

How the Beronok (Meranti Sea Cucumber/*Holothuroidea*) Helps Athletes to Get Stronger on Physical Performance: A Narrative Study

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Abstract Athletic nutrition is often neglected. Nutrition helps athletes perform well. Beronok (sea cucumber or *holothuroidea*) is the original natural product of Meranti, Indonesia. Beronok is highly valued, unlike other sea cucumbers. Beronok is only consumed daily by Meranti people, not athletes. Since protein is important for athletes, this Beronok can be used as a supplement for sports nutrition. This piece of writing used a procedure known as a literature review to complete its research. This undertaking sought to discover, evaluate, and combine research literature while considering the outcomes generated by scholars and professionals in the field. The research highlights that Beronok is nutritionally balanced to meet an athlete's dietary needs by offering a diverse range of foods consumed appropriately to achieve their nutritional objectives. Beronok is a novel product derived from processed sea cucumber intended to complement the protein necessary for optimal bodily function, especially for athletes. This product is expected to culminate in developing a novel product that can serve as a dietary supplement for athletes, catering to their unique nutritional needs and ultimately introducing a new product to the market. Furthermore, the study suggests that more research is needed on the possible benefits of sea cucumbers in sports, such as how they might improve athletes' physical abilities and stability and how they might help communities' economies.

Keywords Athletes, Beronok, *Holothuroidea*, Supplement, Traditional Food

1. Introduction

A deficiency in readily available energy can worsen the body's status, which can make the body more susceptible to developing various diseases. A person needs the energy to participate in physical activity [1]. The carbohydrates, lipids, and proteins digested throughout the day are potential sources of this energy [2,3]. Because of these circumstances, it is essential to consume a diet that is not only nutritionally sound but also, in particular, includes a sizeable quantity of protein for any jobs and activities [4]. It suggests that the energy required for muscular activity can be acquired from macronutrients such as carbs, lipids, and proteins [5].

The food characteristics and patterns of a location act as its identity and help distinguish it from the cuisine of other areas [6]. The terms "food of natural origin" or "traditional food" refer to an original cuisine that receives all its components from natural sources and is indigenous to a specific region [7]. Not only in the way it is prepared but also in the way it is consumed, the flavor is especially evocative of the place's culture [6, 7]. This is represented

not only in how it is processed but also in how it is consumed. From ancient times, people have attempted to develop and perfect the cuisine of their place, and as a result, it can now be found in every location [8, 9].

Food that has been processed traditionally is food that comes from a certain place and is cooked in a manner that is compatible with the outcomes of that region and the needs of the people who live there daily [9]. It is not uncommon for the recipes and flavors of foods indigenous to a particular location to be passed down through the generations, along with the knowledge of how those foods grow and develop. This process is known as "food lore." Traditional food is one of the most prized components of conventional culture since it preserves individuality and age-old expertise [10-12]. This traditional food can also be utilized to determine the characteristics of a certain location, mainly because of how it is prepared, and the flavor is inextricably linked to the people who reside in that area [13]. This is because the people who live in that place are the ones who determine the flavor [14]. Therefore, the general populace of Indonesia thinks it is representative of a wide variety of traditional cuisines that are prepared and served throughout the country [14, 15]. This is a widely held belief. Traditional foods such as tempeh, tofu, garlic, honey, ginger, green beans, sea fish, and land fish are all-natural, high in nutrient density, healthful, and risk-free; in addition, they are not only inexpensive and simple to get, but they are also considered to contain a high nutrient density [16].

On the other hand, traditional meals comprised of processed foods tend to lack a balanced nutritional profile [17]. This cuisine is appealing on many levels, including its flavor, consistency, and aroma. In a similar vein, the eating customs of the region are not readily altered, even when people of a different ethnicity or culture from the surrounding area move in. This is because the eating customs of the region have been passed down through generations [18, 19]. The eating habits of the people in Indonesia considerably impact the country's traditional cuisine [18], which is also firmly established in the social and cultural traditions of many different ethnic groups [20]. By utilizing a fundamental component that allows for a wide variety of permutations, it is possible to create a variety of traditional cuisines that are both tasty and nutritionally sound [21]. This is made possible by utilizing the component with the most potential. Similarly, there are many processing techniques and a wide diversity of them. Some of these procedures include roasting, fuming, burning, cleaning, steaming, frying, and saut áng, amongst many more [22].

Meranti Island, Biological Treasure, and Economic Value in Food Cultural Heritage

Indonesia has the most islands overall and the largest archipelago in the world. This region has a significant amount of water because it has a coastline of around 81,000

kilometers long, 17,504 islands, and a total sea area of approximately 5.8 million km²; because of its advantageous geographical position, Indonesia is home to a diverse range of plentiful biological resources, both on land and in the maritime areas of the country [23]. This biological treasure needs to be utilized in the most fruitful way possible so that the people of Indonesia can enjoy the highest potential levels of health and happiness [24]. Marine commodities with significant economic value include marine urchins, teat fish, and sea ginseng [23]. There are many other marine goods as well. Sea cucumbers are yet another excellent illustration of this. One of the potentially important export items that the fishing business produces is the sea cucumber [25]. However, the use of sea cucumbers as food ingredients in Indonesia is relatively low and less popular than other fishery products [26]. This is because sea cucumbers from marine environments exhibit a distinct nutritional profile compared to other fishery products. Additionally, their unappealing physical appearance may contribute to their low aesthetic value. However, it is noteworthy that sea cucumbers have considerable protein content [12, 23]. This is because sea cucumbers have a poor aesthetic value, which can be derived from their visually ugly shape; nonetheless, they contain quite a high amount of protein [27].

Beronok, also known as Meranti sea cucumber, has been utilized by the Meranti people for a considerable time [28]. If it is utilized appropriately and for the appropriate business, *beronok* also has significant economic worth in assisting the surrounding community [28]. The potential of *beronok* to serve as a source of biopharmaceuticals derived from marine products and as a health food, in addition to its use as a raw material in a wide variety of industries across many countries, is among the most significant aspects that contribute to the economic value of this substance [29, 30].

The Meranti Islands Regency in Riau Province, Indonesia, is renowned for its rich customary cuisine, featuring a diverse array of wet and dry processed foods. Among the traditional dishes, *mpek-mpek* is a popular example of wet-processed food, while various processed flour-based foods represent the dry-processed category. These culinary treasures are products of the region's vibrant cultural heritage and have been preserved and passed down through generations. During fieldwork in the Meranti Islands Regency, a noteworthy finding emerged regarding a particular local delicacy called "*beronok*." This unique food item stood out due to its remarkably elevated protein concentration.

Further exploration led to a study conducted by Syah *et al.* [29], which shed light on the nutritional content of *beronok*. According to their report, *beronok* boasts significant quantities of essential minerals, including Sodium (Na), Potassium (K), Calcium (Ca), and Phosphorus (P), alongside trace amounts of various other minerals, with iron being particularly notable. The abundant presence of essential minerals in *beronok* makes

it a beneficial addition to the local diet. The high iron content is of special significance, as iron is crucial in supporting proper muscle and nerve function in the human body [30]. Incorporating *beronok* into the diet can be particularly advantageous for individuals seeking to maintain their overall well-being and promote optimal physical performance.

The provided evidence makes it abundantly clear that *beronok* possesses numerous advantageous qualities, establishing it as a valuable component of the traditional cuisine of the Meranti Islands Regency. This traditional food not only enriches the region's cultural heritage but also offers potential health benefits, promoting the overall well-being and nutrition of the community. As the culinary treasures of the Meranti Islands continue to be cherished and revered, *beronok*'s significance in supporting proper muscle and nerve function is a testament to the region's diverse culinary legacy. Due to its comprehensive nutritional composition, *beronok* can serve as a versatile dietary supplement for various purposes, with a particular focus on athletes [31]. In this context, an athlete can be defined as an individual actively involved in sports or physical activities, often at a competitive level, requiring a high degree of physical fitness, endurance, and skill. Athletes have distinct nutritional needs compared to the general population due to increased physical exertion and energy expenditure. Nutrition for athletes is a critical component of their training and performance. Despite this, the sea cucumber nevertheless possesses many characteristics that are not desired, such as a color that is not very appetizing and an odor that is not particularly pleasant [32]. The research findings suggest that sea cucumbers possess supplementary attributes that can enhance blood circulation, avert cholesterol obstructions in blood vessels, invigorate renal function, augment metabolic rate, alleviate arthritis, diabetes mellitus, and hypertension, and expedite the recovery of wounds both internally and externally. The nutritional and mineral composition of *beronok* renders it a suitable dietary option for athletes [31-34].

Sea cucumbers are useful in the medical field for treating various disorders and excellent for supplementing the nutritional requirements of athletes who regularly engage in strenuous sports [34]. Sea cucumbers contain a lot of potassium, essential for proper muscle function and recovery after strenuous exercise. Both advantages are present in sea cucumbers. However, athletes' nutritional needs are routinely ignored, negatively affecting their performance. An athlete's level of fitness and quality, both of which are considerably aided by the athlete's diet, are both elements that contribute to an athlete's overall performance [28, 34]. Therefore, diet is one aspect contributing to an athlete's overall performance. In addition, consuming this nutrient is required for the body to carry out its biological functions [34], such as providing body energy when an athlete engages in various physical activities, such as exercising, competing, and recovering while exercising

and after exercising [35].

Furthermore, mending or replacing damaged cells in the body is supported and facilitated by consuming the appropriate food in the appropriate amounts [36-38]. Therefore, the athlete can maximize their energy levels and capacity to quickly recover after competition by making informed choices regarding what they eat [38-41]. Athletes have varying energy needs depending on the duration of their workouts, the exercises they perform during those workouts, and the level of intensity of those workouts.

Beronok, also known as the *Meranti* sea cucumber or *holothuroidea*, is a unique and intriguing sea cucumber variety in saline waters. Although it plays a vital role in the native cuisine of the *Meranti* Islands Regency, it hasn't received sufficient attention in processing, which presents a challenge in preserving and celebrating local culinary traditions. Additionally, compared to other sea cucumber species with higher economic value, *beronok* has relatively lower economic viability. However, exploring its potential as a nutritious food source and dietary supplement for athletes could greatly benefit the community and the region. Researchers have extensively studied its peeling process, nutritional content, and potential applications in sports nutrition, making *beronok* a promising candidate for further investigation and utilization as a processed nutritious food and dietary supplement for athletes. So, this article aims to elucidate the inner workings of sea cucumbers and the potential advantages of integrating them into one's diet, with possible implications for readers' daily lives.

2. Methods

This piece of writing utilized a narrative study known as a literature review to conduct its research. A literature review is an organized and explicit process aimed at finding, analyzing, and synthesizing research works and findings produced by researchers and practitioners [38]. The findings of studies previously presented in scholarly journals served as the primary source for this literature review. These established findings have been previously documented. When crafting a comprehensive literature review, specific key phrases or steps must be undertaken to ensure the thoroughness and adequacy of the review [39, 40]. This literature review's primary source was previous studies in scholarly journals, providing a comprehensive overview of the subject. The literature review process can be divided into five stages [39]. The research procedure involves several stages. Initially, the scope of the topic is defined. Then, relevant sources are identified. Next, the literature is reviewed. Following that, a comprehensive review is written. Finally, the literature is applied to the topic at hand. In this study, a list of sea cucumber-related topics, specifically *beronok*, is compiled to gauge the extent of the issues examined. Data collection about the composition and benefits of *beronok* or sea cucumbers is

completed in the second stage. The subsequent phase includes sourcing information that comprehensively reveals the properties and advantages of *beronok* from various selected sources, including local researchers' studies and reputable international scientific publications. The focus of this discussion is on the distinct properties and benefits of *beronok*, commonly referred to as sea cucumbers. After gathering data, the next step involves assessing the compiled sources, documenting the review's findings, and drawing conclusions based on the acquired knowledge. Finally, a manuscript is prepared for dissemination to contribute to scientific knowledge.

3. Results

***Meranti* is a Top Priority for Food Security Development at the National Level in Sumatra**

The water's high salinity surrounding this island can be attributed to its proximity to the sea, particularly evident in areas like *Meranti*, where the capital city is situated along the Strait of Long. The *Meranti* region in Indonesia has gained recognition as a potential site for enhancing the country's food security, mainly due to its abundant biological resources and strategic geographical location within the Indonesia, Malaysia, and Singapore Economic Growth Triangle (IMS-GT) region and the Hinterland Free Trade Zone (FTZ) area. These areas revolve around Batam - Tanjung Karimun Hall, situated at 0 degrees 42 minutes 30 seconds north latitude and 102 degrees 12 minutes 0 seconds east longitude. As a highly functional Cross-Border Gate or International Gateway, *Meranti* facilitates seamless connectivity between the mainland of Riau and neighboring countries through maritime transportation, thus fostering economic expansion in the border regions adjoining Malaysia and Singapore.

This progress and strategic location hold promising potential for Dumai, a pivotal point for international access, commercial activities, and industrial operations. Dumai had been designated as the state's capital even before these developments. As of December 2022, *Meranti*'s export value amounted to approximately \$2.5 billion, while its import value reached approximately \$187.4 million [41]. The rich biological resources, advantageous geographical location, and thriving trade activities have positioned *Meranti* as a significant player in Indonesia's economic landscape. The island's connection to neighboring countries further contributes to its economic growth and food security potential, making it a vital region for its overall development. With its abundant resources and strategic importance, *Meranti* remains a focal point for progress and economic advancement in the region. As a result, it is reasonable to assert that the *Meranti* Regency has a reliable food source [42]. The industry's growth can be partially ascribed to the endeavors undertaken by the government to augment the utilization of organic

commodities emanating from the *Meranti* regency, particularly holothurians.

According to a study conducted by Sumarto *et al.* [41], the strategic geographical location of the *Meranti* Islands, coupled with the extensive knowledge of traditional agriculture among the local population, has played a crucial role in preserving and cultivating sea cucumbers, particularly the prized *Beronok* variety. This has resulted in *Beronok* holding significant economic value for the community, provided it is effectively utilized with proper effort and management. Keriming highlighted that *Beronok* is the authentic and unadulterated substance produced in *Meranti* [42]. As such, it represents a viable source of sustainable income for the community and a means of developing crucial supplementary resources, especially in fisheries and traditional food products. The composition of *Beronok* is attributed to its utilization of a type of fish native to the area, further enhancing its economic significance.

The economic value of sea cucumbers in *Meranti* goes beyond local consumption and trade. They are also recognized as a potential marine biopharmaceutical source and a valuable dietary supplement, contributing to their demand in various industries across multiple countries. Mukti and Elida support this notion, highlighting *Meranti* as a habitat for sea cucumbers, further emphasizing their importance [41]. Amidst the changing times, the enduring heritage of conventional cuisine, particularly the renowned *beronok*, continues to persist in *Meranti* [42]. Dietary customs remain virtually unaltered, showcasing the cultural significance of this traditional food product in the region. Overall, the strategic location, traditional agricultural knowledge, and enduring cultural heritage have all contributed to the economic significance of sea cucumbers, particularly *Beronok*, in the *Meranti* Islands. The community benefits economically and sustainably by recognizing and capitalizing on this unique marine resource's potential.

***Beronok*: The Traditional Dish of the *Meranti* People**

Many different social groups, religious traditions, and cultural norms coexist in Indonesia; all these factors have left their imprint on the country's cuisine in one way or another. Consequently, the cuisine is rich in variety and quantity [21]. This article explores the potential nutritional benefits of traditional food items, specifically the ethnic dishes of the *Meranti* community that feature *Beronok* as a prominent ingredient. Each recipe reflects the unique characteristics of the *Meranti* community, with *Beronok* being a key component in a diverse array of traditional gastronomy. Among these culinary examples, *Beronok*-based traditional foods are renowned and widely recognized. Despite its unappealing appearance during the processing phase, *Beronok* is deemed more natural, genuine, and authentic by the *Meranti* community, adding to its culinary value. *Meranti* offers a wide selection of

contemporary adaptations of conventional cuisine for patrons to enjoy during their dining experience. However, there remains a prevailing sentiment among individuals favoring traditional cuisine over contemporary dishes due to economic and procedural considerations, leading to the perception of *Meranti's* cuisine as inferior.

Indonesia's equatorial positioning blesses the country with abundant biological resources on both land and water. The sea cucumber, teat fish, and sea ginseng are commercially significant marine commodities [44]. This marine invertebrate is also recognized as *Holothuroidea* and can be a valuable source of marine biopharmaceutical products [45]. Additionally, sea cucumbers are utilized in health foods and as raw materials in various industries across multiple nations, making them valuable export commodities [10]. Despite their economic importance and export potential, Indonesia's utilization of sea cucumbers as a dietary source is limited due to their non-indigenous presence and low aesthetic value. Nonetheless, sea cucumbers are rich in protein, which adds to their nutritional value and potential benefits [46]. To fully harness the potential benefits of biological resources like sea cucumbers, it is crucial to optimize their usage for the benefit of Indonesia's populace and ecosystem.

In addition to sago serving as the primary staple food source, the *Meranti* tree also produces *beronok* due to its natural processes [40]. For instance, consider the potentiality that it could generate a greater quantity of valuable resources and furnish the community with a dependable means of revenue. This could be construed as a favorable advancement. In this context, *Beronok* exhibits the potential to be perceived as a captivating marine commodity that could hold economic significance. This phenomenon can be attributed to the circumstances mentioned above. The archipelago's capacity to serve as a reservoir of marine biopharmaceuticals and health foods is among the multiple factors contributing to the augmentation of the archipelago's economic value. Another aspect to consider is that the archipelago is a primary supplier of unprocessed resources for various sectors across multiple nations. In addition, *Beronok* is a rich source of protein.

Furthermore, *Beronok* contains quantifiable quantities of the chemical elements sodium (Na), potassium (K), calcium (Ca), and phosphorus (P) alongside negligible amounts of various minerals [29]. Upon a cursory examination of the card, it is apparent that *beronok* is conducive to the optimal functioning of the body's nerves and muscles, which is a promising development. The nutritional supplement known as *beronok* is derived from the extensive nutritional composition of *Meranti*. Thus, it is feasible to utilize *Meranti* as a panacea. According to the principles of traditional Chinese medicine, consuming sea cucumbers has demonstrated an ability to enhance the circulation of healthy blood [47]. Subsequently, sea cucumber impedes the constriction of blood vessels induced by cholesterol [48], enhances metabolic processes,

mitigates the onset of arthritis, diabetes mellitus, and hypertension, accelerates the recovery of wounds, facilitates the development and reinforcement of muscular function, and exhibits customary antiseptic characteristics, among numerous other advantageous health effects.

There is presently a shortage of substantial research on *Beronok*. The individual behind this investigation deserves recognition for conducting the sole research on *beronok*, meticulously documenting and disseminating their findings. The main objective of this investigation was to provide a comprehensive overview of the nutritional data related to *beronok* and identify its fundamental characteristics. According to the analysis, the flour derived from threshed and processed beef showed an average ash concentration of 3.2 percent. This data was obtained from the inquiry results and was found within the flour. The disparity in ash content between different substances is significantly associated with the mineral composition of the material. Substances with higher ash content generally have a greater mineral composition than those with lower ones. Additionally, the flour exhibited a protein content of approximately 48.7 percent.

Proteins play various essential roles in the body, such as serving as food reserves, constituents, and regulators, providing a source of energy, enzymes, and materials for tissue formation, and contributing to the production of intricate antibodies [50, 51]. *Beronok* is just one of the diverse examples of the roles proteins undertake. The protein cycle is a pervasive process in various locations within the body, including cells and tissues, and is facilitated by the digestive system [50]. The mean fat content observed in the flour after processing is 3.4 per cent. The production of this flour involves the utilization of meat and skin as primary raw materials, leading to the generation of fat as a by-product.

Consequently, the final product contains lipids. In addition to the circulatory system, the anatomy of a sea cucumber includes auditory muscles, bones, and blood vessels, which serve as adipose tissue reservoirs. Adipose tissue is primarily accumulated in blood vessels and distributed throughout the organism, and the skeletal and muscular structures within the auditory system fulfil this role. The proportion of carbohydrates in flour is 10.5 per cent, while the percentage of minerals is 8.1 per cent. These nutritional components contribute to the overall value and potential benefits of *beronok* as a food source. The aggregate quantity of minerals is 8.1 per cent. Karnila *et al.* [32] state that the author has conducted prior investigations on sea cucumbers and disseminated their discoveries. As per the research findings, the fresh meat of sea cucumbers exhibits an average water content of 8.9 per cent. The meat contains the following nutrient percentages: 6.7 per cent protein, 0.9 per cent fat, 11.3 per cent ash, and 12.5 per cent carbohydrates. Upon careful consideration, drawing parallels between the *beronok* and sea cucumbers is feasible. The dissimilarities between the two versions are expounded upon in the subsequent Table 1.

Table 1. Difference between Sea Cucumber Content and *Beronok* [29,32]

Component	Sea Cucumber	<i>Beronok</i>
Mineral	8.97%	8.19%
Protein	66.07%	48.78%
Fat	0.98%	3.44%
Ash	11.35%	37.21%
Carbohydrate	12.54%	10.57%

After that, the findings of this research are communicated to the wider scientific community using publication in academic publications such as national or international journals, theses, and dissertations. There are a few familiar names on the list [28,10,32]. In addition, the nutritional profiles of numerous sea cucumbers discovered in Indonesia and Australia were the subject of a specific investigation section as part of the study's findings.

According to the conclusions drawn from previous studies, there has been limited research on *beronok*'s nutritional properties, with Karnila's studies [32] and [49] being notable exceptions. The findings from these studies reveal that the average ash content in flour derived from ground meat is approximately 37.2 per cent. The variation in ash content between high and low materials is directly related to the overall mineral quantity present. In simpler terms, materials with higher ash content generally contain a higher concentration of minerals than those with lower ash content. On average, starch makes up about 48.7 per cent of the total protein content in the body. Proteins play a vital role in various biological processes, including tissue regeneration, energy supply [Formatting Citation], enzymatic activities, and the synthesis of complex antibodies through interactions with other molecules. Proteins serve many functions within the human body, with the above examples representing only a small fraction of their diverse roles [51]. They also act as nutrient reserves, suppliers of essential elements, and regulators. Additionally, proteins produce antibodies, a critical stage in the mentioned processes. Protein synthesis can occur within specific cells and tissues and throughout the entire organism [52], facilitated by the digestive system's ability to break down ingested food.

The average fat content in starch is typically around 3.4 per cent. Although the manufacturing process of this flour involves using meat and skin as raw materials, the final product contains only a small amount of fat. The physical structure of a sea cucumber consists of a network of vascular channels that may potentially contain fatty tissue distributed throughout the organism [53, 54]. Additionally, the sea cucumber's body comprises organs such as blood vessels, muscles, and auditory bones that store fat [49, 42]. Carbohydrates can constitute up to 10 per cent of one's diet, while the intake of minerals may reach a maximum of 8.1 per cent. These nutritional components contribute to the overall value and potential benefits of *beronok* as a dietary source [42].

The *Beronok* or *Meranti* sea cucumber is a unique and captivating natural resource. The *Meranti* sea cucumber is an alternative designation for this particular species. The absence of *beronok*, commonly called sea cucumbers, in other regions distinguishes it from the presence of sea cucumbers in those areas. This leads to a substantial disparity. *Meranti* is a distinctive and intriguing natural resource that thrives in saline environments, rendering it distinct from other natural resources and augmenting its overall allure. The indigenous dish of the *Meranti* Islands Regency area, *beronok* (*Meranti* sea cucumber), has been observed to be prepared in a manner that deviates from traditional practices by members of the local community.

Consequently, *Beronok* lacks the adequate nutritional value it ought to possess. Furthermore, this particular sea cucumber's comparative value is relatively low compared to other commercially viable species. The processing is constrained to the necessities pertinent to routine operational activities. There is a lack of recognition regarding the notable economic importance that the town and the *Meranti* Islands Regency hold.

The term "ethnic food culture" encompasses various aspects of a specific ethnic group's cuisine. It includes diverse culinary techniques, nutritional composition, cultural heritage, religious customs, and lifestyle practices that are unique to that particular group. Traditional ethnic dishes are often passed down through generations, with knowledge about their preparation carefully preserved over time. As a result, these dishes are considered suitable and safe for human consumption. The information regarding these traditional recipes can be found in conventional culinary formulas. However, it is essential to acknowledge that some modifications may have occurred before these recipes were included in the traditional culinary canon.

Observing the types of food traditionally consumed on various islands can offer valuable insights into those regions' environmental conditions and biodiversity levels. One can better understand their unique food cultures by examining the agricultural produce cultivated on these islands. Nevertheless, the influence of modernism, urbanization, and social transformation continuously challenges food cultures worldwide, particularly in developing nations. This is particularly true for the culinary customs of underdeveloped countries. Unplanned urbanization has led to a significant portion of the global population becoming disconnected from direct involvement in food production, transforming dietary habits. The lack of a direct connection to food production has changed people's dietary choices and habits.

The Concept of Developing Practical Applications of The Potential of Traditional Food for Athletes

Athletes must maintain a nutritionally balanced diet to meet their dietary requirements, supporting growth, development, cellular maintenance, and vital physiological processes. This well-balanced diet should consist of

various meals in appropriate quantities and ratios. Providing dependable sustenance during training and competitions maximizes athletes' performance. Implementing comprehensive food management software can help achieve satisfactory meal planning focused on optimizing performance during training and competitions. A menu plan is essential to meet athletes' dietary needs, adhering to existing service classification protocols and guidelines. The menu should incorporate various products and substitutes, ensuring a comprehensive and nutritionally satisfying arrangement promoting optimal health and ideal body weight. Including traditional foods, such as organically processed sea cucumbers, prepared through home-based or small to medium-scale industrial processes, can contribute to meeting essential nutrient requirements.

Nutrition is crucial for nutritionists and individuals, especially athletes, as it directly impacts their health and performance. Recognizing the link between nutrition, lifestyle, self-perception, and physical aptitude is vital for developing young athletes, trainers, and local sports mentors, enabling them to achieve optimal health and fitness. Sports coaches can leverage this knowledge to maximize athletes' achievements by understanding how nutrition, lifestyle choices, self-image, and physical performance interact. Athletes engaged in intense physical activity have higher nutritional requirements, making consuming various vitamins and minerals essential. Vitamin and mineral supplements can ensure an adequate intake, especially when consuming large quantities of fruits and vegetables is challenging. This is particularly relevant for children and athletes who may struggle to meet their recommended daily vitamin and mineral needs through food alone. Hydration is also critical for athletes' performance, and consuming an average of 2500 millilitres (ml) of water is necessary to maintain optimal hydration levels. The number of fluids needed accounts for bodily fluids lost through sweat, water vapour, and faeces.

When providing appropriate food for athletes, it is essential to consider the intensity and duration of their physical activities. Different athletic pursuits require specific caloric intake, and proper classification of these activities can help determine the precise nutritional needs of athletes. Ensuring athletes receive adequate nutrition based on their athletic demands can enhance their performance and overall well-being. Sea cucumbers, which have a comprehensive nutritional profile, have the potential to become one of the most nutrient-dense food sources [45]. Their high nutritional content makes them a food source rich in growth factors, and they also possess qualities that make them effective antioxidants, antibacterial agents, antifungal agents, and anticoagulants [27] [55] [24]. In Indonesia, incorporating sea cucumbers into cooking is still a relatively new practice.

For adolescent athletes under 18 to achieve optimal

growth and excel in their athletic pursuits, they must consume a diet that provides essential nutrients. Guidance on selecting high-energy foods, appropriate timing and consumption of specific foods, and optimal dietary practices during physical activity are crucial for adolescent athletes. Replenishing essential nutrients following competitions or strenuous physical exertion is also essential. A nutritionally balanced diet that provides adequate macronutrients (proteins, carbohydrates, and fats) and micronutrients (vitamins and minerals) is crucial to meet the body's energy demands for growth and physical activity. Proper hydration is also essential in facilitating growth and optimizing athletic performance. *Meranti*, a novel product derived from processed sea cucumber, is intended to supplement protein in the diet. The development of this product is expected to cater to the unique nutritional needs of athletes, providing them with a new dietary supplement option.

As shown in Figure 1, a nutritionally balanced diet encompasses various foods consumed in appropriate proportions to meet individuals' dietary requirements. Athletes can attain essential nutrients for optimal bodily function and athletic performance by introducing products derived from *Meranti* sea cucumbers. This innovative nutritional approach opens the door to a range of creative possibilities, potentially leading to the development of novel products. These products may have a substantial impact on the market by offering advantages that extend beyond just nutrition supplements for athletes. Such innovations could encompass the creation of specialized dietary supplements derived from *Meranti* sea cucumber, catering not only to athletes' unique nutritional needs but also to the broader population's health and well-being. These innovative products might include functional foods, dietary supplements, or innovative culinary applications, transforming how we approach nutrition and introducing novel, health-enhancing options to a wide consumer base. Athletes engaged in strenuous physical activities require an elevated intake of essential nutrients, including a broad spectrum of vitamins and minerals. Athletes often consume substantial quantities of fruits and vegetables to meet these elevated nutritional needs. Adding vitamin and mineral supplements can provide an extra layer of assurance. However, in the contemporary context, protein intake is paramount in addressing athletes' nutritional requirements, particularly concerning their pre-competition needs. When formulating dietary plans for athletes, it is imperative to consider the intensity and duration of their physical exertions. Different athletic disciplines dictate distinct caloric demands, and an accurate classification of these activities is crucial for determining the precise nutritional prerequisites of athletes. The provision of nutrition tailored to the specific demands of athletes can profoundly impact their performance and overall well-being.

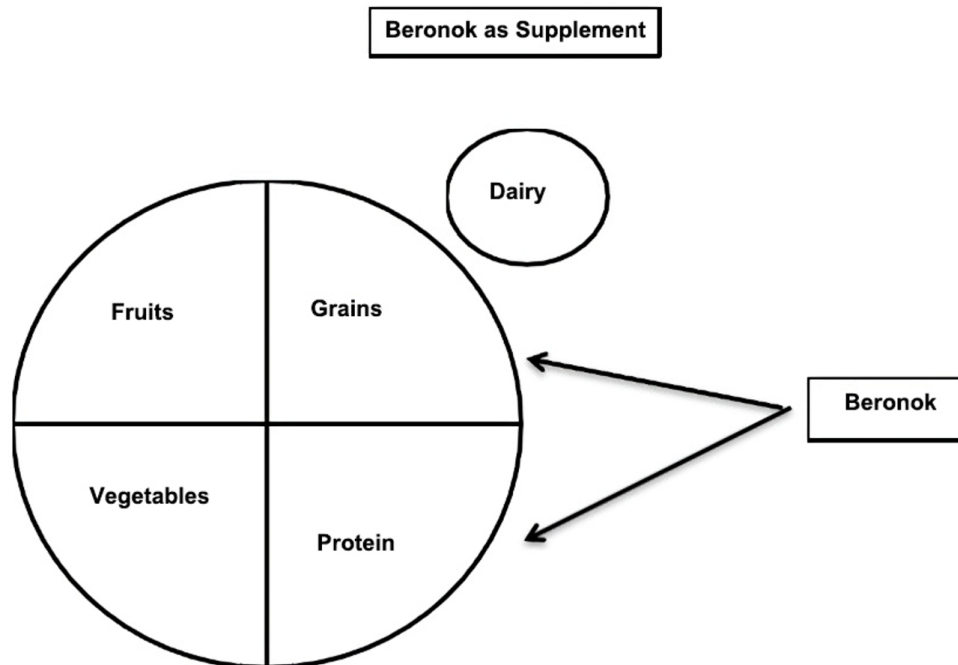


Figure 1. Development of the Concept of Protein Replacement with Beronok as a Supplement

Hence, as shown in Figure 1, while the need for an abundant consumption of fruits, vegetables, and grains to meet the recommended dietary guidelines is acknowledged, incorporating *beronok* as a dietary supplement can be particularly beneficial for athletes. This is especially true when addressing their protein requirements, a critical aspect of their dietary regimen, particularly in the lead-up to competitions or during the recovery phase.

4. Conclusions

The investigation into the potential benefits of *Meranti* sea cucumbers for athletes' physical performance and stability provides a promising pathway to enhance athletes' strength and overall physical performance. Sea cucumbers, particularly those sourced from *Meranti*, offer a unique nutritional profile that aligns with athletes' dietary needs. These sea cucumbers are rich in protein, which is crucial for muscle development and recovery, making them an excellent supplement for athletes. The nutritional content of *Meranti* sea cucumbers also contains essential vitamins and minerals that support athletes' health and well-being. These nutritional components can aid in maintaining energy levels, promoting muscle function, and aiding post-exercise recovery.

Additionally, the potential of sea cucumbers to enhance blood circulation and metabolic rate can contribute to athletes' endurance and overall physical prowess. Overall, by incorporating *Meranti* sea cucumbers into their diets, athletes can access these nutritional benefits, which may contribute to improved strength and physical performance. This innovative approach to sports nutrition represents an

opportunity for athletes to optimize their dietary intake and enhance their abilities. It showcases the unique nutritional assets of the *Meranti* Islands Regency and may contribute to the advancement of sports science, benefiting both athletes and the broader community.

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