Partial Comparative Analysis of Structural Characteristics of Four Specific Coast Guard Models

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The paper explores and analyses the four different organizational and functioning models of the World's Coast Guards with access to semi-enclosed seas through partial comparative analysis. The subject of the research includes the United States Coast Guard (hereinafter: USCG), the European Border and Coast Guard (hereinafter: EBCG), the Canadian Coast Guard (hereinafter: CACG), and the Japan Coast Guard (hereinafter: JCG). Each of the four models has different functional and organizational structure as demonstrated throughout this study. The research is focused on national jurisdictional boundaries, internal institutional hierarchy, locational distribution of resources, and personnel capacities within the various models considered. By synthesizing quantitative metrics - such as coastline extent, maritime constraints, and naval/aviation resources - with qualitative dimensions such as civil-military synergy, this research explains different models of Coast Guard functioning in the context of operational efficiency in protecting rights and interests in the maritime areas of geographical semi-enclosed region researched. The findings indicate that there is considerable variation in institutional arrangements and operational focus, which correspond to the strategic context of each actor. Limitations of the study include the fact that some data might be classified or unavailable.

KEYWORDS
~ Coast Guard
~ Maritime security
~ Partial comparative analysis
~ Organizational structure
~ Coast Guard assets
~ Maritime governance

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1. INTRODUCTION

A semi-enclosed sea is defined as: *"...a gulf, basin or sea surrounded by two or more States and connected to another sea or ocean by a narrow outlet or consisting wholly or primarily of the territorial seas and exclusive economic zones of two or more coastal States"* (UNCLOS, 1982). They are increasingly becoming hot spots in contemporary security environment. At the same time, operational importance of Coast Guards has further intensified with the emergence of various maritime challenges in the present global context. Increasing global maritime traffic, irregular migration, human trafficking, and maritime terrorism have further exploited maritime routes, and Coast Guards have come forward to assume law and order duties that fall under the jurisdiction of national police forces or military forces. Moreover, climate change has further intensified the operational importance of Coast Guards, especially in the Polar Regions, where ice melting has opened new maritime routes. In addition, international criminal organizations have further exploited maritime routes for drug trafficking, illegal fishing, and arms trade, thereby highlighting the strategic importance of Coast Guards in enforcing both national and international laws. This paper aims to conduct a partial comparative study on four representative Coast Guard models, namely USCG, CACG, JCG, and EBCG, based on their contrasting mandates, organizational structures, and strategic importance. This study aims to identify the operational importance of different Coast Guards based on their jurisdictional authority, asset base, personnel strength, legal authority, and mission profiles. In addition to quantitative analysis, this study aims to highlight various qualitative differences in the Coast Guard operational importance. This study aims to highlight the differences in civil-military integration, inter-agency coordination, and international cooperation with both national and supranational priorities. The ultimate objective of this paper is to lay the groundwork for subsequent studies which will focus on developing referential standards for quantitative comparison and further mathematical optimization.

2. LITERATURE REVIEW

The conceptualization and comparative analysis of Coast Guard organizations require engagement with established typologies of maritime governance, state power projection, and civil-military relations. Historically, national maritime security forces have been classified along a spectrum ranging from purely civilian administrative bodies to fully integrated military services. The theoretical basis for categorizing these agencies into military, civilian, paramilitary, and supranational/composite models reflects distinct state strategies in balancing sovereign enforcement, law enforcement legitimization, and international law constraints. The *Military Model* is characterized by full integration into national defense architectures, combat capabilities, and a dual-role mandate spanning peacetime law enforcement and wartime naval operations. The United States Coast Guard (USCG) serves as the primary archetype of this model, operating under civilian executive oversight in peacetime while retaining direct warfighting readiness and force projection capacity (USCG, 2025). The strategic integration of the USCG into joint naval doctrine - such as the *Advantage at Sea* strategy - illustrates how military coast guards bridge domestic law enforcement and international maritime superiority (Mengmeng, 2025). Recent strategic shifts highlight modernization, expanded polar presence, and power projection against transnational crime within complex geopolitical domains (Mengmeng, 2025; USCG, 2025). Conversely, the *Civilian Model* prioritizes non-military maritime administration, search and rescue (SAR), environmental stewardship, and sovereign presence through non-coercive capabilities. The Canadian Coast Guard (CACG) exemplifies this model as an unarmed, non-military entity operating under civilian government departments (CCG, 2025). As Huebert observes, the CACG's mandate is largely driven by Northern recapitalization, Arctic icebreaking, and climate adaptation rather than defense readiness (Huebert, 2025). Furthermore, the CACG's role is increasingly informed by official strategies on reconciliation, co-management of marine resources, and environmental conservation in partnership with Indigenous communities (CCG, 2024). The *Paramilitary Model* occupies a middle ground, utilizing military-style hierarchies, uniforms, and armed platforms while maintaining a formal legal status distinct from the armed forces to navigate sensitive sovereign boundaries. The Japan Coast Guard (JCG) represents this model, acting as an essential actor for managing *grey zone* security challenges in the Asia-Pacific (Mizo & Hauger, 2025). The JCG plays a pivotal role in maintaining a "*Free and Open Indo-Pacific*" facing threats such as resource competition and climate change through rapid technological modernization - such as acquiring MQ-9B Sea Guardian UAVs for wide-area surveillance around the Senkaku Islands - while expanding international capacity-building activities (Inaba, 2025; Mizo & Hauger, 2025). Finally, the *Supranational/Composite Model* introduces a novel dimension to maritime governance, where operational authority is shared between a central coordinating body and sovereign member states. The European Border and Coast Guard (EBCG), centered on Frontex, exemplifies this non-state, multi-tiered architecture (Frontex, 2025). Unlike unitary national models, the EBCG operates through a framework characterized by selective capacity building, reactive policy, and conflictive politicization (EPRS, 2025). Scholars analyze the unique institutional challenges inherent to this model, particularly regarding legal accountability, structural transparency, and fundamental rights oversight during joint border operations and migrant pushbacks at EU external boundaries (EPRS, 2025; Koçi, 2025; Mengmeng, 2025).

3. METHODOLOGY

In order to attain the results of the research, a partial comparative case study analysis employs four unique Coast Guard organizational models. These organizational models, whose primary area of responsibility/operational area are semi-enclosed seas, were compared by numerical and prescriptive parameters in order to assess contemporary transnational maritime security environment in different geographical areas. The methodology of the study was based on the collection, categorization, and evaluation of the agencies' operational data. The process of conducting the research was as follows:

Selection of Representative Models

The selection of the four agencies was based on the major categories of maritime security organizational models. These include:

- Military Model: United States Coast Guard.
- Civilian Model: Canadian Coast Guard.
- Paramilitary/Security Agency Model: Japan Coast Guard.
- Integrated/Agency Model: European Border and Coast Guard.

In the process of data extraction and categorization, specific parameters were extracted from the agencies' strategic reports, formal and official documentation. These parameters were used to create a baseline matrix of partial comparison. The data extracted included:

- Jurisdiction & Scope: Analysis of the area of responsibility, particularly the Exclusive Economic Zone and the length of coastline.
- Organizational Hierarchy: Analysis of the organizational structure, particularly the department or ministry responsible.
- Asset Inventory: A quantitative assessment of the fleet's capabilities, categorized into vessel types and aviation equipment.
- Human Resources: A compilation of the personnel numbers.

The data was synthesized into a partial comparative matrix, as shown in Table 1. This involved normalizing the data in order to highlight the disparities in the allocation of resources in relation to the size of the area of responsibility. This was done in order to compare the organizational models, such as the USCG, which is highly militarized, and the CACG, which is civilian and focuses on icebreaking and environmental protection. In that way, authors tended to numerically depict different area of responsibility and resources dedicated to each one of them.

In contrast to other, here mentioned, national coast guard agency, EBCG, which is a combined EU authority, consisted of the coastal member states' sovereign Coast Guards, and European Border and Coast Guard Agency (Frontex), is described numerically approximately in Table 1, since different member Coast Guards have different classifications of ship classes or status of personnel. Comparison of the personnel data across all four cases relies on using publicly available data since any specific data, related to their internal organization, structure and duties are restricted. What is more, the EEZ coverage represents the sum of all EU member states sovereign EEZ rather than territory directly owned or managed by a single agency.

Particular attention should be given to the frequent variability of qualitative parameters, the misreporting of security-related issues, and the risk of misattribution when interpreting open-source data concerning operational surface platforms and fleet size as major limitations for this paper.

4. COAST GUARD ANALYSIS

4.1. UNITED STATES COAST GUARD

The United States Coast Guard, headquartered in Washington, D.C., is the oldest continuously operating multifunctional maritime service in the United States, established in 1790 (U.S. Congress n.d.; U.S. Government, 2024). The

USCG is a military-type service and one of the six branches of the U.S. Armed Forces. Unlike the other branches, it is organized under the Department of Homeland Security rather than the Department of Defense. The Commandant of the USCG holds the rank of admiral, serves a four-year term, and reports directly to the Secretary of Homeland Security and the President of the United States. In times of war, or by direct presidential order, the USCG is transferred to the Department of Defense and then reports to the Secretary of Defense and the President (Coast Guard Publication 1; 2014). The USCG operates in inland waterways, the coastal zone, ports (361), internal waters, the Territorial Sea, and the Exclusive Economic Zone ((hereinafter: EEZ), which is the largest in the world and covers 11.53 million km² (NMFS, 2015). According to the Department of Homeland Security, the USCG performs 11 statutory missions, including port, waterway and coastal security, drug interdiction as a key task, maritime search and rescue ((hereinafter: SAR), protection of natural resources, national defense readiness, and enforcement of maritime laws (Mujuthaba, 2022). The service numbers more than 50,000 personnel and consists of maritime and aviation components. Its fleet includes patrol boats, cutters and icebreakers, while aviation forces comprise approximately 200 aircraft, including both fixed-wing airplanes and helicopters. Operational command is divided into two geographical areas - Pacific and Atlantic - which are further organized into 9 districts and 37 sectors located in 143 strategically important ports across the United States (Mujuthaba, 2022). The United States has approximately 153,646 km of coastline (NOAA, 2025).

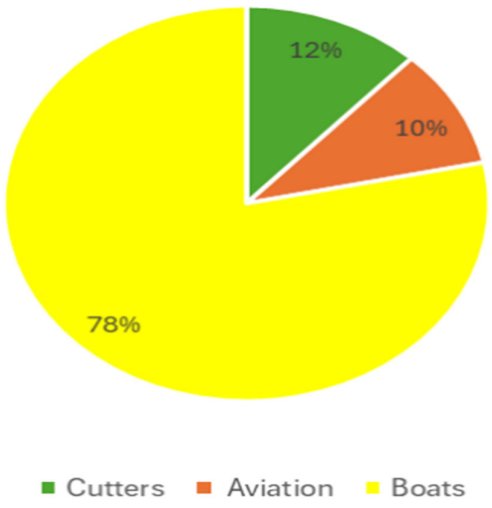


Figure 1. United States Coast Guard Assets (Source: U.S. Coast Guard, 2024; collected, designed, and interpreted by the authors)

4.2. EUROPEAN BORDER AND COAST GUARD

In order to ensure integrated European external border management and internal security, the European Border and Coast Guard was established by Regulation (EU) 2016/1624, and its mandate and competences further increased through the Regulation (EU) 2019/1896. This regulation remains agency's legal basis until today(Frontex, 2022). EBCG consist of the European Border and Coast Guard Agency (Frontex), national border management authorities of EU Member States, and Schengen-associated countries (Frontex, 2022). The primary objective of EBCG is effective management of migration flows and the provision of a high level of security within the European Union (Milt, 2017). EBCG functions as a reserve mechanism that can be activated when a Member State is unable to independently manage a crisis situation at its external borders (Frontex, 2025). A Standing Corps is planned as part of EBCG and is expected to reach full operational capability with 10,000 members by 2027, marking the establishment of the EU's first operational force with executive powers. (Korontzis, Sdrolias, 2026). Frontex acts as the coordinating and operational agency within EBCG but does not hold direct command authority over national Coast Guards or border services.

In addition, Frontex works closely with the European Maritime Safety Agency ((hereinafter: EMSA) and the European Fisheries Control Agency ((hereinafter: EFCA) to support multipurpose coast guard functions (Milt, 2017). The role of EFCA is to coordinate control activities relating to fisheries, while the role of EMSA is to improve maritime safety and prevent marine pollution. The mandate of EBCG is to cover the integrated management of the European Union's external borders, including the maritime and land borders of the EU's Member States and the Schengen-associated States (Canadian Coast Guard, 2025). The area covered is more than 42,000 km of coastline and almost 9,000 km of land borders, from the eastern land borders of the EU, through the Western Balkans, and across the Mediterranean Sea (Milt, 2017). Specific attention is given to the Central Mediterranean, which is a key area for migration control and search and rescue operations (Milt, 2017).

The Central Mediterranean Sea region, a critical zone for Search and Rescue (SAR) operations, has an estimated area of approximately 500,000 km^2 (Frontex, 2025).

4.3. CANADIAN COAST GUARD

Canada has the longest coastline in the world, measuring 243,042 km in length (Croatian Online Encyclopedia n.d.), and a total sea area of 4,000,000 km^2 (Mujuthaba, A.M. 2022). The CACG has a total of 6,100 non-military and unarmed personnel (Canadian Coast Guard, 2025). The main duties of the CACG include SAR, channel maintenance, icebreaking, assistance to distressed vessels, prevention of marine pollution, and maritime communication operations (Canadian Coast Guard, 2025).

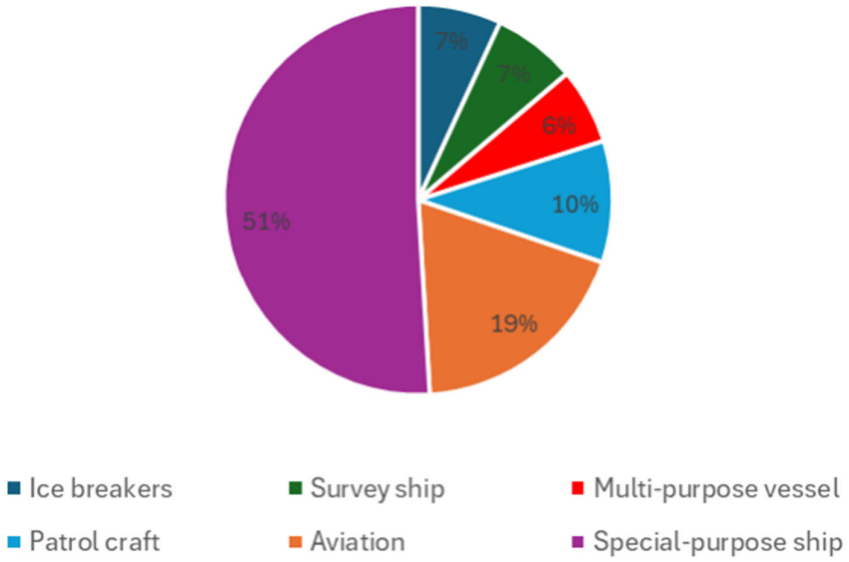


Figure 2. Canadian Coast Guard Assets (Source: Government of Canada, 2024; collected, designed, and interpreted by the authors)

The CACG's area of operation includes the total Canadian maritime jurisdiction, which is divided into four geographical regions for effective operations, i.e., the Arctic, Atlantic, Central, and Western regions (Canadian Coast Guard, 2025). The geographical challenges to be addressed by the CACG include the presence of Hudson Bay, which is frozen throughout the year, and the eastern Canadian coast, which is characterized by fjords and a number of islands. The CACG has 89 maritime bases along the coastline (Croatian Online Encyclopedia n.d.).

4.4. JAPANESE COAST GUARD

The Japan Coast Guard was established in 1948 and works as a special agency of the Ministry of Land, Infrastructure, Transport, and Tourism (Government of Japan, 1999). The JCG is a civilian agency but has a paramilitary character with a similar hierarchical system to the armed forces (Government of Japan, 1999; Japan Coast Guard, 2024). The JCG is an indispensable element of Japanese security policy, especially in the face of increasing regional tensions over the disputed islands of the Senkaku Islands. The JCG employs 14,000 people, divided into 11 offices that coordinate all activities across the entire Japanese maritime area (Japan Coast Guard, 2024). The JCG fleet is amongst largest in Asia, with more than 470 vessels and over 70 aircraft (Japan Coast Guard n.d.). The JCG is responsible for a broad scope of tasks, from Search and Rescue (SAR) operations, the prevention of smuggling and piracy, environmental protection, and the control of maritime traffic. The JCG performs a wide range of duties: Search and Rescue (SAR), combating smuggling and piracy, environmental protection, and maritime traffic control. The JCG operates across approximately 4.47 million km^2 of sea area, including the Territorial Sea and the EEZ (Japan Coast Guard 2024). Key operational areas include the Sea of Japan, the East China Sea, the Pacific Ocean, and the strategic straits (Oguchi, 2025). Continuous surveillance and patrols are maintained around the disputed Senkaku Islands due to the almost daily presence of foreign vessels. Operations in the northern waters are particularly focused on preventing illegal fishing (Japan Coast Guard, 2024). Japan's coast length is 29,751 km. Some coastal studies including smaller islands and detailed measurements give totals closer to 32,800 km – 35,000 km depending on how the measurement is done (Index Mundi, 2021). Japanese Coast Guard operates in 85 ports (Isobe, 1998; Japan Coast Guard, 2021).

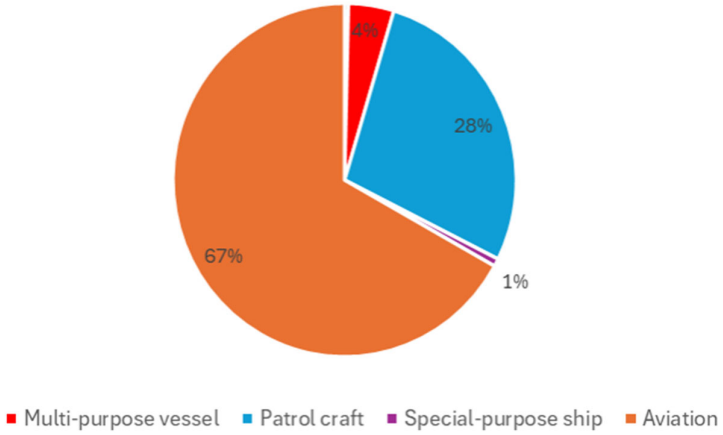


Figure 3. Japan Coast Guard Assets (Source: Japan Coast Guard, 2021; collected, designed, and interpreted by the authors)

5. PARTIAL COMPARATIVE ANALYSIS

The partial comparative analysis of the USCG, the CACG, the JCG, and the European Border and Coast Guard (EBCG) highlights substantial differences in organizational structure, mandate, and operational focus. These differences are an outcome of the different geopolitical circumstances, legal systems, and strategic priorities that influence each of these actors. *United States Coast Guard*: The USCG represents the most comprehensive and militarized type of Coast Guard. This organization encompasses law enforcement, regulatory, and defense roles within one organization that can conduct operations on a global scale. The jurisdiction of the USCG includes extensive maritime boundaries, and it needs a diversified fleet and aviation support for it to remain effective. This organization has a large personnel base, allowing it to carry out multiple roles simultaneously. This includes search and rescue, maritime law enforcement, environmental protection, and national defense. This comprehensive nature of the USCG makes it an exemple of a fully militarized Coast Guard with both domestic and international operational scope. *Canadian Coast Guard*: In contrast, the Canadian Coast Guard represents an example of a purely civilian Coast Guard. This organization is mainly involved in maritime safety, environmental protection, and icebreaking operations. This is an outcome of Canada's geographical circumstances, including an extensive and often remote coastline. This organization operates under civilian authority and lacks military or law enforcement mandates, such as those found with the USCG. *Japan Coast Guard*: The Japan Coast Guard represents an intermediate type of Coast Guard that lies between the militarized and civilian types. Although it is a civilian organization, it is paramilitary in nature, considering the security circumstances in its region. While its maritime boundary is comparatively shorter than that of the USCG or CACG, the JCG maintains high operational intensity to ensure continuous presence in strategically sensitive zones. Its missions include law enforcement, search and rescue, territorial surveillance, and environmental monitoring. This hybrid model demonstrates a balance between civilian administration and operational enforcement capability.

To evaluate whether maritime security resources scale proportionally with geographic responsibilities, raw comparative metrics must be normalized against operational domains—specifically coastline length and Exclusive Economic Zone (EEZ) area - and analyzed through agency-to-agency ratio pairs. Across the sample, the United States Coast Guard (USCG) manages an EEZ of 11.35 million km² and 153,646 km of coastline, the Canadian Coast Guard (CACG) oversees 4.00 million km² of EEZ across 243,042 km of coastline, and the Japan Coast Guard (JCG) operates across a 4.47 million km² EEZ with approximately 32,375.5 km of coastline. (The European Border and Coast Guard is excluded from quantitative ratio modeling due to its structural reliance on member-state reserve mechanisms rather than fixed standing surface assets). Converting these parameters into normalized ratios demonstrates that organizational capacity is strictly non-proportional to geographic scale, driven instead by institutional mandate and operational environment.

Comparing the military USCG to the paramilitary JCG establishes a baseline for security-oriented models. The USCG's EEZ is approximately 2.54 times larger than Japan's (11.35M vs. 4.47M km^2), while its coastline is 4.75 times longer ($153{,}646$ vs. $32{,}375.5$ km). Asset allocation between the two agencies scales with near-perfect proportionality relative to maritime area: the USCG-to-JCG vessel ratio is 2.72:1 (1,280 vs. 470 vessels) and the aviation ratio is 2.86:1 (200 vs. 70 aircraft), closely tracking the 2.54:1 EEZ ratio. This alignment yields nearly identical asset coverage densities, with the USCG maintaining ~112.8 vessels and ~17.6 aircraft per million km² of EEZ, compared to the JCG's ~105.1 vessels and ~15.7 aircraft. However, personnel allocation diverges significantly: the USCG-to-JCG personnel ratio is 3.57:1 (>50,000 vs. 14,000 employees). When normalized against coastline length, the JCG actually maintains a higher human resource concentration (~432.4 personnel per 1,000 km) than the USCG (~325.4 personnel per 1,000 km).

Coast Guard Criteria	United States Coast Guard (USCG)[1]	European Border and Coast Guard (EBCG)[2]	Canadian Coast Guard (CACG)[3]	Japan Coast Guard (JCG)[4]
EEZ[5]	11.351,918	~500,000	4,000,000	4,470,000
Area of operation	Pacific and Atlantic	Mediterranean Sea	Arctic, Atlantic, Pacific, Hudson Bay	Sea of Japan, the East China Sea, the Pacific Ocean
Total length of the coastline [km]	153,646	> 42,000	243,042	29,751–35,000
State maritime border [M[6]]	~5,940[7]	~12,400	~4,800	~1,010
Member	NATO, UN	NATO, EU, UN	NATO, UN	UN
Functional model of the organisation [Peace/War]	Department of Homeland Security, can be transferred to Department of Defense in War	N/A (Reserve mechanism)	Department of Fisheries and Oceans	Ministry of Land, Infrastructure, Transport and Tourism, can be transferred to Ministry of Self-Defense Forces in War
Organisational model type	Military	Consists of Frontex and national border authorities (inter-state cooperation)	Civilian	Paramilitary
Vessels	1,280	N/A	92	~470
Aviation	200	N/A	31	~70
Employees	> 50,000	Standing Corps: ≈10,000 (planned by 2027)	6,100	14,000
Operating ports	143	N/A	89	85
Main tasks	Port/Coastal Security, Drug Interdiction, SAR, Maritime Law Enforcement	Integrated Border Management, Migration Flow Control, High-Level Security	SAR, Channels Maintenance, Icebreaking, Marine Pollution Prevention	SAR, Combating Smuggling/Piracy, Environmental Protection, Preventing Illegal Fishing

Table 1. Partial comparison of the selected Coast Guards (Source: Flanders Marine Institute, 2024; NOAA, 2024; European Commission Joint Research Centre, 2023; Tsuruta, 2023; Sunko, 2024)

The structural non-proportionality becomes stark when comparing security-focused models to the civilian CACG. While the USCG's EEZ is 2.84 times larger than Canada's, Canada's coastline is actually 1.58 times longer than that of the United States. Despite managing a coastline nearly twice as long, Canada operates with a fraction of the resources, resulting in extreme ratio imbalances: a USCG-to-CACG personnel ratio of 8.20:1 (>50,000 vs. 6,100), a vessel ratio of 13.91:1 (1,280 vs. 92), and an aviation ratio of 6.45:1 (200 vs. 31). On a normal basis, Canada operates at just ~25.1 personnel per 1,000 km of coastline, alongside ~23.0 vessels and ~7.8 aircraft per million km² of the EEZ. These severe quantitative discrepancies confirm that geographic scale alone does not dictate force structure. The primary driver of this variance is functional model design. The military and paramilitary mandates of the USCG and JCG demand high personnel and asset densities to enforce law, deter illicit activity, and maintain continuous patrol coverage. Conversely, the civilian CACG is structured around non-coercive services such as search and rescue, icebreaking, marine pollution response, and channel maintenance. Furthermore, Canada's unique geographic reality - managing vast, sparsely populated Arctic expanses - necessitates

[1] All data for the USCG column were compiled from Sunko, 2024, unless otherwise noted.
[2] All data for the USCG column were compiled from European Commission Joint Research Centre, 2023, unless otherwise noted.
[3] All data for the CACG column were compiled from Sunko, 2024, unless otherwise noted.
[4] All data for the JCG column were compiled from Tsuruta, 2023, unless otherwise noted.
[5] All data in the EEZ row are compiled from Flanders Marine Institute, 2024.
[6] A nautical mile (M) is a unit of measurement used in navigation and maritime science, defined as exactly 1,852 meters.
[7] NOAA, 2024.

specialized capital assets (e.g., heavy icebreakers) capable of broad regional multi-mission utility rather than the high-density patrol fleet required for active border interdiction.

6. CONCLUSION

By integrating normalized quantitative indicator ratios directly into the empirical analysis, the comparative framework moves beyond static organizational classifications to demonstrate how distinct capabilities manifest in practice. The data reveals that agency resources do not scale proportionally with geographic parameters alone. Instead, the empirical analysis demonstrates that functional model design and operational priorities dictate force density. The high vessel and aviation asset densities observed in the United States Coast Guard (~112.8 vessels and ~17.6 aircraft per million km² of EEZ) and Japan Coast Guard (~105.1 vessels and ~15.7 aircraft per million km² of EEZ) provide quantitative evidence of an operational focus on rapid-response law enforcement, border control, and maritime interdiction. Conversely, the lower normalized asset and personnel footprint of the Canadian Coast Guard (~23.0 vessels, ~7.8 aircraft per million km² of EEZ, and ~25.1 personnel per 1,000 km of coastline) reflects a structural orientation toward technical, navigational, and environmental support across vast, low-density maritime regions such as the Arctic. These quantitative findings demonstrate that classification models - whether military, civilian, or paramilitary - serve as functional representations of specific operational strategies rather than mere descriptive labels. While military and paramilitary configurations optimize resource density for active security and enforcement in high-density or contested domains, civilian models prioritize specialized multi-mission equipment suited for extreme environmental monitoring and safety services. The supranational framework of the European Border and Coast Guard further highlights how institutional structures adapt to multinational security environments through collaborative reserve mechanisms rather than centralized standing fleets. Ultimately, this empirical normalization proves that no single organizational structure is universally superior; force design, capability allocation, and resource density must be tailored precisely to an agency's unique geopolitical, environmental, and strategic mandate. Bridging these quantitative density metrics with qualitative institutional parameters establishes a robust foundation for future optimization studies, including game-theoretic modeling, simulation analysis, and multi-criteria evaluation of global maritime security architectures.

CONFLICT OF INTEREST

Authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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