CALIFORNIA LUTHERAN UNIVERSITY - DEPARTMENT OF BIOLOGY

Analysis of Microfibers in *Sardina pilchardus* and *Rastrelliger kanagurta*

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ABSTRACT

A study on microfibers was done to determine the quantity of microfibers within *Sardina pilchardus* and *Rastrelliger kanagurta*. Fish were dissected and the gills and gut were extracted. The extracted organs were measured and ground into a paste; which was suspended in a brine solution. The solutions were then filtered through a vacuum pump, and the results were analyzed using light microscopy. When *Sardina pilchardus* (Sardine) was compared to *Rastrelliger kanagurta* (Indian Mackerel) we found that there were significantly more microfibers in *Rastrelliger kanagurta* than they were in *Sardina pilchardus* (t=0.004, df=68 p≤0.05). When small *Sardina pilchardus* were compared to large size to determine which size contain the greater number of microfibers, we found that there was no significant difference between both fish sizes (t=0.53, df= 43,p≥0.05), when small *Rastrelliger kanagurta* were compared to large, we found that there was no significant difference between both sizes as well(t=0.37, df=19, p≥0.05).

INTRODUCTION

- Since 2015 there have been more than 6,300 million tons of plastic generated. The increased in plastic has led to an abundance of it being discarded into our ocean's and natural environment.
- Plastics that are produced are known to be durable and non-biodegradable. Therefore, they tend to last longer in our environment.
- During this research, microfibers (<5mm) that are a subset of microplastics were investigated. These species were chosen based on the accessibility and amount that could be obtain in the food markets.

METHOD

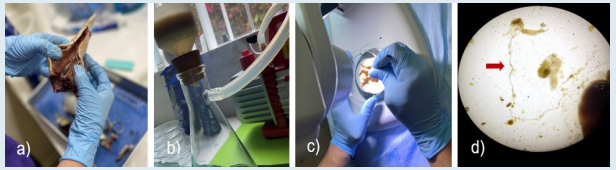


Fig.1. Image of specimen under study(a); filter flask and vacuum pump used for filtration(b); analysis of gut using tweezer(c); and image of microfiber under the microscope.

- **Sample Collection:** Headings of more than 6 words should be in upper and lower case, not all capitals.
- **Dissection:** The fish were measured from fin to the mouth. They were dissected using a surgical scissors and organs were extracted out.
- **Mortar and Pestle:** The digest tract and gills were then placed in separate mortar and then compressed multiple times.
- **Brine solution and filtration:** 150 mL of water and 50g of sea salt were mixed to create a saline solution were the samples were placed and held for a day. A filtration was done using filter paper and a vacuum pump.
- **Observation and validation of microfibers:** All microfibers on the filter paper were examined, counted, and characterized under a Nikon Stereo Microscope.

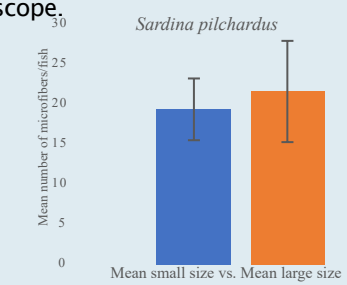


Fig.2. Bar graph comparing average number of microfibers based upon fish size. Mean small fish ($\bar{x}_{SSF}$ =19.43 ±95% C.I. 3.86; N=23) and mean large fish ($\bar{x}_{LSF}$ =21.67 ± 95% C.I. 6.33; N=21) Y-error bars are equal to the 95% C.I. T=0.53, df=43, p≥0.05.

RESULTS

In order to determine the number of microfibers in different fish size and specie the following graphs were made and the mean contrasts of microfibers in *Sardina pilchardus* and *Rastrelliger kanagurta* were controlled by a T-test (p≤0.05)
An aggregate of 1,129 microfibers were recognized under the magnifying instrument; no other kind of microplastic was broke down.

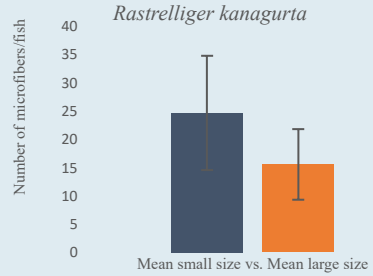


Fig.3. Bar graph comparing average number of microfibers based upon fish size. Mean small fish ($\bar{x}_{SSF}$ =24.67 ±95% C.I.10.12; N=9) and mean large fish ($\bar{x}_{LSF}$ =15.55 ± 95% C.I. 6.25; N=11) Y-error bars are equal to the 95% C.I. T=0.37, df =19, p≥0.05.

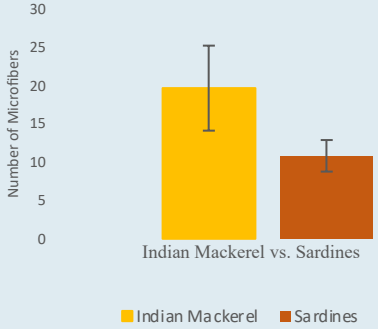
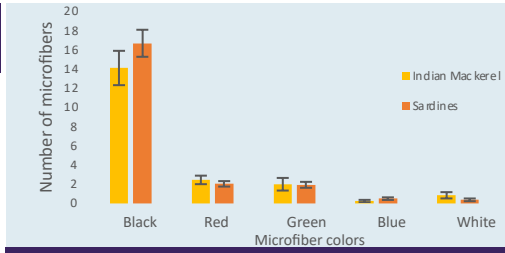


Fig.4. Bar graph comparing average number of microfibers based upon fish species. Mean of *Rastrelliger kanagurta* (Indian Mackerel)($\bar{x}_{IM}$ =19.65±95% C.I. 5.55; N=20) and mean of *Sardina pilchardus* (Sardines) ($\bar{x}_{S}$ =10.82 ±95% C.I. 2.06; N=49) Y-error bars are equal to the 95% C.I. T=0.004, df=68, p≤0.05.



DISCUSSION

- There was no significates differences between the size of the species. (p≥0.05)
- However there was a statistically significant difference in microfibers in different species.
- The significant difference can be due to the different food source that each species consumes.
- All sample contained at least one microfiber or more.
- As a result of limited contamination protocols, we expect in the future to utilize more strategies to restrain contamination, for example, separating water supplies and checking for airborne microfiber strands.
- In order to investigate the microfiber further, a fish models with known time/location of capture will be needed to identified the source of the material.

REFERENCES

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