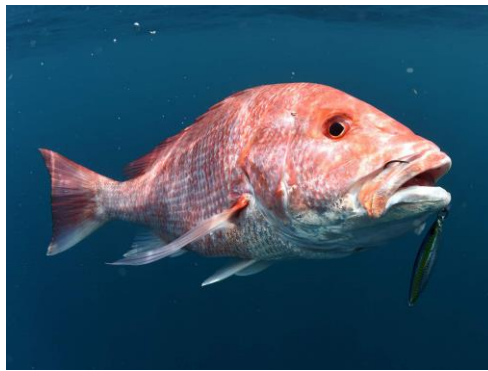


## CHAPTER II

### LITERATURE REVIEW

#### 2.1 Ingredient Review

##### 2.1.1 Snapper Fish Roe



**Figure 2.1** Snapper (*Lutjanus campechanus*)

Snapper fish roe refers to the eggs or roe of snapper fish (Figure 2.1), which are members of the Lutjanidae family. Snapper fish are widely distributed in both tropical and subtropical waters, and they are highly prized for their succulent flesh and delicate flavor (Tikkanen, 2024). However, their roe is often an underutilized or overlooked part of the fish.

The roe of snapper fish, like the roe of many other fish species, is rich in nutrients and can be considered a delicacy in various culinary traditions (Saetang, 2022). It contains high levels of protein, essential amino acids, omega-3 fatty acids, vitamins, and minerals (Anderson et al., 2005). Additionally, fish roe often possesses a unique flavor profile that can range from mild to briny, depending on the species and how it's prepared.



**Figure 2.2** Snapper Fish Roe

Despite its nutritional richness and culinary potential, snapper fish roe (Figure 2.2) is sometimes discarded or not fully utilized in commercial fishing operations (Anderson et al., 2005). This can be due to factors such as limited consumer demand, cultural preferences, or logistical challenges in processing and preserving the roe.

However, there is growing interest in exploring innovative ways to utilize snapper fish roe, including incorporating it into new food products like fish roe chips. By harnessing the nutritional benefits and unique flavor of snapper fish roe, these efforts aim to reduce food waste, diversify culinary offerings, and provide consumers with innovative and nutritious snack options.

### **2.1.2 Soy Sauce**

Soy sauce, originating from China over 2,000 years ago, is a versatile condiment widely used in Asian cuisine and increasingly popular worldwide. It is produced through the fermentation of soybeans, wheat, salt, and a fermenting mold called koji, typically *Aspergillus oryzae* or *Aspergillus sojae* (Yasuda, M. et al., 2007). The fermentation process can take several months to years, during which the mixture undergoes biochemical changes, resulting in its

characteristic savory flavor, known as umami. Light soy sauce is commonly used for seasoning and dipping, while dark soy sauce is thicker, richer, and often used for color and flavor enhancement in cooking (Zhu, M., 2023).



**Figure 2.3** Soy Sauce

Soy sauce (Figure 2.4) is not only valued for its unique taste but also for its nutritional benefits. It is rich in amino acids, particularly glutamate, which contributes to its umami flavor. Soy sauce also contains essential minerals such as iron, manganese, and potassium, as well as antioxidants and phytonutrients derived from the fermentation process (Kim S., 2007). When food is cured with soy sauce, it undergoes a transformation in which the soy sauce penetrates the surface, infusing it with its distinctive taste (Kobayashi et al., 2006). Adding soy sauce to fish roe snacks not only diminishes their briny taste but also extends their shelf life due to its preservative properties.

## 2.2 Product Review

Introducing snapper fish roe chips, a novel and nutritious snack option that combines the distinctive flavors of snapper fish roe with the convenience of a crispy chip format. Snapper fish roe chips are made by dehydrating the roe and coating it in crispy flour for a satisfying crunch. Chips and crackers are both popular snack foods, but they are different in ingredients, preparation methods, and textures. Chips are typically made from thinly sliced potatoes, corn, or other vegetables that are fried or baked until crispy (Hayes, 2021). Common types include potato chips, tortilla chips, and vegetable chips. In contrast, crackers are made from a dough of flour (usually wheat or a mix of grains), water, and various seasonings, which is rolled out thin and baked until crispy (Britannica, 2024). Examples of crackers include saltines, Ritz crackers, and wheat thins. The primary distinction lies in their preparation: chips involve frying or baking, while crackers are from a rolled-out dough.

Snapper fish roe, known for its distinct flavor and nutritional benefits, offers several advantages. Firstly, snapper fish roes are rich in protein, making them an excellent choice for individuals seeking to increase their protein intake for muscle repair and overall health support (Anderson, 2007). This high protein content caters particularly well to health-conscious consumers looking for fulfilling snacks (Elavarasan, K., 2013). Our fish roe chips are designed specifically for the younger generation, catering to those who seek trendy and high-protein foods. By combining the unique taste and nutritional benefits of fish roe with the convenience and appeal of chips, we aim to offer a modern snack that fits seamlessly into the lifestyles of adventurous eaters.

Nutrient density further enhances the appeal of snapper fish roe chips. They are packed with essential nutrients such as vitamin D, which is vital for bone health and immune function, and vitamin B12, essential for nerve function and red blood cell production (Wiharja, 2013). Additionally, they contain selenium, an antioxidant that protects cells from damage, and phosphorus, which supports bone health and energy metabolism (Hussain, 2022). This nutrient-rich profile not only contributes to overall well-being but also makes snapper fish roe chips a smart choice for maintaining a balanced diet.

## **2.3 Process Review**

### **2.3.1 Curing**

Curing generally refers to the process of preserving or preparing food, often meat or fish, through the use of salt, nitrates/nitrites, sugar, or smoking (Lee, Y., 2007). This process helps to enhance flavor, texture, and shelf life by inhibiting bacterial growth. Dry curing involves applying a dry mixture of salt, sugar, and spices directly onto meat, using osmosis for preservation, the process is slow, taking weeks to months, with a concentrated flavor. Wet curing (*brining*) immerses meat in a saltwater solution for days or weeks, quicker but with a more diluted flavor compared to dry curing (Bentley, R., 2007).

Using soy sauce as a curing agent for snapper fish roe serves multiple purposes. Firstly, it enhances the flavor profile by imparting a savory, umami-rich taste that complements the natural flavors of the roe and reducing its brininess, this step is very crucial because raw snapper fish roe is very briny (Yasuda, M., 2007). Additionally, soy sauce contains salt, which acts as a preservative by drawing out moisture from the roe, thereby extending its shelf life and improving texture (Kobayashi, 2005). Curing fish roe in soy sauce for 12 hours is a method to impart flavor and preserve the roe. This method is relatively quick

compared to longer curing processes and can be adjusted based on personal taste preferences for saltiness and flavor intensity (Bentley, R., 2007).

### **2.3.2 Dehydration**

Dehydration is a preservation technique used to remove moisture from food items, typically fruits, vegetables, or meats, by employing methods such as air-drying, sun-drying, or using specialized equipment like food dehydrators (Grandjean, 2007). By extracting moisture from the food, dehydration inhibits the growth of microorganisms that cause spoilage, thereby extending the shelf life of the product. This process concentrates the flavors and nutrients of the food while reducing its weight and volume, making it more convenient for storage and transportation (Thomas et al., 2008).

Dehydrating fish roe serves several purposes. By dehydrating, the roe can be transformed into sheets that are easier to handle and cut into desired shapes. The dehydrated fish roe has around 10% moisture content that it remains firm enough to be cut into pieces without breaking. This level of dehydration balances crispiness with structural integrity, allowing for easier handling and preparation (Sugiyama, 2020). Dehydrating fish roe not only enhances its texture but also concentrates its flavors, making it a versatile ingredient for various dishes where a crispy, flavorful element is desired (Baum, B., 2000).

### **2.3.3 Baking**

In terms of making chips, "baking" typically refers to the process of cooking thinly sliced or cut pieces of vegetables or meat in an oven (Snowdon, 2017). These pieces are often coated lightly with oil and seasonings before being spread out on a baking sheet and baked at a high temperature. This method allows the chips to become crispy and golden brown without the need for deep frying, making it a healthier alternative

. Baking chips also allow for more control over the amount of oil used and can result in a lighter, crunchier texture compared to frying (Reddy, 2021).

Baking method is being used for making these roe chips, the fact that baking uses less fat and less intense heat. When the roe is baked at moderate heat, specifically within the range of 150-180°C, the integrity of fat-soluble vitamins such as A and D is maintained, ensuring these vital nutrients are preserved (Wiharja, 2013). These vitamins are crucial for numerous bodily functions, including vision, immune system performance, and bone health.

Moreover, essential minerals like potassium and calcium, which are abundant in snapper fish roe, can withstand cooking temperatures up to 200°C (Elavarasan, K., 2013). Potassium plays a vital role in protecting cells from oxidative damage and supporting thyroid function. Therefore, baking the chips is a highly advisable method for preparation, as it ensures the retention of these valuable nutrients (Choe, 2007).