



The feeding preference for the color of plastic debris in the hawksbill turtle, *Eretmochelys imbricate*

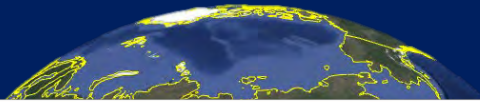
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Marine Zoology Lab

MARINE ZOOLOGY
LABORATORY

Department of Ocean Science, Inha-University, Republic of Korea



- In 2017, 83 individuals
- In 2018, 13 individuals
- In 2019, 14 individuals
- were released here.



[아시아경제 주상돈 기자] #2018년 8월29일 해양수산부는 멸종 위기에 처해 있는 붉은바다거북을 제주 앞 바다에서 방류했다. 개체 수 회복을 위한 조치였다. 하지만 위치추적기와 개체인식표를 부착한 붉은바다 거북은 부산 연안에 이르러 움직임이 멈췄고 방류 11일 만에 폐사한 상태로 발견됐다. 국립생태원 연구원에서 부검한 결과 몸길이 42cm인 3년생 붉은바다거북 한 마리에게서 10.24g에 달하는 쓰레기가 발견됐다. 뱃속에 쌓인 비닐과 플라스틱 조각 등의 해양 플라스틱 탄에 폐사한 것이다. 거북의 뱃속에서 발견된 쓰레기 종류는 과자·라면 봉지, 비닐 조각, 낚시줄, 어망, 노끈 등으로 일상생활에서 발생하는 것들이었다. 사람들이 무심코 해변에 버린 쓰레기가 바다로 흘러 들어갔고, 거북은 먹이인 줄 알고 이 쓰레기들을 삼킨 것이다.

11 days after the turtle was released, it was found dead because of eating plastics.

- Daily Joongang -



Background research



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Customary

60.5 % Green sea turtle (n=8)
(Bugoni et al., 2001)

34% Leatherback sea turtle (n = 5)
(Mrosovsky et al., 2009)

100 % Olive ridley sea turtle (n=37)

90% Green sea turtle (n = 10)

80% Loggerhead sea turtle (n = 5)
(Clukeya et al., 2017)

57.9 % Total sea turtle (n=37)
(Rizzi et al., 2019)

⋮
ate plastic waste.



- From University of
Exeter-



A sea turtle is swimming in clear blue water, positioned next to a large, crumpled piece of clear plastic. The turtle's head is turned towards the plastic, and its front flipper is visible. The background shows a sandy ocean floor with some sparse vegetation.

QUESTION

- Do turtles have a feeding preference for specific color of plastics?

Lutz (1990)

1. Feeding pieces of latex or plastic sheet of 4 different colors (Blue, Pink, Yellow, Transparent) to green sea turtles

Each turtle has their own preference.

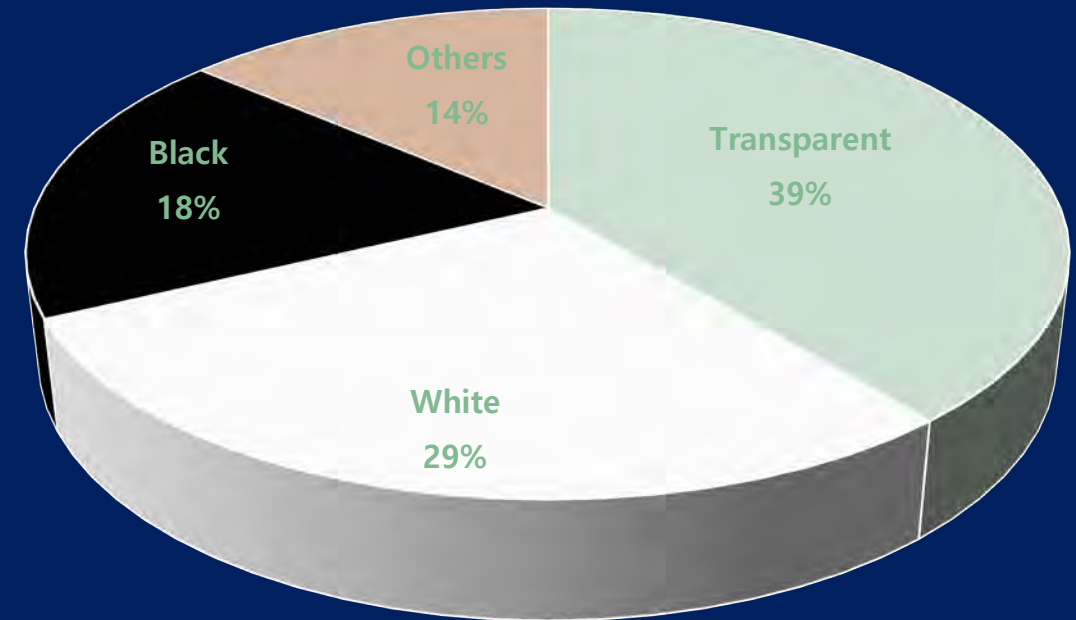
→ **Non of the turtles accepted the transparent ones!**

2. After 3 days fasting

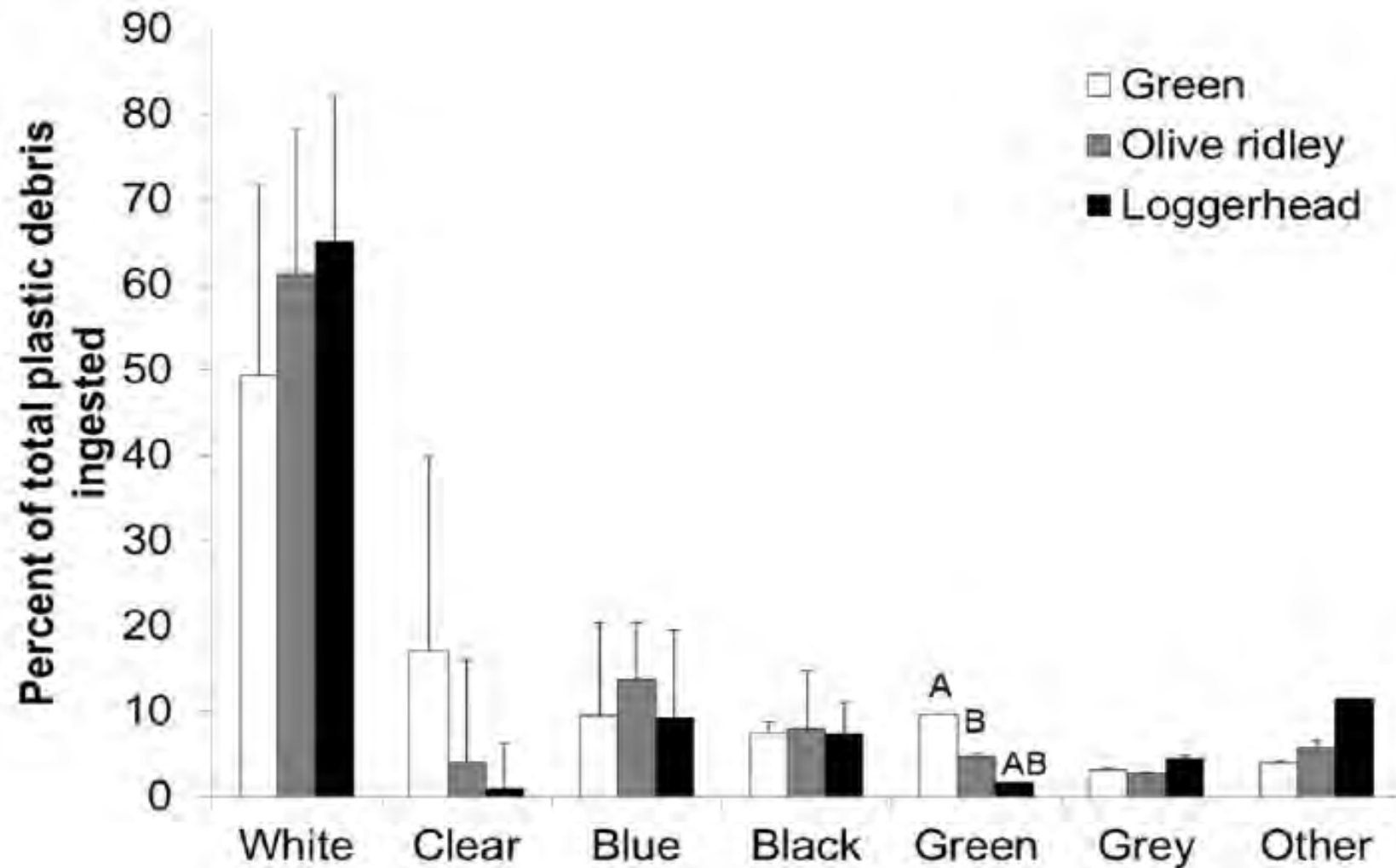
3 of 5 accepted **yellow latex** every time but all turtles except one ignored **transparent plastics.**

Bugoni et al. (2001)

Color of Plastic Debris in Esophagus/stomach of dead sea turtles



K.E. Clukey et al.



Clukey et al. (2017)

HYPOTHESIS

- **Sea turtles would misidentify plastic debris floating in water as food and would react differently to different colors.**
- Prediction : sea turtles prefer white and transparent plastic debris based on studies which have shown that many white and transparent color debris are found in stomach of dead sea turtles.

|Research site



◎ Lotte World Aquarium

**Lotte World Tower B2F, Seoul,
Korea**

◎ **Captive animals**

- Hawksbill Sea Turtles ($N = 8$)
- Sharksucker (*Echeneis naucrates*)
- Nurse shark (*Orectolobus japonicus*)
- Chicken grunt (*Parapristipoma triline*)

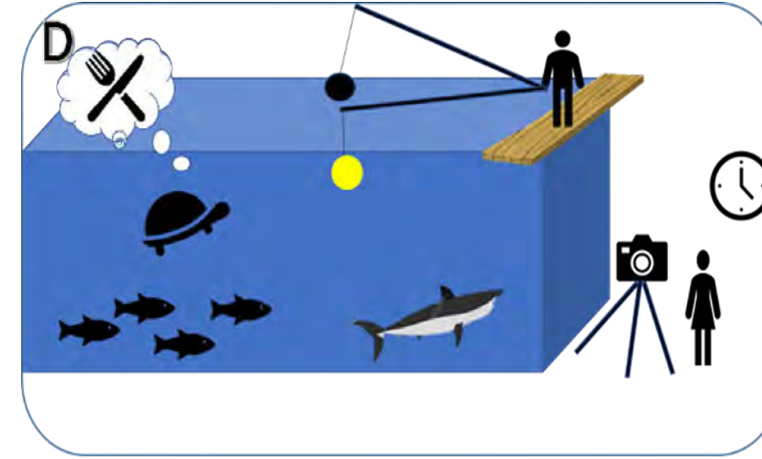
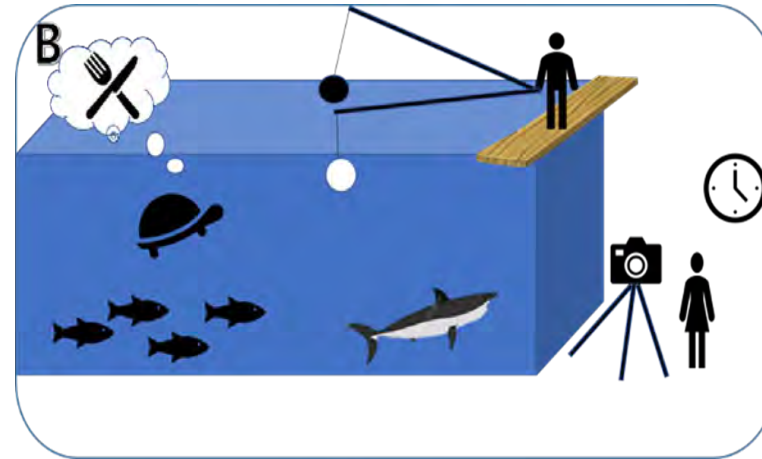
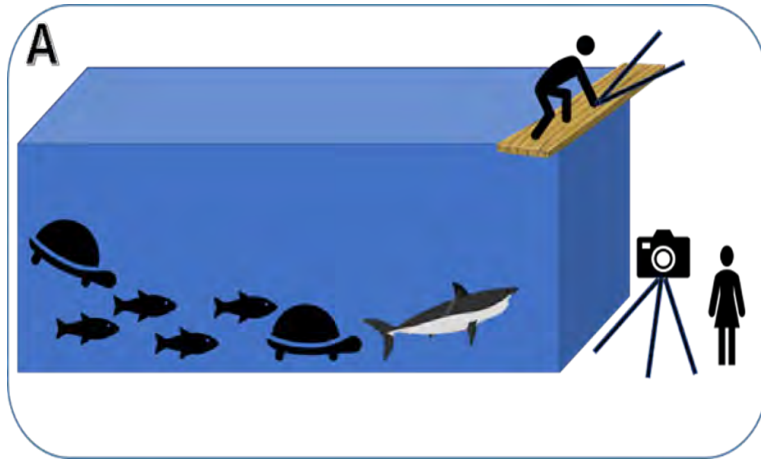
◎ **Experimental hour**

Every Tuesday AM 8:30~ 9:30

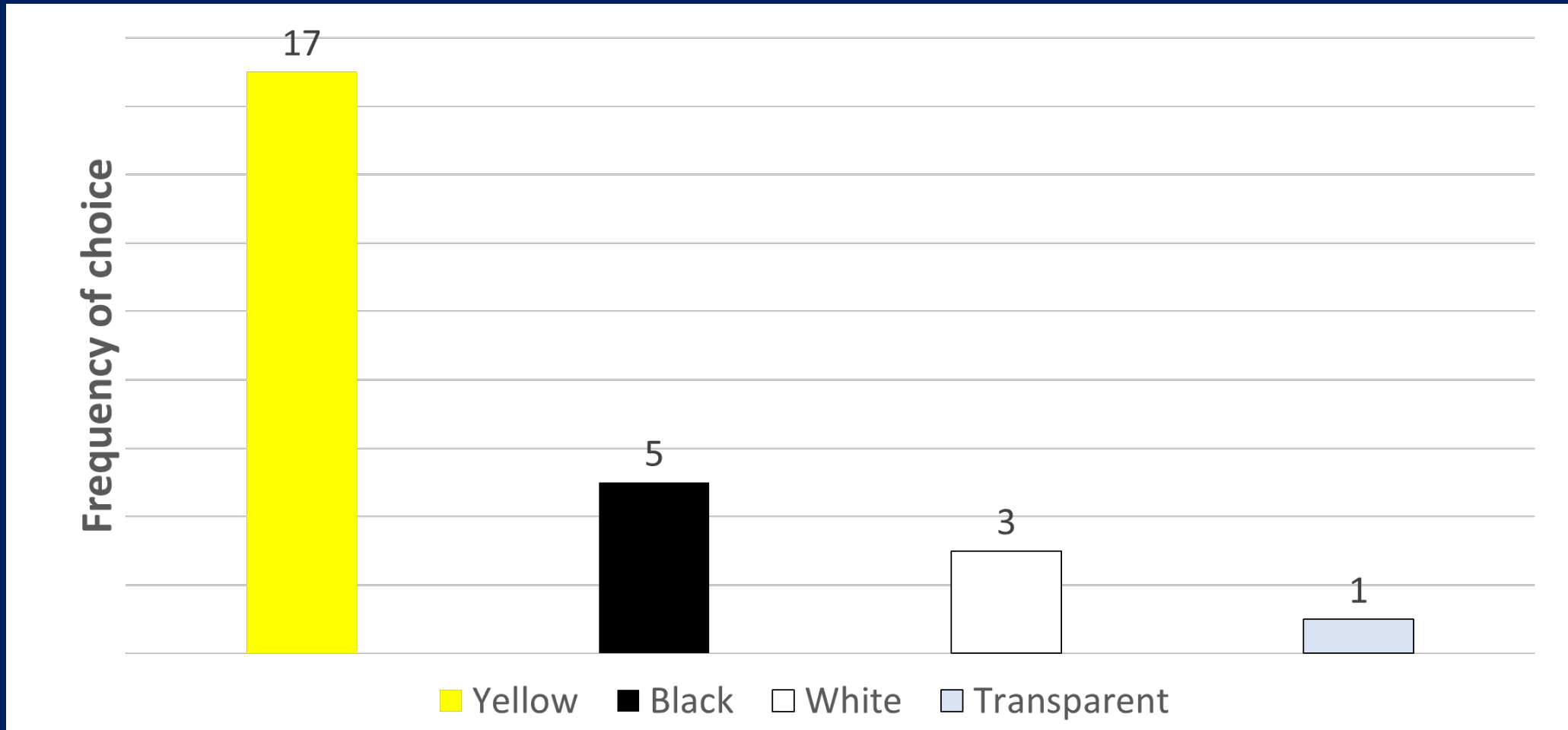
DIFFERENT COLOR TREATMET



EXPERIMENTAL PROCEDURES

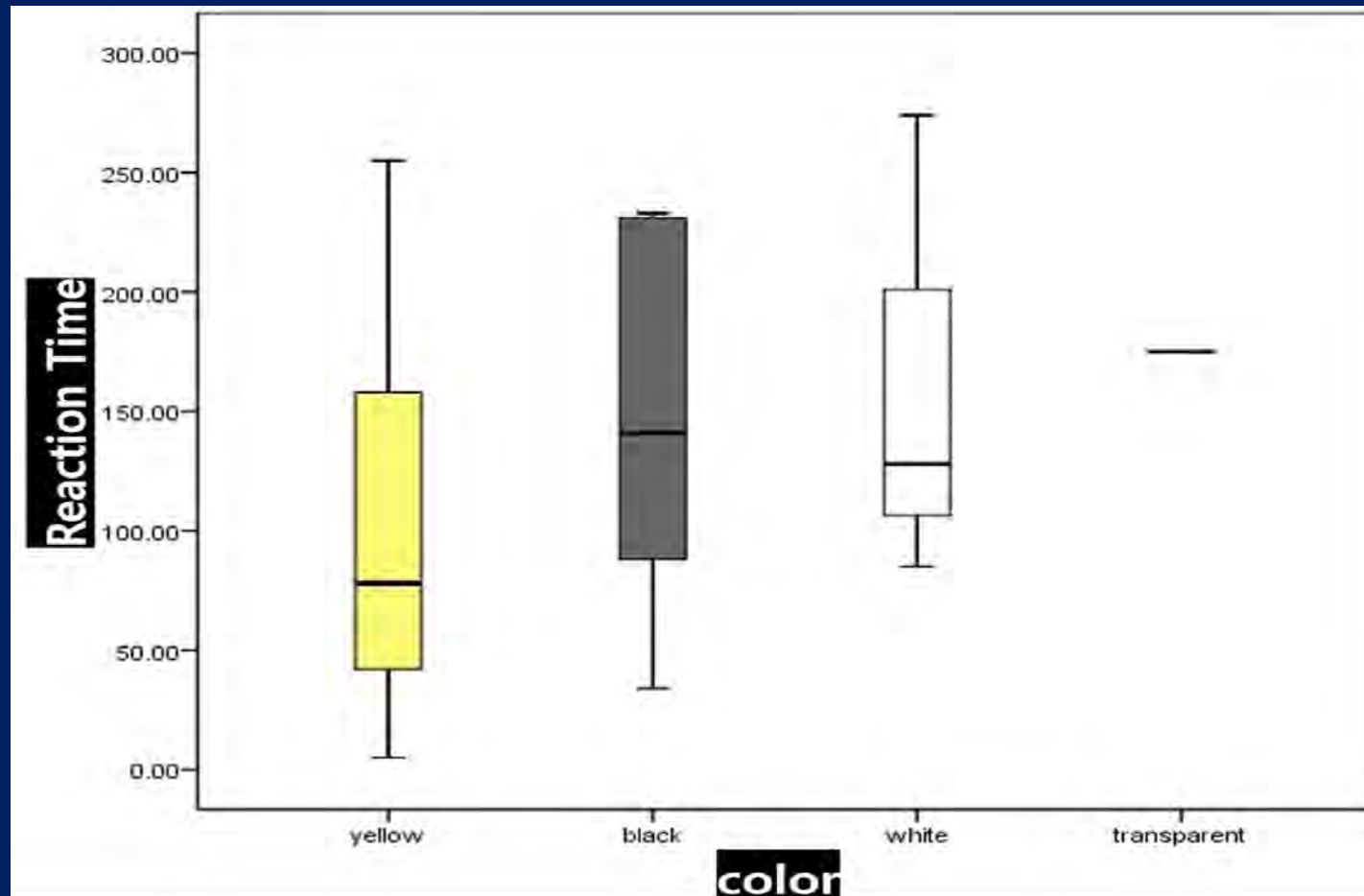


THE HAWKSBILL SEA TURTLES PREFERRED YELLOW PLASTIC DEBRIS TO ANY OTHER DEBRIS.

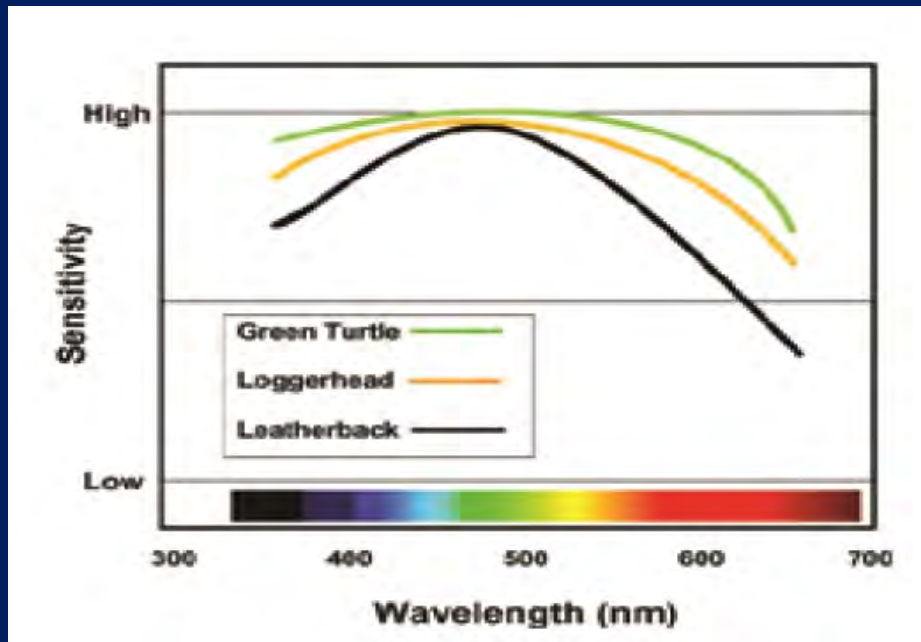


Repeated measures two-way ANOVA : **Color**: $p = 0.007$ No other effect of day, individual, or interaction

THE AVERAGE REACTION TIME WAS ALSO THE SHORTEST FOR YELLOW PLASTICS, FOLLOWED BY BLACK AND WHITE ONES



WHY PREFERENCE FOR **YELLOW PLASTICS**?



- Sea turtles were most sensitive to the wavelength from blue to yellow colors

Salmon et al. (2018)

WHY MOSTLY WHITE OR TRANSPARENT PLASTICS IN STOMACH OF SEA TURTLES?

What are plastics used for?

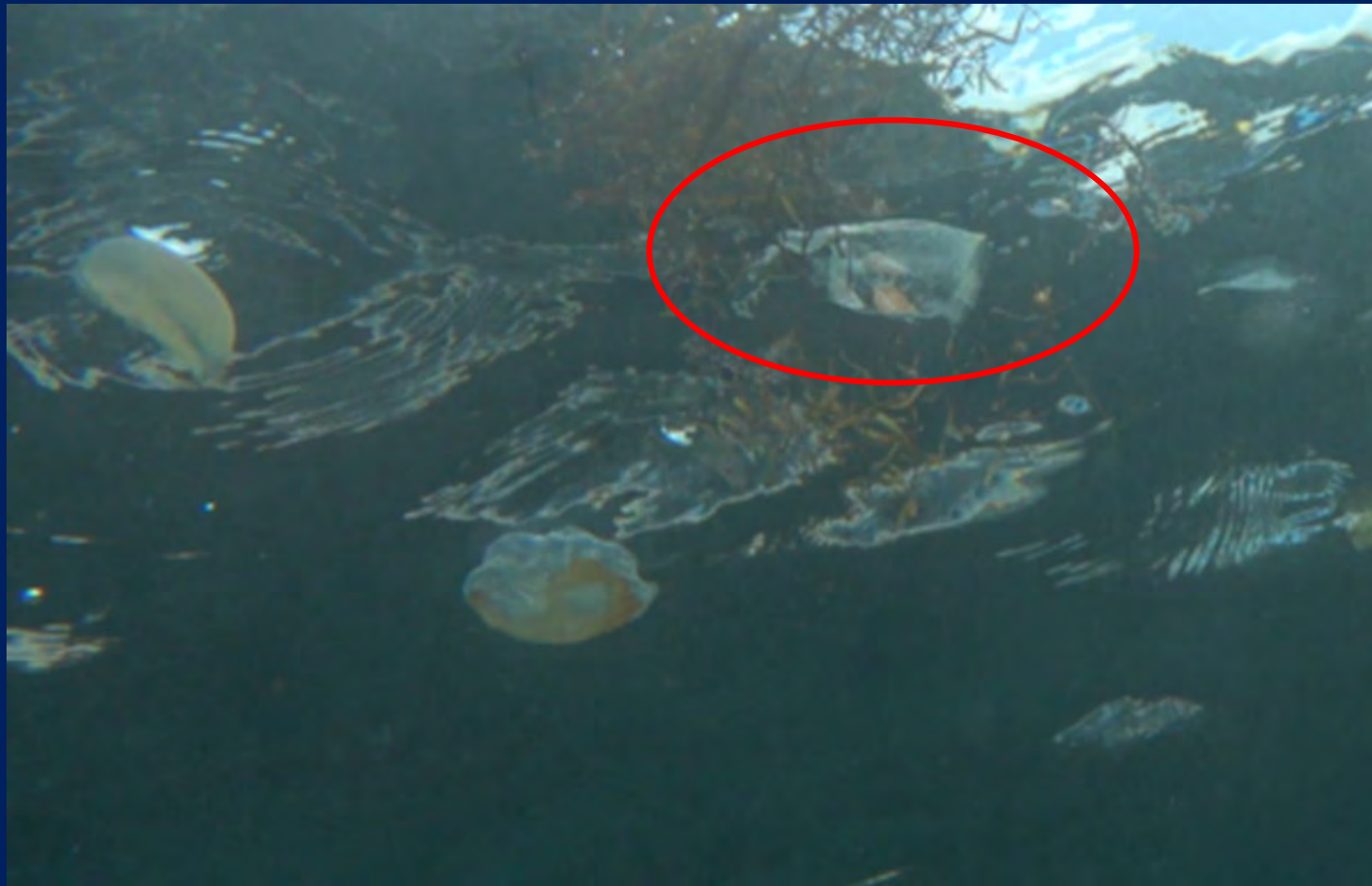
More than one-third of the plastic polymers produced in 2015 were used for packaging. That category also generated the most waste.



Chart: The Conversation, CC-BY-ND • Source: [Science Advances \(2017\)](#) • [Get the data](#)

DO NOT USE YELLOW PLASTICS FOR SEA TURTLES!







However, no study provided the direct evidence that sea turtles recognize plastic bags as jellyfish!



Plastic bags look yummy if you're a sea turtle

Be Plastic Wise: use reusable bags

Using the green plastic reusable bags for the amount of plastic bags needed for school and shopping is better.

Plastics snag marine animals

Ghost nets — the term for any lost, abandoned and discarded fishing gear in the ocean — have entangled six out of seven species of sea turtles worldwide.

Plastic litter affects more than 660 marine species. Some are snagged by fishing lines and nets; many more eat drifting plastic pieces, mistaking them for food.

In abandoned fishing net entangled these sea turtles off the coast of Bahia, Brazil a few days after a storm.

Sea turtles, especially young ones, can mistake plastic bags for jellyfish — a favourite food.

Researchers have found plastics in the stomach of all seven species of sea turtles, and the most common debris they find is disposable bags.

Can you identify the plastic bag in the photo to the left?

Is this green sea turtle (Chelonia mydas) eating a plastic bag or a jellyfish?

It's eating a red substance and looking happy!

Eco Right

CAN'T SEA TURTLES DISCRIMINATE JELLYFISH AND PLASTIC BAGS?



Hawksbill turtle

Visual cue



Olfactory cue

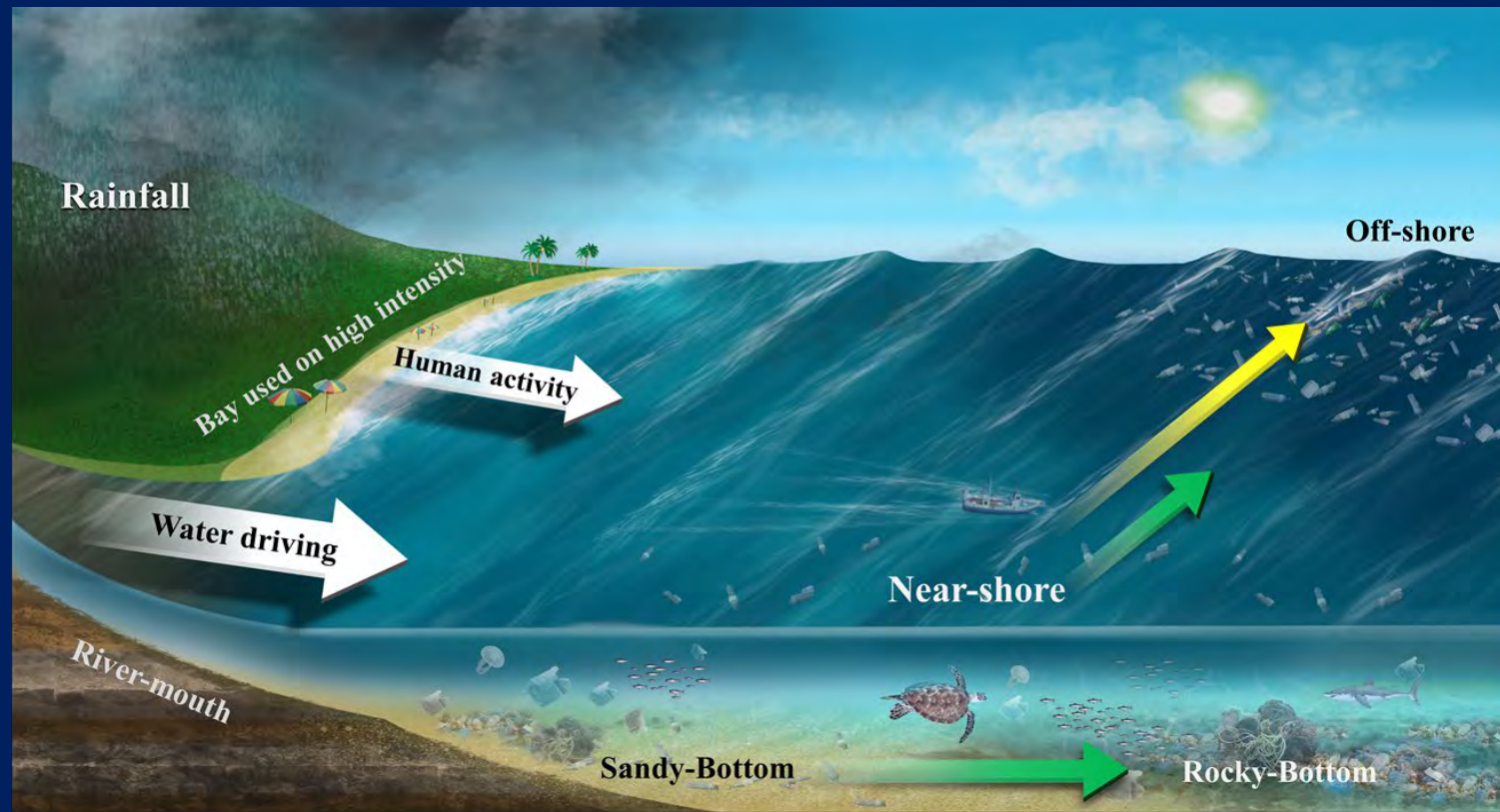


PICES SPECIAL RESEARCH PROJECT “SEA TURTLE ECOLOGY IN RELATION TO ENVIRONMENTAL STRESSORS IN THE NORTH PACIFIC REGIONS”



TRASH MONITORING

- Objective: Monitoring trash as possible risk for sea turtles in the subtidal areas of beach
- Place: Jungmun Saekdal beach, Jeju Island, Korea
- Period: Aug 19- Sep 8, 2019



the Saekdal-Beach in Jeju-Island

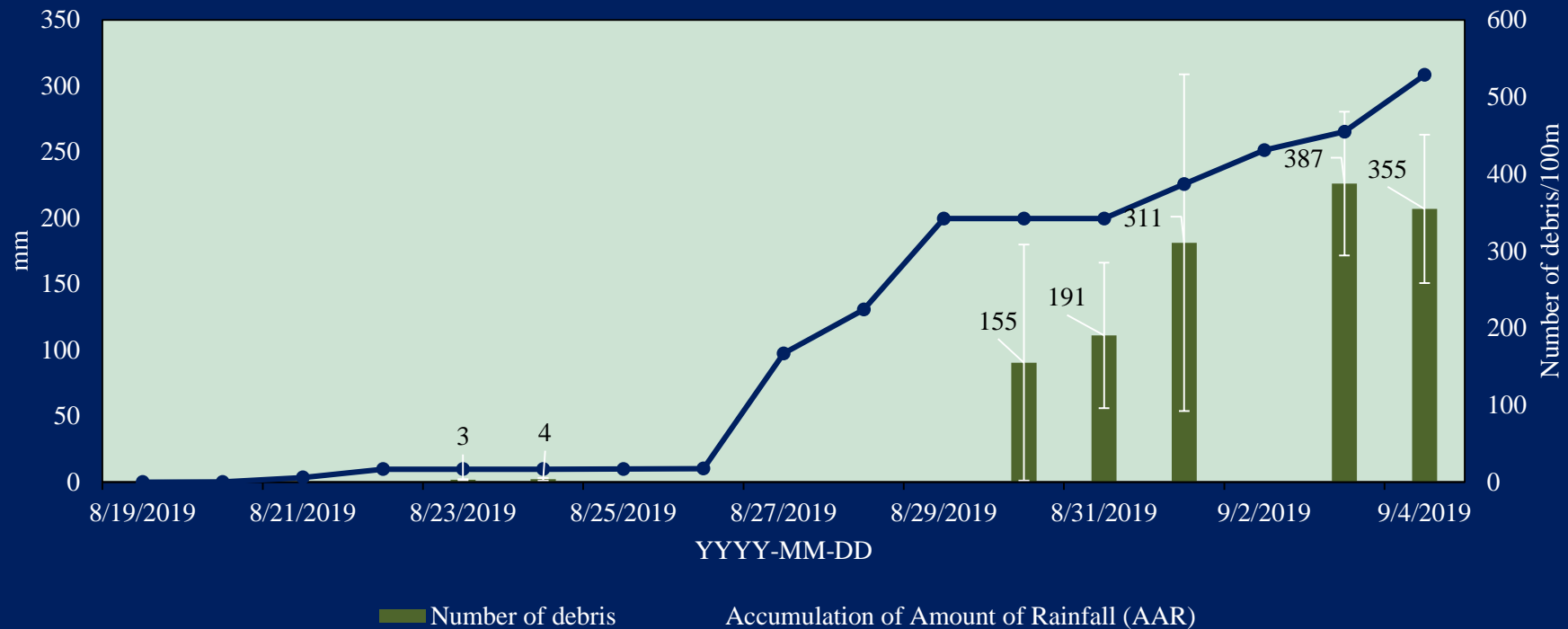
Every year, more than 200,000 of people visit here



- ✓ Total Area : 48,541 m^2
- ✓ Average 8.603 ± 7.625 fragments / m^2 (maximum 39 fragments/ m^2) of marine debris ($\geq 25mm$) were discovered.



After the rainfall, amount of debris dramatically increased.



Materials & Methods

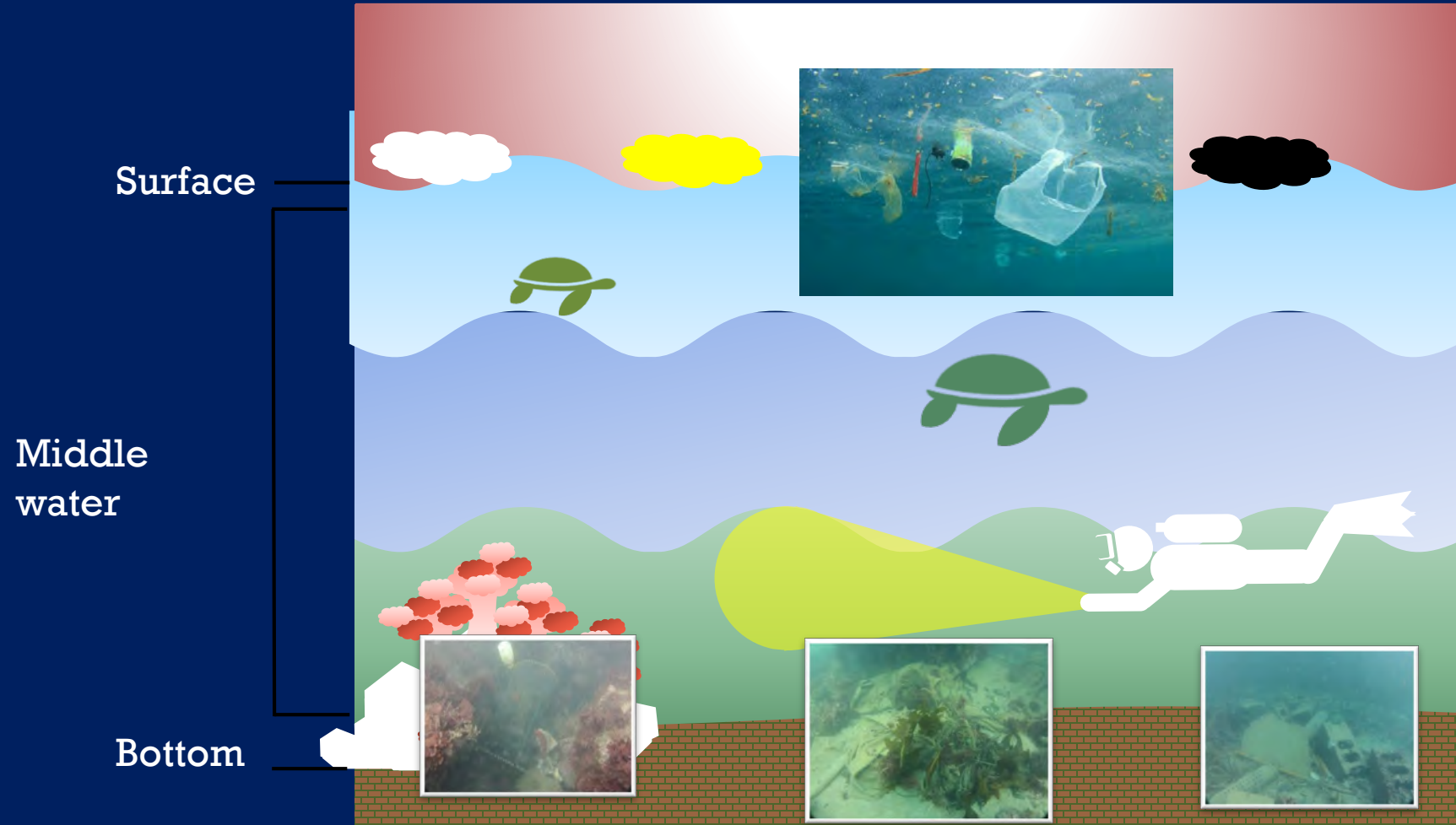
Dive research



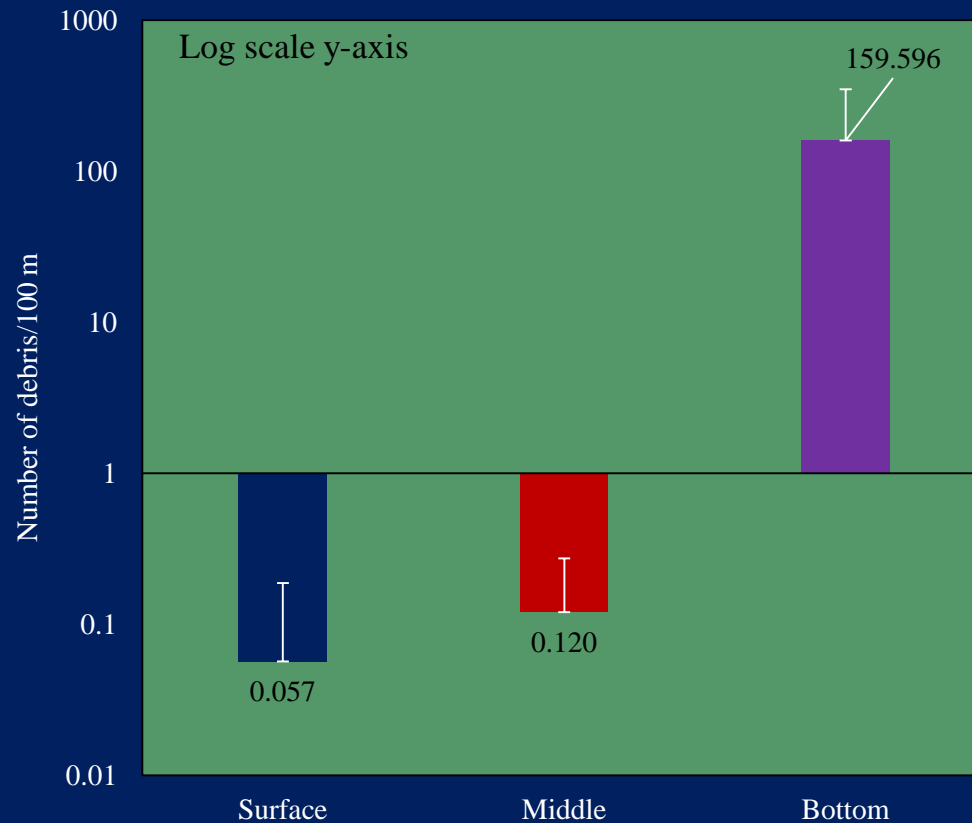
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- ✓ Underwater Volunteers NSW (UVNSW) protocol



BOTTOM HAS EXTREMELY MORE PLASTIC DEBRIS THAN SURFACE AND MIDDLE PART OF THE WATER COLUMN.



Kruskal Wallice test, $\chi^2 = 37.593$, $p < 0.0001^*$



브이 라면 (株) 農心 개발



「(株) 農心(대표 辛春浩)은 라면의 느끼한 맛을 제거시킨 브이 라면을 새로 만들어 최근 시판에 들어갔다. 브이 라면은 『스프에 야채를 듬뿍 넣었으며, 식물성 팔유를 사용, 느끼한 맛을 완전히 제거시켰다』

고 메이커측은 설명! 또한 면발이 가늘고 부드러우며, 소량의 카레가 가미돼 있어 향긋한 뒷맛을 느낄 수 있다고... 農心은 브이 라면 생산을 위해 日本에서 최신 식기재를 도입, 安養공장에 설치했다. 브이 라면 소비자가 적은 1백 20개당 95원.



SEATURTLE BUS. MTG. WITH GEORGE SHILLINGER AND NOBUAKI SUZUKI (OCT 19, 2019)



THANK YOU!
HOPE TO SEE YOU AT PICES 2020 IN QINGDAO!

