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Kerak Telor in an Ethnobiological Perspective: Integration of Indigenous Knowledge and Biodiversity in Educational Videos

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Abstract: Indonesia is a megadiverse country, but the younger generation's understanding of its biodiversity is still low, especially in linking the concept of biodiversity with indigenous knowledge. This research aims to examine the traditional food of *Kerak telor* from an ethnobiological perspective and promote it through educational videos. Information was collected through in-depth interviews with key informants using snowball sampling techniques, as well as visual documentation of the *Kerak telor* process. The results of the study show that the *Kerak telor* utilizes nine biological species, comprising six plant species and three animal species, with the dominance of *the Monocots* group reflecting the relationship of the Betawi people with the local flora. The manufacturing process retains traditional tools such as braziers, pans, fans, and sodets, reflecting the preservation of local cultural values and culinary technology. These results are presented in a 12-minute 32-second educational video, recommended as a contextual learning medium based on indigenous knowledge to support students' understanding of biodiversity and local wisdom.

INTRODUCTION

Indonesia is one of the megabiodiverse countries in the world. With a land area of about 1.3% of the earth's surface, Indonesia is home to more than 30,000–40,000 plant species, of which about 40% are endemic (Afiyah et al., 2020; Kusmana & Hikmat, 2015; Malik et al., 2020). Indonesia's biodiversity also includes 729 species of mammals (ranked first globally), 4,813 species of fish (ranked second), 1,723 species of birds (ranked fourth), and 773 species of reptiles (ranked fourth) (Adhiem, 2023). This wealth of biodiversity is a crucial asset that not only sustains human life but also supports ecosystem stability and environmental resilience (Gour, 2022; Heydari et al., 2020; Kusmana, 2015).

However, various studies indicate that the younger generation, including students and college students, still has a limited understanding of the concept of biodiversity. Zarisma et al. (2016) found that the classification aspect of the plant world was one of the indicators with the highest learning difficulties (62.63%). Similar findings were reported by Christanty et al. (2021) and Fitri et al. (2021), which notes the obstacles in understanding the characteristics of the plant and animal worlds. Even Agustin et al. (2020) report that most students do not understand basic concepts about vertebrates. Emilda et al. (2023) noted that students typically only recognize the species mentioned in the textbook, without relating them to local reality. Understanding biodiversity is one of the demands of biology learning achievements in the Independent Curriculum (Ministry of Education and Culture, 2022).

This problem highlights a gap between the teaching material and the students' real-life experiences. Therefore, a contextual learning strategy is needed that can connect scientific concepts to daily life (Jayanti & Susantini, 2021). One approach that can be used to enrich contextual learning is the integration of indigenous knowledge or local wisdom. Indigenous knowledge is a distinctive form of knowledge owned by local communities, acquired through accumulated experience and passed down from generation to generation (Adam et al., 2019; Chikaire et al., 2012). This knowledge is closely related to the use of biodiversity in various aspects of life (Toledo, 2013), including traditional foods.

One of the traditional foods from the Betawi Tribe in Indonesia is the *Kerak telor*. *Kerak telor* is a traditional Betawi dish that utilizes local biological resources, including glutinous rice, duck eggs, grated coconut, and spices, reflecting the close relationship between culture and the environment. Various studies have discussed it from the perspective of culinary, culture, and tourism. Adriansyah & Parantika (2023) highlight the preservation and promotion efforts of the government. (Dewantara, 2018) reviews the history, philosophy, and its creation, while Dominique et al. (2024) emphasize its contributions to tourism and the local economy.

However, there has been no research that has examined eggshells from an ethnobiological perspective for biodiversity-based contextual education. Therefore, the purpose of this study is to examine the eggshell from an ethnobiological perspective and promote it through educational videos. Ethnobiology is the study of the interaction between humans and living organisms in a cultural context (Ludwig & El-Hani, 2020). In the digital era, educational videos are one of the most effective learning media because they can convey information visually and aurally simultaneously, thereby increasing students' understanding and interest in the material presented (Wu, 2016; Marpaung et al., 2025). Thus, the use of ethnobiology-based educational videos can be an innovative approach to introducing biodiversity through a local cultural lens. The urgency of this research lies in the importance of introducing Indonesia's rich biodiversity through a relevant and meaningful approach for the younger generation, while preserving traditional knowledge as part of cultural identity and as a science learning resource.

RESEARCH METHODS

Methods

It used field exploration through direct observation of behavior in its natural environment (Garcia & Sunderlin, 2011). This approach also applies the principles of ethnobiology, which is an interdisciplinary field that examines the complex interactions between biodiversity and culture (Sobral & Albuquerque, 2016). The field exploration procedure in this study began with the selection of informants using *snowball sampling*, where recommendations were obtained by asking one informant to suggest another who was considered relevant. After the informants are selected, the researcher conducts an initial interview to dig up basic information. Furthermore, documentation was conducted in the field with tour guides and informants to record various cultural aspects related to the study object. Based on the results of the initial exploration, the researcher then identifies and assigns key informants who have in-depth knowledge of the research topic. Follow-up interviews were also conducted in depth with key informants. The results of all interviews and literature studies are then summarized, and the free list (*Free list*) is

compiled from the information obtained. As a final stage, the researcher created an artifact in the form of an educational video, intended for publication and dissemination to the broader community. The procedure is presented in Figure 1.

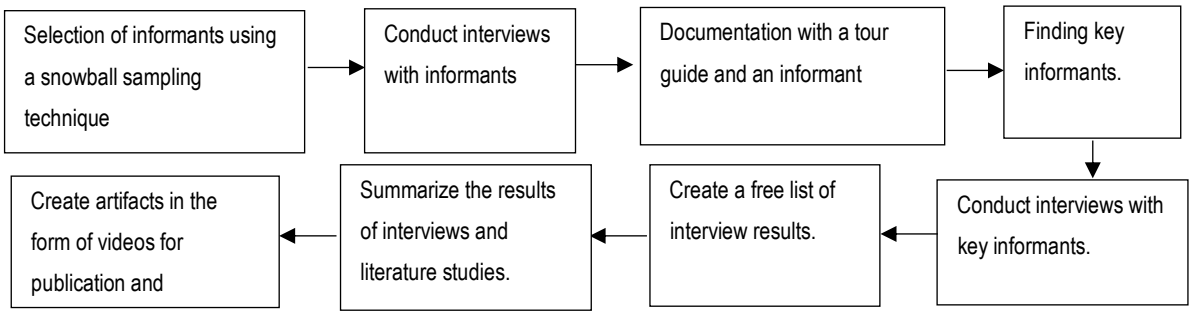

Figure 1. Research Procedure (Adinugraha, 2024)

Research Location

This research was carried out from March to April 2024. The primary location of the research is in the Setu Babakan area of South Jakarta. Additionally, research was conducted in the National Monument area, Central Jakarta. The location of the research is presented in Figure 2.

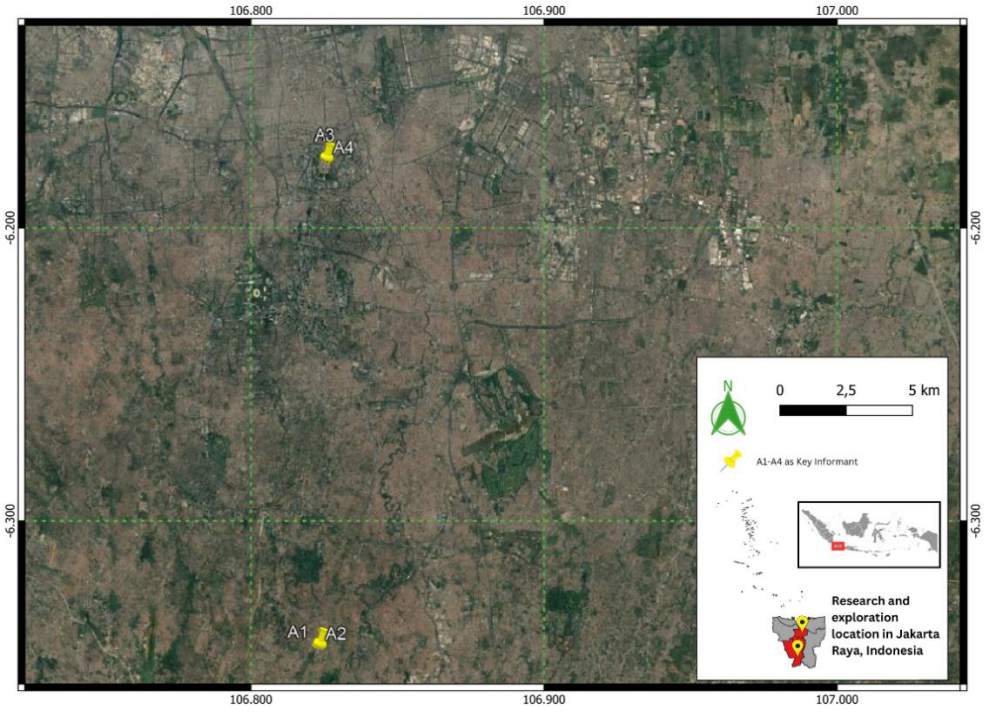

Figure 2. Research Location

Technical Data Collection

Data collection techniques include interviews, observations, and documentation. Interviews were conducted with four informants, all of whom worked as *Kerak telor* sellers; two of them were designated as key informants because they had in-depth knowledge of the history and practices of their making. Key informants are coded A1 until A4 (**Figure 2**). Semi-structured interviews are used to allow informants to share information openly while remaining aligned with the research objectives. Observations are focused on the tools, materials, and process of making *Kerak telor*. To support the findings of interviews and observations, the researcher documented the visual elements through photos, videos, and field notes, which will then be used as material for the preparation of educational videos.

Data Analysis Techniques

The collected data is analyzed qualitatively through three main stages: data reduction, data presentation, and concluding. The information obtained from observations, interviews, and documentation is filtered, simplified, and categorized based on relevant themes such as tools, materials, and the process of making *Kerak telor*. The reduced data is then compiled into descriptive narratives, tables, or visuals to illustrate the relationship between various aspects of *Kerak telor*.

RESULTS AND DISCUSSION

The Betawi tribe is an indigenous group that inhabits the city of Jakarta, but its existence is being threatened due to the influx of immigrants. The development of Jakarta as a metropolitan city has led to the Betawi community dispersing and being pushed to the suburbs, such as Tangerang, Depok, Bekasi, and Bogor (Haikal, 2005). The informant explained that *Kerak telor* began to be promoted under the leadership of Governor Ali Sadikin and continues to be the main dish at various major events in Jakarta to this day. *Kerak telor* has also become an identity and characteristic of the city, as it is believed to have originated from the Betawi community during the Dutch colonial period (Dewantara, 2018).

According to Informant A3, the *Kerak telor* was originally a simple snack made from rice crust attached to the cooking place, then added free-range chicken

eggs. This food continues to be developed until it is known as *Kerak telor*. Meanwhile, Informant A4 mentioned that the *Kerak telor* appeared during the time of Si Pitung as a food provision during the war due to its durability, which could last up to four days. On the other hand, Informant A1 stated that the idea of making *Kerak telor* also arose because of the abundance of coconuts among the Betawi people, so they processed them into a mixture of coconut roasting and *Kerak telor*.

The tools used in the *Kerak telor* process reflect a blend of tradition and modern adaptation. Traditional tools such as braziers, pans, pan lids, stirrers, sodets, and fans are still used today to maintain the distinctive taste and authentic Betawi way of cooking. Although some sellers are starting to use more modern tools, traditional elements remain the main feature in their presentation. A more complete explanation of these tools is presented in Table 1 and can also be seen in Figure 3.

Table 1: Tools used in *kerak telor*

Tool name	**Explanation**	**Uses**
Anglo	A brazier is a furnace made of terracotta. This brazier has a stove-like function, but it lacks a closed heating chamber, allowing the burner flame to open directly from the fuel.	As a burner, the place holds charcoal and places the pan.
Wok	A frying pan is a frying pan with a round bottom.	As a place to cook the *kerak telor* dough.
Cover the pan	A pan lid is a commonly used tool to cover the pan, preventing moisture from evaporating to the surface.	As a pan cover, when all the *kerak telor* dough is mixed and cooked.
Mixer	A food mixer is a piece of equipment used to stir dough in the food manufacturing process.	To ensure that the dough is well mixed, so that it reaches the appropriate consistency.
Sodet	Sodet is a tool used in the processing of fried or sautéed food.	As a tool to take the *kerak telor* when it is cooked and will be served.
Fan	A fan is a tool to fan the embers in the cooking stove to keep them burning.	As a tool to help the *kerak telor* cook evenly and improve the taste of food.

Figure 3: *Kerak Telor* tools. (1) Pitcher (2) Skillet, (3) Pan Lid, (4) Stirrer, (5) Sodet, (6) Fan

The manufacture of *kerak telor* involves the use of various materials derived from plant and animal organisms. In the context of ethnobiology, this reflects the

relationship between the Betawi people and the surrounding biological resources. Various species of plants and animals are used as the primary ingredients, demonstrating local knowledge in selecting and processing natural resources to meet traditional food needs. The species used in the manufacture of egg shells are presented in Table 2 and Figure 3.

Table 2: Species Used in the Making of *Kerak Telor*

Local name	**Species**	**Genus**	**Family**	**Order**	**Clade**	**Parts used**
Plants						
Glutinous rice	*Oryza sativa* L.Var *glutinosa*	*Oryza*	*Poaceae*	*Poales*	*Monocots*	Seed
Coconut	*Cocos nucifera L.*	*Cocos*	*Arecaceae*	*Arches*	*Monocots*	Fruit (endosperm)
Red chili peppers	*Capsicum annum L.*	*Capsicum*	*Solanaceae*	*Solanace*	*Eudicots*	Fruit
Turmeric	*Turmeric longa L.*	*Curcuma*	*Zingiberaceae*	*Zingiberales*	*Monocots*	Rhizome
Shallot	*Allium cepa L.*	*Allium*	*Amaryllidaceae*	*Asparagus*	*Monocots*	Layer tubers
Pepper	*Piper nigrum L.*	*Piper*	*Piperaceae*	*Piperals*	*Magnoliids*	Seed
Animals						
Chicken	*Gallus gallus domesticus*	*Gallus*	*Phasianidae*	*Galliformes*	*Aves*	Egg
Duck	*Anas platyrhynchos domesticus*	*Anas*	*Anatidae*	*Anseriformes*	*Aves*	Egg
Ebi shrimp	*Indicus Acetes*	*Acetes*	*Sergestidae*	*Decapod*	*Malacostraca*	All parts

* Some use chicken eggs, but some use duck eggs

Figure 1: Species used for the manufacture of *kerak telor*. (a) Glutinous rice; (b) Coconut; (c) Red Chili; (d) Turmeric; (e) Shallots; (f) Lada; (g) Chicken Eggs; (h) Duck Eggs; (i) Ebi

Figure 4 shows the results of class/*clade identification* of biological ingredients used in the manufacture of traditional *Kerak Telor* food. From the graph, it can be seen that the Monocots group is the most dominant, with a frequency of 4, followed by Aves (the class of birds), with a frequency of 2, while Eudicots, Magnoliids, and Malacostraca each have a frequency of 1. Materials derived from plants (*plant clades*) dominate, especially those from the Monocots group, which generally includes cereals and spices. Meanwhile, ingredients from

animals (*animal clades*) such as Aves (e.g., eggs) and Malacostraca (e.g., shrimp or shellfish) contribute to the biological diversity in the culinary world. This graph illustrates the complexity of the biological composition in the *Kerak Telor*, which involves various classes from both the plant and animal kingdoms.

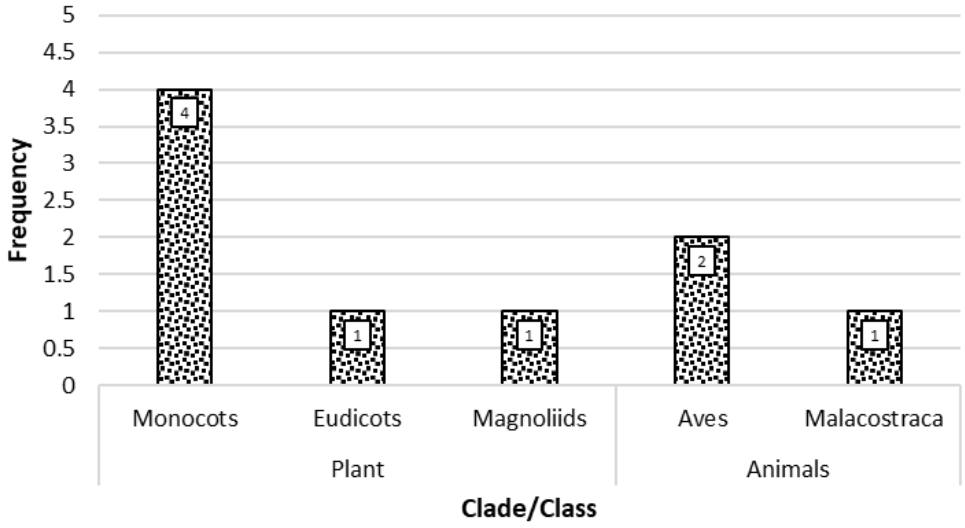

Figure 4 Identification of the class/clade used in the *Kerak Telor*

Oryza sativa L. var. *Glutinous*, or better known as glutinous rice, is a rice variety that has a high amylopectin content and contains almost no amylose, which causes its texture to become sticky when cooked (Ali & Hashim, 2024). Glutinous rice is a primary food crop in Asia that provides long-lasting energy to the body due to its high amylopectin content (Guo et al., 2024). In addition to its distinctive texture, glutinous rice—particularly the black and purple varieties—is rich in bioactive compounds such as anthocyanins, phenolics, and flavonoids, which offer important health benefits, including antioxidant, anti-inflammatory, and anticancer potential (Liu et al., 2022; Pramitasari & Herlina, 2023).

Cocos nucifera L. is the most valuable plantation plant because almost all of its parts—from leaves, pulp, stems, to roots—can be used by the community, so it is known as the "tree of life"(Tooy et al., 2025). The coconut tree (*Cocos nucifera* L.) is a high-value tropical plant with an edible part rich in nutrients and nutraceutical compounds (S. A. Kumar et al., 2025). Another important

characteristic is the phenolic and antioxidant content in various parts of the coconut, including water, oil, and shell, which suggests potential as a functional food and disease prevention agent (Surboyo et al., 2024).

Red chili (*Capsicum annuum* L.) has the characteristic of fruits that change color to bright red when ripe, due to the accumulation of carotenoid pigments such as capsanthin and capsorubin that increase during the ripening process (Erol, 2024). *Capsicum annuum* L. is known to have a high content of vitamin C, carotenoids, and other bioactive compounds, thereby significantly contributing to its nutritional value (Vardanian et al., 2025). In addition, chili peppers are rich in bioactive compounds, including alkaloids, carotenoids, and antioxidants, which are beneficial for their antioxidant, anti-inflammatory, and lipid-lowering properties (Díaz et al., 2025). Antioxidants and capsaicin are also analyzed for fruit *Capsicum* (Archibong et al., 2024).

Turmeric is also widely used as a natural coloring agent and functional supplement in the food and health industries due to its safety and scientifically proven effectiveness. Turmeric (*Turmeric longa* L.) is a tropical rhizome plant of the Zingiberaceae family known for its distinctive yellow-orange color, derived from a primary active compound called curcumin, which also provides important pharmacological properties (H. Kumar et al., 2025). *Turmeric longa, a member* of the Zingiberaceae family, is globally recognized for its anti-inflammatory, anticancer, and anthelmintic properties, and is widely utilized in cosmetics and medicine (Ayub et al., 2024; Sharma et al., 2024).

Shallots (*Allium cepa* L.) contain a large amount of non-sulfur compounds such as phenolic acids and flavonoids that exhibit strong antioxidant and anti-inflammatory properties (Muscolo et al., 2025). The species *Allium*, widely known for its use as a flavoring in foods, vegetables, and traditional medicine, has been extensively researched for its therapeutic and pharmacological effects (Nergui et al., 2025). Onions are rich in vitamins, minerals, and bioactive compounds, such as quercetin and allicin, which act as antioxidants, anticancer agents, and improve immune and cognitive function (Gupta et al., 2025).

São Paulo (*Piper nigrum* L.) is an aromatic spice of the Piperaceae family known for its pungent taste and active compounds, especially piperine, which provide a wide range of pharmacological benefits (Pop et al., 2024). Black pepper is valued for its pungent taste and aroma, as well as its nutrient and bioactive compound content, which provides health benefits and has wide applications in the food, medical, and cosmetic fields (Hegde et al., 2025). Black pepper extract is capable of synthesizing environmentally friendly silver nanoparticles that exhibit anticancer potential against prostate cancer cells (Slman et al., 2023).

Chicken eggs (*Gallus gallus domesticus)* are one of the economically important products in Indonesia due to their relatively affordable price compared to other animal protein sources (Kurnia et al., 2021). In addition, chicken eggs contain vitamins A, D, B12, and B9, which are important for vision, immunity, blood cell formation, and cell growth, as well as minerals such as iron, phosphorus, and selenium, plus healthy fats such as omega-3s that support overall body health (Attia et al., 2024). Lutein and zeaxanthin in eggs are important carotenoid pigments that support eye health and give food a yellow-orange color (Abdel-Aal et al., 2013).

Duck eggs (*Anas platyrhynchos domesticus)* are larger, offer a richer flavor, and contain more fat, protein, vitamins, and omega-3s than chicken eggs (Kokoszyński, 2017; Nanubhai & Jha, 2024). The nutritional value and quality of duck egg whites are influenced by their amino acid content, making them a potential source of protein and bioactive peptides (Azzam et al., 2025). Duck eggs are rich in nutrients but are rarely consumed directly due to their fishy aroma. However, supplementation of feed with 1.5 g/kg of honeycomb extract has been shown to lower cholesterol, improve amino acid and fat profiles, and improve the antioxidant status and immunity of laying ducks (Chen et al., 2023).

Indicus Acetes is a shallow-water planktonic shrimp that has high economic value in tropical Asia and is rich in proteins and essential nutrients, making it widely used in local food products, such as EBI (Hanamura et al., 2024). Generally, these shrimp are dried for use as natural flavorings, such as ebi, as well as a basic ingredient in making shrimp paste and petis, not for fresh consumption (Asih, 2020). Traditionally, *Indicus Acetes* is used as a primary component in shrimp

paste—a typical Indonesian fermented seasoning—that gives it a strong, complex flavor. However, some regional variations also incorporate other seafood ingredients, such as fish (Surya et al., 2024).

The process of making *kerak telor* begins by soaking glutinous rice overnight without any added mixture. After that, the shredded coconut is roasted and divided into two parts—one part is roasted dry, while the other part is still slightly wet to maintain the softness of the flavor. This stage shows special attention to the texture and flavor produced. This process also reflects the Betawi culinary tradition, which is rich in cultural significance and has been passed down from generation to generation.

The cooking stage of the *kerak telor* begins by placing the soaked sticky rice in a pan and flattening it on the surface. Next, serundeng, pepper, and salt are added on top of sticky rice, then followed by chicken or duck eggs as a complementary ingredient. All ingredients are stirred until evenly distributed, then let stand while gently fanning until they are cooked perfectly. After that, the pan is turned over so that the top of the dough faces the charcoal coals directly, resulting in a distinctive aroma that is appetizing. After cooking, the *kerak telor* is sprinkled again with serundeng and fried onions, and then it is ready to serve. The complete stages of this process are illustrated in Figure 5.

Figure 5: The process of making *kerak telor*. (a) Put glutinous rice in the pan; (b) Spread the sticky rice on the pan; (c) Add serundeng, salt, and pepper; (d) Put chicken or duck eggs; (e) Stir all ingredients until evenly distributed; (f) Let the dough sit so that the bottom is cooked; (g) Turn the pan over so that the top cooks directly on top of the coals; (h) Add serundeng and serve the *kerak telor*.

The results of the *kerak telor* research are published in the form of educational videos. The educational video was created using the CapCut application, with Canva used to support illustrations, and the footage was captured using a smartphone camera. The educational video can be accessed via the following link: https://youtu.be/zlZv0OtMPVg. The video is 12 minutes and 32 seconds long. This video introduces various cultural icons found in the Betawi Museum located in Setu Babakan. In this video, we also explore one of the legendary Betawi specialties, namely the *kerak telor*. To dig deeper into the *kerak telor*, we interviewed with an informant from Betawi in Setu Babakan. Through direct observation and a series of questions, we gathered information about the *kerak telor* history, the materials used, the tools employed, and the overall manufacturing process. To enrich our insights, we continued our journey to the National Monument area and conducted interviews with two other Betawi informants. This interview was conducted using a similar method, namely observation and question-and-answer sessions about the same aspects, to gain a broader perspective on Berawi food in the form of *kerak telor*.

This research is still limited to the ethnobiological study of Pletok Beer and its implementation in the form of videos. The application of learning based on local knowledge and culture through ethnobiological studies should be incorporated into teachers' learning activities (Adinugraha, 2022). Therefore, researchers are further advised to develop learning strategies that integrate local knowledge to introduce biodiversity, for example, through traditional medicines made from medicinal plants (Silalahi & Nisyawati, 2018), objects of offerings in traditional rituals (Adinugraha, Zubaidah et al., 2024), ethnoecology-based environmental studies (Sabasti et al., 2024), as well as traditional foods (Silalahi et al., 2024). The integration of local knowledge in learning is believed to form the character of curiosity and insight into biodiversity.

CONCLUSIONS AND RECOMMENDATIONS

This research reveals that the *kerak telor* is not only a traditional Betawi food, but also reflects the close relationship between culinary culture and local

biodiversity. A total of nine species of organisms—six from plants (dominated by *the Monocots* group) and three from animals (*Aves* and *malacostraca*)—were used in the manufacturing process, demonstrating the community's use of ethnobiological knowledge in selecting functional foodstuffs. The utensils used, such as braziers, pans, pan lids, stirrers, sodets, and fans, affirm the preservation of traditional cooking techniques in the presentation of this heritage culinary tradition. The manufacturing process, which begins with soaking glutinous rice, mixing animal and vegetable ingredients, and roasting on open charcoal, shows a combination of cultural values, nutrition, and local culinary techniques. Visual documentation through an educational video, lasting 12 minutes and 32 seconds, also strengthens efforts to preserve and promote the *kerak telor* as a Betawi identity rich in cultural and biodiversity values.

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