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# POTENTIAL OF COBIA (*Rachycentron Canadum*) IN MALAYSIA: A REVIEW

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**Abstract:**

The *Rachycentron canadum*, more often referred to as the Cobia, is a pelagic fish that migrates and is found in tropical and subtropical oceans. This species, belonging to the Perciformes order, has been commercially farmed since the late 1990s due to its fast growth rate, high-quality meat, and tolerance to temperature and salinity fluctuations. The majority of commercial

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manufacturing takes place in China and Taiwan, with China being the primary location. *R. canadum* is a highly migratory species, often associated with structures like buoys, oil rigs, and shipwrecks for shelter and prey. Its high nutritional value, including 18% to 21% protein content, omega-3 fatty acids, and essential vitamins and minerals like vitamin D, vitamin B12, selenium, and phosphorus, contributes to its ecological role as both predator and prey in marine ecosystems. Commercialization opportunities for *R. canadum* include rapid development and high-quality white flesh, with operations in the Americas, Vietnam, Thailand, the USA, Australia, and other regions. The International Union for Conservation of Nature (IUCN) does not categorize the *R. canadum* as vulnerable or endangered, but it is classified as a species of least concern.

**Keywords:**

Cobia, Commercialization, Ecology, Nutrition, *Rachycentron canadum*

## Introduction

The cobia, scientifically known as *Rachycentron canadum* (*R. canadum*), is a migratory fish found in tropical and subtropical oceans globally, excluding the central and eastern Pacific Ocean. It is classified in its own family within the Perciformes order according to Briggs (1960). Table 1 shows The taxonomy descriptions of *R. canadum.* While it is a satisfactory food species, there is an insufficient population in the wild to support commercial fishing. Targeting other species may result in unintentional capture. Due to its favourable traits such as fast growth, high-quality meat, and ability to withstand changes in temperature and salinity, this species has become an important aquaculture species since it was first commercially farmed in the late 1990s (Estrada et al., 2015). Although research and production are conducted globally, the main commercial manufacturing activities are concentrated in China and Taiwan, with China being the key location (Liao et al., 2004).

**Table 1: Taxonomy Descriptions of *R. canadum***

| Taxa | Descriptions |
|---|---|
| Domain | Eukaryota |
| Kingdom | Metazoa |
| Phylum | Chordata |
| Subphylum | Vertebrata |
| Class | Actinopterygii |
| Order | Perciformes |
| Suborder | Percoidei |
| Family | Rachycentridae |
| Genus | *Rachycentron* |
| Species | *Rachycentron canadum* |

The *R. canadum* is a significant fish species for natural ecosystems and human activities due to its migratory nature and habitat in the ocean (Sampaio et al., 2011). Therefore, it is a fascinating research topic with significant implications for the sustainable utilisation and administration of marine resources (Bullard & Overstreet, 2006). However, there is a lack of

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knowledge on the distribution, characteristics, nutritional value, commercial potential, and conservation status of *R. canadum*.

This paper aims to comprehensively analyse several aspects linked to *R. canadum*, including its distribution, features, nutritional value, commercialization potential, and conservation status. This review's conclusions will enable us to create well-informed strategies for sustainable utilisation and long-term conservation. We need a thorough understanding of *R. canadum*'s presence in different geographical locations, its biological characteristics, nutritional value, market opportunities, and conservation issues. This review aims to compile the existing knowledge on *R. canadum* to add to the ongoing conservation. To achieve this, this paper provides a comprehensive view that considers ecological, nutritional, economic, and conservation issues.

## Methodology

The data collection for this manuscript entailed the methodical extraction of information from electronic databases, namely Google Scholar (https://scholar.google.com/), PubMed (https://pubmed.ncbi.nlm.nih.gov/), Scopus (https://www.scopus.com/), and ResearchGate (https://www.researchgate.net) (Shaik Farid et al., 2024; Suffian et al., 2025). The search queries utilized in these databases incorporated keywords such as *R. canadum*,' 'distribution of *R. canadum*.,' 'health benefits of *R. canadum*,' 'medical properties of *R. canadum*,' 'ecology of *R. canadum*,' 'commercialization of *R. canadum*,' 'phytoremediation in *R. canadum*.,' and 'Conservation status of *R. canadum*.

## Literature Review

### *Distribution*

Warren et al. (2017) stated the widespread population of *R. canadum* is found in tropical and subtropical seas. These waters include locations such as the Gulf of Mexico, the Caribbean, and the western Atlantic Ocean (Bowden & Bricknell, 2013). In addition to this, the substantial recreational sport fisheries that target *R. canadum* in the coastal seas of the United States, with a particular emphasis on the Gulf of Mexico and the northwestern Atlantic Ocean. Aquaculture operations involving *R. canadum* in sea cages and identify it as a substantial and swiftly growing sector in Asia. Culturing *R. canadum* has involves at least twenty-three countries, highlighting significant production growth over the years (Warren et al., 2017).

Benetti et al. (2008) also record that *R. canadum* is classified as a tropical and subtropical fish species widely distributed across global oceans. *R. canadum*, recognized for its adaptability, occupies diverse habitats, including coastal waters, estuaries, bays, and offshore reefs. The species displays a preference for various structures like buoys, oil rigs, and shipwrecks, indicative of its ability to thrive in varied marine environments. Their findings emphasise that the extensive distribution of *R. canadum* in tropical and subtropical regions underscores its capability to flourish in diverse oceanic conditions. This versatility places the species in a position where it is a prominent target for commercial as well as recreational fishing in certain geographical locations (Benetti et al., 2008). To date, Rajaprabhu et al., (2021) reported that *R. canadum* has been successfully cultured in open sea cages at Olaikuda, Pamban Island, India.

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***Characteristics***

According to Warren et al., (2017), *R. canadum* possesses distinct features, such as an elongated, fusiform body, a broad head, and a protruding lower jaw. A notable characteristic of this species is a dark lateral stripe running from the eye to the tail. Additionally, *Rachycentron canadum* exhibits a single, flat, and broad dorsal fin extending over a huge portion of their back. These fish are recognized for their swift growth and remarkable adaptability to diverse environmental conditions, including fluctuations in temperature, salinity, and dissolved oxygen levels. (Warren et al., 2017). Furthermore, the body of *Rachycentron canadum* is adorned with small, smooth scales. Adults of this species can reach considerable size, with lengths exceeding two metres and weights surpassing sixty-eight kilograms (Benetti et al., 2008).

Felip et al., (2011) stated that *R. canadum* is a highly migratory species and often associated with other structures like buoys, oil rigs and shipwrecks to get shelter and forage for prey. *R. canadum* are opportunistic feeders, meaning that they eat on a wide variety of marine species, such as fish, crabs, and cephalopods, according to the studies conducted by the researcher. Their migratory behaviour and feeding habits contribute to their ecological role as both predator and prey in marine ecosystems. (Felip et al., 2011).

**Table 2**: **Morphology and Colour of *R. canadum***

| Findings | Authors (Year) |
|---|---|
| Found a mean length of 133 cm and mean weight of 30.5 kg for 9-year-old females in Chesapeake Bay in the early 1960s. | Shaffer and Nakamura (1989) |
| The head is large, flattened, and broad, and occupies almost one fifth of the body: head length averages 19.9% of total length (TL) and head width averages 55.6% of head length. | Sajeevan and Kurup (2014a) |
| The spinous portion of the dorsal fin averages 17.6% TL. The second dorsal-fin base is also long, averaging 36.7% TL, and comprises 31-34 rays; its anterior rays are elevated in adults | Smith and Merriner (1982) |
| The large pectoral fins are normally carried horizontally. They are long and pointed, becoming more falcate with age, and fixed in the horizontal position, with 20 –21 rays. | Collette (1978) |
| The mature cobia has a forked, slightly lunate tail, which is usually deep brown while the juvenile cobia has a rounded tail | Shaffer and Nakamura (1989) |
| The colour may change according to mood | Su et al. (2000) |
| The fins are mostly all deep or dusky brown; anal and pelvic pale with grey or dusky markings; ventral surface greyish white to silvery. | Shaffer and Nakamura (1989) |

***Nutritional Values of R. canadum***

*R. canadum* possesses a high nutritional content, which is beneficial to human health. *R. canadum* typically contains between 18 and 21 percent protein. *R. canadum*, like the majority of fish species, is an important source of eicosapentaenoic acid (EPA), docosahexaenoic acid, and omega-3 fatty acids (DHA). Additionally, *Rachycentron canadum* is rich in vital minerals and vitamins, including selenium, vitamin B12, vitamin D, and phosphorus. (Tien et al. 2016).

Cui et al. (2022) conducted a supplementary study highlighting the significant presence of polyunsaturated fatty acids (PUFA), particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which make *R. canadum* significant. As a result of its reputation

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for a number of health benefits, including a reduced risk of cardiovascular disease and cancer, their research saw that the high fatty acid content of *Rachycentron canadum* is essential for human health. Furthermore, it is considered that *R. canadum* has low values for the atherogenicity index (AI), the thrombogenicity index (TI), and the hypocholesterolemic/ hypercholesterolemic fatty acid index (HHI). This indicates that incorporating *R. canadum* into one's diet has the potential to improve cardiovascular health by lowering the likelihood of developing coronary thrombosis and atherosclerosis. Furthermore, phospholipids (PL) and triacylglycerols (TAG) are present in *R. canadum* which can be nutritionally valuable for both eating and processing (Cui et al.2022).

***Commercialization Opportunities***

According to Mohamed Yousif et al., (2023), *R. canadum* has a high potential in commercial aquaculture because of its quick development and high-quality white flesh. With operations in the Americas, Vietnam, Thailand, the USA, Australia, and other regions, the commercial production of *R. canadum* has grown worldwide (Bourtoom et al., 2009). The growth proves the market potential and rising demand for *R. canadum*. The Gulf Cooperation Council (GCC), Europe, Asia, the USA, and Australia are just a few of the markets that *R. canadum* may be able to sell (Yousif et al., 2023). For conventional markets, producers and processors may want to consider developing value-added *R. canadum* products, for instance smoked fillets, battered *R. canadum*, fish patties, and sticks. The best ways to prepare *Rachycentron canadum* are by grilling, barbecuing, baking, and deep and shallow frying, though it is also excellent for producing sashimi (Craig et al., 2006). *R. canadum* complements other finfish, such tuna, nicely on sashimi dishes because of its flavour and colour. These goods can satisfy a variety of consumer tastes and commercial sectors (JR Webb et al., 2010).

Other than that, in the same study, it is mentioned that *R. canadum* has the potential to be exported to another country due to premium *R. canadum* goods being in high demand in upscale markets. *R. canadum*, which is grown in the United Arab Emirates, has the potential to be exported to supply luxury items to markets in the Gulf Cooperation Council (GCC), Europe, and Asia (Mohamed Yousif et al., 2023). *R. canadum* 's successful introduction into the markets of the United States and Europe demonstrates the demand for high-quality *R. canadum* products in upscale markets. Using modern technologies, like sea stations and aqua pods, opens possibilities for creative and sustainable *R. canadum* production.

***Conservation Strategy***

According to Bester (2017), the International Union for Conservation of Nature (IUCN) does not categorise the *R. canadum* as vulnerable or endangered. The *R. canadum* is classified as a species of least concern on the IUCN Red List as of 2021, showing that currently, there is no imminent threat of extinction. Nevertheless, populations of *R. canadum* may be in danger in certain locations due to factors such as disease (Guo et al., 2015), overfishing (Darden et al., 2014), bycatch (Ganga et al. 2012), and other factors.

For aquaculture perspective, it is widely acknowledged that disease is the single most crucial factor that is preventing the expansion of *R. canadum* culturing operations (Villegas-Plazas et al., 2022). Disease is recognised as the most important limiting factor in the expansion of cage farming operations, and it is known that *R. canadum* is susceptible to the typical assortment of parasites and diseases that are found in other warm water species ((Benetti et al., 2010). The diseases that are caused by the parasitic *Amylodinium* sp. and the bacterial *Photobacterium* sp. are among the most common diseases that have been reported to cause mass mortality of *R.*

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*canadum* at all stages of their life cycle (Liu et al., 2003). Furthermore, Sajeevan & Kurup, (2014b) suggested that to guarantee the sustainable exploitation of cobia available in the Indian Exclusive Economic Zones, a concentrated effort is required to evaluate the biomass and potential of cobia susceptible to pelagic gears.

Phinchongsakuldit et al. (2012) recommended conducting population genetics studies as a crucial element in the formulation of policies for fisheries, conservation management, and aquaculture advancement. Phinchongsakuldit et al. (2012) assessed the genetic diversity and population structure of indigenous *R. canadum* in the Gulf of Thailand and Andaman Sea, determining the current population distributions and providing data to support policy development before large-scale aquaculture expansion. Bignami et al., (2013) suggested to seek the effect ocean acidification that has a graded effect on *R. canadum* otoliths, with the potential to substantially influence the dispersal, survival, and recruitment of a pelagic fish species. These results have important implications for population maintenance, connectivity, and conservation efforts for other valuable fish stocks that are already being deleteriously impacted by overfishing.

***Potential of Rachycentron canadum in Malaysia***

*R. canadum* is commonly known in areas of tropical and subtropical waters hence its applicability to produce an aquaculture farm here in Malaysia. Ademola's (2016) study highlights the insufficient data regarding inventory assessment, morphometric characteristics, eating habits, and reproductive biology of wild *R. canadum* in Malaysian waters. This lack of information underscores the need for further research to fully assess the suitability of *R. canadum* for aquaculture and consumption in Malaysia (Ademola, 2016). *R. canadum* is expected to be a well-suited species for aquaculture in Malaysia due to its growth rate, overall aquaculture performance, market demand, and price (Mazlan et al, 2017), but no known aquaculture farm has developed in Malaysia. *R. canadum* has high nutritional benefits (Yang et al., 2008) and can even be branded as a luxury product hence further studies on producing and implementing a *R. canadum* farm in Malaysia will contribute to the country's economy. At the same time, the government needs to ensure that the water quality is in the best condition to ensure that this species lives sustainably (Kamaruddin et al., 2021). This is because poor water quality affects the ecology (Kamaruddin et al., 2022) and population of this species. Studies on microplastics can also be expanded to ensure that there are no cases of microplastic pollution in this species (Kamaruddin et al., 2020). Microplastics can have negative effects on the environment and adverse effects on humans (Mohd Rizal et al., 2022).

**Conclusion**

*R. canadum,* also known as the Cobia, is a migratory pelagic fish native to tropical and subtropical oceans. Commercial cultivation began in the late 1990s due to its rapid development, superior flesh quality, and resistance to temperature and salt variations. China and Taiwan are major producers. *R. canadum* is riches in omega-3 fatty acids, EPA, and DHA, is a nutritious food source with 18-21% protein and essential vitamins and minerals. With its elevated levels of PUFA, is crucial for human health, reducing the risk of cardiovascular disease and cancer. Its commercialization opportunities include rapid growth, high-quality white flesh, and exports to the Americas, Vietnam, Thailand, the USA, Australia, and the Gulf Cooperation Council. Despite not being considered vulnerable, *R. canadum* is highly desirable for commercial and recreational fishing due to its exceptional qualities.

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