INITIAL FINDINGS OF MICROPLASTICS CONCENTRATION IN THREE COASTAL ENVIRONMENTS: A CASE STUDY IN THE PERUVIAN COAST

Camila Timana [1*], Andrea Tipe [1], Pedro Cahuana [1], Mauricio Rivas [1], Ryuji Segami [1], Tania Meza [1] & Daniel Horna [1,2]

[1] Universidad de Ingeniería y Tecnología - UTEC, Lima, Perú; [2] Centro de Investigación y Tecnología del Agua - CITA, Universidad de Ingeniería y Tecnología - UTEC, Lima, Perú

*Correspondence YP: rosa.timana@utec.edu.pe

Abstract This paper presents the results of a comparative field study to determine the concentration of microplastics in three coastal environments in the coast of Peru. Samples were taken in both sand and sea water using a sieve and a neuston net, respectively. Three study sites were selected in the coast of Lima, Peru: Naplo (South of Lima), Los Yuyos (in Lima) and Chancay (North of Lima). It was found that Naplo beach presented the highest number of micropollutants, most of them were pellets with size ranges of 1-4mm and 0.5-4mm on the sea and seashore respectively, whereas Yuyos presented the lowest number of microplastics in both sand and sea.

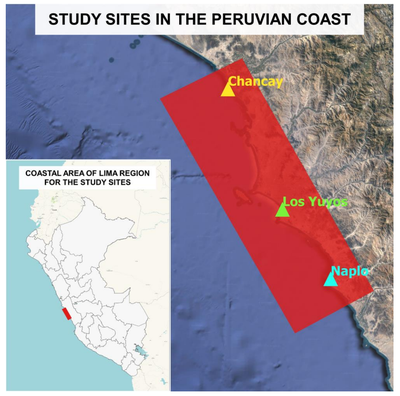
Keywords: microplastic, seashore, micropollutants, marine debris.

Methods

Three beaches were studied along the Peruvian coast in Lima's region: Naplo, Los Yuyos, and Chancay (Fig 1a.)

1. **Field measurements**: sand (approx. 35 samples) and sea water (approx. 10 samples) from April to June 2019.
   - **Sea water**: Equidistant points were distributed in the area and a neuston net of 300 microns was employed.
   - **Sand samples**: Divided into quadrants, using a 0.5 by 0.5m frame, the sample was collected and sieved.
1. **Data processing**: microplastics quantification and concentration map elaboration.
   - **Sea water**: microscope processing
   - **Sand samples**: sediments and microplastics separator

a)



b)

c)

Figure 1: a) Study sites. Field measurement in b) sand and c) sea water

Results

The highest concentration of microplastics was identified at Naplo beach, a bottling factory might be the main source of this result., mixed with a recirculation region. The microplastics on Chancay beach seems to come mainly from the presence of the fishing industry. Additionally, recreational activities on Yuyos beach are considered the principal pollution source.

Table 1: Features of sampled microplastics for each beach location.

Beach	Features	Location	
		Sand	Seawater
Naplo	No. microplastics	103	703
	Shape	fragment, fiber	fragment, fiber, pellet
	Size	<0.5 - 4 mm	<1 - 5 mm
Los Yuyos	No. microplastics	23	96
	Shape	Not determined	fragment, fiber
	Size	Not quantified	<1 - 8 mm
Chancay	No. microplastics	85	361
	Shape	fragment, fiber	fragment
	Size	0.5 - 5 mm	0.5 - 5 mm

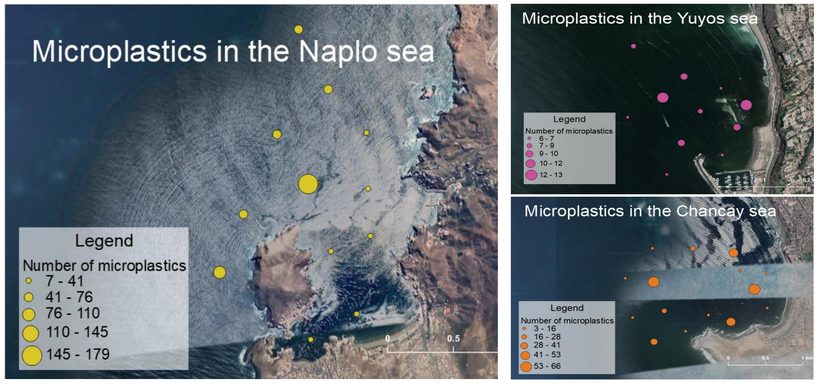


Figure 2: Microplastics concentration in Naplo, Yuyos and Chancay

Conclusions

The data was obtained at one field campaign, thus further campaigns are needed to complement the results from this study. Moreover, results can be further complemented with numerical model results. This is necessary to enable more accurate predictions of the spread of these micropollutants throughout seashores and the sea itself. Likewise, the type of polymer should be analyzed in order to enhance the understanding of the possible sources of these pollutants as well as their relative danger to the marine ecosystem.

Bibliography

Coppock, R. L., Cole, M., Lindeque, P. K., Queirós, A. M., & Galloway, T. S. (2017). A small-scale, portable method for extracting microplastics from marine sediments. Environmental Pollution, 230, 829-837.

Jovanović, B. (2017). Ingestion of microplastics by fish and its potential consequences from a physical perspective. Integrated Environmental Assessment and Management, 13(3), 510-515.

Kovač Viršek, M., Palatinus, A., Koren, Š., Peterlin, M., Horvat, P., & Kržan, A. (2016). Protocol for Microplastics Sampling on the Sea Surface and Sample Analysis. Journal of Visualized Experiments: JoVE, 118.

Purca, S., & Henostroza, A. (2017). Presencia de microplásticos en cuatro playas arenosas de Perú. Revista peruana de Biología, 24(1), 101–106.