Health hazards of barn swallow (*hirundo rustica*) in Rizal Avenue, Digos City

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ABSTRACT

Birds are susceptible to many bacterial diseases common to humans and domestic animals (Broman, 2002). Barn swallow collections, precisely the fecal matter, have been a disease-causing agent. This study aims to identify the barn swallow assemblages that serve as indicators of disease occurrence in Rizal Avenue, Digos City. Particularly, the birds' status in terms of morphometric measurements and estimated population were assessed. The bacteria found in barn swallow fecal matter and their possible health hazard were also identified in the study. This research employed a descriptive design in determining the status and possible bacteria present in fecal matter. A sample of 77 Barn Swallows was caught using mark-recapture in four identified areas. Morphometric measurements like bill length, bill depth, tarsus length, wing length, tail length, and body weight were obtained. Fecal matter was also collected and sent to Regional Animal Disease Diagnostic Laboratory, which provided the results for identifying the bacteria present through an API 20E kit. A description of the identified morphometric measures revealed that the barn swallows of Digos City conform to the measurement done by Samuel (1971). Comparing the morphometric measurement between male and female barn swallows shows no significant difference in their bill length, bill depth, tarsus length, wing length, and body weight. However, there is a significant difference in tail length at 0.05 level of significance wherein males (6.18) have longer tailed than females (5.1) which confirms the methods used by Smith (2008) in identifying the sex of barn swallows. Furthermore, there were 8 bacteria identified using the API 20E kit, which was all gram-negative, and most of them are rod-type bacteria.

Keywords: *health hazards, barn swallow, descriptive, Digos City*

INTRODUCTION

Birds are carriers of diseases and act as hosts for the virus and thus may involve spreading the disease among vertebrates like horses, birds, and humans (Entomology Today, 2015). Birds are widespread all over the world. Of all vertebrates, birds of class Aves are the most visible, with more than 9,900 species distributed over nearly the entire earth. (Hickman Jr., Roberts, Larson, & Eisenhour, 2007). In Idaho, starlings are a problem for agriculture. The estimated damage to crops in the United States was $800 million yearly (Pimentel, Lach, Zoniga, & Morrison, 2000). Indeed, starlings contributed to the decline of the economic impact on agriculture. Also, starlings carry infectious diseases which can cause a massive threat to livestock and humans. In the Philippines, a tropical country ram-pant migratory bird named Barn Swallows (Hirundo rustica) is now evident. According to (International Union for Conservation of Nature and Natural Resources, 2015), it is considered one of the least concerned species in the world.

In Batangas City, barn swallow is predominant. Residents are surrounded by these swallows, considered this a major problem when swallows start dipping their droppings. Moreover, in the western United States, specifically in Colorado, barn swallows are often making their nest in garages, houses, commercial buildings, and other structures. People find trouble in these swallows because of the parasites found in their nests. Most people in the city surrounded by these swallows are not aware of the birds' droppings may carry bacteria, fungal agents, pathogens, and parasites. Also, these swallows might be carrying diseases such as avian flu. There may be more than just avian flu to be worried about. It has been suggested that these birds and their droppings can harbor 60 diseases (Medical News Today, 2014). Considering the diseases of these swallows are a threat to human health, it is advised to propagate this emerging problem to such health specialists and the Local Government's intervention. Hence, this may result in health problems through their droppings, including cryptococcosis, psittacosis, and histoplasmosis. Also, bird waste may damage property and equipment (Hinders, 2013). Besides, there will be a possible sign that it can affect the living among citizens within the area.

In Digos City, barn swallows are now widespread. It has been observed for about five years they perch in the wires, sidewalks, and other commercial buildings. People in the city are not aware of this bird's wastes may contract diseases through inhalation. No one has been in the study or evaluated the birds in Digos City for

five years. The researchers express concern to assess this serious problem and promote awareness to Digos City residents.

METHOD

This study employs the use of quantitative research design with field observation. The study collects information that does not vary on the environment. It provides data such as behavior, health status, and attitudes or individualities of a certain group (Office of Research Integrity, 2016). A descriptive type of research is also used to acquire information concerning the existing status concerning the conditions in a situation to describe the current phenomena (Key, 1997). About the study, researchers observed the area where the birds are sighted. Researchers were able to determine the population status of the birds. Thus, this gives the knowledge of the estimated population of barn swallow in the area.

An experimental type of research attempts to identify known or expected variability and design the experiment to improve the answers' accuracy (Valerie & John, 1997). The study entails laboratory experimentations to obtain consistency and valid results. The bird dung and saliva are necessary to be tested in acceptable laboratory tests to distinguish if there are bacteria, fungal agents, and parasites present.

This study utilized two sets of instruments, namely: a monitoring data notebook and required paraphernalia to complete the study. (1) *Monitoring Data Notebook*- is a patterned from a morphometric study on bird barcoding in UP Diliman. However, modifications were done by deleting and adding the dung on the data. A faculty biologist in the College validated this instrument. (2) *Mist net*- the mist net is a five-meter in width and ten meters in length. It is attached on two poles to capture the barn swallow. One of the important tools in monitoring population is assessment in the composition of the species, population size, relative abundance, and demography. Using mist net gives advantages in visual numbering methods, including standardized samples, ability to identify species by the use of other counting methods, low participant bias, and a chance to observe birds in hand by providing data's on (capture history, age, condition, sex, morphometry). Mist netting is an effective tool in capturing birds combined with a mark-recapture method to estimate population size (Dunn & Ralph, 2004). (3) *Bird Tags*- commonly used for bird identification of any marked bird. This tag has a unique ID number for an individual's identity. Tagging is preferable every time bird is captured and then release after being tagged. (4) *Vernier caliper* is an instrument used in length measurements to obtain additional digits compared to a simpler

ruler. This was used for measuring the bird's morphometry. (5) *Triple beam balance*- is a device used to obtain the birds' mass. (6) *Vials*- a small bottle used to hold for feces and saliva of the bird. (7) *Icebox*- a container for keeping the feces, saliva, and ectoparasites of the birds. (8) *Surgical Gloves*- it protects the hand from exposure to possibly infectious materials. Thus, it gives protection against bird waste and bites from ectoparasites. (9) *Surgical Mask*- a device used to cover the mouth and nose to prevent disease spread. (10) *GPS mobile phone*- to locate the exact sampling site of the study.

The researchers conduct a sampling site selection to ensure the sampling location after the City mayor's approval. The sampling site is located along with Mary Mediatrix church to Digos City Central Elementary School. The study will take 2-3 months to obtain the bird population's accuracy.

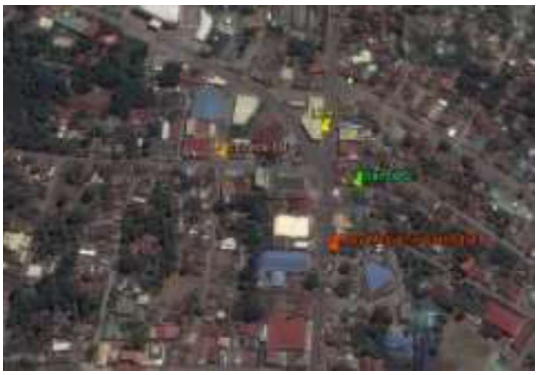

Figure 1. *Identified areas in Digos City*

The following areas were sampled at Rizal Avenue Digos City. 1- LYR that has coordinates of 6°45'19.97"N, 125°21'20.36"E, 2- Estrada 1st has coordinates of 6°45'18.67"N, 125°21'15.82"E, 3-Llanos St. has coordinates of 6°45'17.37"N, 125°21'21.78"E and 4- Mary Mediatrix Cathedral has coordinates of 6°45'14.64"N, 125°21'20.74"E.

The sample sizes of Barn Swallows that were taken for morphometric measurements and dung samples in every identified area are found in Table 1.

The researchers communicate with a certified institution to perform laboratory testing of the birds' feces for bacterial isolation. The personnel make species identification of field samples of the Regional Animal Disease Diagnostic Laboratory, which is housed at the Department of Agriculture for Region XI.

Table 1. Sampling Sites

Sampling Site	Morphometry Sample	Dung Sample
Estrada 1st	16	6
Llanos Street	36	2
LYR	1	0
Mary Mediatrix Cathedral	24	7
Total	77	15

Particularly, the API test kit was used by the laboratory technicians to provide bacterial identification.

Mean was used to determine the average in the population, while the frequency was used to determine the total number of marked birds. Moreover, mark-recapture was utilized to determine the bird's estimated population size. A tool used for estimating the population and abundance as long as the necessary assumption is met. There are parameters where this may be ascribed to an individual's characteristics of a bird, such as age, sex, or body weights which are crucial in the mark-recapture process. It also assesses the population's feasibility over time (Thompson, White, & Gow-an, 1998). Hence, the close population is used since the abundance of the bird population does not change with time. In addition, mark-recapture involves taking a series of samples of the population under study separated by one or more days or weeks, which in practice means any discrete time intervals.

RESULTS AND DISCUSSIONS

Morphometric Measurements of Barn Swallow

This research also aimed to describe the morphometry of the 77 Barn Swallows in bill length, bill depth, tarsus length, wing length, tail length, and body weight. Table 2 presents the descriptive measures using central tendency, variation, and normality.

Table 2. Descriptive statistics of morphometric measures

	Mean	Lower Bound	Upper Bound	Standard Deviation	Min	Max	Skew	Kurt
Bill length (cm)	1.42	1.37	1.47	0.24	0.74	2.02	-0.49	0.34
Bill depth (cm)	0.28	0.24	0.32	0.17	0.11	1.22	4.59	22.83
Tarsus length (cm)	0.84	0.78	0.89	0.24	0.45	2.17	2.98	10.93
Wing length (cm)	12.71	12.55	12.88	0.73	10.64	13.84	-0.98	0.76
Tail length (cm)	5.90	5.66	6.13	1.03	3.59	9.47	0.90	1.21
Bodyweight (g)	12.61	11.65	13.56	4.21	3.90	17.90	-1.17	-0.20

Considering the comparison and contrast of the morphometric measures when the barn swallows are classified as male and female, Table 2 depicts the findings. It is revealed from the descriptive comparison of the 57 male and 20 female Barn Swallows that in terms of bill length, females (1.45 cm) have longer billed than males (1.41 cm) slightly. Bill depth females (0.35) have slightly deepness than bill depth males (0.26). Tarsus length female (0.95) is elongated than tarsus length male (0.8). Wing length female (12.53) is slightly shorter than wing length male (12.78). The tail length female (5.1) is shorter than the tail length male (6.18). Bodyweight female (12.51) is slightly lighter than bodyweight male (12.64). The morphological measurements of Barn Swallows confirm and are supported by the study (Samuel, 1971) that the descriptive measurements, particularly wing length, and tail length, strongly affirm that the normal values verify that male barn swallow has longer wing length and visibly greater tail length. Moreover, some studies also attest that bill length measurements, bill depth, and tarsus length are not considered in the sex determination of barn swallow. Nevertheless, the tail length, wing length, and bodyweight of barn swallow were enough for morphological measurements to determine sexing individuals (Hermosell, Balbotin, Alfonso, Maribel, & Florentino, 2007).

After describing female and male Barn Swallows' morphometry, this study also performed inferential statistics to ascertain whether significant differences exist between males and females. The results are presented in Table 3. It was found that

Table 3. *A descriptive comparison of morphometric measures between male and female Barn Swallows*

	Male (n=57)		Female (n=20)	
	Mean	SD	Mean	SD
Bill length	1.41	0.217	1.45	0.287
Bill depth	0.26	0.566	0.35	0.318
Tarsus length	0.80	0.20	0.95	0.316
Wing length	12.78	0.625	12.53	0.957
Tail length	6.18	0.986	5.10	0.713
Bodyweight	12.64	4.055	12.51	4.737

there are no significant differences in bill length, bill depth, tarsus length, wing length, and body weight at 0.05 level of significance. This result conforms to (Smith, 2007).

However, there is a significant difference in tail length between male and female barn swallows. This result corroborates to (Samuel, 1971) who found out that the length of outermost tail features was used to significantly determine the sex that males have longer tail feathers than females.

Table 4. *Test of Difference in Morphometric Measurement between male and female Barn Swallows*

	Test statistics	p-value	Remark
Bill length	t=-0.55	0.586	Not significant
Bill depth	t=-1.28	0.215	Not significant
Tarsus length	t=-1.97	0.060	Not significant
Wing length	t=1.09	0.288	Not significant
Tail length	t=5.22	0.000	Significant
Bodyweight	t=0.11	0.915	Not significant

Bacteria and Health Hazard

To find out whether Barn Swallows' fecal matter post health hazards to humans in the identified areas in Digos City. The results of the bacterial isolation were utilized. These results were validated by Regional Animal Disease Diagnostic Laboratory (RADDL), and it contains the bacteria present in the fecal matter of the 15 dung samples. Table 5 summarizes the result and the type, gram–stain

reaction, and diseases these bacteria can bring about. The table is also organized according to the identified areas in Digos City, namely Llanos Street, Estrada 1st, and Mary Mediatrix Cathedral.

According to the results, there are two prominent bacteria in Llanos Street, namely the Enterobacter sakazakii and Pseudomonas luteola, which are both rod-shaped and gram-negative. Enterobacter sakazakii is particularly identified by (CDC, 2015) to cause meningitis, seizures, wound or infections, and urinary tract infection. Medical experts verify these… other bacteria found was the Pseudomonas luteola which can cause bloodstream infections, tuberculous pleurisy, and empyema.

In Estrada 1st, there are four distinguished bacteria, namely Pseudomonas aeruginosa, Stenotrophomonas maltophilia, Escherichia coli I, and Enterobacter cloacae which are all rod – shaped and gram-negative. First, Pseudomonas aeruginosa was recognized by Samuel (1971), which can cause respiratory tract infection, urogenital and wound infections. Second, the Stenotrophomonas maltophilia was known by Smith (2007) that causes pneumonia, bacteremia, endocarditis, meningitis, and wound infections. Then, Escherichia coli I is well – known for it can cause urinary tract infections. Lastly, Enterobacter cloacae were identified by its effect on human by causing lower respiratory tract infection, skin and soft tissue infections, intra-abdominal infections, and endocarditis.

Table 5. *List of Isolated Gram-negative Bacteria*

Location	Bacterium	Type	Diseases
Llanos Street	*Enterobacter sakazakii*	rod	Meningitis seizures wound or infection urinary tract infection
	Pseudomonas luteola	rod	bloodstream infections tuberculous pleurisy empyema
Estrada (1^{ST})	*Pseudomonas aeruginosa*	rod	respiratory tract infection urogenital wound infections
	Stenotrophomonas Maltophilia	rod	pneumonia bacteremia endocarditis meningitis

			wound infections urinary tract infections
	Escherichia coli I	rod	urinary tract infections
	Enterobacter cloacae	rod	lower respiratory tract infection skin and soft tissue infections intra-abdominal infections endocarditis
Mary Mediatrix Cathedral	*Pseudomonas aeruginosa*	rod	respiratory urogenital wound infections
	Pseudomonas luteola	rod	bloodstream infections tuberculous pleurisy empyema
	Aeromonas salmonicida ssp salmonicida	Non-motile rods/coccoid	furuncolosis
	Chromobacterium violaceum	rod	osteomyelitis cellulitis diarrhea conjunctivitis ocular infection
	Enterobacter cloacae	rod	lower respiratory tract infection skin and soft tissue infections intra-abdominal infections endocarditis

Mary Mediatrix Cathedral has five distinguished bacteria, namely Pseudomonas aeruginosa, Pseudmonas luteola, Enterobacter cloacae, and Chromobacterium violaceum rod-shaped and gram negative except to Aeromonas salmonicida ssp salmonicida, which was coccoid. According to Moller (1994), Pseudomonas aeruginosa causes respiratory tract infection, urogenital and wound infections, while Pseudmonas luteola causes blood-stream infections, tuberculous pleurisy, and empyema (Sakas, 2016). Then Chromobacterium violaceum known by Moller (1994) causes osteomyelitis, cellulitis, diarrhea, conjunctivitis, and ocular infection. Enterobacter cloacae were identified by their effect on the human that causes lower respiratory tract infection, skin and soft tissue infections, intra-

abdominal infections, and endocarditis. And lastly, Aeromonas salmonicida ssp salmonicida was recognized by Ruth, Robert Tord (1993), which can be the reason for furuncolosis.

CONCLUSION AND DISCUSSIONS

Morphometric measurements were used in determining the comparison between males and females Barn swallows. It is stated that there is no significant difference in bill length, bill depth, tarsus length, wing length, and body weight in identifying the sexes of the Barn swallow. However, it is indicated that there is a significant difference in tail length between male and female barn swallows. This result corroborates to Samuel (1971) that males have longer tail length than females. There were 8 identified bacteria identified: all gram-negative, and most of them were rod–type shaped bacteria. These results were validated by Regional Animal Disease Diagnostic Laboratory (RADDL).

The Local Government may conduct seminars or projects regarding environmental and health awareness. The researchers may further investigate to research barn swallow saliva and ectoparasite. Conduct research wherein the goal is to validate the sex identification and estimated population size of barn swallows.

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