Sails up on a Sustainable Ocean: Informing Design through Autoethnography of a Seven-Day Sailing Expedition

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Figure 1: Pictures from the sailing expedition include sunrises and sunsets, sails and boats, the dinghy, snorkelling moments, and fish filmed underwater.

Abstract

In this workshop opinion paper, I share a first-person account of my lived experience during a seven-day sailing expedition around Mallorca, with a focus on water sustainability. The paper highlights critical incidents from the journey that inspired reflection and informed design recommendations — opening up discussions on how to foster more symbiotic, respectful engagements with water across all forms of water sports.

Keywords

WaterCHI, Autoethnography, Sustainability

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1 Background and Research Area

I am an Asian female researcher with a background in Human-Computer Interaction (HCI), having completed my bachelor's degree in Beijing, China and my master's in Munich, Germany. Currently, I am in the third year of my PhD at the University of St. Gallen in Switzerland, where I research the integration of technology into our daily lives, with a focus on mixed reality (MR) technologies. In one of my studies, I conducted an autoethnography in which I spent two months living entirely with a mixed reality headset [11]. I documented my experiences from a first-person perspective, reflecting on technology use, identifying opportunities for various applications, and discussing both the benefits and the negative impacts of MR technologies on our lives and social connections. This work will be presented at DIS 2025. Beyond this, I design, prototype, and evaluate VR/MR systems that support daily life scenarios, such as shopping [10], working, and relaxing in virtual environments.

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2 Interest in Water Sports

I grew up in a beautiful coastal city in China where I had direct contact with the ocean. Back then, my attention was mostly drawn to the resources the ocean provided — the juicy seafood and the humid, salty air that I loved so much. However, I had little embodied experience with the water itself. I did not truly coexist with the ocean in an experiential sense; rather, I consumed its offerings without deeply engaging with its presence, its rhythms, or its movements.

My real interest in water sports developed after an offshore sailing trip where I spent seven days intimately connected to the ocean. For an entire week, we sailed a full circle around Mallorca, lived in the middle of nowhere — a world of endless blue, where sky and sea merge into one, occasionally accompanied by mountain silhouettes. We had an extremely close relationship with the ocean: feeling its temperature, its textures, and its touch; moving in sync with its waves; struggling with strong winds and seasickness; yet observing the vibrant life of fishes beneath the surface, the sunsets and sunrises unfolding along the horizon where sky and water meet, and vibing with the oceanic dolphins together.

During this trip, I swam, dived, snorkelled, paddled, meditated on the stand-up paddling (SUP) board, photographed fishes and waves, captured my "mermaid" friend diving underwater, took short excursions to the astonishing shorelines with a dinghy, and even

experienced a sting from a jellyfish. Now, when I think of the word freedom, a sailing boat navigating the vast and deep ocean instantly comes to mind. This experience really turned me into a water person. It changed my mindset and attitude towards the ocean — its power, beauty, mystery, and our relationship with it. In the following section, I will reflect on several critical incidents that occurred during this trip. These reflections inform my thinking on human behaviours and their impact on the ocean, and inspire ideas on how we might design for a more sustainable ocean from an HCI perspective.

Besides sailing, I also explored several other water sports before and after that trip. For example, I tried scuba diving in a pool, where I had to get used to having my face underwater and adapting to a new way of breathing. I went kayaking in a rapid river, where I experienced life-threatening situations and was capsized by the waves countless times, but also felt a rush of adrenaline when I was finally able to control the boat and ride the 1–2 metre high waves. I practised SUP, where I had to sense the softness of the surface beneath my feet and find balance on the unstable water. I also experimented with foil surfing, where I could feel the sensation of flying, powered by the floating force of the water. These sports offered me embodied encounters with water, allowing me to connect with my body, feel the water's presence, and reflect on our relationship with it — a relationship I now see as a rich ground for design, not only in sailing but across the diverse practices of water sports that shape our interactions with the ocean.

3 Designing for Water Sustainability

Below, I share four story snippets drawn from my sailing experiences — each offering reflections and lessons for designing more sustainable ocean futures.

3.1 What We Leave Behind in the Ocean

"*We had a small kitchen on our boat, and I could rinse dishes in the galley sink. I began to wonder where the soapy water was going — did we have a wastewater tank for kitchen water, or was it going straight into the sea?*" After researching how wastewater systems work on yachts, I discovered that many charter boats are typically designed like this: for black water (toilet waste), the boat is equipped with wastewater holding tanks. Discharge is only permitted offshore — several nautical miles away from the coast — or via pump-out and treatment systems at marinas [3]. This can be understood in a simplified yet romanticised way: we respect the shores where people swim and only let the sea take care of our waste once we sail far enough into her open arms. For grey water (from kitchen sinks, showers, and handwashing), it is often discharged directly overboard without a separate holding tank, even though it contains soaps, shampoos, food residues, and other pollutants [3]. In open waters, small quantities of biodegradable soap and food waste have traditionally been tolerated, and many yachts are not legally required to install grey water tanks. Although soaps and human waste are technically biodegradable, they are not harmless to marine ecosystems. These substances are not designed for nature; they often contain medications, artificial supplements, nutrients, and microplastics [5]. Certain nutrients, such as nitrogen and phosphates, can promote algal blooms, which deplete oxygen levels and result in fish mortality — a particular concern in semi-enclosed seas like the Mediterranean or Baltic, where water exchange is limited. Pharmaceuticals such as antidepressants have even been detected in aquatic wildlife [6]. In addition, viruses and bacteria from human waste may pose health risks for swimmers and compromise seafood safety.

Encouragingly, some modern charter fleets — particularly newer catamarans or eco-yachts — now feature full grey water tanks, especially in protected waters or high-end eco-charters. Furthermore, an increasing number of regulations (notably in marine protected areas) are starting to discourage or prohibit grey water discharge directly into the sea [1].

Design Recommendation: 1) Wastewater Tank Visualisation: Tank levels can be visualised via the built-in dashboard on the boat (black water and grey water tanks displayed separately). Sensor-based fullness alerts can support and reduce manual checks, and notifications can be sent via a phone-based app. 2) Context-Aware Discharge Recommendations based on the following data: i) GPS-based location (e.g. distance from shore; in the middle of the Atlantic, pump-out at shore is not feasible) ii) Local discharge regulations (e.g. whether the area is a marine protected zone and if discharge is permitted) and iii) Ecological sensitivity (e.g. sea enclosedness, oxygen levels, biodiversity maps). A real-time "impact level" bar, ranging from low to high ecological risk, can be displayed. The system can be map-based and include detailed information about local ocean conditions and harbour facilities.

"Another trace we leave in the ocean is diesel. Although we were on a sailing boat, we sometimes rely on fuel engines, which somewhat contradicts the very spirit of sailing. Besides, we also use a diesel-powered motor on our small dinghy, which produces a strong and unpleasant smell."

Reflection: One way forward is to return to the original idea of sailing itself. For example, a Chinese-built oil tanker has adopted a sail-assisted intelligent system that can save up to 14.5 tons of fuel per day — approximately 12% less fuel consumption compared to conventional tankers [4]. Alternatively, when motor power is necessary due to unfavourable wind conditions, electrifying the engine offers a more sustainable option. In fact, fully electric propulsion is increasingly being adopted on modern sailing yachts, combining electric motors, large lithium battery banks, and renewable energy sources such as solar and hydro regeneration — achieving truly green and quiet experience.

3.2 Unintended Object Loss at Sea

"*We were playing a kind of swing game on the boat. To create a flying sensation, we attached a ball-shaped fender and held onto it while the boat turned sharply, causing us to swing out with the movement of the boat. Normally, we're very careful with anything that might move on board. But while packing up, we thought the heavy metal ladder could simply stay on the stern deck instead of being secured in its storage container — after all, it was large and heavy. As the captain performed the sharp turn to create a big swing for us, the force unexpectedly threw the ladder straight off the boat. Being heavy, it immediately sank into the sea. When we reported this to the charter company, they initially considered diving to retrieve it, but since we hadn't marked the location of the manoeuvre, it would have been*

nearly impossible to find. In the end, they gave up, and the ladder remains at the bottom of the ocean."

Reflections: Trackable object tags such as Apple AirTags [2] — which rely on ultra-wideband and Bluetooth — are becoming increasingly popular. However, these technologies face significant limitations underwater. Firstly, most are not designed for full submersion and lack waterproofing. Secondly, GPS, Bluetooth, Wi-Fi, and radio signals do not penetrate water well, meaning signal is typically lost as soon as an object sinks. In addition, water pressure and corrosion further degrade the performance and lifespan of electronics in marine environments.

Although real-time underwater tracking is not yet commercially viable, there is still value in capturing pre-sink location data — especially as everyday objects continue to become smarter [7]. In our case, a smart object could be paired with a mobile app, periodically logging its location or using built-in motion sensors to detect unusual movement. If a fall is detected, the object could immediately log and transmit GPS coordinates before hitting the water, giving users a last known location for potential recovery.

For retrieval after sinking, autonomous underwater inspection drones [12] are an emerging solution. These devices use sonar imaging to map the underwater landscape and identify objects — increasingly applied in research, rescue, and industrial contexts.

However, embedding electronics in everyday objects raises its own environmental concerns. We should prioritise passive systems over powered ones. One alternative is the auto-floating safety pouch: a pressure- or water-sensitive bag that inflates automatically when submerged. Already used in devices like smartphones, GoPros, and diving gear, this approach could be scaled up for heavier objects — offering a low-tech, eco-conscious solution to prevent permanent loss at sea.

3.3 Informing About Human Impacts on Marine Protected Areas

"After we found a bay and dropped the anchor, a small boat approached us. The crew handed us some flyers and asked us to move to another anchoring spot, as this area was a protected habitat of Posidonia oceanica[1]*."*

According to the booklet[2], Posidonia oceanica is a type of seagrass that grows extremely slowly, gradually forming vast underwater meadows. These meadows play a crucial role in the Mediterranean's sea-beach-dune ecosystem. They fix CO_2 and produce oxygen, protect sandy coastlines and reduce sand loss, create crystal-clear waters, and provide habitats for numerous species. However, in the past 50 years, it is estimated that 34% of Posidonia meadows have been lost in the western Mediterranean, mainly due to boat mooring, eutrophication, and pollution. In our case, if we had dragged the anchor as usual, it would have torn up the seagrass and contributed to further meadow loss.

We moved to a different anchoring spot and also learned some helpful tips from the booklet: observe the seabed before dropping the anchor and avoid dropping the anchor on Posidonia oceanica; raise the anchor vertically when leaving; or use a mooring buoy instead of anchoring directly. In addition to the printed booklet, all this information is also available online or in mobile apps, where boaters can check interactive maps showing the Posidonia meadows, verify whether their boat is in a protected area, and even book a mooring buoy in advance.

Lessons Learned: This experience shows how awareness can shift our anchoring behaviour and highlights the importance of situated knowledge and embodied learning in the right moment. Whether the awareness comes from a booklet, a person, or an app, it can shape our actions in other environmental contexts too. Our embodied interaction with the ocean was key in fostering this awareness and willingness to learn. Such moments can be further supported through location-based technologies or subtle digital nudges that promote more eco-friendly practices.

3.4 Sun, Sea, and Self-Sufficiency: Technologies for Symbiotic Ocean Life

"On most boats, electricity usually comes from a combination of batteries and engine-generated power. During the first two days of our trip, we were extremely cautious with electricity usage and even avoided charging our phones, as we were unsure when we would next connect the boat to shore power at the port. We also wanted to avoid burning fuel to generate electricity. I brought a small solar panel with me, which was able to provide enough power to keep my phone charged without relying on other power sources. "

Reflections: Although still relatively new, solar panels are becoming an increasingly popular option for supplementing electricity on boats. For example, some YouTubers have installed entire layers of solar panels across the surface of their boats [8], with one even powering a dinghy entirely through solar energy [9].

4 My Contribution

As an HCI researcher and passionate water-sports enthusiast, I share first-hand stories that combine embodied experience with academic reflection — aiming to inform the design and use of technologies that support a more sustainable relationship with the ocean.

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