

Original Article

Billfish in coastal visual art in Kenya: a resource for ocean science communication

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Western Indian Ocean
JOURNAL OF
Marine Science

Open access

Citation:

Kihia S W, Uku J, Kioko M, Kadagi N I, Wambiji N (2023) Billfish in coastal visual art in Kenya: a resource for ocean science communication.

Western Indian Ocean Journal of Marine Science 22(1): 67-77 [doi: 10.4314/wiojms.v22i1.7]

Received:

October 02, 2022

Accepted:

May 03, 2023

Published:

June 20, 2023

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Abstract

Approaches to marine conservation and management issues has often been limited to using scientific research to propose technical and policy interventions. However, communicating outputs as scientific publications and policy briefs has limited reach and impact for non-academic audiences. Art markets in Mombasa and Kilifi Counties in Kenya were sampled to determine how the creative arts can be used to communicate ocean science. Artwork with terrestrial themes was popular and increasingly available to buyers compared to ocean art. Billfish as a representative species was popular in ocean art culture, underscoring its potential in a niche market for ocean art. Our study highlights opportunities for active collaboration between scientists and artists in communicating messages from scientific work to non-academic audiences. Engagement of Western Indian Ocean countries in the UN Decade of Ocean Science for Sustainable Development will benefit from the use of ocean art in science communication and enhance ocean literacy in the region.

Keywords: ocean art, billfish, ocean literacy, science communication

Introduction

The advent of the United Nations Decade of Ocean Science (2021-2030) has sparked global interest and an increased focus on the development of innovative solutions to pressing ocean challenges. Actions within the Ocean Decade aim to address human-induced impacts affecting the world's oceans such as climate change, ocean acidification, coral bleaching, and overfishing (Claudet *et al.*, 2020). The successful implementation of these anticipated actions requires collective action and uptake across a diverse non-scientific stakeholder spectrum which ranges from local coastal communities to policy makers (Jefferson *et al.*, 2021). Incorporating these multiple stakeholders to promote Ocean Decade priorities and targets requires added emphasis on fostering effective communication

to ensure increased knowledge sharing for decision making, behaviour change, and sustainable ocean resource use (Paterson *et al.*, 2020).

In Kenya, the focus on SDG 14 has been amplified by the increasing attention on achieving a sustainable blue economy. Several towns and counties along Kenya's coastline are heavily reliant on the productivity and health of the ocean and are significant contributors to the nation's economy through revenue generating industries such as fisheries, maritime shipping, and tourism (Rasowo *et al.*, 2020; Muigua, 2018). Sustainably leveraging these marine-based economic sectors to advance Kenya's Blue Economy requires integrating science-based measures that utilise inclusive societal approaches to

ocean conservation (Okafor-Yarwood, *et al.*, 2020). The authors recognize that effective uptake of science-driven information for sustainable development agendas by the public and private sector calls for effective knowledge sharing and dissemination of scientific findings to the users of marine and coastal resources.

Current forms of communicating science using scientific publications, policy briefs and contemporary media have a limited reach and low impact on the behaviours of non-academic and non-scientific audiences (Guest *et al.*, 2015; Wilson *et al.*, 2016). This gap in communicating science to non-scientific communities can create obstructions in collaborative decision-making processes closely associated with ocean governance (Kopke *et al.*, 2019). Science communication approaches can be innovatively and contextually curated to address specific outcomes such as enhancing stakeholder engagement in decision making for coastal resource management (Cooke *et al.*, 2017; Garcia and Cater, 2022). Strengthening stakeholder engagement in marine conservation efforts has been

linked to communication strategies which emphasise cultural connections and human values (Cvitanovic *et al.*, 2015; Chambers *et al.*, 2019). One such avenue that is intrinsically interconnected with these ideals is the creative arts sector. Art can uniquely and expansively communicate and connect scientific findings to human values and emotions therefore motivating behavioural change, supporting evidence-based science and enhancing capacities for tackling challenges associated with coastal and marine resource use (Worm *et al.*, 2021; Santoro *et al.*, 2017; Kendall-Bar *et al.*, 2021).

Successful efforts in utilising visual art for various environmental awareness campaigns over the years reveal the capacity the arts hold as a tool for enhancing public involvement with conservation actions (Hicks and King, 2007). This success is attributed to the nature of art itself; its ability to trigger emotive and intuitive responses in the human mind (Hicks and King, 2007; Lesen *et al.*, 2016; Savoie, 2022). Ocean literacy, which emphasises the necessity for generating awareness and understanding of oceanic ecosystems,

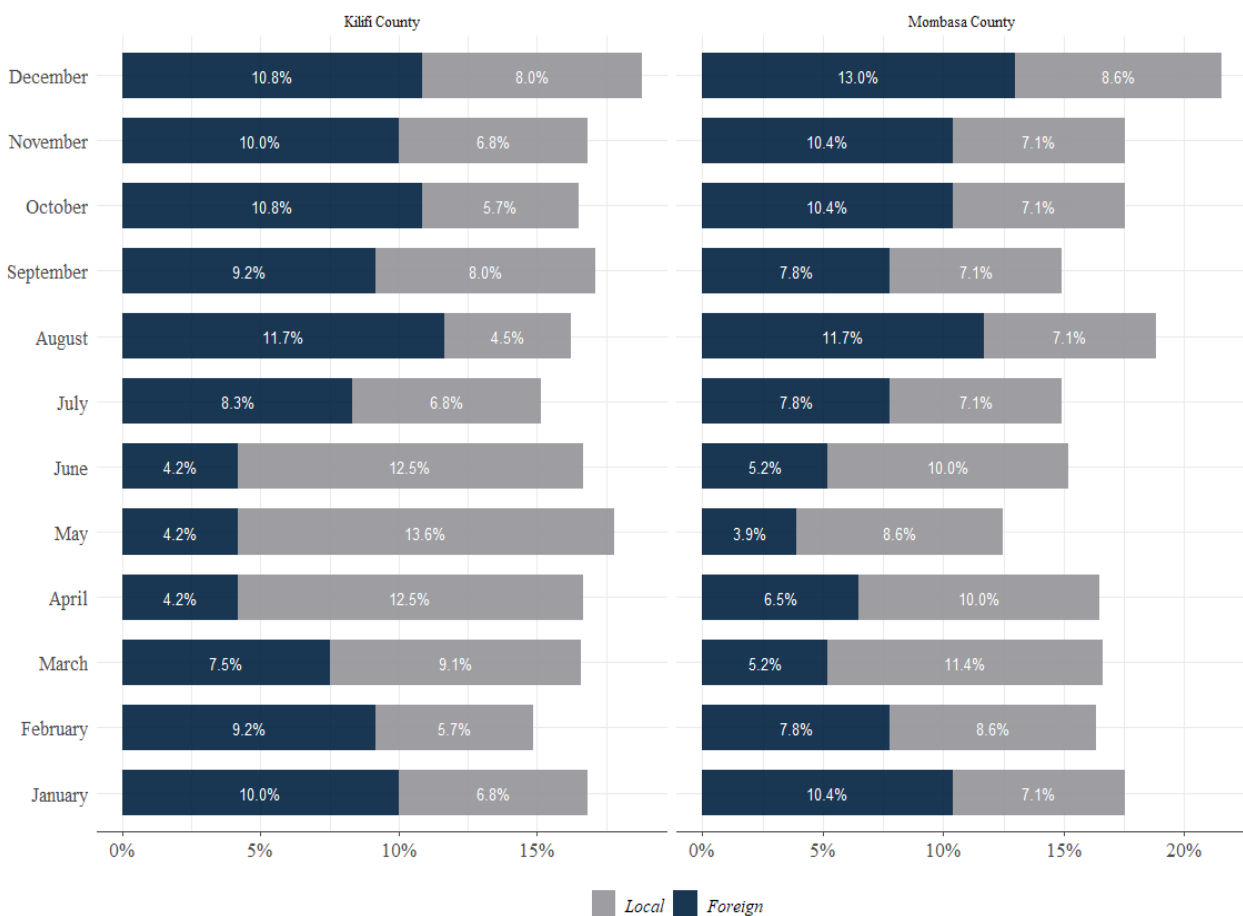


Figure 1. Artist description of local and foreign buyers of artwork per month (pre-COVID-19).

has also been coupled with arts-based approaches in advancing the accessibility of ocean knowledge to the public (Worm *et al.*, 2021).

In Kenya, the coastal visual art sector has operated since the colonial era and is an industry that is still largely informal with historical linkages to the tourism industry (Kasfir, 2004; Mahoney, 2012). Kenyan coastal visual artists are based in towns and cities adjacent to the ocean and are well situated in easy-to-access locations that can be used to convey ocean-based messaging. Nonetheless, the scope of Kenya's coastal visual artists and the avenues for their inclusion into ocean science communication remains unexplored.

This pilot study was developed to examine the role coastal visual artists in Kenya play in fostering the understanding of the ocean and marine life through their art. The study sought to enhance the understanding of (1) the demographics of the coastal artist population, (2) their level of awareness of ecological and ocean matters, and (3) possibilities of the integration of their art into ocean science communication.

The study also attempted to further understand how locally landed fish species like billfish are understood and represented by coastal visual artists. Specifically, the drivers were explored behind art production with a focus on billfish, a renowned migratory fish species especially in sport and recreational fisheries that is landed along Kenya's coast (Kadagi *et al.*, 2011). Due to their legendary charismatic nature, agility and speed, billfish have a history of strongly influencing ocean cultures across the globe (Ulanski, 2013). The marlin, a billfish species, features prominently in Ernest Hemingway's famous allegory of the *Old Man and the Sea*, which revolves around strong connections between a fisherman, a billfish, and relationships with nature through the sea (Alexis *et al.*, 2014). Previous studies linked to assessing pro-environmental behaviour have utilised a flagship species that fits in local contexts as avenues to engage with surrounding communities for conservation efforts (Bowen-Jones and Entwistle, 2002; Senzaki *et al.*, 2017). Thus, this study used familiarity with billfish as a topical entry point to investigate the perceptions of environmental and ocean stewardship for visual artists in Kenya. The choice of billfish reflects the use of a charismatic marine fisheries species in ocean art which has the potential to transform ocean literacy, a critical component for the Ocean Decade and promoting sustainable blue economy both in Kenya and the Western Indian Ocean (WIO).

Materials and methods

Site selection

This study focused on Mombasa and Kilifi Counties which are situated along the Kenyan coast (Fig. 2). Within the two counties, the specific study sites were public locations where there were popular art markets and artists present. In Mombasa County, the artist survey covered the Old Town area, Akamba handicraft market, Bombolulu workshop, art vendors outside Fort Jesus, Jomo Kenyatta (Pirates) and Voyager public beaches, Swahili Pot, Swahili Cultural Centre and Kibarani. In Kilifi County, artists were surveyed along Watamu Beach, the Gede-Watamu roadside, in Malindi art market and Kilifi town.

Methods

The artist survey was undertaken from 24th May to 16th June 2021 in the counties of Mombasa and Kilifi, Kenya. The specific study sites were locations where there were artists and art markets. A mixed methods approach was used and obtained (1) quantitative data from questionnaires, and (2) qualitative data and insights from focus group discussions.

To gain an introductory understanding of the dynamics of the Kenyan coastal visual artist population and sector, a questionnaire was used as the primary survey tool to guide inquiry into the area of interest (Milena *et al.*, 2008; Showkat and Parveen, 2017; Kabir, 2016). The surveys were carried out with the artists at their respective point of sale and the questionnaire was sequenced to understand the artists demographics; the content of art that artists had on display; the artists' familiarity with billfish and their ocean awareness; and the drivers of their art production (Glithero and Zandvliet, 2021). The coastal visual artist population in Kenya has not been the primary focus of prior research and as such, a defined sample population is not yet known. For this reason, this study employed the purposive sampling method whereby respondents were selected based on the artist information available (Neetij and Thapa, 2015).

The study was complemented by a series of focus group discussions (FGDs) which were held with the same artists whom were engaged in the questionnaire data collection. The guiding questions in the FGDs were thematically categorised as: interactions with the ocean, awareness of human impact on the ocean, current ocean knowledge, and ocean art market information. The purpose of the FGDs was to interrogate social and cultural issues that may not have been captured in the questionnaire.

Data collection and analysis

Data from administering the questionnaire was collected digitally via Google Forms on the researchers' phones or on the artists' personal phones. For areas where internet connectivity was limited, printed copies of the questionnaire were filled by the artists and later keyed into Google Forms by the researchers. Data from the questionnaires was analysed using R software (version 4.1.3). Responses to the themed questions in the FGDs were sequentially recorded with

limited the number of artists that could be accessed. A total of five FGDs were held.

In Mombasa County, a majority of the artists were male and with an average age of 45 years old. In Kilifi, male artists were a majority and were younger than their Mombasa counterparts with an average age of 34 years. In both counties, the female artists were notably fewer and made up approximately 10 % of the artists identified and interviewed in the study.

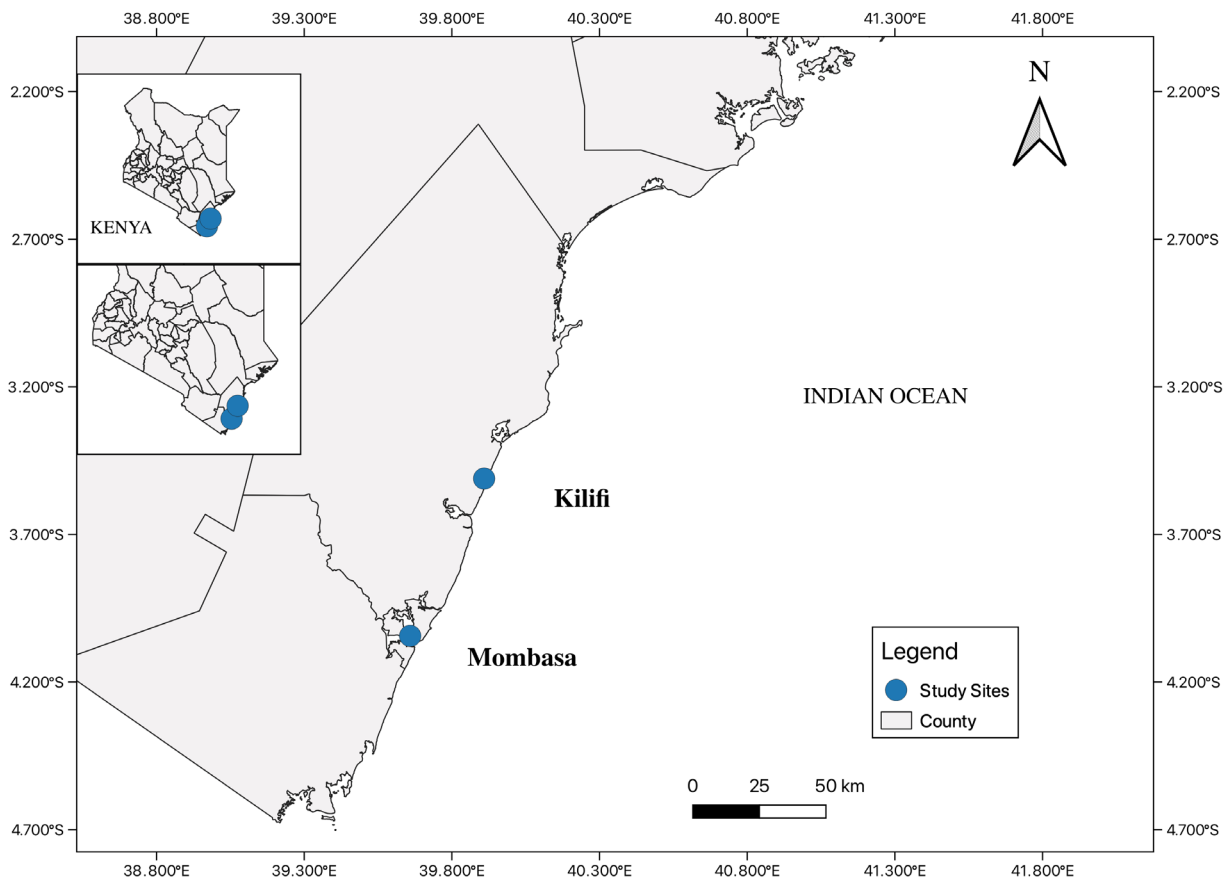


Figure 2. Map of Kenya alongside a close-up of the study sites in Kilifi and Mombasa Counties.

respondent's consent, noted down according to main statements made, and keyed into an Excel spreadsheet. These data were then coded to extract categories for each specific question. This was followed by refining these categories into overarching themes that highlighted additional information.

Results

Demographics of the art community

A total of 29 artists were surveyed in the two counties of Mombasa (14) and Kilifi (15). The study was conducted during the COVID-19 pandemic period which

Less than 25 % of the respondents in both Mombasa and Kilifi Counties had received formal art education. One female participant in Mombasa County had prior art training accounting for 8.3 % of the total number of participants while the majority of the artists (83.3 %) who were male had no formal art training. Two male artists in Kilifi counties had received art education accounting to 14.3 % whereas the majority (78.6 %) of the artists who were male, and one female artist (7.1 %) did not have any formal art training. The artists who did not receive formal training explained that they had developed their artistic skills

through observation, apprenticeship, and individual creative expression.

Twenty eight out of 29 of the artists encountered highlighted their dependency on the art industry for their livelihood. A majority of them in both Kilifi (86.7 %) and Mombasa (92.3 %) noted that the art sector was their primary occupation. More than half of the respondents completely depended on art as their source of livelihood (60.7 %) while 21.4 % were very reliant on art income, whereas only 17.9 % moderately relied on art as their source of income.

Content of art on display

Twenty-eight of the artists interviewed provided an affirmative response to the production of nature-based art. When specifically asked about the visual content of the art they made, more than half of the artists revealed that they produced both land and ocean themed artwork. In Mombasa, eight out of 13 (61.5 %) artists indicated that they produce art with both land and ocean themes. Only four (30.8 %) of the Mombasa artists noted that they produced purely land based art and only one (7.7 %) of them solely focused on oceanic features. In Kilifi, most (93.3 %) of the artists reported to depict both land and ocean features in their art while only one artist (6.7 %) primarily portrayed only oceanic themes in his artwork.

Familiarity with billfish and ocean awareness of artists

In Mombasa County, 14.3% of the artists were extremely familiar with billfish and 28.6 % were slightly familiar. In Kilifi County, 41.7% of the artists were extremely familiar with billfish and 33.3 % were slightly familiar with this group of fish.

When asked about their awareness of the ocean and its systems, 53.8 % of the Mombasa artists and 20 % of the Kilifi artists reported that they were very aware. Most of the Kilifi artists (40 %) cited that they were slightly aware. In terms of awareness of their counterparts (other artists), the respondents in both counties indicated a slight awareness. In Mombasa County, the artists believe that 38.5 % of the total artist population was slightly aware of the ecosystems while in Kilifi County, the level of awareness of other artists was cited to be 47 %.

Drivers of art production

The majority of the artists from both Kilifi and Mombasa counties reiterated that their production of art is primarily driven by market demands and the opportunity

to make sales. 86.7 % of the artists in Kilifi County and 64.7 % of the Mombasa County based artists reported that their main buyers were foreigners/international tourists. Local buyers were fewer; 35.3 % in Mombasa and 13.3 % in Kilifi. All the artists interviewed noted that their sales were affected by the COVID-19 pandemic.

Additionally, more than 60 % of the artists interviewed in both Kilifi and Mombasa counties reported that their nature-based artwork portraying terrestrial features were more popular with buyers compared to ocean-based art. Kilifi County recorded the highest foreign demand for artwork in the month of August, followed by the months of December and October respectively, while the lowest demand was in the months of April, May, and June. The highest local demand in Kilifi was in the month of May followed by the months of April and June respectively, with the lowest demand in the months of August, October, and February. The highest local demand for artwork in Mombasa County was in the month of March, followed by the months of April and June respectively, with the lowest demand recorded in January and July through November. The highest foreign demand for arts was in the month of December followed by August with the lowest demand recorded in the month of May (Fig.1).

Focus Group Discussions

The FGDs were focused on thematic aspects which included the interactions of the artists with the ocean, the artists' awareness of human impact on the ocean, the artists' current ocean knowledge, and additional information the artists considered significant about the ocean art market (Table S1).

The artists indicated that they interacted relatively often with the ocean through various activities such as fishing, selling art on the beach, and collection of material such as driftwood for art pieces from the beach. They also demonstrated an awareness of anthropogenic activities on the ocean by highlighting challenges such as plastic and chemical pollution, illegal fishing, and climate change, among others. Regarding the depiction of these trends of human activity in their artwork, some noted that the use of recycled material and subtle colour schemes captured some of these themes.

The artists also shared that the sizes of fish that are part of their art pieces are determined by the actual sizes of the fish they encounter. Billfish was the focal species to determine ocean knowledge for this study,

and when asked about billfish, some artists noted that billfish are iconic for their large sizes, have been consumed for food, and that they have interacted with sport fishers who commissioned them to produce billfish sculptures.

Further information from the FGDs highlighted that ocean art does not sell as fast as other themes, as evidenced by one artist who had a marine piece in Malindi on display for over a year. Aside from market demand, the artists in both counties during the FGDs indicated that watching oceanic films, admiring aquatic life, having experiences around the marine realm, and wanting to create awareness were other motivations for creating ocean art.

Most of the artists in the FGDs in Mombasa were aware of challenges affecting the ocean such as pollution, climate change, and oil spills and felt that this may be linked to the urban nature and higher population of Mombasa County.

The artists explained that they would be motivated to create more ocean-based art if they had more knowledge and understanding of it as well as having buyers for the ocean art. They expressed interest in ocean art but noted that one of the main challenges in its production is fewer sales of ocean art in comparison to terrestrial-themed art.

The few female respondents highlighted that they face challenges as artists which include the outdoor nature of the art production process in locations without sanitary amenities and responsibilities that come with gender roles in the family context.

The artists explained that the majority of them began seeking other livelihood generating business streams during the COVID – 19 pandemic due to the drop in foreign buyers who they attributed to be the main driver of the art industry. In the FGDs, the artists reiterated that low tourism numbers during the pandemic greatly affected their sales. They further explained that the increase in domestic tourism during the pandemic resulted in a notable increase of local art buyers.

During the FGD with the artists in Watamu, the artists expressed that they would like to find out how to unite as artists and work as a group to access better opportunities and have better resource management. The artists in Kilifi town were organised into a Community Based Organisation (CBO). During one

of the FGDs in Mombasa, a group of artists explained that although they had run a vibrant group, membership and activities significantly declined during the COVID-19 pandemic.

Discussion

This first-time pilot study aimed at exploring the potential roles that coastal visual artists could play in ocean science communication. This was done through gaining a baseline understanding of the coastal visual art industry characteristics and drivers in two coastal counties in Kenya. The findings from this inquiry provide a starting point to map out possible collaborative pathways in the creation of science communication outputs between ocean scientists and coastal artists. Owing to the charismatic nature of billfish species and their significance as a food source, this study used familiarity with the species as a topical focal point to investigate the perceptions of environmental and ocean stewardship for visual artists in Kenya.

These findings based on the artists encountered convey that the visual art industry is dominated by males and that apprenticeship is the main method of growth in the industry particularly in the recruitment of youth into the sector. It is envisioned that the use of artwork for science communication would present an opportunity for the inclusion of more youth across genders through formal training workshops which can be matched with apprenticeship from older artists. It is also noted that the inclusion of more female artists in this sector may be made possible through the creation of more conducive operating environments that include proper sanitary amenities to support women working in beach-based art studios.

The majority of the artists encountered were engaged in art production as their primary source of livelihood. The artists' awareness of the ocean and marine ecosystems was present, however art is a business, and like any other business, the artists produce the type of art that sells. They placed emphasis on market demands as the determinant for the type and content of art they produce, and they therefore focussed on the production of terrestrial art since it sells. Responses given by some of the artists revealed that the active creation of demand for ocean art would contribute to the promotion of the production of ocean-centric art. This is considered to be an opportunity for the creation of market demand by the marine scientific community through the incorporation of the creative arts in campaigns and workshops to disseminate scientific

findings to a non-scientific and non-academic audience. This would be an effective method in promoting effective ocean science communication whilst improving the livelihoods of coastal artists (Lesen *et al.*, 2016).

The increase in domestic tourism during the COVID-19 pandemic resulted in a notable increase of local art buyers suggesting that there is a growing local art market within the country that is purchasing nature-based artwork. This market can be aligned to the purchase of ocean art through appropriate messaging and visibility of this type of artwork.

In terrestrial art, elephants and other animals are seen as representatives of the living organisms of the terrestrial environment. For the ocean, billfish were selected as a representative of an organism living in the ocean and it was found that the artists encountered in this study had a clear awareness of billfish, ocean ecosystems, and the environmental challenges affecting ocean health. Several artists were also fishers, and their knowledge came from individual experiences with the ocean and observations they had made. Herein lies an opportunity to tap into the observations made by artists who are fishers to show changes in the ocean and creatures that they encounter while at sea. This awareness and knowledge sharing of ocean resources may also be used to propel the FAO -Blue Growth Initiative (BGI) for sustainably developing fisheries and aquaculture.

In Kenya, Kilifi County is one of the major billfish fishing zones contributing to the country's prominence in big game fishing dating back to the 1950s (Kadagi *et al.*, 2020). The localization of sport fishing in Kilifi contributes to the higher familiarity with billfish among the artists in Kilifi compared to Mombasa. The artists in Kilifi County have captured the unique opportunity of creating fibreglass sculpture models from the catches made by sport fishers thus enhancing their livelihoods.

Kelly *et al.* (2018) rightly observed that marine scientists should not assume that the non-academic community share their concerns about marine environments and threats that they face. They further indicate that the scientific method of research communication through scientific papers is ineffective as the readability of papers has declined (Kelly *et al.*, 2018). Dupont *et al.* (2017) indicate that the scientific process does not end until the science is communicated and that scientists need to become effective communicators by

using simple messages, and narrative stories that can motivate environmental actions. The appreciation of nature has been long acknowledged to be understood by children, as highlighted in Woodsworth's Ode to Immortality (1820), and by artists; thus art is a medium in which science may be perfectly explained and understood (van Boeckel, 2013).

The findings of the current study provide opportunities for art to be used as a creative outlet for science communication. The ability of the arts to evoke emotions and propel self-reflection as well as the will to take actions (Dupont *et al.*, 2017) forms a key consideration for this linkage of creative arts to science. This was noted in a survey conducted for public schools in Canada where the knowledge and value of the ocean was predetermined by the exposure to ocean related activities and hence the interest in the ocean resources (Guest *et al.*, 2015).

As advocated by Chambers *et al.* (2019), the creation of a community of practice in Kenya and across the Western Indian Ocean region through the creation of a network of scientists and artists that can work together across disciplines, is here again recommended. They would need to share knowledge and expertise in a collaborative manner to create innovative messaging that can drive the creative sharing of scientific information (Garcia and Cater, 2022). As this recommendation is made, the challenges in evaluating the impact of such trans-disciplinary collaborations is recognised (Paterson *et al.*, 2020). It is also important to consider that there is a need for the use of a variety of media platforms which bring inclusivity as they allow more stakeholders to be part of the conversation (Paterson *et al.*, 2020).

Furthermore, consideration has to be given to the different expectations of the artists and scientists due to differences of mind set, training, communication styles, values and societal status (Paterson *et al.*, 2020). Despite these challenges, marine scientists in the region are urged to consider actively engaging and collaborating with coastal artists in the artistic visualisation and co-production of key messaging they would like to convey to specific audiences such as policy makers, the youth, and coastal communities (Lesen *et al.*, 2016).

Artist and ocean scientist workshop residencies are recommended approaches worth exploring for the co-designing and development of art-centred outputs

for ocean science communication that connect ocean ecosystem concepts to emotive-linked art (Jung *et al.*, 2022; van Boeckel, 2013). Such collaborative engagements can further consider making the outputs accessible to local markets through avenues such as affordable pricing, and sculptures and murals in public spaces. Different age sets ranging from children to the old can also be engaged in the artistic methodologies for qualitative oceanic research. Further possibilities for multidisciplinary and collaborative engagements between cross-disciplinary artists at all levels and ocean scientists include holding ocean art workshops and competitions for students such as the World Oceans Day Art Contest in Chumbe Island, Tanzania and the development of projects such as the South African based lalélauLwandle project that created community ocean-focused art using theatre (van Bresse *et al.*, 2006).

Ongoing ocean literacy platforms within the Kenyan context surround marine thematic campaigns for learners. In addition, recent innovative approaches such as Science Cafes have been facilitated in Mombasa, Kenya, which are conversations between ocean scientists, artists and the public (Uku pers. comm.; IOC-UNESCO, 2022). It is further recommended that attention be given to the creation and adoption of programmes and curricula aimed at inculcating art appreciation and marine species science for the young through exciting ocean-themed activities such as excursions, song, dance, and storytelling. A growing focus on such engagements as a pathway to fostering artist inclusion in the science communication of the region is envisioned.

Conclusions

To propel the marine community of practice, it is important to define a shared vision, develop a clear strategy of engagement between artists and scientists as well as diverse stakeholders- which demonstrates the benefits of the collaboration and provides tools to evaluate progress in the uptake of co-designed messages (Heritage and Golfomitsou, 2016; Santoro *et al.*, 2018; Pocock *et al.*, 2019).

The findings from this study underscore the use of various forms of artistic expression to promote citizen engagement with environmental issues. The significance of marine art which could provide alternative sources of income for communities and accelerate collective actions for sustainable resource use and management is also highlighted. The integration of art and

sciences has the benefits of interdisciplinary collaborations which can contribute towards making scientific knowledge accessible to the public and local communities for the creation of spaces that support visualisation of scientific issues. Finally, the consolidation of science communication efforts with coastal visual art focused on iconic marine species like billfish holds the promise of fruitful possibilities to advance easily understood messages related to the marine realm and environmental issues that will further support the Sustainable Blue Economy dialogue and policy development processes in Kenya and the WIO (Lesen *et al.*, 2016).

Acknowledgements

This project was implemented by a research team from the Kenya Marine and Fisheries Research Institute with funding from The Pew Project grant no Contract ID 00033947 awarded to Dr Nina Wambiji to work on strengthening data collection on billfish in four countries by The Pew Charitable Trusts to whom we are incredibly grateful. We are thankful to all our respondents (artists, art vendors, and art dealers) for insights into their unique world of art and its connection to the ocean. Support from the KMFRI management for the advancement of the Ocean Literacy dialogue is much appreciated. NK thanks the World Wildlife Fund-USA. The authors also wish to thank the BILLFISH–WIO MASMA project (Grant No: MASMA/OP/2019/01) funded by Western Indian Ocean Marine Science Association (WIOMSA). Both the Pew Project and the BILLFISH-WIO project provided technical support for data collection, study design, and analysis on billfish research which spanned across 10 countries in the Western Indian Ocean.

References

- Alexis TA, Lanior AE, Theophilus KA (2014) Overcoming the biological trap: A study of Ernest Hemingway's 'A farewell to arms' and 'The old man and the sea. *Advances in Language and Literary Studies* 5 (2): 166-170 [doi: 10.7575/aiac.all.v.5n.2p.166.]
- Bowen-Jones E, Entwistle A (2002) Identifying appropriate flagship species: The importance of culture and local contexts. *Oryx* 36 (2): 189-195 [doi: http://dx.doi.org/10.1017/S0030605302000261]
- Chambers R, Hart N, Ranger S, Birney A, Angheloiu C, Loring J, Williams S, Hooper L (2019) The marine CoLAB: Taking a collaborative, values-based approach to connect people to the ocean. *Frontiers in Marine Science* 6: 619 [doi: 10.3389/fmars.2019.00619]
- Claudet J, Bopp L, Cheung WW, Devillers R, Escobar-Briónes E, Haugan P, Heymans JJ, Masson-Delmotte V,

- Matz-Lück N, Miloslavich P, Mullineaux L (2020) A roadmap for using the UN decade of ocean science for sustainable development in support of science, policy, and action. *One Earth* 2: 34-42 [doi: 10.1016/j.oneear.2019.10.012]
- Cooke SJ, Gallagher AJ, Sopinka NM, Nguyen VM, Skubel RA, Hammerschlag N, Boon S, Young N, Danylchuk AJ (2017) Considerations for effective science communication. *FACETS* 2: 233-248 [doi: 10.1139/facets-2016-0055]
- Cvitanovic C, Hobday AJ, van Kerkhoff L, Wilson SK, Dobbs K, Marshall NA (2015) Improving knowledge exchange among scientists and decision-makers to facilitate the adaptive governance of marine resources: a review of knowledge and research needs. *Ocean & Coastal Management* 112: 25-35 [doi: https://doi.org/10.1016/j.ocecoaman.2015.05.002]
- Dupont S, Fauville G (2017) Ocean literacy as a key toward sustainable development and ocean governance. *Handbook on the economics and management of sustainable oceans* 26: 519-537 [doi: https://doi.org/10.4337/9781786430724.00037]
- Garcia O, Cater C (2022) Life below water; challenges for tourism partnerships in achieving ocean literacy. *Journal of Sustainable Tourism* 30 (10): 2428-2447 [doi: https://doi.org/10.1080/09669582.2020.1850747]
- Glithero LD, Zandvliet DB (2021) Evaluating ocean perceptions and ocean values: the Canadian ocean literacy survey. *Canadian Journal of Environmental Education (CJEE)* 24 (1): 216-232
- Guest H, Lotze HK, Wallace D (2015) Youth and the sea: Ocean literacy in Nova Scotia, Canada. *Marine Policy* 58: 98-107 [doi: https://doi.org/10.1016/j.marpol.2015.04.007]
- Heritage A, Golfomitsou S (2015) Conservation science: Reflections and future perspectives *Studies in Conservation* 60 [doi:10.1080/00393630.2015.1117858]
- Hicks LE, King RJH (2007) Confronting environmental collapse: visual culture, art education, and environmental responsibility. *Studies in Art Education* 48: 4: 332-335 [doi: 10.1080/00393541.2007.11650111]
- IOC-UNESCO (2022) A new blue curriculum – A toolkit for policy-makers. *IOC Manuals and Guides* 90. UNESCO, Paris, France. 127 pp [doi: http://dx.doi.org/10.25607/OBP-1882]
- Jefferson R, McKinley E, Griffin H, Nimmo A, Fletcher S (2021) Public perceptions of the ocean: lessons ocean: lessons for marine conservation from conservation from a global research review. *Front Review. Frontiers in Marine Science* 8: 711245 [doi: 10.3389/fmars.2021.711245]
- Jung J, Berardi A, Juniper K, Mistry J, Owens D (2022) Developing empathy and embracing multiple ways of knowing about ocean science through a participatory art process. *Authorea Preprints*. pp 1-10 [doi: 10.1002/essoar.10509459.1]
- Kabir SMS (2016) Basic guidelines for research. An introductory approach for all disciplines 4 (2): 168-180
- Kadagi NI, Harris T, Conway N (2011) East Africa billfish conservation and research: marlin, sailfish and swordfish mark-recapture field studies. *IOTC, WPB* 09-10: 1-12 [doi: 10.13140/RG.2.2.36027.98083]
- Kadagi NI, Wambiji N, Swisher ME (2020) Potential for conflicts in recreational and artisanal billfish fisheries on the coast of Kenya. *Marine Policy* 117: 1-12 [doi: https://doi.org/10.1016/j.marpol.2020.103960]
- Kasfir SL (2004) Tourist aesthetics in the global flow: orientalism and “warrior theatre” on the Swahili coast. *Visual Anthropology* 17 (3-4): 319-343 [doi: 10.1080/089460490468171]
- Kelly R, Fleming A, Pecl GT (2018) Social licence for marine conservation science. *Frontiers in Marine Science* 5: 414 [doi: 10.3389/fmars.2018.00414].
- Kendall-Bar J, Kendall-Bar N, Forbes AG, McDonald G, Ponganis PJ, Williams C, Horning M, Hindle A, Klinck H, Beltran RS, Friedlaender AS (2021) Visualizing life in the deep: a creative pipeline for data-driven animations to facilitate marine mammal research, outreach, and conservation. *Institute of Electrical and Electronics Engineers*. pp 1-10 [doi: 10.1109/VISAP52981.2021.00007]
- Kopke K, Black J, Dozier A (2019) Stepping out of the ivory tower for ocean literacy. *Frontiers in Marine Science* 6: 60 [doi: 10.3389/fmars.2019.00060]
- Lesen AE, Rogan A, Blum MJ (2016) Science communication through art: objectives, challenges, and outcomes. *Trends in Ecology & Evolution* 31 (9): 657-660 [doi: https://doi.org/10.1016/j.tree.2016.06.004]
- Mahoney D (2012) Changing strategies in marketing Kenya’s tourist art: from ethnic brands to fair trade labels. *African Studies Review* 55 (1): 161-190 [doi: https://doi.org/10.1353/arw.2012.0013]
- Milena ZR, Dainora G, Alin S (2008) Qualitative research methods: a comparison between focus-group and in-depth interview. *Annals of Faculty of Economics* 4: 1279-1283
- Muigua K (2018) Harnessing the blue economy: Challenges and opportunities for Kenya. *Journal of Conflict Management and Sustainable Development*: 1-6
- Neetij R, Thapa B (2015) A study on purposive sampling method in research. *Kathmandu School of Law* 5: 1-12

- Okafor-Yarwood I, Kadagi NI, Miranda N F, Uku J, Elegbede IO, Adewumi IJ (2020) The blue economy–cultural livelihood–ecosystem conservation triangle: the African experience. *Frontiers in Marine Science* 7 (586): 1-18 [doi: 10.3389/fmars.2020.00586]
- Paterson SK, Le Tissier M, Whyte H, Robinson LB, Thielking K, Ingram M, McCord J (2020) Examining the potential of art-science collaborations in the Anthropocene: a case study of catching a wave. *Frontiers in Marine Science* 7: 340 [doi: 10.3389/fmars.2020.00340]
- Pocock MJ, Roy HE, August T, Kuria A, Barasa F, Bett J, Githiru M, Kairo J, Kimani J, Kinuthia W, Kissui B (2019) Developing the global potential of citizen science: assessing opportunities that benefit people, society and the environment in East Africa. *Journal of Applied Ecology* 56 (2): 274-281 [doi: https://doi.org/10.1111/1365-2664.13279]
- Rasowo JO, Orina P, Nyonje B, Awuor S, Olendi R (2020) Harnessing Kenya's blue economy: prospects and challenges. *Journal of the Indian Ocean Region*. 16 (3): 292-316 [doi: 110.1080/19480881.2020.1825199]
- Santoro F, Santin S, Scowcroft G, Fauville G, Tuddenham P (2018) Ocean literacy for all - a toolkit. *IOC Manuals and Guides, 80 Revised (IOC/2017/MG/80rev.)*. IOC/UNESCO, Paris, France, and UNESCO, Venice. 136 pp [doi: http://dx.doi.org/10.25607/OBP-1554]
- Savoie G (2022) Turning the tide: crafting a collective narrative of the ocean through participatory media. *Journal Science Communication* 21 (02) [doi: https://doi.org/10.22323/2.21020401]
- Senzaki M, Yamaura Y, Shoji Y, Kubo T, Nakamura F (2017) Citizens promote the conservation of flagship species more than ecosystem services in wetland restoration. *Biological Conservation* 214: 1-5 [doi: https://doi.org/10.1016/j.biocon.2017.07.025]
- Showkat N, Parveen H (2017) In-depth interview. *Media and Communication Studies*. e-PG Pathshala (UGC & MHRD). pp 1-10
- Ulanski S (2013) *The billfish story: Swordfish, sailfish, marlin, and other gladiators of the sea (Vol. 3)*. University of Georgia Press. 195 pp
- van Bresseem, MF, Alfaro-Shigueto J, Geysen K, Onton K, Vega D, Chavez-Lisambart L, Van Waerebeek K (2006) Dolphins and children: a blueprint for marine environmental education in Peru. *Applied Environmental Education and Communication* 5 (3): 183-191 [doi: https://doi.org/10.1080/15330150600914719]
- van Boeckel J (2013) *At the heart of art and earth: An exploration of practices in arts-based environmental education*. Aalto University publication series. Doctoral Dissertations 73/2013. 420 pp [doi: https://doi.org/10.1080/13504622.2014.959474]
- Wilson MJ, Ramey TL, Donaldson MR, Germain RR, Perkin EK (2016) Communicating science: sending the right message to the right audience. *FACETS* 1 (1): 127-137 [doi:10.1139/facets-2016-0015]
- Worm B, Elliff C, Fonseca JG, Gell FR, Serra-Gonçalves C, Helder NK, Murray K, Peckham H, Prelovec L, Sink K (2021) Making ocean literacy inclusive and accessible. *Ethics in Science and Environmental Politics* 21: 1-9 [doi: https://doi.org/10.3354/esep00196]

Supplementary material



Figure S.1. An artist outside their shop in Kilifi County, Kenya.

Table S1. Focus Group Discussion Responses

Questions	Thematic Area	Examples of responses
1. Time spent around ocean	Interactions with the ocean	<ul style="list-style-type: none"> • Always, when fishing • Often
2. Reasons for being around ocean	Interactions with the ocean	<ul style="list-style-type: none"> • Local tourism • To collect ocean resources such as driftwood as material for art pieces • Point of sale is at the beach • Part of a fishing crew
3. Challenges facing the ocean	Awareness of human impact on ocean	<ul style="list-style-type: none"> • Coastal development moving onto beach taking over turtle nesting sites • Plastic pollution • Chemical pollution • Declining species of starfish • Illegal fishing • Climate change • Oil spills
4. Does your art capture trends?	Awareness of human impact on ocean	<ul style="list-style-type: none"> • Use of recycled and eco-friendly material such as bottles, wood, soda cans • Yes, but subtly using colours • They struggle selling themed art outside of an exhibition context • Designs do not capture trends
5. Knowledge on billfish	Current ocean knowledge	<ul style="list-style-type: none"> • A fish that can grow bigger than a man • Billfish has been eaten before • Sport fishers measure billfish and commission sculptured moulds made of fibreglass
6. Does the size of fish in art change?	Awareness of human impact on ocean	<ul style="list-style-type: none"> • They draw the size of the fish as they see them. Tuna and billfish are depicted to be big because that is their actual size. Sardines are small because that is how the artists see them • Yes, it does. Depending on the scene, location, and environment of artists
7. Additional information on ocean market	Ocean art	<ul style="list-style-type: none"> • There is no demand for environmentally themed art unless pieces are commissioned • Artists need awareness on what materials they are allowed to collect from the ocean for their art