Dispersal and establishment of jewelled geckos following ‘hard’ and ‘soft’ releases

Carey Knox[1] & Jo Monks[2]

[1]EcoGecko Consultants Ltd.
[2]Department of Conservation

Outline

2012 data (Knox & Monks, in press)

- Introduction, methods, results, discussion.

2014 data

- Preliminary analyses and results.

Introduction

- Research comparing dispersal of jewelled geckos from soft-release (SR) and hard-release (HR) translocations.
- Sometimes following translocation individuals may disperse to the point where they are no longer in contact with other individuals.
- Consequences for population growth and establishment.
- Soft-release pens aim to habituate animals to the release area, potentially aiding in population establishment.

Introduction

- The advantages and disadvantages of using soft-release pens for lizard translocations have never been scientifically assessed (Germano & Bishop, 2008).

- Increased/on-going need to move frogs and lizards in New Zealand due to pressure from development (Sherley et al. 2010).

- Aim – to test the relative impacts of SR and HR on dispersal of jewelled geckos through a simultaneous radio-tracking comparison.

Jewelled gecko
(*Naultinus gemmeus*)

One of 9 species of the long-lived, arboreal, endemic *Naultinus* geckos.

Give birth to ~2 live young (Cree 1994).

Habitat: native forest and shrublands.

Threat status: at risk, declining (Hitchmough et al. 2013).

Individuals can be reliably identified by photo-ID (Knox *et al*. 2013).

Methods

- 2012 study took place at Orokonui Eco-sanctuary.
- 0.7g BD2 transmitters used to monitor the movements of 19 jewelled geckos for 3 weeks. Movements recorded 1-2X daily by ‘moving peg’, tape measure and compass.
- We also recorded emergence, weather conditions, vegetation species and perch height.
- Our research capitalised on translocations for conservation. Hence number of animals and sex ratios were not always balanced between groups.

Methods

- HR group: 9 geckos (3M, 6F) were translocated from Otago Peninsula straight to Orokonui in late September 2012 and then released with transmitters at the HR site.

- SR group: transmitters attached to 10 geckos (1M, 9F) out of 42 translocated to Orokonui in January 2012. SR geckos spent 9 months in a pen. Movements >2m recorded by photo-ID.

- The pen was removed at the start of transmitter monitoring.

- Both groups of geckos radio-tracked simultaneously.

Methods

- Made the sites as comparable as possible. Similar habitat: both shrubland dominated by *C. taylorae* with some taller trees e.g. kānuka, *Pittosporum tenuflorum.*

- Hard-release and Soft-release sites 200m apart.

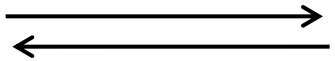
- Geckos released at similar density and spacing between the sites.

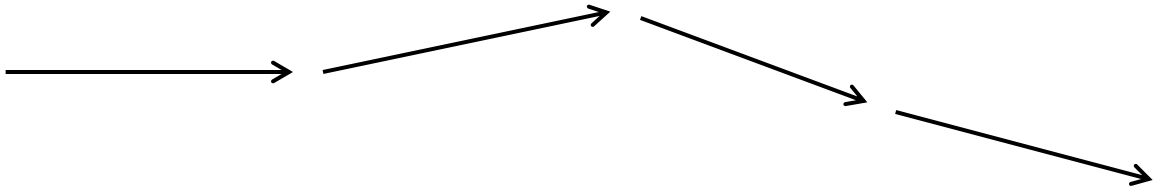
Soft-release pen

Results

- Daily movements averaged 1.61m for the hard-release group and 1.05m for the soft-release group ($t1 = 2.18$, $p = 0.03$).

- Total movements averaged 38m for the hard-release group and 23m for the soft-release group.

- Soft-release 

- Hard-release 

Results

- None of the radio-tracked soft-release geckos moved outside of the ‘pen area’ despite suitable habitat being available.

- In contrast, the radio-tracked hard-release geckos moved distances of up to 40m outside of their release area.

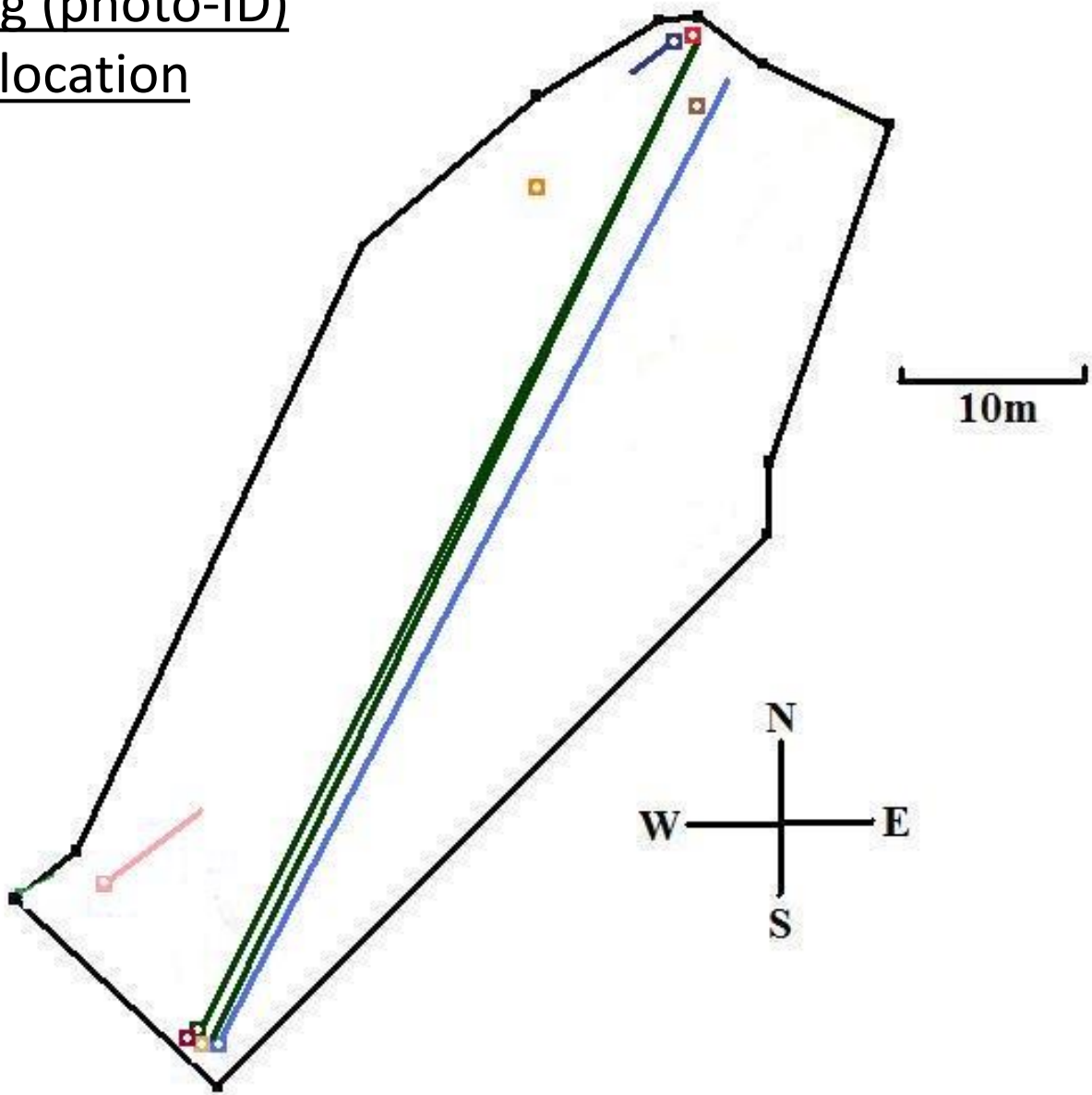
- Average distance from release point at the end of tracking… SR = 5m, HR = 15m ($t1 = 2.20$, $p = 0.042$).

- HR geckos increased area occupied by > 4 X.

Soft-release monitoring (photo-ID)
0-3 months after translocation

Some large initial movements.

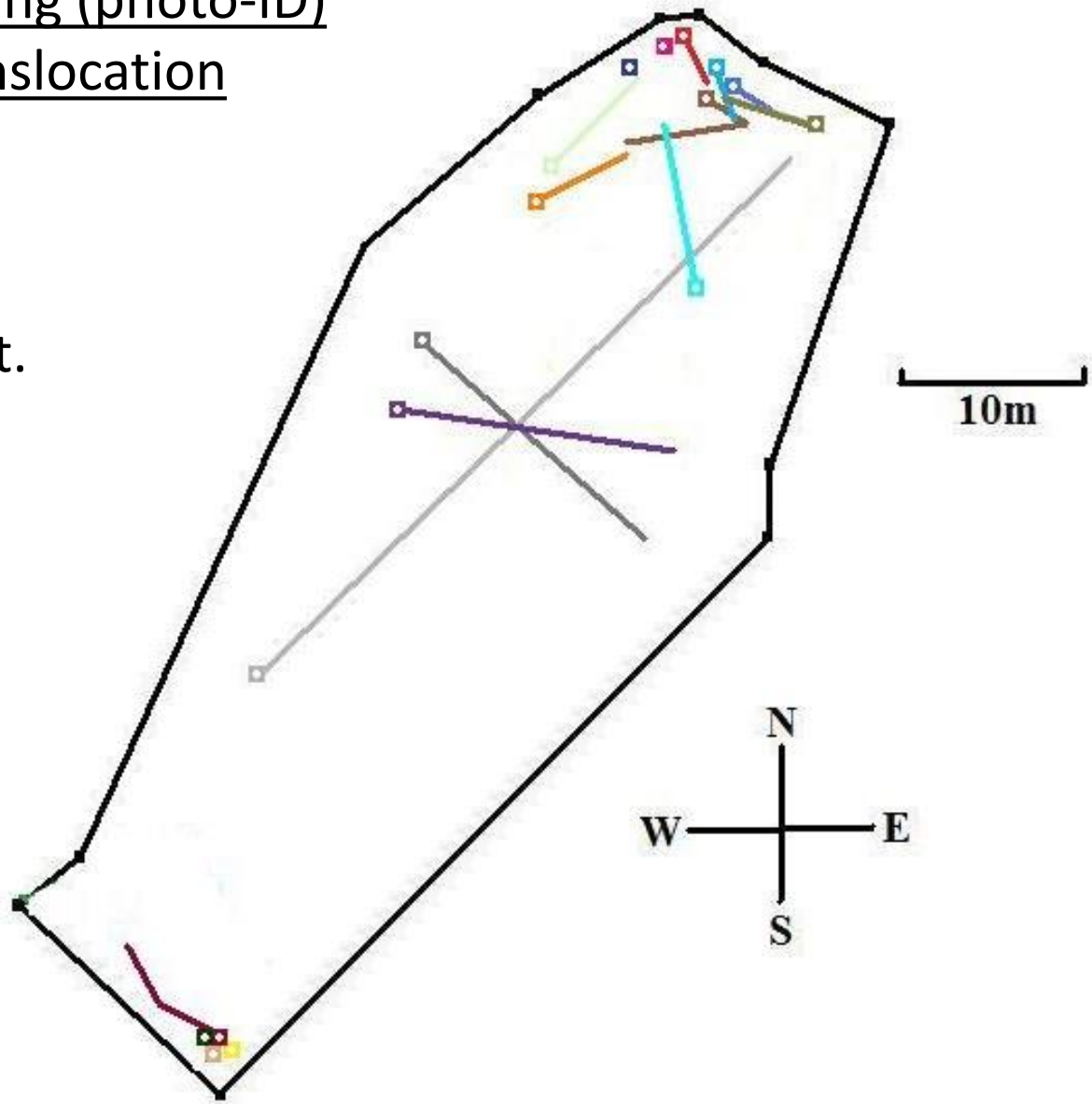
Average = 15.3 m



Soft-release monitoring (photo-ID)
4-9 months after translocation

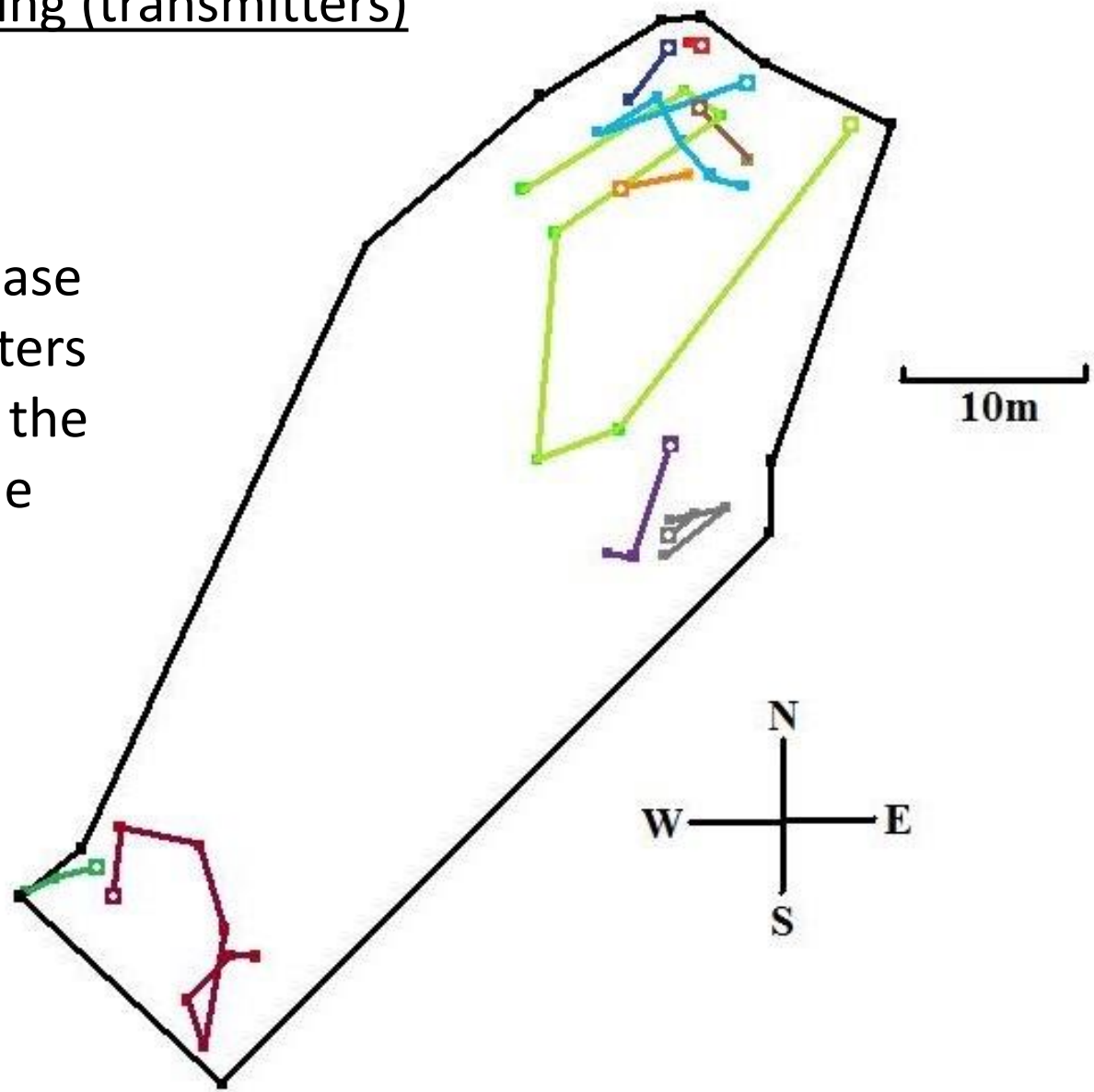
Large movements
become less frequent.

Average = 3.4 m



Soft-release monitoring (transmitters) AFTER pen removal

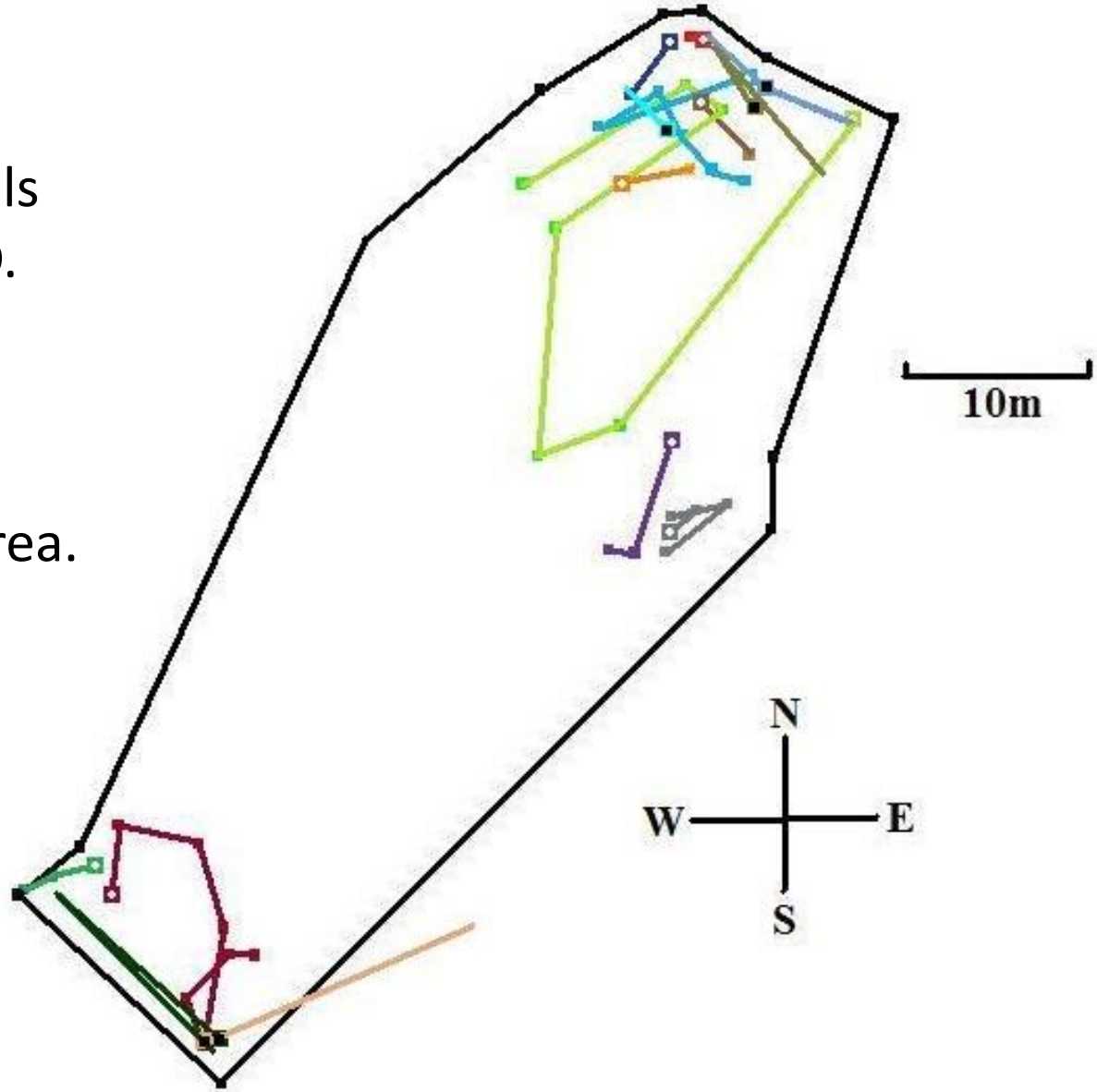
None of the soft-release geckos with transmitters on moved outside of the ‘pen area’, despite the pen being removed.



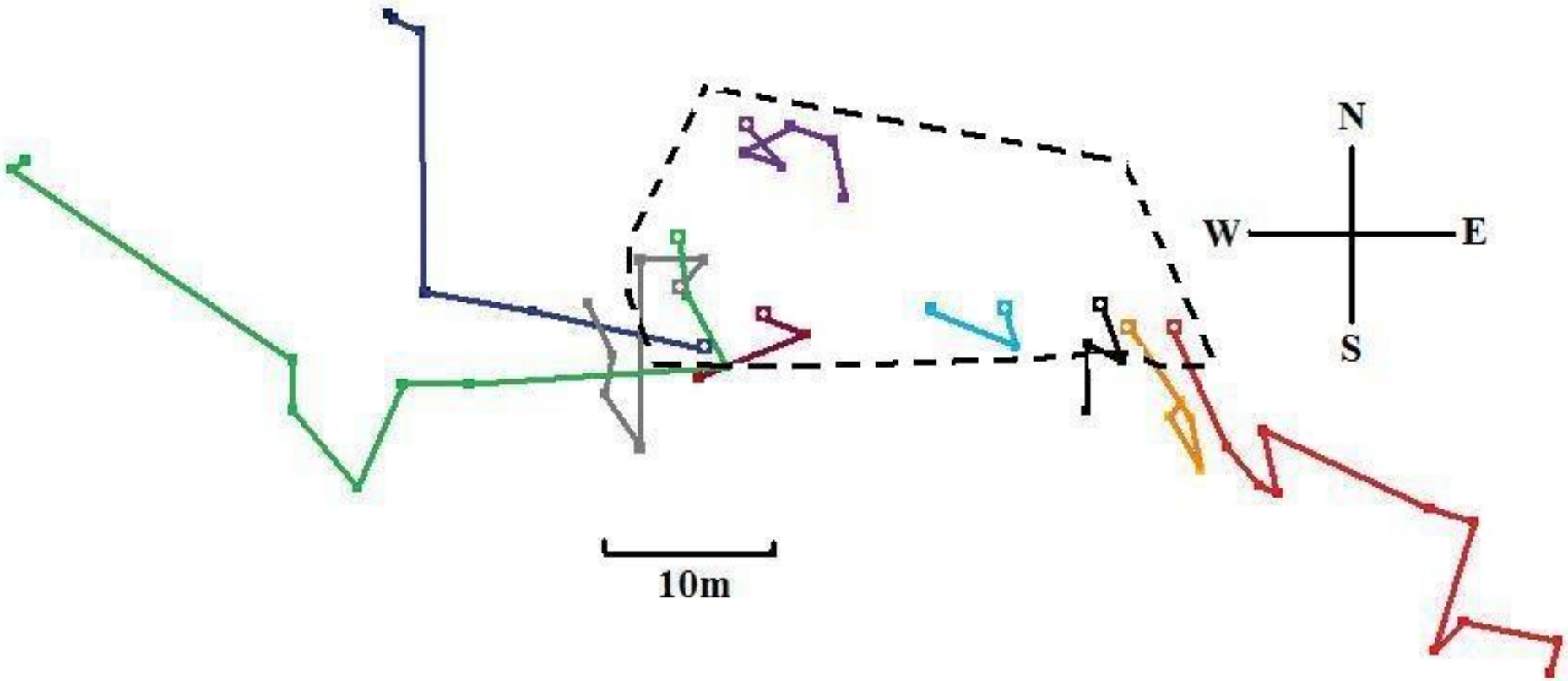
Soft-release monitoring (transmitters and photo-ID) AFTER pen removal

5 additional individuals observed by photo-ID.

One gecko (without a transmitter) moved outside the release area.



Hard-release monitoring (transmitters)

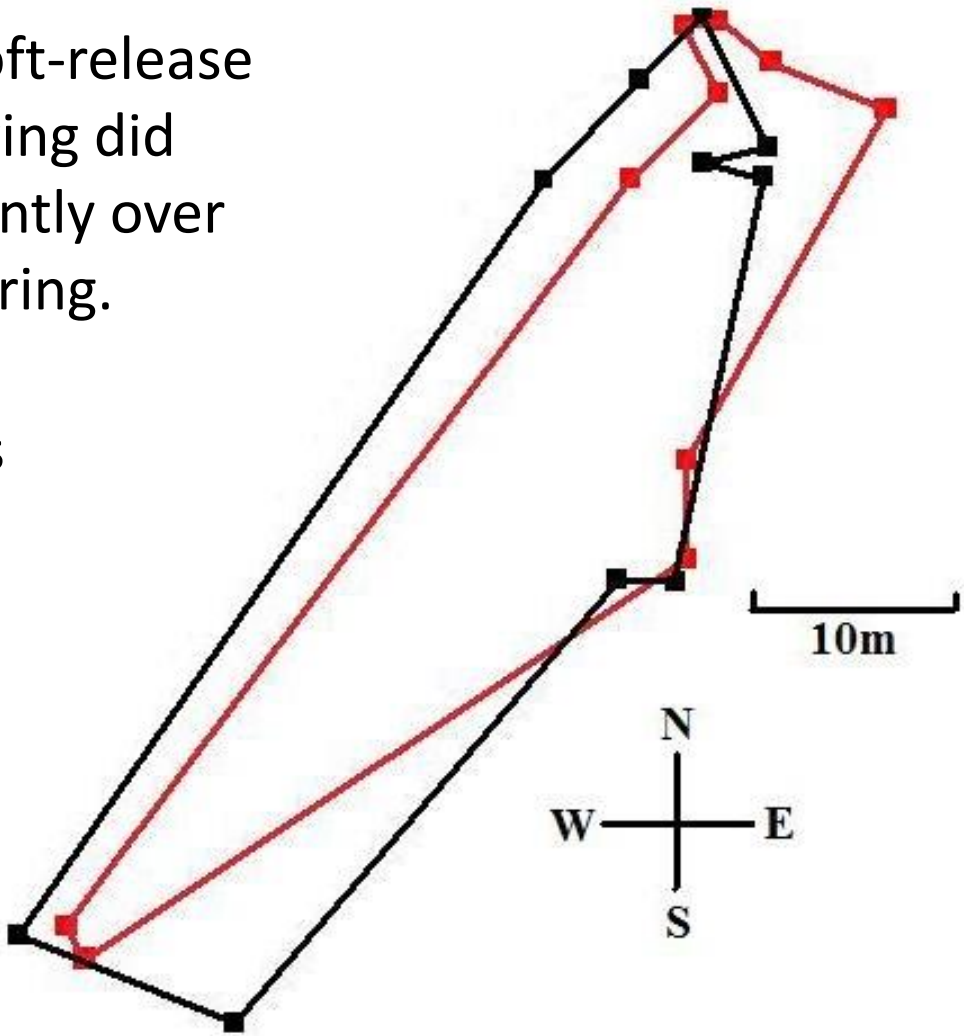


The hard-release geckos moved distances of up to 40m outside of their release area (dotted line).

Soft-release monitoring (transmitters)

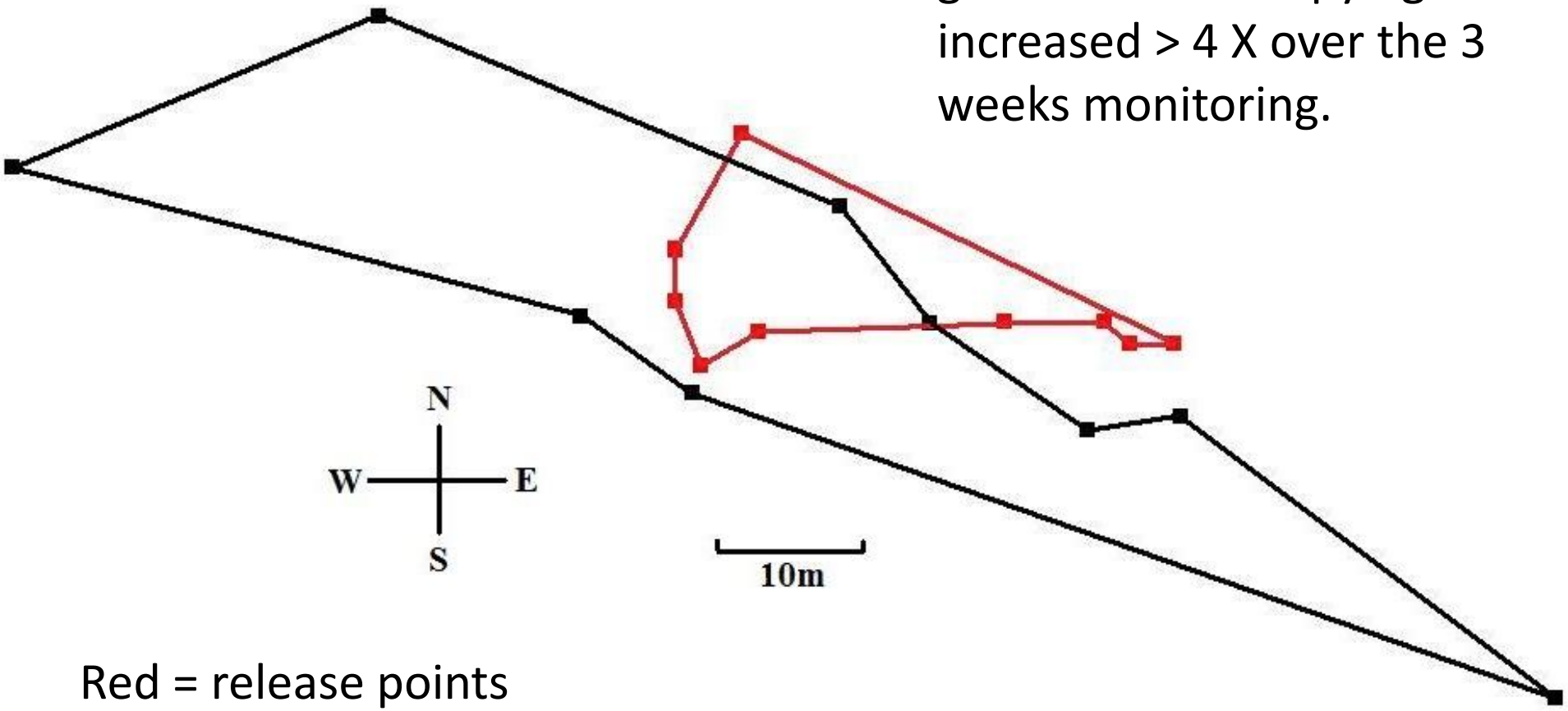
The area that the soft-release geckos were occupying did not change significantly over the 3 weeks monitoring.

Red = release points
Black = end points



Hard-release monitoring (transmitters)

The area the hard-release geckos were occupying increased > 4 X over the 3 weeks monitoring.



Red = release points
Black = end points

Results

- Largest total movement Male: 81m (HR).
- Largest total movement Female: 68m (SR + HR).

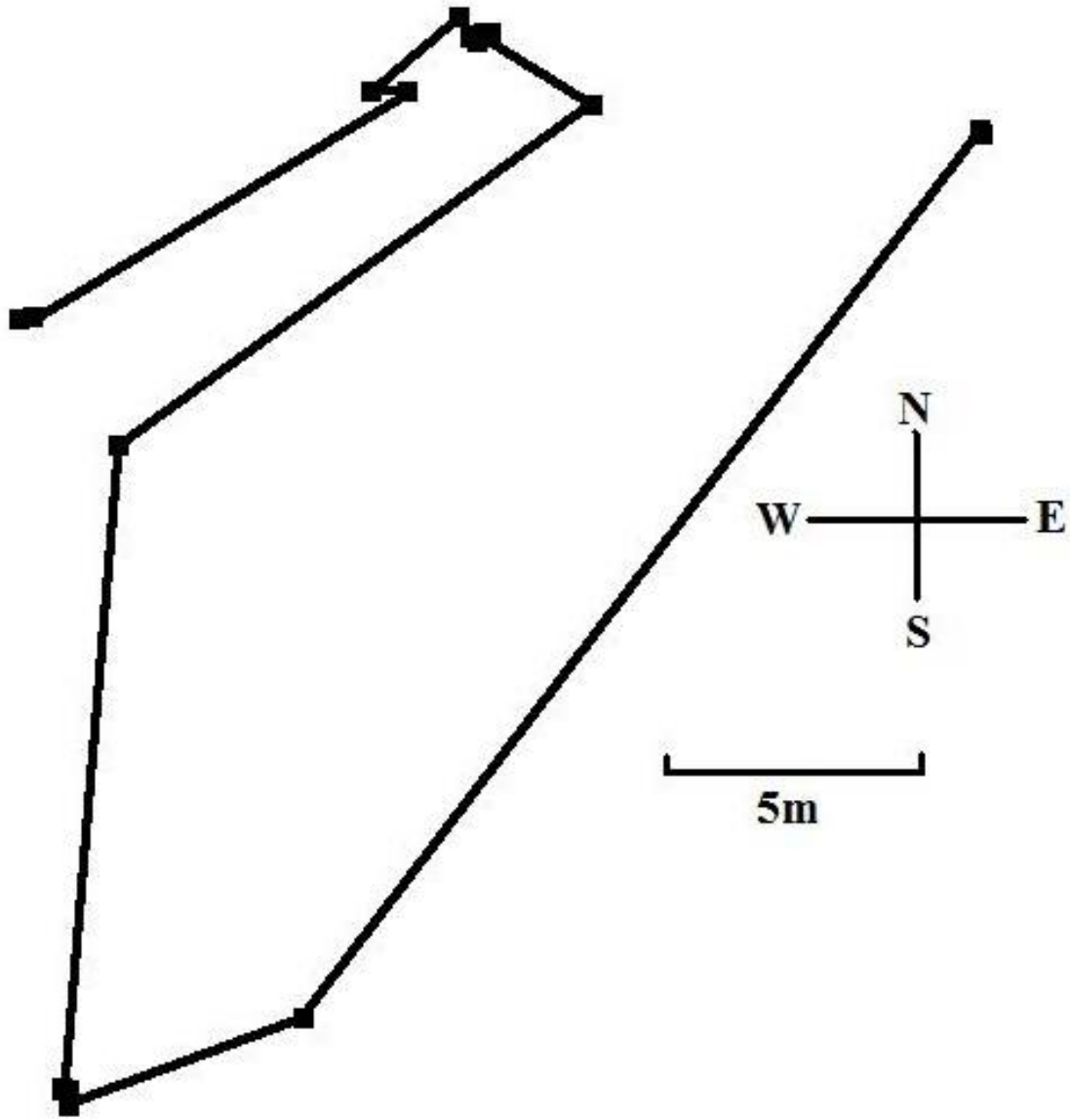
- Minimum total movement Male: 20m (HR).
- Minimum total movement Female: 4m (SR).

- Largest daily movement Male: 22m (HR).
- Largest daily movement Female: 17m (SR).

Soft-release monitoring (transmitters)

Two females at the soft-release site.

Couch Potato



Results

- 80% of fixes were arboreal and 20% were on or below ground. Ground used for shelter, moving between habitat patches, and for basking by some geckos.

- A wide range of plants were used by geckos.

- *Coprosma taylorae* (45% of fixes), grass (13%), *Muehlenbeckia* (11%), gorse (*Ulex europaeus*) (6%), broadleaf (*Griselinia littoralis*) (5%), kohuhu (*Pittosporum tenuifolium*) (5%), bracken (*Pteridium esculentum*) (4%), kānuka (*Kunzea ericoides*) (3%) and another 13 other plants (<1%).

Results

- The following summer…..
- We undertook 2 surveys of the HR site and the SR site.
- 2 females were found at the HR site and both were not gravid. In contrast, 4/4 females found at the soft-release site were gravid. Have the HR males lost contact with the SR females?
- Non-gravid females very rarely found on Otago Peninsula in summer (C. Knox, *pers. obs.*).

Discussion

- Interpretation of results limited by small sample size and individual variation; but some interesting patterns still found.
- Daily movements in the hard-release group were significantly higher than daily movements in the soft-release group.
- Distance from release point at the end of the monitoring was 3 X higher in the hard-release group.
- The area occupied by the hard-release geckos was over 4 times higher at the end of monitoring than at the start.

Discussion

- Daily movements, home-ranges and dispersal from release point for translocated animals may be influenced by several factors such as:
- Habitat structure and species composition.
- Climate, altitude and season (cold may restrict dispersal).
- Density of geckos.
- Interactions with predators.
- Length of time in the pen prior to release.

- Future research could look at the effect of these variables on the dispersal of geckos following translocation.

2014 research

- In 2014 further research was undertaken at Orokonui Eco-sanctuary and 2 sites on Otago Peninsula.

- Increased sample size.
- Looked at the minimum length of time required in a pen to minimise dispersal (4 months vs. 9 months).
- The effect of season on movement/dispersal patterns.
- Comparison with a natural population on Otago Peninsula.
- Habitat analyses: which plants or micro-habitats are they showing a preference for?
- Homerange / overlap analyses.

Summary of research undertaken on the dispersal of jewelled geckos

	Trial #1	Trial #2	Trial #3	
Site	Orokonui	Orokonui	Otago Peninsula site A	Otago Peninsula site B
Date	Sep/Oct 2012	Jan 2014	May/June 2014	
Groups and no. geckos*	SR(10), HR(9)	HR(10)	SR(10), HR(10)	NP(18)
Soft-release period	9 months	NA	4 months	NA

*HR = hard-release, SR = soft-release, NP = natural population. The number of geckos radio-tracked is in brackets.

Release strategy	Season	Site	No. of geckos	Daily movement (m ± SE)	% of geckos remaining in release area after 3 weeks
SR	Winter	OP, A	10 (6F, 4M)	0.80 ± 0.07	90%
SR	Spring	OROK	11 (10F, 1M)	1.06 ± 0.16	100%
HR	Winter	OP, A	10 (7F, 3M)	1.39 ± 0.22	0%
HR	Spring	OROK	9 (6F, 3M)	1.61 ± 0.21	22%
HR	Summer	OROK	10 (7F, 3M)	2.79 ± 0.30	40%
NP	Winter	OP, B	18 (9F, 9M)	1.13 ± 0.10	N/A

Release strategy	Season	Site	No. of geckos	Daily movement (m ± SE)	% of geckos remaining in release area after 3 weeks
HR: F	TOTAL	OP+OROK	20	1.81 ± 0.15	30%
HR: M	TOTAL	OP+OROK	9	2.36 ± 0.34	0%
SR: F	TOTAL	OP+OROK	16	0.90 ± 0.10	94%
SR: M	TOTAL	OP+OROK	5	1.03 ± 0.10	100%
NP: F	Winter	OP	9	0.72 ± 0.10	N/A
NP: M	Winter	PORT	9	1.58 ± 0.17	N/A

Conclusions

- We suspect that the likelihood of population establishment and the speed of population growth is much diminished when soft-release pens are not used for *Naultinus* gecko translocations.

- Soft-releases/pens also increase ease of monitoring during population establishment.

- We recommend that soft-release is adopted as ‘standard practice’ for *Naultinus* gecko translocations. We suspect that geckos should spend at least 3 months in the pen to ‘settle’.

Conclusions

- Soft-release pens should also be considered and trialled with other lizard and frog species being translocated in NZ.

- We hope to undertake future research on a large skink species (*Oligosoma*) and another gecko genus (e.g. *Mokopirirakau*). This will allow us to make more general recommendations.

Acknowledgements

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