



# NEW ZEALAND SEA LION PUP BEHAVIOUR AROUND WALLOWS ON CAMPBELL ISLAND

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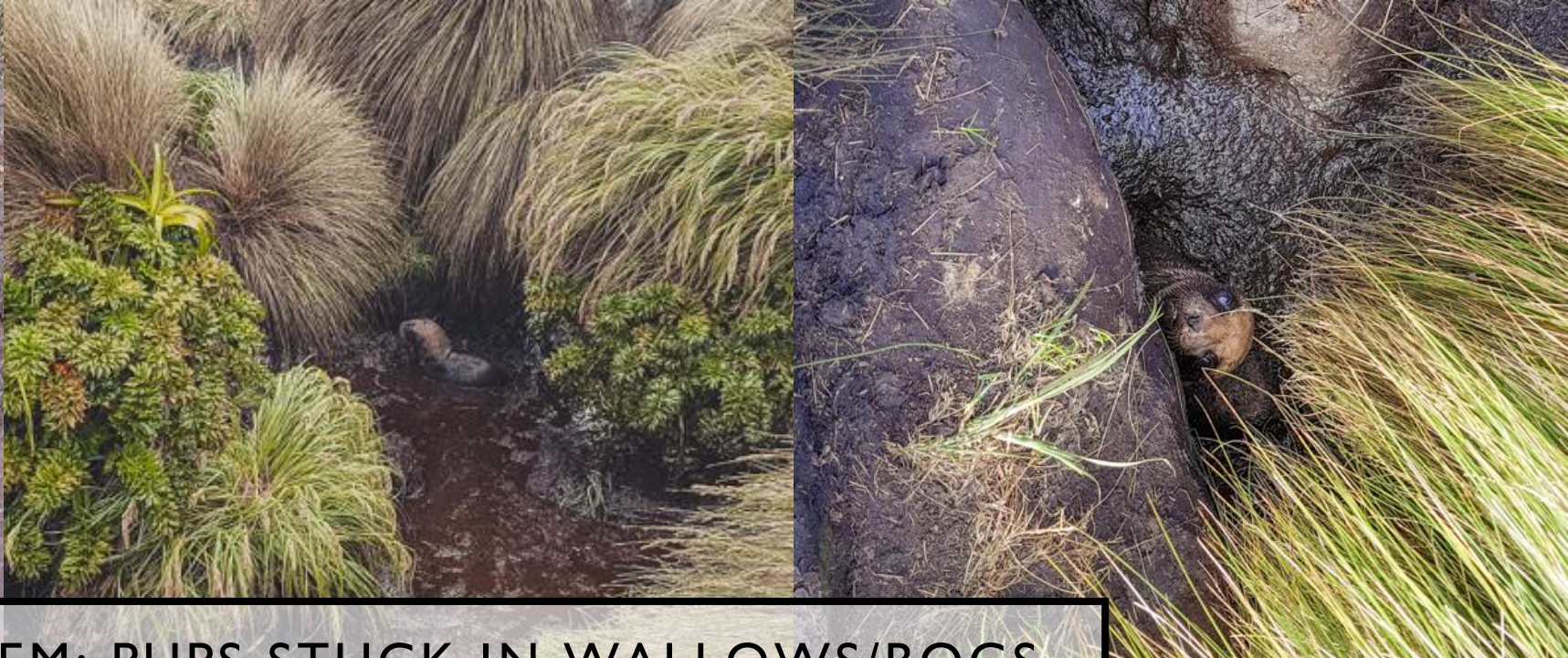
Research conducted under a contract with the Department of Conservation, NZ



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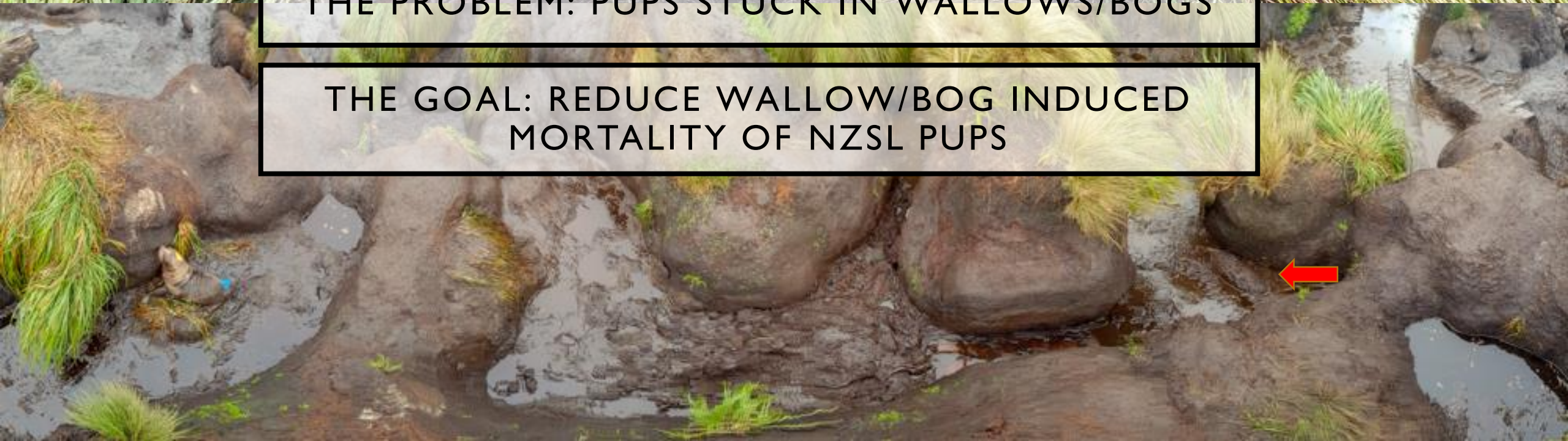


IMAS  
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THE PROBLEM: PUPS STUCK IN WALLOW/BOGS

THE GOAL: REDUCE WALLOW/BOG INDUCED MORTALITY OF NZSL PUPS





## OBJECTIVES

- To assess how pups are using the colony terrain at Davis and Paradise Points in relation to wallows/bogs/tomos
- Spatially quantify risk wallows/bogs pose to pups during the breeding season at Davis and Paradise Points

# METHODS: CAMERA TRAPS

## Aims

- Records no. of pups in vs. out of wallows
- Observe how pups fall into wallows

## Methods

- Outdoor Swift 3C cameras with 50 deg FOV
- 5 camera traps at wallow/bog areas where pups have been found dead or trapped
- Camera traps moved/repositioned according to pup movements
- Captures a photo every 10 minutes
- Photos were downloaded after ~ 2 weeks
- Glued blue circle patches on the bumps of 100 pups for ID purposes.



A photograph of several elephant pups resting on a rocky, sandy ground. One pup in the foreground has a blue GPS tracker attached to its back. The text 'METHODS: GPS TRACKING' is overlaid in a white box at the top center.

## METHODS: GPS TRACKING

### Aims

- Track pup movements in the colony and quantify time spent near/in wallows
- Identify core areas pups visit

### Methods

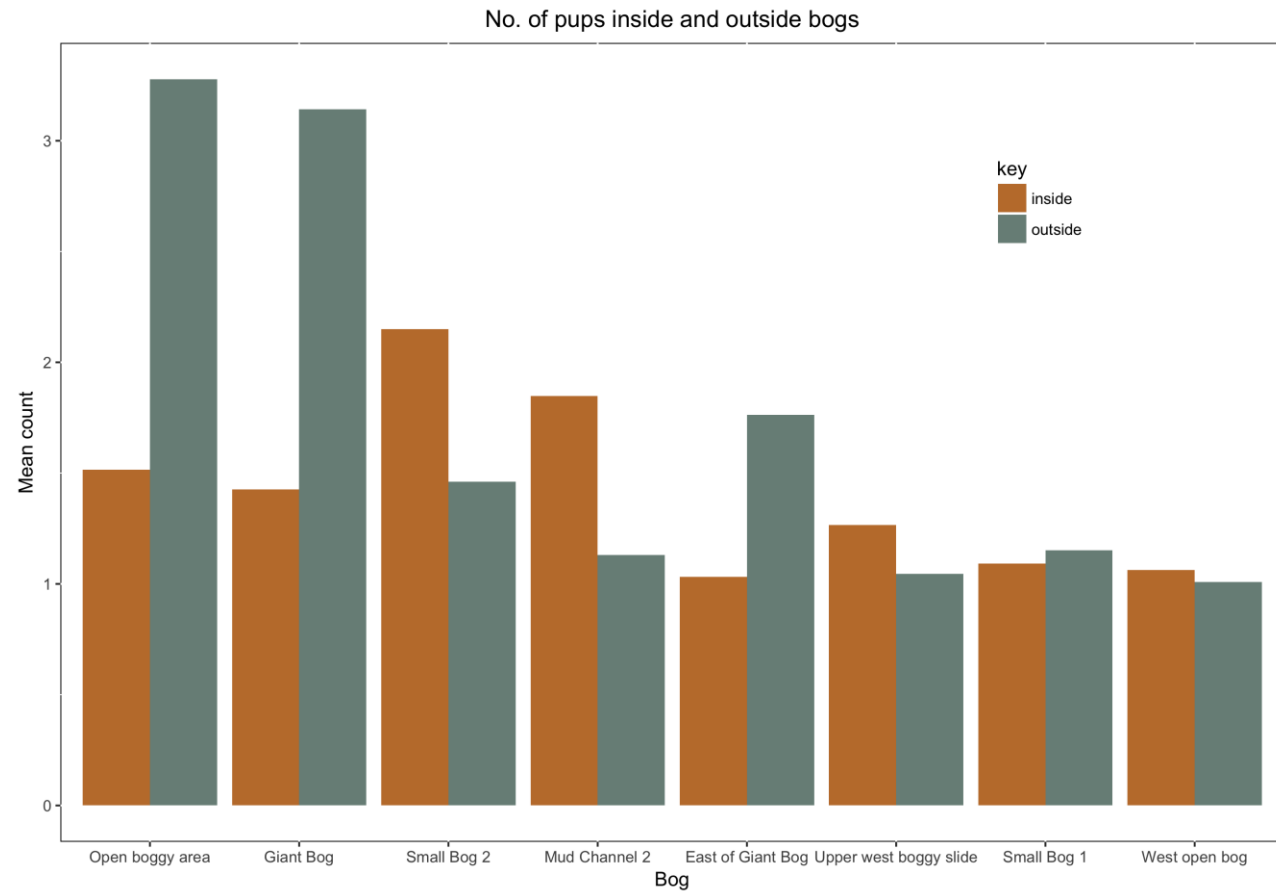
- Deployed 20 GPS trackers ( $\pm 5$  m resolution, Catlog S, Catnip Technologies) – records a position every 10 min
- Glued to neoprene, secured by zip ties, then a thin coating of glue (quick-setting epoxy) to the back of pups
- Pups were captured by hand and manually restrained
- Pups were weighed, measured (length and girth) and sexed
- Recovered trackers after  $\sim 12$  days.

# LOCATIONS OF WALLOWS/BOGS

- West cliff
- Upper west bog area
- Small bog 2
- Mud channel 2
- Mud channel
- West open bog
- Small bog + tiny bog
- Giant Bog
- East of Giant Bog

## CAMERA TRAPS: HIGH TRAFFIC BOGS

- For each photo: recorded number of pups inside and outside wallows.
- Only counted pups that can be clearly identified
- Mean no. pups inside and outside bogs seen from photos calculated by excluding photos without pups inside/outside
- Total no. pups counted inside = 1555
- Total no. pups counted outside = 9467
- Overall, there's a 36% chance of going into a bog (only including photos with both pups in and outside the bogs)



## GIANT BOG

- Ramp very effective
- Most pups able to self-rescue via ramp
- Some not able to figure out escape route – end up wandering to deeper parts of the bog/channel and risk getting stuck
- Higher chance of falling in when conditions are wet because steep sides, slippery and no vegetations/sticks





# SMALL BOGS

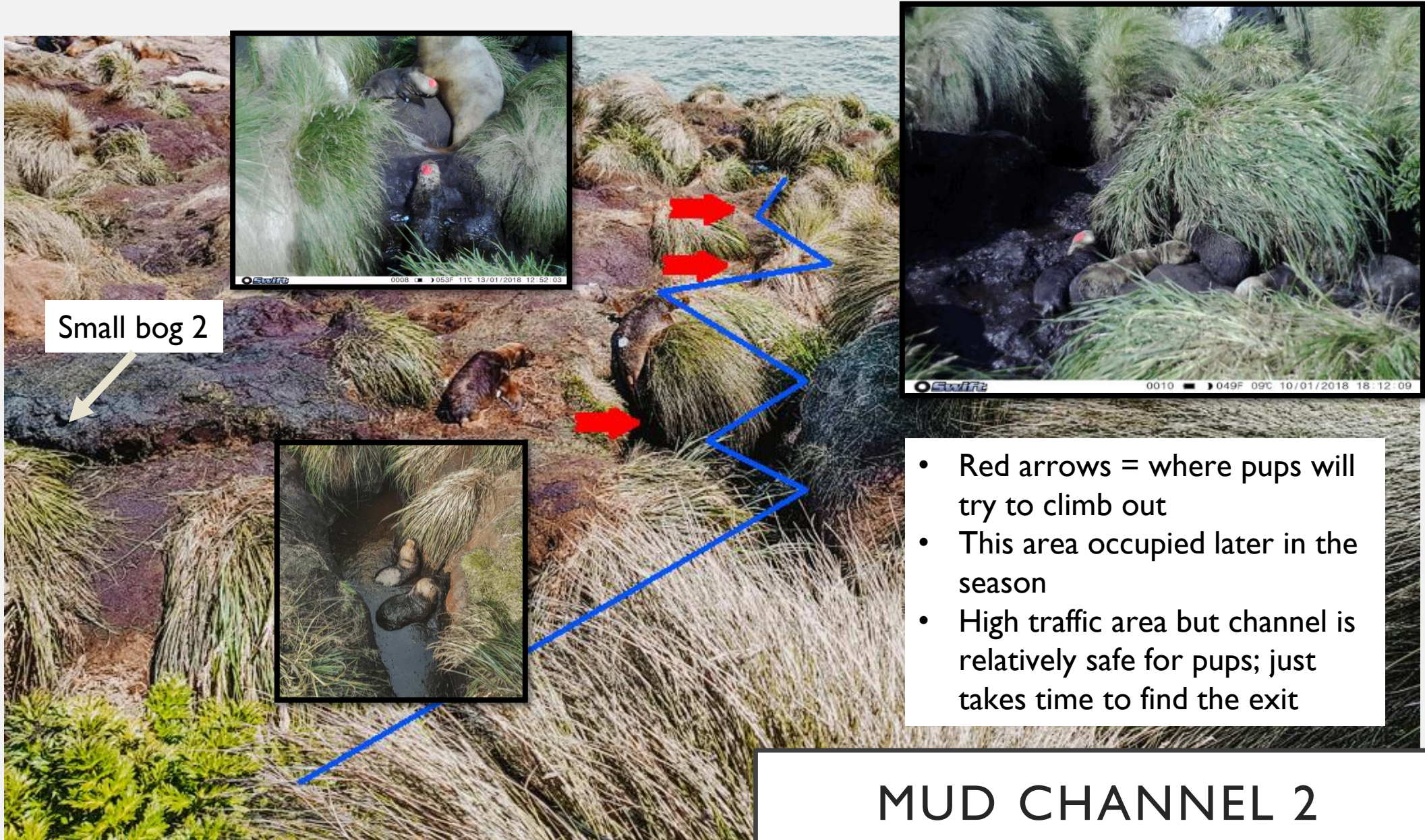
- One of the deadliest bogs – small and deep
- Bog composition can change quickly based on weather or random events e.g. male sitting in a bog
- However, dried up bog is still deep and pups need a ramp to climb out if they go in

Small bog 1



Small bog 2





Small bog 2

- Red arrows = where pups will try to climb out
- This area occupied later in the season
- High traffic area but channel is relatively safe for pups; just takes time to find the exit

## MUD CHANNEL 2

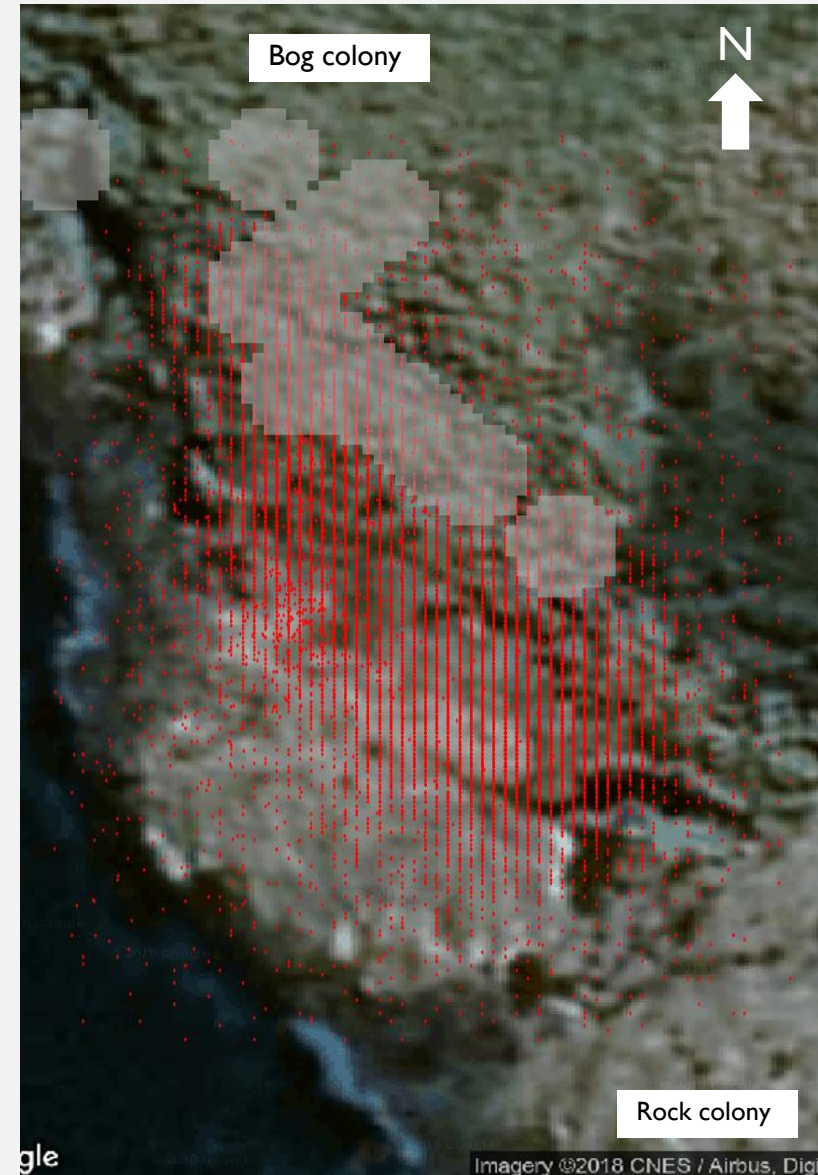
## GPS TRACKING ANALYSES

- 5 m buffer around the problem wallows and channels



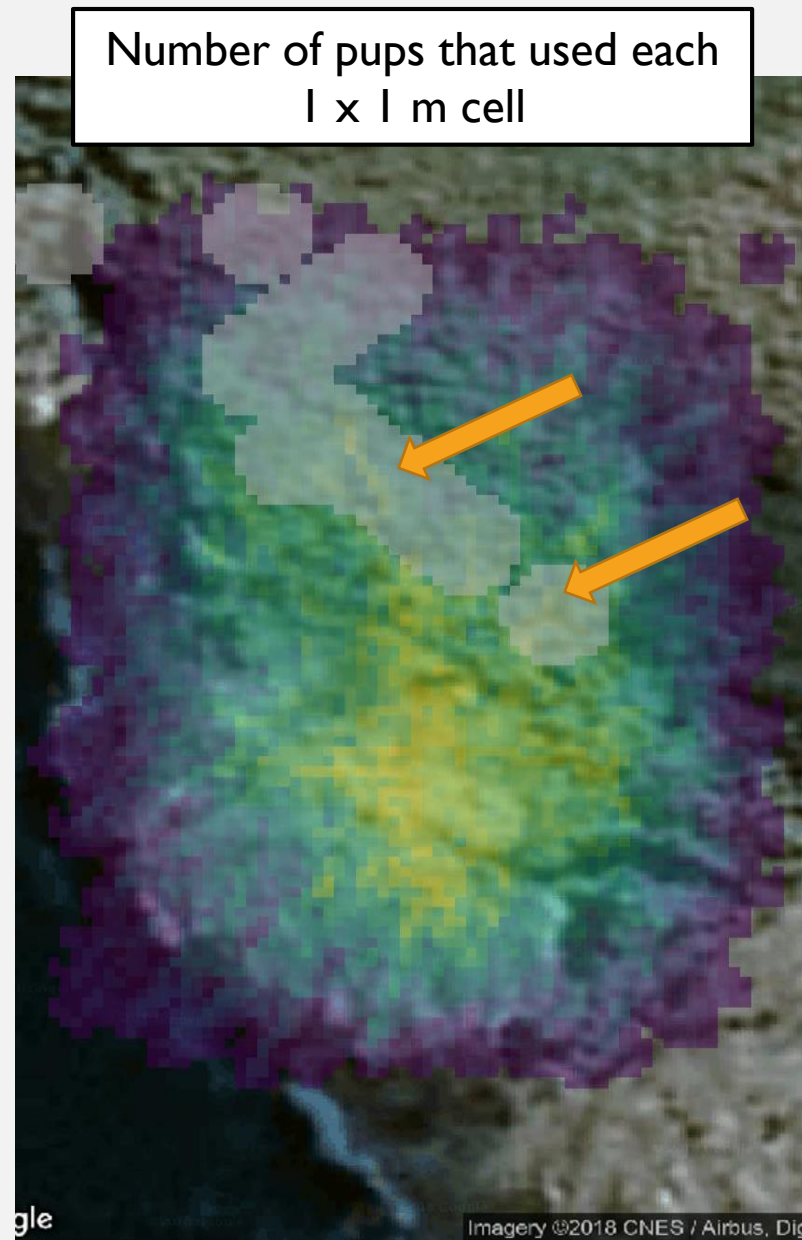
## GPS LOCATIONS

- 17 pups tracked between 30 Dec 2017 and 13 Jan 2018 (15 days)
- Individual track duration ranged from 1.9 to 14.8 days ( $9.9 \pm 3.7$ )
- After a speed filter, there were 22,283 locations in total ( $1310 \pm 520$ )
- Considerable pup movement within the colony, including within the buffer



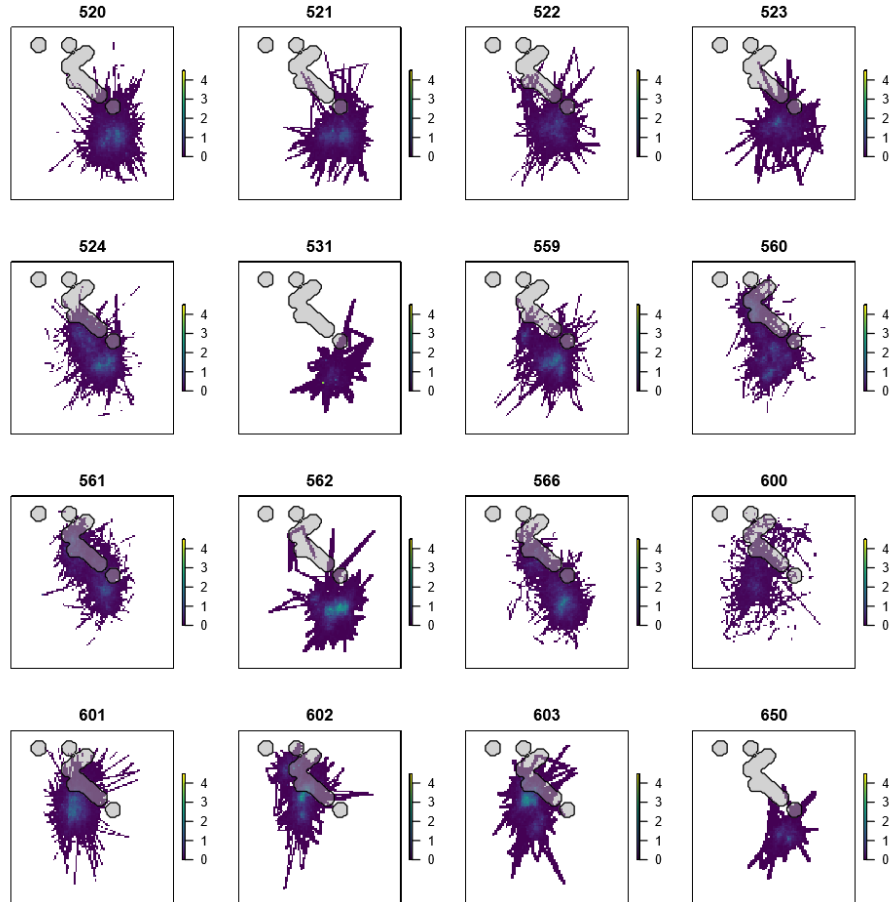
## PUP DISTRIBUTION MAP

- All pups moved a lot...
- Every one spent some time in the buffer
- Tracking area  $\sim 480 \text{ m}^2$



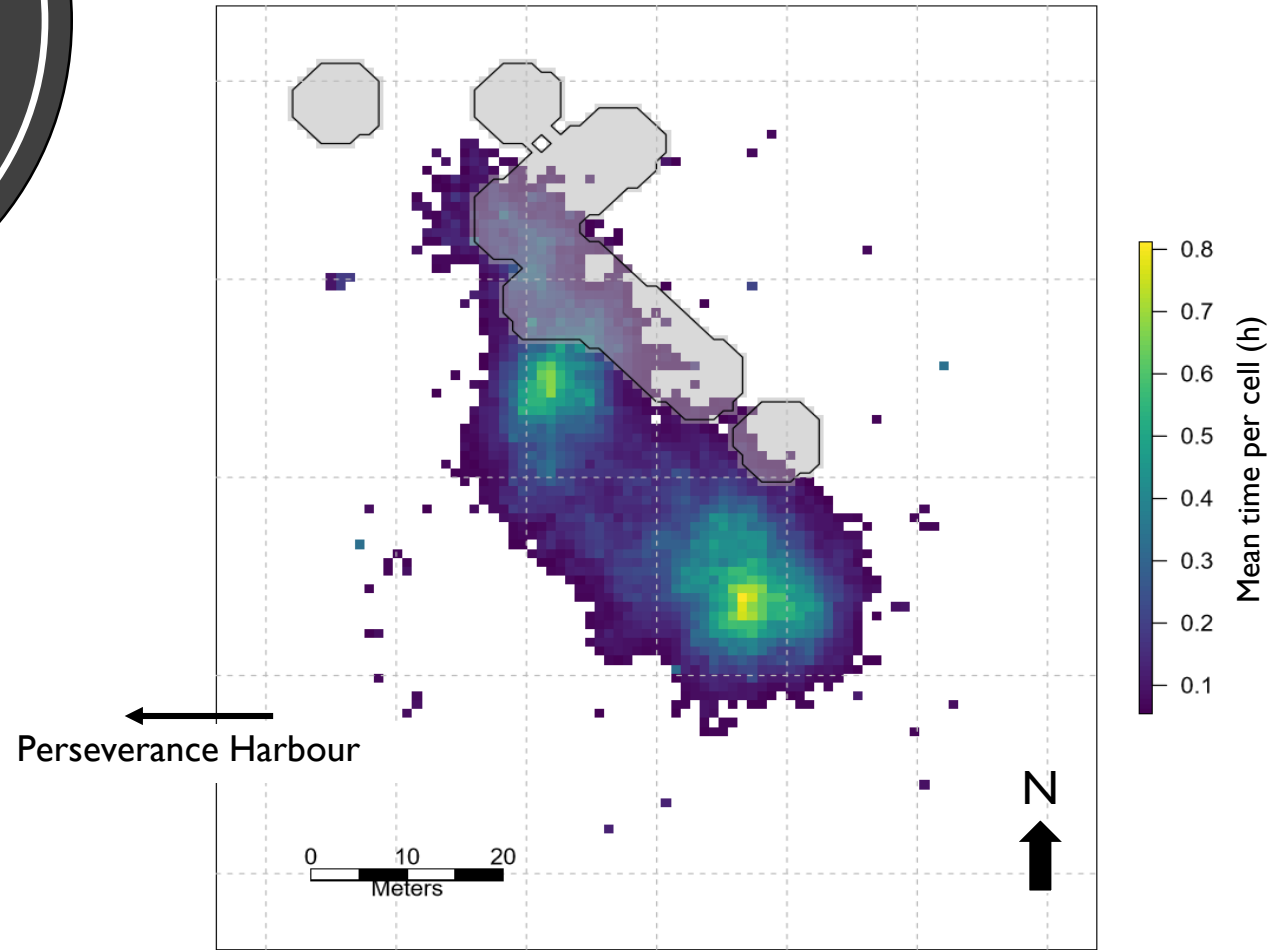
CORE USAGE  
DISTRIBUTION  
OF 16 PUPS

Hours spent in each 1 x 1 m cell (70<sup>th</sup> percentile)



CORE PUP  
USAGE AREAS  
IN RELATION  
TO THE  
WALLOW  
BUFFER ZONE

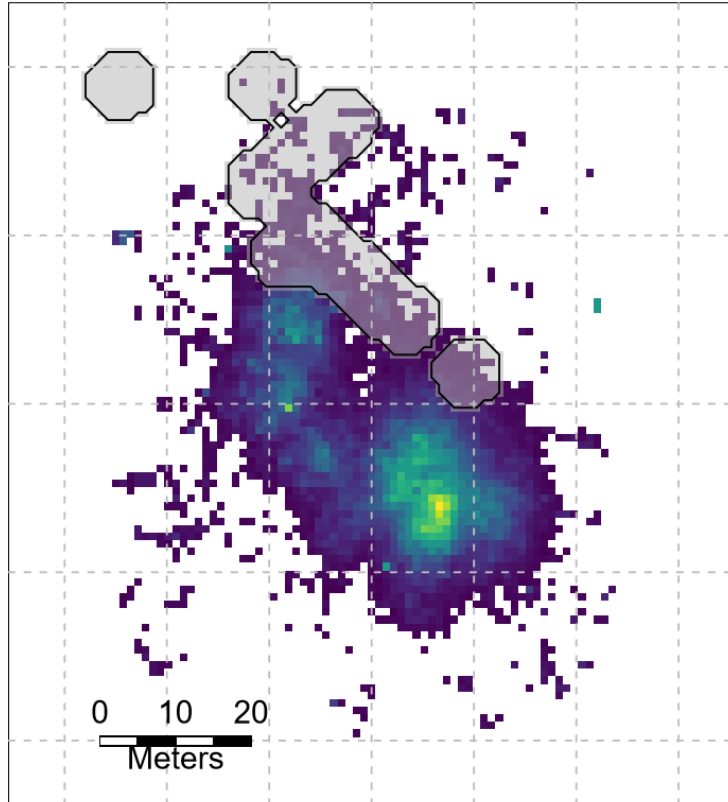
Time spent in each 1 x 1 m cell averaged over all  
pups (70<sup>th</sup> percentile)



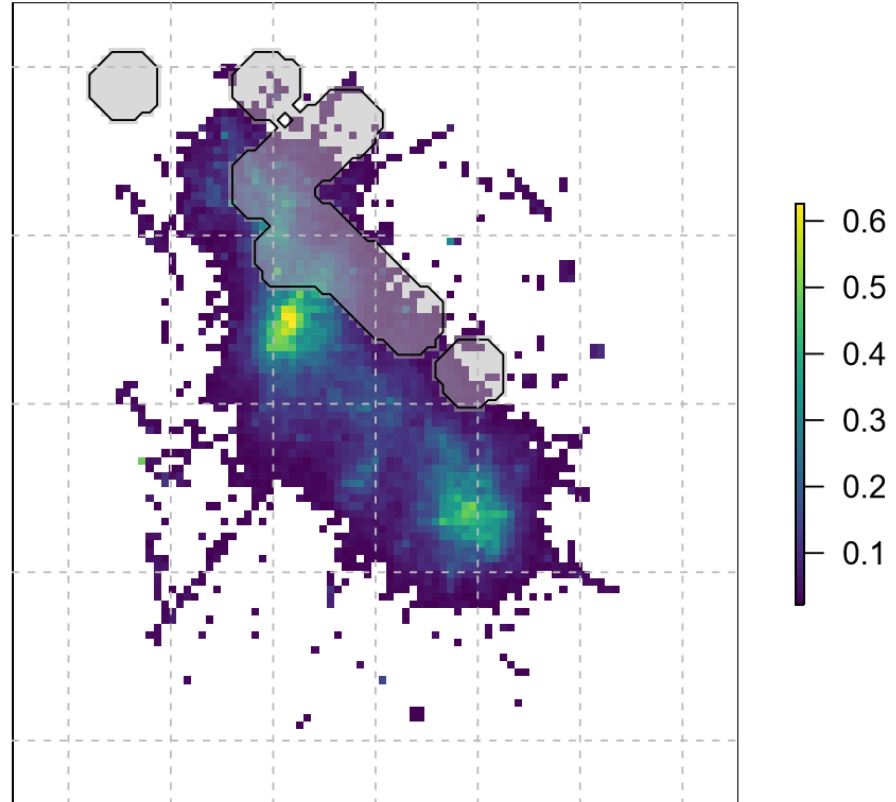
# USE OF THE COLONY CHANGED OVER TIME

GPS data split into:  
Early: 2017-12-30 to 2018-01-06  
Late: 2018-01-06 to 2018-01-13

Core usage: Early



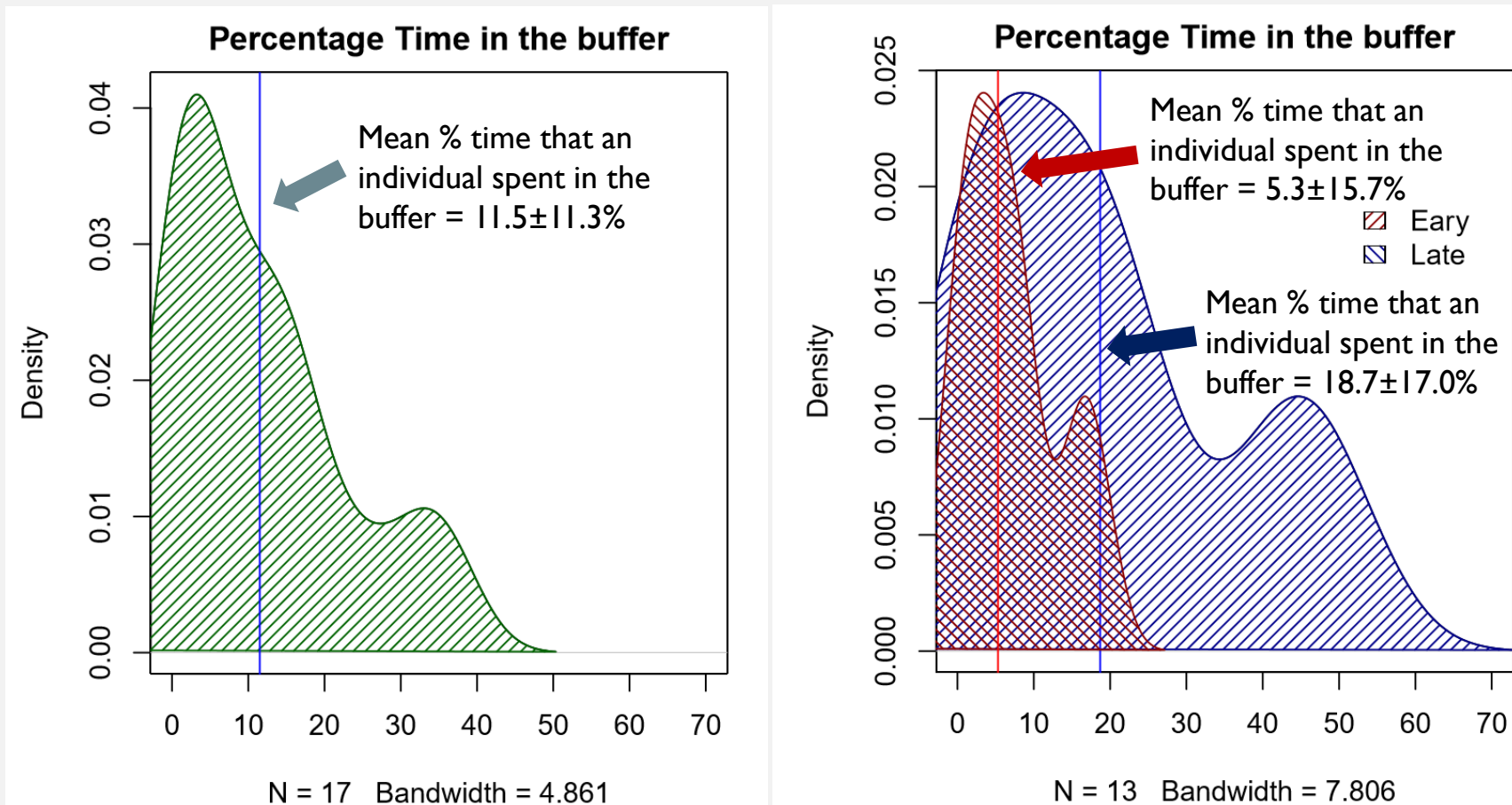
Core usage: Late





# THE PERCENTAGE TIME THAT EACH INDIVIDUAL SPENT IN THE BUFFER:

Overall and split into *Early* and *Late*  
Density plots of frequency distributions



2014-15  
DIFFERENCES IN  
BOG  
CHARACTERISTICS  
BETWEEN YEARS

2017-18

- Red arrows = dead pups
- Orange arrow = reference tussock between years
- From 2017-18 direct counts:
  - ~ 8 deaths in bogs (over ~ 2 weeks)
  - ~ 29 pups rescued (vs. > 60 in 2014/15)
- 2017-18 terrain was drier than 2014-15
- 2014-15 death bog ridges have opened up (blue arrow). Not a bog any more.





West cliff



Bog colony cliff



Bog colony cliff

OTHER GEOGRAPHIC CAUSES OF MORTALITY: CLIFFS

# CONCLUSIONS

- The pups at Davis Point moved a lot – most individuals traverse the entire colony, and all got to within 5 m of a problem wallow
- The overall % time individuals spent in proximity to problem wallow was 11%
- Once near a wallow there was a 36% likelihood of a pup entering it
- Pups nonetheless had regions that they used more than others, and these core regions changed over time
- In early January pups spent only 5% of their time near problem wallows – this increased to 18% two weeks later
- **Most effective period of direct intervention?** Risk of pups entering wallows and the wallow-induced pup mortality changes in the short and long term e.g. permanent vs dynamic bogs, differences in terrain conditions between years, age of pups vs. different bog types (variable risk)

## Management implications:

- All pups are at risk
- Ramps and digging trenches are effective solutions but requires maintenance
- Human intervention (rescuing pups) are also effective. Others: active infilling of wallows?

# EXTRAS: BOG COLONY DIFFERENCES BETWEEN YEARS

- Mud waterfall in 2014-15 (top row) is gone
- Main colony boggier in 2014-15 than 2017-18
- Bottom row 2017-18 photo was taken when the team first arrived at Davis, the area got progressively drier due to sunny weather

2014-15



2017-18

