



PENGHU EXPERIMENTAL SOUND STUDIO

How Corals Think 珊瑚如何思考

REPORT

an interdisciplinary approach
by **Yannick Dauby**

Theme :

**Underwater Sound Recording
&
Coral Reefs Acoustic Survey**

Introduction 計劃緣起

Since 2004, I am regularly visiting Penghu archipelago, located in the Taiwan Strait.

During my stays on the islands, I spend time observing the marine fauna and experiment with sound recording techniques.

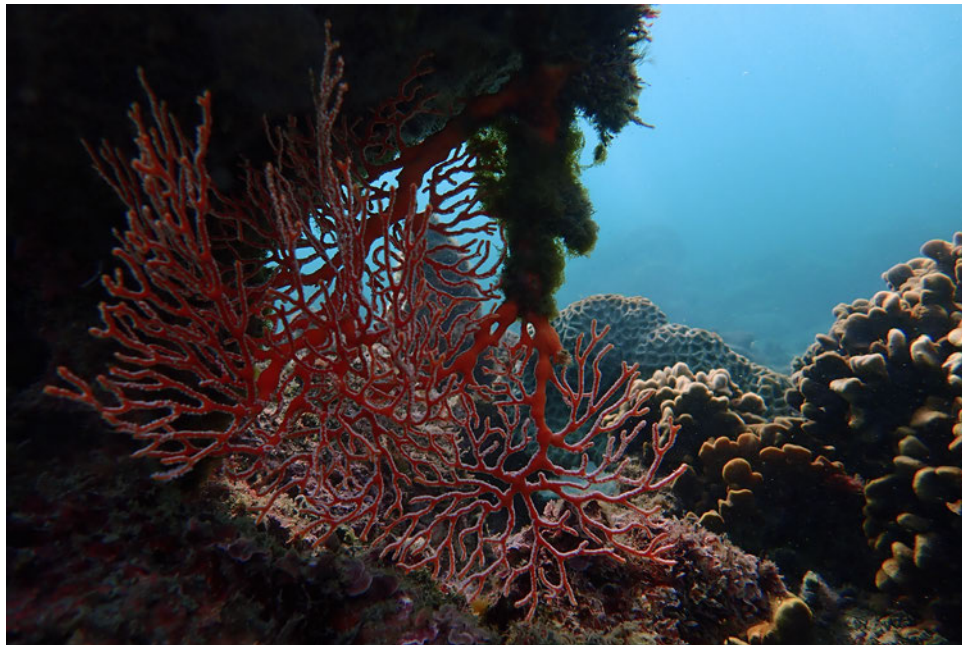
In 2009 was published the book "Village, Vestiges", in collaboration with Wan-Shuen Tsai, which contains a large part devoted to traditional houses of Penghu made of coral.

Since 2013, and every two years, we organize a longer stay, several months for developing art projects and educational activities.

In 2015, we made a teaching project in the remote islands of Penghu, which was concluded by a video creation, shown in Sydney Biennale 2016, entitled "Childhood of an Archipelago".

In 2017, after meeting with local divers and biologists I decided to start a project related to the underwater sounds, especially in coral reefs. That first session, without fundings, was the beginning of an experimental platform and archive. This first steps led to the exhibition "How Corals Think" (exhibited in Kaohsiung Fine Arts Museum, Kosovo Biennale, TheCube gallery in Taipei, and under a radio form for Documenta #14 all in 2018, and in Penghu Reclamation Hall in 2019).

This year 2018, I got a grant by National Foundation for the Arts , for developing this project in between art practice, audio-visual creation and ecology.



RECORDING DEVICES AND METHODS

錄音工具和方法

For three kind of recording situation, I use three systems. The third one, developed this year thanks to the grant, is the most interesting and promising, with very good results that attracted the attention of bioacousticians.

I will describe all of them below.

1. Setup for recording from the seashores, piers and boats

在岸邊，碼頭和船上的錄音工具

- DPA hydrophone
- Zaxcom MAX recorder
- Sennheiser HD25 headphone

I am standing on dry land, handling the hydrophone, immersing it directly to the water. Therefore I am able to use headphone to monitor the sound under the surface.

Since is the most regular sound recording practice I use since many years.



2. Setup for recording in the sea, while swimming/snorkeling

海中錄音工具(游泳或浮潛方式)

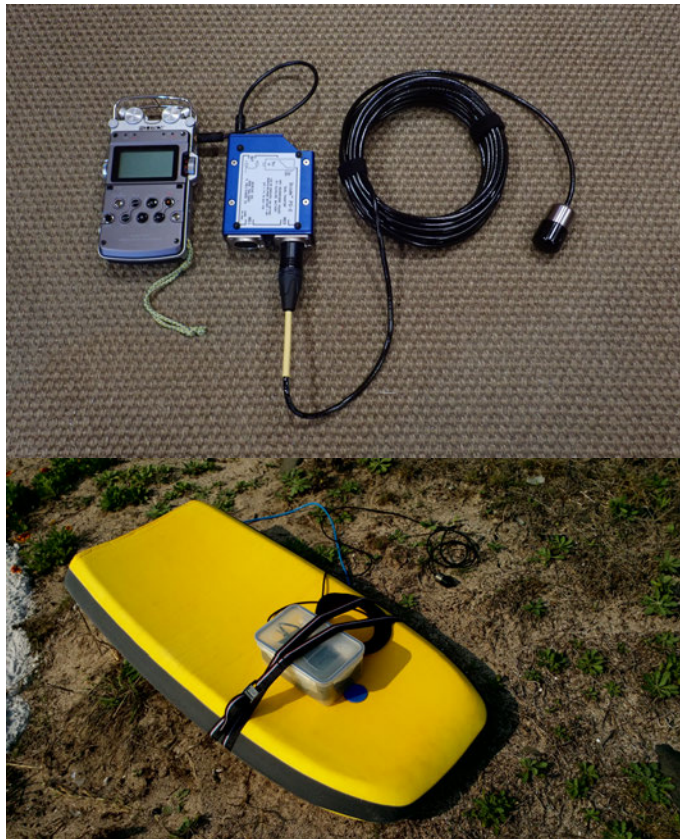
- Aquarian Audio hydrophone
- Denecke PS-2 phantom power adapter
- Sony PCM-D50 recorder
- USB battery

The recorder, battery and power adapter are all set into a waterproof plastic box. I drilled a hole in the box and sealed the hydrophone cables with silicone.

While swimming I am dragging a bodyboard floating with the plastic box, and I am holding the hydrophone by its cable. Of course the equipment need to be active and recording before entering the water. I can very slightly hear some of the loudest sounds emitted by emitted under the water. When I notice them, I can place the hydrophone close to the area where I suppose the sounds comes from. Each time I choose a recording location, I will take photos for documentation, also I strike gently the hydrophone. This allow me to compare afterwards the recording and the photos.

I developped this method in 2017 during my first experimentation, and I have been able to find very interesting recording locations and also record three species of damselfishes and identify them.

This year 2018, I continue using this method as it is the only way to visually observe the animals and record their sounds.



3. Autonomous underwater recording device 水下自動錄音機

I tried in the past some recording devices designed for biaoacoustic research. Unless getting the extremely expensive ones, the autonomous systems are poor in term of audio quality. Thanks to the grant I got in 2018, I could design my own and realize it with simple components.

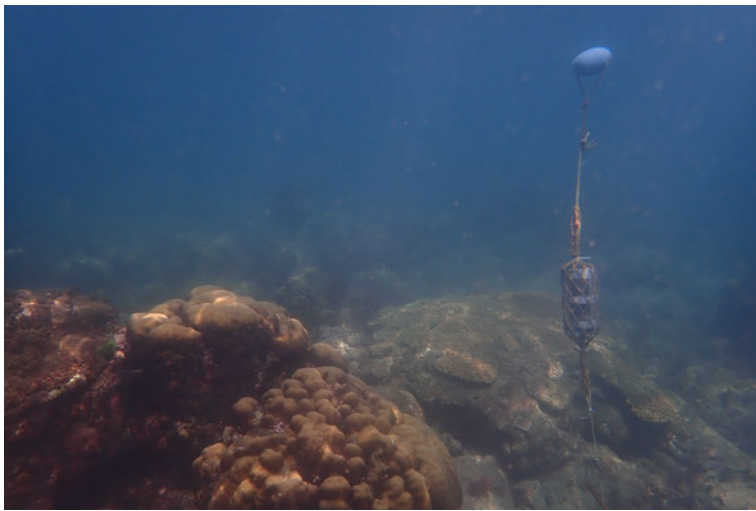
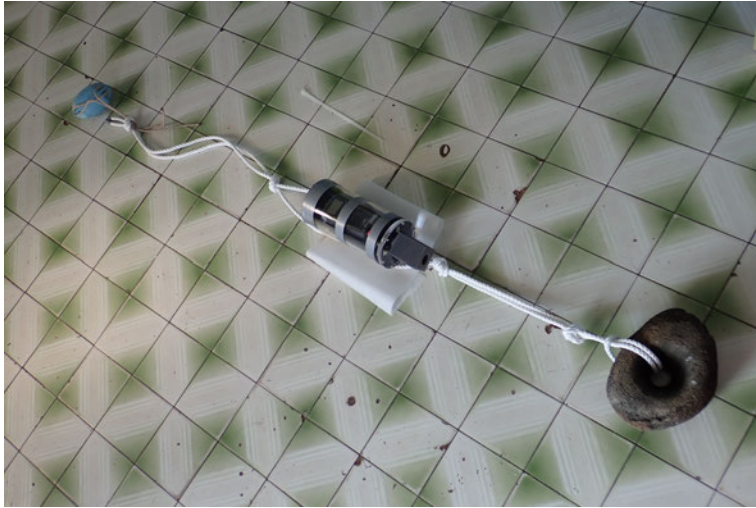
I am using a Zoom H5 recorder : it's a simple portable recorder which internal

microphone can be detached and who has decent quality microphone preamplifiers. It can be powered by a USB Li-On battery, allowing to it to record during 24 hours at 44.1kHz/24bit resolution.

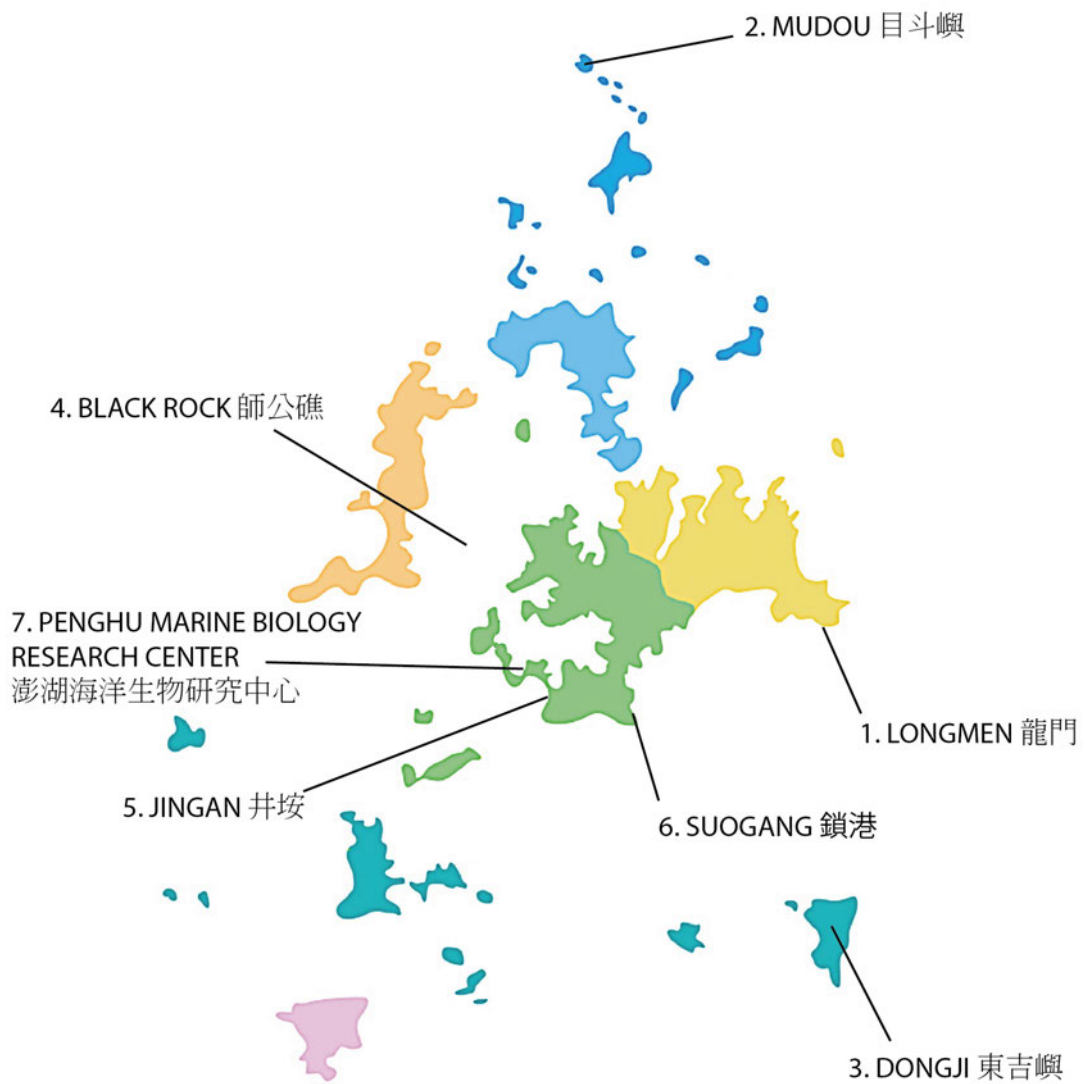
The hydrophone I choose is a convenient model from Aquarian Audio, H2c, that can be directly screwed on a waterproof enclosure. It's quality is much better than simple piezoceramic transducer, and can also detect ultrasounds (an option I didn't use this year since it would reduce the battery life).

For protecting all the system, I choose Blue Robotics waterproof enclosure : it is a modular system with different accessories. I had to build myself a little plastic system to hold the recorder and battery. The whole system can be deployed easily, is not too heavy and simply require an anchor or a weight (in my case a simple big stone with a hole) and a floater for keeping it vertical, the hydrophone pointing at the seafloor. After experimenting and discussing with local divers and researchers, we found the most elegant and efficient solution for protecting and attaching the device : a cylinder made of fishing net, holding very tightly and very resistant.





RECORDING SITES 錄音海域分佈點



~ Tidal pools area 潮池環境

1. Longmen 龍門海域(湖西鄉)

Tidal pools are of course very different than open sea and coral reefs: very shallow, only small animals are staying in these holes at low tide. But this is a very good opportunity for experimenting with recording techniques, and also document very unusual sounds such as crustaceans, molluscs and urchins moving and feeding. Also, the holes are sometimes connected between them to the open sea, and some gurgling sounds caused by the movement of water pushed by the waves can be heard in those tidal pools. The area I visit regularly is spread between the coasts of Longmen and Guoye.



(Longmen, large tidal pool) (龍門，大潮池)



(Longmen, tidal pool) (龍門，潮池)

~ **Three sites for yearly visits** 每年紀錄的地點(三個)

In 2017, I started an ongoing discussion and collaboration with biologists and divers from Penghu Marine Biology Research Center.

One of the researchers, LU Yi-Lin invited me to follow him during his field work. His research includes monitoring of the water temperature in the archipelago. He deployed some permanent sensors which run all the year in three spots, On the North-South axis. Regularly the sensors need to be cleaned and updated, that is the moment I can join the team, and do my sound recording in these same spots. It's a practical solution for transportation, but also it can correlate the sound recording with information about the local temperature.

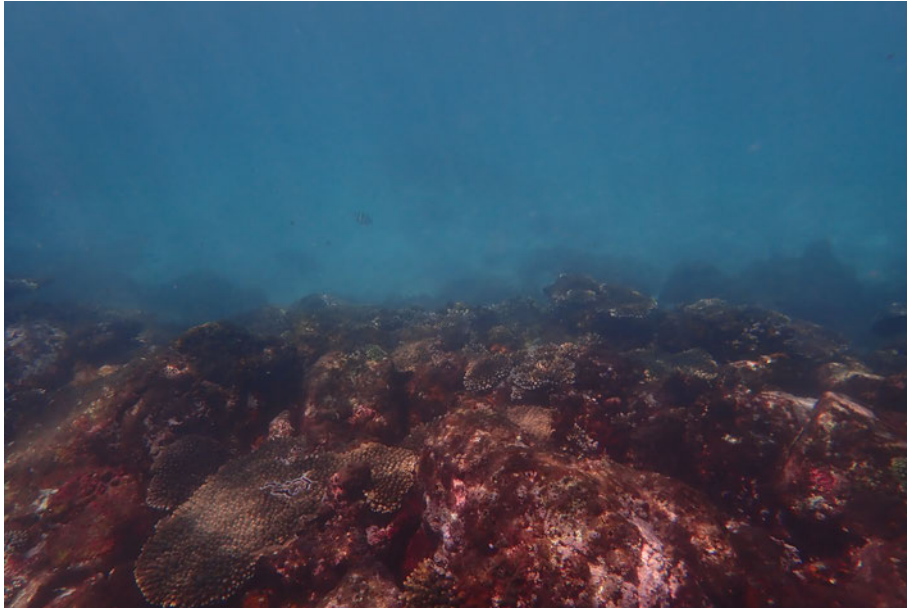
Every year, I am able to visit at least once these spots. Each visit being one to two hours, so I can deploy the autonomous recording device during that time, or use the second method (described above) by snorkeling, observing and recording.

2. Mudou Island 目斗嶼

Located in the most Northern part of the archipelago, I make my recording on the eastern side of the island, where currents are less strong, inside the remains of a stone weir. The coral coverage is quite weak : in 2008, the ecosystem was strongly affected by the cold current. The water is also much cooler in this area.



(Mudou island, from the water - recording site)



(Mudou island, remains of the stone weir, western side)

(目斗嶼，礁石上的遺骸)

3. Dongji Island 東吉嶼

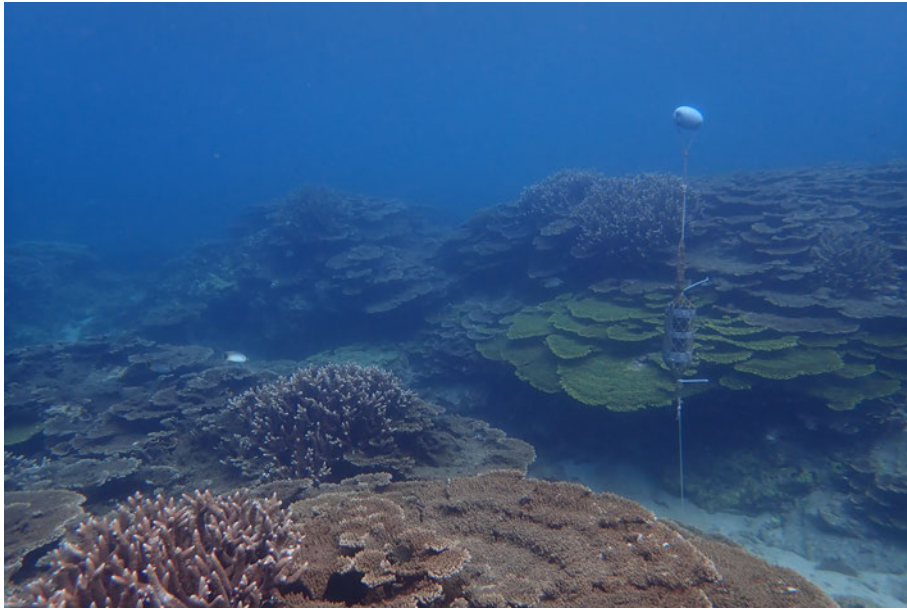
This island is part of the South Penghu Marine National Park, in the most Southern part of the archipelago. It is also the closest island of Penghu from Taiwan island (Tainan county).

The coral reefs of the national park was not reached by the cold current of 2008, therefore the coverage of coral community and the condition of the ecosystem is the best ones of Taiwan.

The temperature sensor deployed by the researchers are located at the entrance of the harbour on the South side of the island, but I also have chance to record in the North side where are the famous lavender color corals, very reknowned among divers.



(Dongji island, from the North) (東吉嶼，北側海域)



(Dongji island, West side) (東吉嶼，西側海域)

4. Black Rock Islet 師公礁 (澎湖內海，鄰近大倉嶼)

Sai Gong Ta, located in the inner Sea, near Makung, appeared in French maps as "Rocher noir", and is presenting a marine beacon on its top. It can be reached by kayak, a very eco-friendly way of navigating through the archipelago. There is also a temperature sensor, and present some coral reefs, but the water is very blur and the current can be strong according to the tidal movements. I rely on the help of a Kayak teacher, Wu Zhao Zhen, since we need to usually depart from one spot (Baisha island for example), reach the islet, do the recording, and then return to Makung harbour. The whole trip is about three hours and I usually record from the kayak itself.



(Black Rock islet, from kayak) (師公礁，從獨木舟上錄音)



(Black Rock islet, from kayak) (師公礁，從獨木舟上錄音)

Two sites for long-duration recordings 兩個較長時間的錄音點 (馬公市澎南地區)

During my stays in Penghu I either reside in Husi village or in Shili village, on the main island of Makung. I have chosen two sites which are very easy of access, quite safe for a lone swimmer, and not too often visited by fishermen and divers. Therefore I am able to deploy the long duration system : my autonomous underwater recording device. I also frequently visit these sites,

snorkeling/recording . I am now very familiar to these two sites, so it is easier to recognize species and observe the specific conditions of the reefs.

5. Jingan 井垵海域

This spot is located on the southern part of the long bay of Shili village. The seashore is presenting a quite good environment and wildlife, the local fishermen stay on the shores, but swimming along a bit further, very few people are reaching the coral reef, which is spread only a few meters from the pebble beach. The rest of the bay is covered with sand. The precise spot I choose is very easy to recognize, and from time to time, I always reach it, setup my equipment nearby : a coral community with a quite odd protruding shape. There are always damselfishes and other species swimming around.



(Jingan, with the little embarcation for transporting the recording devices)
(井垵，利用一片小型浮板作為在水上運載錄音器材的載具)



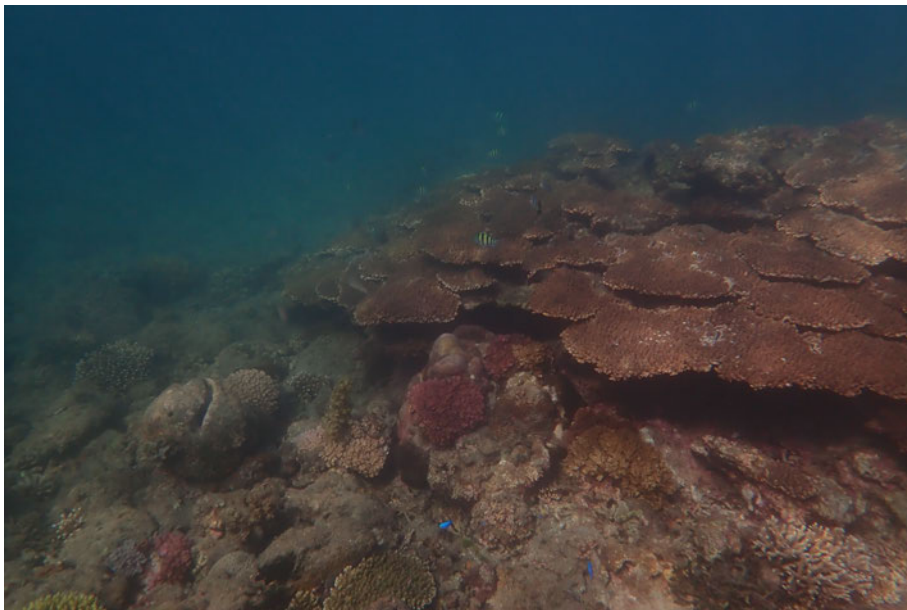
(Jingan, my all-time favorite sound recording spot)
(井垵，我最常進行水下錄音的地點)

6. Suogang 鎖港海域

Not very far from the previous recording site, the site I choose in Suogang are very close to a little bay where a lot of tourists are taken for snorkeling tours. The swimmers usually don't leave the bay, where I also reach the reef. But I setup my recorder outside, a bit more distant from the coast. The situation there is pretty good, the coverage of corals being probably the best of the island of Makung. It is pretty easy to get confused when I deploy the autonomous recorder and it happened a couple of times that I didn't immediately found it. Fortunately until now, no equipment has been lost. Like in Jingan, I always chose carefully my recording site by selecting a protuding coral community, but unfortunately I can't here find the exact same spot. The waves and currents are usually stronger than in Jingan.



(Suogang, unstable weather - recording site on the right side of the image)
(鎖港海域，海象不穩時攝-錄音地點在照片的右側區域)



(Suogang, near the recording sites)
(鎖港海域，鄰近錄音點)

7. Penghu Marine Biology Research Center

Most of the time I rely on my own observation and audio-visual documentation for identifying the sounds. Occasionally I can compare with other recordists or researchers documents (very rare). Another important option is to experiment recording in aquariums. Thanks to Yili Lu and the technicians, researchers and students, I could have access to a number of aquariums from the Penghu Marine Biology Research Center. Of course, in such breeding conditions, the animals don't have the same behaviour as in their native environment, but it can give hint for future identification.

The most interesting results was some of the sounds by urchins, lobsters and fishes would hardly be noticed in the ocean, since their sounds are very close to the snapping shrimps, but they certainly participate to the whole sonic marine environment.



COLLABORATORS 主要在地合作者

Yi-Lin LU - Penghu Marine Biology Research Center

Without the discussion with Yi-Lin, this project wouldn't exist... He is our advisor, helping for identification of animal species, and also for logistics. Thanks also to the other researchers and technicians to the Penghu Marine Biology Research Center, we could also have access to some aquariums to experiment with recording and also listen to some captive species being bred there.

呂逸林- 澎湖海洋生物研究中心研究員

如果幾年前沒有和呂逸林討論過，這個計畫應該不會存在...。他作為計畫的主要顧問，協助辨認某些物種，也提供關於錄音器材、海況條件、地點選擇等專業意見，主動協調研究中心單位，因此中心其他的幾位研究員和一部分工作人員也提供了協助。讓我得以進入研究中心的飼養池，進行一些錄音實驗，並觀察、聆聽人工條件下生長的一些物種所發出的聲響。



Zhao-Zhen WU - Piano Sea

Teacher of music and kayaking. Thanks to him we can organize our expeditions to Black Rock islet and safely record there.

吳兆振 - 「綠舟輕艇」獨木舟體驗_負責人

獨木舟教練與音樂教師。因為有他豐富的獨木舟海洋航行經驗，我們才能安全並順利地進行往返於馬公島與位於內海的師公礁去錄音。



Ariel WU - Penghu Ocean Citizen Foundation
吳佳蓉-澎湖海洋公民基金會 工作人員



Yi-Jun CHEN - Penghu Ocean Citizen Foundation
陳宜君-澎湖海洋公民基金會 工作人員



Ariel Wu and Yi-Jun Chen are both working at Penghu Ocean Citizens Foundation, NGO which helped organizing the experiments for sound recording and some educational activities. Also for this year's project, sometimes Ariel and Yi-Jun would accompany and help for setting up the autonomous recording device.

吳佳蓉與陳宜君兩位都是澎湖海洋公民基金會的主要工作人員，她們一方面協助了自動錄音機的一部分錄音行程，另一方面也將與澎葉生合作，將部分的聲音內容應用於一些環境推廣教育活動中。

THE ARCHIVE - 2018
2018 年的聲音資料建檔

Summary 目錄：

從 108 小時的錄音資料中選出的 96 段聲音紀錄。

96 sound recordings selected for the archive for a total duration of 108 hours.

(CHECK THE .XLS DOCUMENT 參見附檔及.XLS 數位檔)

EXHIBITION 作品發表(展覽)

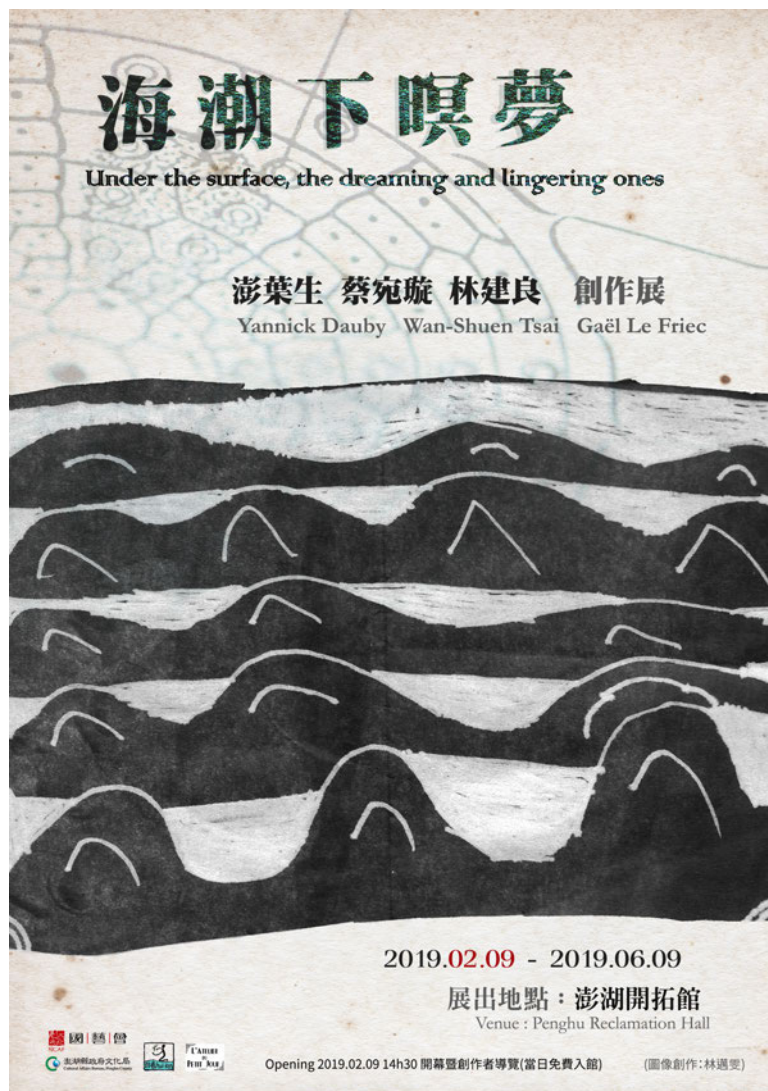
展覽名稱《海潮下暝夢_三人創作展》

展期 2019.02.09-2019.06.09

本計劃發展出的參展作品：**How Corals Think** 珊瑚如何思考

媒材：雙聲道喇叭、數位輸出(裱貼於木板)、聲音





展覽視覺 EDM

IN THE FUTURE 後續

The sound recording practice should never been considered as a passive documentation activity, but rather as an active reasearch, a process of interrogation and challenge for our listening abilities.

Through this medium, and during the project in Penghu during year 2018, I have developed some skills and methods. Very quickly, I have been requested to make sound works related to marine underwater recording in Pingtung (Haikou harbour, Luo Shan Feng Art Festival 2019) and Green Island (exhibition in June-August 2019) for two on-going exhibitions.

I am currently in discussion with marine researchers in Keelung (National Museum of Marine Science and Technology) for a short-term recording project. All the sounds collected are systematically used an interface between public, audience from exhibition or in education, and the ocean.

This project will also be presented in 2019 in the "Wildlife Sound", journal of the Wildlife Sound Record Society (UK).

Sound and listening are very unique ways to related to fauna and nature in general, and this project seems to attract attention from some very diverse people. Several members of audience of



(removing the Autonomous Underwater Recording Device)