前調查成蟹分佈範圍之來源水系，選擇合適地點每月大潮進行台灣旱招潮幼生誘捕工作，同時進行環境DNA的指紋比對分析。







大眼幼蟹









# 臺灣早招潮的蚤狀幼生捕獲

過去文獻在外海並沒有補捉到臺灣早招潮的幼生，也無定序到野生幼生的紀錄。

依據調查成蟹分佈範圍藉由光陷阱的捕捉，5、6、7月都有定序到其序列，在河道內成功捕捉臺灣早招潮的蚤狀幼體，雖然數量並不多，讓我們對臺灣早招潮生活史有更進一步的了解。

Query Cover : 93%  
E value : 0.0  
Per. Ident : 99.68%  
Name : *Uca formosensis*

100px

Per. Ident - 99.85%  
Query Cover - 95%  
E value - 0  
Name - *Portunus pelagicus*  
(遠海梭子蟹)

1mm

曾文溪口南岸樣點 01 蚤狀幼體 - 臺灣早招潮

曾文溪口南樣樣點 02 蚤狀幼體 - 遠海梭子蟹

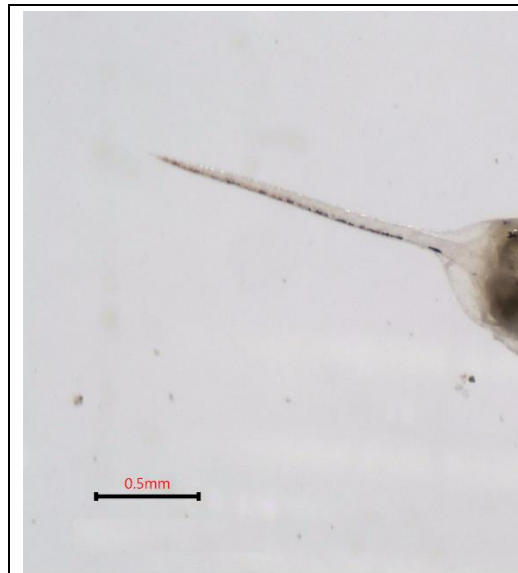




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Name : *Perisesarma bidens*

曾文溪口北岸樣點 01 蚤先

- 未來可於不同河並追蹤更廣的幼



曾文溪口南岸樣點 C

## Genetic Structure of the Endemic Fiddler Crab *Uca (Xeruca) formosensis* on the West Coast of Taiwan

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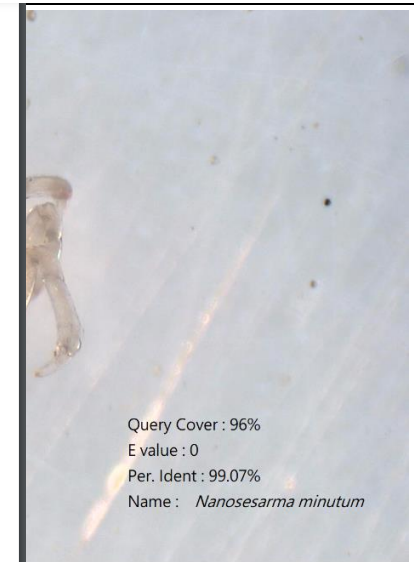
*Xeruca formosensis* is the only endemic species of fiddler crab on the west coast of Taiwan. However, its natural habitats and populations have been compromised by excessive anthropogenic activities and improper land use over the past four decades. In light of these changes, we sought to evaluate the genetic diversity and gene flow of the species by examining the genetic variation of *X. formosensis* at different sampling locations. To this end, we performed molecular analyses of three endonuclease-amplified fragment length polymorphisms (TE-AFLP) and the cytochrome oxidase subunit I (*COI*) marker from leg muscle samples. We found that the genetic variation within sampling locations was higher than that among sampling locations, and the expected heterozygosity of genetic diversity ( $H_e$ ) was 0.152 for TE-AFLP data. Meanwhile, the *COI* marker showed high haplotype diversity ( $h = 0.976 \pm 0.008$ ) and a low genetic differentiation level ( $F_{ST} = 0.021$ ) in *X. formosensis* populations. Importantly, the genetic connectivity of *X. formosensis* may be influenced by larval-stage crabs drifting between coastal and marine habitats. As such, crab gene flow is promoted among populations by larval exchange via nearshore currents. Although *X. formosensis* has high gene flow, the species could undergo an extinction crisis if the population sizes continue to decline, as with most endangered species. In order to maintain the natural habitats and population size of *X. formosensis*, long-term monitoring and investigation will be necessary.

**Key words:** *Xeruca formosensis*, Genetic variation, Larvae drifting, Genetic diversity.

### BACKGROUND

In Taiwan, there are 15 known species of fiddler crabs, with *Xeruca formosensis* being the only endemic species on the west coast. The first record of this species was made at Lugang in Changhua County in 1918 (Shih et al. 1999), and it was announced as a new species (originally *Uca formosensis*) in 1921 (Shih et al. 1999). In 2016, the genus was changed to *Xeruca* based on morphological and molecular evidence, including mitochondrial 16S rDNA, cytochrome oxidase subunit I (*COI*), and nuclear 28S rDNA (Shih 2015; Shih et

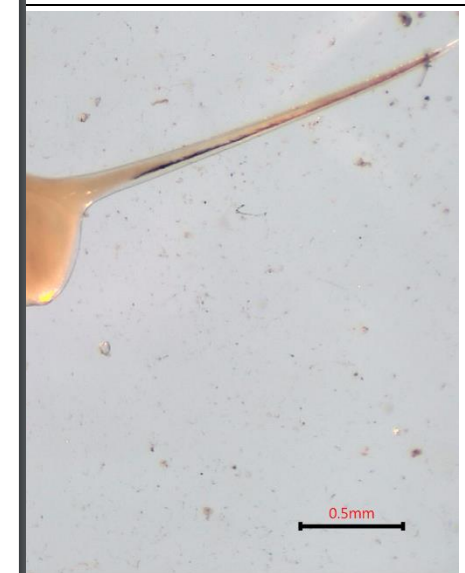
al. 2016), which has been further supported by the mitogenome analysis (MY Liu and Shih 2022). Previous studies indicated that *X. formosensis* inhabits tidal areas where there are wide flats with very clayey-muddy substrate and no mangroves on the supratidal zone (Shih et al. 1999; Liou 2012). In the past, large populations of this species existed at several locations, including Zengwen estuary, Dadu estuary, Xiangshan area, and Shengang area (Fig. 1). In particular, the Shengang area of Changhua County was once known as the “hometown of *X. formosensis*” (Shih 1997; Liou 2012). However, recent anthropogenic activities and improper land use



Query Cover : 96%  
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Name : *Nanosesarma minutum*

— 中華泥毛蟹

- 捕捉，以此確認生命週期。



狀幼體 — 未知





G1 北  
七  
將軍  
JIANGSU







瞭解台灣旱招潮的分布及棲地需求，施工後可以營造台灣旱招潮可利用的棲地



**感謝聆聽 敬請指教**

