

EFFECT OF DENSITY SEPARATION SOLUTION ON ISOLATION OF MICROPLASTICS FROM SEA TURTLE NESTING BEACH SAND IN MAHARASHTRA AND GOA, INDIA

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INTRODUCTION

Microplastic pollution has emerged as a pervasive environmental issue affecting marine ecosystems worldwide (Thompson *et al.*, 2004). Defined as plastic particles smaller than 5mm, microplastics are commonly classified into two major categories based on their origin: primary and secondary microplastics. Primary microplastics are intentionally manufactured in microscopic sizes, for use in industrial and commercial applications (Cole *et al.*, 2011). These include industrial resin pellets or nurdles, cosmetic microbeads used in personal care products, synthetic textile fibres, and abrasive particles used in cleaning process (Andrady, 2011; Browne *et al.*, 2011). Secondary microplastics originate from the fragmentation and degradation of larger plastic debris already present in the environment. Common sources of secondary microplastics include discarded plastic bottles, fishing nets, packaging materials, plastic bags, and other consumer products that progressively breakdown into smaller fragments over time (Andrady, 2011) through physical, chemical, and biological weathering processes such as UV radiation, wave abrasion, mechanical friction, and thermal degradation (Thompson *et al.*, 2004; Wright *et al.*, 2013). Secondary microplastics are often irregular in shape and include fragments, films, foams, and degraded fibres, reflecting the characteristics of their source material (Cole *et al.*, 2011).

Both primary and secondary microplastics are persistent, light weight, buoyant, and small in size, enabling their extensive dispersal across coastal environments, particularly sandy beach sediments that function as important habitats for various marine organisms (Browne *et al.*, 2011; Wright *et al.*, 2013). These organisms include sea turtles, which use beach habitats for incubation of eggs to produce hatchlings. Microplastics in beach substrates may change physical, chemical, and/or thermal properties of the nest substrate (Estrella-Jordan *et al.*, 2023; Fuentes *et al.*, 2023) and, therefore, influence nest microclimate,

embryo development and survival, and hatchling sex ratios (given that the taxa demonstrate temperature-dependent sex determination). Hence, quantifying beach substrate microplastics and understanding the potential impacts is especially important, given ongoing concerns about the potential feminisation of sea turtle populations (Laloë *et al.*, 2024) and increased embryo (Santidrián Tomillo *et al.*, 2012; Hays *et al.*, 2017; Mollet Saint Benoit, 2019) and hatchling mortality (Laloë *et al.*, 2017; Hays *et al.*, 2021) with climate change. Understanding the likelihood and contribution of environmental pathways of microplastic accumulation in the sea turtle egg (Savoca *et al.*, 2018; Curl *et al.*, 2024) is required to assess the contribution of beach plastics to embryo exposure to particles and plastic-associated chemicals that may affect organ development, metabolism, immunity (Zhang *et al.*, 2021; 2024), sex determination, embryo development, and adult fertility, with potential long-term implications for population viability (Savoca *et al.*, 2018). Quantifying beach microplastics and understanding the impacts is also required to inform plans, policy, and legislation to manage current plastics loads and minimise the entry of additional plastics into the environment (e.g., Dijkstra *et al.*, 2021; Kumar *et al.*, 2021; Willis *et al.*, 2022).

Reliable detection and quantification of microplastics in beach sediments are, therefore, essential for understanding the extent of contamination and its ecological implications. Several methodologies have been developed for microplastic isolation from sediments, commonly involving sequential steps such as drying, sieving, density separation, organic matter digestion, filtration, and polymer identification (Hidalgo-Ruz *et al.*, 2012; Prata *et al.*, 2019). Density separation using a salt solution is one of the most widely applied techniques for isolating microplastics from sediments, as most plastic polymers possess lower densities than mineral particles in sediments, allowing plastics to float while heavier sediment grains

settle (Claessens *et al.*, 2011; Hidalgo-Ruz *et al.*, 2012; Masura *et al.*, 2015). Following density separation, the supernatant containing suspended microplastics typically undergoes vacuum filtration using fine filter membranes or glass fibre filters to retain the particles for further analysis. The filtered particles are visually inspected under a stereomicroscope or dissecting microscope, and suspected microplastics are identified and categorised based on their physical characteristics such as shape, colour, size, and texture (Nuelle *et al.*, 2014; Masura *et al.*, 2015). Visual inspection is an important preliminary step in microplastic analysis, as it enables synthetic particles to be distinguished from natural materials prior to polymer identification techniques such as Fourier Transform Infrared Spectroscopy (FTIR) or Raman spectroscopy (Hidalgo-Ruz *et al.*, 2012).

A variety of salt solutions have been used to separate microplastics from sediments, including sodium chloride (NaCl), zinc chloride (ZnCl_2), potassium carbonate (K_2CO_3), sodium iodide (NaI), sodium bromide (NaBr), and sodium hexametaphosphate (SHMP). Each solution differs in density, cost, and isolation efficiency (Imhof *et al.*, 2012; Claessens *et al.*, 2013; Patti *et al.*, 2020). Lower-density solutions such as NaCl ($\sim 1.2\text{g/cm}^3$) are inexpensive, non-toxic, and widely available, but may have less efficiency at isolating denser polymers such as polyethylene terephthalate (PET) and polyvinyl chloride (PVC) (Claessens *et al.*, 2011; Masura *et al.*, 2015). In contrast, high-density solutions such as ZnCl_2 , NaI, and NaBr can isolate a broader range of polymers more efficiently, although they are relatively more expensive and may involve greater handling, disposal, environmental, and safety concerns (Coppock *et al.*, 2017; Schütze *et al.*, 2022). Recently, K_2CO_3 has gained attention as a comparatively high-density and less hazardous alternative; however, its performance relative to other commonly used salts still requires further evaluation under field-relevant conditions (Gohla *et al.*, 2021).

As isolation efficiency is strongly influenced by the type and density of the salt solution used during extraction (Nuelle *et al.*, 2014; Coppock *et al.*, 2017), and different salt solutions can selectively recover different polymer types and particle sizes, recent studies comparing the efficiency of different salt solutions for microplastic isolation have highlighted the importance of selecting a solution based on sediment characteristics and target polymer types. Schütze *et al.* (2022) demonstrated that increasing solution density generally resulted in higher recovery rates of both conventional and biodegradable microplastics from solid matrices such as sand and soils.

Sodium bromide (NaBr; density $\sim 1.53\text{g/cm}^3$) showed particularly high recovery efficiencies for a wide range of polymers compared with lower-density solutions such as NaCl (density $\sim 1.20\text{g/cm}^3$) and water (density $\sim 1.0\text{g/cm}^3$) (Schütze *et al.*, 2022). Similarly, NaI (density $\sim 1.80\text{g/cm}^3$)-based density separation has achieved recovery efficiencies exceeding 95% for microplastics from complex sediment matrices (Karami *et al.*, 2017). These findings indicate that differences in isolation solution can substantially influence microplastic recovery, thereby affecting estimates of microplastic abundance, composition, and morphology as well as comparability among studies.

Other factors may also be a consideration when selecting a salt solution for microplastic isolation. For example, NaBr and NaI provide high recovery efficiencies for microplastic isolation but are not commonly used due to the cost, handling requirements, and greater environmental and laboratory safety concerns in comparison to other salt solutions (Karami *et al.*, 2017; Quinn *et al.*, 2017). SHMP is rarely used as standalone isolation solution because it acts mainly as a dispersing agent rather than as a density separation solution (Masura *et al.*, 2015).

In advance of work examining microplastics at sea turtle nesting sites in the states of Maharashtra and Goa, India, we compared the microplastic isolation efficiency of three density separation solutions – K_2CO_3 , ZnCl_2 , and NaCl – for isolating microplastics from surface sand collected from four sea turtle nesting beaches. K_2CO_3 , ZnCl_2 , and NaCl were selected for comparison as these solutions are among the most widely used in studies worldwide because of their density, cost, isolation efficiency, and low environmental toxicity (Claessens *et al.*, 2011; Imhof *et al.*, 2012; Coppock *et al.*, 2017; Patti *et al.*, 2020). By evaluating variations in microplastic recovery using different salt solutions, this study aims to determine the most efficient density separation solution for isolating microplastics from the beach sediments of the selected study sites and demonstrate good research practice in microplastics research.

METHODS

Study Sites

The study sites encompass four sea turtle nesting beaches (Figure 1). Velas and Wayangani beaches are located in the state of Maharashtra, and Morjim and Agonda beaches are in Goa, India.

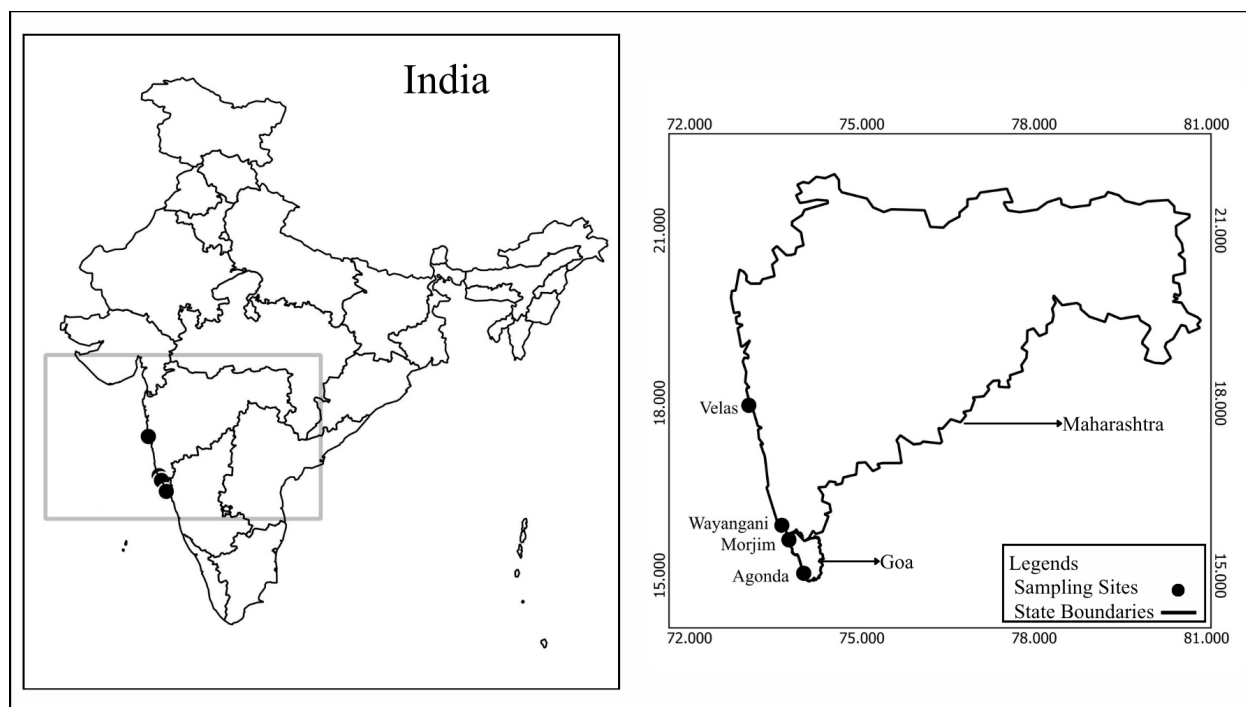


Figure 1. Sea Turtle Nesting Beaches from Which Sand Was Collected to Compare Microplastic Isolation Efficiency Using Different Salt Solutions.

Contamination Control

Several precautionary measures were implemented throughout field sampling and laboratory processing to minimise the risk of plastic contamination (Monteiro *et al.*, 2020; Patti *et al.*, 2020). During field sampling, sediments were collected using a metal trowel and transferred into pre-labelled paper bags to avoid contact with plastic materials. All clothing (including laboratory coats composed of 100% cotton) and accessories (e.g., hair ties) worn by researchers during field and laboratory work were plastic-free. Latex gloves were used while handling chemicals.

Non-plastic equipment and materials were used in the laboratory, including glass stirring rods, glass storage containers, and metal utensils. All equipment and laboratory utensils were rinsed three times with distilled water prior to use and dried using paper or cotton towels. Laboratory surfaces and instruments, including weighing balances and microscopes, were cleaned with ethanol before use, and ovens were thoroughly cleaned before drying procedures.

To monitor airborne contamination in the laboratory, three procedural control samples consisting of damp Whatman GF/B filter papers (1.2µm) placed in open petri dishes were exposed to laboratory air during sample

preparation and analysis. In addition, all salt solutions used for density separation (K_2CO_3 , NaCl, and $ZnCl_2$) were examined for microplastics by pre-filtering before use. Materials and equipment, including beakers, flasks, filters containing extracted material, and decanted solutions, were covered with aluminium foil throughout processing to minimise the risk of airborne particle contamination.

Sample Preparation

Sampling at each study site occurred in January 2026. Surface sand samples were collected to a maximum depth of 2cm using a metal garden trowel, and ~1kg of sediment at each location was collected into paper bags. Following collection, the samples were transported to FLAME University, Pune, Maharashtra, and stored at ambient temperature until processing.

For laboratory analysis, sand samples collected from each study site were homogenised separately in pre-cleaned glass trays using the coning and quartering method to ensure representative subsampling and to minimise sample heterogeneity (Campos & Campos, 2017). The sand was thoroughly mixed, then triplicate subsamples of 20g were placed in glass petri dish and oven dried at 50°C for 24hr to remove moisture prior to microplastic isolation.

Density Separation Protocol

Solutions for each salt were prepared using distilled water to concentrations in Figure 2 and stored in clean glass containers. The three subsamples of dried sand from each study sites were thoroughly mixed with each salt solution, by hand with a glass stirrer, in a 1L glass beaker then allowed to stand undisturbed at room temperature (Figure 2). Methods followed those outlined for previous studies on microplastic separation from sand using a solution of K_2CO_3 (Patti *et al.*, 2020; Gohla *et al.*, 2021), $ZnCl_2$ (Imhof *et al.*, 2012), and $NaCl$ (Thompson *et al.*, 2004; Claessens *et al.*, 2011; Balasubramaniam & Phillott, 2016).

Microplastic Isolation

The floating fraction (supernatant) from each beaker containing the sand-salt suspension was carefully decanted into a glass Büchner funnel fitted with Whatman glass fibre filter paper (pore size $1.2\mu m$). Vacuum filtration was subsequently carried out using a glass Büchner funnel assembly connected to a side-arm vacuum flask and an oil-free diaphragm vacuum pump under controlled vacuum pressure ($\leq 700 mm Hg$) for the recovery of microplastics from sediment samples (Hidalgo-Ruz *et al.*, 2012; Masura *et al.*, 2015).

The filtration process typically required ~2–5 minutes per sample. Sides of the beaker were rinsed with distilled water into the filter to ensure complete transfer and recovery of any microplastic particles that may have adhered to the beaker surface (Masura *et al.*, 2015; Miller *et al.*, 2017). Filters were then rinsed with distilled water to remove residual salts and stored individually in glass petri dish to dry at room temperature prior to further analysis (Claessens *et al.*, 2013; Masura *et al.*, 2015).

Dried filter papers were examined for the presence of microplastics using a dissecting microscope at $10\times$ magnification. Filter papers were systematically scanned to ensure complete coverage, guided by grid paper attached to the underside of the petri dish. Microplastics were retrieved using clean forceps under microscopic observation; a hot needle test (Beckingham *et al.*, 2023) was performed on suspected particles that did not visually resemble microplastics for confirmation of their composition. Microplastics were transferred to a glass petri dish with labelled grid paper affixed beneath to aid spatial referencing. To maintain consistent orientation during observation and counting, the top and bottom of the grid paper were marked in different colours. Microplastics isolated

from each sample were counted and categorised by shape (fibre, pellet, fragment, foam, film) according to Duncan *et al.* (2019).

The distribution of microplastic counts isolated using each salt solution at each location was assessed using a Shapiro-Wilk normality test, which indicated that the data were not normally distributed ($p < 0.05$). Therefore, a permutational multivariate analysis of variance (PERMANOVA) was conducted to compare the number of microplastics isolated at each location using different salt solutions. The PERMANOVA (comprising 999 permutations) was conducted in PAST 4.03.

Sediment Characteristics

Sand samples from each location were also processed and analysed for grain size distribution, sorting, and skewness to characterise the sediment properties of each beach and assess their potential influence on microplastic isolation using different solutions. Approximately 200g of sediment from each study site was oven dried at $60^\circ C$ and weighed at 24-hour intervals until the difference between consecutive weights was $< 0.1\%$, after which the sand was considered completely dry.

The dried sand was then sieved manually for 15–20min using stacked Endecott metal sieves (200mm diameter) with mesh sizes of 4mm, 2mm, 1mm, 0.5mm, 0.25mm, 0.125mm, and 0.063mm, following standard procedures (Carson *et al.*, 2011; Blott & Pye, 2012). After sieving, the sand retained in each sieve was transferred into separate glass containers. Residual sand grains adhering to the sieves were carefully removed using a sieve

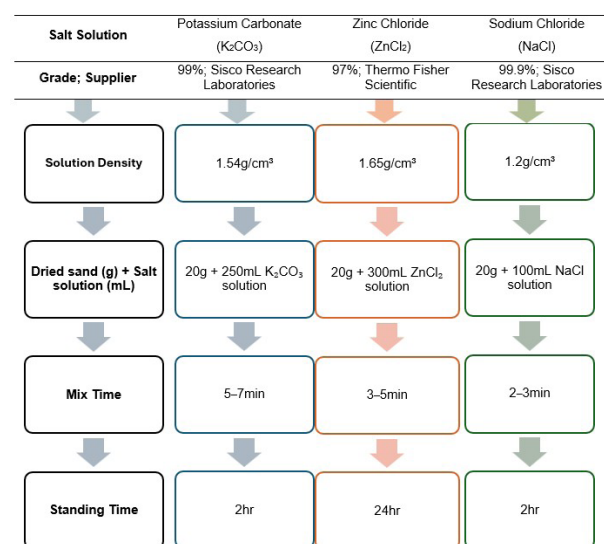


Figure 2. Density Separation Method for Microplastic Isolation Using Different Salt Solutions

brush and by gently tapping the underside of the sieves into the appropriate containers. Each sand fraction was subsequently weighed separately. Sand fractions were then classified into size fractions according to the Wentworth grain size scale (Carson *et al.*, 2011; Blott & Pye, 2012).

The percentage weight retained in each sieve fraction was used to calculate mean grain size and other sediment characteristics. Mean grain size, sorting, and skewness, were determined using the graphical method proposed by Folk & Ward (1957), based on phi (ϕ) values, where grain size is expressed on a logarithmic scale ($\phi = -\log_2 d$), with d representing grain diameter in millimetres. Percentile values including ϕ_5 , ϕ_{16} , ϕ_{25} , ϕ_{50} , ϕ_{75} , ϕ_{84} , and ϕ_{95} were obtained from the grain size data and used to calculate these parameters. Mean grain size represents the average sediment particle size, sorting indicates the uniformity of sediment distribution, and skewness reflects the dominance of finer or coarser particles within the sediment sample.

Sorting was used to evaluate the uniformity of sediment grain sizes, where lower sorting values indicate more uniform sediments and higher values indicate greater variability in grain size distribution. Inclusive graphic standard deviation (sorting) was calculated using the following equation (Folk & Ward, 1957):

$$\sigma_I = \frac{\phi_{84} - \phi_{16}}{4} + \frac{\phi_{95} - \phi_5}{6.6}$$

where ϕ_{84} and ϕ_{16} represent the 84th and 16th percentiles, respectively, and ϕ_{95} and ϕ_5 represent the 95th and 5th percentiles. Lower sorting values indicate well sorted sediments with relatively uniform grain sizes, whereas higher values indicate poorly sorted sediments with greater variability in particle size distribution (Blott & Pye, 2001).

Skewness was calculated to determine whether sediments contained a greater proportion of finer or coarser particles relative to the average grain size. Inclusive graphic skewness was calculated using the following equation (Folk & Ward, 1957):

$$k_I = \frac{(\phi_{16} + \phi_{84} - 2\phi_{50})}{2(\phi_{84} - \phi_{16})} + \frac{(\phi_5 + \phi_{95} - 2\phi_{50})}{2(\phi_{95} - \phi_5)}$$

where ϕ_{50} represents the median grain size. Positive skewness values indicate dominance of finer particles, negative skewness values indicate dominance of coarser particles, and values close to zero indicate symmetrical grain size distribution (Folk & Ward, 1957).

RESULTS

Microplastic Isolation

The number of microplastics isolated at each location varied with separation solution. Isolation performed with K_2CO_3 resulted in the highest mean counts for all categories of microplastics at all locations. The lowest microplastic counts were recorded when microplastic isolation was done using $ZnCl_2$ (Table 1). However, a PERMANOVA found no significant variation ($F=1.006$, $R^2=0.60$, $p=0.455$) among the total number of microplastics isolated from each study site using different salt solutions. Fibres were the dominant microplastic category isolated from all beaches irrespective of the salt solution used. Microplastic fragments, pellets, foam, films, and other forms were comparatively few (Table 1). Control filter papers and salt solutions, visually inspected for airborne contamination, revealed no microplastics.

Sediment Characteristics

Sediment characteristics differed among the four study sites. Using the Wentworth grain size classification, sediments from Velas and Morjim predominantly consisted of very fine sand fractions, whereas Wayangani and Agonda were dominated by fine sand. Velas beach sediment exhibited the lowest sorting value (0.45), indicating well-sorted sediment with relatively uniform grain sizes. In comparison, sediments from Wayangani, Morjim, and Agonda were classified as moderately well sorted, with sorting values ranging from 0.56 to 0.66, suggesting greater variability in grain size distribution. Skewness values also varied among study sites, reflecting differences in sediment particle distribution. Velas (-1.1) and Morjim (-1.66) exhibited strongly negative skewness, indicating a higher proportion of coarser particles relative to the mean grain size. Wayangani (-0.16) showed near-symmetrical distribution, whereas Agonda (0.40) displayed positive skewness, suggesting a relatively greater proportion of finer sediment particles (Table 2).

DISCUSSION

This study compared the efficiency of three commonly used density separation salt solutions ($NaCl$, K_2CO_3 , and $ZnCl_2$) for isolating microplastics from sand collected from four sea turtle nesting beaches along the coasts of Maharashtra and Goa, India. A PERMANOVA revealed no statistical difference in microplastic isolation efficiency among the salt solutions across locations ($p=0.455$), despite differences in sand characteristics (grain size and classification, sorting value and category, and skewness).

Table 1: Microplastics (number $\pm$ standard deviation (range) in a 20g sample) isolated from surface beach sand at four study sites using K_2CO_3 , NaCl, and $ZnCl_2$ solutions.

Solution	Study Site	Microplastic Category						Total
		Fibre	Pellet	Fragment	Foam	Film	Other	
K_2CO_3	Velas	60.0 $\pm$ 2.0 (58-62)	0.0	0.0	0.0	0.0	0.0	60.0 $\pm$ 2.0 (58-62)
	Wayangani	38.7 $\pm$ 9.1 (32-49)	0.0	0.0	0.0	0.0	0.3 $\pm$ 0.6 (0-1)	39.0 $\pm$ 8.7 (33-49)
	Morjim	53.7 $\pm$ 11.6 (43-66)	0.0	1.0 $\pm$ 1.0 (0-2)	0.0	0.0	0.0	54.7 $\pm$ 11.0 (44-66)
	Agonda	51.7 $\pm$ 9.5 (41-59)	0.0	2.3 $\pm$ 2.1 (3-4)	0.0	0.0	0.7 $\pm$ 1.2 (0-2)	54.7 $\pm$ 10.5 (44-65)
NaCl	Velas	40.0 $\pm$ 11.5 (27-49)	0.0	1.3 $\pm$ 0.6 (1-2)	0.0	0.0	0.0	41.3 $\pm$ 11.0 (29-50)
	Wayangani	34.3 $\pm$ 10.8 (22-42)	0.0	0.7 $\pm$ 0.6 (0-1)	0.0	0.0	0.3 $\pm$ 0.6 (0-1)	35.3 $\pm$ 11.0 (23-44)
	Morjim	37.7 $\pm$ 4.7 (34-43)	0.0	0.3 $\pm$ 0.6 (0-1)	0.0	0.0	0.0	38.0 $\pm$ 4.4 (35-43)
	Agonda	42.3 $\pm$ 11.0 (31-53)	0.0	1.7 $\pm$ 0.6 (1-2)	0.0	0.0	0.0	44.0 $\pm$ 11.5 (32-55)
$ZnCl_2$	Velas	30.0 $\pm$ 2.6 (28-33)	0.0	1.0 $\pm$ 1.0 (0-2)	0.0	0.0	0.0	31.0 $\pm$ 3.6 (28-35)
	Wayangani	25.7 $\pm$ 5.8 (19-29)	0.3 $\pm$ 0.6 (0-1)	0.3 $\pm$ 0.6 (0-1)	0.0	0.0	0.0	26.3 $\pm$ 6.9 (20-30)
	Morjim	19.0 $\pm$ 2.6 (16-21)	0.0	0.0	0.0	0.0	0.0	24.7 $\pm$ 7.5 (17-32)
	Agonda	24.0 $\pm$ 7.5 (17-32)	0.0	0.7 $\pm$ 1.2 (0-2)	0.0	0.0	0.0	19.0 $\pm$ 2.6 (16-21)

Among the tested salt solutions, K_2CO_3 consistently isolated higher mean microplastic counts across all sampling sites and across most microplastic categories, particularly fibres and fragments. The comparatively higher isolation efficiency of K_2CO_3 may be attributed to its density (1.54g/cm³). Previous studies have similarly identified K_2CO_3 as an effective and environmentally safer alternative for microplastic isolation when compared with other salts such as $ZnCl_2$ and NaI (Patti *et al.*, 2020; Gohla *et al.*, 2021). K_2CO_3 solution also exhibits lower viscosity and reduced particle aggregation during separation, which

improves sediment settling, facilitates decanting and vacuum filtration, and enhances overall microplastic isolation efficiency. Its ability to recover a broader range of polymer types while maintaining operational simplicity makes it particularly suitable for microplastic research (Coppock *et al.*, 2017; Rani *et al.*, 2020; Gohla *et al.*, 2021).

NaCl isolated intermediate numbers of microplastics across all beaches in this study. NaCl is widely used in microplastic studies because it is inexpensive, easily available, and non-toxic (Thompson *et al.*, 2004;

Table 2: Characteristics of beach sediments

Study Site	Mean Grain Size (ϕ)	Wentworth Classification	Sorting Value	Sorting Category	Skewness
Velas	3.73	Very fine	0.45	Well sorted	-1.21
Wayangani	2.07	Fine	0.57	Moderately well sorted	-0.16
Morjim	3.69	Very fine	0.56	Moderately well sorted	-1.66
Agonda	2.28	Fine	0.66	Moderately well sorted	0.40

Claessens *et al.*, 2011). However, the relatively low density of NaCl solution limits the isolation of heavier polymers such as polyethylene terephthalate (PET) and polyvinyl chloride (PVC), which may remain within the sediment fraction during separation (Claessens *et al.*, 2013; Coppock *et al.*, 2017). Consequently, NaCl-based isolation methods may underestimate the total abundance of microplastics in beach sand, particularly where dense polymers are present (Imhof *et al.*, 2012; Prata *et al.*, 2019).

ZnCl₂ isolated the lowest number of microplastics in this study despite its high density (1.6g/cm³), which is generally considered suitable for isolating dense plastic polymers (Imhof *et al.*, 2012). The lower isolation observed in this study may be associated with interactions between the dense solution and sediment grain size characteristics. Fine-grained sediments, particularly very fine sand and silt fractions, tend to remain suspended for longer periods in ZnCl₂ solutions, resulting in increased turbidity and aggregation of sediment particles (Claessens *et al.*, 2013; Coppock *et al.*, 2017). These aggregates can entrap microplastics and reduce flotation efficiency during separation and filtration. Since beach sediment from this study sites were dominated by very fine to fine sand fractions (Carson *et al.*, 2011; Turra *et al.*, 2014), sediment texture may have contributed to the comparatively lower recovery at these locations observed with ZnCl₂. Therefore, the reduced microplastic counts observed with ZnCl₂ in this study may reflect limitations associated with sediment texture.

Despite differences in sediment characteristics among the study beaches, the isolation efficiency pattern of the salt solutions remained consistent across locations. K₂CO₃ consistently isolated the largest number of microplastics across all beaches and microplastic categories, while also providing advantages in terms of high density, operational simplicity, and cost-effectiveness. Therefore, K₂CO₃ was

determined to be the most suitable salt solution for the locations and will be used for the isolation and analysis of microplastics from all remaining sediment samples in the current study.

CONCLUSION

This study compared effectiveness of three salt solutions K₂CO₃, NaCl, and ZnCl₂ for isolating microplastics from beach sediments collected from sea turtle nesting beaches along the coasts for Maharashtra and Goa, India. Although no significant differences were detected among the number of microplastics isolated by each salt solution, K₂CO₃ consistently recovered higher numbers of microplastics compared with NaCl and ZnCl₂. NaCl showed moderate recovery efficiency whereas ZnCl₂ isolated the fewest microplastics, possibly due to interactions between dense salt solution and fine sediment fractions that reduce separation efficiency. Considering its comparatively high isolation efficiency, cost effectiveness, environmental safety, and ease of handling, K₂CO₃ will be used to isolate microplastics during more detailed examination of temporal and spatial variation in beach microplastics at the four study sites in future research.

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SSTCN TURTLE DIARY OF 2026

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Introduction

The 2025 nesting year was quite a landmark season in many ways. We registered the highest number of stranded dead turtles in SSTCN's and, therefore, Chennai's history. The Forest Department swung into action and reactivated the Nodal Task Force. The task

force met frequently and every potential department of the Government was pressed into action. The Fisheries Department came under close scrutiny to take action against trawlers breaking the law by fishing in illegal waters. The Coast Guard was pulled in to monitor the trawlers. The Forest Department acquired two boats of their own to monitor the coast. The Coastal Security