

# Preliminary results on the spatio-temporal distribution of tuna at Cross Seamount

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# Objective

- Acoustic study of the spatial and temporal distribution of tuna at Cross Seamount
  - Time period(s) during which the spatial distribution of tuna is stable
  - Implementation of appropriate acoustic survey to conduct quantitative studies



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# Materials and methods

- Acoustic sampling
- Characterisation of tuna targets
- Maps of tuna distribution



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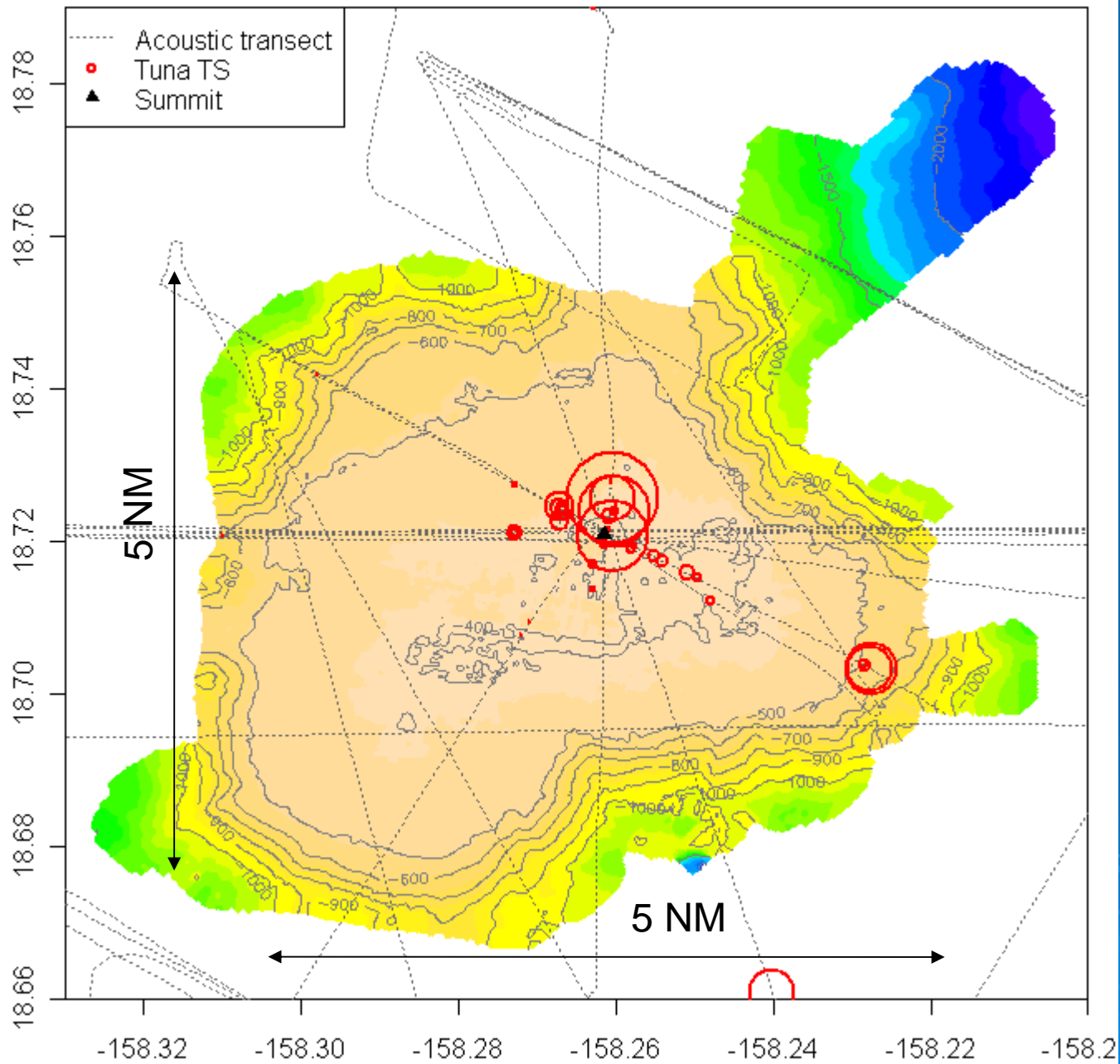


# Acoustic sampling

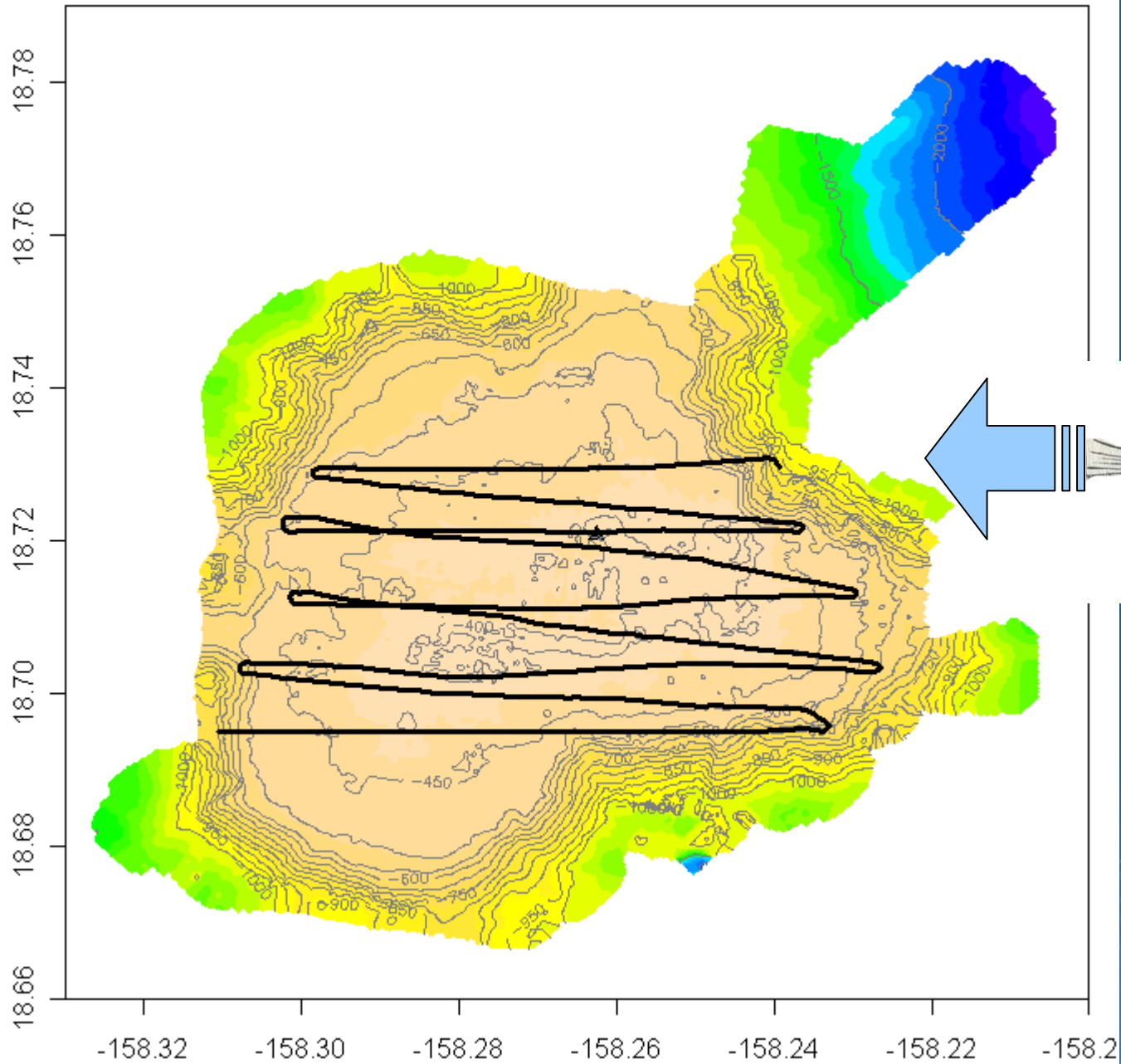
- Scientific cruise 04/21/07-05/13/07
  - NOAA 70 m vessel O.E. Sette,
  - Scientific echosounder Simrad EK60, 38-120 kHz
- Acoustic performance
  - Very silent ship but acoustic detection harmed by air bubbles generated by ship motion
  - Survey speed: 4 knots
  - Acoustic sampling limited in case of choppy sea conditions



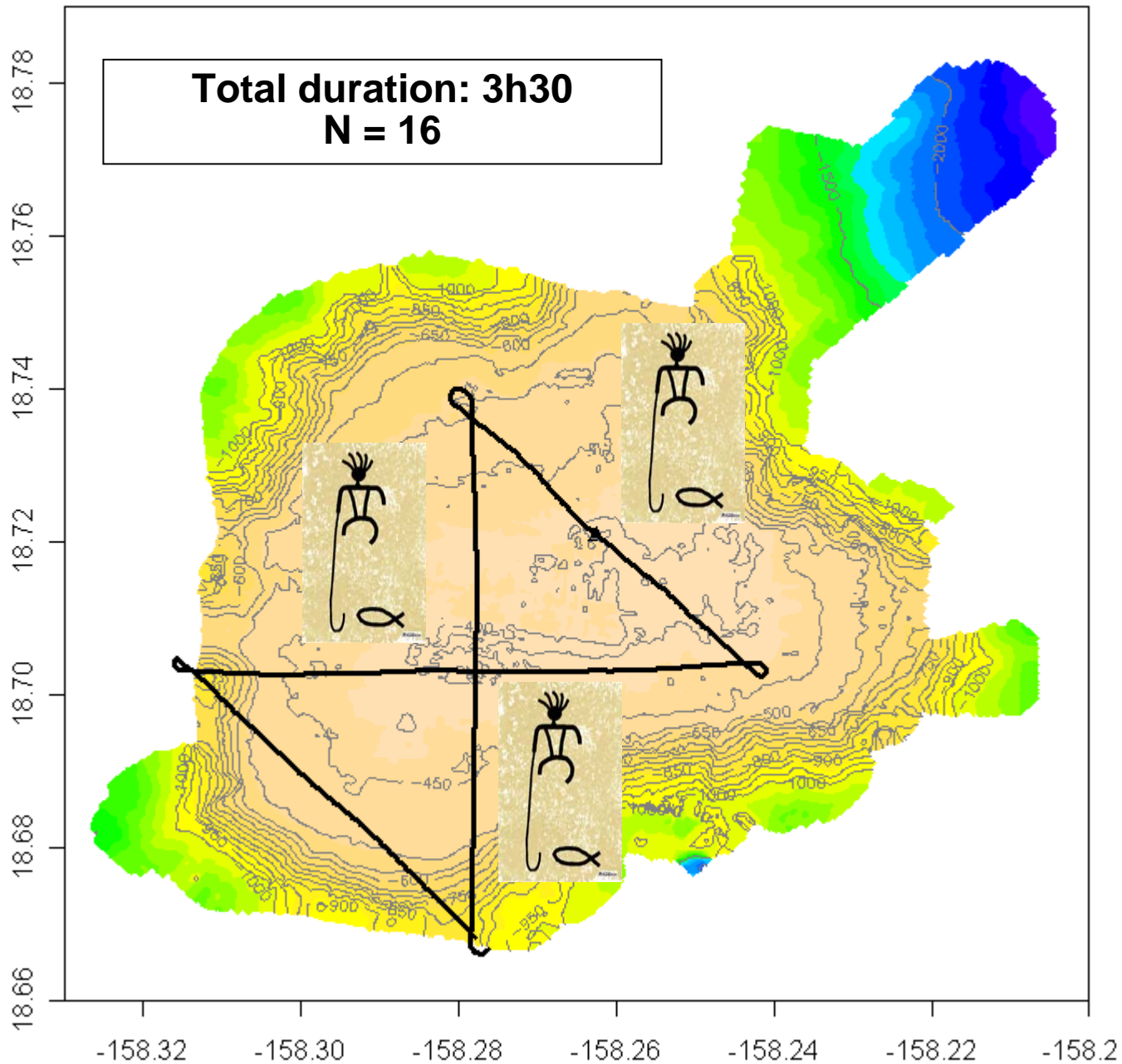
# Cross seamount, 120 kHz TS



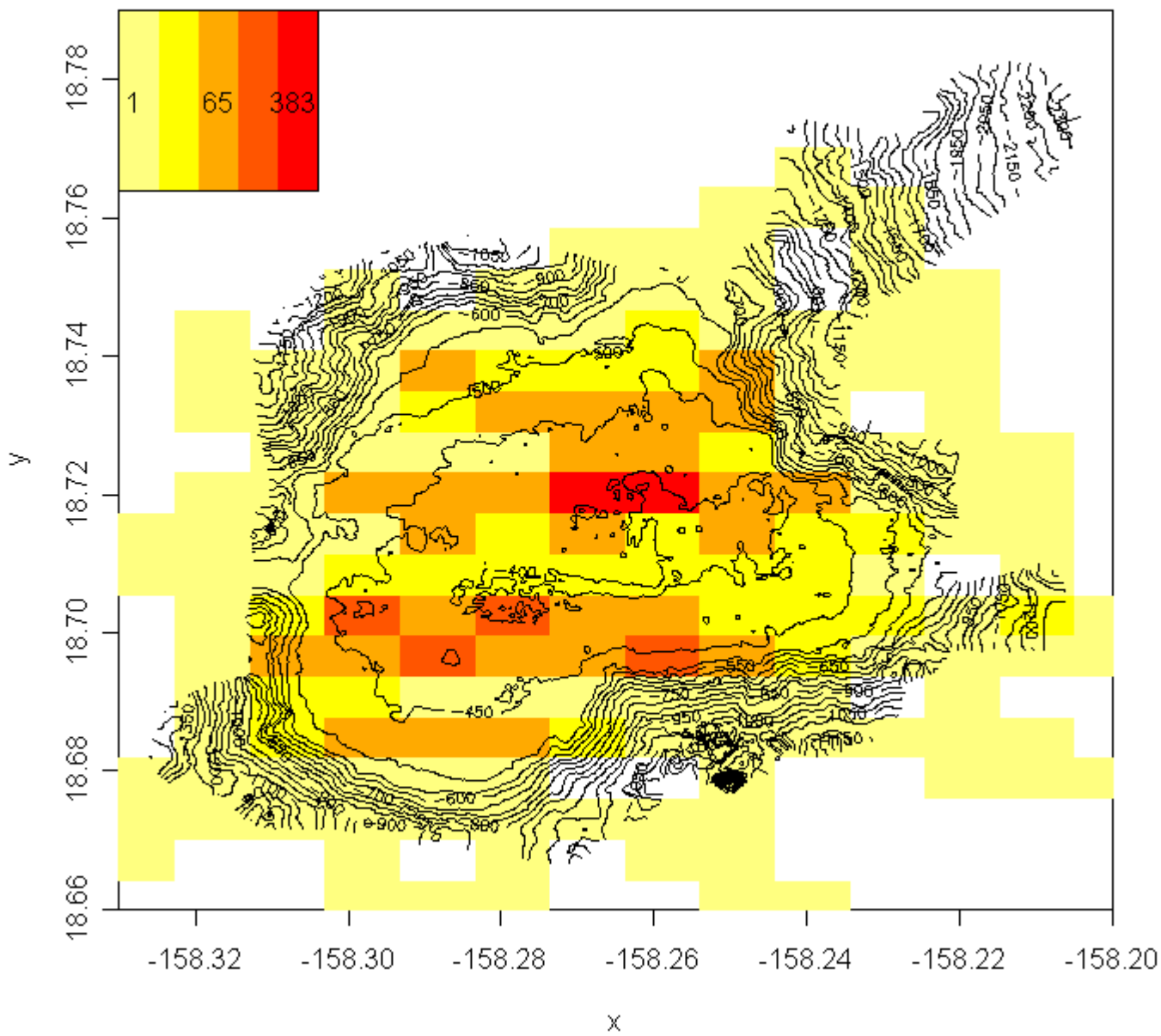
# Zig-zag survey



# Cross survey



# Number of night-time samples



# Selection of tuna targets

- Two types of targets:
  - scattered fish (Target Strength: TS)
  - tuna aggregation
- No groundtruthing for target allocation
- Target allocated according to:
  - acoustic descriptors: energetic, positionnal and morphological criteria
  - prior studies on fish distribution at Cross seamount:
    - fisheries study: Itano (2004)
    - archival tags: Musyl et al. (2003)



# Mapping

- Abundance of scattered and shoaling tuna aggregated in 40 m Elementary Sampling Units (ESU) for each survey
- Abundances in each ESU averaged into 400 X 400 m cells over all surveys
- Abundance maps based on cells with similar sampling effort
- Gravity center and inertia



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# Results

- Acoustic target characterisation
- Average spatial distribution of tuna over all surveys
- Average spatial distribution of tuna over a diel cycle

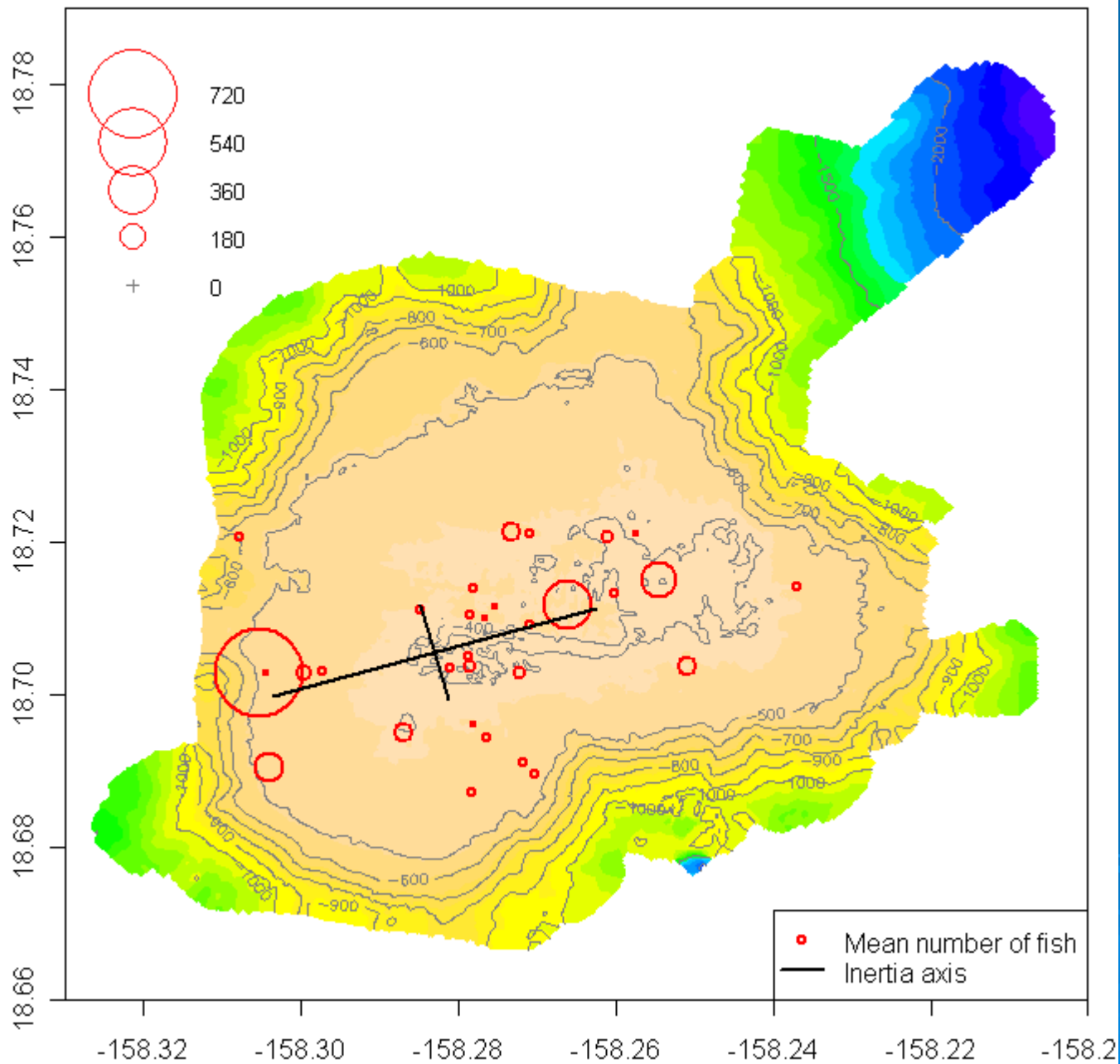


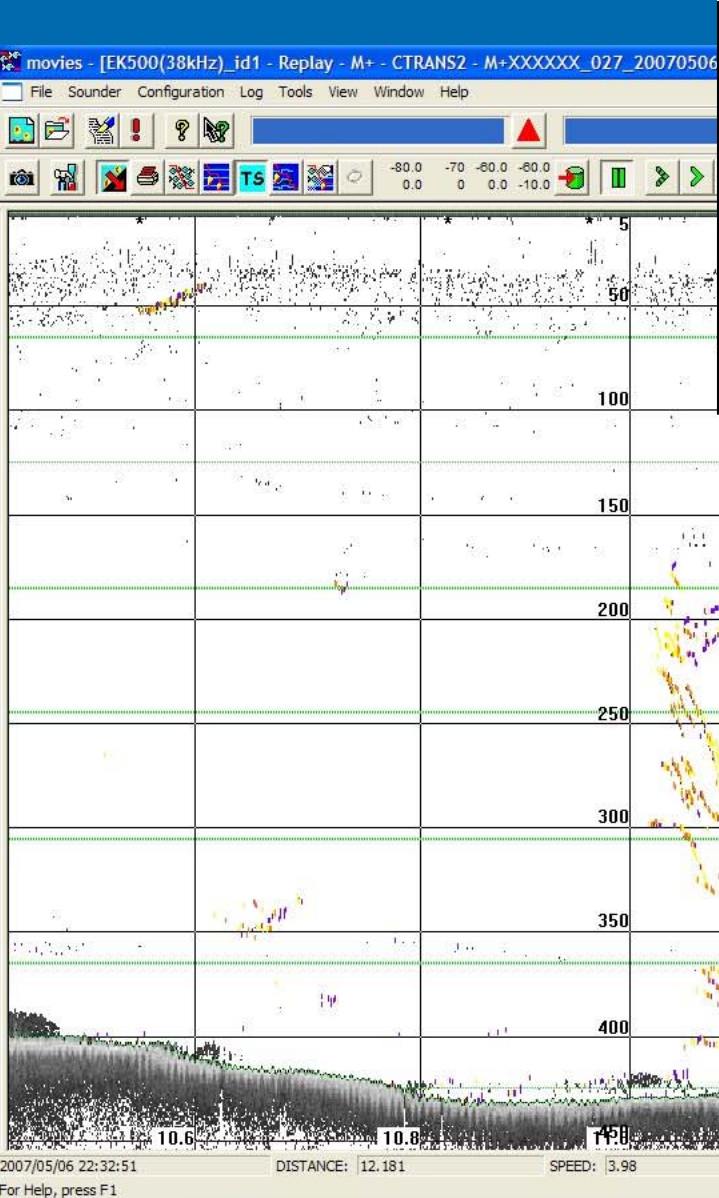
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# Tuna aggregations detected during all suveys (38kHz)

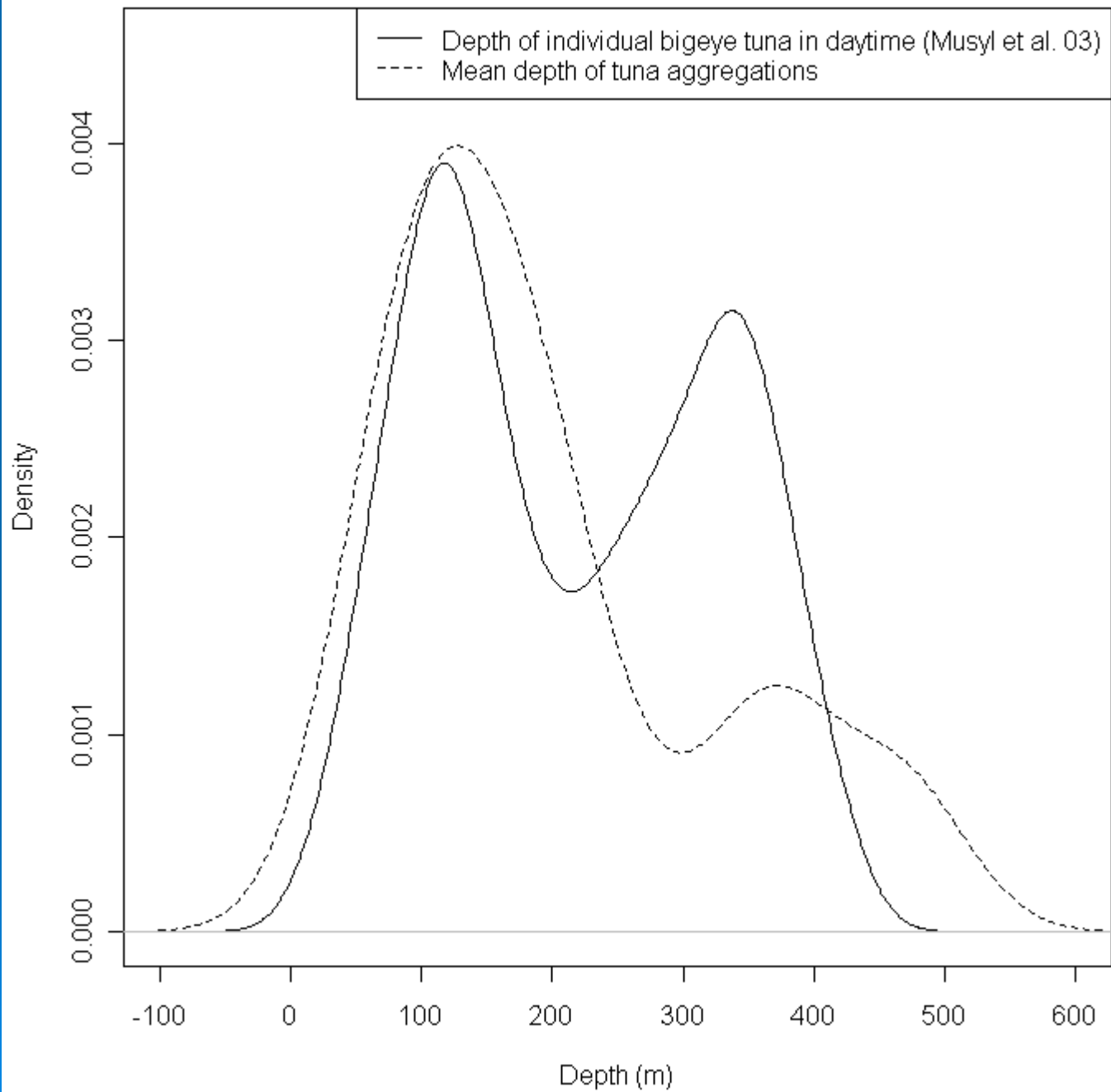




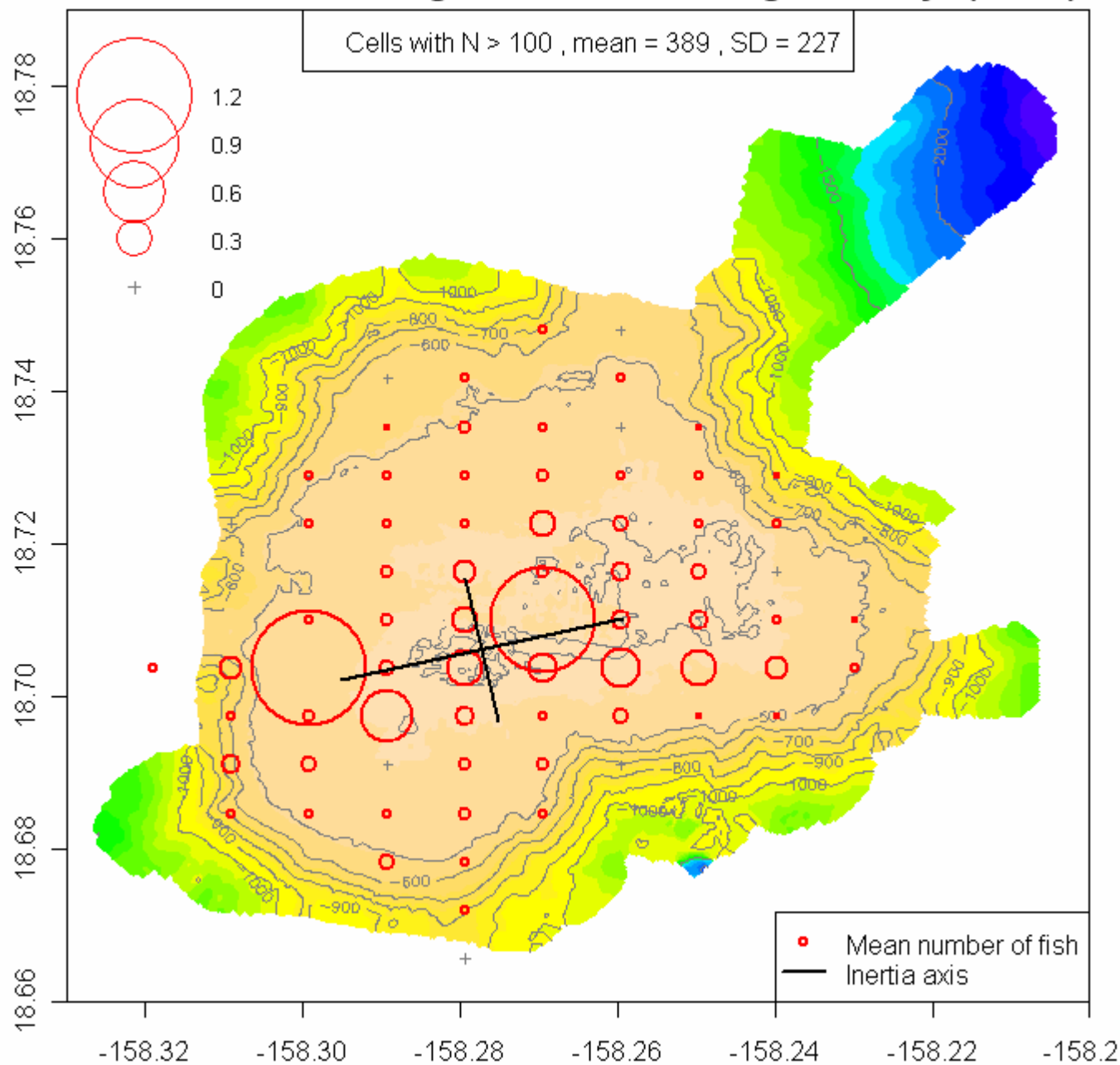
Aggregation descriptors, N = 34	Mean	SD
Max. height (m)	111	56
Max. length (m)	189	95
Min. depth (m)	97	81
Max. depth (m)	205	104
Mean depth (m)	200	127
Nb. of fish	83	143

2007/05/06 22:32:51      DISTANCE: 12.181      SPEED: 3.98      GPS: 18°42.1989N - 158°16.2699W      HEADING: 271      PING: 778769      DEPTH: 407.83

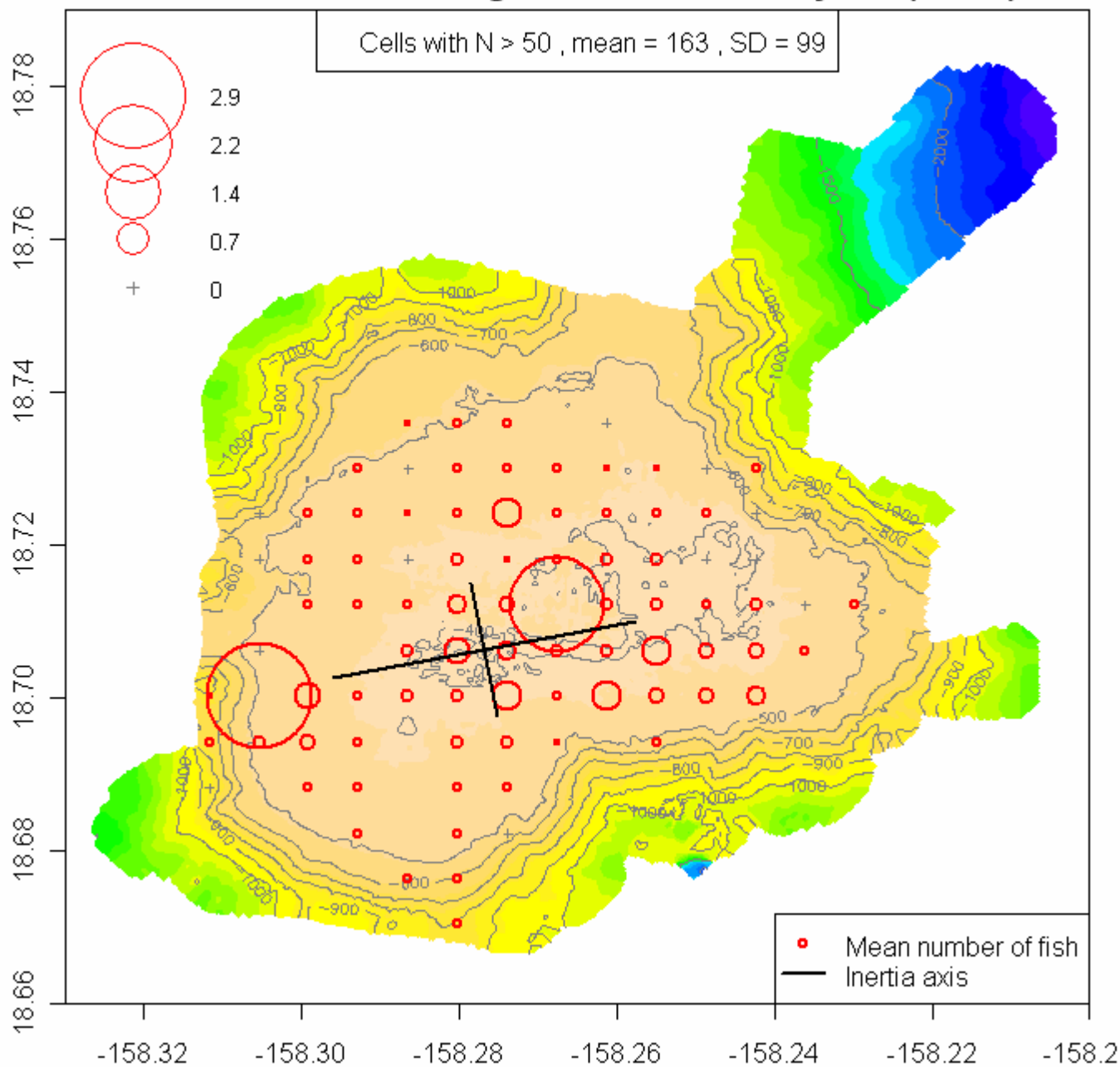




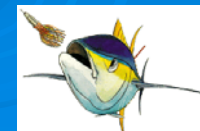
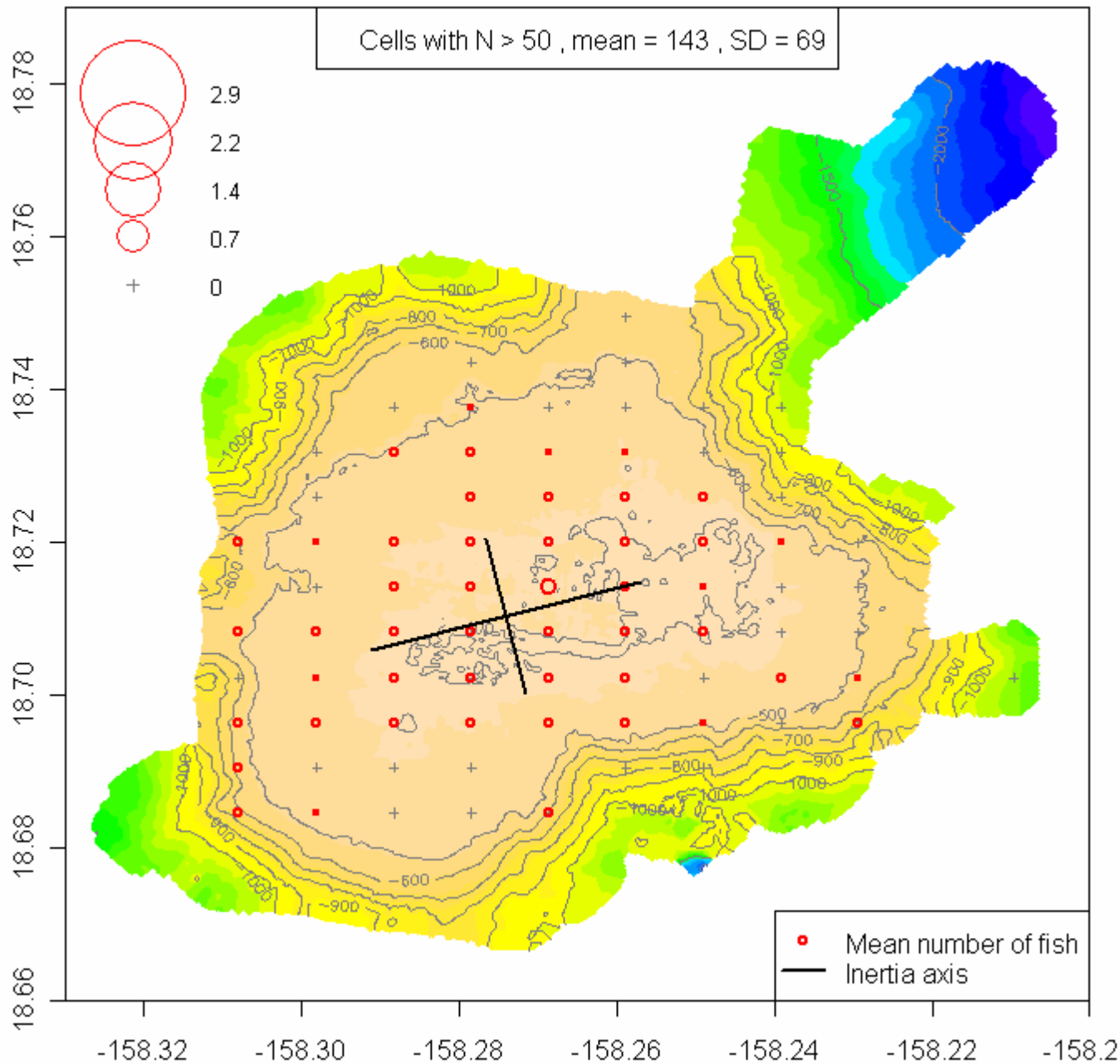
# Mean abundance of large fish detected during all surveys (38kHz)



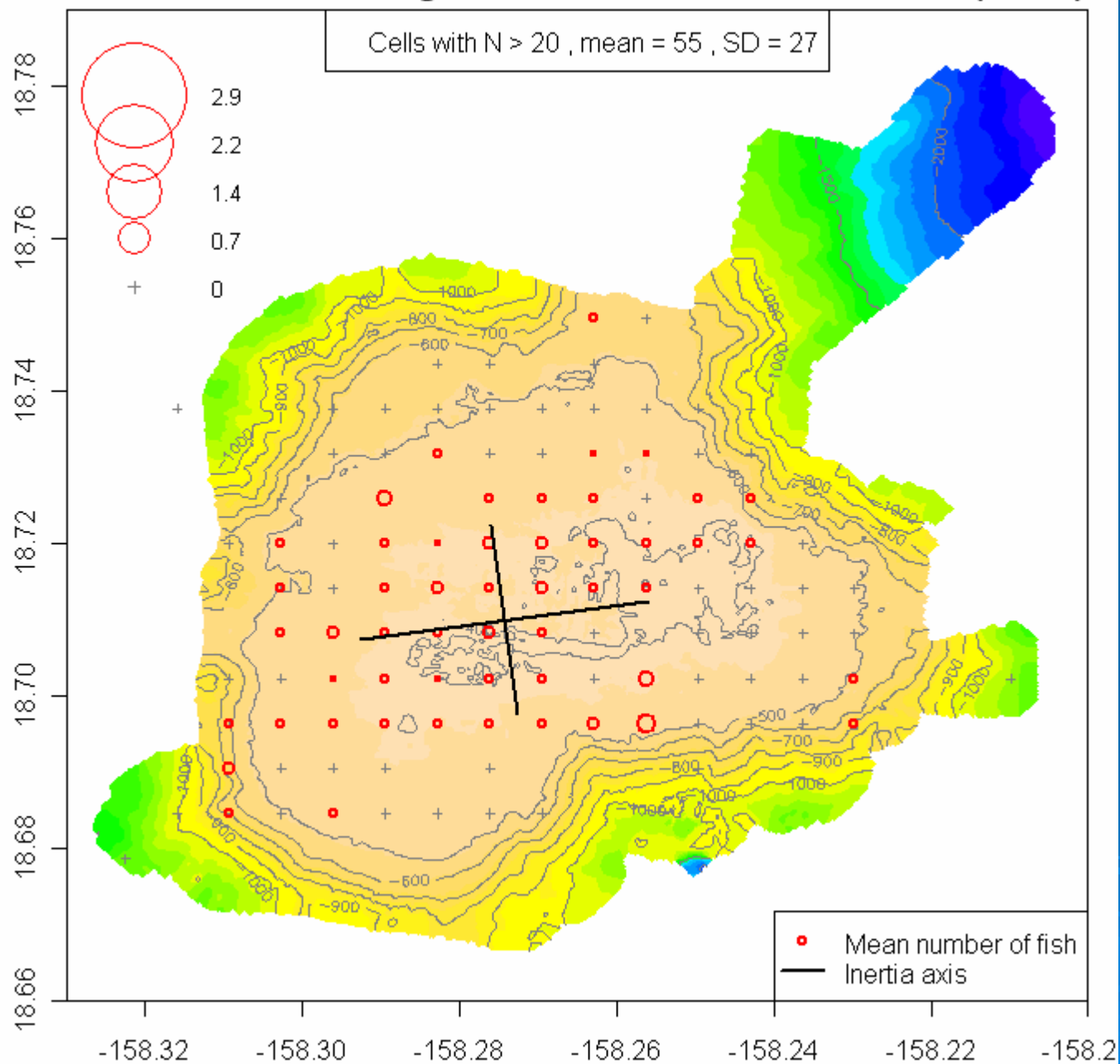
# Mean abundance of large fish detected in daytime (38kHz)



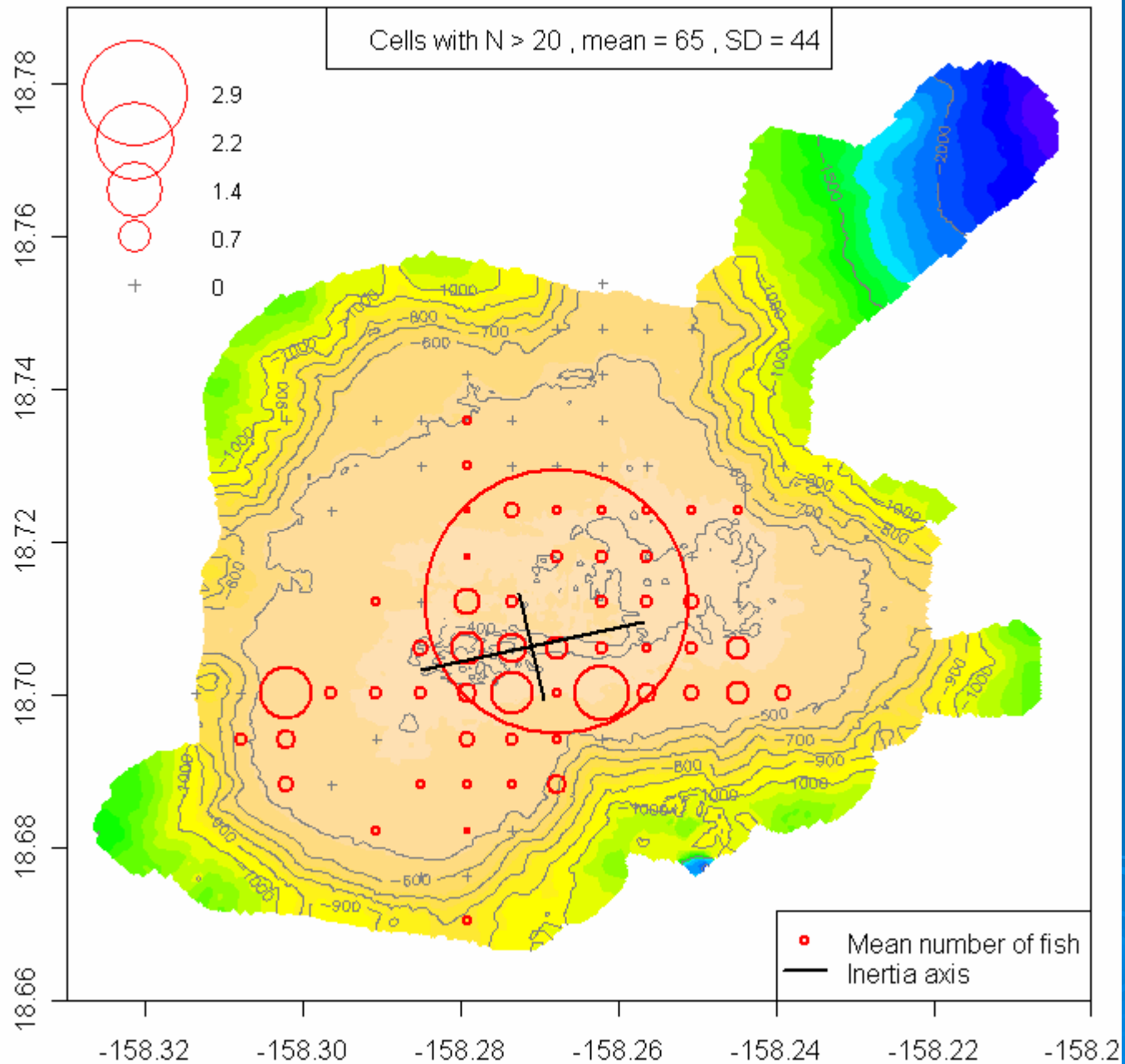
# Mean abundance of large fish detected in night-time (38kHz)



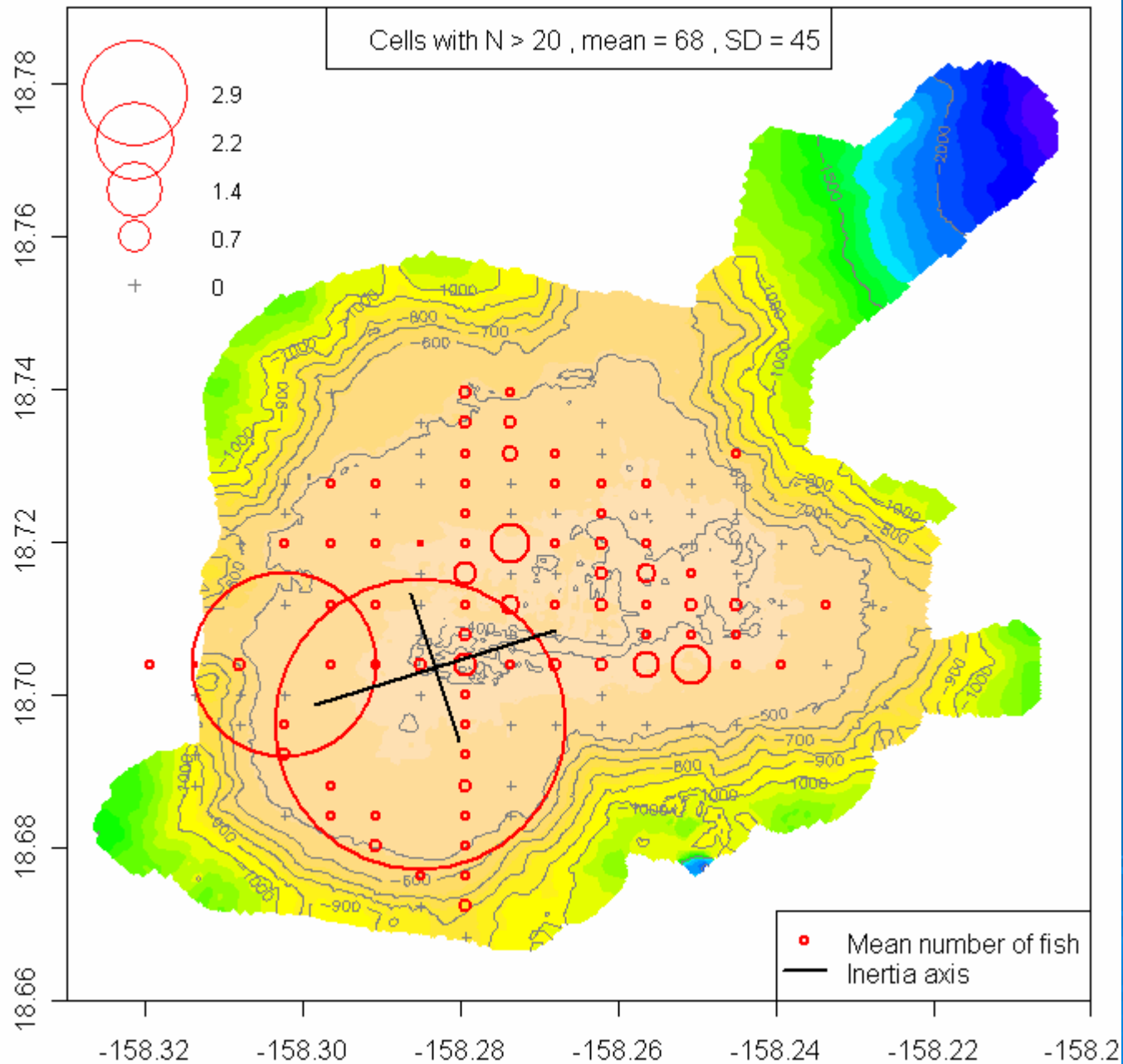
# Mean abundance of large fish detected from 00:00 to 06:00 (38kHz)



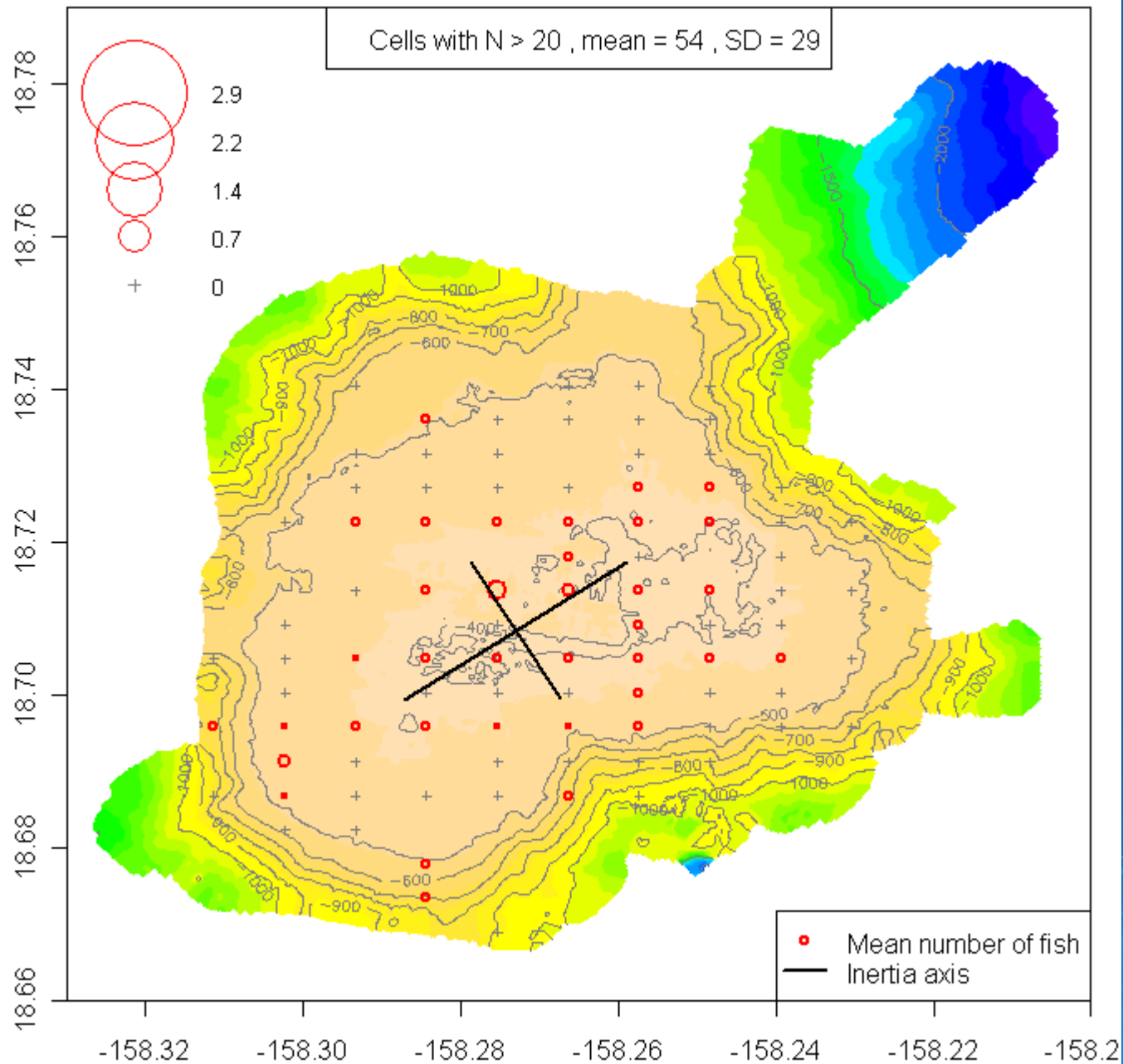
# Mean abundance of large fish detected from 07:00 to 12:00 (38kHz)



# Mean abundance of large fish detected from 12:00 to 18:00 (38kHz)



# Mean abundance of large fish detected from 19:00 to 00:00 (38kHz)



# Conclusions

- First insight into the spatio-temporal distribution of tuna at Cross Seamount
  - Diel cycle
  - Day to day variability
  - Deep shoaling behavior
- Assessment of tuna spatio-temporal distribution at Cross Seamount requires:
  - Fast and stable acoustic platform
  - Complementary identification tools

