# Knowledge, Perception, and Attitudes of Students in Caraga Region Towards Philippine Snakes: Implications to Biodiversity Conservation

*Leonardo A. Estaño[1,2]\*, Deolito M. Bicua Jr[2]., Sandy Ling Choo[3],*
*and Juancho B. Balatibat[4]*

[1]Department of Biology, College of Mathematics and Natural Sciences, Caraga State University, Ampayon, Butuan City, Agusan del Norte, Philippines

[2]Animal Biology Division, Institute of Biological Sciences, University of the Philippines Los Baños, Laguna, Philippines

[3]Department of Veterinary Paraclinical Sciences, College of Veterinary Medicine, University of the Philippines Los Baños, Laguna, Philippines

[4]Department of Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippines Los Baños, Laguna, Philippines

A B S T R A C T

Snakes, being less charismatic and infamous among threatened wildlife, are usually given biased treatment for conservation. Hence, the study on knowledge, attitudes, perception, and actions of 264 university students toward Philippine snakes was conducted on Caraga State University's main campus. The survey questionnaire consisted of four parts: socio-demographics, knowledge (snake identification), attitudes and perception toward snakes, and their source of information. A point bilateral correlation test was used to determine the association of knowledge and attitude and knowledge with information sources. Association of attitudes with sources of information and the inter-attitudinal association was determined via Fisher's Exact Test. Results showed that most students lack knowledge of snake species, having a mean score of 2.2 out of ten. Despite the low score observed, students tend to have positive attitudes towards snakes. The majority (86%) of the respondents favored the conservation of the taxa, despite the perceived fear (81%) and dislike for snakes (83%). The students' perception also demonstrated considerable awareness with regards to the ecological role of snakes. Meanwhile, TV news (81%) and school (60%) were the most identified sources of information, while social media, family, and documentary were positively associated with the students' knowledge of snakes. Information from this study would be essential in the formulation of efficient management plans and conservation for snakes in the Philippines, particularly in the Caraga region.

Keywords: *Knowledge, Perception, Caraga Region, Philippine Snakes*

## 1 Introduction

Attitude towards wildlife is an essential factor to consider the success of conservation measures for a particular species, especially for snakes. In comparison, mammals and birds are more appreciated than reptiles (Schlegel and Rupf 2010), which may be accounted for various cultures, the people's knowledge, and gender (Roskraft et al. 2003, Prokop et al. 2009, and Campos et al.

2012). Various cultures developed the inherent fear of snakes primarily due to their capability to cause severe damage to humans, and it led them to be the center for human-wildlife conflict (Alves et al. 2014). People tend to be biased over charismatic characteristics of wildlife rather than their conservation status (Colleony et al. 2017). As a result, aesthetic attitudes towards the charismatic species or "lovable species" and negativistic perspective towards human-threatening animals or "fear-relevant species" such as snakes were developed (Schlegel and Rupf 2010, and Knight 2008). To address this phenomenon, intervention on people's beliefs and myths should be integrated into conservation programs (Prokop et al. 2009).

Knowledge of species drives people towards a positivistic attitude on "fear-relevant species" such as snakes and other threatened species. This positive attitude was especially observed among biology-major students, although accounts vary between males and females (Prokop et al. 2009). Among younger students, it is observed that males were more acquainted and possessed more positive attitudes towards snakes, compared to females. These negative attitudes were accounted to the student's roles, irrational fears, or preconceived threats, and untrue myths connected to these species (Knight 2008, Prokop et al. 2009, Campos et al. 2012, and Alves et al. 2014).

Humans are an essential component of wildlife management, particularly in the success of conservation programs. The human-component is a critical consideration for the formulation of programs aiming for the protection of particular species (Liordos et al. 2017, and Campbell 2009). An increased human population in a particular area relates to an increase in the rate of poaching and illegal hunting of wildlife, which therefore compromises the species populations (Jachmann 2008). For snakes being less charismatic compared to other threatened wildlife, the perception of the people towards snake species is highly essential to be determined. Attitudes, naturalistic activities, gender, moralistic attitudes, and preconceived fears predict the protection of these species (Knight 2008, and Liordos et al. 2017).

To date, there has been no study to document perceptions of snakes in the Philippines, although there are numerous reports of snake bites and attacks on humans (Roa 2018, and Aguirre 2019). As a result, people tend to kill snakes. In 2019,

dozens of king cobras (*Ophiophagus hannah*) were killed in several provinces in the country during its breeding season (Cinco 2019). About 15% only of the terrestrial snake species are venomous, while the rest are harmless (Weinell et al. 2019). All Philippine snake species are equally important ecologically and deserve proper perception.

This study may provide information predictive of the probable cause of human-wildlife conflicts and formulation of resolves which require appropriate educational strategies (Schlegel and Rupf 2010). This study aimed to determine the knowledge on the identification, describe attitudes, and perception of the participants towards snakes, and also the association of attitudes and other factors. The results of this study are vital towards snake conservation and a better perspective towards Philippine snakes.

## 2 Materials and Methods

### Study area

The study was conducted on Caraga State University's main campus (8.9560° N, 125.5968° E) in May 2018. The campus is known for its natural science and other related programs. This academic institution is a state-governed university located in Ampayon, Butuan City, Agusan del Norte, Caraga Region, Philippines. Students enrolled are coming from various provinces of the region, which includes Agusan del Sur, Agusan del Norte, Surigao del Sur, Surigao del Norte, and Dinagat Province (Figure 1).

Caraga region is a hotspot for herpetofauna diversity in the country, boasting more species, of any comparably-sized Philippine faunal subregion (Sanguila et al. 2016). It is also a home to various Key Biodiversity Areas (KBAs) of the country.

### Data Collection

The study used a survey questionnaire for the collection of data, and before the conduct of the survey, a permit was secured from the CSU administration and participants signed a free prior consent form. The survey was taken using stratified random sampling. Two-hundred sixty-four students taking Biology courses were randomly selected to participate in the survey. Their knowledge of snakes were assessed by their ability to identify snake species in the photographs shown to them and by writing common or local names on the given answer sheets. The snake species used in the survey

represented selected snake families occurring in the Philippines, especially in Mindanao are listed in Table 1. The list includes both venomous and non-venomous species, their diversity in terms of unique characteristics, and habitat. The wart snake (*Acrochordus granulatus*) and Phillipine cobra (*Naja philippinensis*) were also included in the list, being species with no known records in Mindanao, due to their unique features. *Naja philippinensis* has close resemblance to the known recorded species in Mindanao, king cobra (*Ophiophagus hannah*).

To assess attitudes, students were given a set of items with two choices of both positive and negative correspondence pertaining to a specific attitude. The attitudes assessed were likeness toward snakes, fear of snakes, ignorance of snakes, tendency to kill snakes, eating snake meat, killing of snakes for medicinal purposes, snake conservation, snakes being friends to farmers, and snakes being beautiful organisms. The statements used in the questionnaire were modified from the survey of

Pandey et al. (2016). Moreover, for the perception, students were asked an open-ended question about their perception of why snakes exist. To determine sources of information affecting their knowledge, attitudes, and perception, students were asked to check possible sources of information from the list included in the questionnaire. Only 18 years old and above participated the study. Privacy and confidentiality of the information and other data were maintained throughout the study.

### Data Analysis

To determined the level of knowledge among students, each of the questionnaires was manually checked for the correct answers and recorded. The students' knowledge of snakes was recorded as a ratio based on the number of snakes they managed to identify. The binary responses were tabulated as "0" for every negative response and "1" for the positive response for the assessment of attitude. The perception was recorded as short
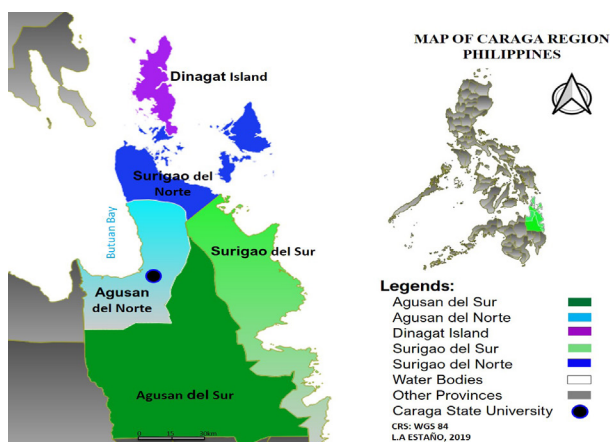


Figure 1. Map of the Caraga Region, Philippines.

Table 1. Representative of Philippine snake species used for the survey.

| Family | Scientific Name | Common Name |
|---|---|---|
| Elapidae | *Laticauda colubrina* (Scheider 1799) | Yellow-lipped sea krait |
| Elapidae | *Hydrophis cyanocinctus* (Daudin 1803) | Annulated sea snake |
| Elapidae | *Naja philippinensis* (Taylor 1922a) | Northern Philippine Cobra |
| Elapidae | *Ophiophagus hannah* (Cantor 1836) | King Cobra |
| Pythonidae | *Malayopython reticulatus* (Scheider 1801) | Reticulated Python |
| Colubridae | *Lycodon capucinus* (Boie 1827) | Common Asian wolf snake |
| Viperidae | *Trimeresurus flavomaculatus* (Gray 1842) | Philippine Pit Viper |
| Colubridae | *Ahaetulla prasina* (Boie 1827) | Asian vine snake |
| Typhlopidae | *Indotyphlops braminus* (Daudin 1803) | Brahminy blind snake |
| Acrochordidae | *Acrochordus granulatus* (Scheider 1799) | Little wart snake |

and concise keywords that best fit their responses. A point bilateral correlation test was used in determining the association of knowledge with attitude and knowledge with sources of information. Association analyses were conducted based on the responses obtained in the questionnaire. Association of attitudes with sources of information and inter-attitudinal association was also determined via Fisher's Exact Test at confidence level 90% (p=0.1). A weak association is indicated when the coefficient value is less than 0.1; moderate association at 0.10-0.30; and strong association at more than 0.30. Negative values indicate the inverse association. All statistical analyses were done using SAS version 9.4 software.

## 3 Results and Discussion

### *Demography and Knowledge on the identification of snakes*

The 264 students participated the survey were surveyed in Caraga State University's main campus in Ampayon Butuan City. The respondents were from different programs taking up biology courses

(Figure 2) comprising mostly undergraduate majors in Biology, Forestry, Environmental Science majors, and senior high school students.

Knowledge of students on snakes was determined utilizing their mean scores from the identification test. The mean score of the students was 2.2 out of 10, which is considerably low. Figure 3 summarizes the percentages of respondents based on their ability to identify the snake species correctly. About 5% of the respondents were not able to identify any of the snake species correctly, while 23% were able to identify only one species. The majority of the respondents can identify only 2 (28%) to 3 (30%) species. Only 9% of the respondents identified four snake species out of ten species of snakes presented in the survey. Most of the scores were concentrated in the lower intervals, indicating a low level of knowledge on the identification of the snake species.

Three snake species are relatively more identified than others based on the observed scores of the respondents. Figure 4 shows the percentage of correct answers for each snake species. The reticulated python is the most identified species,
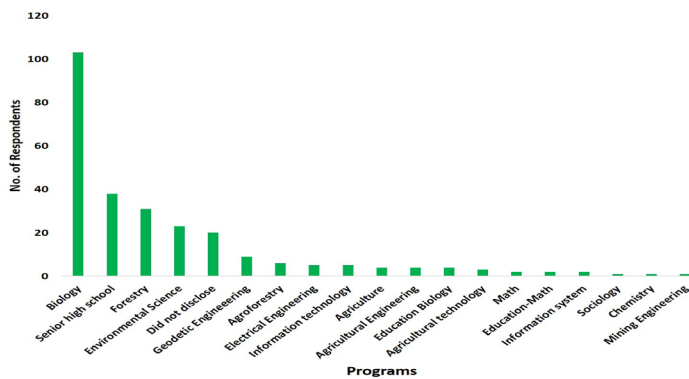


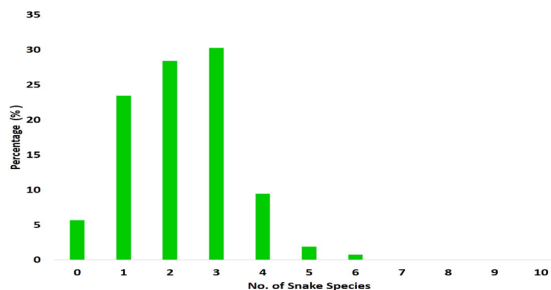Figure 2. The demographic overview of the 264 respondents of Caraga State University.



Figure 3. Percentage of identified snake species based on the number of recognized snakes by the respondents.

of which, 77% of the respondents were able to identify the snake, followed by relatively similar scored species, Philippine cobra (53.79%) and king cobra (51.14%). Philippine cobra and king cobra are both from the family Elapidae, from which sea krait and sea snakes also belong. But sea krait and sea snakes have relatively lower scores, they have relatively lower scores generated from the respondents. Likewise, arboreal species such as the pit viper and vine snake have relatively lower scores in comparison to python and the cobras, but higher in comparison with sea kraits and sea snake. Interestingly, none of the respondents were able to identify a blind snake and wart snake. It was observed that most species identified by the respondents are those species involved in human-wildlife conflict, and the less harmful ones are not in common knowledge. Also, forest terrestrial dwelling species, except for wolf snake (0.76%), tend to be more familiar to the respondents than those species inhabiting aquatic habitats.

According to Alves et al. (2014), snakes are among the most disliked animals in the world due to limited knowledge about these animals and their ecological and utilitarian role. Although the majority of the respondents in this study were students taking natural sciences programs, their knowledge on snakes that naturally occur in the Mindanao, Philippines appears rather limited, as evident by their knowledge score being in the lower range. It could be accounted for the fact that 5 of the species in the survey were not presently recorded in the Caraga region (Leviton et al. 2019). *L. colubrina*, recorded only in Zamboanga and Sulu archipelago, and *H. cyanocinctus* recorded only in the Basilan province, both are marine species, and it could account for the inability of the respondents to identify the species. Both species are not found

and recorded in the region of residence, although coasts are observed. Other species that are not recorded in the region are *N. philippinensis* which is restricted in Luzon, *I. braminus* recorded in many areas of Mindanao, and *A. granulatus*.

The top charters of the commonly identified snake species are those best-known to involve in human-snake conflict. For instance, the reticulated python, Headland, and Greene, (2011) reported that this species is well-known for its man-eating reputation in the Philippines, with 26% of the adult male Agta Negritos community having been reported to survive predation attempts by the species while six fatal attacks were recorded. Similarly, Philippine cobra bites as an important cause of death among rice farmers. Moreover, multiple human fatalities associated with King Cobras (Watt et al. 1987, Magbanua 2015, and Angie 2016) and sea kraits (Elias 2016) have also been reported in local news.

Possible sources of information may play essential roles in influencing the knowledge and attitudes of individuals. This could be vital for determining a more productive channel towards conservation education. Based on the survey, television news (81.06%) serves as the most avenue for the respondents to learn more about snakes. Schools and books have almost similar regard to having a nearly 60% score, while social media and family and the nature walk in the forest had nearly 50% responses. Movies and friends had relatively lower scores, while documentary, pet snakes, museum, and own experiences scored the least. It could be observed that most of the sources are associated with the dissemination of legitimate and unbiased information. Simultaneously, social facets and entertainment such as social media, movies, family, and friends tend to be less regarded.
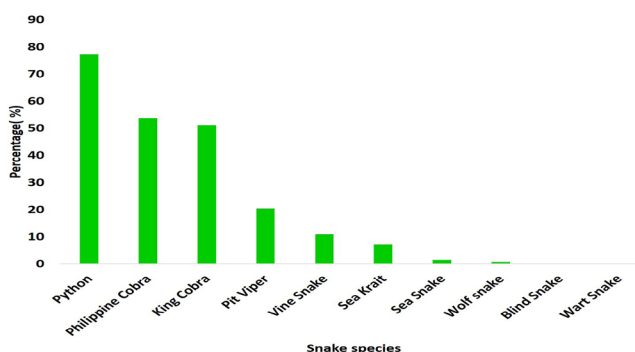


Figure 4. Percentage of respondents who identified the snake species correctly.

It is worth noting that the most credible sources of information are the ones having the highest scores (television news, school, and books), thus providing more influence on the respondents. Considering its potential, the authors of published materials should be updated, cautious, and unbiased.

To determine whether the level of knowledge among respondents is associated with the sources of information, association analysis was conducted based on their responses to the questionnaire. Among the twelve sources of information (Figure 5), only three sources of information were shown to have an association with knowledge (Table 2.1). A study by Campos et al. (2012) mentioned the use of information sources close to nature is necessary to improve knowledge of animal species. In this study, it is interesting to note that books and magazines are the main source of information in learning about snakes. The statistical results indicated that respondents' identification of snakes is moderately associated with social media, family members, and documentary instead. This observation may imply that the latter factors play more significant and effective roles in the learning of snake identification, despite the former three factors being the more common source of information among students.

### Attitudes and Perception

Figure 6 summarizes the proportion of positive and negative responses on a specific category that the majority of the respondents have fear of snakes because of snake bites and its effects to human health, similar to the findings of Alves et al. (2014) and Pandey et al. (2016) in Brazil and Nepal, respectively. Likewise, about 63% of the respondent will not ignore snakes, which may be related to their fear and dislike towards the snake. Despite this observation, most of the respondents generally have positive responses on the other categories, indicating a positive attitude towards snakes. About 80% of the students responded not to kill snakes, not to consume the meat of snakes, and would agree to conserve snakes. Additionally, about 50-60% of them agree not to kill snakes for medical purposes; snakes are friends to farmers, and that these species are of aesthetic importance. It is worth noting that this study observed that the respondents generally have positive orientations towards snakes.

The perception of the respondents on the existence of snakes was assessed using an open-ended question. Most of their responses are of a similar sense and therefore reworded for

quantification based on its essence. The statements that are mostly mentioned were summarized in Figure 7. Most of the respondents (31%) mentioned that snakes exist because it is involved in ecological balance, while 18% of them mentioned snakes have a role in the environment without specifying the specific roles. About 10% of them, on the other hand, mentioned specific roles of snakes as being predators that aids population control of animals and pests. These three statements are generally of similar sense but greatly varied on the specificity. Along with the ecological roles, about 6% mentioned snakes exist because of evolution. These sets of statements were of scientist perceptions, which could be accounted for the courses they are currently taking. On the other hand, a percentage of respondents (6%) mentioned that snakes exist because they are created by God and that those are living things like humans. This perception reflects a moralistic point of view concerning the species. In contrast, a lower percentage of respondents (3%) mentioned that a snake exists because of medical purposes (anti-venom), which is an anthropocentric perception. In line with their attitudes, in general, the respondents have positive perceptions of the snake species. According to Liordos et al. (2017), fear of animals is negatively correlated with the conservation of the species, and aesthetics is, on the other hand, favors conservation. Despite the dislike and fear of respondents observed in this study, the students tend to agree of conserving the snakes, which could be accounted for their education level and nature of their taken programs, as shown in Figure 3. The attitudes of the students for this study coincides with the findings of Prokop et al. (2009) that biology majors tend to possess more positive attitudes towards the species. Although many of the respondents do not like and fear snakes, the students are still able to rationalize the necessity of snake conservation due to their educational awareness of the species role in maintaining ecological balance. A study of Gamalo et al. (2018) demonstrated that awareness was important for a positive perception towards the conservation of wildlife animals.

Association analysis revealed that among the nine attitudinal categories presented in Figure 6, only two attitudes were shown to have an association with knowledge (Table 2.2). Results show a moderate positive association of knowledge on the attitudes of those who do not fear snakes, which made up the student minority 18%. This means that the low scores of students are associated
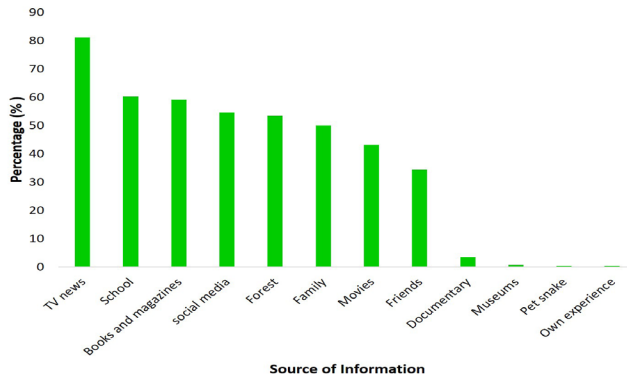
Figure 5. Sources of information of the respondents for Philippine snakes.
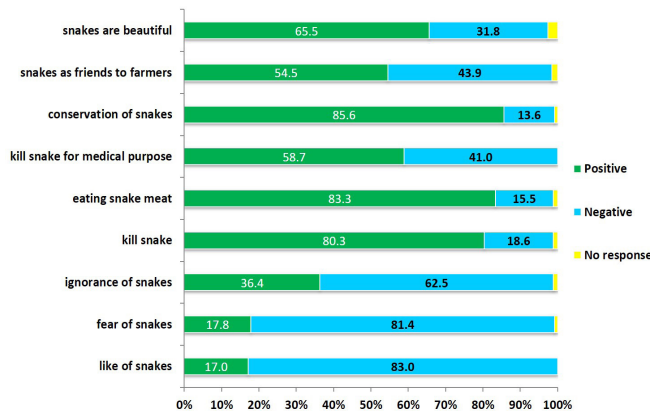


Figure 6. Proportion of responses for each attitudinal category toward Philippine snakes. N=264


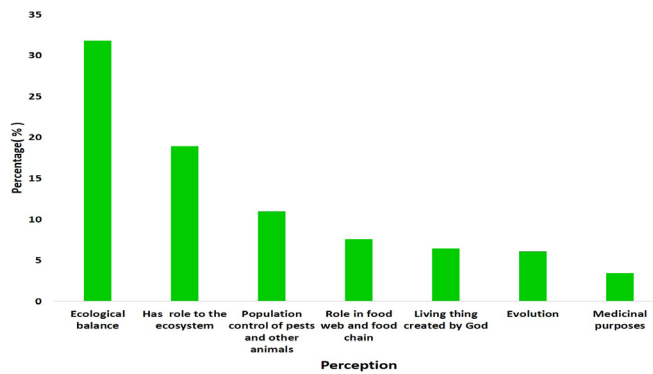
Figure 7. Perceptions of respondents and their percentage of why snakes exist.

Table 2.1. Association of Knowledge vs Source of Information, as shown by point bilateral correlation test.

| Parameters | Correlation coefficient | P-value |
|---|---|---|
| Knowledge vs Social media | 0.12765 | 0.0382 |
| Knowledge vs Family | 0.17720 | 0.0039 |
| Knowledge vs Documentary | 0.10512 | 0.0883 |

7

with their fear of snakes. Curiously, a moderate negative association was also shown concerning the students' knowledge of the attitude towards not eating snakes. While this inverse association may imply that students who are knowledgeable about snakes show a tendency to eat snakes, it can also imply that the students who eat snakes are likely to be knowledgeable in the identification of snakes. Note that such an association relationship does not imply any causation of one attitude to another.

Inter-attitudinal association was also determined to demonstrate the relationship between the students' attitudes, to provide a basis to how some attitudes may be positively or inversely associated with another, attitudes or possible actions. The statistical analysis revealed 18 pairs of possible inter-attitudinal associations, as shown in Table 3, which generally indicate positive attitudes towards snakes are more likely to be associated with other positive attitudes or possible actions. Unsurprisingly, a strong association was exhibited by students who like snakes and their un-fearing attitude towards the animals. The students who like snakes are also more likely to show favoring attitudes and actions towards snakes, as demonstrated by the moderate association towards them to not kill, to conserve, to consider snakes as friends of farmers and being beautiful creatures. Similarly, those with an un-fearing attitude towards snakes are also moderately associated with the appreciation attitude of the animals, such as regarding them as friends of farmers and being beautiful. Notably, students that think of snakes as beautiful animals show a highly significant difference in multiple associations with positive attitudes and favoring actions towards snake conservation. While most associations exhibited were positive, an inverse association was also observed between those exhibiting un-fearing attitude and do not eat snake, which could be interpreted bilaterally; those who are not afraid of the snake may be associated with eating the animal, or those who eat snakes are not afraid of them.

The associations between attitude types and the sources of information were also examined (Table 4), which revealed a moderate association between attitude types and social media, books, school, documentaries, personal snake encounters, and experiences (forest, owning pet snake). Curiously, moderate inverse associations were observed between several attitude types and sources of information. While social media is positively associated with attitudes favoring snake conservation and appreciation of their beauty, it is also inversely associated with attributes that are considered positive attitudes by Pandey et al. (2016), such as against snake's use as medicine and ignoring the snake during an encounter. Similarly, while books and magazines were mostly positive-associated with attitudes supportive of snake conservation (i.e., attitudes of liking snakes, do not kill or eat snakes, even for medicinal purposes), it is also inversely associated with ignoring snakes during the encounter. At the same time, personal experience with the snake is inversely associated with a positive attitude toward conservation and to not kill the snake.

Therefore, it is worth looking to further assess the personal experiences and the possible encounters with snake species of the participants in this study. According to Roskraft et al. (2003), those people living in an area where carnivores exist tend to be less fearful than those who do not encounter them. In the case of King cobras, they have the more tendency to be killed by humans when they escalated defensiveness (Shankar et al. 2013). While the probable reason for dislike and fear of snakes of the respondents may be due to their lack of personal encounters, negative personal experience may escalate a negative attitude even more. In this study, one particular respondent, despite being rather knowledgeable in snake identification for having identified 4 out of ten snake species, an overall negative attitude was exhibited toward snake conservation, stating "snake exists to harm human with venom" with the source of information cited as own experience.

The presence of cobra, pythons, and monitor lizards in some areas significantly affect livelihood decision-making (Campbell et al. 2009). It could be hypothesized that the increase

Table 2.2 Association between Knowledge vs Attitude, as shown by point bilateral correlation test.

| Parameters | Correlation coefficient | P-value |
|---|---|---|
| Knowledge vs Do not fear | 0.11067 | 0.0726 |
| Knowledge vs Do not eat | -0.11959 | 0.0523 |

Table 3.  Inter-attitudinal association of attitudes/actions as demonstrated via Fisher's Exact Test.

| Attitudes/Actions | Correlation coefficient | P-value |
|---|---|---|
| Like vs Do not fear | 0.50002 | 0.0001 |
| Like vs Do not kill | 0.12319 | 0.0455 |
| Like vs To conserve | 0.18588 | 0.0024 |
| Like vs Friend to farmers | 0.17104 | 0.0053 |
| Like vs Beautiful | 0.28637 | 0.0001 |
| Do not fear vs Do not eat | -0.11071 | 0.0725 |
| Do not fear vs Friend | 0.14644 | 0.0173 |
| Do not fear vs Beautiful | 0.15002 | 0.0147 |
| Ignore vs Do not kill | 0.16743 | 0.0064 |
| Do not kill vs Not for medicine | 0.18436 | 0.0026 |
| Do not kill vs To conserve | 0.23104 | 0.0002 |
| Do not kill vs Beautiful | 0.22195 | 0.0003 |
| Not for medicine vs To conserve | 0.13831 | 0.0246 |
| Not for medicine vs Friends to farmers | 0.11518 | 0.0617 |
| Not for medicine vs Beautiful | 0.10405 | 0.0916 |
| To conserve vs Friends to farmers | 0.23247 | 0.0001 |
| To conserve vs Beautiful | 0.29292 | 0.0001 |
| Friends to farmers vs Beautiful | 0.36232 | 0.0001 |

Table 4.  Association between Attitudes and Source of Information as demonstrated via Fisher's Exact Test.

| Parameters | Correlation coefficient | P-value |
|---|---|---|
| Like X Booksmags | 0.11082 | 0.0722 |
| Like X Pet snake | 0.13603 | 0.0271 |
| Do not fear X Documentary | 0.13084 | 0.0336 |
| Do not fear X Pet snake | 0.13250 | 0.0314 |
| Ignore X Social media | -0.11645 | 0.0588 |
| Ignore X Forest | 0.12198 | 0.0477 |
| Ignore X Booksmags | -0.10939 | 0.0760 |
| Do not Kill X Booksmags | 0.10259 | 0.0962 |
| Do not Kill X School | 0.12295 | 0.0460 |
| Do not Kill X Experience | -0.12451 | 0.0433 |
| Not for medicine X Socmedia | -0.10206 | 0.0980 |
| Not for medicine X Booksmags | 0.12403 | 0.0441 |
| To conserve X Socmedia | 0.10245 | 0.0967 |
| To conserve X School | 0.19592 | 0.0014 |
| To conserve X Experience | -0.15038 | 0.0145 |
| Beautiful X Socmedia | 0.15424 | 0.0121 |

in knowledge among students would drive a more efficient and conservation-oriented decision making for the general welfare of snakes and the reduction of human-wildlife conflict in the future. With the combined observations on attitudes and perceptions observe among respondents, the species is predicted for protection (Knight 2008, and Liordos et al. 2017). This study provided vital information for the future formulation of a management plan for snakes in the Caraga Region, Philippines. The

knowledge, attitudes, and perceptions would serve as predictors for future wildlife managers of human behavior and decision, which influences the roots of human-wildlife conflict (Hudenko 2012). With that diversity studies on the snakes, promotion, and publication, emphasizing snakes in conservation efforts should incorporate in Biodiversity courses of students. Collaboration with the government agencies, and non-government organizations which includes engagements in community immersions to discuss the ecological importance of snakes, especially in areas with greater occurrence of snake fatality.

Consequently, it may be necessary to look into how television and online news are affecting the public's knowledge, attitude, and perceptions with regards to snake conservation, which can potentially turn into invaluable tools for snake conservation proponents in the country. It is, therefore, vital to incorporate accurate and unbiased information on the value of snake species to promote their conservation. Local TV shows should be expected to present updates, considering phylogenies are always changing, and the ecological issues concerning these animals are often neglected. The use of words to convey information without bias should be crucially checked.

## 4 Conclusion and Recommendations

The knowledge of the students on the identification of snakes was relatively low, and most of the respondents can identify only two snake species. The snake species most identified are Python (*Malayopython reticulatus*), Philippine Cobra (*Naja philippinensis*), and King Cobra (*Ophiophagus hannah*). However, students generally have a positive attitude towards snakes, and their perceptions incline on the ecological importance of snakes. TV and school tend to be the most identified sources of information among students, although social media and family and documentary are associated with students' knowledge. The lack of knowledge among students is associated with their fear and tendency of consuming snakes. Establishing connections and addressing specific attitudes among these perceptions would facilitate logical approaches for snake conservation. The findings of the study should be disseminated to promote the importance of snakes and their conservation.

## Statement of Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

## 6 Literature Cited

Aguirre, E. (2019, August). King cobra kills Davao Sur farmer. Philippine News Agency. Retrieved on December 28, 2020 from https://www.pna.gov.ph/articles/1077216

Alves, R.N., Silva, V.N., Trovão, D.M.B.M., Oliveira, J.V., Mourão, J.S., Dias, T.L.P., Alves, A.G.C., Lucena, R.F.P., Barboza, R.R.D., Montenegro, F.G.P., Vieira, W.L.S & Souto, W.M.S., (2014). Students' attitudes toward and knowledge about snakes in the semiarid region of Northeastern Brazil. *Journal of Ethnobiology and Ethnomedicine*, **10**:30.

Angie, V. (2016). Man bitten by King Cobra in comatose condition. Kicker Daily News. from https://kickerdaily.com/posts/2016/03/man-king-cobra-in-comatose-condition

Campos, C. M., Greco, S., Ciarlante, J.J., Balangione, M., Bender, J. B., Nates, J., & Lindemann-Matthies, P. (2012). Students' familiarity and initial contact with species in the Monte desert (Mendoza, Argentina). *Journal of Arid Environments*. **82**: 98-105

Campbell, M. (2009). Repositioning zoogeography within the nature–culture borderlands: An animal geography of reptiles in southern Ghana. *Applied Geography*. **29**: 260–268

Cinco, M. (2019). Alarm raised as dozens of king cobras killed. Philippine Daily Inquirer. Retrieved on December 28, 2020 from https://newsinfo.inquirer.net/1104522/alarm-raised-as-dozens-of-king-cobras-killed#ixzz6huMIvJGU

Colléony, A., Clayton, S., Couvet, D., Jalme, M. S., & Prévot, A. (2017). Human preferences for species conservation: Animal charisma trumps endangered status. *Biological Conservation*. **206**: 263–269

Elias, J. (2016). "Sea Snakes" kills 5-year old boy. Northbound Philippines News Online. Retrieved on May 25, 2018 from http://northboundasia. com/2016/03/31/sea-snakes-kills-5-year-old-boy

Gamalo, L.E., Cabañas, A.J., Suetos, K.J. Tauli, J.I Vegafria, N.J. Tenorio, F.M. Galapon, M. & Balatibat, J. (2018). Awareness and perception on wildlife and conservation of teachers and college students in Los Baños, Laguna Philippines. *Journal of Biodiversity and Environmental Sciences*. **12**(2), 160-167,

Headland, T. N. & Greene, H. W. (2011). Hunter-gatherers and other primates as prey, predators, and competitors of snakes. *PNAS*, **108**(52)

Hudenko, H. W. (2012). Exploring the influence of emotion on human decision making in human–wildlife conflict. *Human Dimensions of Wildlife*. **17**:16–28

Jachmann, H. (2008). Illegal wildlife use and protected area management in Ghana. *Biological conservation*. **141**: 1906-1918

Knight, A. J. (2008). Bats, snakes and spiders, Oh my! How aesthetic and negativistic attitudes, and other concepts predict support for species protection. *Journal of Environmental Psychology*, **28**:94–103

Leviton, A. E., Siler, C. D., Weinell, J. L., & Brown, R. M. (2018) Synopsis of the snakes of the Philippines: A synthesis of data from biodiversity repositories, field studies, and the literature. *Proceedings of the California Academy of Sciences Series 4*, **64**(14) 399-568

Liordos, V., Kontsiotis, V. J., Anastasiadou, M., & Karavasias, E. (2017). Effects of attitudes and demography on public support for endangered species conservation. *Science of the Total Environment*. **595**: 25-34

Magbanua, W. (2015). North Cotabato village orders hunt for King Cobra. Inquirer.net. Retrieved on May 25, 2018 from http://newsinfo.inquirer.net/673552/north-cotabato-village-orders-hunt-for-king-cobra

Pandey, D.P., Pandey, S. Devkota, G. & Goode, M. (2016) Public perceptions of snakes and snakebite management: implication for conservation and human health in southern Nepal. *Journal of Enthobiology and Ethnomedicine.* **12**, 22

Prokop, P., Ozel, M., & Usak, M. (2009). Cross-cultural comparison of student attitudes toward snakes. *Society and Animals*. **17**: 224-240

Roa, E. (2018). Boy dies from snake bite in Leyte. Philippine News Agency. Retrieved on December 28, 2020 from https://www.pna.gov.ph/articles/1028810

Roskraft, E., Bjerke, T., Kalterborn, B., Linnell, J. D. C., & Andersen, R. (2003). Patterns of self-reported fear towards large carnivores among the Norwegian public. *Evolution and Human Behavior*. **24** :184–198

Sanguila, M.B., Cobb, K.A., Siler, C.D., Diesmos, A.C., Alcala, A.C., & Brown, R.M. (2016). The amphibians and reptiles of Mindanao Island, southern Philippines, II: the herpetofauna of northeast Mindanao and adjacent islands. *Zookeys*,. **2016**, (624): 1–132.

Shankar, P. G., Singh, A., Ganesh, S. R., & Whitaker, R. (2013). Factors influencing human hostility to King Cobras (*Ophiophagus hannah*) in the Western Ghats of India. *Hamadryad*. **36**(2) 91 – 100

Schlegel, J., & Rupf, R. (2010). Attitudes towards potential animal flagship species in nature conservation: A survey among students of different educational institutions. *Journal for Nature Conservation*. **18** : 278–290.

Watt, G., Padre, L., Tuazon, M. L. & Hayes, C. G. (1987). Bites by the Philippine cobra (Naja naja philippinensis): an important cause of death among rice farmers. *The American Journal of Tropical Medicine and Hygiene*. **37**(3):636-639.

Weinell, J. L., Hooper, E., Leviton, A. E., & Brown, R. M. (2019) Illustrated key to the snakes of the Philippines. *Proceedings of the California Academy of Sciences Series 4*, **66**(1) 1-49.