

# TESTS OF DRONES IN DENMARK

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# Limfjorden

- 8 islands

Covered in two days (including counts of birds from the ground)

# The Wadden Sea

- Sneum Engsø
- Langli



# EQUIPMENT AND PROCEDURES

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- 3DR Solo. GoPro Hero 4. Black.
- Easy to transport in a back-pack
- Flight height 25-35 m (besides overview photos)
- Camera at app. 40° (easier to navigate)
- The drone was flying at a distance of up to 550 m
- Possible in wind up to 8-9 m/s
- Duration of flights:
  - 6-14 min. before battery shift





# EQUIPMENT AND PROCEDURES

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- Video streamed to notepad
- Location of the drone visible on a satellite map
- GoPro in Gyro (stability when taking photos)
- Video quality at 2.7K
- 60 fps => still photos at 2704x1520
- 30 fps => still photos at 3840x2160 (best)



# SNEUM ENGSØ – Black-headed gull

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# Sneum Engsø – Black-headed Gull

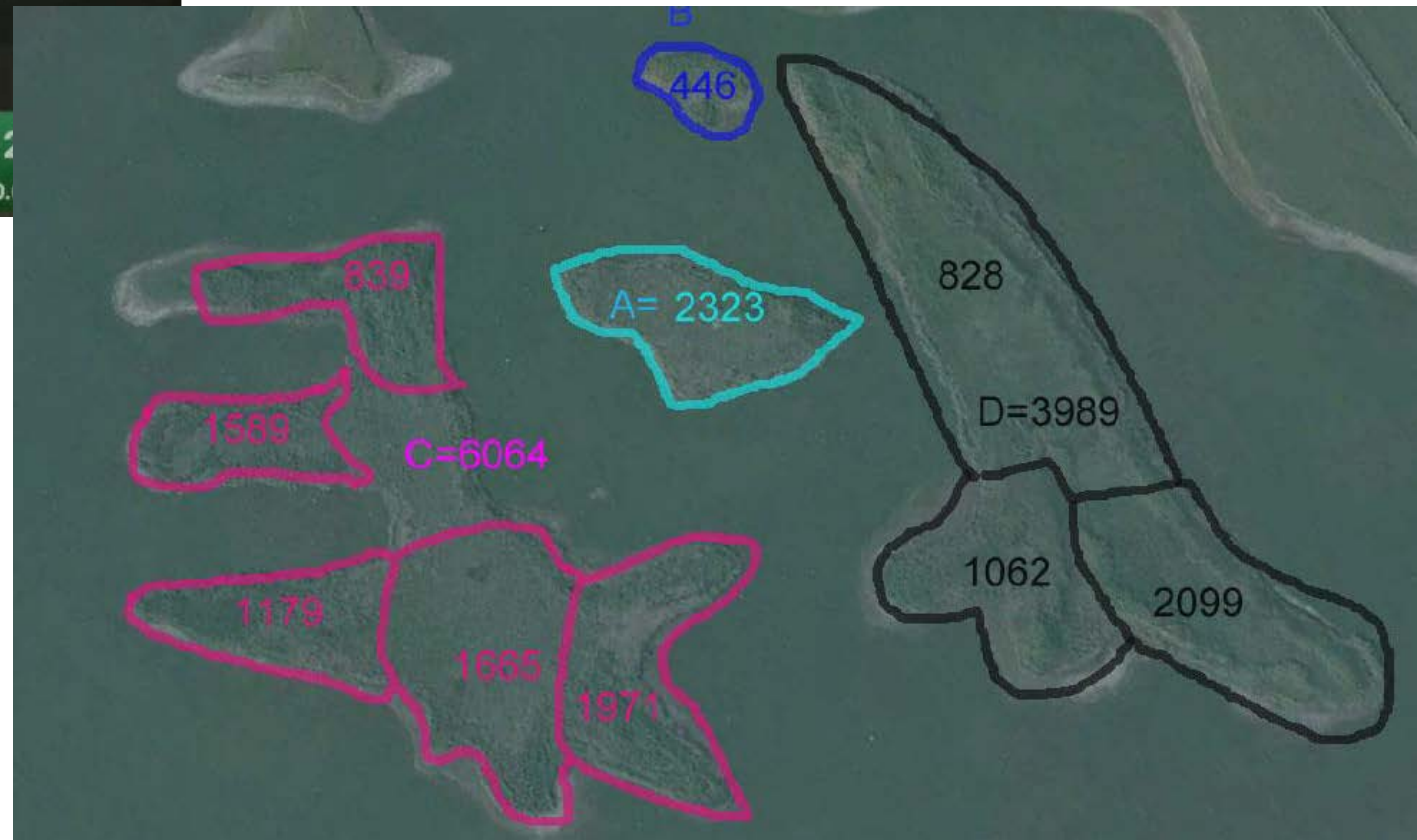






## Sneum Engsø - Black-headed Gull

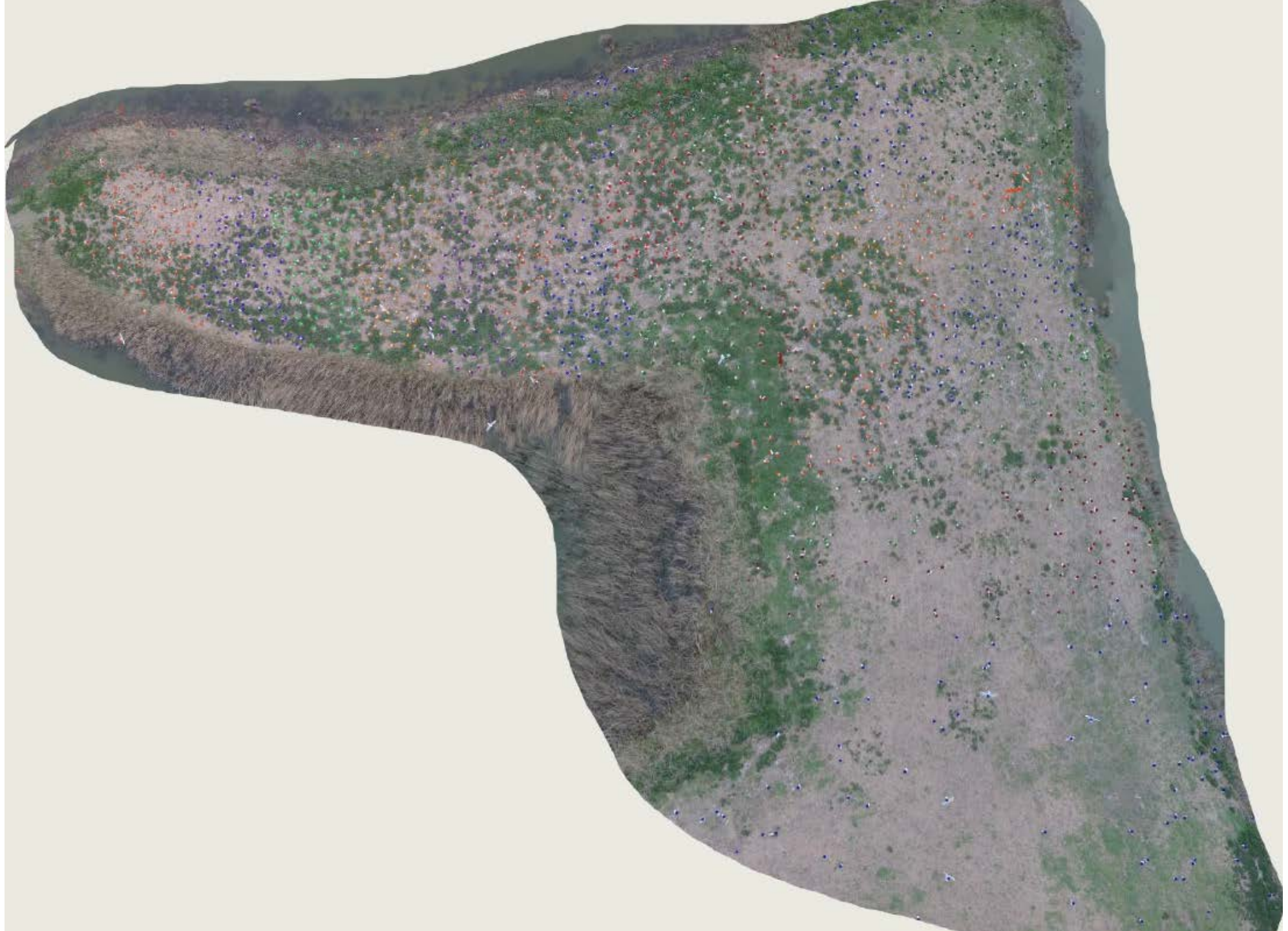
Handling of photos + counting of birds  
= 12 hours



# Sneum Engsø

8 photos  
stitched

Manual count  
1800 BHG





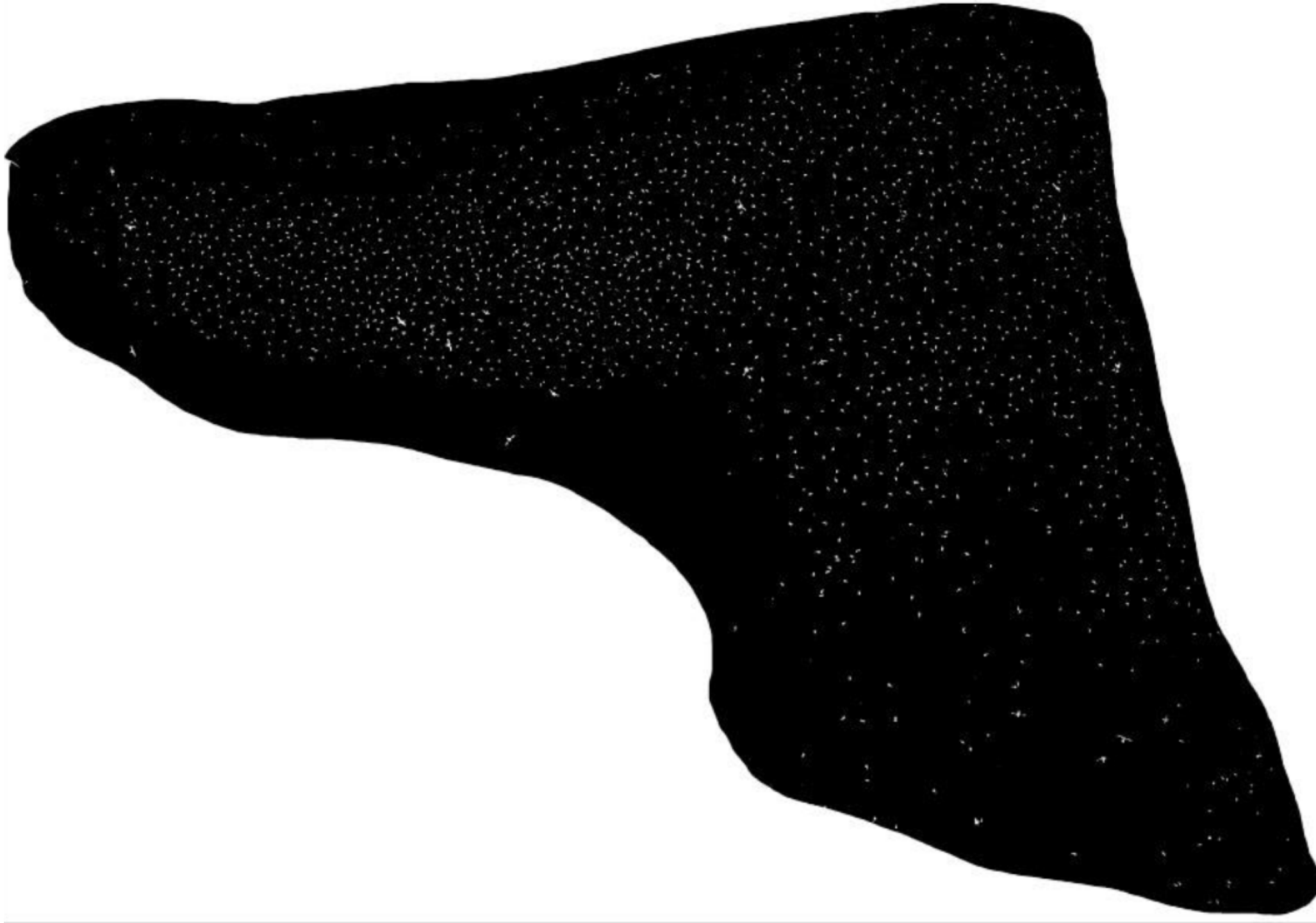
# Sneum Engsø

6 automatic  
counts:

1561-2803

one count =  
1763

1800 BHG

















# Sneum Engsø

## Black-headed Gull

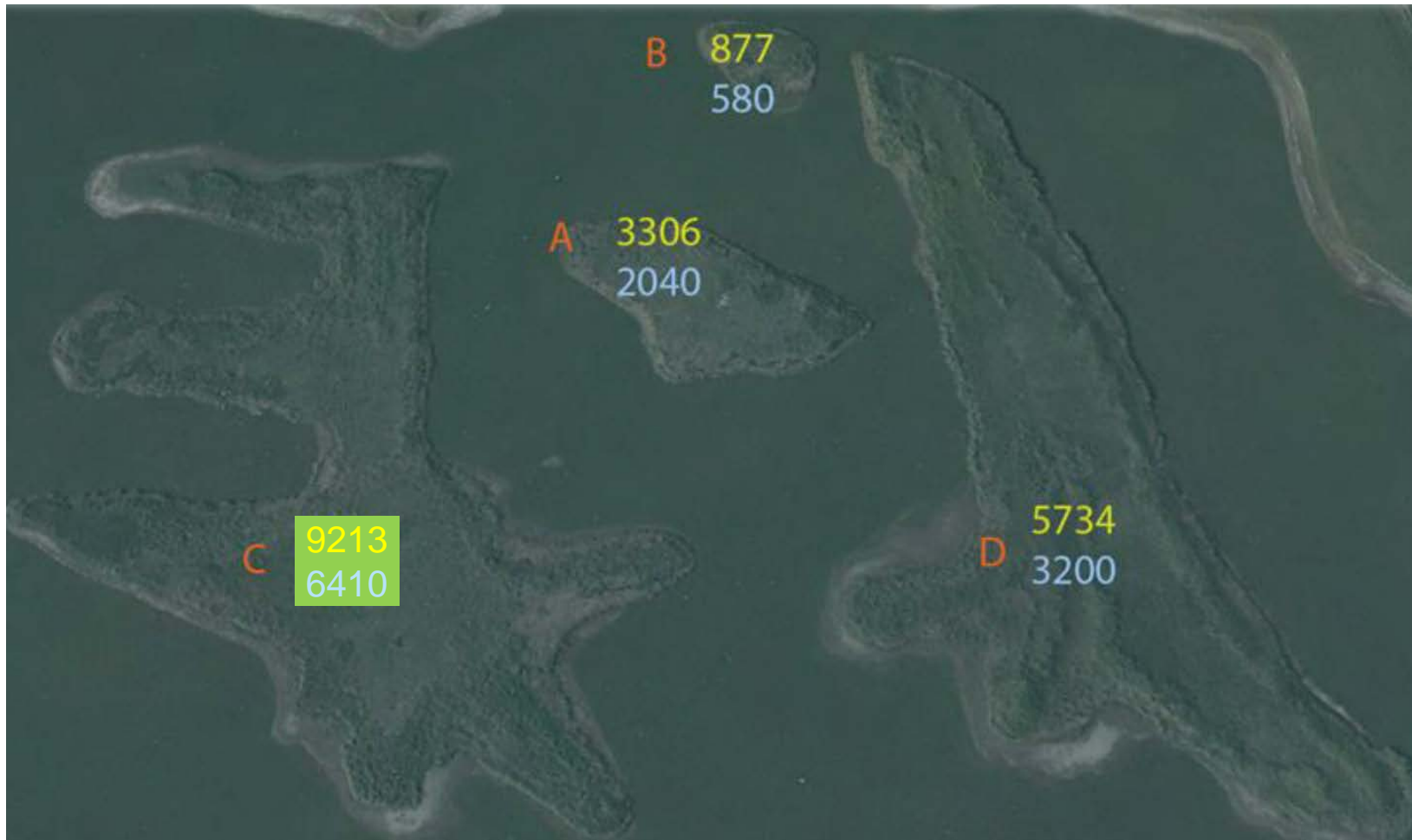




# GROUND COUNTS







## Total numbers of birds

Count from dike      10190

Drone photos      15824

⇒ **64%** of those present  
were counted by  
the standard method

# THE ISLAND OF LANGLI





# Langli

- 40 m height
- Spoonbills on nests
- Barnacle Goose on nest









**Langli**

10 m height





**Langli – 2,5 km long**





# LIMFJORDEN









# Vår Holm

30 m height  
only a section of the photo





# Hornsgård Holm

Spoonbills on nests





# Fruens Holm

3911 Herring Gulls

32 Lesser Black-backed Gulls

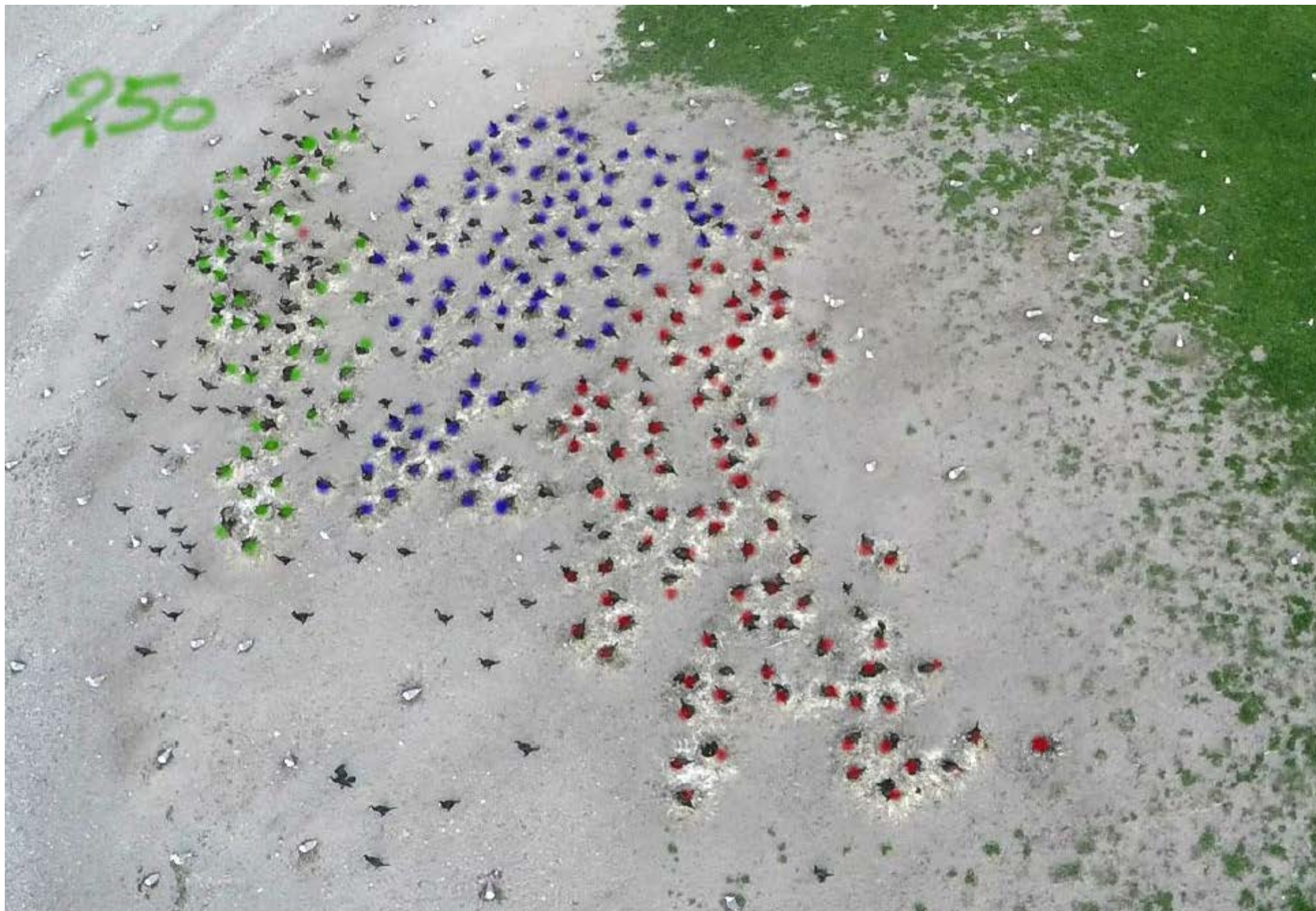




# Counts of Herring Gulls - Limfjorden

Ground count	Drone count	% counted at ground count
2230	3057	73
1970	3464	57
1530	1877	82
3770	3911	96
2630	4114	64

















Common Gull

Herring Gull

Oystercatcher

Common Eider



# DISTURBANCE





# CONCLUSIONS

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- Highest photo quality – not full sunshine and not totally clouded
- Check the films and photos immediately before leaving the island
- Supplementary observations from the ground
- 53-95% of the Black-headed Gulls and Herring Gulls were counted when using traditional methods (ground counts)
- In general when tested, Herring Gulls and Lesser Black-backed Gulls stayed on the ground as long as the drone was >7-10 m from the ground. Keep it from 15 m and up.
- Roosting Brent Geese reacted but incubating and nest attending Barnacle Geese did not
- Highly applicable to count Cormorants and Spoonbills and these species did not respond at the applied flying heights
- Conduct ground counts and drone flying at the 'same' time



# Thank you

