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Human–Asian Palm Civet Conflict in Malaysia

Siti Mastura Hasan * and Sándor Csányi

Department of Wildlife Biology and Management, Institute of Wildlife Management and Nature Conservation, Hungarian University of Agriculture and Life Sciences, Páter Károly u. 1., H-2100 Gödöllő, Hungary; csanyi.sandor@uni-mate.hu

* Correspondence: smasturahasan@gmail.com

Abstract: The Asian palm civet (APC), *Paradoxurus hermaphroditus*, is a native Malaysian mammal, and recently, it has increasingly caused conflicts with humans as it ventures into local settlements for food. A study surveying 212 locals and analyzing the APC scats was conducted in Hulu Langat, Selangor, Malaysia, from August 2021 to December 2022 to understand the coexistence potential. The findings show: (1) The conflicts mainly arise due to the APCs' foraging habits. (2) APCs cause local damage, including cultivated fruit consumption, poultry predation, and agricultural and property damage. (3) Most locals have a positive attitude toward APCs, although, in local settlements, they are considered to be pests. Respondents who experienced losses of cultivated fruits and poultry, and were familiar with APCs, had more negative attitudes. (4) Most locals believe that the APC population has increased over the past decade. (5) Only a few locals actively engage in mitigating the conflict through the use of poison, while most of them do not take any action. Although Malaysia's human–Asian palm civet conflict is relatively tolerant, prioritizing management strategies is crucial. Conservation practitioners must address these conflicts by highlighting the need for further research and a holistic approach considering social, economic, and ecological factors.

Keywords: Asian palm civet; *Paradoxurus hermaphroditus*; Musang Pandan; human–wildlife conflict; local; Malaysia

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1. Introduction

Asian palm civets (*Paradoxurus hermaphroditus*), also known as Musang Pandan, as they emit the distinctive odor of pandan leaves (*Pandanus amaryllifolius*), are small carnivorous mammals (~2–5 kg) and a viverrid that are native to many of the Southeast Asia countries, including Malaysia [1,2]. In Malaysia, they are also known as toddy-cat because they also feed on palm flower sap which, when it undergoes fermentation, becomes a sweet liquor (toddy) [3]. They exhibit a flexible omnivorous diet, mainly consisting of fruits, and opportunistically consume invertebrates and small vertebrates, helping to maintain the ecosystem via seed dispersal [4]. APCs also are primarily arboreal and nocturnal animals that inhibit trees with dense foliage in the daytime, while foraging on trees and the ground at night [5,6].

They are also known for their role in producing Luwak coffee, a type of coffee made from coffee beans that have undergone partial digestion and subsequent excretion by civets [7]. Although Luwak coffee has gained popularity in certain parts of the world, there are big concerns about the welfare and treatment of civets that are used for its production [8,9]. In addition to that, the APC is also hunted for its meat and traditional purposes [10], even though hunting the species is illegal in Malaysia [11]. The APC is protected by law in Malaysia as its numbers have declined over the years [11,12]. However, globally, they have been classified as a "Least Concern" species by the IUCN Red List [13] due to their wide distribution and presence in various types of habitats throughout the country, including forests, plantations, urban areas and tolerance to some degree of habitat change [14]. Due to deforestation and increasing urbanization, their natural habitats have

been destroyed, forcing these wild animals to become urban adapters and adapt to urban environments [10].

The human–Asian palm civet conflict in Malaysia is a result of urbanization and the encroachment of human activities into the natural habitats of these wild animals [14,15]. While some locals enjoy the presence of these wild animals in their surroundings, others view them as a nuisance [16]. APCs have been known to encroach on fruit trees, attack poultry, and cause damage to local properties, such as roofs and basements, due to their climbing nature and their sharp teeth and claws [10]. In certain situations, they may exhibit aggression towards locals through direct contact, especially when they feel threatened and cornered [17]. Consequently, conflict with APCs has become a significant local social issue within communities. Generally, the human–wildlife conflict not only causes damage and losses but also can threaten the safety of locals [17–19]. When the conflict exceeds the tolerance level and develops more negative attitudes, it can potentially reduce the local's enthusiasm for protecting and conserving these species [20].

Therefore, it is imperative to promptly prioritize the protection and management, and mitigation of the human–Asian palm civet conflict in order to protect APCs. Considering that the local community's attitude directly influences the effectiveness of implementing conservation policies and establishing scientific human–wildlife coexistence approaches [21], it is necessary to study the relationship between humans and APCs. This study has identified the following: (1) the current status of human–Asian palm civet conflict; (2) the impact of the human–Asian palm civet conflict on the respondents (3) the knowledge and attitude of the respondents towards APC and further investigation into their attitude's reasons; (4) the changes in the APC population over past decade; and (5) the measures taken by the respondents to alleviate the conflict were presented with the aim of providing empirical evidence that supports the mitigation of the human–Asian palm civet conflict.

2. Materials and Methods

2.1. Study Area

This study was conducted from August 2021 to the end of December 2022 in 6 villages (Sg. Michu, Sg. Serai, Sg. Semungkis, Sg. Tekali, Jawa, and Dusun Tua) of Hulu Langat (3.1131° N, 101.8157° E) (Figure 1). Hulu Langat district is the fifth largest district in Selangor state in Malaysia, with an area of 840 sq km and a population of 1,400,461, with a household number of 387,600 [22]. The Hulu Langat region geographically encompasses diverse topography, including rolling hills, rivers, dense rainforests, agricultural land, and local settlements [23]. The region is scattered with various local settlements, ranging from traditional villages to urban townships [24]. Agriculture plays an important role in this region, with extensive land dedicated to cultivating trees and livestock farms, and it is home to an abundance of flora and fauna, including endemic species that live in its unique landscapes [23]. The climate of the region is categorized as tropical rainforest climate and typically has warm and humid conditions, with average temperatures ranging from 23 °C to 32 °C [25]. November, December, and January are the months with the highest rainfall, whereas June and July are the driest months in Hulu Langat [25]. The region experiences an average monthly rainfall (annual) ranging between 1500 and 2000 mm [25].

2.2. Survey Data Collection

In August 2021, a preliminary survey was carried out in Hulu Langat to identify potential respondents and gather information on the human–Asian palm civet by interviewing locals from eight villages bordering a forest reserve. We used this initial investigation to identify potential respondents who were not only familiar with the conflict but also possessed the necessary knowledge and expertise concerning APCs. The main aim was to ensure that the selected respondents could offer valuable insights, relevant perspectives, and knowledgeable opinions, thus improving the validity and comprehensiveness of the research findings. Based on this investigation, the six study areas (Sg. Michu, Sg. Serai, Sg. Semungkis, Sg. Tekali, Jawa, and Dusun Tua) were selected for formal investiga-

tion (Figure 1). Next, a formal investigation with local respondents from target sites was conducted from July until the end of August 2022, and used semi-structured interviews and a questionnaire survey as the research methods. Respondents were selected based on the initial survey and local inventory from the target areas, using 2020 population census records [22] and updates from local district administration representatives at the village level.

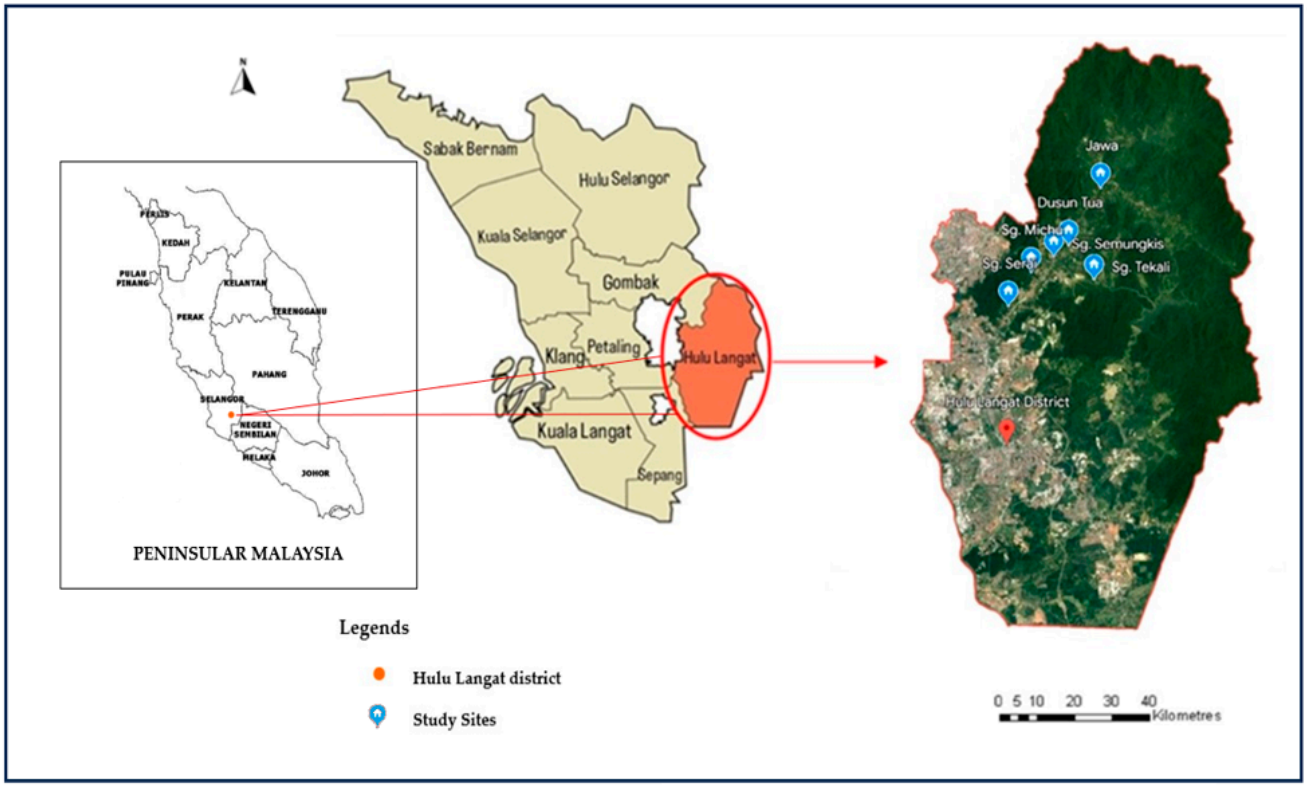

Figure 1. Maps of the study area.

The semi-structured interview was designed to establish an overall framework, and open-ended questions were used to encourage respondents' personal interpretation of the human–Asian palm civet conflict. This approach created an environment where respondents could freely express nuanced responses that encompassed complexity, ambiguity, and uncertainty [26,27]. Subject to the respondents' consent, most of the interviews were recorded. In cases where recording was not feasible, detailed notes were taken. The aim of the interviews was to outline the causes of the human–Asian palm civet conflict and the challenges encountered in the conflict mitigation process.

Respondents were initially queried about their perceptions of the human–Asian palm civet conflict based on their own experiences. To elicit their initial opinions, first, the respondents were asked the question, "What is the relationship between the local community and APC?". Second, they were inquired about the factors that they consider when assessing the human–Asian palm civet conflict in order to gain insight into their objectivity in the process of evaluating the conflicts. Third, they were asked to describe the damage and losses caused by the APC incidents. Finally, they were asked about the countermeasures taken to mitigate and deal with the conflicts.

In addition to that, we also conducted the questionnaire survey method to accurately identify the local's attitudes and knowledge of APC. To ensure the questionnaire's quality, individual interviews with locals were conducted. We surveyed using the Malay language (official language) since most of the locals in the study areas were primarily Malay native speakers and also inhabited by Indigenous people. We then distributed the questionnaires to respondents (>18 years), which were conducted face to face to allow a comprehensive

understanding among the locals in a guided and casual manner [28]. The collection of data was conducted in a confidential manner, and none of the respondents' personal data was recorded [29].

We constructed a comprehensive questionnaire considering the various socio-demographic backgrounds that potentially affect the attitudes of locals toward APCs. To ensure the content and clarity of the wording, a preliminary survey was administered to 20 locals in Hulu Langat. Based on the feedback received, necessary adjustments were made before conducting the final survey. The final questionnaire, consisting of four pages, was constructed based on the scientific literature and guided by the research objectives. It comprised an introductory page followed by three pages containing questions organized into five sections: (1) the demographic backgrounds of the respondents, which included gender, age, occupation, education, and residence; (2) the impact of the APC conflict on the respondents; (3) the attitude and knowledge of the respondents towards APCs and further inquiry into their attitude's reasons; (4) the perceived population change of the APC in the last 10 years; and (5) the measures taken by the respondents to address the conflict.

All the transcripts of the interviews and surveys were checked to ensure the accuracy and validity of the data. All collected data were analyzed using SPSS (Statistical Package for the Social Science) version 27 [30]. The data were analyzed using both descriptive and inferential statistical analysis. We used Chi-square, Tukey's post hoc tests, and univariate analysis of variance (ANOVA) to explore patterns, relationships, and significant differences within the data set.

2.3. Scats Data Collection

The food preferences of the APC in the study area were studied by collecting scats between January and December 2022. A total of 57 scat samples collected opportunistically from the target species during the study period were analyzed. As the APC is nocturnal and predominantly inhabits dense canopy cover and understory [6], direct observations of feeding or camera trapping were not possible. Therefore, to obtain APC scat samples, we collected them from the potential area where the species is known to inhabit. We distinguished APC scats based on their general appearance (e.g., color, size, and shape), textures, smell, other evidence of APCs (e.g., tracks, feeding signs, and location), and the information gathered from locals. APC scats are usually tubular or cylindrical, rounded at both ends, ~0.5–1.0 cm diameter, and also commonly defecated as a single bolus or mass on distinguished locations [10]. The scats of APCs were distinguished from those of wildcats and leopards reported to occur in the study area. Throughout this study, we employed various methods to identify scats samples. However, out of the 68 scats collected, 11 could not be conclusively assigned to species and were excluded from the analysis. As a collective, these procedures strongly indicate a low probability of misidentification of APC scats [31].

The date and location of the collection were recorded for each scat sample. All scat samples were air-dried and then stored in air-tight bags until analyses were conducted. The scat analyses were conducted following the Kruuk and Parish (1981) method [32]. The scat samples were diluted in distilled water and observed using a dissecting microscope. Food items present in the APC scats were taxonomically identified by examining plant materials and chicks' feathers [33] based on the number of paired anatomical elements. Undigested food remains were analyzed by comparing them with reference collections of specimens from the study area [34].

For analysis of scat samples, food preferences of APCs were expressed as the frequency of occurrence. To determine the frequency of occurrence for each item, we counted the number of scat samples that contained a specific food item, then divided it by the total number of scat samples collected [33]. We characterized the components found in the scats based on their relative frequency of occurrence (%O):

$$Relative\ frequency\ of\ occurrence = \frac{Number\ of\ the\ same\ species\ or\ taxonomic\ group}{Total\ number\ of\ scats\ sampled} \times 100$$

We also examined the difference in season on the proportion of foods found in scat samples. We calculated the proportional representation of each food item and recorded the relative abundance of each food item within the scat samples. All the descriptive analyses were implemented with SPSS software version 27 [30].

3. Results

3.1. Local Socio-Demographic Information

Among the surveyed respondents, the majority were males (n = 172, 81.1%), and more than 60% (n = 137, 64.6%) belonged to the 35–55 age group (Table 1). Since this study was conducted in the Hulu Langat region, where traditional gender roles and cultural norms often result in a higher proportion of male farmers compared to female farmers, the overrepresentation of male respondents can be attributed to the agricultural demographics of the study area. A total of 157 respondents had at least a primary level of education, and almost half of the respondents engaged in farming activities (n = 105, 49.5%). In addition to that, over 75% of respondents (n = 165, 77.8%) reported familiarity and having experience with wildlife, while the remaining did not have any experience with wildlife (22.2%), as indicated, respectively in Table 1.

Table 1. Local socio-demographic information (N = 212).

	Variables	***N***	**%**
Gender	Male	172	81.1
	Female	40	18.9
Occupation	Farmer	105	49.5
	Other	107	50.5
Education	<Primary	55	25.9
	≥Primary	157	74.1
Age	<35 years	47	22.2
	35–55 years	137	64.6
	>55 years	28	13.2
Residence (Villages)	Sg. Michu	29	13.7
	Sg. Serai	37	17.5
	Sg. Tekali	31	14.6
	Sg. Semungkis	35	16.5
	Jawa	41	19.3
	Dusun Tua	39	18.4
Familiarity (experience)	Yes	165	77.8
	No	47	22.2
Damage and Losses	Yes	158	74.5
	No	54	25.5
Knowledge of APC Population	Increase	151	71.1
	Decrease	61	28.8

3.2. Types of Damage Caused by Asian Palm Civets

The local communities in Hulu Langat suffered losses due to the consumption of cultivated fruits and poultry attacked by APCs. Based on the survey from the respondents, the main driver of the conflict was the APCs' foraging behavior. According to the survey findings, consumption of cultivated fruits (59%), attacks on poultry (19%), agricultural (12%), and property damages (10%) were the most common types of damage (Figure 2).

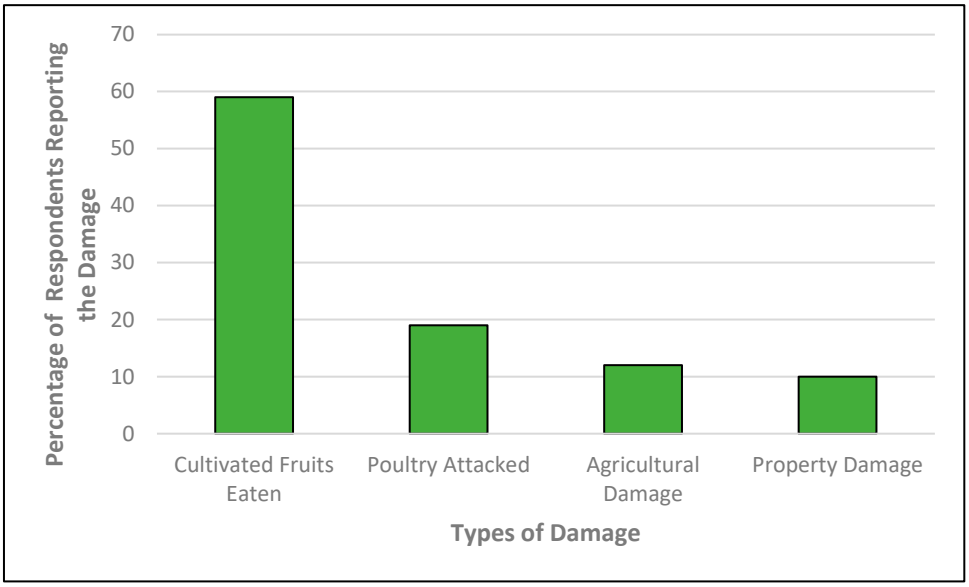

Figure 2. Different types of damage by APC in Hulu Langat reported by respondents.

According to the respondents, poultry attacks predominantly occurred during dawn and dusk hours. Locals revealed that APCs primarily targeted young chicks rather than fully grown chickens, and preferred consuming chicken eggs. Based on the survey, the remnants of only chicken feathers were sighted by respondents as evidence of APCs attacking poultry chicks in the local area.

3.3. Asian Palm Civet Food Preferences

APCs feed at least on 13 types of fruits, including rambutan (*Nephelium lappaceum*), mangosteen (*Garcinia mangostana*), mango (*Mangifera indica*), durian (*Durio zibethinus*), papaya (*Carica papaya*), pineapple (*Ananas comosus*), banana (*Musa acuminata*), guava (*Psidium guajava*), wax apple (*Syzygium samarangense*), langsat (*Lansium domesticum*), jackfruit (*Artocarpus heterophyllus*), chempedak (*Artocarpus integer*), and cacao (*Theobroma cacao*). The APC also consumed poultry and rotten fruits (Table 2). Rotten fruits can be visibly differentiated from fresh ones based on their appearance (e.g., soft or mushy spots, discoloration, and an off smell).

Table 2. The food preferences of APCs in Hulu Langat, Selangor, Malaysia.

Foods	January	February	March	April	May	June	July	August	September	October	November	December
Nephelium lappaceum							■	■	■			
Garcinia mangostana				■	■	■	■	■	■			
Mangifera indica						■	■	■				
Durio zibethinus	■						■	■	■	■	■	■
Carica papaya			■	■	■	■	■	■	■			
Ananas comosus							■	■	■	■		
Musa acuminata					■	■	■					
Psidium guajava									■	■	■	
Syzygium samarangense					■	■	■	■				
Lansium domesticum							■	■	■	■		
Artocarpus heterophyllus						■	■	■				
Artocarpus integer												
Theobroma cacao	■										■	■
Poultry		■	■	■								
Rotten fruits		■								■	■	

Notes: ("grey" is feeding, and "blank" is not feeding).

Fruits were primarily consumed by the APC throughout the year. Among the fruits, durian emerged as the most frequently (more than 25%) preferred and mostly found in the scats in this study for both seasons (Table 3). Interestingly, this fruit also derives its scientific name, *Durio zibethinus,* from the omnivore, "Zibetha" (the Latin word for civet) [35]. According to Linnaeus (1774) [35], the specific epithet *zibethinus* comes from the name of the Indian owl *Viverra zibetha* which is also a species of the Viverridae family, and these fruits were used to capture it. Between June and August (Southwest Monsoon), which is considered the fruit season in Malaysia [25], most fruits, such are durian, rambutan, mango,

papaya, pineapple, wax apple, langsat, jackfruit, and chempedak, were consumed by APCs. Malaysia has a tropical climate characterized by high temperatures and high humidity throughout the year. This period aligns with the country's dry season, which brings less rainfall and more favorable conditions for fruit production [25]. However, during the Northeast Monsoon season between November and January, Selangor typically experiences a relatively wet period [25] and reduced availability of fruit sources. Consequently, when the fruit sources became limited, the APC began preying on poultry and feeding on rotten fruits.

Table 3. Relative frequency of occurrence (% O) and frequency of occurrence (FO) of foods found in 57 scats of APCs between dry and wet seasons in Hulu Langat, Selangor.

	Wet Season, *n* = 18		Dry Season, *n* = 39	
Foods	**FO**	**% O**	**FO**	**% O**
Nephelium lappaceum	-	-	8	20.51
Garcinia mangostana	-	-	2	5.13
Mangifera indica	-	-	2	5.13
Durio zibethinus	5	27.77	10	25.64
Carica papaya	-	-	1	2.56
Ananas comosus	-	-	1	2.56
Musa acuminata	-	-	1	2.56
Psidium guajava	3	16.67	-	-
Syzygium samarangense	-	-	2	5.13
Lansium domesticum	-	-	3	7.69
Artocarpus heterophyllus	-	-	2	5.13
Artocarpus integer	-	-	7	17.95
Theobroma cacao	3	16.67	-	-
Poultry	3	16.67	-	-
Rotten fruits	4	22.22	-	-

3.4. Local Attitudes towards Asian Palm Civets

The majority of respondents exhibited a positive attitude towards APCs (*n* = 132, 62.3%) and expressed their preference for maintaining or increasing the number of APCs. Conversely, a few farmers dislike APCs (*n* = 35, 16.5%) and desired a reduction in their population number. The primary reason behind the favorable attitudes of certain locals towards APCs stems from their acknowledgment as protected animals with significant environmental value. Oppositely, the negative attitudes of locals towards APCs arise from the perception that these animals cause damage and result in losses to locals.

The differences in locals 'attitudes towards APCs in various socio-demographic categories were explored using the Chi-Square (χ^2) test in SPSS 22 version 27 [30]. The findings indicated that occupation ($\chi^2 = 7.445$, $p = 0.007$), gender ($\chi^2 = 7.425$, $p = 0.006$), cultivated fruits eaten ($\chi^2 = 17.174$, $p = 0.001$), and familiarity ($\chi^2 = 4.463$, $p = 0.031$) had significantly influenced the locals' attitudes towards APCs (Table 4). Female respondents displayed more negative attitudes towards APCs compared to males. In addition to that, respondents who had experienced property damage caused by APCs exhibited lower tolerance and a more negative attitude towards them. Locals who had seen and were familiar with APC held more negative attitudes than those who had never encountered them.

Table 4. Differences in local's attitudes towards an APC in socio-demographics.

Variables	Categories	No. of Likes for APC	No. of Dislikes for APC	$\chi 2$	*p*
Gender	Male	101	71	7.425	0.006 **
	Female	31	9	-	-
Age	<35 years	34	13	0.741	0.673
	35–55 years	96	41	-	-
	>55 years	17	11	-	-
Education	<Primary	37	18	0.179	0.634
	≥Primary	111	46	-	-

Table 4. *Cont.*

Variables	Categories	No. of Likes for APC	No. of Dislikes for APC	$\chi 2$	p
Occupation	Farmer	70	35	7.445	0.007 **
	Other	87	20	-	
Familiarity (experienced)	Yes	62	103	4.463	0.031 *
	No	41	6	-	-
Cultivated fruits eaten	Yes	69	56	17.174	0.001 **
	No	73	13	-	-
Poultry attacked	Yes	14	16	2.971	0.085
	No	126	46	-	-
Property damage	Yes	19	2	0.037	0.875
	No	148	43	-	-

Note. ** Significant at $p < 0.01$, * Significant at $p < 0.05$.

3.5. Locals' Preference for Mitigating Measures of Human-Asian Palm Civet Conflict

Most of the locals employed passive methods or chose to leave the APC undisturbed as a means to prevent conflicts between humans and APCs both before and after incidents involving the APC (Figure 3). The majority of the locals did not take any action or implement any measures (pre-measures: n = 97, 45.28%, post-measures: n = 102, 48.11%). For actively engaged methods, most locals chose to drive away APCs with firecrackers (n = 47, 22.17%), and almost 10% number of respondents chose to set a trap. However, a small number of respondents turned to using poison (n = 11, 5.2%) to eliminate the civets as a last recourse to mitigate economic losses incurred from APC damage and losses to their cultivated fruits, poultry, agriculture, and property. After the APC incidents, most of the respondents chose to cover fruits (n = 70, 33.02%) and call wildlife control (n = 40, 18.87%) to capture and relocate the problematic civets.

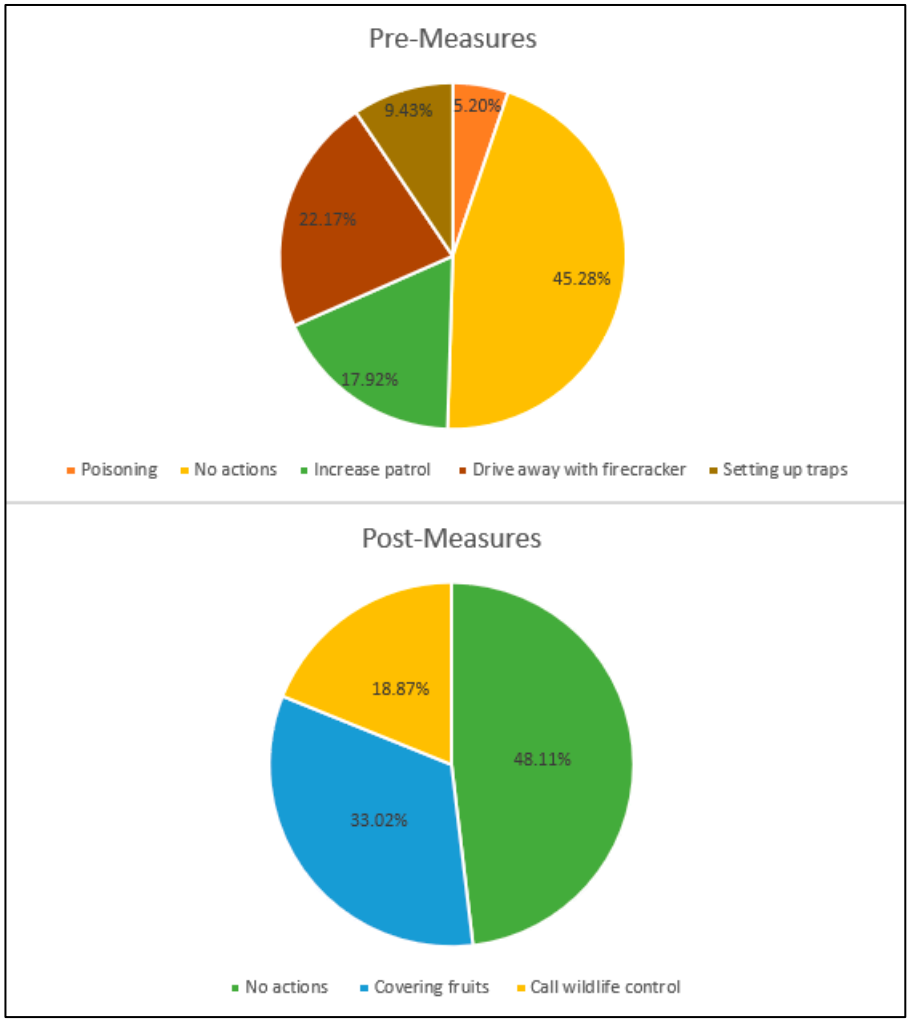

Figure 3. Locals' preferences for mitigating human–Asian palm civet conflicts in Hulu Langat.

3.6. Locals' Knowledge of Population Change of Asian Palm Civets

Many respondents (n = 151, 71.2%) stated that the population of APCs had increased over the past decade. On the other hand, a minority of respondents (n = 61, 28.8%) believed that the population of APCs had decreased during the same period (Table 1). During the survey, locals mentioned that they formed their opinions based on the following evidence, namely: (1) the frequency of seeing APCs; (2) the frequency of encountering APC scats; and (3) the occurrence of APC conflicts. The respondents attributed the growth in the APC population to inadequate population control measures and poor wildlife management. Nevertheless, specific data for the APC in Malaysia are currently undocumented. However, globally, according to the IUCN Red Lists data, the population of APCs is experiencing a decline [13].

4. Discussion

4.1. Dimensions of Human–Asian Palm Civet Conflict

The results presented the assessment of the human–Asian palm civet conflict among locals in Malaysia. Over 50% of Hulu Langat locals in this study experienced different types of conflicts related with APCs. Based on the survey findings, locals involved in farming, notably those who had experienced APCs damaging their cultivated fruit, and have familiarity with APCs, tend to have more negative attitudes towards APCs. Negative attitudes towards APCs hinder their protection [36], and the social coexistence relationship between the local community and APCs could influence this. The primary types of damage caused by APCs are consumption of cultivated fruits and poultry attacks. Since farming serves as the primary economic source for most local communities and directly impacts their livelihoods, farmers and locals who have experienced APCs damaging their cultivated fruits and attacking poultry are more sensitive to APC damage and thus hold more negative attitudes [37]. For locals who have never encountered or are unfamiliar with APCs, their perception tends to remain rooted in the charismatic image [38]. However, once they encounter APCs, their attitudes shift based on their actual feelings and experiences [38]. Therefore, it is crucial to raise awareness and provide education to improve the protection of this species and foster tolerance towards human–Asian palm civet conflict.

4.2. Causes of Human–Asian Palm Civet Conflict

Most respondents believe that the steady increase in the APC population over the past decade is the main cause of the human–Asian palm civet conflict. They state that the increasing population trend is a result of a lack of population control measures and ineffective wildlife management. This perception has led to negative attitudes of locals toward these wild animals as they believe that an abundance of this nuisance animal will bring about more damage and losses to them. However, they are unaware that the global population number of these animals is experiencing a decline [13]. Areas characterized by a high degree of conflicts between humans and wild animals are often associated with a decline in wildlife populations trend [39,40]. The process of urbanization, tourism development, road construction, and highways have contributed to the loss of APCs' habitat [14,15]. The loss of habitat and limited resources have created a challenging environment for APCs, pushing them into more frequent conflict with humans. According to Su et al. (2020) [37], the conflict between humans and APCs becomes inevitable when both entities compete for limited space and natural resources.

Unfortunately, only a few studies have been carried out in Malaysia on the conflict between humans and APCs in relation to anthropogenic disturbance and on the diet of civets, as traditionally, fruits have been considered the civets' primary food [41]. Based on this study, the drivers of the conflicts are the foraging habits of the civets, which caused damage to the local property, consumption of cultivated fruits, and predation of domestic poultry. According to Wang (1987) [41], when a civet comes across a tree containing ripe fruits, it develops a preference for revisiting that foraging area.

Additionally, given the comparable results regarding the occurrence of food items in the diet, we were able to determine the frequency of the foods consumed during both the wet and dry seasons. The remarkable patterns revealed a peak of predation on poultry in the wet season and an increase in the consumption of cultivated fruits in the dry season. The consumption of poultry by APCs in the study area may reflect a decrease in the availability of the cultivated fruit during the wet season, as measured by the amount of fruit produced. Based on our findings, it appears that APCs in our study area exhibit opportunistic feeding behavior. Consequently, we conclude that they adapt their diets in response to changes in the availability of food sources within the area.

4.3. Human–Asian Palm Civet Conflict Mitigation Measures

Currently, most locals in the area prefer passive measures or leave the APC alone to address conflicts between humans and APCs. However, it is noteworthy that some locals have resorted to using poison when confronted with such conflicts. The enforced shift in their preferred measures may lead to negative attitudes among locals towards these animals, subsequently undermining the effectiveness of APC protection and conservation efforts for APC. While extermination of the APCs may seem like a solution to mitigate these conflicts, it is important to consider the broader ecological context and implement a more proactive and sustainable strategy.

In situations where APCs pose an immediate threat to cultivated fruits, poultry, and local property, targeted trapping and relocation can be considered. Trapping should be carried out by trained wildlife experts and should focus on removing problematic individuals causing the conflict rather than indiscriminate trapping. Relocating captured APCs to suitable habitats away from human areas can help reduce the conflict. In addition to that, offering compensation to affected locals is an effective strategy for fostering tolerance towards APCs among locals. The compensation mechanism not only helps minimize the economic losses and damage caused by wildlife but also enhances the locals' tolerance toward wildlife [42,43]. Therefore, compensation is a significant tool for protecting wildlife and improving local's livelihood [44]. However, despite its importance, implementing a compensation mechanism for wildlife damage to crops and properties in Malaysia has not yet been launched.

Nevertheless, in certain cases, governments may compensate locals who have suffered injuries and fatalities caused by wildlife. In 2004, the government introduced the implementation of the Wildlife Attack Victims Assistance Fund, which aims to alleviate the financial burden of treatment for victims of wildlife attacks. Compensation amounts for such incidents can vary and are typically determined case-by-case. Various factors are considered, including the injury's severity, the species involved, and the incident circumstances. According to DWNP (2023) [45], the Federal Government compensates locals injured by wild animals with amounts up to RM 20,000, depending on the reported level of injuries or death confirmed by the medical officer. The Department of Wildlife and National Parks (PERHILITAN) is responsible for assessing incidents, investigating the circumstances, and determining eligibility for compensation [45].

Unfortunately, several deficiencies in the wildlife damage compensation process in Malaysia result in frequent disappointment. Government-run schemes have encountered failures for various reasons, including insufficient funds, devious claims, management inadequacies, and practical challenges [46]. In addition, the qualitative and quantitative analyses of wildlife damage have proven to be challenging. According to respondents, compensation mainly covered injuries and fatalities, and the time required to process the claims and provide compensation is also one of the significant factors that cause victims to give up reporting wildlife damage in Malaysia.

Consequently, locals reduce their level of willingness to protect the APC because they suffer from the damage. Hence, it is crucial to acknowledge the livelihood concern of the local communities and ensure that they foster positive attitudes towards APCs in any initiatives to address these conflicts. Additionally, a collaborative endeavor involving the

government, conservation practitioners, and local communities is essential to safeguard the APC population, minimize local damage, and effectively address the issue posed by the human–Asian palm civet conflict.

In addition to that, several measures can also be implemented, such as setting up an infrared trigger camera alarm system and establishing a modern defense system to prevent conflict. A modern defense system could include a variety of measures, such as local community education and awareness programs, habitat conservation, and non-lethal deterrents implementation. These measures can help to reduce the conflict and promote coexistence between humans and APCs. To reduce cultivated fruit consumption, locals can adopt various tactics that do not involve extermination, such as erecting fences or nets around orchards and using chemical or natural repellents to deter APCs from accessing the fruits. Locals can also provide alternative food sources to divert APCs' attention from valuable fruits and crops. Since APCs are predominantly nocturnal, keeping poultry enclosed in secured structures and employing trained dogs during nighttime can minimize the risk of predation. Furthermore, APCs can occasionally cause property damage, such as chewing on electrical wiring and nesting in roof spaces [10]. Thus, sealing all entry points to ensure houses and buildings have no gaps or openings that allow APCs to access roof spaces can help prevent damage and conflict.

This study showed that human–Asian palm civet conflict is apparent in the study area. The conflict primarily arises due to cultivated fruit consumption, poultry predation, and property damage caused by APCs. The conflict also becomes the main cause of the continued survival of the APC species in the area. However, this study was carried out in a specific region of Hulu Langat, and the results may not be fully representative of other regions with different biological, ecological, and socio-cultural aspects. Additionally, the sample size used in this study was small and lacked information on the movement patterns of APCs within the study area. This knowledge gap limits the understanding of their territorial behavior, spatial distribution, and potential interactions with human activities. Therefore, while this study provides valuable insights into the dynamics and challenges surrounding the conflict, it is important to acknowledge the limitations that may influence the generalizability and interpretation of the findings in other contexts. For future research, it is recommended to compare the behavior of APCs in areas that are remote from human influences and attractions to provide valuable insights into the impact of human activities on the behavior of these wild animals.

5. Conclusions

This study investigated various aspects, including the types, causes, attitudes, and knowledge of locals regarding conflicts between humans and APCs. Our findings revealed that APCs exhibit opportunistic behavior and are adaptable feeders, primarily consuming locally cultivated fruits. When fruit sources diminish, they also resort to preying on poultry as an alternative food source. The APCs' foraging activities result in multiple types of damage, leading to conflicts with local communities. Consequently, this contributes to negative perceptions and attitudes among locals towards these wild animals, resulting in the use of poisoning methods to exterminate them when conflicts emerge.

Considering the concerns regarding the perceived versus actual threats posed by APCs to the local community, it is important to conduct further research on the feeding habits and movement patterns of APCs. This research will help to support and facilitate conservation actions aimed at the protection of APCs. In addition to that, given the conflict arising from cultivated fruits consumption, poultry predation, and agricultural and property damage, obtaining an accurate estimation of APC feeding habits is crucial for the long-term protection and conservation of the species. With the continuous urbanization and development of the local community, the natural environment of APCs is changing, and the conflict between APCs and humans will continue, and the relationship between humans and the APCs will also change. In the future, more initiatives should be taken to reduce this human–wildlife conflict.

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Abbreviations

APC—Asian palm civet; HWC—Human–wildlife conflict; DWNP—Department of Wildlife and National Parks, Peninsular Malaysia; IUCN—International Union for Conservation of Nature.

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