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MONETARY VALUATION BY APPLYING PENALTY RATE ON BIRD POPULATION AT KENYIR LAKE RAINFOREST, MALAYSIA

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Abstract: A variety of methods have been used by researchers to monetise the value of birds in the forest ecosystem. In this study, a valuation method based on fines and penalty rate imposed on poachers or individuals who commit offenses that contribute to the destruction of wildlife of birds listed under Malaysia Wildlife Conservation Act 2010 has been used to estimate monetary value of bird population study conducted at Kenyir rainforest. For the purpose of this study, secondary data on bird population recorded at Kenyir rainforest was used. The result suggests that monetary value of birds in the study area was estimated to be in the MYR 2.07 million to MYR 6.9 million range. The exercise of converting the direct value of birds in monetary terms is important to assist in the determination of the value of wildlife in the eyes of the Malaysian law and its people to make them more appreciative of the value of wildlife in the forest ecosystem.

Keywords: Monetary valuation, birds value, ecosystem service, sustainability.

Introduction

The global forest ecosystem harbours unique flora and fauna, including several species of birds. According to BirdsLife International, Malaysia is home to 718 different species of birds. 64 of them are globally threatened birds and 8 are country endemic. The forest ecosystem provides many things that benefit human beings these benefits are known as ecosystem services. MEA 2005, defines ecosystem services as benefits obtained directly or indirectly from ecosystems – the goods and services of nature and are closely linked to human wellbeing. Ecosystem services are categorised into four classes. The first is provisioning services; i.e. products obtained from the ecosystem. The second is regulating services; benefits obtained from ecosystem processes. The third is cultural services; non-material benefits obtained from the ecosystem and the fourth is supporting services; services necessary to produce all other ecosystem services (MEA, 2005).

Birds contribute to all four types of ecosystem services. As members of ecosystems, birds play many roles and contribute regulating and supporting services via their foraging ecology. These services include scavenging carcasses, nutrient cycling, seed dispersal, pollination, and pest control (Whelan *et al.*, 2008). Birds are also observed, fed, and used as artistic and spiritual inspiration by millions of people around the globe. Birds also play an important role as an indicator to the sustainability of an ecosystem (O'connell *et al.,* 2001). From the notion of the canary in the coal mine, to the influential book Silent Spring by Carson (1962), birds have long been appreciated as an early indicator of changes in environmental quality (Kolstoe and Cameron, 2017).

Yet the economic relevance of birds is not widely appreciated and the economic relevance to human society of birds' ecological roles is even less understood (Whelan *et al.,* 2015). Birds are examples of a forest service that lacks value in the market and generally their value to the society is unmeasured. Furthermore, because the economic benefits of birds are measured in qualitative form, like social benefits, the benefits of the birds are usually underestimated (Amiry *et al.,* 2009).

Perhaps, expressing the value of birds in monetary unit is a way to convey the importance and value of birds in the forest ecosystem to the eyes of people. Quantifying the value of birds is crucial to understand their importance for the ecosystems and for the people that benefit from them. Biodiversity and its associated ecosystem services can no longer be treated as inexhaustible and free goods and their true value to society and the costs associated with their loss needs to be properly accounted for (Costanza *et al.,* 2014). The economic value associated with the birds can be examined in the form of use and non-use values. Use value includes non-consumptive use value such as sightseeing, birds watching, photographing, and education. The effects of birds on ecology may include being enemies of many insects, pollinators of flowers, and disseminators of seeds can be referred to as an indirect use value which are unmeasured by conventional market mechanisms (Amiry *et al.,* 2009).

Although the economic valuation of birds is categorised as intangible value, especially with the value of the currency but there are several techniques for measuring the birds value. To date, contingent valuation method has been the most widely used technique for non-use value. This is probably due to its ability to estimate all types of values in particular non-use value of ecosystem goods and services. There have been hundreds of contingent valuation applications worldwide.

Open-ended questions, bidding games and dichotomous choice questions are the main elicitation formats. Dichotomous choice, among other formats for contingent valuation study, is the most recommended because of its ability to match the way consumers make choices in the marketplace. Also, the format improves the reliability of responses (Amiry *et al.,* 2009). Furthermore, non-use value involves ascertaining how much an individual is willing to pay (WTP) to ensure that the existence and heritage attributes of the bird species are preserved while the use value is estimated through eco-tourism services offered by bird parks or bird sanctuaries (JPSM, 2017).

Alternatively, monetary valuation of birds could be conducted using a proxy value based on fines and penalty rate for hunting and capturing bird species listed under Malaysia Wildlife Conservation Act 2010 (JPSM, 2017). Wildlife Conservation Act 2010 is aimed to provide a protection and conservation of wildlife and for matters connected therewith. This Act provides for the regulation, protection, conservation and management of wildlife in Malaysia. The Act applies to the Peninsular Malaysia and the Federal Territory of Labuan. This Act does not apply to any wildlife falling within List II of the Ninth Schedule of the Federal Constitution and the Fisheries Act 1985 [Act 317]. This Act contains nine parts and seven schedules. The offences and penalties are described in part seven, which include offenses relating to licences, offences relating to permits, offences relating to special permits and miscellaneous (Wildlife Conservation Act, 2010).

In this study, similar method was applied to put monetary value on the bird population study conducted at Kenyir rainforest. There is a lack of published data on bird study conducted at Kenyir rainforest, was limited for only three surveys of bird assemblage available by Sulaiman *et al.,* (2015), David *et al.,* (2017) and Nelson *et al.,* (2018). Two of them were surveys conducted at Tanjung Mentong area.

The first preliminary survey of the birds at Tanjong Mentong was conducted by Sulaiman *et al.,* (2015) with a total of 21 individual birds comprising 12 species belonging to 10 families were recorded during the sampling period.

The second survey was conducted at Tanjung Mentong by David *et al.,* (2017) with result of total of 50 individuals comprising 25 species belonging to 20 families were recorded during this survey. A third study on bird counts was conducted by Nelson *et al.,* (2018) at an identified trail at Kenyir rainforest with 94 individuals belonging to 25 species of selected iconic avian species.

Table 1: Previous study on bird survey at Kenyir rainforest

	Study 1	**Study 2**	**Study 3**
Subject	Preliminary survey of birds assemblage at Tanjong Mentong	Checklist of birds at Tanjong Mentong	Iconic Avian data from Kenyir Rainforest Trail
Authors	Sulaiman *et al*. (2015)	David *et al*. (2017)	Nelson *et al*. (2018)
Total no. of individuals	21	50	94
Total no. of species	12	25	25
Methods used	Mist-netting	Mist-netting and point count	Transect construction and visualize using binocular and DSLR camera
Duration of survey	4 net-days	6 sampling days	5 months count data

Materials and Methods

Study Site

The study on converting the value of birds in monetary terms was applied to the bird population at the Kenyir rainforest. Kenyir is a luxurious forest located Hulu Terengganu district, which lies at a longitude of 102 degree 40 minutes and a latitude of 4 degrees and 40 minutes. Standing about 138 meters above sea level, Kenyir lake is surrounding by tropical rainforest with rich and valuable flora and fauna. In the north is Hulu Telemong Forest Reserve and in the south is Hulu Terengganu Forest Reserve. This leads to the National Park. Kenyir lake is the largest man-made freshwater lake at Malaysia. Covering more than 340 islands spread out in water catchments area of 38,000 hectares. The lake is known as a unique tourist destination for its beautiful tropical forest and widely known for its valuable wood species, plants, animals, birds and insects. Rich with numerous types of flora and fauna its boundary leads to endless discoveries and adventures. Its beautiful aesthetic views of flora and fauna are attracting tourists to enjoy being in natural habitat. Kenyir Lake is one of the most popular destinations for recreation and birding activities.

Flowchart of Estimation on the Monetary Value of Bird

Estimation on the monetary value of birds was conducted using fines and penalties rate coded by Wildlife Conservation Act 2010 (Act 716) on hunters or individuals who commit offenses that contribute to the destruction of wildlife of birds. According to Act 716, protected wildlife means any wildlife specified in the First Schedule and totally protected wildlife means any wildlife specified in the Second Schedule. Each individual of birds from the latest survey by Nelson *et al*. (2018) at Kenyir rainforest then classified into protected or totally protected species accordingly. The flowchart below illustrates the application in this study.

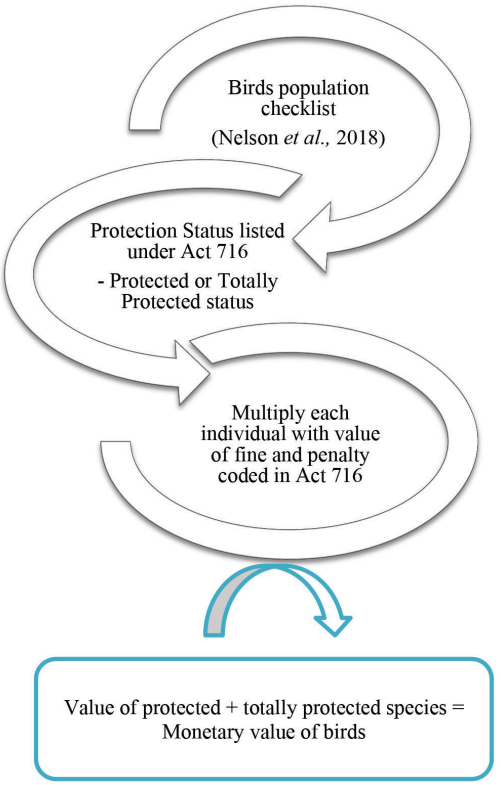

Figure 1: Flowchart of estimation on the monetary value of birds

Relation between Offences and Penalties Value with Protected and Totally Protected Species in Wildlife Conservation Act 2010

In Wildlife Conservation Act 2010 (Act 716), Part VII elaborates offences and penalties and outlines the fine rate for any person who commits an offence in hunting protected (chapter 1) and totally protected bird species (chapter 3). Chapter 1 stated that any person who without a license commits an offence in hunting protected birds and on conviction shall be liable to a fine not exceeding fifty thousand ringgit (MYR 50,000.00). Chapter 3 stated that any person who without a special permit commits an offence in hunting totally protected birds and on conviction shall be liable to a fine not exceeding a hundred thousand ringgit (MYR 200,000.00). The information on fine and penalty rates for protected and totally protected wildlife of birds is summarised below:

Table 2: The fine and penalty rate for protected and totally protected species

Category	Fine and Penalty rate
Protected (Chapter 1)	
Protected species	Not more than MYR 50,000
Specific species: Common Shama (*Copsychus malabaricus*) Oriental White Eye (*Zosterops palpebrosa*) Hill Myna (*Gracula religiosa*)	MYR 20,000 – MYR 50,000 (Exceeding twenty heads, shall on conviction be punished with a fine of not less than twenty thousand ringgit and not more than fifty thousand ringgit)
Totally Protected (Chapter 3)	
Totally protected species	Not more than MYR 100,000
Specific species: Crested Argus (*Rheinardia ocellata*) Mountain Peacock Pheasant (*Polyplectron inopinatum*) Great Argus (*Argusianus argus*) Green Peafowl (*Pavo muticus*) Straw-headed Bulbul (*Pycnonotus zeylanicus)* Rhinoceros Hornbill (*Buceros rhinoceros*) Plain-pouched Hornbill (*Aceros subruficollis*)	MYR 30,000 – MYR 100,000 (Shall on conviction be punished with a fine of not less than thirty thousand ringgit and not more than one hundred thousand ringgit)

The information on fine and penalty rates provided in Part VII Offences and Penalties in Act 716 is then linked to First Schedule and Second Schedule of Part IX General in Act 716. The first schedule and second schedule provide list of species of birds that are categorised as protected wildlife and totally protected wildlife, respectively. Hence, the bird species listed under first schedule are worth as much as value of fine and penalty rate of Chapter 1 and bird species listed under second schedule have as much value in monetary terms as the value of fine and penalty rate of Chapter 2.

Calculation Formula on Monetary Valuation

Calculation on total monetary value of birds could be done by multiplying each individual number of birds with the penalty rate stipulated under Wildlife Conservation Act 2010 (Act 716) as formulated below;

$$C = \sum(a_1 \text{ X } b_1) + (a_2 \text{ X } b_2) \quad (1)$$

Where:

a_1 = number of individual (protected species)
a_2 = number of individual (totally protected species)
a = rate for protected species (minimum is RM 20,000 and maximum is RM 50,000)
a_4 = rate for totally protected species (minimum is RM 30,000 and maximum is RM 100,000)
C = monetary value of birds

Results and Discussion

Data on bird population according to their protection status by Act 716

Extracted data on the bird population at Kenyir rainforest shows 94 individual birds belonging to 25 different species were categorised as either a protected species or totally protected species according to First and Second Schedule of the Wildlife Conservation Act 2010 (Act 716). The results of the data are shown in Table 3.

Calculation on Monetary Value of Birds

By using the formula $C = \sum(a_1 \text{ X } b_1) + (a_2 \text{ X } b_2)$, the calculation of the monetary value on birds population is shown in Table 4 below:

According to information in Table 3, based on protection status by Act 716, 69 out of 98 total individuals captured were categorised as totally protected species and none of them were protected species. Protected species means any birds specified in the First Schedule and totally protected species means any birds specified in the Second Schedule of Act 716. 25 birds from these 2 species *Pycnonotus goiavier* (Yellow-vented Bulbul) and *Acridotheres javanicus* (Javan Myna) were highlighted as their protection status was "unidentified" as the species was not listed under Act 716.

There is a likelihood that the bird population at the Kenyir rainforest might be worth more with a more surveys done since the broad area of the Kenyir rainforest was not fully researched. The results of the calculations of the monetary value of the individual birds according to their protection status by Act 716 in the study area was estimated to be between a minimum of RM 2.07 million and a maximum of RM 6.9 million. This valuation method also should be highlight as a direct conversion and only reflect part of bird biodiversity value. Their total value to the ecosystem of course much more and complex. The total biodiversity value of birds to ecosystem should be expanded to include other component of ecosystem services, for example, as seed dispersers or pollinators.

The main principle of this valuation method is the value estimated totally depending on the number of individuals of birds captured at study area and their protection status by Act 716. Therefore, this method could be applied to estimate the monetary value of bird population at any ecosystem where research on the bird population, species, type, and number has been carried out before.

This valuation method is alternative to most applied method, Contingent Valuation Method (CVM). CVM involves ascertaining how much

Table 3: Data on bird population and their protection status by Act 716

Species	Local name	No of individuals	Protection status under Act 716
Near Threatened			
Aegithina viridissima	Green Iora	6	FP
Alcippe brunneicauda	Brown Fulvetta	2	FP
Anthracoceros malayanus	Black Hornbill	2	FP
Buceros rhinosceros	Rhinoceros Hornbill	4	FP
Calyptomena viridis	Green Broadbill	3	FP
Chloropsis cyanopogon	Lesser Green Leafbirds	12	FP
Enicurus ruficapillus	Chestnut-naped Forktail	1	FP
Eurylaimus ochromalus	Black-and-yellow Broadbill	3	FP
Hydrochous gigas	Waterfall Swift	7	FP
Iole olivacea	Buff-vented Bulbul	6	FP
Megalaima mystacophanos	Red-throated Barbet	4	FP
Megalaima rafflesii	Red-crowned Barbet	2	FP
Meiglyptes tukki	Buff-necked woodpecker	1	FP
Oriolus xanthonotus	Dark-throated Oriole	2	FP
Pericrocotus igneus	Fiery Minivet	3	FP
Platylophus galericulatus	Crested Jay	1	FP
Pycnonotus cyaniventris	Grey-bellied Bulbul	2	FP
Pycnonotus eutilotus	Puff-backed Bulbul	1	FP
Pycnonotus goiavier	Yellow-vented Bulbul	19	unidentified
Pycnonotus squamatus	Scaly-breasted Bulbul	1	FP
Rhizothera longirostris	Long-billed Partridge	1	FP
Vulnerable			
Acridotheres javanicus	Javan Myna	6	unidentified
Chloropsis sonnerati	Greater Green Leafbirds	1	FP
Endangered			
Meiglyptes tristis	Buff-rumped Woodpecker	3	FP
Critically Endangered			
Rhinoplax vigil	Helmeted Hornbill	1	FP
Total number of individual		94	
Unidentified status under Act 716		25	

Table 4: Calculation on monetary valuation on bird value

	Protected species	Totally Protected species
Total number of individuals	0	69
Minimum value (MYR)	20,000	30,000
Maximum value (MYR)	50,000	100,000
Monetary value calculated (MYR)	0	2,070,000 – 6,900,000
Total monetary value (MYR)	**Min value is 2,070,000 and Max value is 6,900,000**	

an individual is willing to pay (WTP) to ensure that the existence and heritage attributes of the bird species are preserved. However, the weakness of CVM is the value are estimated based on the value of Willingness to Pay (WTP) which is sometimes does not reflect the actual value of birds in ecosystem.

Conclusion

This study is helpful in enhancing the exploration of methodology to valuate the monetary value of biodiversity product or service provided by ecosystem especially birds population. Expressing the value of birds in monetary unit is an important fundamental step to raise awareness and perception of the public on the value of wildlife from the perspective of Malaysia law. The monetary valuation can provide a powerful and much needed tool to influence decision-making in forest development and conservation. Furthermore, the measurement of their value in monetary units is a fundamental step towards generating expenditure values needed as a tool to measure the effectiveness of conservation and sustainable management initiatives of biodiversity resources, for example in preparation for the implementation of payment for ecosystem services (PES).

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Appendix

Appendix I

First Schedule on Protected Wildlife of Bird Species as described in Part IX, Malaysia Wildlife Conservation Act 2010.

WILDLIFE CONSERVATION ACT 2010

PART IX

First Schedule

Protected Wildlife (Birds)

Family	Scientific Name	Common Name
	CLASS AVES (BIRDS)	
Charadriidae (Plovers)	*Charadrius asiaticus*	Eastern Dotteral
Columbidae (Doves, pigeons)	*Chalcophaps indica*	Emerald Dove
	Treron olax	Little Green Pigeon
	Treron vernans	Pink-necked Green Pigeon
	Treron seimundi	Seimunds's Pintail Pigeon
Dromadidae (Crab plover)	*Dromas ardeola*	Crab Plover
Phasianidae (Jungle, Fowl, Quail)	*Coturnix chinensis*	Painted Quail
	Gallus gallus	Red Jungle Fowl
Rallidae (Rail)	*Amaurornis phoenicurus*	White-breasted Waterhen
	Poliolimnas cinereus	White-browed Rail
Scolopacidae (Snipe, stint)	*Calidris subminuta*	Long-toed Stint
	Gallinago gallinago	Common Snipe
	Gallinago nemoricola	Wood Snipe
	Gallinago pratincola	Collared Pratincole

❖ For full list, please refers to Laws of Malaysia, Act 716, Wildlife Conservation Act 2010 (2010). Part IX General, First Schedule

Appendix II

Second Schedule on Totally Protected Bird Wildlife Species as described in Part IX, Malaysia Wildlife Conservation Act 2010.

WILDLIFE CONSERVATION ACT 2010

PART IX

Second Schedule

Totally Protected Wildlife (Birds)

Family	Scientific Name	Common Name
	CLASS AVES (BIRDS)	
Accipitridae (Hawks, Eagles)	*Accipiter badius*	Shikra Goshawk
	Accipiter gularis	Japanese Sparrowhawk
	Accipiter soloensis	Chinese Goshawk
	Accipiter trivirgatus	Created Goshawk
	Accipiter virgatus	Besra
	Aegypius monachus	Cinereous Vulture
	Aquila clanga	Greater Spotted Eagle
	Aquila heliaca	Imperial Eagle
	Aquila nipalensis	Steppe Eagle
	Aviceda jerdoni	Jerdon's Baza
	Aviceda leuphotes	Black Baza
	Butastur indicus	Grey-faced Buzzard Eagle
	Buteo buteo	Common Buzzard
	Circaetus gallicus	Short-toed Eagle
	Circus aeruginosus	Western Marsh Harrier
	Circus cyaneus	Northern harrier

❖ For full list, please refers to Laws of Malaysia, Act 716, Wildlife Conservation Act 2010 (2010). Part IX General, Second Schedule.