OCCURRENCE OF MICROPLASTIC FROM CILACAP COASTAL AND SEGARA ANAKAN LAGOON

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Aix*Marseille université

Year of the Maritime Continent

BMKG

YEAR OF THE MARITIME CONTINENT

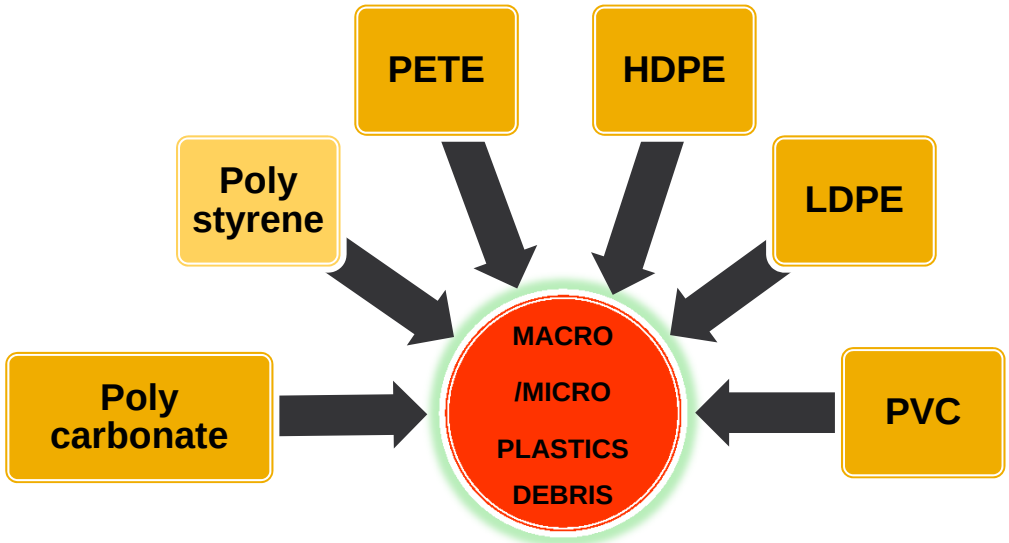
Implementation Plan Workshop

24-26 Nov 2015

OBJECTIVES

To identify the occurrence and to determine the amount of microplastic from Cilacap coastal and Segara Anakan Lagoon

- 1 nm – 5 mm
  - 300 µm-5 mm



BACKGROUND

Source : Republika

- ✓ 5.4 million tons of plastic (0.5-1.3 million tons)
- ✓ 60 % of waste is not collected
- ✓ **Out of Sight Out of Mind**
- ✓ River to the sea

Why Segara Anakan Lagoon Cilacap is so important?

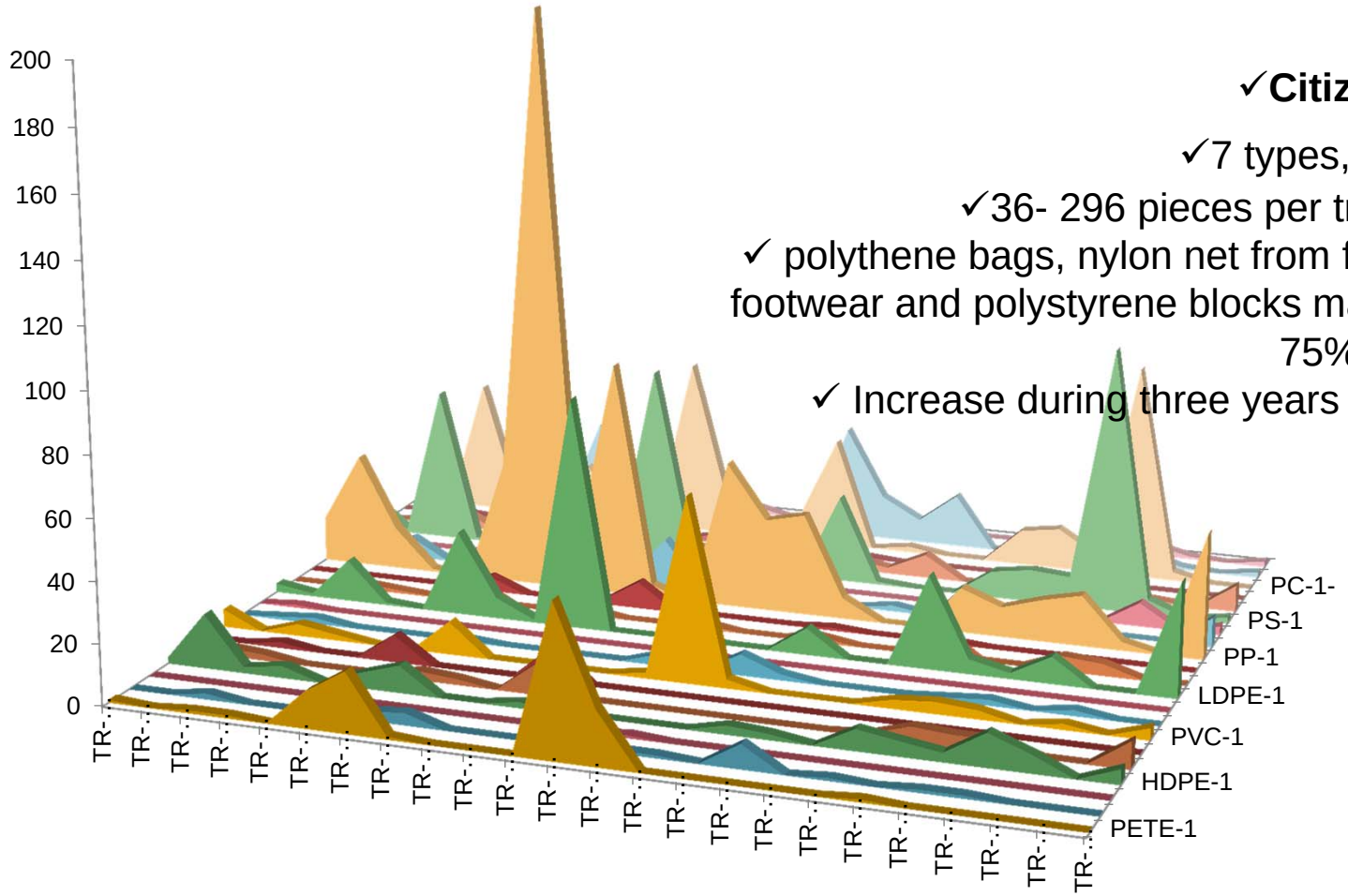
- **Segara Anakan is one of the last remaining mangrove/lagoon ecosystems on the Indonesian island of Java;**
- **The Mangroves of Segara Anakan are home for a number of marine species;**
- **Segara Anakan includes three major ecosystems; marine, estuarine and upland, that are intimately linked with each other by biophysical processes;**
- **The estuary has 24,000 ha of mangrove forest.**

RECENT STUDIES

- Micro Pollutants Organic Compounds
  - Hydrocarbons (Mar. Pollut. Bull. 74 (2013) : 141-148
  - PCBs and Organochlorine Pesticides (Mar. Pollut. Bull., under review)
- Emerging Organic Pollutants (IERI Procedia 5 (2013) : 216-222
  - ✓ Recently detected in the environment
  - ✓ Not included in environmental routine monitoring programmes
  - ✓ That can generate adverse effect on the ecosystem
- Heavy metals (Environ. Monit. Asses. (2015) 187 : 4089
- Bioremediation (Biored. J. 17 (2013) : 11-20
- **Marine debris**

PREVIOUS RESULTS

Macro plastic stranded on the Cilacap's beach



✓**Citizen science**

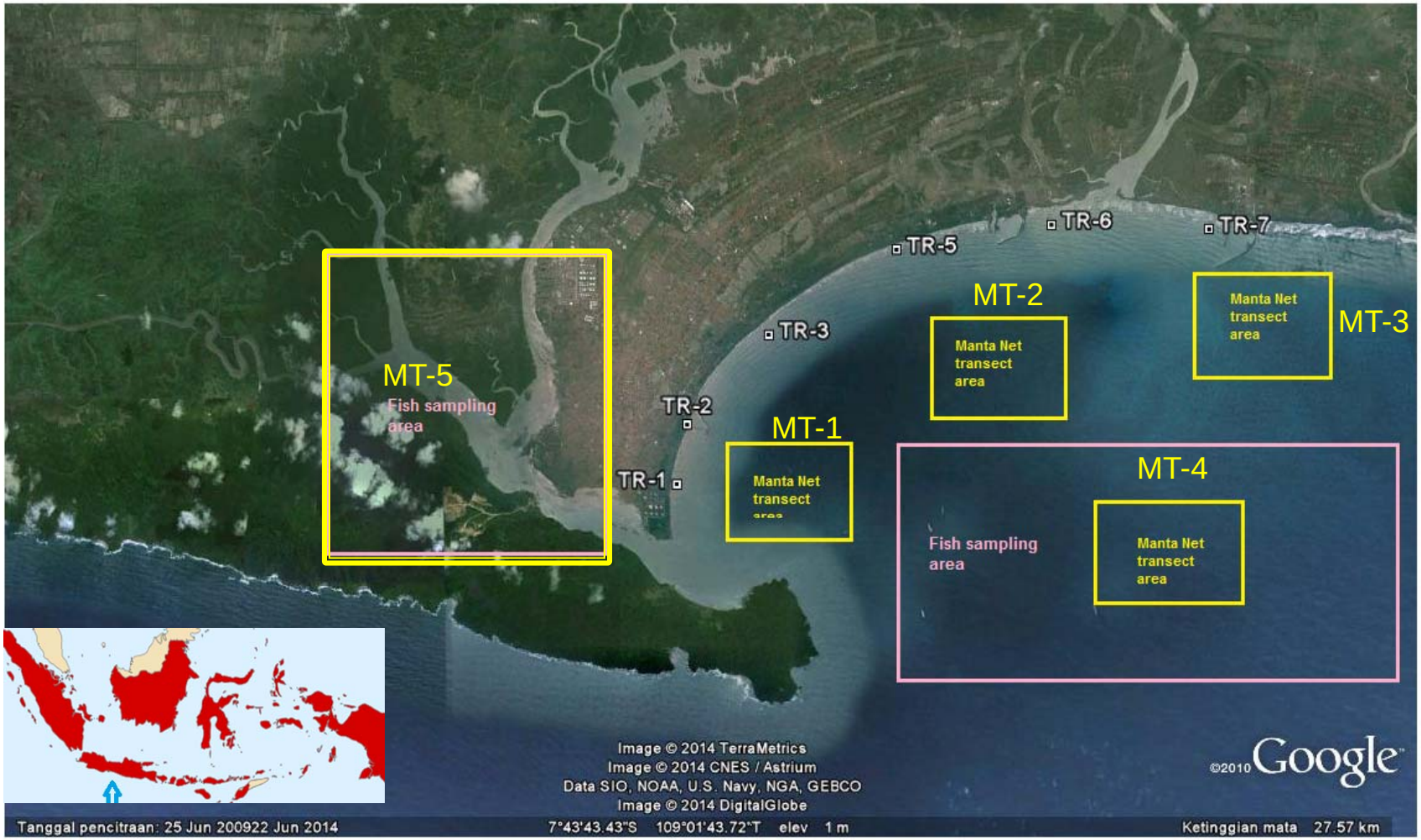
✓7 types, 2313 items

✓36- 296 pieces per transect (96)

✓ polythene bags, nylon net from fishing gear, footwear and polystyrene blocks made up over 75% of the litter

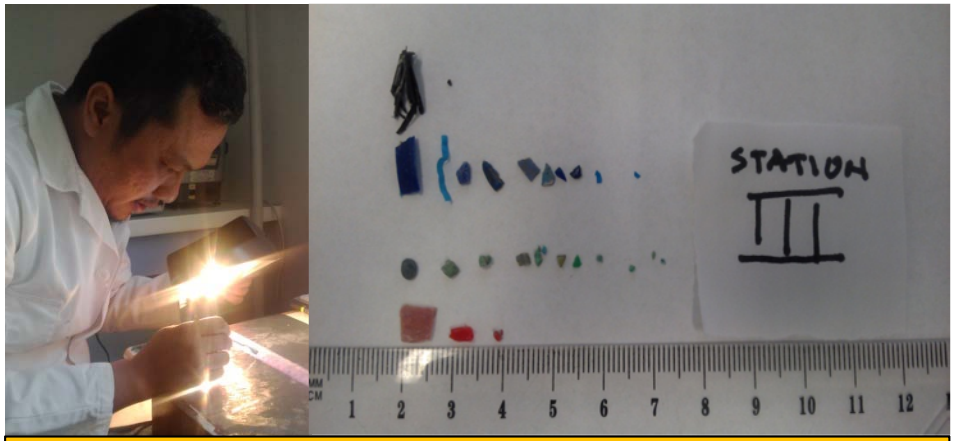
✓ Increase during three years observation

Site Study


TR-5
TR-6
TR-7
TR-3
TR-2
TR-1
MT-5
Fish sampling area
MT-2
Manta Net transect area
MT-3
Manta Net transect area
MT-1
Manta Net transect area
MT-4
Fish sampling area
Manta Net transect area
Image © 2014 TerraMetrics
Image © 2014 CNES / Astrium
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2014 DigitalGlobe
©2010 Google
Tanggal pencitraan: 25 Jun 200922 Jun 2014
7°43'43.43"S 109°01'43.72"T elev 1 m
Ketinggian mata 27.57 km

METHODOLOGY

MantaNet Sampling
(CMBS)



Classified + Counted

✓MantaNet dimension : 75 cm x 20 cm
✓ Mesh size : < 5,000 µm.
✓ Trajectory path : ca. 2000 m
✓ Estimated volume : ca. 300 m^3.

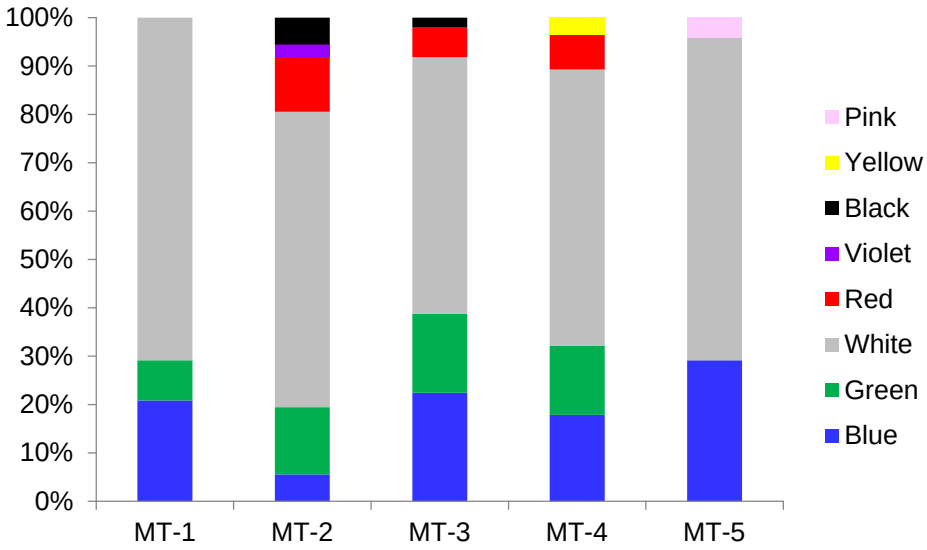
✓ **Color grouping** : Visual perception
✓ **Weigh**t : DISCOVERY DV215CD (± 0, 001 mg),
✓ **L , W, S** : Binocular microscope equipped by DCM 310 (4SB 2.0), 3M pixels, CMOS Chip
✓ **IR** (Thermo Electron Corporation) equipped by (ATR)

Polymer identification
FTIR

RESULTS

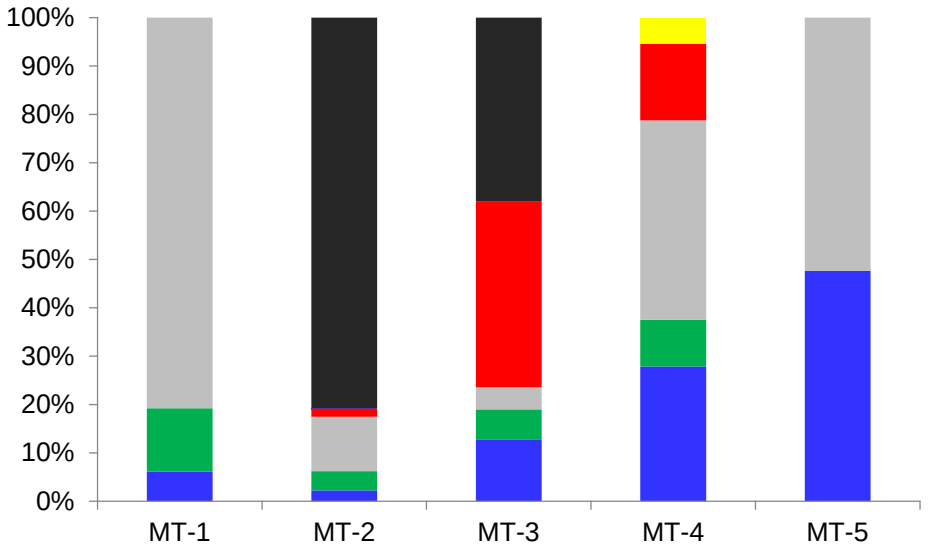
Sampling area	Plastic debris number	Surface (cm^2)	Weight (mg)
MT-1	24	484.85	104.68
MT-2	35	1657.5	437.97
MT-3	49	1300513.7	153.03
MT-4	28	2416.9	226.8
MT-5	24	4120	757.11

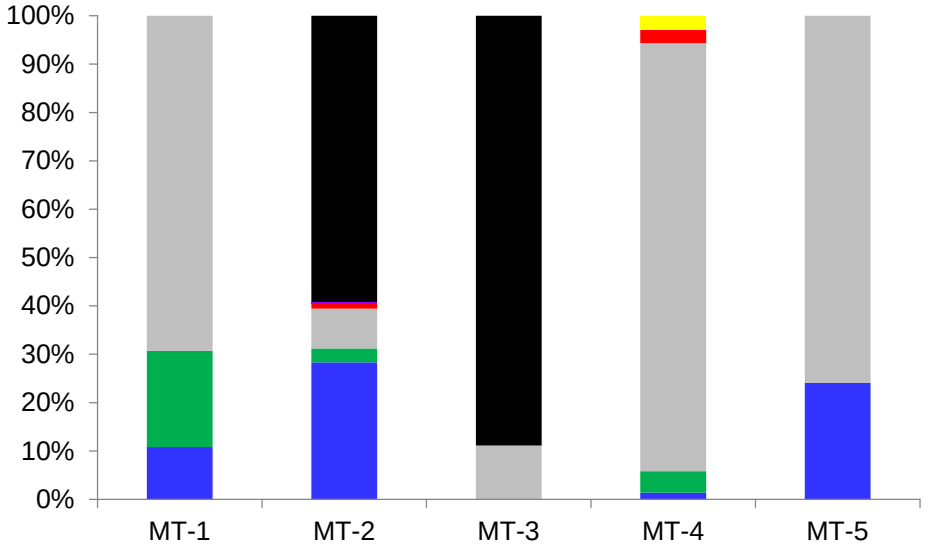
Ca.	30	250,000	300



Color occurrence

Weigth

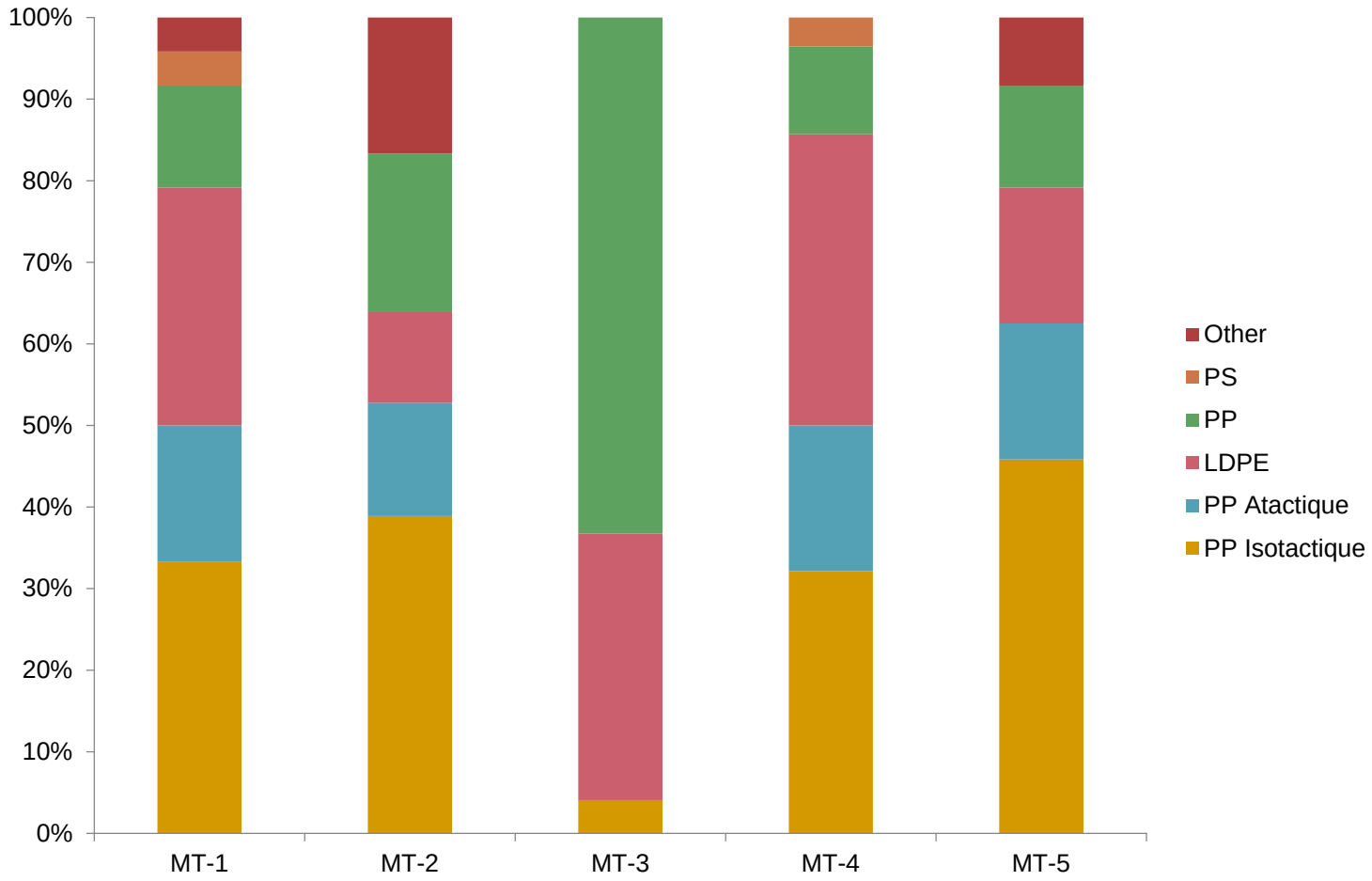




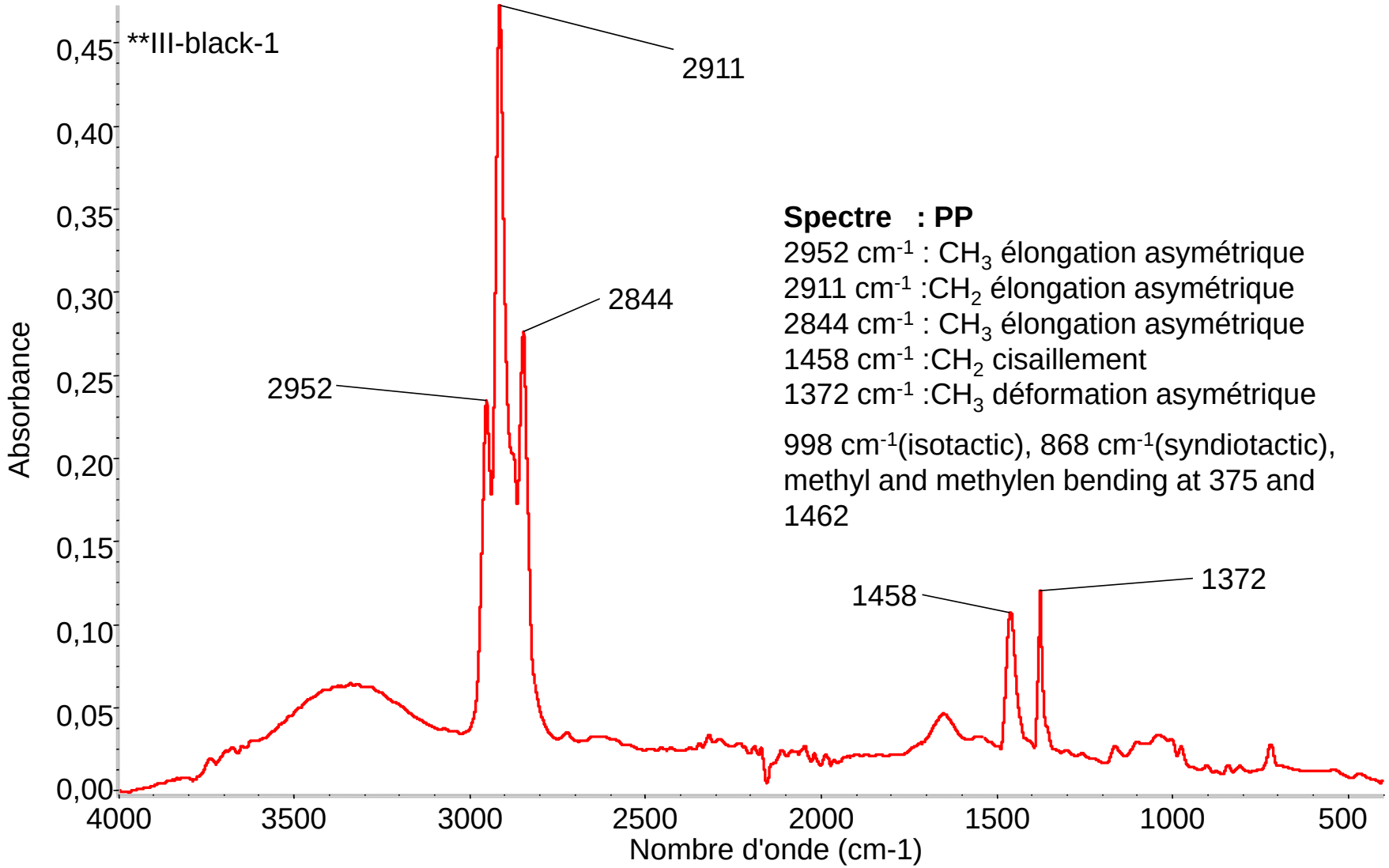
Surface

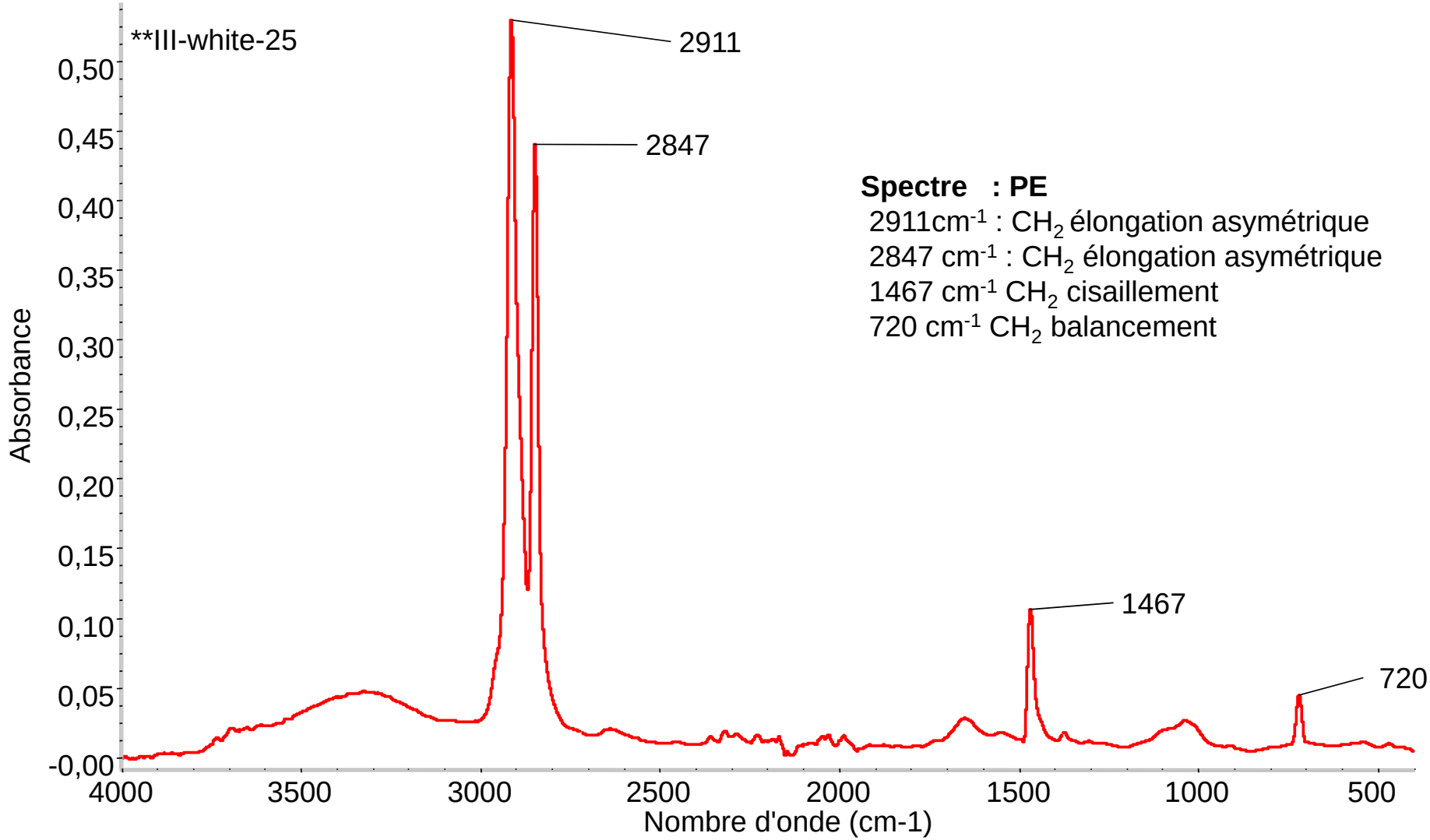
Ingestion :

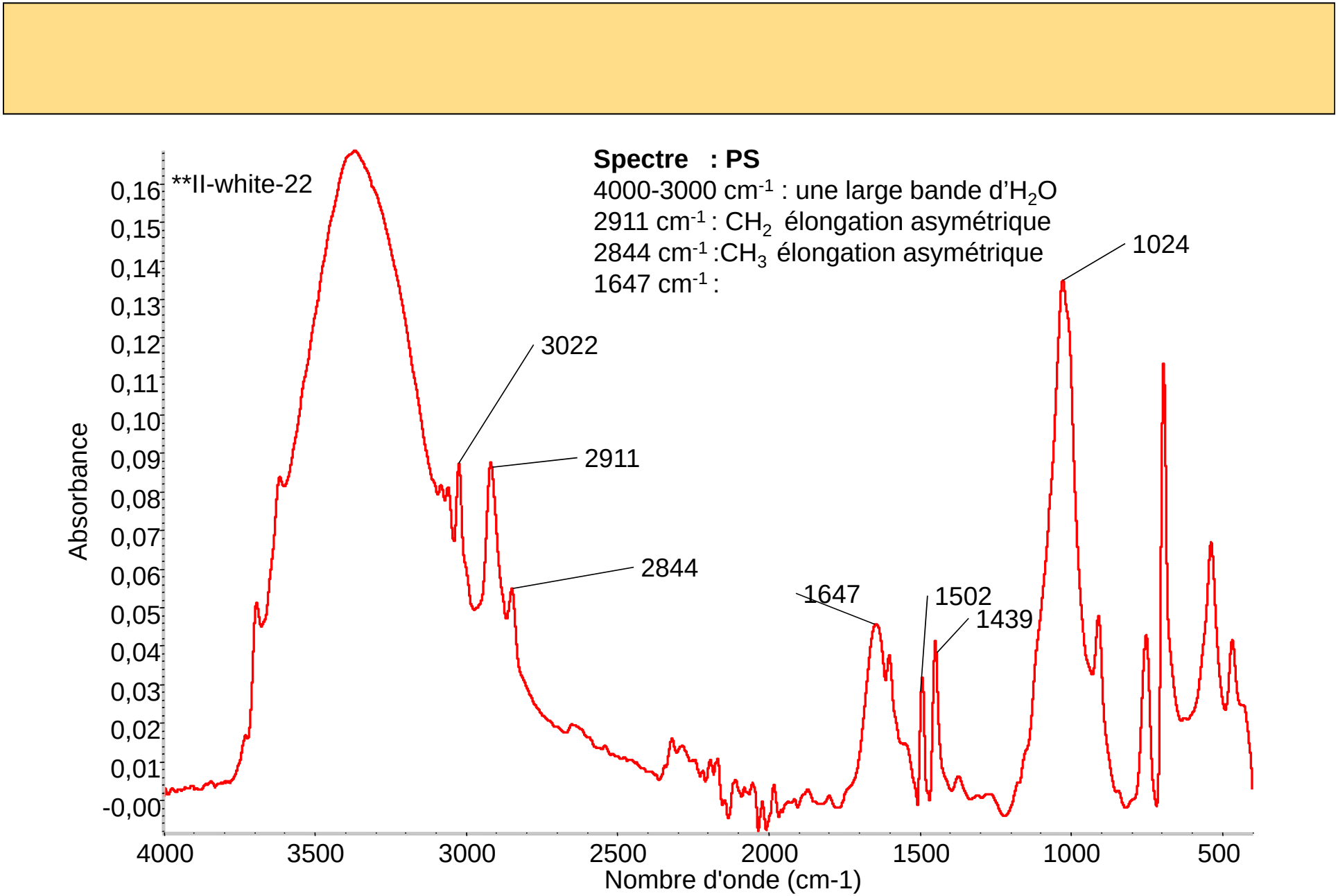
White, clear, and blue plastics were primarily ingested by planktivorous fish (Kühn et al., 2015)



Polymers occurrence

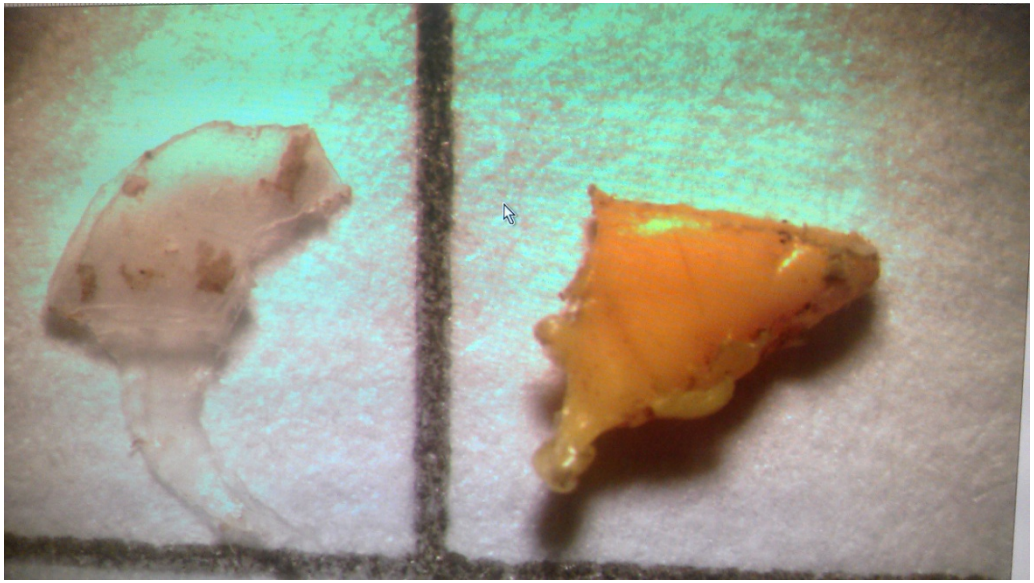

**III-black-1
Absorbance
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
4000
3500
3000
2500
2000
1500
1000
500
Nombre d'onde (cm-1)
2911
2844
2952
1458
1372
Spectre : PP
2952 cm-1 : CH3 élongation asymétrique
2911 cm-1 :CH2 élongation asymétrique
2844 cm-1 : CH3 élongation asymétrique
1458 cm-1 :CH2 cisaillement
1372 cm-1 :CH3 déformation asymétrique
998 cm-1(isotactic), 868 cm-1(syndiotactic), methyl and methylen bending at 375 and 1462


**III-white-25
2911
2847
1467
720
Absorbance
0,50
0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
-0,00
4000
3500
3000
2500
2000
1500
1000
500
Nombre d'onde (cm-1)
Spectre : PE
2911cm-1 : CH2 élongation asymétrique
2847 cm-1 : CH2 élongation asymétrique
1467 cm-1 CH2 cisaillement
720 cm-1 CH2 balancement


**II-white-22
Spectre : PS
4000-3000 cm-1 : une large bande d'H2O
2911 cm-1 : CH2 élongation asymétrique
2844 cm-1 :CH3 élongation asymétrique
1647 cm-1 :
3022
2911
2844
1647
1502
1439
1024
Absorbance
0,16
0,15
0,14
0,13
0,12
0,11
0,10
0,09
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
-0,00
4000
3500
3000
2500
2000
1500
1000
500
Nombre d'onde (cm-1)

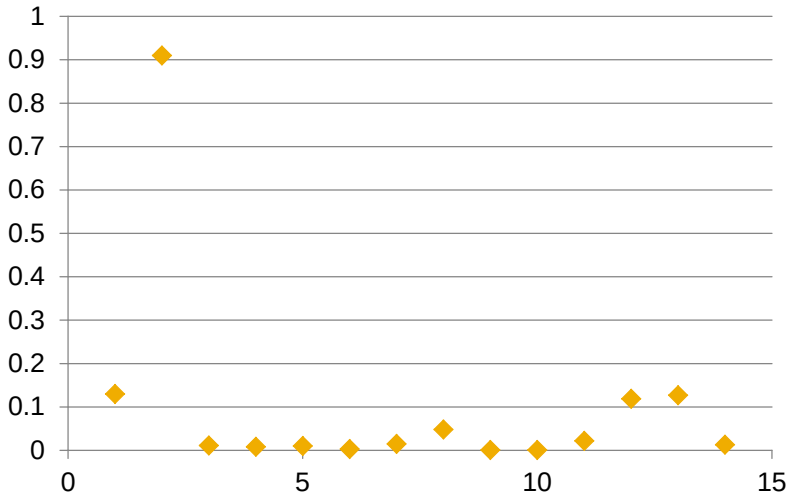
PE : 1710 cm^{-1} / 2924 cm^{-1}

PP : 1775 (1715) cm^{-1} / 2870 cm^{-1}

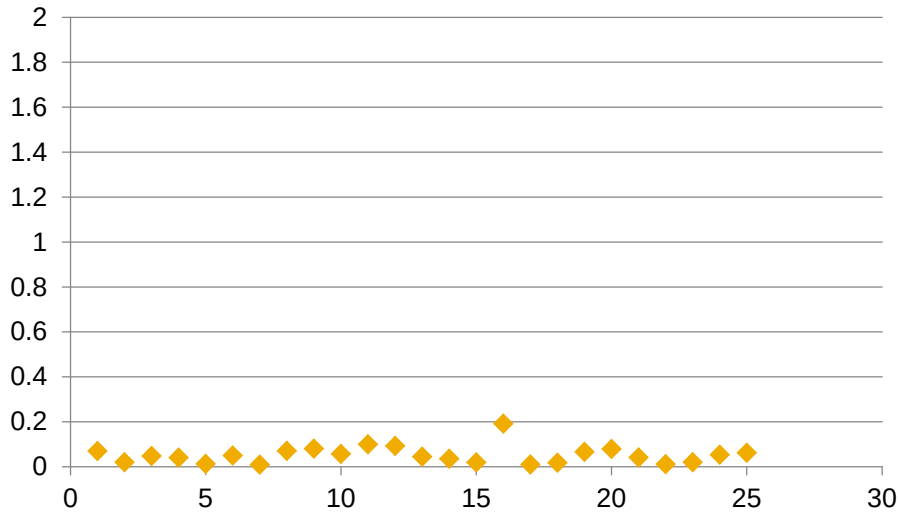


Indice carbonyle

Polyéthylène



Polypropylène



CONCLUDING REMARKS

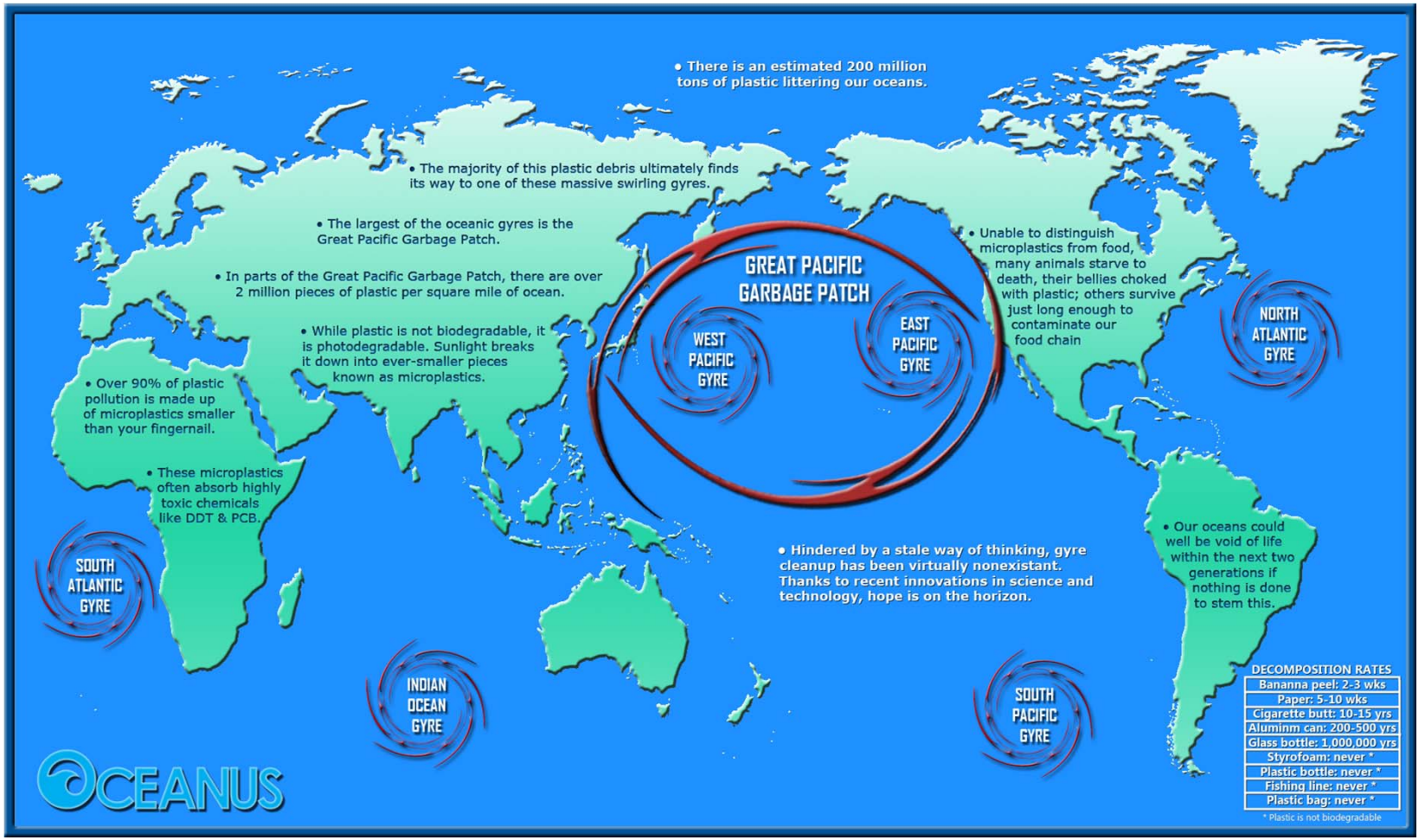
- Important of the study
- A potential risk and hazard of the plastic pollution.
- PP was the most abundance plastics in Cilacap and Segara Anakan water
- Plastic recent apportionment was probably near from the sources.
- Some limitation due to the lack of RV, limited to the coastal water

PERSPECTIVE

- 30/95 public state universities
- 3000 privates universities

➢ New additional themes : Ocean observation and MarPoll

Map source : http://cheatssoul.blogspot.co.id



https://projectoceanus.wordpress.com/tag/ocean/