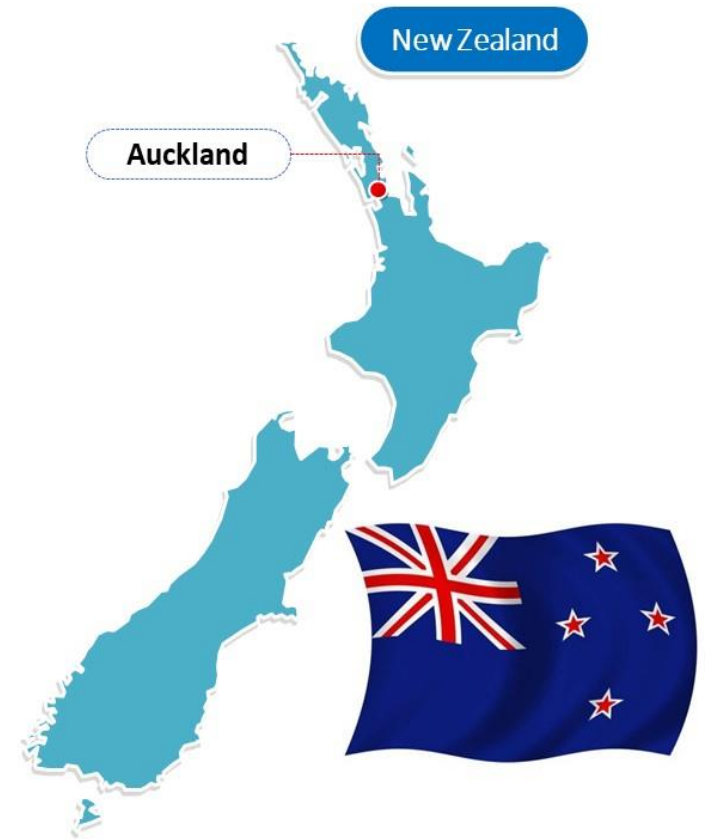




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# Biogenic marine habitats

- Seagrass meadows, oyster reefs and kelp forest
- Intertidal marine biogenic habitats contribute significant services to the marine ecosystem, including habitat provision, carbon fixation, and nutrient transport
- Directly and indirectly, support numerous cultural, commercial, and recreational fisheries, including the formation of a unique reef ecosystem
- Act as ecosystem engineers



# Significance of this study

- The degradation of habitats in shallow waters restricts and hinders other processes in the ocean and compromises the Indigenous (Māori) values and New Zealand's recreational enjoyment of coastlines and beaches.
- The marine environment is highly interconnected, and the impacts of activities in one habitat can have flow-on effects elsewhere making management a great challenge
- Determining the **Where** is an important step in being able to assess **Why** behind changes occurring in a marine ecosystem.

# Natural threats to biogenic habitats



Black swan grazing on seagrass



Predatory oyster borer snail (*hastrum scobina*)

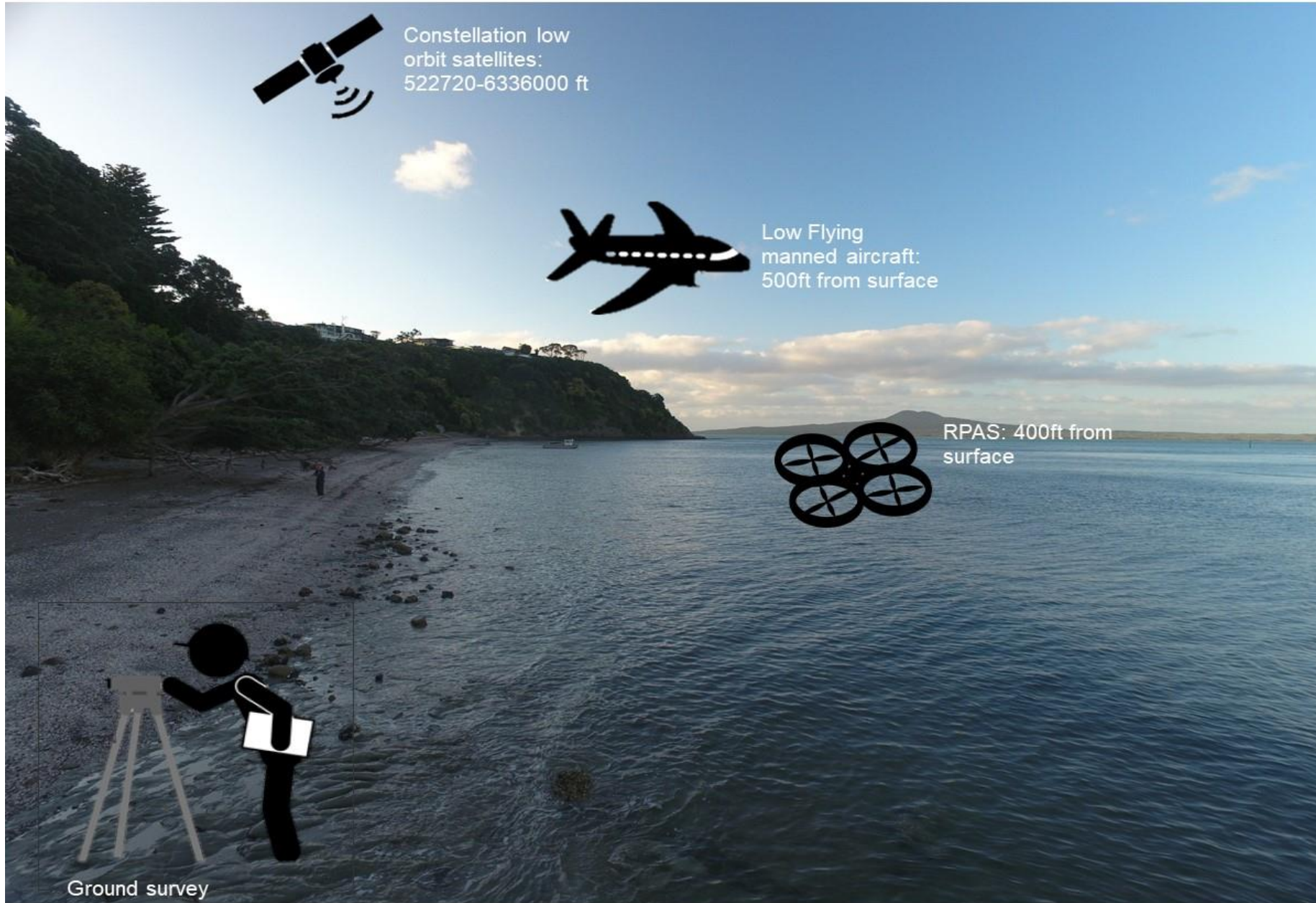


Aftermath



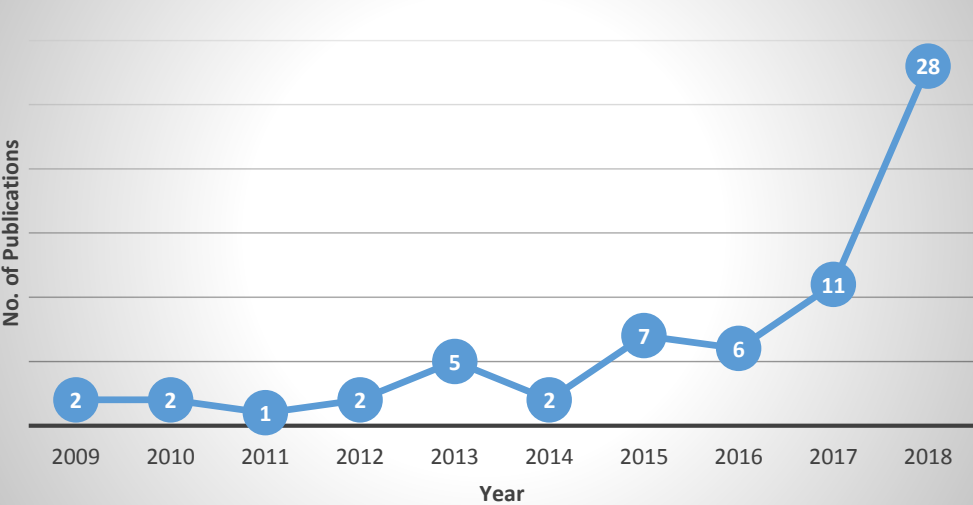
Aftermath

# Remotely Piloted Aircraft System (RPAS)

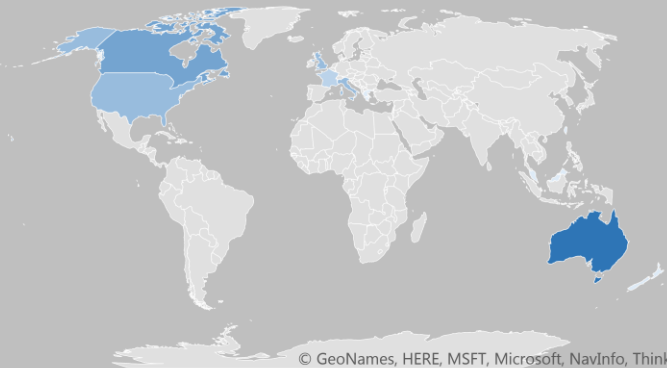


# Evolution of RPAS for marine applications

RPAS used for marine research



Publications world wide using RPAS



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# Rationale: Why RPAS?

- Further evaluations regarding the utility of small RPAS with multispectral sensors are required in the field of marine ecology.
- Complement other datasets for marine conservation planning
- There is a gap in exploring the potential of Remotely Piloted Aircraft System(RPAS) for fine scale marine sampling in New Zealand.





# Bridging the gap between satellite and ground surveys

- Marine ecologist, during low tide use quadrats along a transect and at high tide snorkeling or SCUBA at appropriate depths.
- This practice is still valuable, but sampling is constrained across large areas and is tedious.
- RPAS provide essential on-demand low altitude remote sensing capabilities, economically with reduced human risk and are poised to transform marine science and conservation.

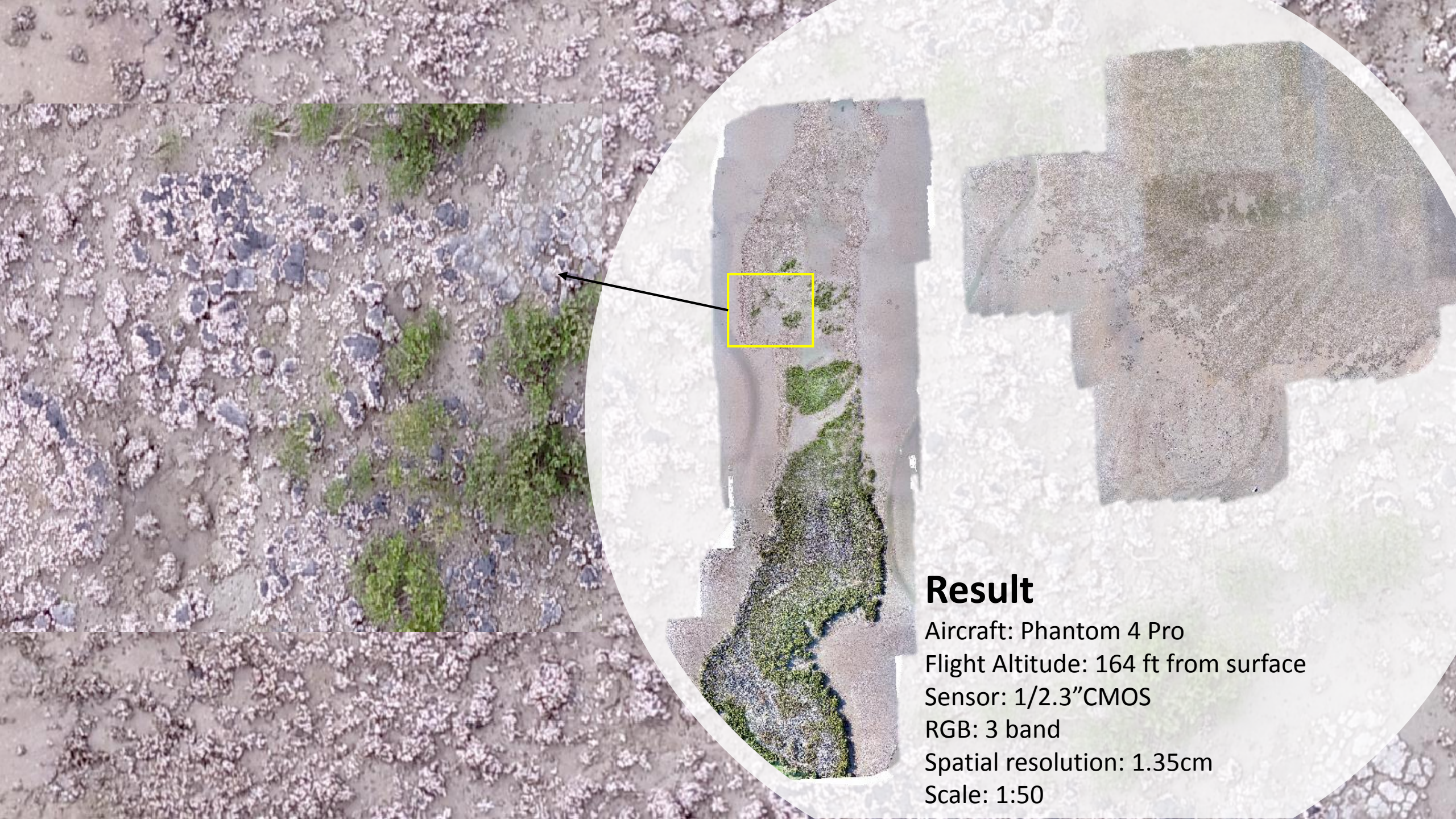
# Image Scale

**RPAS imagery:** 3 band RGB  
imagery

Spatial resolution: 1.35cm

**Pixelated at a Scale  
1:10**





## Result

Aircraft: Phantom 4 Pro

Flight Altitude: 164 ft from surface

Sensor: 1/2.3" CMOS

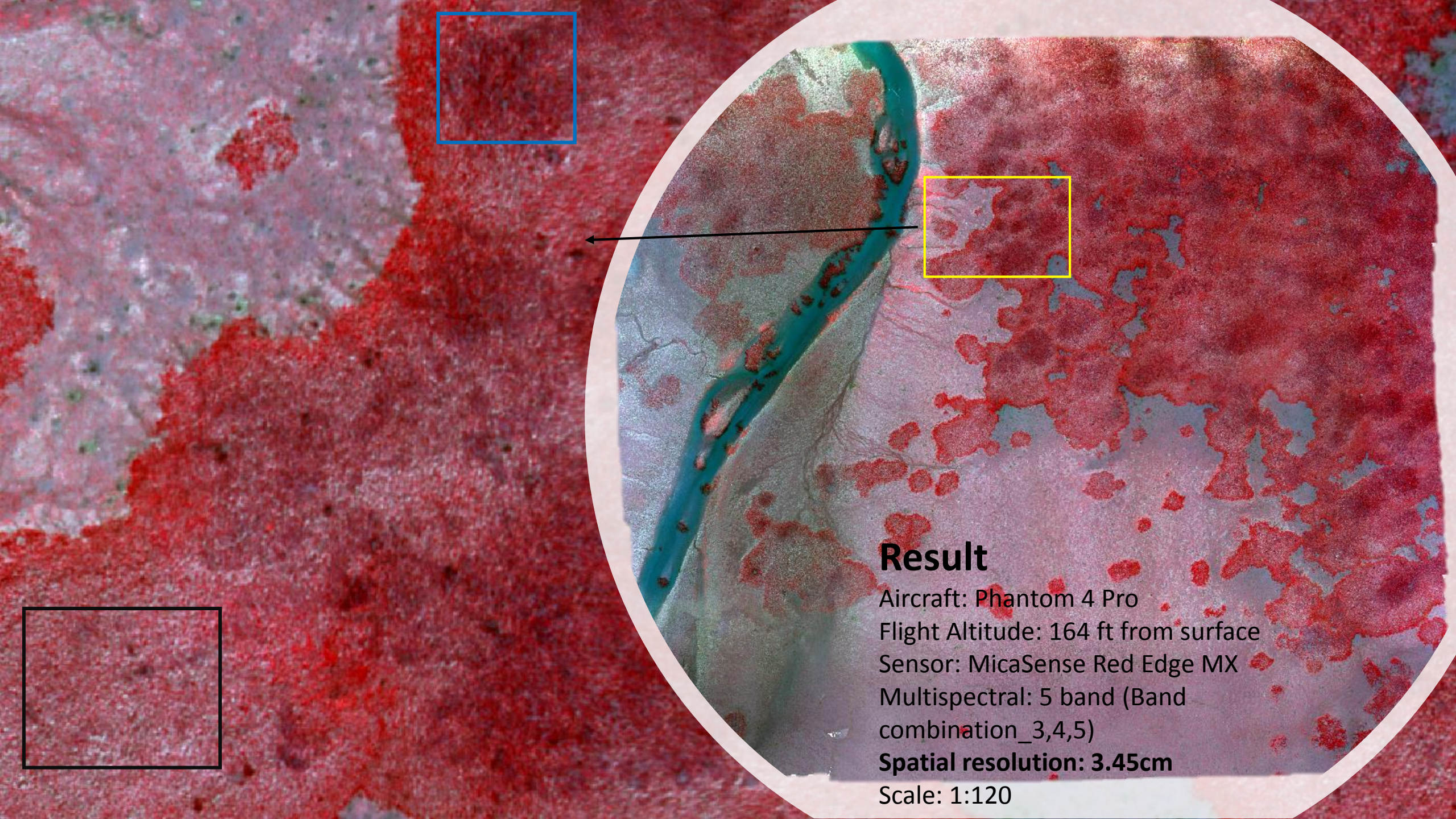
RGB: 3 band

Spatial resolution: 1.35cm

Scale: 1:50



NZ aerial mapping: Aerial image  
RGB: 3 band  
Spatial resolution: 50cm  
Scale: 1:250



## Result

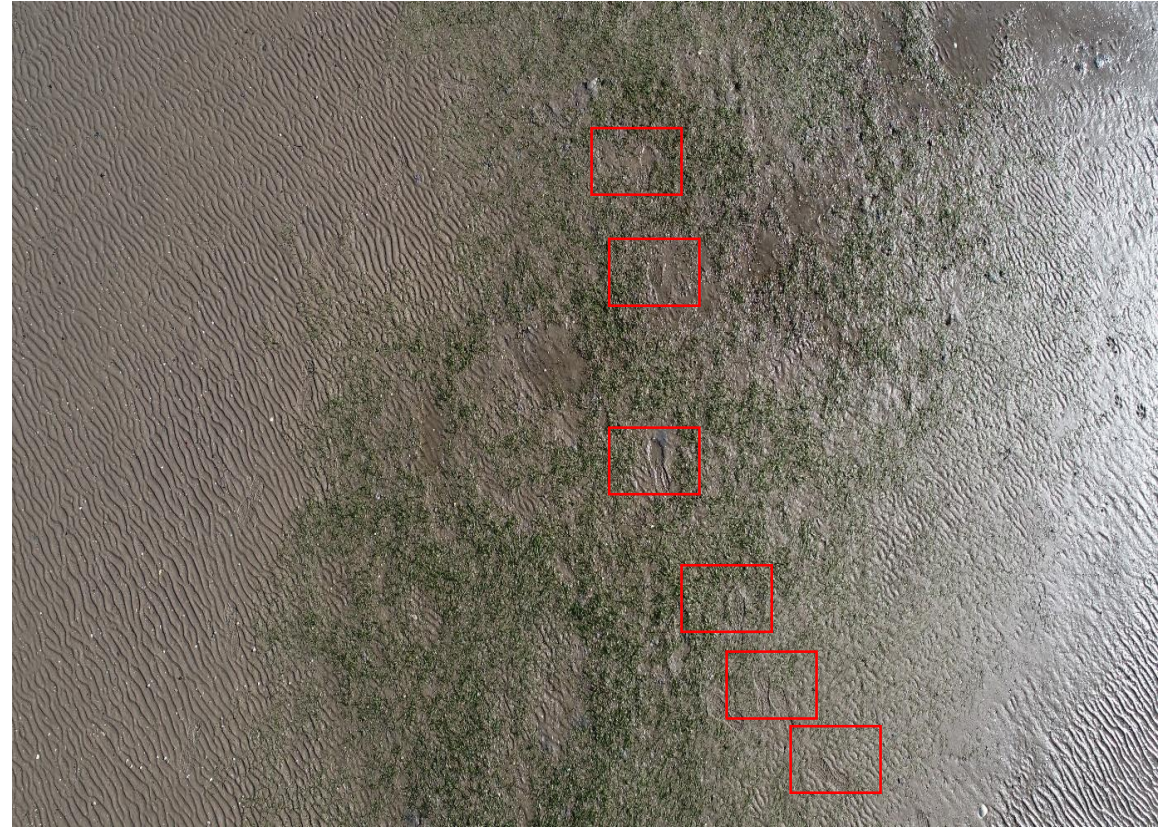
Aircraft: Phantom 4 Pro  
Flight Altitude: 164 ft from surface  
Sensor: MicaSense Red Edge MX  
Multispectral: 5 band (Band combination\_3,4,5)  
**Spatial resolution: 3.45cm**  
Scale: 1:120



NZ aerial mapping: aerial image  
RGB: 3 band  
Spatial resolution: 50cm  
Scale: 1:250

# Conclusion

- RPASs offers a rapid and inexpensive tool to produce high-resolution orthomosaics, giving ecologists a new way for responsive, timely, and cost-effective technique for monitoring of ecologically sensitive habitats
- Increase efficiency for on demand sampling and surveying in the marine environment considering tidal variations
- Minimize or avoid human footprint on these ecological sensitive habitats during ground surveys.



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**Ngā mihi (Thank You!)**