**Presenter: Kristofer Helgen**

**Title: Taxonomic problems and priorities**

What makes a good problem

* 1. Work on high species richness region (SEA)- number of species
	2. Well documented biogeography (Wallace)
	3. Distributions
	4. Associations / interactions

Which group

* 1. Highly diverse although within a geography (Bats)

Topics (morphology, phylogenetics etc)

Geographic areas

Conservation priorities

1. Systematics – classification as in the units and the links between those units
2. Biogeography – distribution of those units
3. Revisionary taxonomy: how understanding of biological diversity changes through time
4. Biodiversity discovery: new species! – the exciting part
5. Categorization of bioD by using Linnaean system
* Hierarchical system
1. Understanding life is important to a robust understanding of names
* But those names have to be consistent and applied uniquely
1. ID of organisms is foundation of bioD species
2. What is a species?

Challenging to define but necessary to do

2 possible dimensions:

* 1. Reproductive isolation was the gold standard of the BSC
	2. Ecological differentiation (what morphologists are after to differentiate species)
	3. Subspecies
1. So why is life sorted into these nested hierarchies?

B/c diversity of life united through common descent

Systematics = Taxonomy (Linneaus) + Phylogeny (Darwin/Wallace) = Classification

Biogeographically one of the most complex in the world

4 biodiversity hotspots each with unique biogeographic histories but each also have high levels of endemism

* **Why Bats?**
* Diversity – highly diverse across and within geography in SEA, many undescribed
* Ecology – important role in ecosystem services
* Health – important role in biology of human and animal diseases – species difficult to discriminate may have quite different disease biologies
* Conservation – threatened by human activities, extinctions progressing
* **What makes a good problem?**
* # of species
* distribution
* associations/interactions
* **What are their names?**
* Importance of history of scholarship. literature, museum specimens
* You need to know who these people are—their personalities, how they make decisions—to understand the literature
* Geoffroy, Temminck, Gray, Peters, Dobson, Andersen, Thomas, Miller, Tate, Hill

***Case studies***

*Pteralopex flanneryi* :–

* Might be one of the biggest bats in the world but didn’t get named until 2005
* In 1907, Thomas received specimens that were large and dark colored, he named it “*anceps*” so whenever anyone else saw it was big and black, it was Pteralopex *anceps*. But there are bats out there that were yellower and then there were associated characters: differing fur patterns, different cheek teeth, different elevational associations, one is a little bit bigger than other, different feeding preferences
	+ *P. anceps* is in less disturbed areas so it is less threatened
	+ *P. flanneryi* is in lowland forest that is now being disturbed a lot so it is now endangered and requires conservation action

Borneo *Kerivoula* :–

* supposedly were all *papillosa* based on available field guide
	+ But when you take the skull morphology and do even basic *cytb*, you would get 3 different species
	+ *Papillosa* is what the holotype is, *malayana* (previously a synonym) was the name for the medium one, and the largest one is new
	+ Using the types to figure out what gets precedent
* **Where to start?**
* Personal curiosity and interests
* Look for unanswered questions
* Relevant references and contacts
* Field guides (good for overview)
* Corbin and Hill (1992) – Mammals of the Indomalayan region
* Mammal species of the world (2005)
* Each of these point out problems in bats that need working on
* **Topics?**
* Build on the basic topics we cover to get at:
* Comparative anatomy and morphology
* Biogeographic insights
* Inferring regional environmental change through deep time (tectonics, sea level) 🡪 brings it to a wider audience
* Clearly illuminate conservation issues
* **Geographical areas?**
* Differential spatial distributions may be delimited by actual islands or isolated mountains dotting the landscape, karsts, etc.
* Characterizing bioD:
* Sum up all the specimens there are and find out where the black holes are
* Foja Mts. in Irian Jaya – no one has ever caught anything there
* Immediate discovery of lots of new species
* First vertebrate there was a honeyeater that was never described before (first new bird species in NG since WWI)
* Smallest kangaroo family member here also
* 1990s tree kangaroo – was previously thought was essentially extinct from another mountain range and it turns out that it was common on this range
* **Conservation priorities?**
* Projects that will make a difference
* An example:
* Raccoons in the Caribbean – named as 3 species, but they are actually all just the same as the raccoons on the mainland 🡪 they were actually invasive (starting 300 years ago)
* Informing governments about bioD 🡪 never predict how the results are used

***Bat example from Christmas Island:***

* Christmas Island pipistrelle
* Very far flung island, such that Europeans were the first to arrive there in the 1880s for phosphate mining
* 5 mammals, 2 of which were bats: 1 *Pteropus*, 1 pipistrelle
* Never had a systematic study on how unique this pipistrelle is from other small brown pipistrelles in the region
* In 2008, Australian govt recognized that there was an extreme decline in the population (100 left only) and needed to know if this was actually distinctive (to know if they should be spending money on protecting it)
* In about a month, 20 left, needed quick answer to protect species
* Using skull and *cytb* and RAG1, *P. murrayi* is distinct species
* At the month the report was finish, the bat became extinct
* Since the discovery of the island, many invasives have come in but no one knew what happened
* This was the only insectivorous bat here so the ramifications on the ecosystem is unknown
* **Documenting overlooked extinctions:**
* *P. samoensis* and *P. tonganus* were well studied out in the S. Pacific
* But specimens of 4 different species were originally collected in late 1800s
* A small one (*P. allenorum*)
* A large one like *Pteralopex* (*P. coxi*)
* Each were ecomorphologically distinctive
* These Samoan taxa are extinct now (most likely), so cannot go back and study them now
* Or they are happening right now and we don’t have that well-resolved enough taxonomic lens to conserve and protect

***The Pteropus with the mottled-wings***

* SE Sulawesi peninsula – largest bat in Sulawesi – no name, no idea where they roost
* Need more work to find these things out
* Discovering mammals
* Most are small (rodents and bats)
* Most nocturnal and secretive
* Hiding in museums that we don’t know about
* Characterizing bioD
* Big pulse in different decades, but cumulatively, there has been pretty regular increase in mammalian diversity discovery, no sign of plateauing, still lots of discovery to be made
* New techniques, closer scrutiny
* Bats are one of the groups being consistently discovered, esp in SE Asia
* As we do revisionary work, old names from Thomas and Andersen becoming validated again

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* **Not good projects:**

Depends on where you are studying –

For instance, if you are in SE Asia, you might have access to field, but not to worldwide collections

Access to resources or what kinds of data you want (genes, acoustics)