Non-native mammals: their varying roles in a novel ecosystem

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Novel ecosystems

- Systems with species assemblages historically unknown from that area
- Arise through species invasion, environmental change, or both – from anthropogenic causes
- Describes the majority of ecosystems in the world
- Describes Guam’s bird-less habitats
Mammalian introductions to the Marianas

- Philippine deer (*Rusa marianna*) introduced to Guam 1770’s
- Pigs (*Sus scrofa*) introduced to Guam 1660’s
- Polynesian rat (*Rattus exulans*) no later than 1200-1000 AD, ship rat (*Rattus rattus*) with European explorers
Deer and pigs: ecology in Guam

- Do they kill seedlings?
- Do they disperse seeds?
- How do they affect different forest characteristics?
Do deer and pigs kill seedlings?

- Set up paired treatments:
  - Fenced
  - Unfenced
- Planted six common species:
  - Mapunao (*Aglaia mariannensis*)
  - Ladda (*Morinda citrifolia*)
  - Ågao (*Premna serratifolia*)
  - Fagot (*Ochrosia oppositifolia*)
  - Papåya (*Carica papaya*)
  - Aplokåting (*Psychotria mariana*)
Do deer and pigs kill seedlings?
Do deer and pigs disperse seeds?

- Collected pig and deer scats
- “Planted” scats
- Identified germinants
Do deer and pigs disperse seeds?

<table>
<thead>
<tr>
<th>Species</th>
<th>Average seeds per fruit</th>
<th>Deer</th>
<th>Pig</th>
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<tbody>
<tr>
<td>Morinda citrifolia</td>
<td>164</td>
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<tr>
<td>Ficus prolica</td>
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<td>Vitex parviflora</td>
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<td>Chromolaena odorata</td>
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</table>

Average seeds per scat per species:

- *na* indicates not applicable.

Average seedlings per scat:

- *1* indicates one seedling.
- *2* indicates two seedlings.
- *3* indicates three seedlings.
- *4* indicates four seedlings.
- *5* indicates five seedlings.
- *6* indicates six seedlings.
- *7* indicates seven seedlings.
- *8* indicates eight seedlings.
- *9* indicates nine seedlings.
- *10* indicates ten seedlings.
Do deer and pigs disperse seeds?

Native plants

Species
- Meiogynne (paipai)
- Ochrosia (fagot)
- Aglaia (mapunao)
- Flagellaria
- Eugenia (a’abang)
- Ochrosia (langiti)
- Cycas (fadang)
- Morinda (ladda)
- Ficus (nunu)

Non-native plants

Species
- Vitex parviflora
- Triphasia trifolia
- Passiflora suberosa
- Mikania micrantha
- Leucaena leucocephala
- Conyza canadensis
- Coccinia grandis
- Chromolaena odorata
- Carica papaya

Proportional abundance
How do deer and pigs affect different forest characteristics?

- Belt transects were used to survey forest-community composition.
- Larger belt transects were used to count scat and estimate ungulate abundance.
How do deer and pigs affect different forest characteristics?
Takeaways from deer and pig studies

- Deer strongly linked to declines in seedling and vine abundance
- Pigs disperse seeds of both native and non-native plant species
- Deer appear to be more detrimental in limestone karst forest sites
- Important to make distinctions between species and habitats in consideration of novel ecosystems
What about rats?

- Known to be harmful
  - Direct predation on native wildlife
  - Out-compete native fauna
  - Spread disease
  - Destroy seeds
- Can they disperse seeds?
  - Evidence that some small seeds can survive gut passage
What about rats?

Feeding trials
1.) Trap wild rats (black rats or *Rattus rattus*)
2.) Collect fruits from limestone karst forest areas of Guam
3.) Feed rats collected fruits
4.) Recorded what happened to fruits and seeds
## What about rats?

<table>
<thead>
<tr>
<th>species</th>
<th>native?</th>
<th>#fruits added</th>
<th>#seeds handled</th>
<th>#fruits remaining</th>
<th>#seeds in scat</th>
<th>approx #seeds destroyed</th>
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What about rats?
Future work

• Feeding trials
  • Continue with rats
  • Begin trials with pigs
  • Germination trials
• Estimation of environmental damage
• Forest trajectories for how to rebuild/restore functioning ecosystems in Guam
• Social science work
Si Yu’os Ma’åse’