

Summarizing the Data

Examples from Windsor long-term monitoring efforts

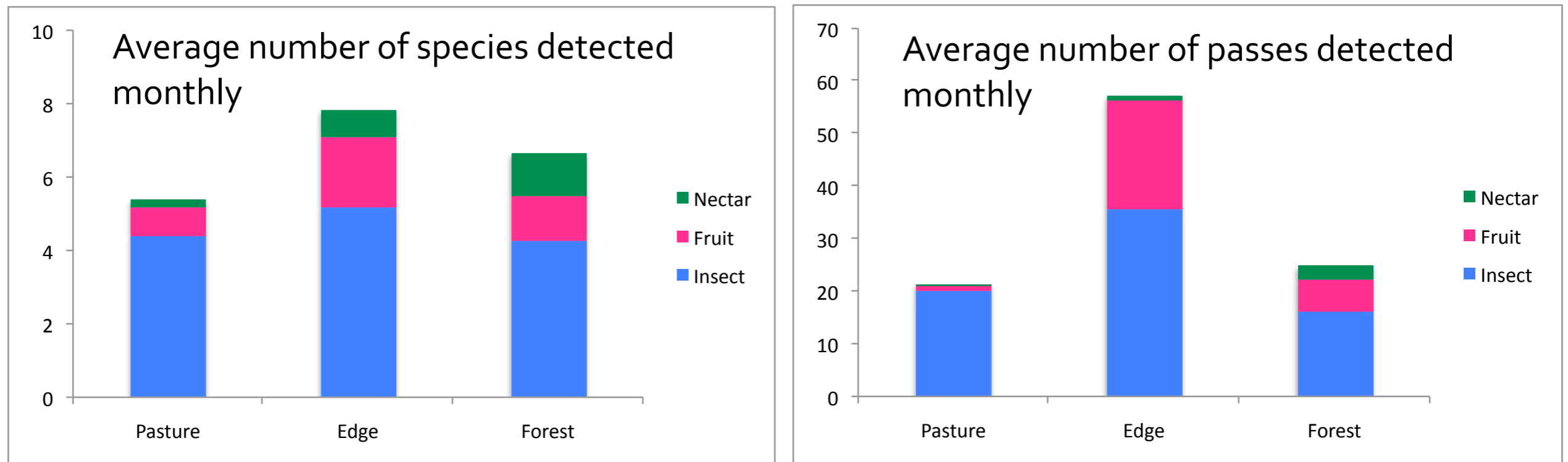
Methods

1. Study area 0.5 - 3 km from Windsor Cave
2. Sample habitats include: (a) closed canopy forest ($n=3$); (b) degraded forest edge ($n=4$); (c) open pasture ($n=4$); (d) coffee & mixed fruit tree ($n=3$); and (e) riparian vegetation ($n=2$)
3. Passive acoustic surveys
 - SongMeter 384 kHz with omni-directional microphone
 - 1-min record, 1-min pause from sunset -20 mins to sunrise +20 mins
 - Two sessions per month (lunar cycle \pm 3 days of new or full moon)
 - Flowering & fruiting phenology recorded
 - May 2011 : on-going
 - 13 months (2011-08 thru 2012-08) presented for 3 sites
4. All recordings analyzed manually using CallViewer v18

Summarizing the Data

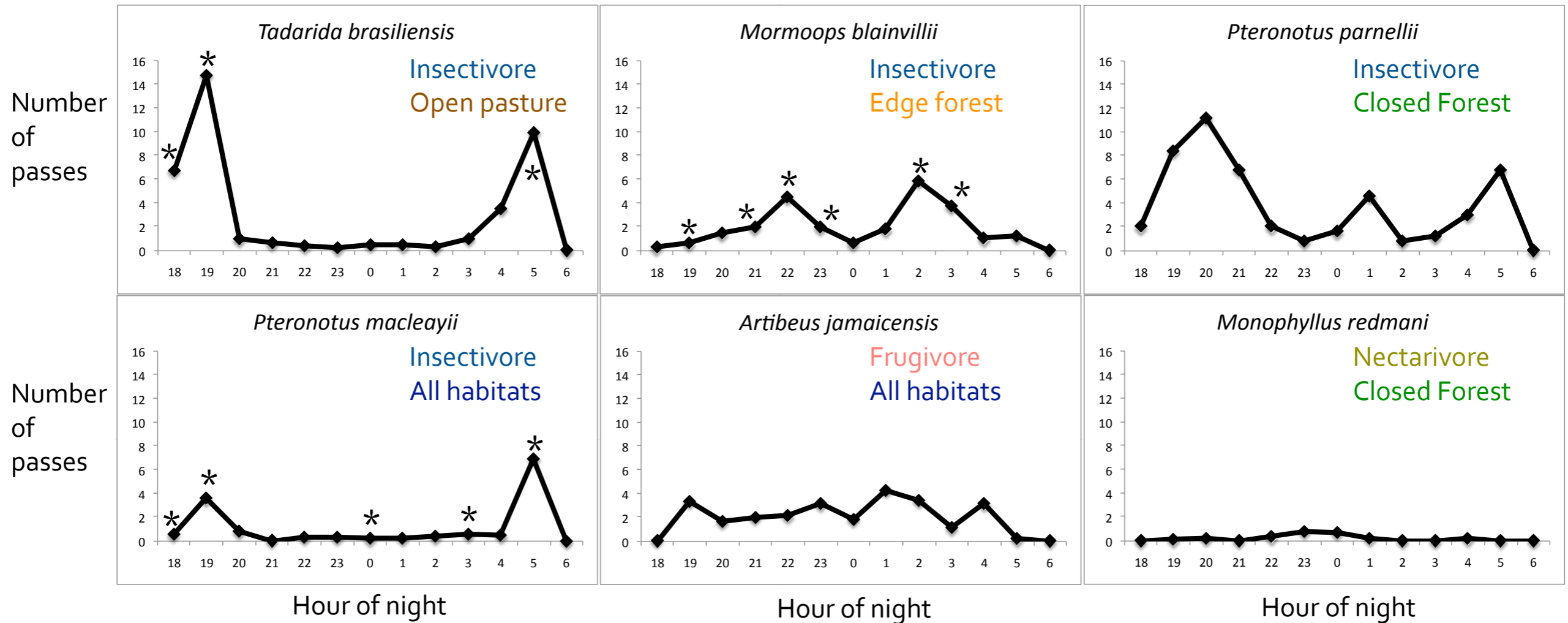
Examples from Windsor long-term monitoring efforts

Habitat Associations



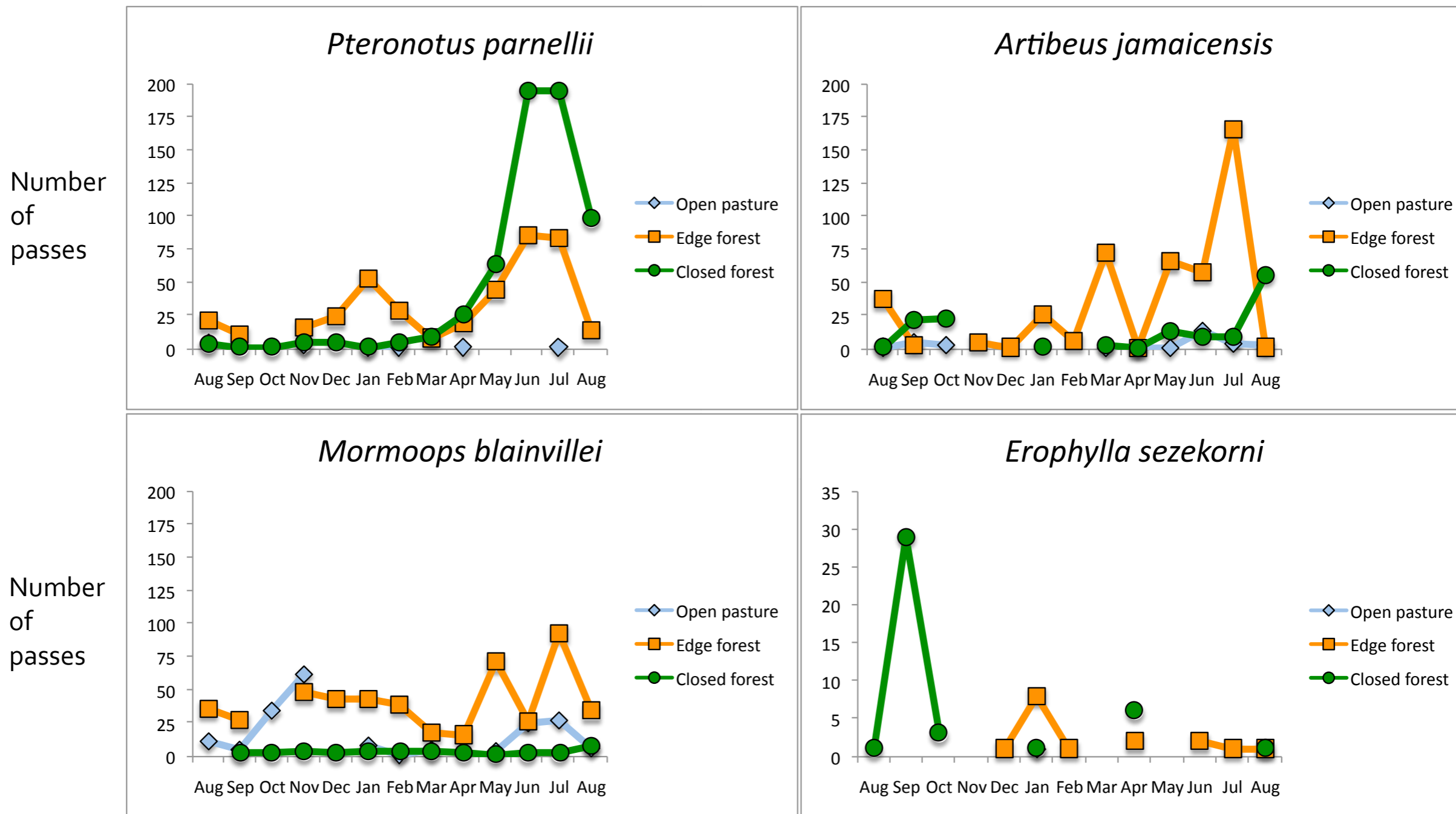
Significantly more species were detected each month in edge habitat compared to pasture ($p < 0.001$) and forest ($p = 0.003$). Nectarivores were rarely detected in open pasture compared to closed-canopy forest ($p = 0.039$) but whether this was due to preference for forested habitat or a function of the acoustic properties of their calls cannot be fully assessed with the current data set.

Nightly Activity Index



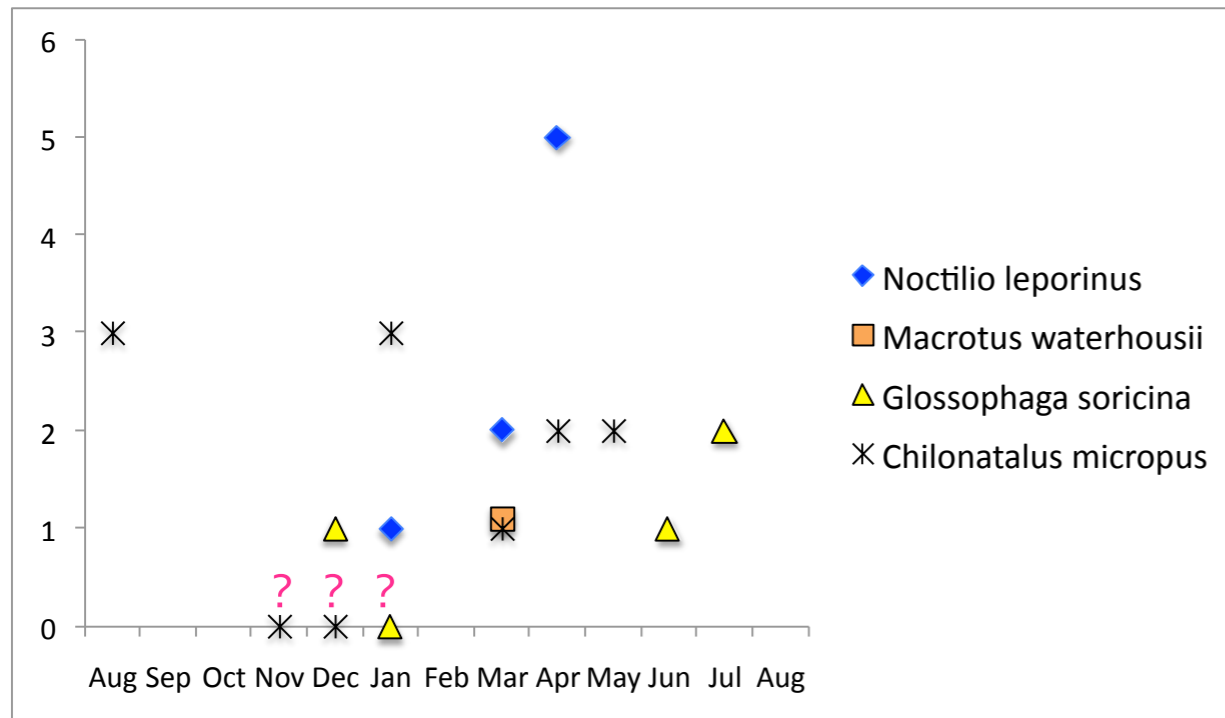
Activity patterns presented for April - August 2012, when sunset ranges 18hr28 - 18hr49. *Pteronotus parnellii* activity does not include movements of co-ordinated dusk flightlines, which last for 20-40 minutes and usually exceed 500 detection passes. * indicates detection of hunting buzzes.

Monthly Activity



Peak numbers of *P. parnellii* correspond to emergence of volant pups. Breeding cycles for other species are not adequately known, but post-lactating *A. jamaicensis* have been detected in April and juveniles detected in April, May, and August. Differences in numbers detected for Aug 2011 and Aug 2012 suggest annual variation should be evaluated. Note: y-axis scale for *E. sezekorni*.

Rare? Or Difficult to Detect?



Glossophaga soricina (Phyllostomidae) is considered “abundant” in Windsor Cave but was rarely detected acoustically. *Macrotus waterhousii* is confirmed resident year-round: a bachelor male lives in my roof and girlfriends visit for the summer! “?” = possibly present, poor sonogram.

And putting all this together for the North American Society of Bat Researchers’ conference in Puerto Rico (2012) ...

Rapid Ecological Assessments: How *Rapidly* Can They Identify Important Bat Habitats?

Susan Koenig, Windsor Research Centre, Jamaica



Abstract

Rapid Ecological Assessments, such as those deployed in Environmental Impact Assessments (EIAs), are thought to give a snapshot of species diversity in a localized area. However, for mobile species such as bats, temporal variation in food availability can lead to significant seasonal shifts in spatial occupancy. Since May 2011 I have conducted fortnightly acoustic surveys, using passive bat detectors, to better understand habitat associations, nocturnal activity patterns, and seasonal variation in site-use for a 14-species bat community in northern Cockpit Country, Jamaica. Within monthly recording sessions, species diversity and relative abundances differed significantly amongst land-use categories defined by plant diversity and physiognomy. Between months, abundance indicators for each species also varied, indicating either changes in number of individuals (incl. successful breeding) or changes in time spent engaged in specific activities such as feeding on seasonally-available resources. Based on variation in activity among feeding guilds and the need to ensure detection of rare species, "rapid" EIA assessments should survey at least quarterly for a minimum of 15 months and also deploy non-acoustic survey methods for Phyllostomidae.

1. Introduction

- Wildlife surveys in Jamaican EIAs typically are conducted for < 5 days, during a single week.
- Such limited survey time precludes evaluating seasonal usage of habitat by highly mobile species.
- Grounded in rapid, inadequate, baseline data, standard EIA mitigations include: (a) "don't worry, the animals will just move"; and (b) "leave large trees standing in isolation, if possible." However, this does not mitigate for major changes in forest structure, which will affect travel routes and feeding areas of closed-canopy "cluttered space" species.
- Bats have never been methodically surveyed in any Jamaican EIA, with a consequence that no foraging habitat is protected explicitly for bats.
- There are no guidelines for surveying bats in Jamaica.

This research addresses these major gaps in Jamaican EIAs.

2. Methods

- (1) Study area 0.5 - 3 km from Windsor Cave, Cockpit Country, Jamaica
- (2) Sample habitats include: (a) closed-canopy wet forest ($n=3$); (b) degraded forest edge ($n=4$); (c) open pasture ($n=4$); (d) coffee and mixed fruit tree farming ($n=3$); and (e) riparian vegetation ($n=2$)
- (2) Passive acoustic surveys:
 - SongMeter 384 kHz with omni-directional microphone
 - 1-min record, 1-min pause from sunset-45 mins to sunrise +45 mins
 - two sessions per month (lunar cycle)
 - flowering & fruiting phenology recorded
 - May 2011 - on-going
 - 13 months presented, for 3 sites
- (3) Recordings analyzed using CallViewer:
 - Species identified manually
 - Nightly Activity Index (NAI):
 - number of passes, hunting buzzes
 - ANOVA to compare NAI by habitat types



3. Results

- Recordings collected over 670 nights, for 8,028 hours.
- To-date, 100 nights (~ 1,200 hours) reviewed.

Diversity

Fourteen of Jamaica's 21 bat species were detected:

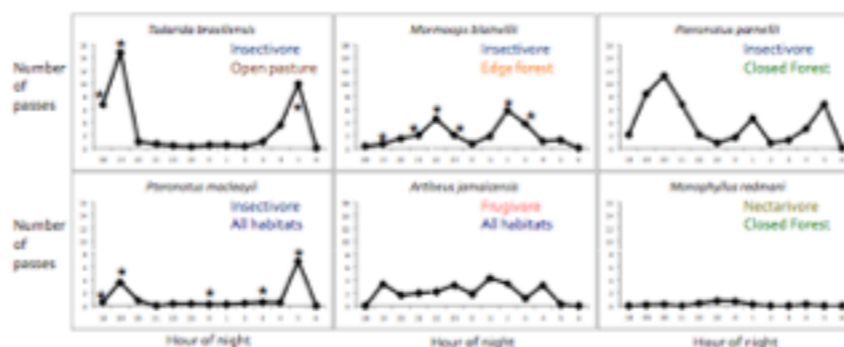
8 insectivores; 2 frugivores; 3 nectari- omnivores; 1 piscivore

Habitat Associations



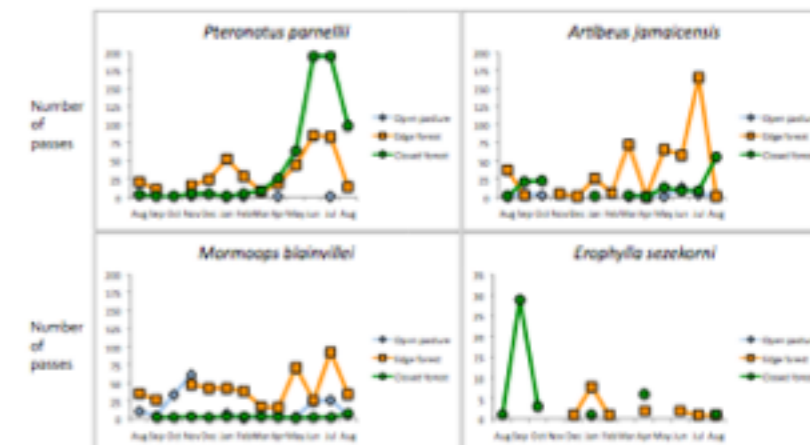
Significantly more species were detected each month in edge habitat compared to pasture ($p < 0.001$) and forest ($p = 0.003$). Nectarivores were rarely detected in open pasture, preferring closed-canopy forest ($p = 0.039$).

Nightly Activity Index



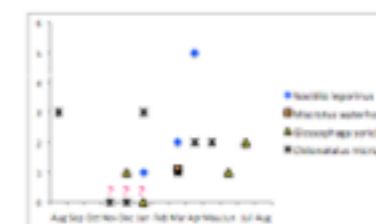
Activity patterns presented for April - August 2012, when sunset ranges 18hr28 - 18hr49. *Pteronotus pumilus* activity does not include movements of co-ordinated dusk flightlines, which last for 20-40 minutes and usually exceed 500 detection passes. * indicates detection of hunting buzzes.

Monthly Activity



Peak numbers of *P. pumilus* correspond to emergence of volant pups. Breeding cycles for other species are not adequately known, but post-lactating *A. jamaicensis* have been detected in April and juveniles detected in April, May, and August. Differences in numbers detected for Aug 2011 and Aug 2012 suggest annual variation should be evaluated. Note: y-axis scale for *E. sezekorni*.

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Glossophaga soricina (Phyllostomidae) is considered "abundant" in Windsor Cave but was rarely detected acoustically. *Macrotus waterhousei* is confirmed resident year-round: a bachelor male lives in my roof and girlfriends visit for the summer! *? = possibly present, poor sonogram.

4. Conclusions

- Surveys must be conducted all night, not only for hours at dusk and dawn
- Surveys should be conducted quarterly to assess seasonal changes in activity and numbers of individuals, and in order to detect rare species
- Annual variation must be assessed, possibly driven by El Niño rain cycles
- Acoustic surveys: poor at detecting small Phyllostomidae ("whisperers")