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Local knowledge and community behavior in the exploitation of parrot in surrounding area of aketajawe lolobata national park

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A B S T R A C T

Parrot includes in *Aves* class and *Psittaciformes* order. In Indonesia, parrot is known by their local species names such as Nuri (true parrot), Kakatua (Cockatoo), and Perkici (Loriini). Parrot can be found almost in all type of habitat in Halmahera Island, Maluku Utara Province, from mangrove to tropical rainforest in lowlands and highlands. The research aims to describe community activities in the exploitation of parrots around the Aketajawe Lolobata National Park, Halmahera Island. The study used the ex-post facto method with questionnaire as the instrument to interview communities consist of the catcher, seller, and owner of parrots. Research result data were analyzed descriptively and presented in the form of tables and charts. The result showed that there were five kinds of parrot caught, sold, and raised by the communities of Gitaraja, Bale, Koli, and Kosa Village. The exploited birds were Kasturi Ternate (*Lorius garrulus*) Nuri Kalung Ungu (*Eos scuamata),* Nuri Bayan (*Eclectus roratus),* Kakatua Putih (*Cacatua alba*) and Kakatua Jambul Kuning (*Cacatua galerita*). The number of parrots being caught during 2013-2016 were 327, 320 were sold, and 213 were raised. The highest percentage of parrot caught and sold were 21% in 2013, and the lowest was 2% in 2016-2018. The highest percentage of raising was 8% in 2015, and the lowest was 3% in 2018. Kasturi Ternate (*Lorius garrulus*) was the species with the highest rate of exploitation.

INTRODUCTION

The high reliability of communities on Aketajawe Lolobata National Park and the supervision of the territory's buffer zone has become an important issue recenlty. Approximately one hundred Kakatua Putih (*Cacatua alba*) are traded by the community in one year, with the average price of Rp

500.000 each for regions outside Maluku Utara Province, especially Java Island. Bird hunting in Maluku Utara has been done since the Dutch Colonization era. However, at that time, the hunting was aimed to add collections of specimen for European museums. Hunting for trade is likely to be conducted explicitly since the emerging demand of parrots as a pet. Caught birds will be sold at the bird markets for a commercial purpose (Prakosa & Kurniawan, 2014; Bravo & Porzecanski, 2014).

Aketajawe Lolobata National Park is a conservation area of eastern Indonesia and one of natural preservation area appointed with the objective to preserve the representation of ecosystem diversity and a complete series of habitats from lowlands to mountains as well as it could cover the native representative of all essential terrestrial habitats in Halmahera (Arini, 2011; Suryanda, Komala, & Rahmawati, 2018; Ernawati, Azrai, & Wibowo, 2016). Result of a survey conducted by Burung Indonesia in Aketajawe Lolobata National Park during 2008-2009, 104 species of bird in the area were found, including 25 out of 27 endemic species of Maluku Utara. Four endemic species of Maluku Utara were found as well, including the most mysterious species, the Mandar Gendang *(Habroptila wallacii)* (Basahari & Nurdin, 2010). Fact shows that Aketajawe Lolobata National Park is a home for four genus of typical birds. As many as 24 species of world's typical birds can only be found in Maluku Utara. Those birds fly freely in this area, including Burung Bidadari *(Semioptera walacii)*, Nuri Ternate *(Lorius garrulus),* Paok Halmahera *(Pitta maxima),* and Kakatua Putih *(Cacatua alba)* as well as other typical birds. As many as 213 species of birds are recorded to be found in the area (Basahari & Nurdin, 2010).

In Maluku Utara, there are currently reasons why people hunt the parrots in nature, including as a livelihood source (income purpose), as well as a part of field pest extermination (Hume, 2007; Hadianti, Azrai, & Sukandar, 2014). Hunting for trade is likely began since the emerging demand of parrots as a house pet. Having birds as pet is an activity that represented a culture and considered as describing the harmony of inter-creature relationship (Jepson and Ladle, 2009).

People's interest in having birds as their pet is based on various reasons, from hobby to a symbol of prestige to show their social status. The interest in having birds as the pet has caused some people to make an effort to fulfill that passion. This has resulted in a great number of people who hunt birds for a pet. Low public awareness on environment has brought consequences on illegal hunting of various bird species. An effort to overcome the issue is by developing an environmental education model at school that integrated into the curriculum. Thus, it becomes a local content subject at school (Nurhayati, Sukandar, & Suryanda, 2018; Purbaya, Komala, & Seribulan, 2015).

METHOD
Design

The research used an ex-post facto method. The study was conducted in August to October 2018 in four phases: 1) informant determination, 2) interview, 3) identification, and, 4) data verification. The research locations were in Gitaraja, Bale, Koli, and Kosa village. Those villages were chosen since they were located at the border of Aketajawe Lolobata National Park area in Halmahera Island.

Instrument

The questionnaire is used as an instrument for an interview with the communities to obtain data on parrots species being exploited in the area of Aketajawe Lolobata National Park and its surroundings. Researcher attendance acted as a key instrument of research.

Informant

Informant determination phase used a purposive sampling technique, resulted in 69 people becoming the informants. The interview phase was conducted in-depth to obtain a piece of comprehensive information concerning parrots exploitation activity. The identification phase carried out to classify every species of birds found.

Data Analysis

Research data were analyzed descriptively through a table and graphic presentation to describe the knowledge of communities' activity in parrots' exploitation. Tabulation of data using Microsoft Excel version 2010.

RESULT AND DISCUSSION
1. Types and Population of Parrots

According to the interview result, five species of exploited birds were revealed. (Table 1).

Table 1.
Species of Parrots being Exploited.

No	Scientific Name	Indonesian Name	Local Name
1	*Lorius garrulus*	Kasturi ternate	Luri
2	*Eos scuamata*	Nuri kalung ungu	Perkici Merah
3	*Eclectus roratus*	Nuri bayan	Kakatua Hijau (jantan)
4	*Cacatua alba*	Kakatua Putih	Kakatua Putih
5	*Cacatua gallerita*	Kakatua Jambul Kuning	Kakatua

According to Table 1, it were revealed that the species of parrots caught, sold, and raised by the communities were: Kasturi Ternate (*Lorius garrulus*), Nuri Kalung Ungu (*Eos scuamata*), Nuri bayan (*Eclectus roratus*), Kakatua putih (*Cacatua alba*) and Kakatua Jambul Kuning (*Cacatua gallerita*) of Papuan endemic. Information obtained from the locals stated that the hunting, selling, and raising parrots were a whole-year activities. There were also people who raised the Kakatua Jambul Kuning (*Cacatua gallerita*), which is a Papuan endemic. According to the community, those birds were bought in Papuan and then shipped to Ternate. The description on the percentage of hunting, selling, and raising activities are presented in Figure 1, 2 and 3.
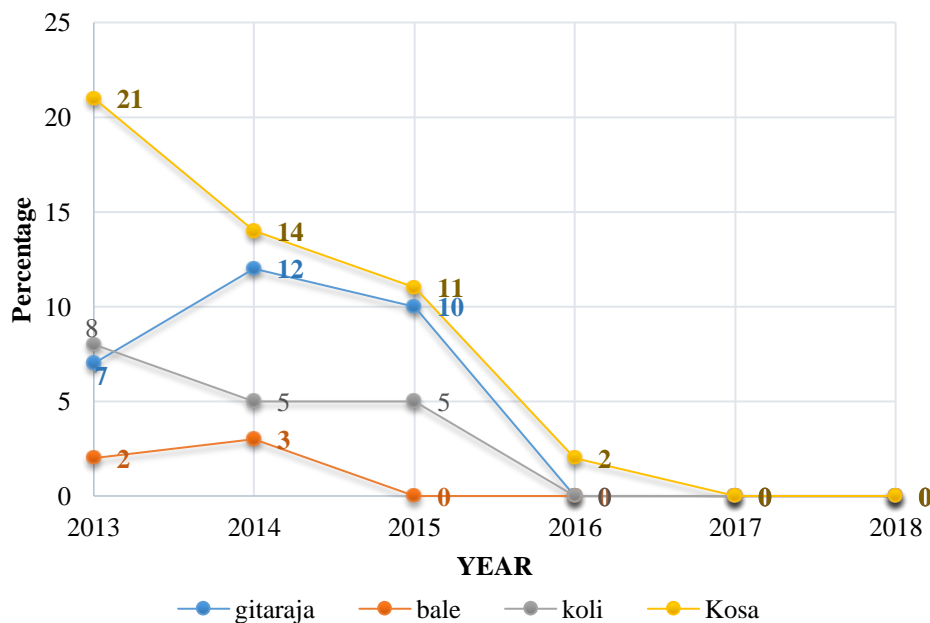

Figure 1. Percentage of Parrots Hunting in the Four Villages.

Based on Figure 1, it was indicated that the highest rate (21%) of parrot hunting occurred in 2013 in Kosa Village, followed by Koli Village (8%), and Gitaraja Village (7%). In 2014, the highest rate were in Kosa (14%) and Gitaraja Village (12%). In 2015, the highest were in Kosa Village (11%)

and Gitaraja Village (10%). As for the lowest rate occurred in 2016, which was 2%. There was no information in the research concerning the people's activity of parrot hunting for 2017-2018.
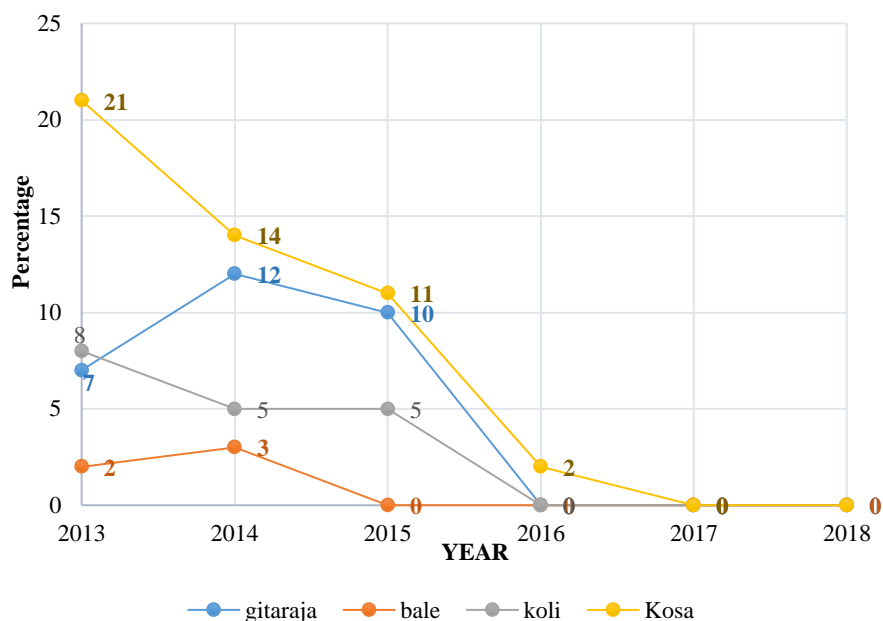

Figure 2. Parrot Selling Rate in the Four Villages.

Figure 2 shows that the highest selling rate (21%) was in Kosa Village in 2013, followed by Koli Village (8%) and Gitaraja Village (7%). In 2014, the highest rate was Kosa Village (14%) and Gitaraja Village (12%). In 2015, Kosa Village (11%) and Gitaraja Village (10%). As for the lowest selling rate, which was 2%, occurred in 2016. There was no information concerning communities' activity of parrot selling for 2017-2018.
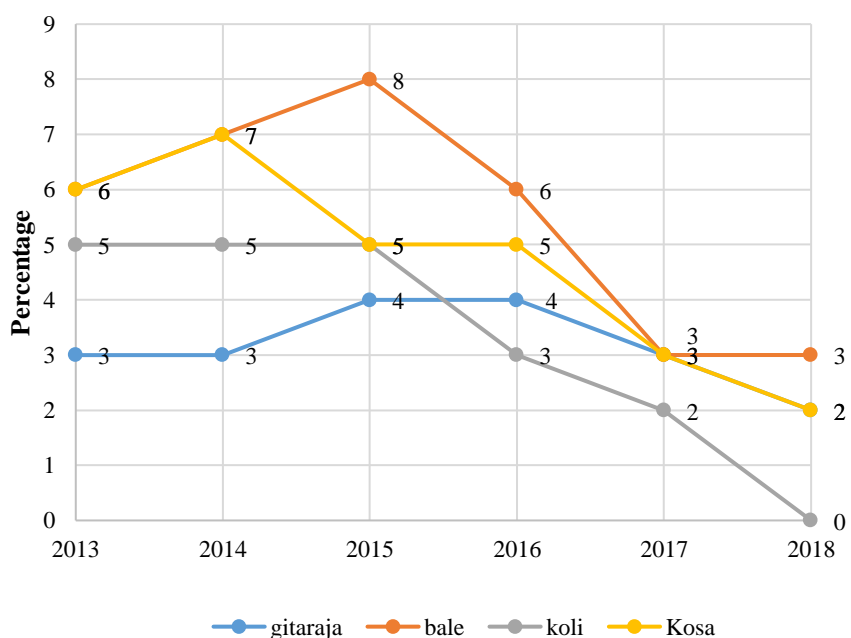

Figure 3. Parrot Raising Rate in the Four Villages.

According to Figure 3, parrot raising activity in Bale Village was 6% in 2013, 7% in 2014, and 8% in 2015. In 2016, there was a decline of 6% and another decline to 3% in 2017-2018. Next, in

Kosa Village, almost similar to Bale Village, the rate was 6% in 2013, 7% in 2014, and a decline opposite to Bale Village to 5% in 2015 and 2016. Also, there was another decline to 3% in 2017 and 2% in 2018. In Koli Village, the selling rate in 2013-2015 was 5%, and a decline to 5% in 2016, and yet another decline to 2% in 2017. As for 2018, no people were found having a parrot as their pet. In Gitaraja Village, the rate was 3% in 2013-2014 and increased to 4% in 2015-2016, and yet it declined again to 3% in 2017, and 2% in 2018. The most caught, sold, and raised parrot species were Nuri Kalung Ungu (*Eos scuamata*) and Kasturi Ternate (*Lorius garrulus*) compared to Nuri Bayan (*Eclectus roratus*) and Kakatua Putih (*Cacatua alba*). The description is presented in Figure 4, 5, and 6.
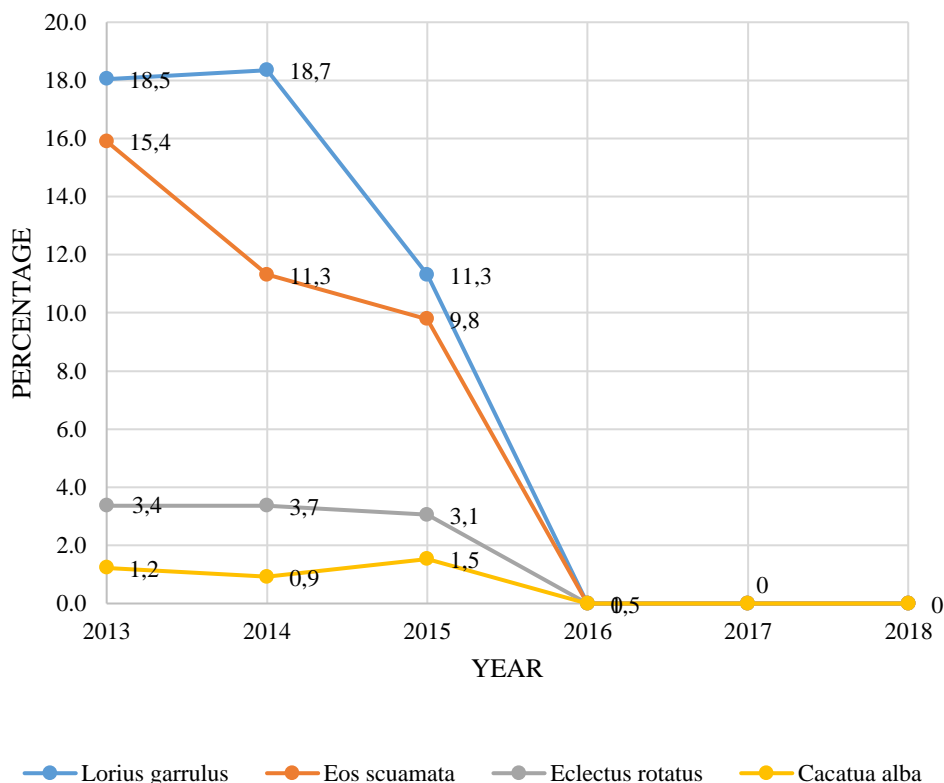

Figure 4. Percentage of Parrot Hunting.

Figure 4 shows that the Kasturi Ternate (*Lorius garrulus*) was in the first position as the most hunted in the forest by the communities. Data from 2013 showed that the rate was 18,5%, 18,7% in 2014, and 11,3% in 2015. The second position was the Nuri Kalung Ungu (*Eos scuamata*) with the hunting rate of 15,4% in 2013, 11,3% in 2014, 9,8% in 2015, and it declined to 1,5% in 2016. The *Eos scuamata* was mostly caught by the people of Kosa Village. The third position was the Nuri Bayan (*Eclectus roratus*) with 3.4% of hunting rate in 2013, 3,7% in 2014, and 3,1% in 2015. The fourth place was Kakatua Putih (*Cacatua alba*) with 1,3% in 2013, 0,9% in 2014, and 1,5% in 2015. There were no more people who hunted parrots around Aketajawe Lolobata National Park in 2017-2018 since the rangers of Aketajawe Lolobata National Park Board has banned the people from doing illegal hunting.
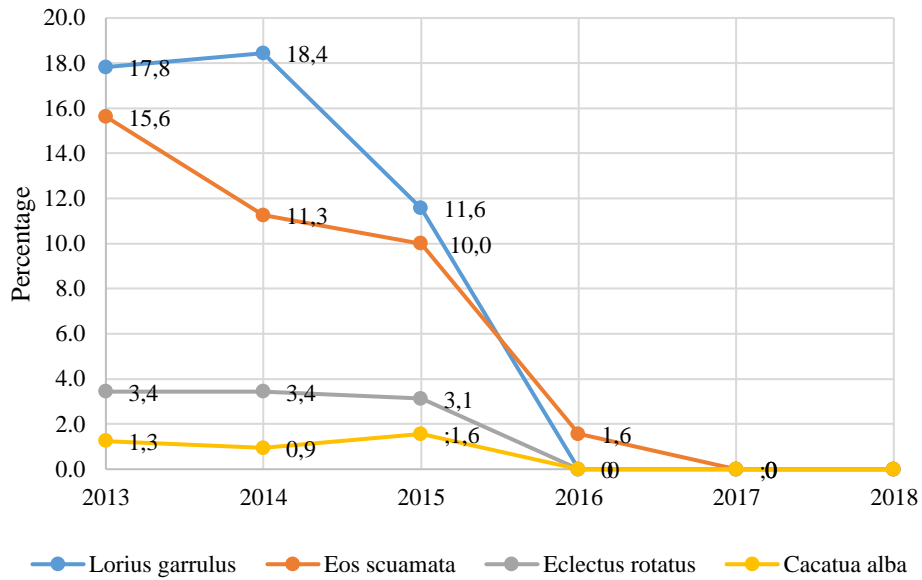
Figure 5. Percentage of Parrot Selling.

Figure 5 shows that the most traded parrot was the Kasturi Ternate (*Lorius garrulus)* with a selling rate of 17,8% in 2013, 18,4% in 2014, and 11,6% in 2015. The second position was Nuri Kalung Ungu (*Eos scuamata*) with 15,6% in 2013, 11,3% in 2014, 10,0% in 2015, and 1,6% in 2016. The third place was Nuri Bayan (*Eclectus roratus*) with 3,4% in 2013-2014, and 3,1% in 2015. As for the lowest selling rate was Kakatua Putih (*Cacatua alba*) with 1,3% in 2013, 0,9% in 2014, and 0,6% in 2015.
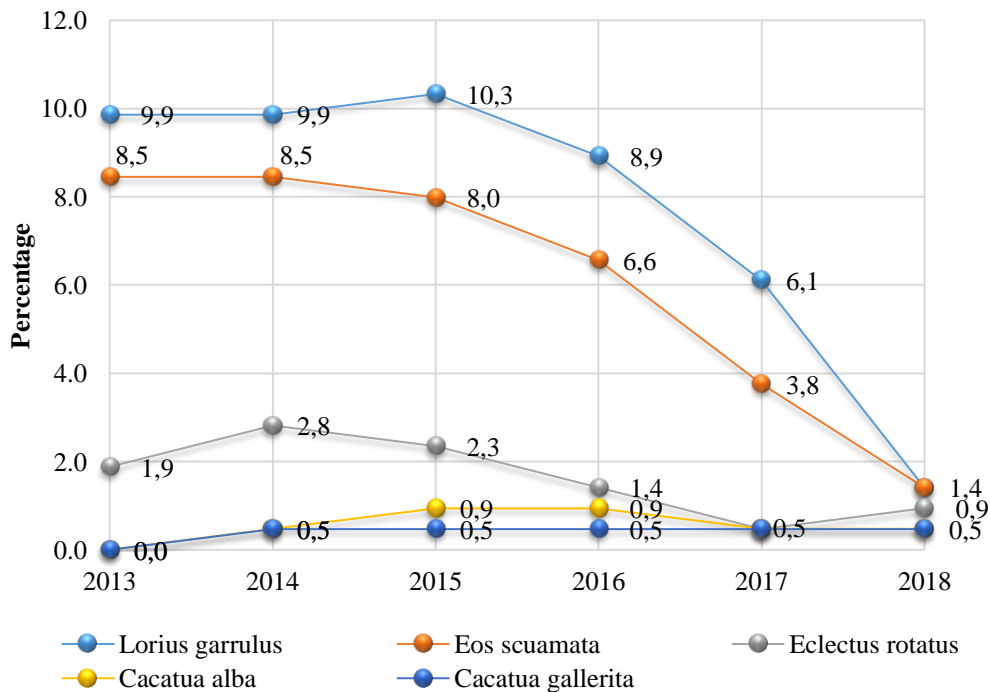

Figure 6. Percentage of parrot raising.

Figure 6 shows that the percentage of parrot raising for Kasturi Ternate (*Lorius garrulus*) was 9,9% in 2013-2014, 10,3% in 2015, 8,9% in 2016, 6,1% in 2017, and 1,4% in 2018. The second

position of most raised species was Nuri Kalung Ungu (*Eos scuamata*) with 8,5% in 2013-2014, 8.0% in 2015, 6,6% in 2016, 3,8% in 2017, and 1,4% in 2018. The Nuri Bayan (*Eclectus roratus*) was at 1,9% in 2013, 2,8% in 2014, 2,3% in 2015, 1,4% in 2016, 0,5% in 2017, and 0,9% in 2018. As for the Kakatua Putih the percentage was at 0% in 2013, 0,5% in 2014, 0,9% in 2015-2016, and 0,5% in 2017-2018. Whereas the Kakatua Jambul Kuning was at 0,5% in 2014-2018.

Parrots that were caught, sold, or raised by the people were the Kasturi Ternate (*Lorius garrulus*), Nuri Kalung Ungu (*Eos scuamata*), Nuri Bayan (*Eclectus roratus*), and Kakatua Putih (*Cacatua alba*). The most hunted parrot was the Kasturi Ternate, Nuri Bayan, and Nuri Kalung Ungu. There was also non-endemic species of Maluku Utara found raised by the communities of Bale Village, which was Kakatua Jambul Kuning (*Cacatua gallerita*). The bird was bought from Papua and raised it as a pet. According to the local people, the Nuri Kalung ungu *(Eos scuamata)*, or the Perkici bird, as the local says, was the easiest parrot to be found and to catch. This bird was predominant in the border area between the field and forest. This species was the most hunted by the people of Kosa Village to be sold to the neighboring villages such as Bale, Koli, and Gitaraja. The most favorite parrot for a pet was the Kasturi Ternate (*Lorius garrulus).* People love their color and beautiful voice.

The number of a parrot being caught during 2013-2015 was 327 birds, 320 of them were sold, and 213 birds were raised. The record shows that there were only four species of parrots being traded in Maluku Utara in the present day. Those were the *Kasturi Ternate* (*Lorius garrulous),* Kakatua Putih (*Cacatua alba),* Nuri Bayan (*Eclectus roratus),* and Nuri Kalung Ungu (*Eos squamata)*. Their price was varied. For example, the Kasturi Ternate was sold from Rp.100.000-150.000 according to their body size. The Nuri Kalung Ungu or the Perkici Merah, as local says, sold from Rp.10.000-30.000. The Kakatua Putih was sold from Rp. 150.000-300.000, and the Nuri Bayan was sold from Rp.150.000-200.000. The more beautiful the color, and the healthier the bird, the higher the price. No one would buy a bird with a disease symptom (Bahtiar, Susanti, & Rahayuningsih, 2014).

The emerging demand for birds among the communities is a market opportunity for bird hunters and traders to gain economic advantages (Wilson & Tisdell, 2005). To fulfill that demand, the traders will do anything to keep their stock available for the buyers. Various ways were taken by the traders and hunters, and they could hunt parrots without any concern on their sustainability in nature (Butchart et al., 1996; Fischer & Lindenmayer, 2002). In the activity of bird hunting, selling, and raising, it is common that people are ignorant about birds' conservation and rehabilitation. In another word, they are ignorant with birds' population in the wildlife since they only think about economic advantages. Only some of them who think that maintaining birds' population is an important issue. This lack of awareness among the people resulted in ecosystem damage that will threat the existence of flora and fauna. Hence, the cause of declining animal population cannot be avoided (Manning, Lindenmayer, Barry, & Nix, 2006; Herrera & Hennessey, 2007a; Herrera & Hennessey, 2007b; Bennett & Ford, 2016). Efforts to overcome the problem of low public awareness on parrot preservation can be undertaken by developing a model of local community culture-based environment education. The model is integrated into the school primary school, secondary school, and higher education learning. The development of environmental education teaching materials is a solution to minimize the potential of biodiversity theft. The research implication includes a collaboration between community and government to formulate an environmental education learning module at school (Tilbury, 2004; Ignatow, 2006; Ornek, 2008; Jeronen, & Raustia, 2009). The module could provide knowledge and awareness on the importance of biodiversity for sustainable life (Blair & Lacy, 2000; Possatto, Barletta, Costa, do Sul, & Dantas, 2011).

Parrot is one of the most popular pet birds in the world. It brings a negative impact on the existence of parrots in wildlife. From 356 species of parrot, 123 are near to extinction. Even 16 of them have been labeled as critically endangered (Birdlife International, 2014). Conservation of Indonesian natural and biological resources needs to be done continuously by raising awareness among the communities (Astirin, 2000; Boillat & Rist, 2013; Bennett & Ford, 2016). According to

the endangered status of the IUCN (International Union for Conservation of Nature and Natural Resources) in 2008, most of parrots are included to the list of endangered birds, including the Kakatua Putih (*Cacatua alba)*, which is categorized as Vulnerable (VU), whereas the Kasturi Ternate (*Lorius garrulus)* was categorized as endangered (EN). This category is provided to species that are facing the high risk of extinction in the wildlife in the future. If exploitation continues, it is not impossible that this species will eventually extinct, considering that this species is the most hunted parrot and people's favorite pet. It is related to human activities such as excessive hunting that go beyond the birds' ability to reproduce. The growing passion among society in having birds as the pet becomes one of the issues that threat the birds' existence in the wildlife (Daut, Brightsmith, Mendoza, Puhakka, & Peterson, 2015). This also caused by the shift in construction meaning of birds that are currently inclined towards economic (Weston & Memon, 2009). Also, people have an appropriate attitude concerning birds' preservation. However, when it comes to economic or daily needs, their attitude is forced to alter (Widodo, 2007).

According to CITES Appendix list, parrots that are Maluku Utara endemic, such as *Cacatua alba, Eos scuamata, Lorius garrulus, Eclectus roratus, Loriculus amabilis, Charmosyna placentis, Geoffroyus geoffroyi, Alisterus amboinensis* are included in Appendix II. It can be said that parrots of Nort Maluku endemic are not at the risk of extinction. However, it will become a concern if exploitations such as excessive hunting, selling, and raising of those species continue. Whereas, according to the Indonesian preservation law PP RI/1999, only *Eclectus roratus* that is categorized as a protected animal.

CONCLUSION

According to the result and discussion above, the following conclusions can be drawn: 1) Species of parrots that are hunted, sold, and raised by the communities were Kasturi Ternate (*Lorius garrulus*), Nuri Kalung Ungu (*Eos scuamata*), Nuri Bayan (*Electus roratus*), Kakatua Putih (*Cacatua alba*), Kakatua Jambul Kuning *(Cacatua galerita*). 2) The number of parrots being hunted during 2013-2016 were 327 birds, 320 of them sold during the same period, and 213 were raised during 2013-2018. 3) The highest percentage of parrots hunting and trading was 21%, occurred in 2013. Whereas, the lowest was 2% in 2016-2018. The highest percentage of parrots raised was 8% in 2015, and the lowest was 3% in 2018. 4) Kasturi Ternate (*Lorius garrulus)* and Nuri Kalung Ungu (*Eos scuamata*) were birds with the highest rate of being caught and traded.

The following are suggestions from the researcher: 1) Teachers are required to develop an environmental education model for school learning. 2) It is suggested to people who are still having parrots as a pet to let the birds free, since expressing love to parrots does not have to make them as a pet, but by allowing them to live freely in their habitat and. 3) The research can be considered as a reference for future research concerning the exploitation of parrots in other National Park area in Indonesia.

REFERENCES

Arini, D. I. D. (2011). Avifauna penghuni hutan kobe provinsi maluku utara Avifauna of Kobe Forest in Aketajawe Lolobata National Park North Maluku Province terutama pada jenis burung (avifauna). Avifauna kawasan Wallacea sangat Sebagai bagian dari wilayah paling timur garis W. *Info BPK Manado*, *1*(1), 1–20. Retrieved from: http://www.forda-mof.org/files/avifauna_penghuni_hutan_kobe.pdf.

Astirin, O. P. (2000). Permasalahan pengelolaan keanekaragaman hayati di indonesia. *Biodiversitas, 1*(1), 36–40. Doi: 10.13057/biodiv/d010107.

Bahtiar, D. H., Susanti, R., & Rahayuningsih, M. (2014). Keanekaragaman jenis ektoparasit burung paruh bengkok famili psittacidae di taman margasatwa semarang. *Unnes Journal of Life Science,* *3*(2), 139-147. Retrieved from: https://journal.unnes.ac.id/sju/index.php/UnnesJLifeSci/article/view/4571.

Bashari, H. & Nurdin, K. (2009). *Burung Paruh Bengkok Status Perburuan dan Perdagangannya di Maluku Utara 2008–2009*. Laporan Teknis No. 06. Program Kemiteraan untuk Pengelolaan Konservasi di Kawasan TN Aketajawe Lolobata. Bogor: Burung Indonesia.

Blair, J., & Lacy, M. G. (2000). Statistics of ordinal variation. *Sociological Methods & Research,* *28*(3), 251–280. Doi: 10.1177/0049124100028003001.

Boillat, S., & Rist, S. (2013). Linking local knowledge, conservation practices, and ecosystem diversity : comparing two communities in the tunari national park (bolivia). *Ethnobiology and conservation, 2*(1), 1–28. Doi: 10.15451/ec2013-8-2.8-1-28.

Butchart, S. H. M., Brooks, T. M., Davies, C. W. N., Dharmaputra, G., Dutson, G. C. L., Lowen, J. C., & Sahu, A. (1996). The conservation status of forest birds on flores and sumbawa, indonesia. *Bird Conservation International*, *6*(4), 335–370. Doi: 10.1017/S0959270900001817.

Bravo, A., & Porzecanski, A.L. (2014). Overexploitation of parrots in the neotropics. *Lessons in Conservation*, *4*, 51-56. Retrieved from: https://www.gallaudet.edu/Documents/Office-of-Academic-Quality/Assess/NCEP-CS1-Parrots.pdf.

Daut, E. F., Brightsmith, D. J., Mendoza, A. P., Puhakka, L., & Peterson, M. J. (2015). Illegal domestic bird trade and the role of export quotas in Peru. *Journal for Nature Conservation*, *27*, 44-53. Doi: 10.1016/j.jnc.2015.06.005.

Ernawati, E., Azrai, E., & Wibowo, S. (2016). Hubungan persepsi kearifan lokal dengan sikap konservasi masyarakat desa lencoh kecamatan selo di taman nasional gunung merapi. *Biosfer: Jurnal Pendidikan Biologi*, *9*(1), 65-69. Doi: 10.21009/biosferjpb.9-1.10.

Bennett, A. F, & Ford, L. A. (2016). Land use, habitat change and the conservation of birds in fragmented rural environments: a landscape perspective from the Northern Plains, Victoria, Australia. *Pacific Conservation Biology*, *3*(3), 244-261. Doi: 10.1071/PC970244.

Fischer, J., & Lindenmayer, D. B. (2002). The conservation value of paddock trees for birds in a variegated landscape in southern New South Wales. 1. Species composition and site occupancy patterns. *Biodiversity and Conservation*, *11*(5), 807–832. Doi: 10.1023/A:1015371511169.

Hadianti, S., Azrai, E., & Sukandar, P. (2014). The correlation between conservation knowledge and fisherman perception about mangrove plantation activities on kampung garapan, desa tanjung pasir, tangerang. *Biosfer: Jurnal Pendidikan Biologi*, *7*(2), 10-14. Doi: 10.21009/biosferjpb.7-2.3.

Herrera, M., & Hennessey, B. (2007a). Monitoring results of the illegal parrot trade in the los pozos market, santa cruz de la sierra, bolivia. *Proceedings of the fourth international partners in flight con-ference: tundra to tropics*. McAllen, TX: Partners in Flight, 232-234. Retrieved from: https://www.partnersinflight.org/wp-content/uploads/2017/03/Herrera-M.-and-B.-Hennessey-p-232-234.pdf.

Herrera, M., & Hennessey, B. (2007b). Quantifying the illegal parrot trade in Santa Cruz de la Sierra, Bolivia, with emphasis on threatened species. *Bird Conservation International*, *17*(4), 295-300. Doi: 10.1017/S0959270907000858.

Hume, J.P. (2007). Reappraisal of the parrots (Aves: Psittacidae) from the Mascarene Islands, with comments on their ecology, morphology, and affinities. *Zootaxa, 1513*(1), 1-76. Doi: 10.11646/zootaxa.1513.1.1

Ignatow, G. (2006). Cultural models of nature and society: Reconsidering environmental attitudes and concern. *Environment and Behavior*, *38*(4), 441–461. Doi: 10.1177/0013916505280791.

Jepson, P. & Ladle, R. J. (2009). Governing bird-keeping in Java and Bali: evidence from a household survey. *Oryx, 43*(3), 364-374. Doi: 10.1017/S0030605309990251.

Jeronen, E., Jeronen, J., & Raustia, H. (2009). Environmental education in Finland - A case study of environmental education in nature schools. *International Journal of Environmental and Science Education*, *4*(1), 1–23. Retrieved from: https://eric.ed.gov/?id=EJ884383.

Manning, A. D., Lindenmayer, D. B., Barry, S. C., & Nix, H. A. (2006). Multi-scale site and landscape effects on the vulnerable superb parrot of south-eastern Australia during the breeding season. *Landscape Ecology*, *21*(7), 1119–1133. Doi: 10.1007/s10980-006-7248-6.

Nurhayati, N., Sukandar, P., & Suryanda, A. (2018). The comparison of junior high school student comprehension about slow loris conservation based on participation on slow loris awareness activity. *Biosfer: Jurnal Pendidikan Biologi*, *7*(1), 49-57. Doi: 10.21009/biosferjpb.7-1.8.

Ornek, F. (2008). Models in science education: applications of models in learning and teaching science. *International Journal of Environmental and Science Education*, *3*(2), 35–45. Retrieved from: https://eric.ed.gov/?id=EJ894843.

Possatto, F. E., Barletta, M., Costa, M. F., do Sul, J. A. I, & Dantas, D. V. (2011). Plastic debris ingestion by marine catfish: An unexpected fisheries impact. *Marine Pollution Bulletin*, *62*(5), 1098–1102. Doi: 10.1016/j.marpolbul.2011.01.036.

Prakosa, B. H., & Kurniawan, N. (2015). Studi burung-burung yang diperdagangkan di pasar burung splendid, kota malang. *Biotropika, 3*(1), 7–11. retrieved from https://biotropika.ub.ac.id/index.php/biotropika/article/download/316/211.

Purbaya, S., Komala, R., & Seribulan, M. N. M. (2015). A correlation between knowledge about coral reef ecosystem and marine tourist attitude toward conservation at pramuka island, kepulauan seribu. *Biosfer: Jurnal Pendidikan Biologi*, *8*(1), 34-38. Doi: 10.21009/biosferjpb.8-1.5.

Suryanda, A., Komala, R., & Rahmawati, S. (2017). Sikap masyarakat di desa batu busuk, sumatera barat terhadap konservasi harimau sumatera (panthera tigris sumatrae) berdasarkan pengetahuannya. *Biosfer: Jurnal Pendidikan Biologi*, *10*(2), 73-81. Doi: 10.21009/biosferjpb.10-2.9.

Tilbury, D. (2004). *Environmental Education For Sustainability: A Force For Change In Higher Education*. In Higher education and the challenge of sustainability (pp. 97-112). Springer, *Dordrecht.* Doi: 10.1007/0-306-48515-x_9.

Weston, M. K., & Memon, M. A. (2009). The Illegal Parrot Trade in Latin America and Its Consequences To Parrot Nutrition. *Bird Populations*, *9*(1), 76–83. Retrieved from: https://www.birdpop.org/docs/journals/Volume-9/BPJ09-10_Weston_and_Memon.pdf.

Widodo, W. (2007). Profil dan persepsi para pedagang burung terhadap perdagangan perkici pelangi (trichoglossus haematodus) dan upaya pelestariannya. *Berkala Peneligtian Hayati, 13*, 67-72. Retrieved from: https://berkalahayati.org/files/journals/1/articles/455/ submission/455-1476-1-SM.pdf.

Wilson, C., & Tisdell, C. (2005). Knowledge of birds and willingness to support their conservation: An Australian case study. *Bird Conservation International*, *15*(3), 225–235. Doi: 10.1017/S0959270905000419.