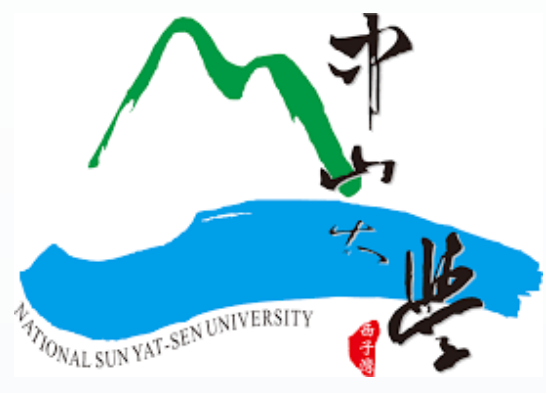


Identify Species Composition of shark landing in Sri Lanka by DNA Barcoding



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Abstract

Sharks and rays are commonly identified as elasmobranchs, which considered as top predators in marine ecosystems. Recently, the elasmobranchs are overexploited in the global scale. Due to the high market value for shark fins, fishing pressure for this top predator have increased significantly during past few decades and considered as a threatened vertebrate group in the ocean. Sri Lanka is a small island nation in Indian Ocean with 21 major fish harbors in operation and the annual shark catch in 2018 was 13,500 Mt. Although the demand for shark meat is high, the species consumed by Sri Lankan are in question since the identification is difficult at the fish markets. Because the products consumer purchased are highly processed (without morphological traits e.g. fish filet). In addition, shark meats are sold and reported under common local terms at the local fish markets without proper species-based sorting. Species composition of shark catch is poorly studied in Sri Lanka. In present study, we applied DNA barcoding approach to identify species composition of shark catch in Sri Lanka. 353 shark tissue samples were collected between 2018 to 2019 from 10 fishing harbors and fish markets around Sri Lanka. So far, mitochondrial cytochrome oxidase I (COI) gene was successfully amplified for 223 shark tissue samples and following sequencing. Sequences of COI were BLASTed to identify to species level. Currently, 15 shark species belongs to five families have been identified including *Carcharhinus falciformis*, *Prionace glauca*, *Carcharhinus melanopterus*, *Carcharhinus leucas*, *Rhizoprionodon oligolinx*, *Rhizoprionodon acutus*, *Sphyrna lewini*, *Hemipristis elongata*, *Loxodon macrorhinus*, *Alopias superciliosus*, *Carcharhinus amblyrhynchoides*, *Carcharhinus longimanus*, *Carcharhinus sorrah*, *Chiloscyllium griseum* and *Galeocerdo cuvier*. Among them *Carcharhinus falciformis* (Silky shark) is the dominant (36.9%) and considered as a vulnerable species. Samples from Central fish market-Peliyagoda and Kudawella fish harbor has high abundance of silky shark while Mullaitivu fish harbor catch was the most diverse comprised of seven shark species. We have identified *Alopias superciliosus* (Bigeye Thresher) in Puttalam fish market whose catch was prohibited in 2012. Considering the IUCN conservation status, nearly 40% of shark species identified in our study are threatened globally. Furthermore, the results of this study could provide valuable information for a sustainable shark fishery management plan in Sri Lanka in the future.

Methodology

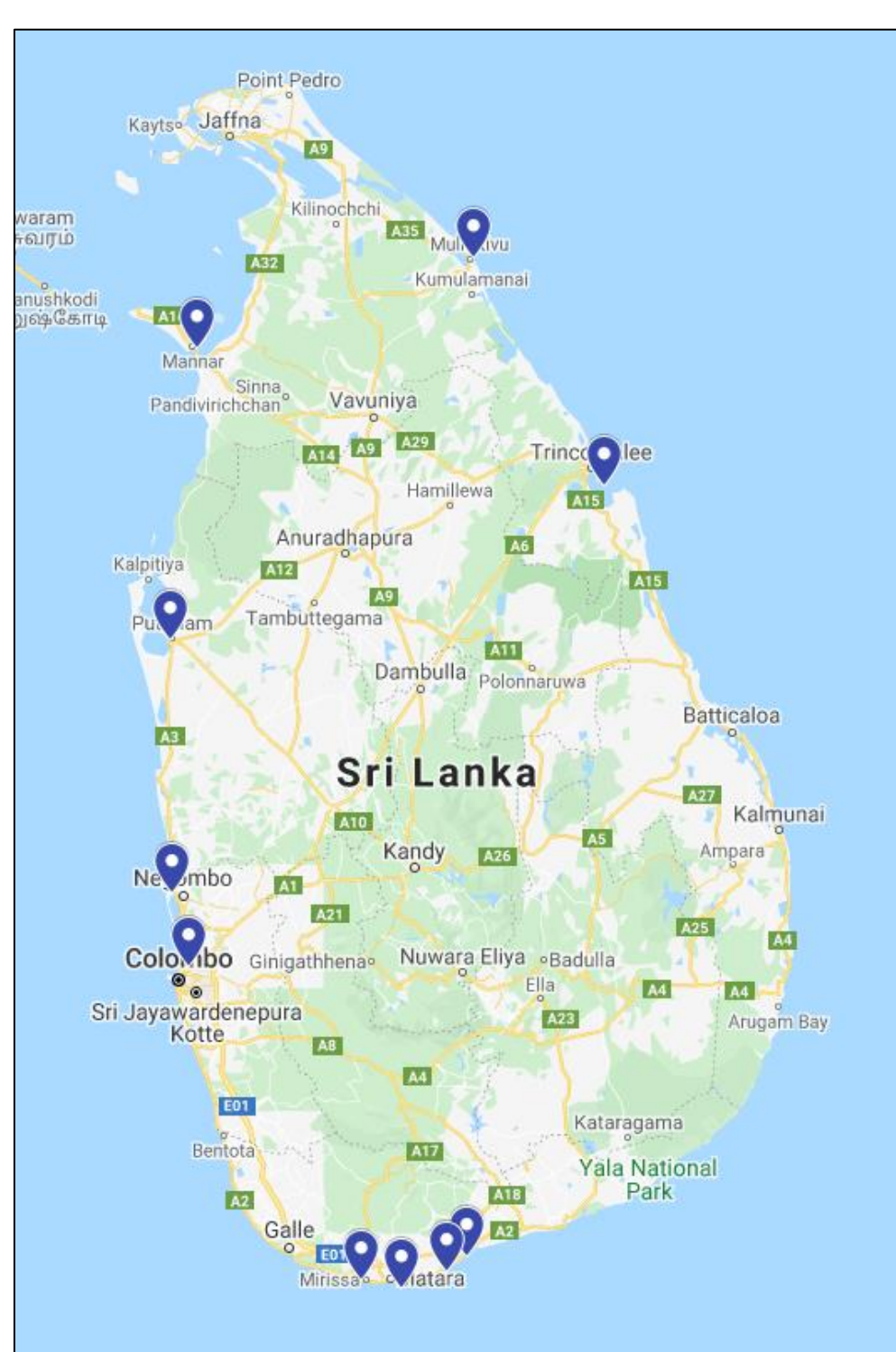


Figure 1. Map of Sri Lanka showing the sampling locations

Sample Collection

- ✓ 353 Shark tissue samples
- ✓ 6 Major fishery harbours and 4 fish market

DNA Extraction & PCR

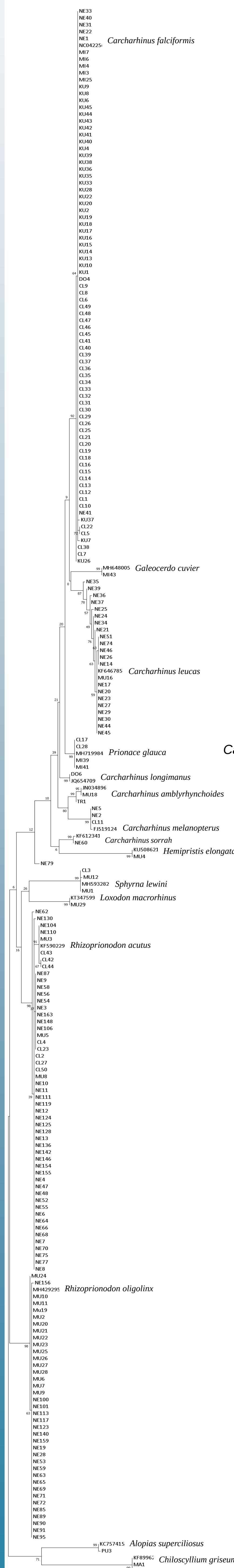
- ✓ Mitochondrial COI gene was amplified
- ✓ Four primer pairs

Sequencing & Editing

- ✓ Sequence edition and analysis with Geneious R9

GenBank BLAST

Results and Discussion



- Currently, 223 samples collected among 10 locations around Sri Lanka (Figure 1) were successfully sequenced and identified to species level.
- According to the results of DNA barcoding (COI), 15 shark species were identified (Figure 2).
- Several samples were failed to sequence due to multiple templates within the PCR product, we will try to use different approaches to tackle this problem.
- Based on the species composition found in present study (Figure 3), *C. falciformis* (Silky shark) was the main catch in Sri Lanka.
- From Kudawella fish harbor, 45 shark tissue samples were collected, among them 31 were successfully sequenced and identified as *C. falciformis*.
- Kudawella harbor is one of the major fishery harbor with large boats operate longline fishing targeting on tunas. Therefore, this could be the reason for high silky shark abundance as by-catch in this location.
- Mullaitivu fish harbor located in the northern part of Sri Lanka and based on our results, it has the highest shark species diversity, however we did not find any of *C. falciformis*, this could due to different fishing gears used in different areas.
- We have identified *Alopias superciliosus* (Bigeye Thresher) in Puttalam fish market, however the fishery of thresher sharks was banned in Sri Lanka since 2012 by regulations made under the Fisheries and Aquatic Resources Act, No. 2 of 1996.
- About 40% of shark species identified in our study are threatened globally according to the IUCN conservation status (Figure 4).
- The results of this study could provide a valuable data for future shark fishery management plans in Sri Lanka.

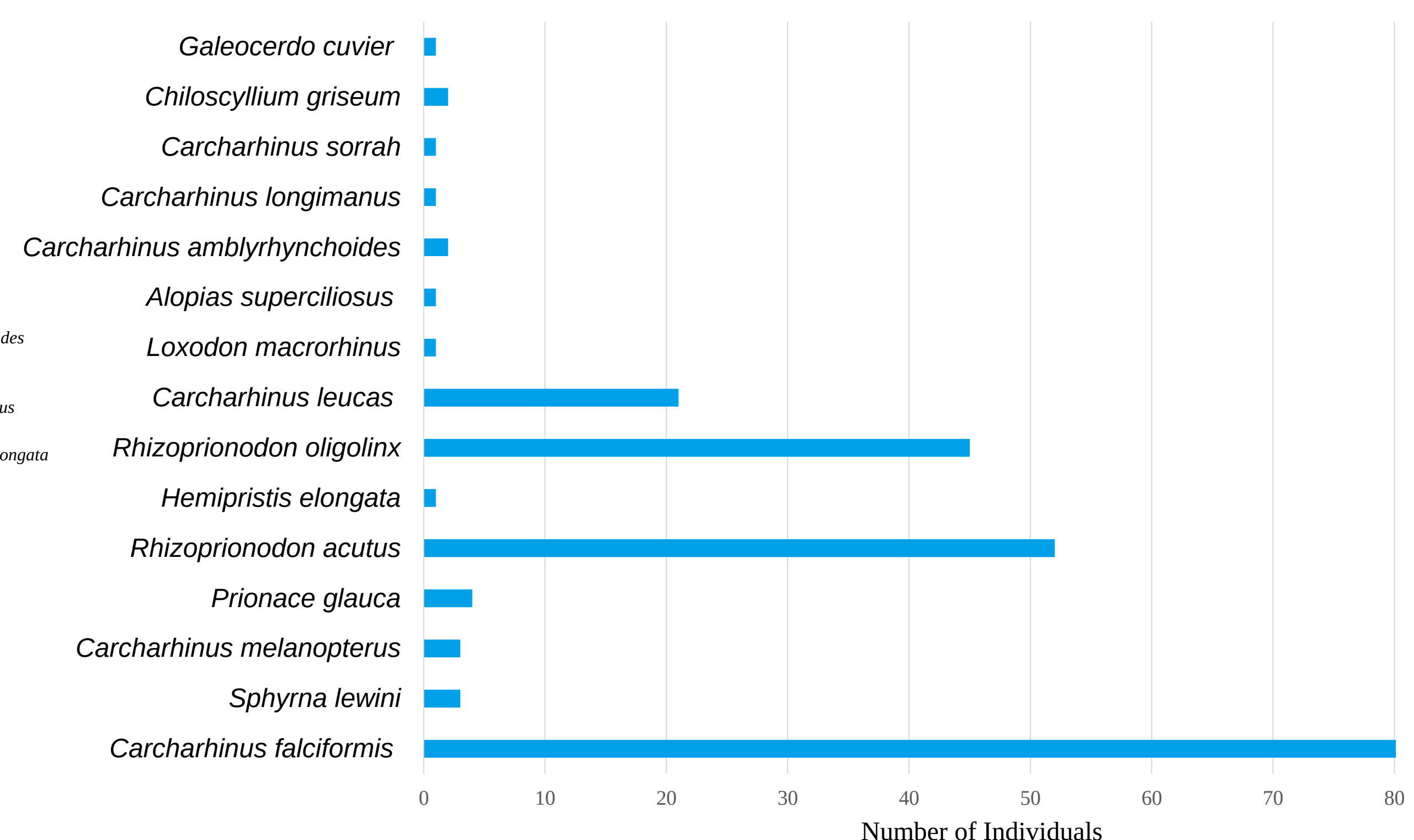


Figure 3. Total species composition identified in this study

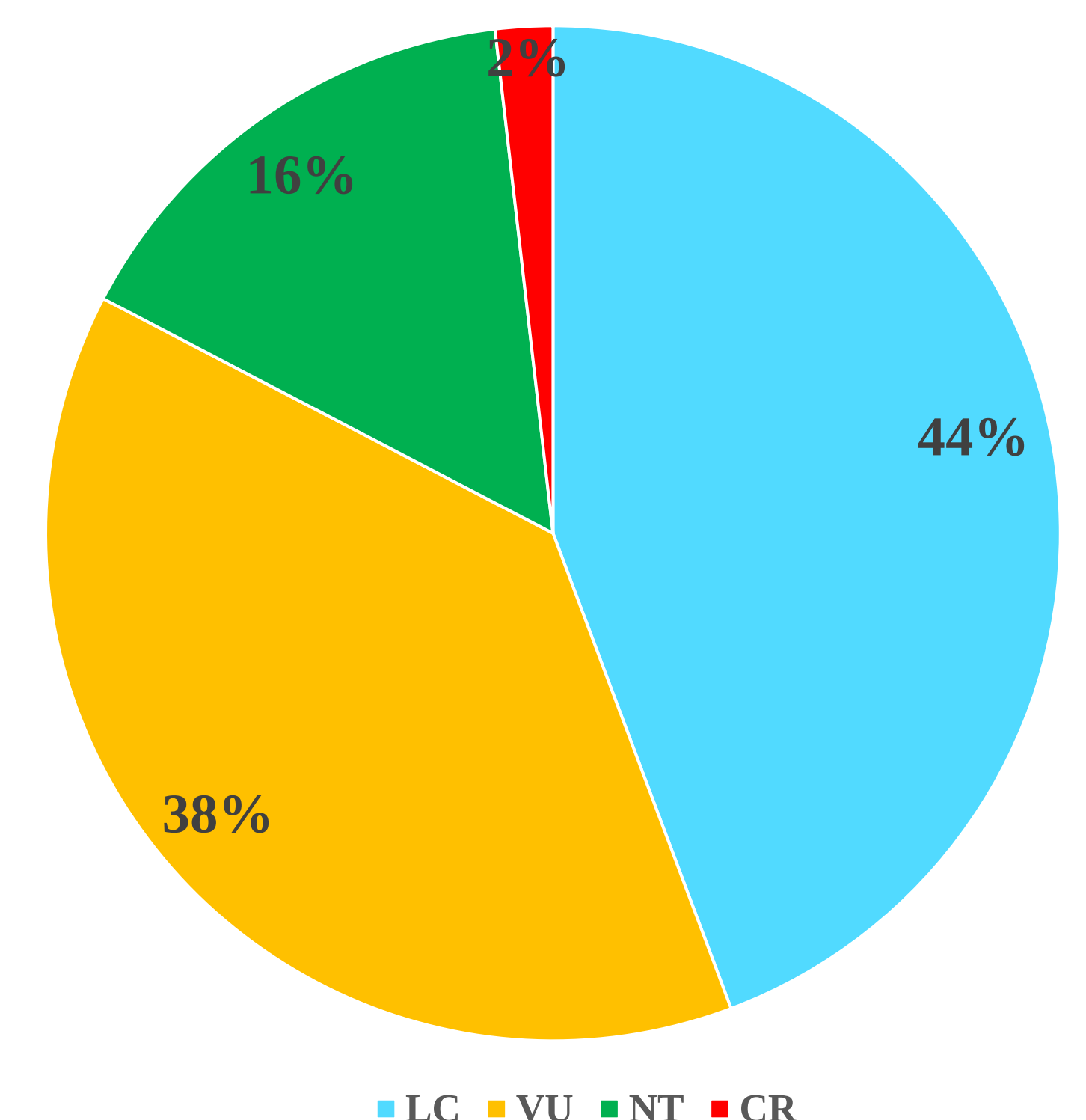


Figure 4. IUCN consevation status Percentages of species identified in this study with their relevant IUCN conservation status

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