



Philological investigation of specialized discourse and cultural variations across global marine science terminology

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Abstract

The degrees of discourse within marine science and terminology have evolved. Global marine studies illustrate to what degree ethnolinguistics and culture align with different zones of science. The current research focuses on the history of culture and sciences to describe the marine discourse traditions of other cultures. Study the marine science terminology of distinct cultures and the marine terminology of English, Japanese, Classical and Medieval Tamil, Māori, Icelandic, and Latin. The study illustrates that, with the immersion of classical and Latin Greek into the craft of marine science, a discernible trend emerges in which an indigenous culture becomes the custodian of a varied and enriched marine discourse. Medieval ethnomedical and marine discourse terminology is elucidated to enrich global marine terminology. The study explains ethnolinguistic creativity observed across cultures to illustrate marine studies. The study supports the discourse patterns and culture of indigenous marine and ecological knowledge, as well as the discourse language of marine science globally. This study also illustrates that marine lexicons are not simply words used in specialized discourse; instead, they are the result

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of significant cultural, historical, and linguistic factors that research and science are continually advancing.

Keywords: Marine science terminology, Philology, Cultural linguistics, Specialized scientific discourse, Etymology, Indigenous knowledge, Cross-cultural communication

Introduction

In studying the biological, physical, and ecological components of the global ocean, marine science is an expansive interdisciplinary field (Ayyappan and Ekambaram, 2025). A specialized marine vocabulary developed as the field grew, reflecting the description of aquatic organisms, oceanographic phenomena, and environmental relationships (Wu *et al.*, 2021; Amirante and Bagni, 2022). This marine and oceanographic vernacular is not uniformly global, as it contains a unique blend of the science and systems of diverse historical and cultural sea relationships (Carter and Tanaka, 2024). The ocean is a major contributor to the domains of human civilization, trade, food, cultural security, and systems of knowledge, and to the sea vocabulary shaping marine science today (Radhakrishnan and Chandrasekharan, 2025).

The study of the history of the English language (philology) enables a researcher to examine the history and development of a scientific term and the culture associated with it within the context of marine science (Sun, Liu and Xiong, 2021). Most of the terms used in marine science today come from the classical languages of Greek and Latin, which were used to write science and to communicate internationally. Words like plankton, hydrosphere, and echinoderm are examples of that classical language influence.

At the same time, many marine terms worldwide come from and are influenced by indigenous and local languages that reflect cultural knowledge, indigenous ecological relationships, and particular socio-ecosystem interactions within a region (Virani *et al.*, 2025). For centuries, coastal people of Japanese, Polynesian, Tamil, and Inuit languages have had a rich vocabulary to describe marine life and have been masters of navigation and of understanding ocean conditions.

The globalization of marine science has created a mixed bag of opportunities and challenges for the field's lexicon (Adewumi, 2021). The positive side is that the wealth of culturally diverse lexicons provides multiple perspectives and knowledge systems. The downside is that diverse cultural terminologies can create communication gaps in international collaborations, policy frameworks, and outreach communication. These gaps are addressed through the intersection of philological analyses that examine the disparate yet intertwined cultural and historical origins of vocabulary and the cultural significances that construct the framework of scientific communication (Li, 2022). Relations of this sort can be strengthened through diverse terminology, particularly in integrating Indigenous knowledge of marine systems and enhancing cross-cultural communication within global marine science communities.

Key contribution:

- This study illuminates the influence of different cultures on the naming of the ocean, marine species, and ecological processes, thus showing the interplay between language and traditional knowledge of the sea.
- This research provides an example of the understanding of the Multilinguality of marine science through the origins, evolution, and meanings of marine lexicon in English, Japanese, Tamil, Māori, and Icelandic.
- The results facilitate the identification of terminology and comprehension discrepancies, thereby enabling better cross-cultural collaboration and the collective integration of Indigenous marine knowledge into marine science.

Section I shows that marine science terminology is shaped by both scientific advancements and cultural influences, with a focus on how classical languages like Greek and Latin, alongside indigenous languages, have contributed to its development. Section II shows the historical roots of marine science terminology, emphasizing the influence of classical languages and the rich marine vocabularies of indigenous cultures, such as those in Polynesia, Japan, and South Asia. Section III shows the research approach, which includes etymological analysis, cross-cultural comparison, and discourse analysis to explore the evolution of marine terminology and its cultural contexts. Section IV shows that marine terminology is the product of historical, linguistic, and cultural factors, revealing that while classical languages

laid the foundation for scientific terms, indigenous languages provide valuable ecological insights, and cultural variations present both opportunities and challenges in global marine research. Section V (Conclusion) shows that marine science terminology is shaped by both historical and cultural influences, emphasizing the need for linguistic diversity to foster global collaboration and preserve ecological knowledge.

Literature Survey

The history of miscellaneous fields of science and, even more so, of science and linguistics in combination, has produced works on the history of the vocabulary of marine science. Most research indicates that much of the terminology in marine science derives from ancient languages such as Greek and Latin (Krupnik *et al.*, 2022). These languages had a systematic approach to naming sea creatures and describing phenomena related to the sea. The ancient literature emphasizes the classical roots as the foundation of a global scientific language that provided unambiguous communication across the globe and clear communication across scientific communities (Mentz, 2009).

The literature documenting native marine knowledge offers a very different lens through which to view the work (Mansoorian, Homayoun and Nasab, 2016). The work on communities in the Pacific Islands, such as Polynesia and New Zealand, shows that, through their close interactions with the sea, the languages of those communities developed specialized vocabulary related to the marine ecosystem. Their terminology concerning wind, sea currents, navigation, and aquatic systems

is very traditional and part of everyday life. This work shows that much indigenous terminology describes ecosystems and behaviors that are forgotten in contemporary science.

Other studies have examined the Asian marine lexicon, especially in areas with a long history of fishing and navigation. Japanese studies in the linguistics of the culture of fishing over centuries have produced elaborate systems of naming aspects of the oceans, their flora and fauna, and the sea's changing patterns and seasons. Some of these items eventually entered the worldwide scientific lexicon, illustrating how a local scientific vocabulary permeates other scientific thought.

South Asian coastal languages, particularly South Indian languages such as Tamil and Malayalam, have a rich marine lexicon, and this has been documented. Literary evidence from early civilizations along the coast describes in great detail the art of fishing, the species of fish, and the behavior of the sea. The studies suggest that the lexicons of ancient civilizations and their marine vocabularies were extensive, and these lexicons contain a great deal of ecological data that sheds light on the civilizations' marine culture and their relationship with the sea (Preiser *et al.*, 2021).

These studies, and others similarly comparative in the field of linguistics, point out that culture plays a significant role in the collection of marine vocabulary. For instance, the languages of the Nordic region contain a considerable number of historical words related to the sea, fishing, navigation, and marine conditions. These linguistic patterns suggest that these communities

had a long history of reliance on the sea, which, in turn, shows that words and culture move hand in hand with the environment (McAllister, 2025).

Recent discussions among scholars have highlighted the importance of the ways and manners in which various marine scientists and professionals engage with others worldwide in their fields of specialty – i.e., the unilingual focus (Begum *et al.*, 2022). In other disciplines, the unilingual focus of international communications often leads to inconsistent, uncoordinated, and hence, misaligned international collaborations and policy discussions, which, in the case of marine science, tend to have costly and lethal consequences. Therefore, scholars have promoted the necessity of philological studies to facilitate the comprehension of unilingual communications, as well as the integration of various forms of marine knowledge, comprising and/or ensconced in a culture, into modern scientific discourse.

Methodology

This research investigates the variation of marine science terminology cross-linguistically and cross-culturally from a qualitative research perspective. The methodology employs the discipline of historical linguistics, which studies the origin and development of specialized terms and the cultures that accompany them. By analyzing various sources of the language and contrasting the terms with those of other cultures, this research aims to understand the evolution of the lexicon of the sea.

The methodological approach begins with the etymological component.

Important terms and concepts in the marine sciences were identified, and their roots and trajectories traced. This examination uncovers the contributions of the primary ancient tongues, native words and phrases, and local varieties of

a language to the construction of the scientific lexicon. The examination also pertains to the so-called 'shifts' whereby a term assumes a different meaning in another linguistic sphere.

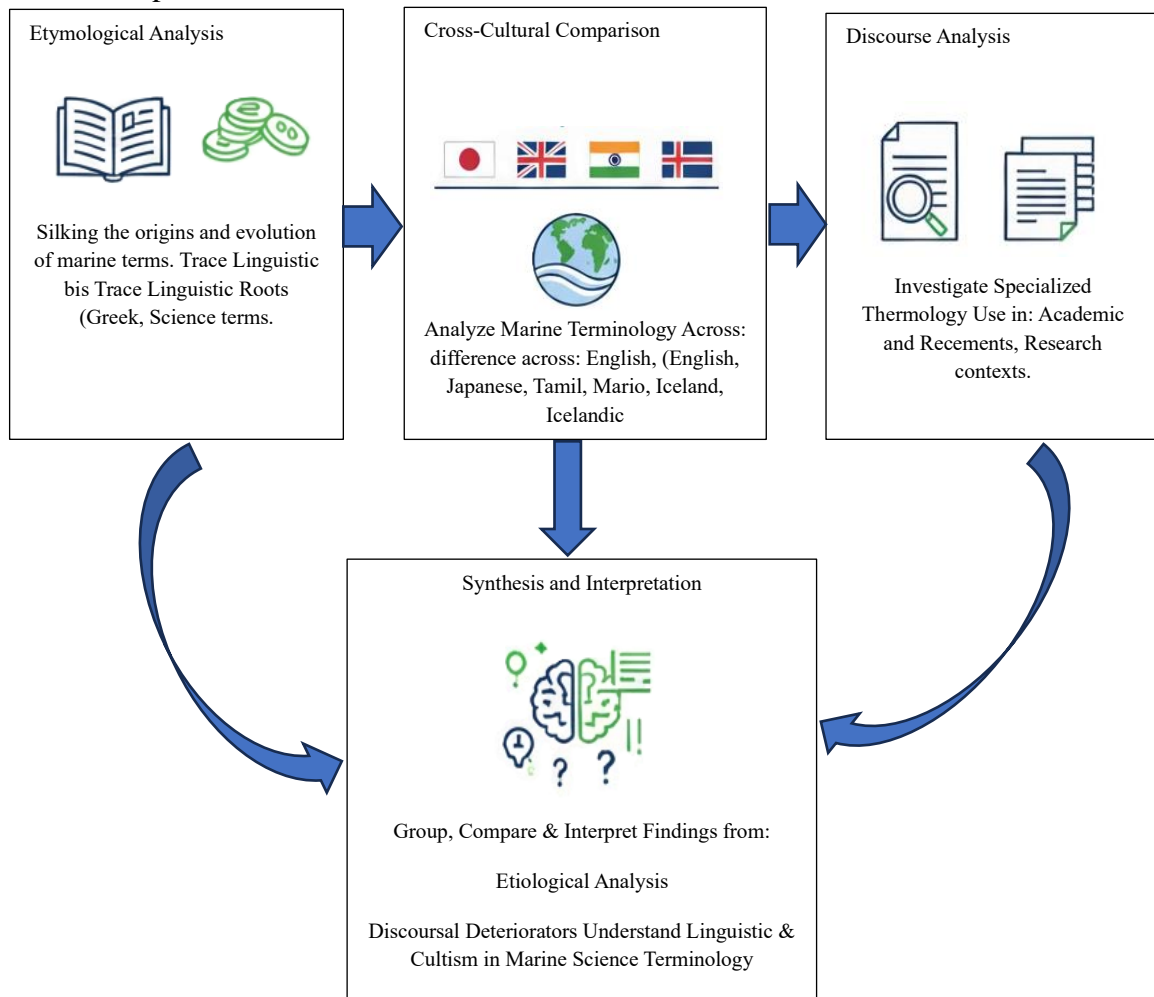


Figure 1: Research methodology flow in marine science terminology study.

The Research methodologies depicted in Figure 1 begin with the Origin Study, in which terms used in marine science are etymologized and traced to their roots. Special attention is paid to classical languages such as Greek and Latin. Then, there is Cross-Cultural comparison, which analyzes marine science terminology in English, Japanese, Tamil, Māori, and Icelandic, along with their respective cultures. This analysis aims to understand the varying degrees and differences in the naming of marine life,

bodies of water, and ecosystems. After that, there is cultural Discourse Analysis which studies the terminology of marine science in the vocabulary of different cultures. Then, there is the analysis of the various fields of discourse in which marine science is subdued, and the culture of these fields is diversified. Finally, Synthesis and Interpretation involve the collection and comparison of data from the previous studies in order to determine the focal and overarching thematic interested. This research

paradigm is centered on science and culture to understand the different factors which affect the discourse culture of a given science and terminology.

The second stage employs a cross-cultural comparative methodology. Terminology relating to the sea within the spheres of English, Japanese, Tamil, Maori, and Icelandic was analyzed to discern the cultural nuances governing the naming of oceanic and ecological species and phenomena. Such a juxtaposition emphasizes the collection of marine lexicons that stem from particular cultural backgrounds, seafaring customs, and geographies.

During the third stage, the focus of the analysis shifts to marine discourse and the ways in which authors of scholarly articles, legislation, and reports pertaining to marine science deploy particular marine vocabularies. This focuses on determining the owned disparity of marine vocabularies within and among particular social contexts, the divergence of purpose and intention, and the cross-border discourse of marine science.

Lastly, the disparate outcomes of the analyses are synthesized to uncover the explanatory principles that dominate the intersection of language and culture in marine science taxonomy. Such a method delivers unparalleled insights on the dual trajectory of culture and science in the expansion of marine lexicons, owing to the unprecedented cultural and scientific history of a society.

Basic Linear Model of Terminology Formation

$$T = \alpha L + \beta C + \gamma S \quad (1)$$

This equation (1) models' marine terminology (T) as a weighted sum of linguistic (L), cultural (C), and scientific (S) influences. The constants α , β , and γ represent the relative importance of each factor in forming the term. It provides a simple way to quantify how these factors contribute to terminology formation.

Interaction Model of Terminology Formation

$$T = \frac{(L^\alpha \cdot C^\beta \cdot S^\gamma)}{1 + \delta L + \epsilon C + \zeta S} \quad (2)$$

This equation (2) represents a non-linear interaction between linguistic, cultural, and scientific factors in terminology formation. Exponents (α , β , γ) control the intensity of each factor's influence, while the denominators model diminishing returns. It captures the complex and non-proportional relationships between these influences.

Results And Discussion

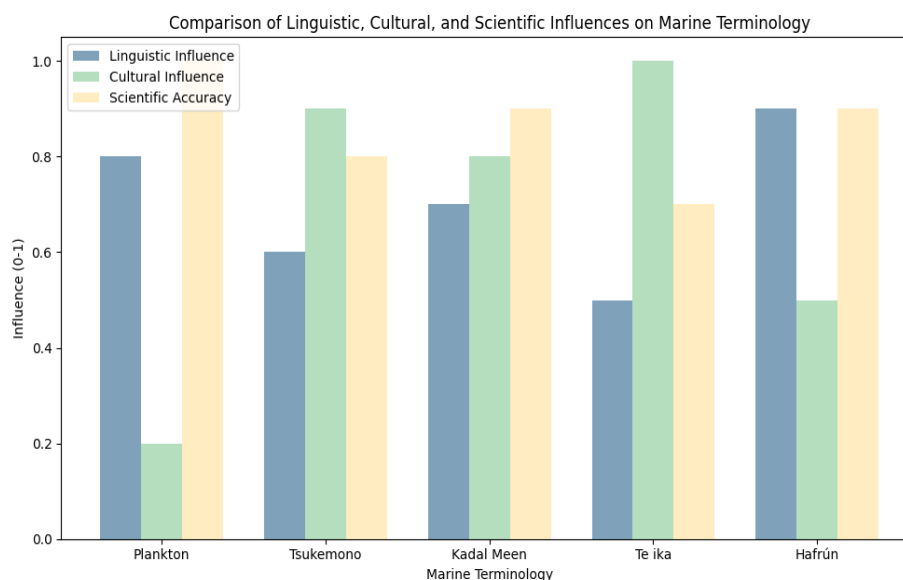
As evidenced by the findings of this study, the formulation of the terminology pertinent to marine sciences is attributed to the historical, cultural, and linguistic influences of the particular region. The investigation of the etymological constituents of the lexicon determined that a considerable proportion of the contemporary scientific terminology has its roots in the language of the Greeks and the Latins. Such classical languages were able to construct a marine lexicon that was precise and consistent in the denomination of the marine organisms, the processes of oceanography, and the principles of marine ecology. This shows the strong impact legacy scientific customs have made on contemporary terminology.

Table 1: Marine terminology across languages and influence factors.

Term	Language	Linguistic Influence (L)	Cultural Influence (C)	Scientific Accuracy (S)	Overall Terminology Score (T)
Plankton	English	0.8	0.2	1.0	0.86
Tsukemono	Japanese	0.6	0.9	0.8	0.78
Kadal Meen	Tamil	0.7	0.8	0.9	0.80
Te ika	Māori	0.5	1.0	0.7	0.75
Hafrún	Icelandic	0.9	0.5	0.9	0.77

This Table 1 presents sample marine science terms in five different languages (English, Japanese, Tamil, Māori, and Icelandic). For each term, the table quantifies the Linguistic Influence (L), Cultural Influence (C), and Scientific

Accuracy (S) on a scale from 0 to 1. The Overall Terminology Score (T) is derived using the formula $T = \alpha L + \beta C + \gamma S$, representing the combined influence of all three factors.

**Figure 2: Comparison of linguistic, cultural, and scientific influences on marine terminology.**

This figure 2 provides a comparison of the Linguistic Influence, Cultural Influence, and Scientific Accuracy of five chosen marine terms from across the world's languages – English, Japanese, Tamil, Māori, and Icelandic. Every term's impact in the aforementioned categories is represented in a certain color; Linguistic Influence is depicted in blue; Cultural Influence is in green and Scientific Accuracy is yellow. The chart illustrates the differences between languages in creating marine science terminology and the differences in the

contributions of distinct cultures in naming marine species, oceanographic features, and ecological processes.

Vocabulary for ocean-related topics differs considerably among cultures. A cross-cultural analysis of this field demonstrates the specificity of Japanese terminology concerning the classification of fish, seaweeds, the cycles of water, and the country's famous fishing culture. Likewise, the Terminology of Tamil marines reflects deep and extensive coastal ethnography and a history of maritime trade. The first oceanic term

culture of the Māori valued the terminology weak ecologically and spiritually. The importance and meaning of marine terminology in a culture is significantly influenced. Many Icelandic maritime terms are of Norse origin, and old terms for the sea are preserved in the lexicon. All culturally distinct maritime vocabularies mentioned in the analysis contribute to the Australian aboriginal experience of the sea.

The analysis of discourse confirms the existence of marine science respect among a distinct category of terminology as well as the diversity of its use in different areas. Cultural specificity of reception illustrates the standardized scientific terms. Cultural specificity of reception illustrates the standardized scientific terms. Considering the use of the culturally rich vocabulary, the findings indicate the need for philological sensitivity of the audience. The results point to the need for the speakers of the scientific discourse to demonstrate philological sensitivity to the specified audience.

Broadly, this research indicates that the lexicon of marine sciences acts secularly as a field of study, as well as an instrument of cultural identity, and a product of historical evolution. These cultural variants inform marine science via diversified viewpoints, as well as traditional ecological wisdom. Conversely, an inadequate appreciation of this cultural aspect is likely to impede worldwide collaboration. This discourse emphasizes the need to incorporate the world's linguistic variations in the communication of science to further international collaboration in marine

research and the safeguarding of cultural diversity.

Conclusion

This research demonstrates that marine science terminology is impacted by history, culture, and language, showcasing how diverse societies understand and articulate the marine world. While classical languages have provided the foundation for most scientific terminology, the languages of indigenous and regional populations, have contributed significant knowledge of the ecologies as they relate to the sea, due to daily engagement with it. Recognizing these differences enhances scientific discourse and augments international cooperation. Future studies should aim to record undocumented marine terminologies, amalgamate indigenous knowledge with scientific information, and create multilingual marine glossaries to aid global research and policy formulation. Such initiatives will better preserve cultural diversity and improve marine science communication globally.

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