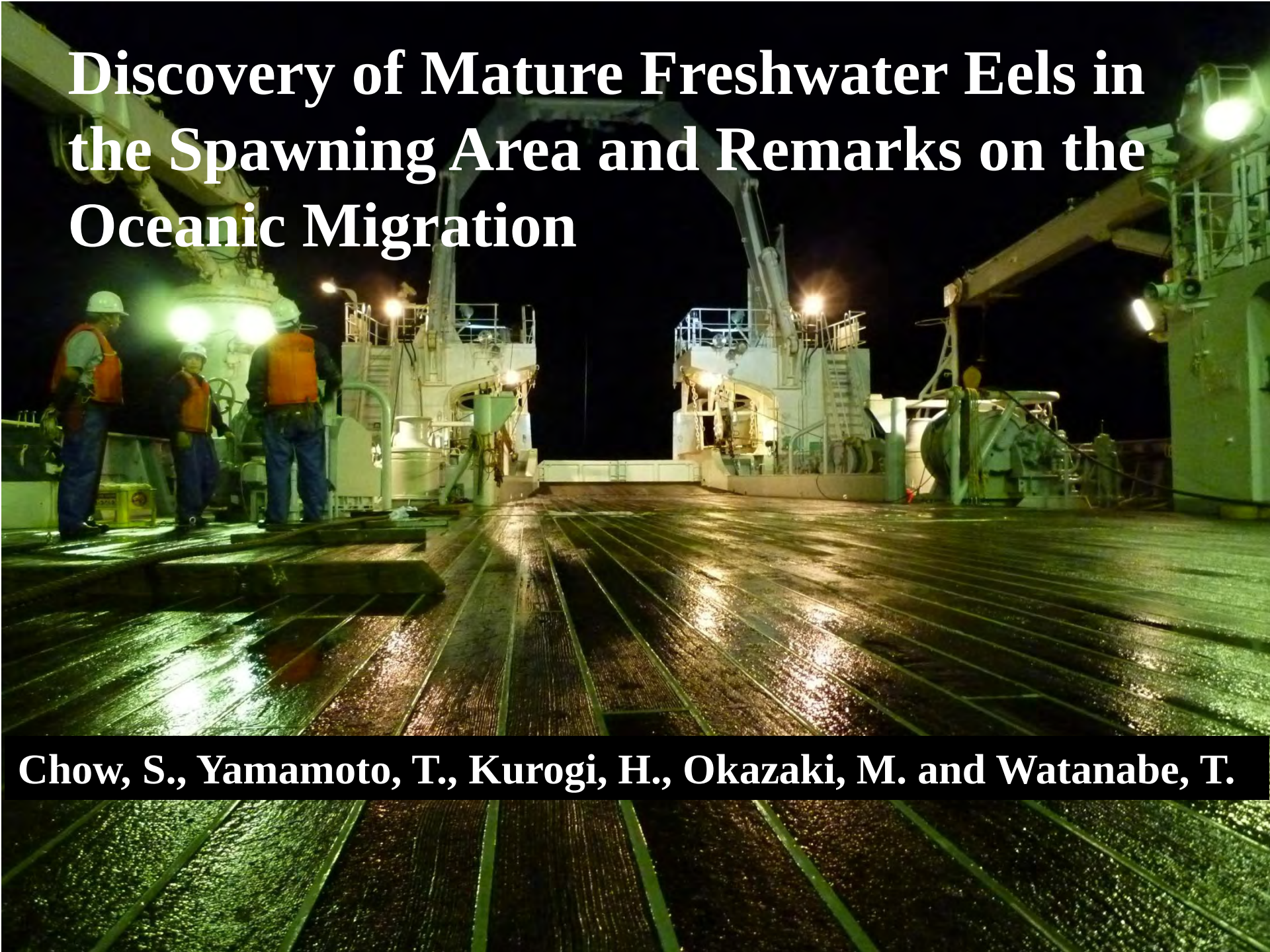
Discovery of Mature Freshwater Eels in the Spawning Area and Remarks on the Oceanic Migration

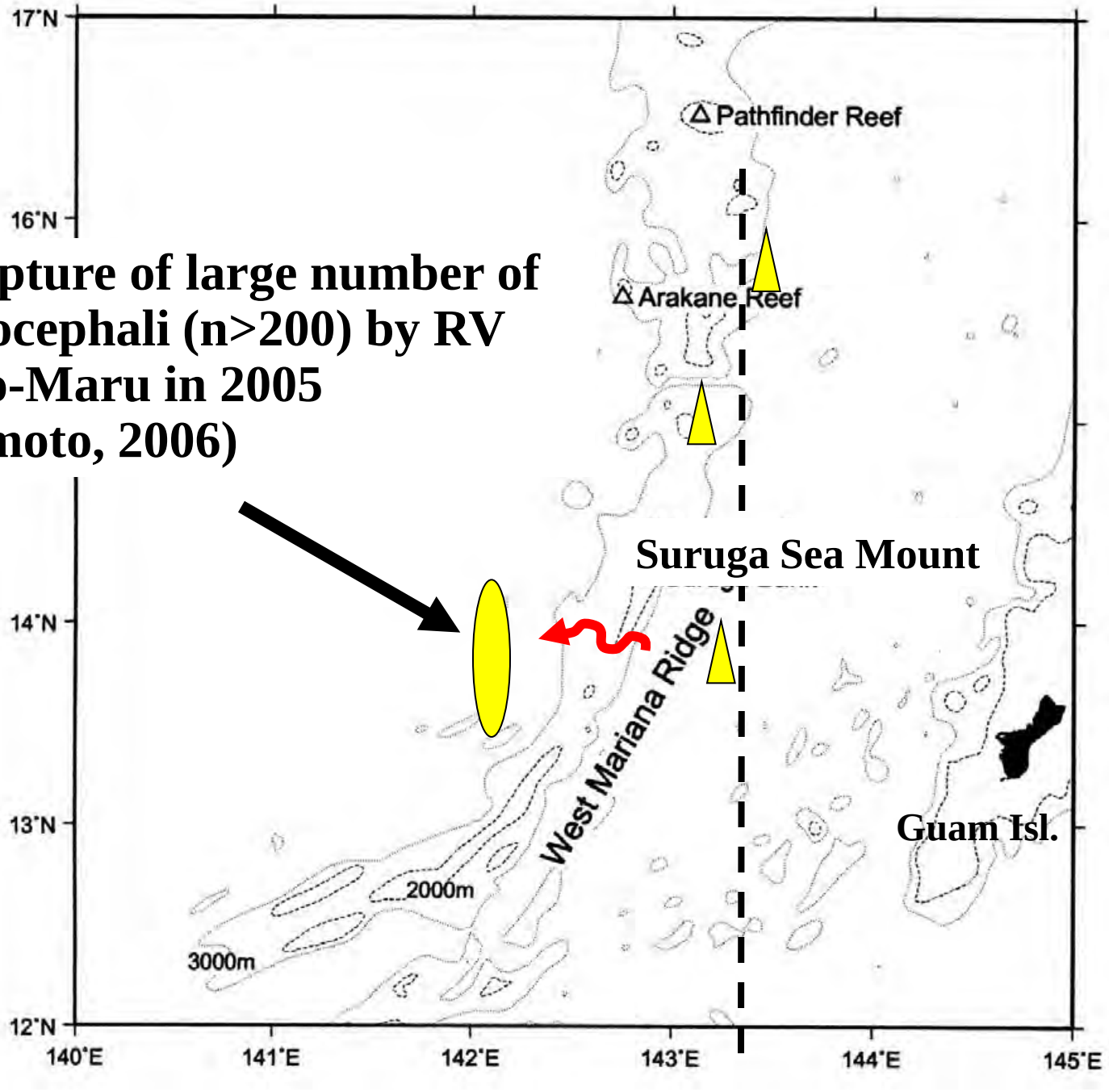


Chow, S., Yamamoto, T., Kurogi, H., Okazaki, M. and Watanabe, T.

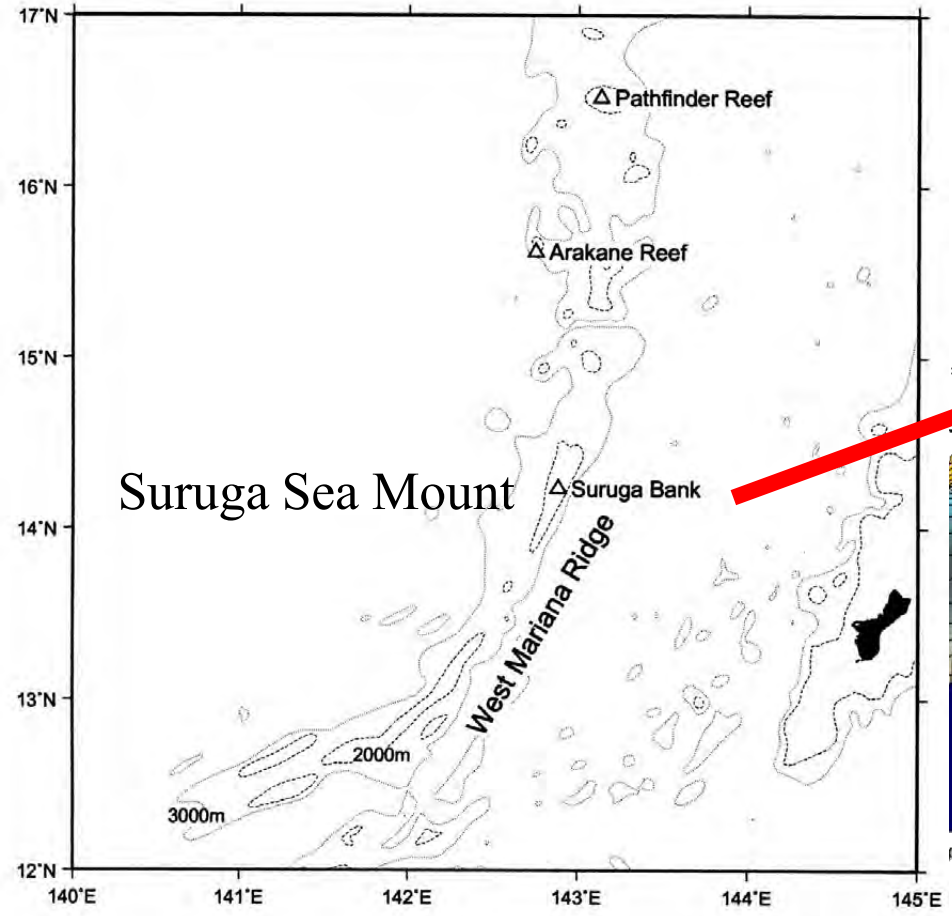
Everybody thought it to be a mission impossible.
But it started anyway since 2008.

RV Kaiyo-Maru（2,630 ton）
Fisheries Agency

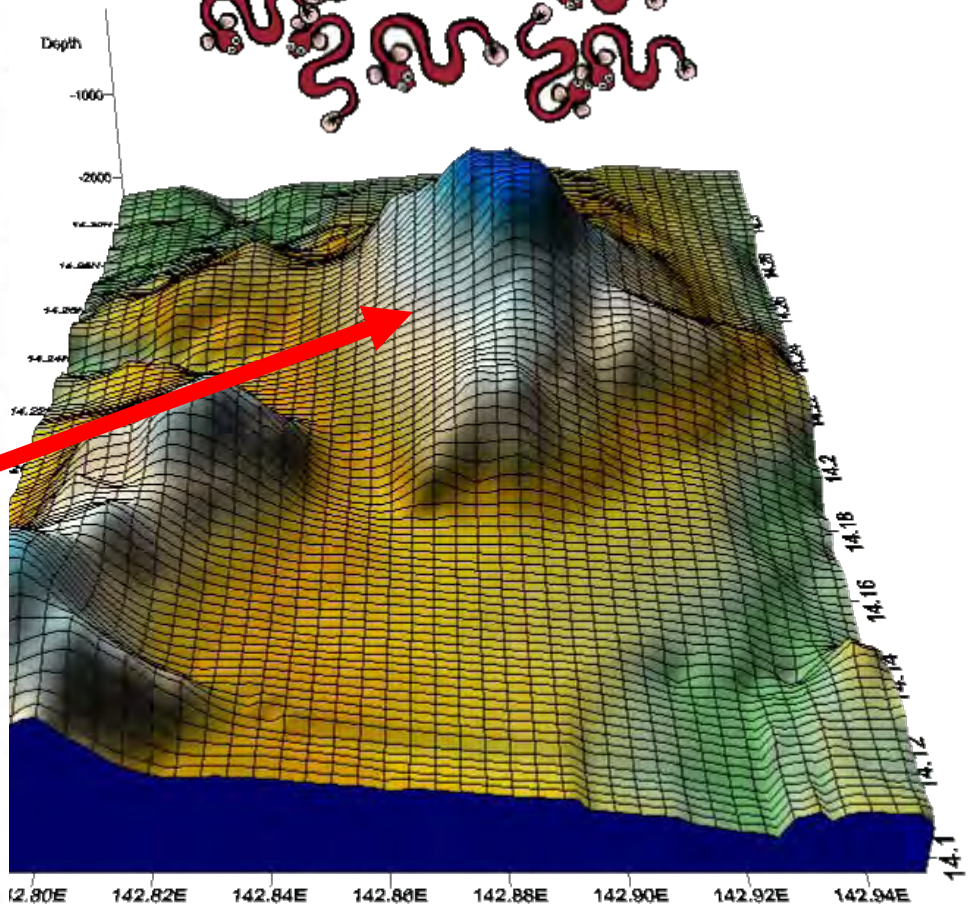
First capture of large number of preleptocephali (n>200) by RV Hakuho-Maru in 2005 (Tsukamoto, 2006)



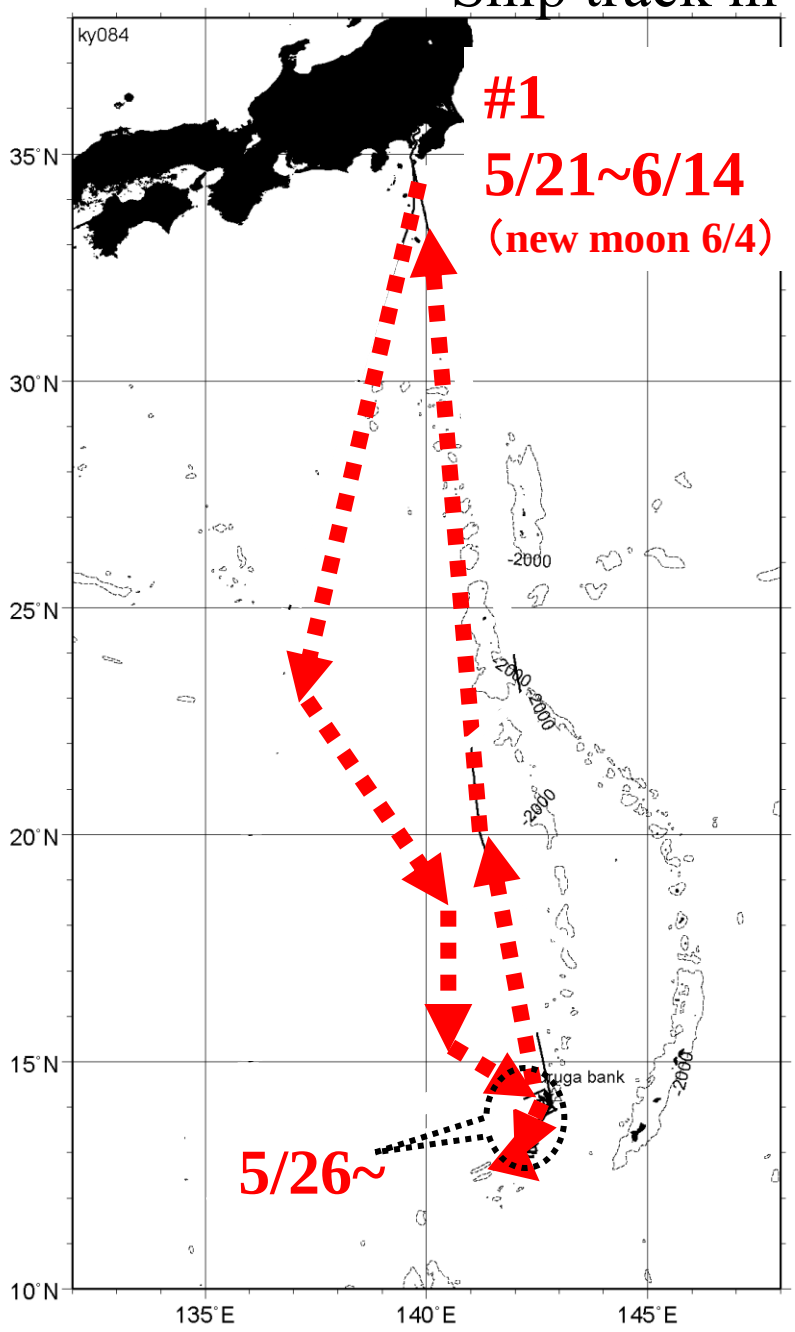
New Moon

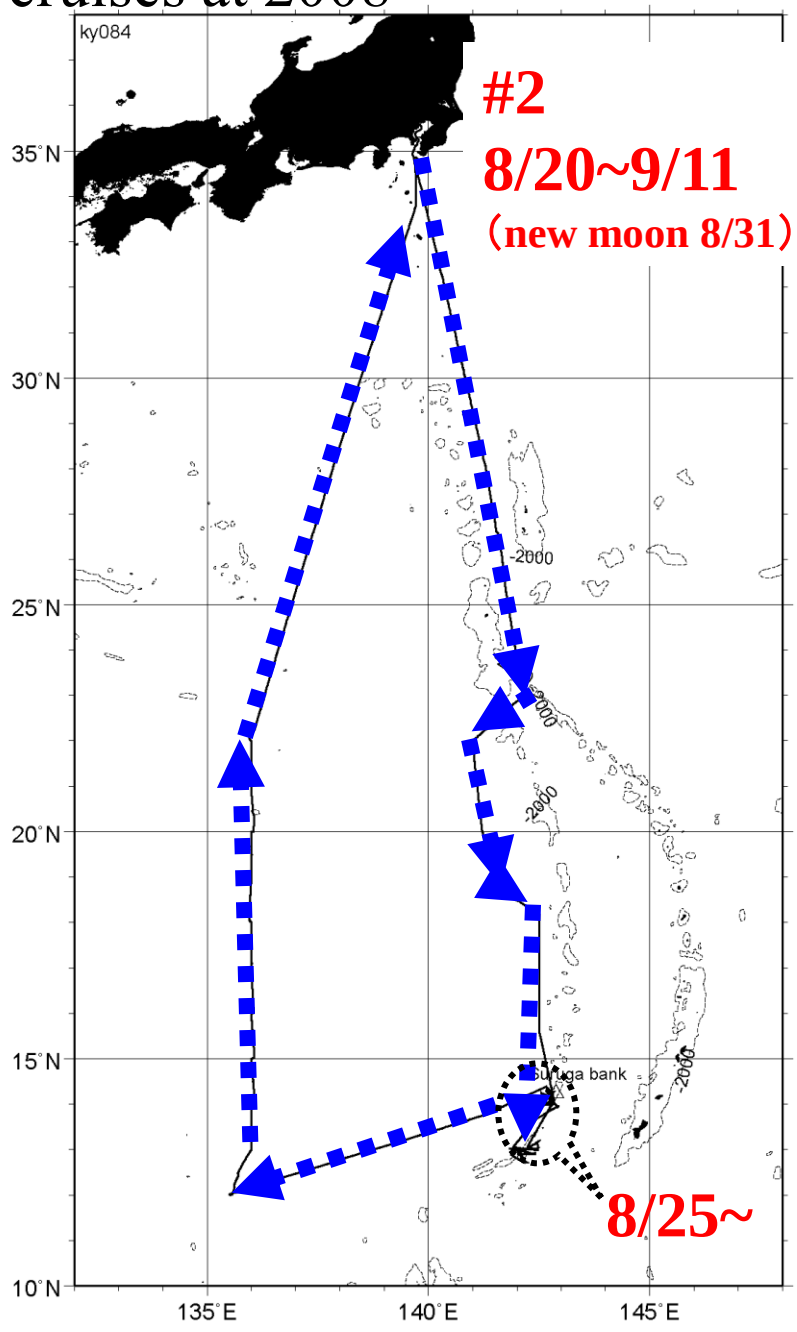


Suruga Sea Mount

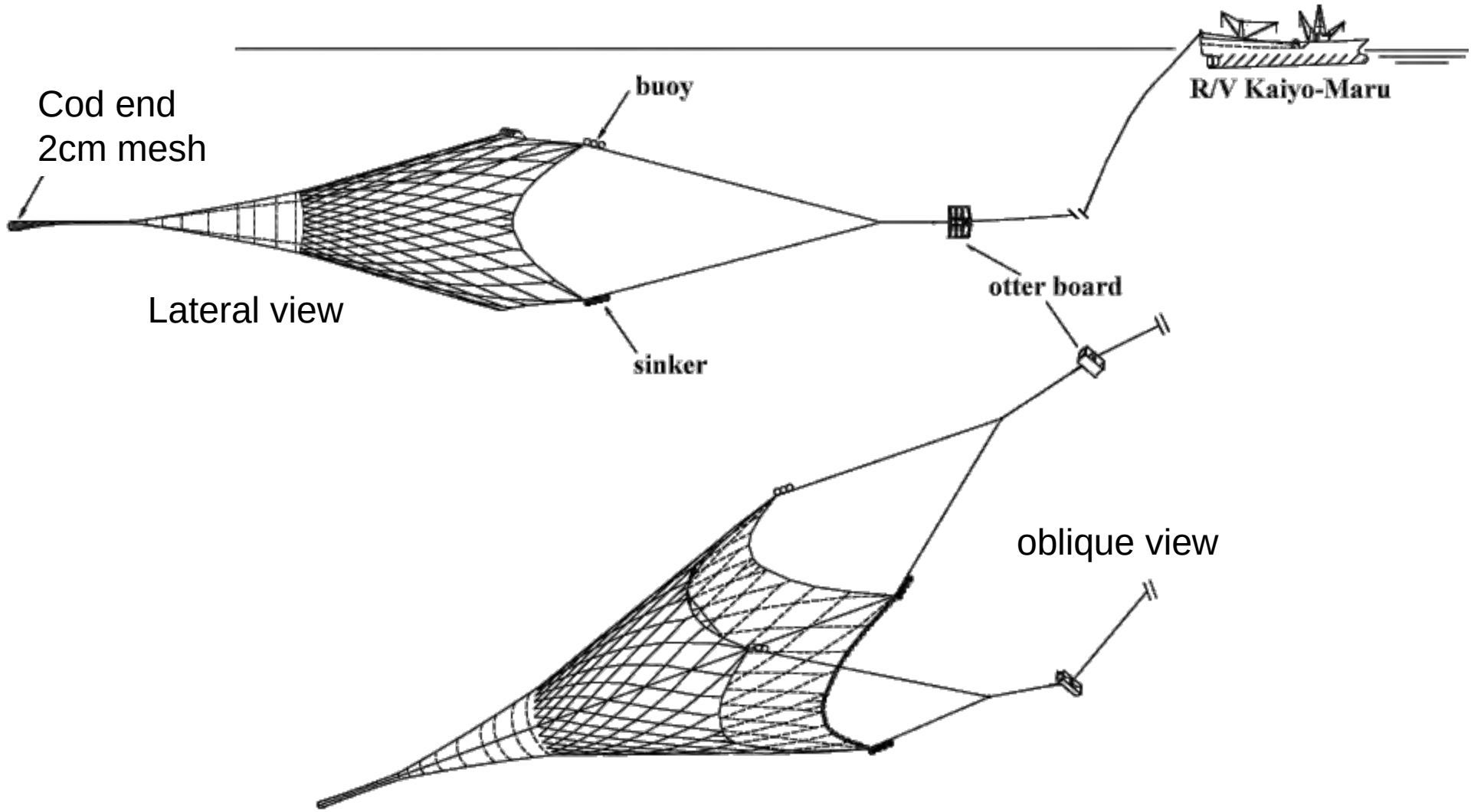


Ship track in eel cruises at 2008



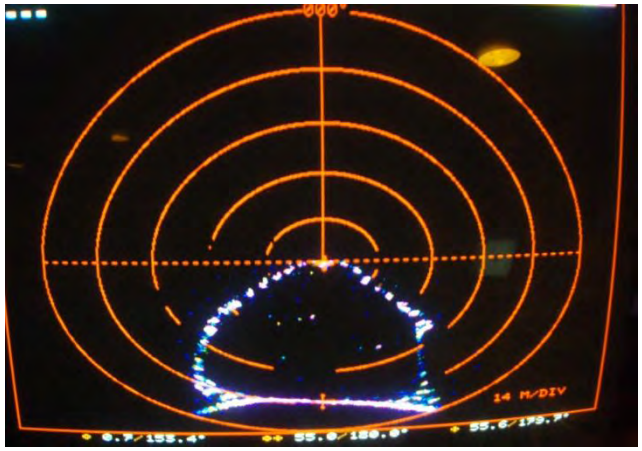


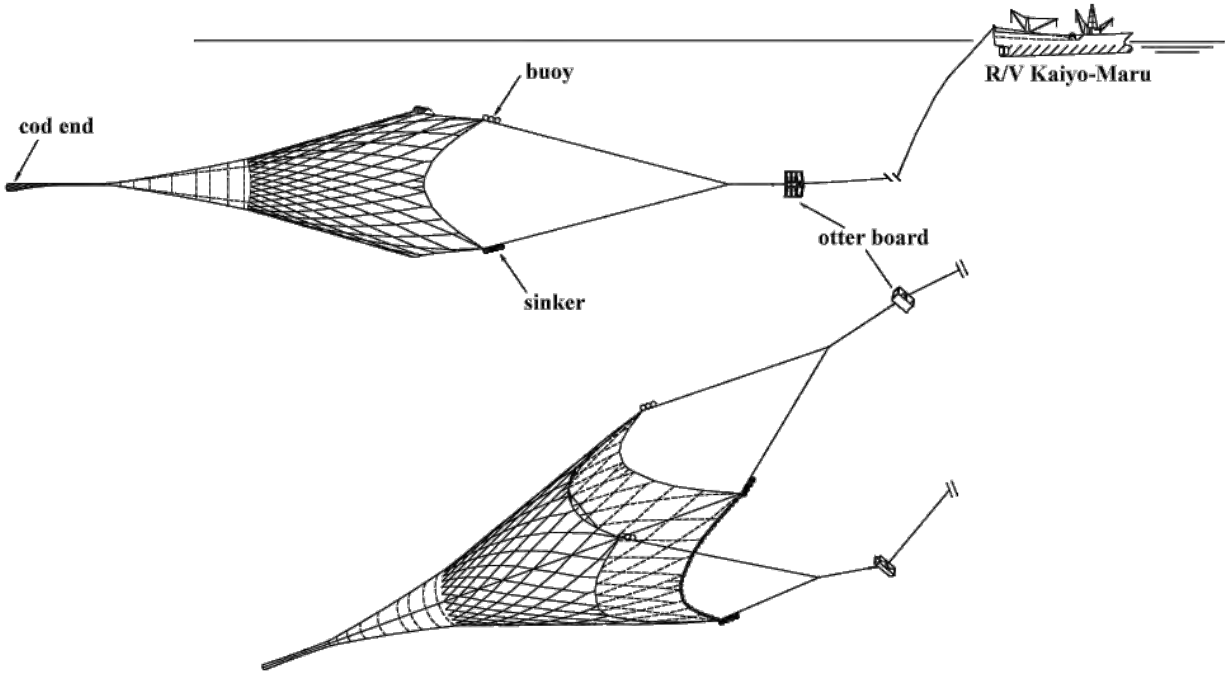
A large midwater trawl net

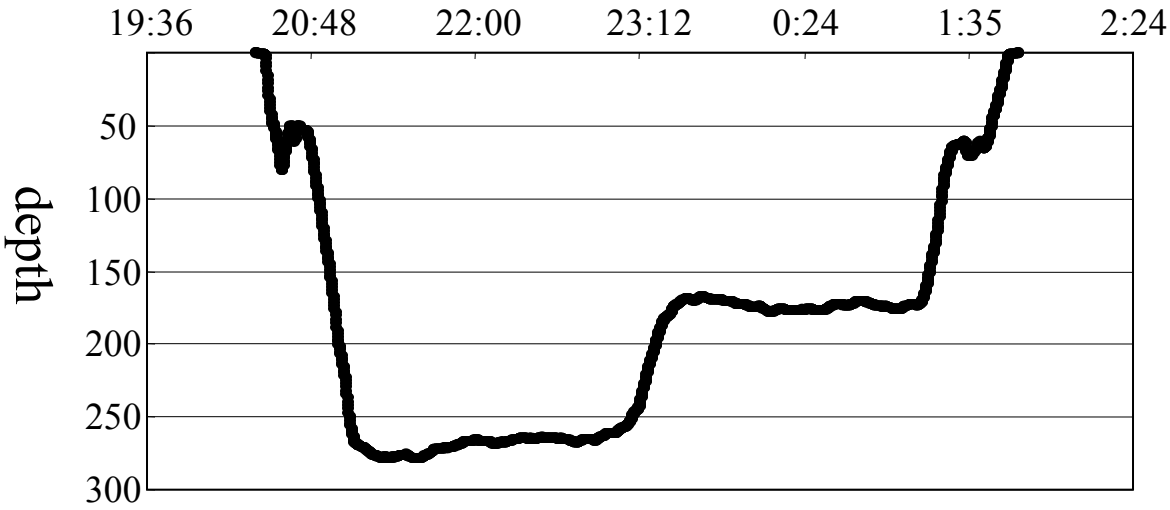


The moth opening 50m height x 60m wide

Net sonar

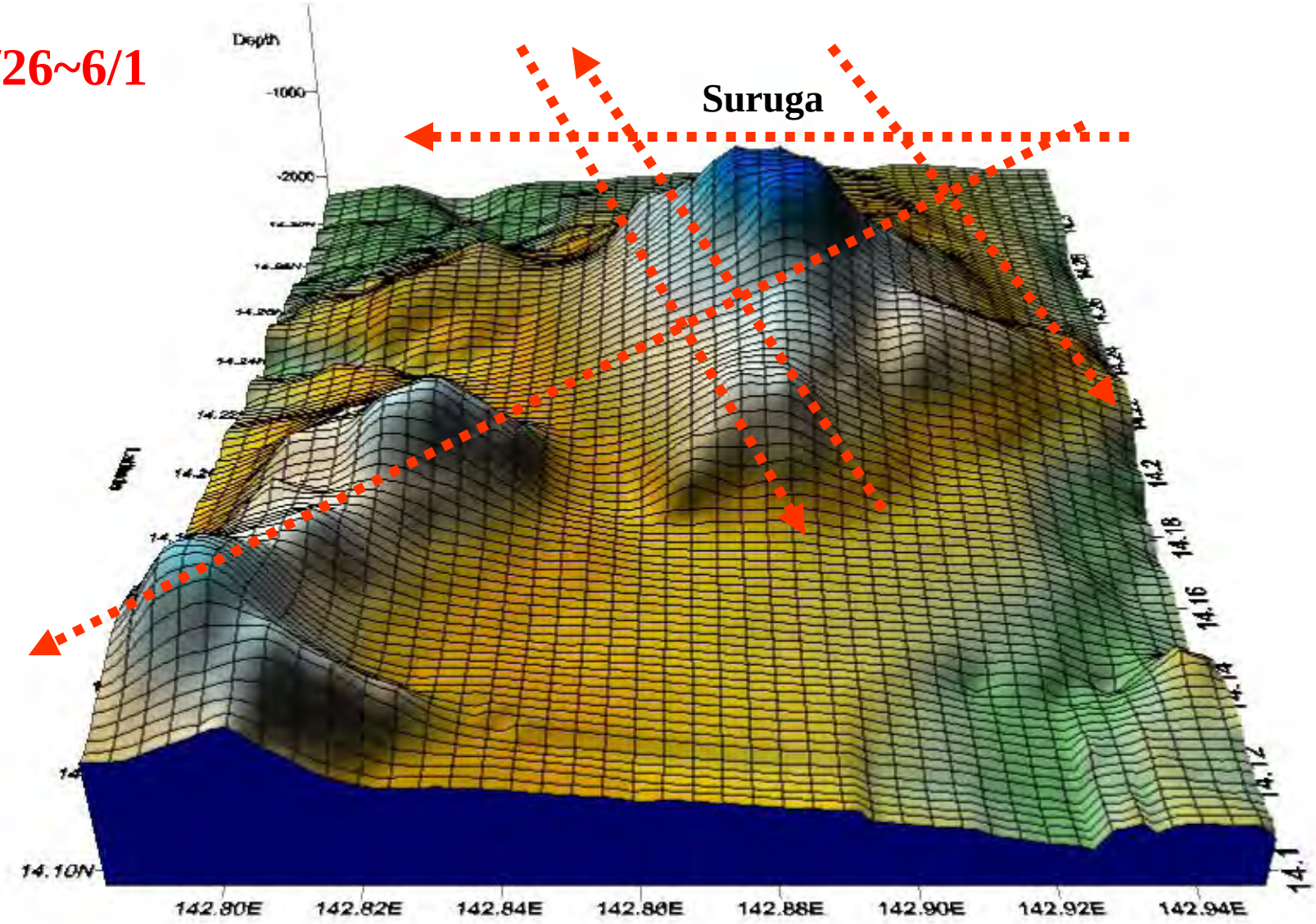

14 M/DIV


buoy
R/V Kaiyo-Maru
cod end
otter board
sinker

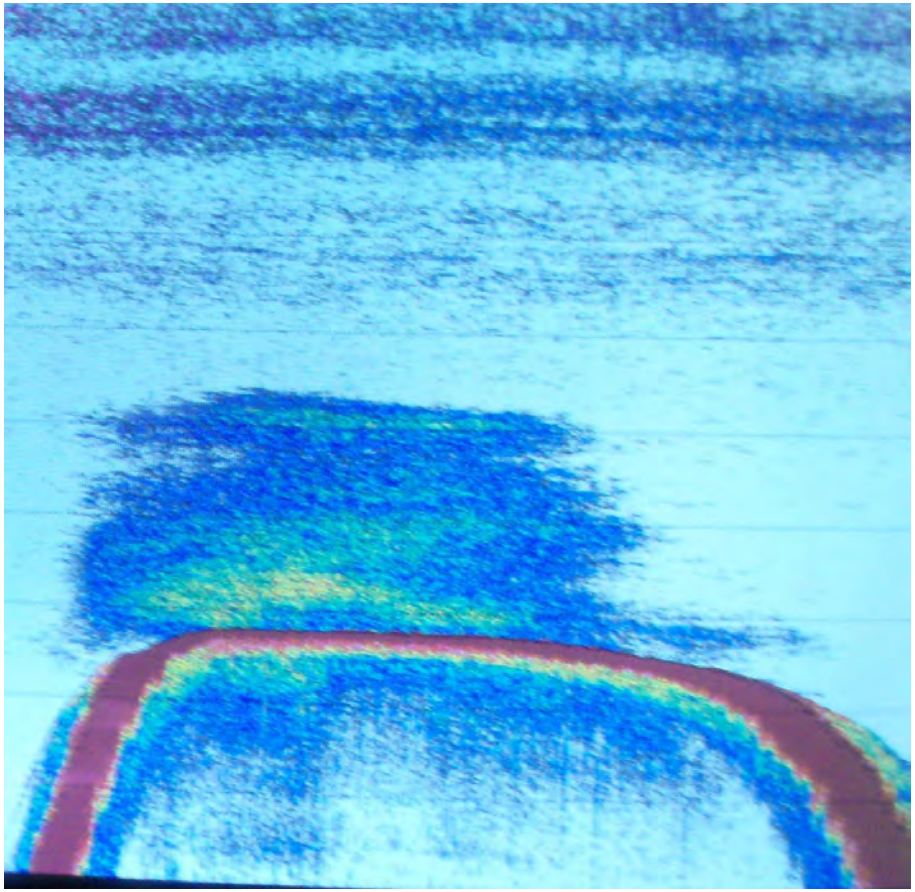

19:36
20:48
22:00
23:12
0:24
1:35
2:24
depth
50
100
150
200
250
300

Trawl operation around Suruga Sea Mount

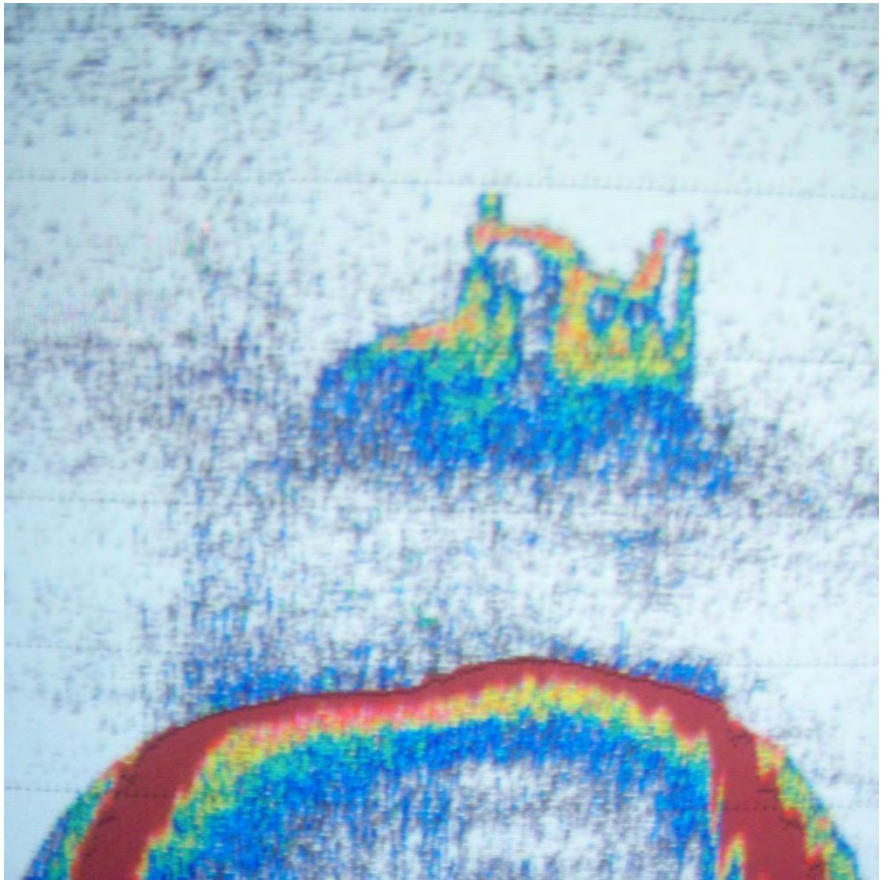
5/26~6/1



4:30 AM



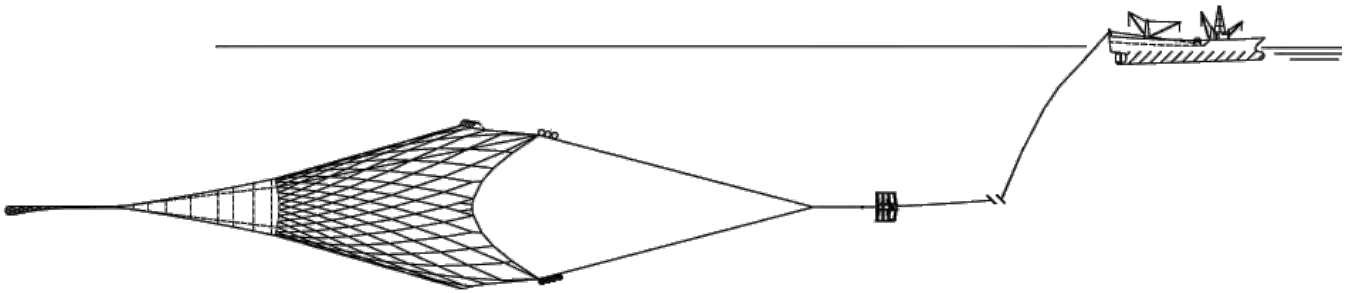
4:45 AM

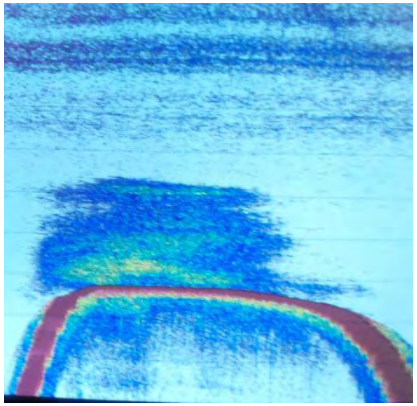


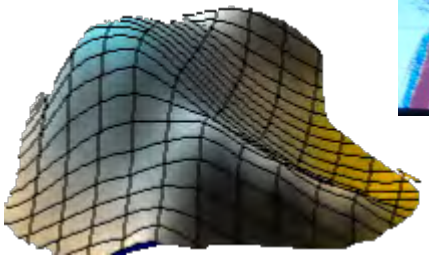
Large fish aggregation found on the small sea mount

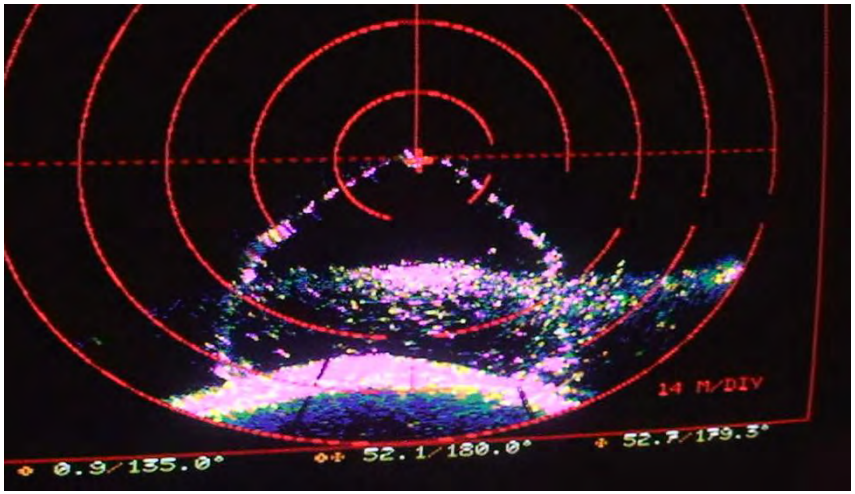
AM 4:45

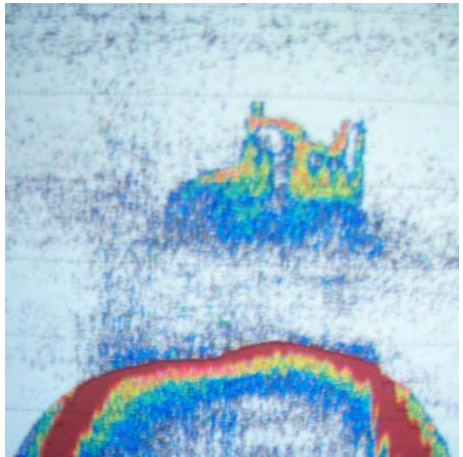
AM 4:30









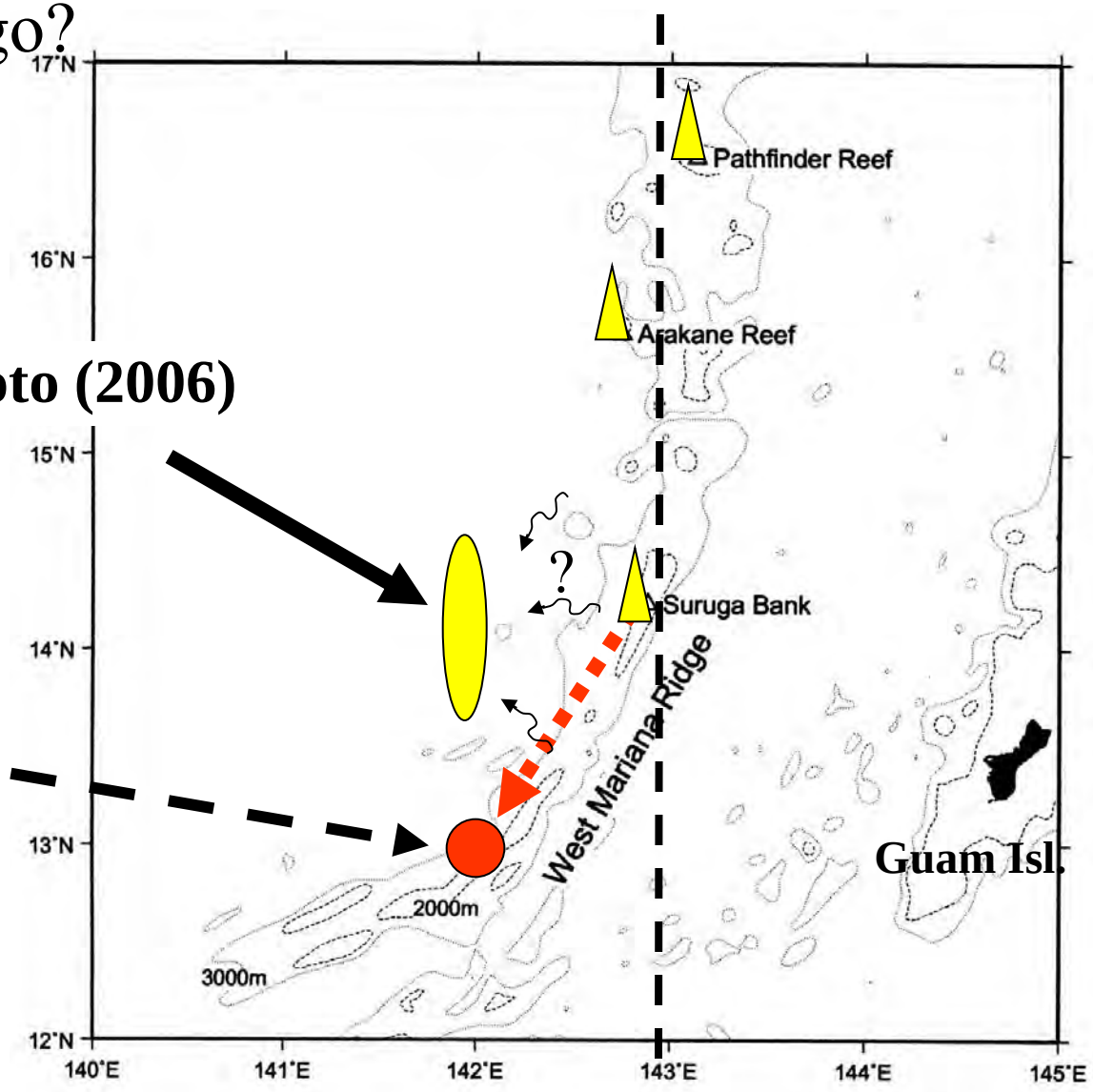


Deepwater cardinalfish

（*Sphyraenops bairdianus*）

10-15cm TL

- Eels do not live on the sea mount or they do not even know it.
- Let's forget about sea mount and leave it.
- But where to go?



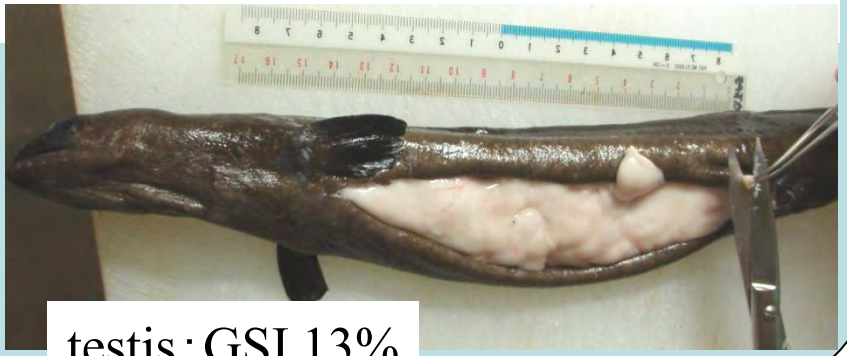
Tsukamoto (2006)

13ºN, 142ºE

Convenient number

Two eels captured at June 3, 2008

Anguilla marmorata #1 TL: 62.3cm, male

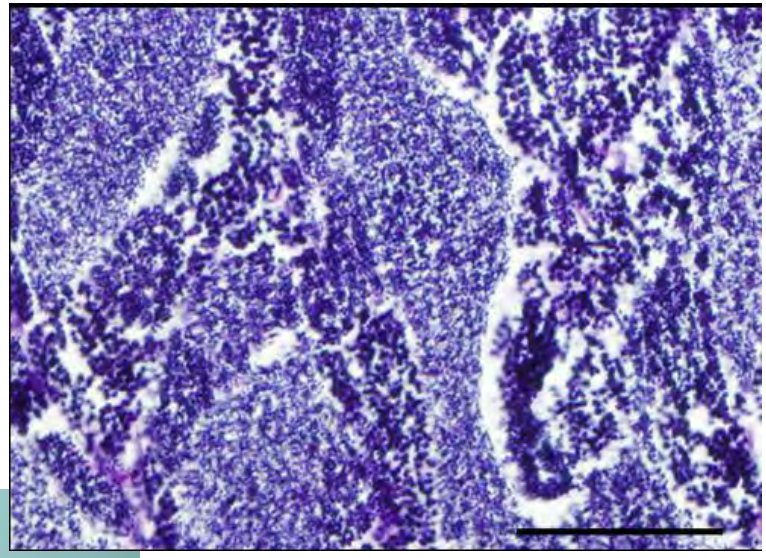


testis : GSI 13%

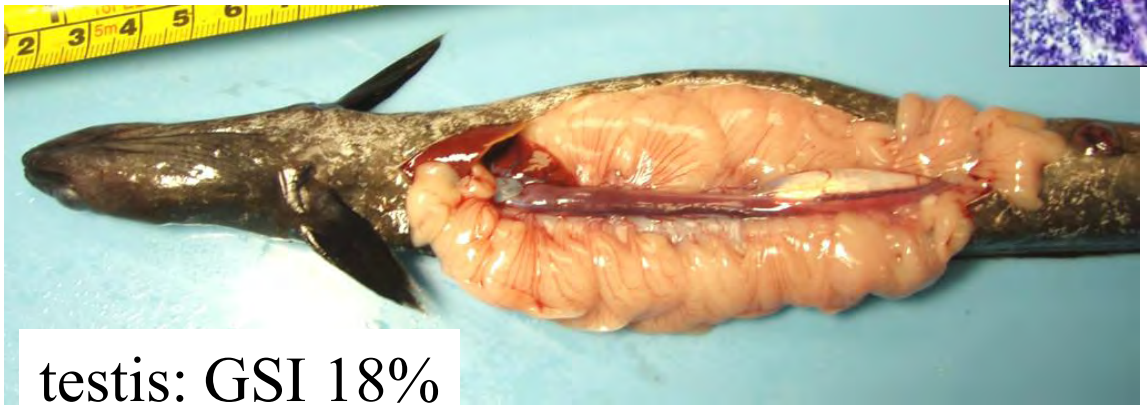
Anguilla japonica #1 TL: 48.5cm, male

One eel captured at June 4, 2008

Anguilla japonica #2 TL:51.3cm, male

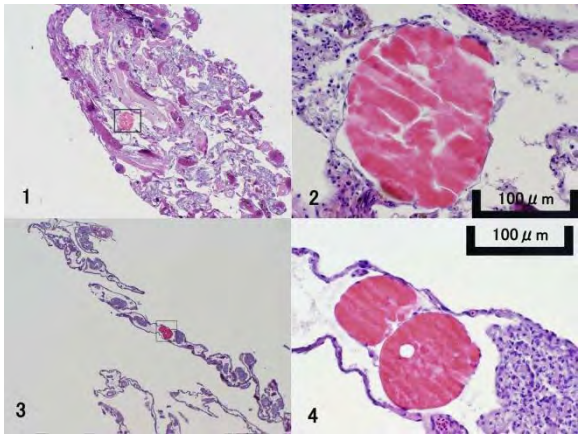


testis



testis: GSI 18%

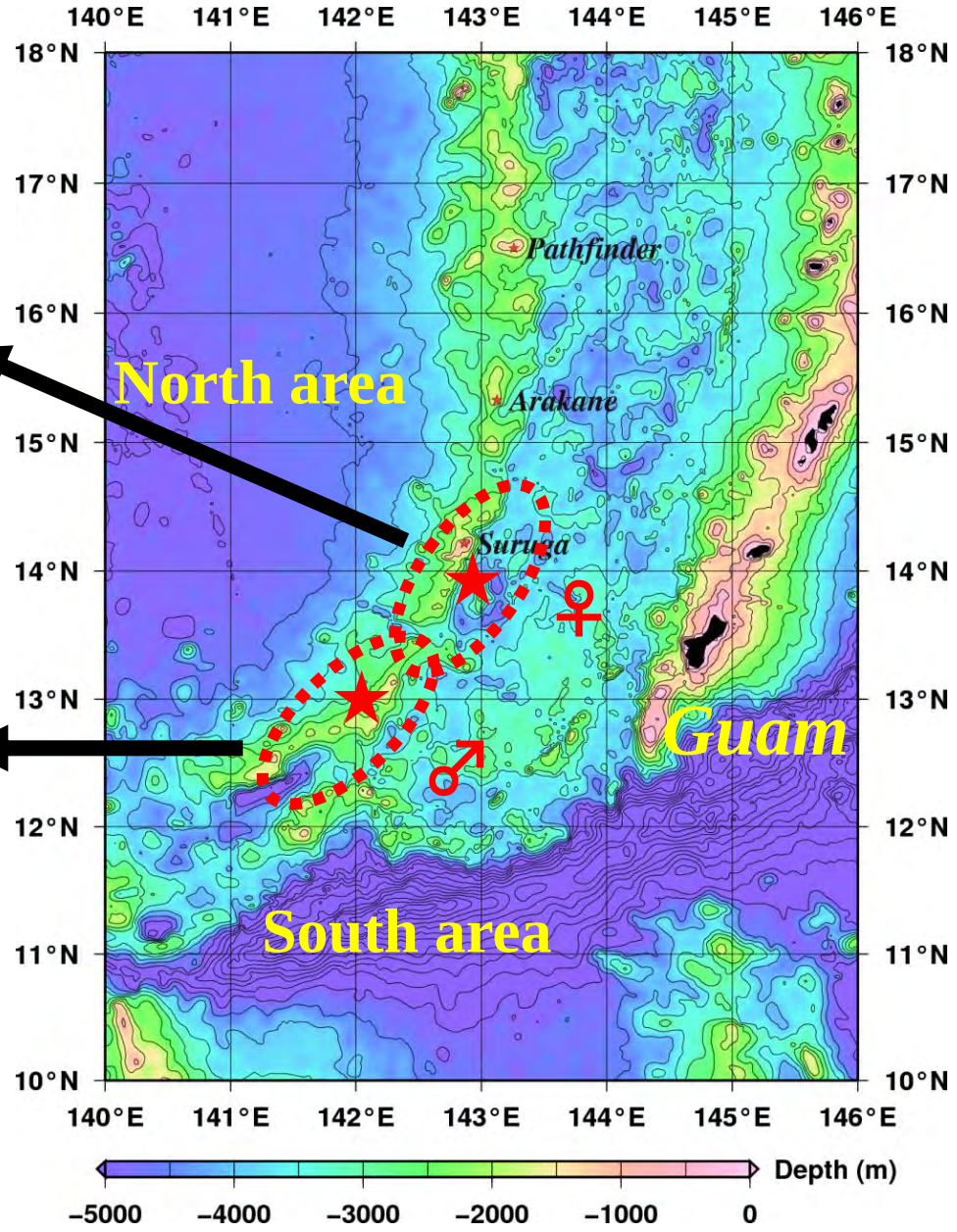
Two female *Anguilla japonica* captured at 30 August, 2008



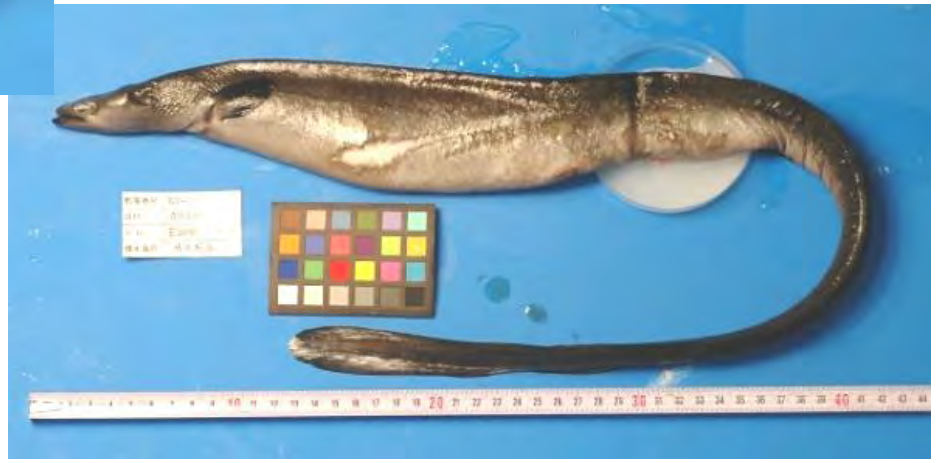
Two vessels operated in the north and south area separately at the same time in 2009

RV Hokko-Maru（910 ton）

RV Kaiyo-Maru（2,630 ton）



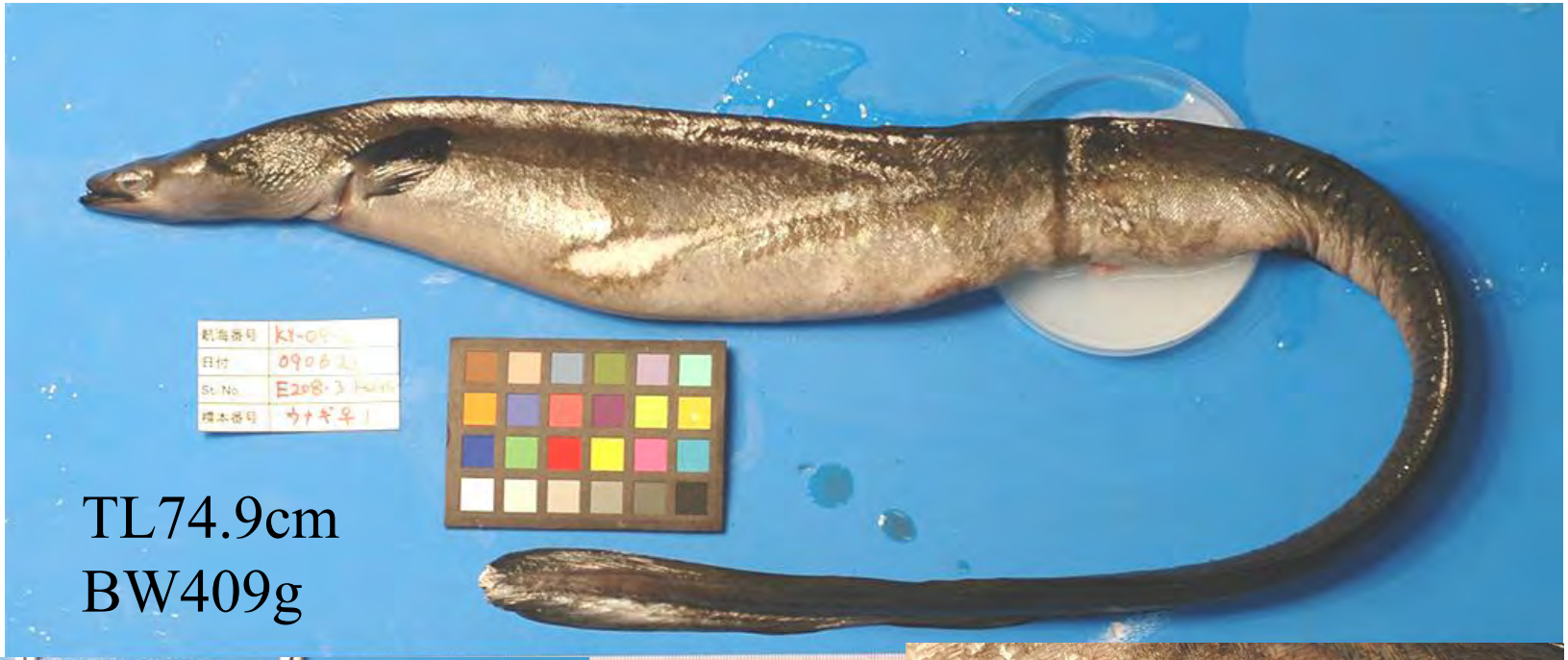
Several eels captured by RV Kaiyo-Maru in 2009

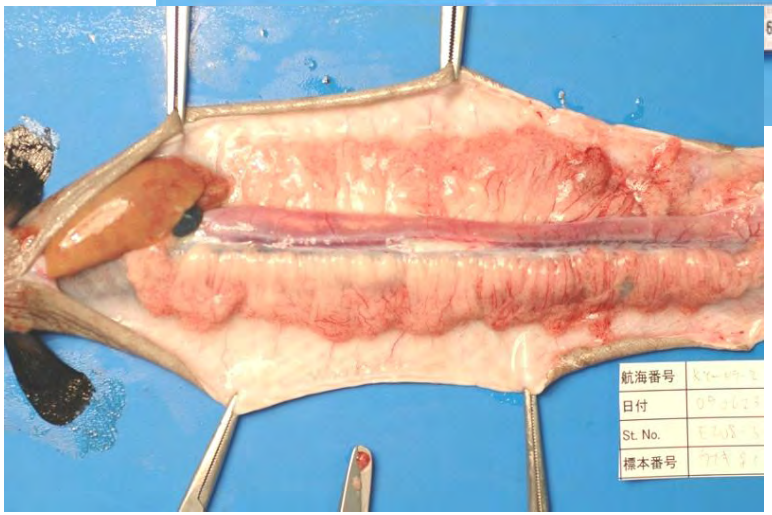


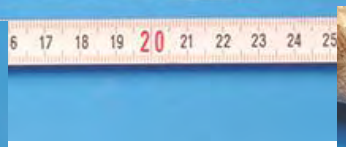
A. japonica: 3 males, 4 females
A. marmorata: 1 female

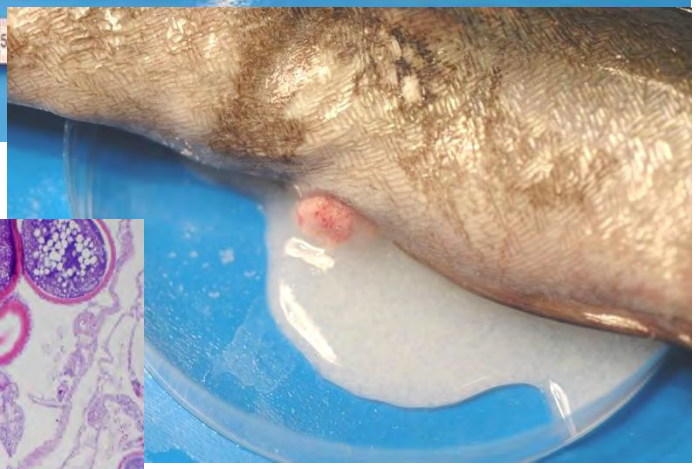
A. japonica male having highest GSI (40.3%)

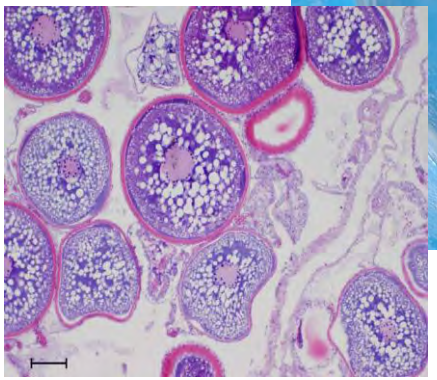
A. japonica female having ovulated eggs





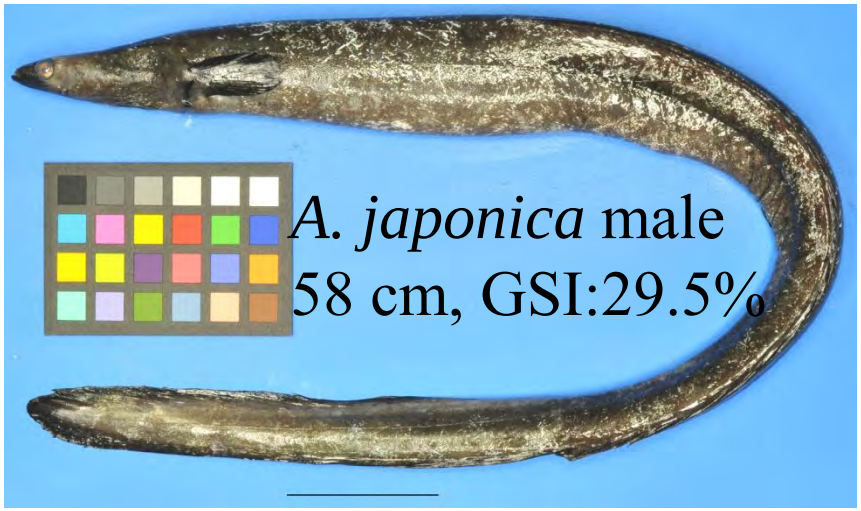


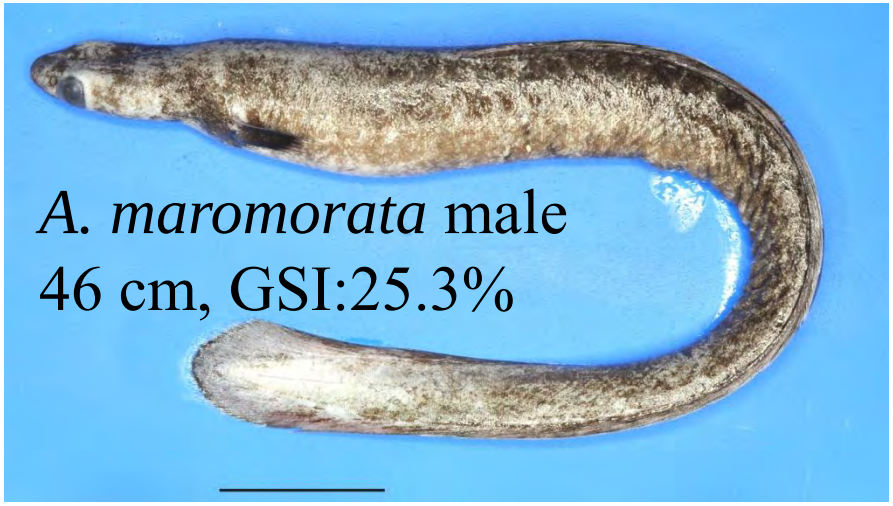


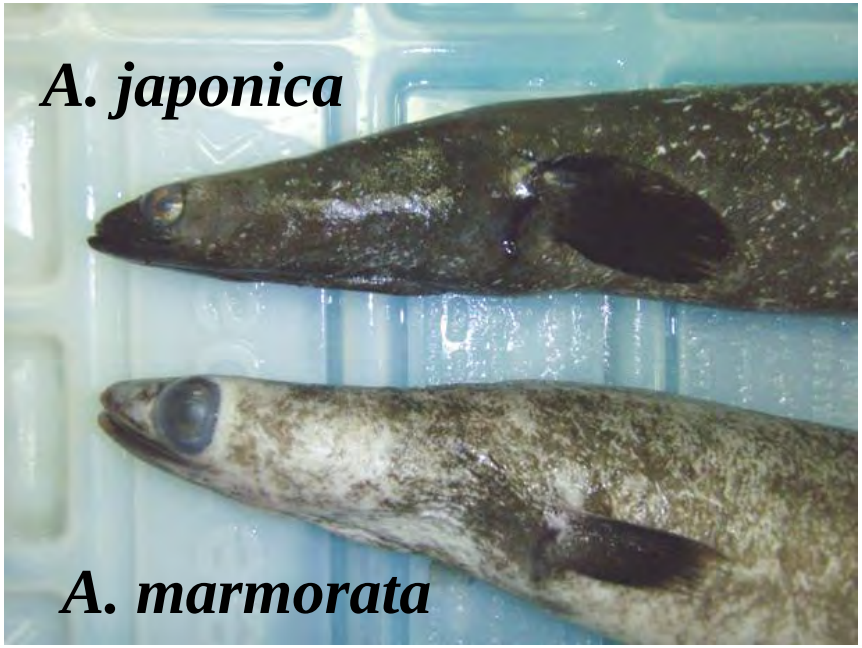


June 23, 2009

Two eels captured by RV Hokko-Maru in 2009

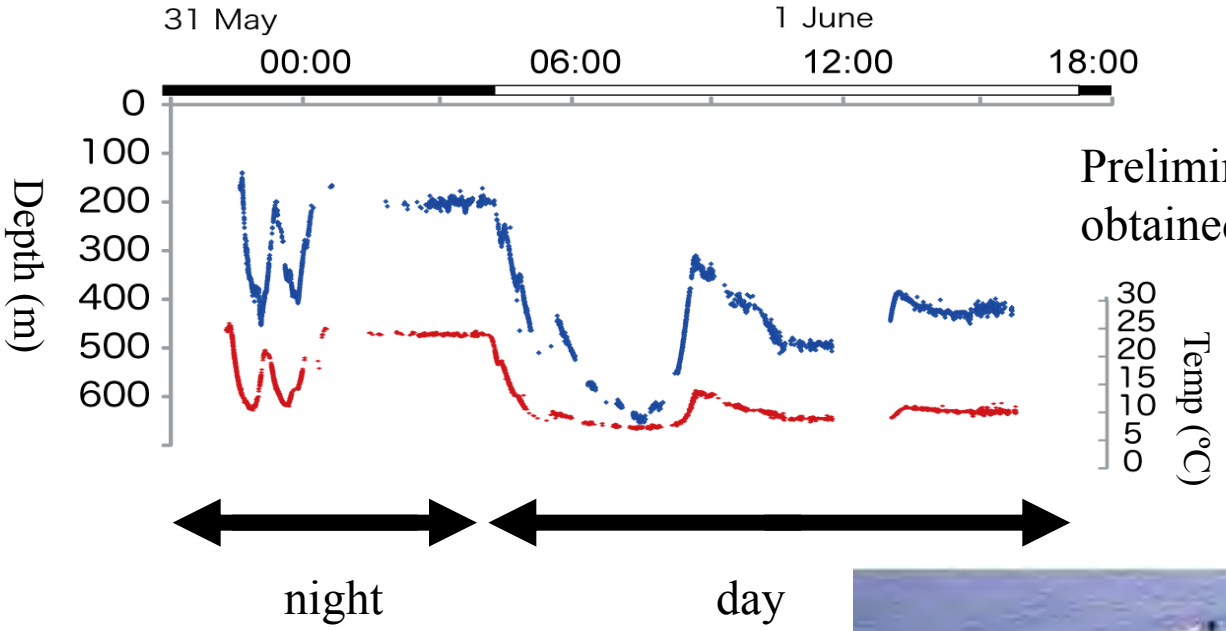






These two species were captured by a single tow at the same time

Biotelemetry for investigating eel's behavior

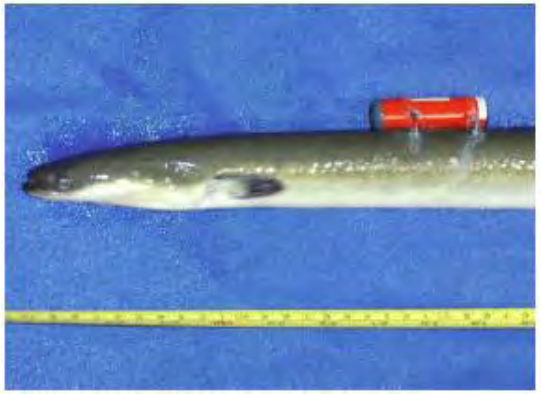


Preliminary result of pinger tracking obtained in 2009 Kaiyo-Maru cruise

Biotelemetry for investigating eel's oceanic migration

Ultrasonic transmitter
(pinger)

1.5cm
5.5cm

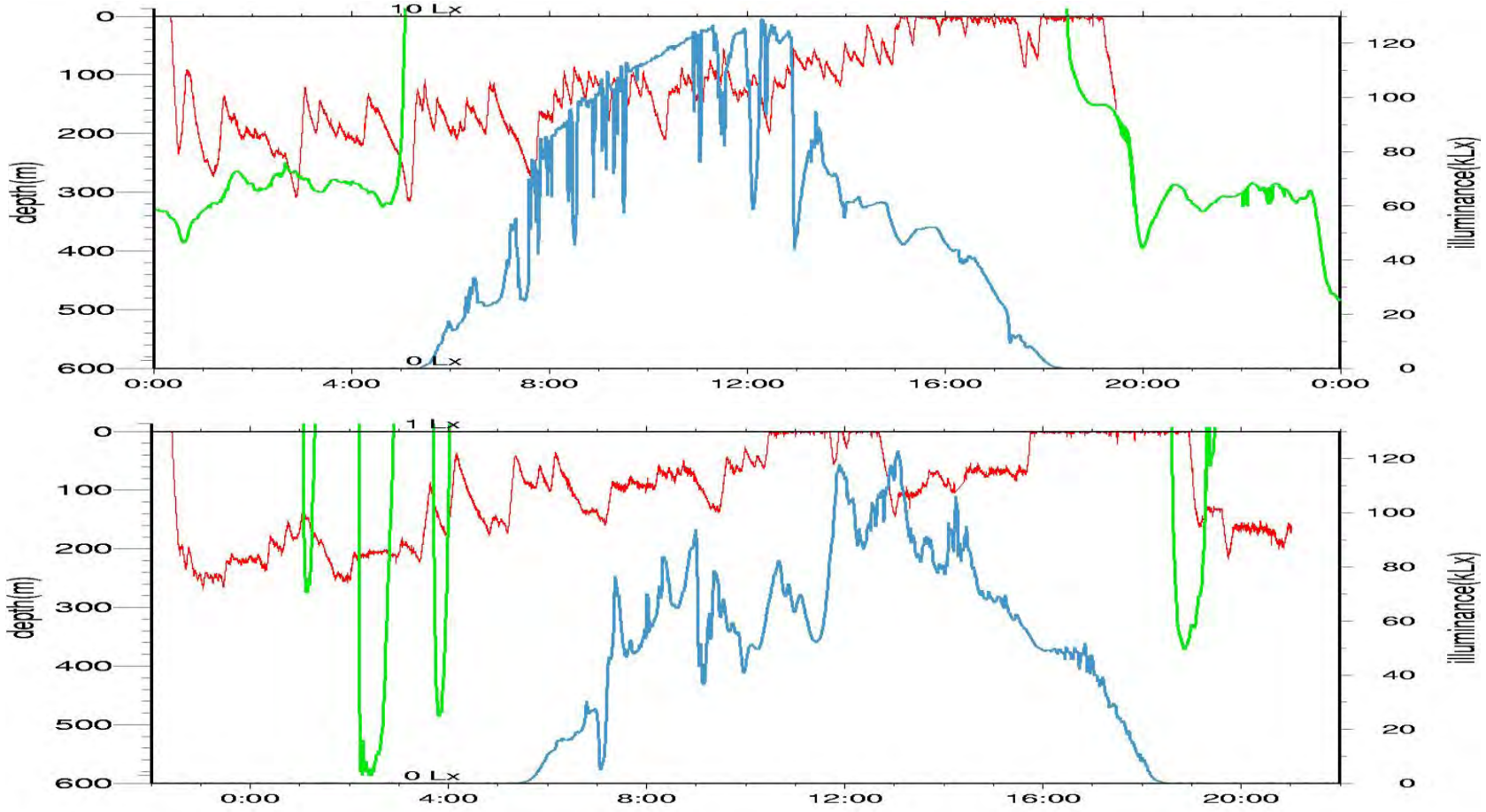


RV Shoyo-Maru（2,214 ton）
@2010

30˚N
20˚N
10˚N
120˚E
130˚E
140˚E
10 km
10 km
north
west
central

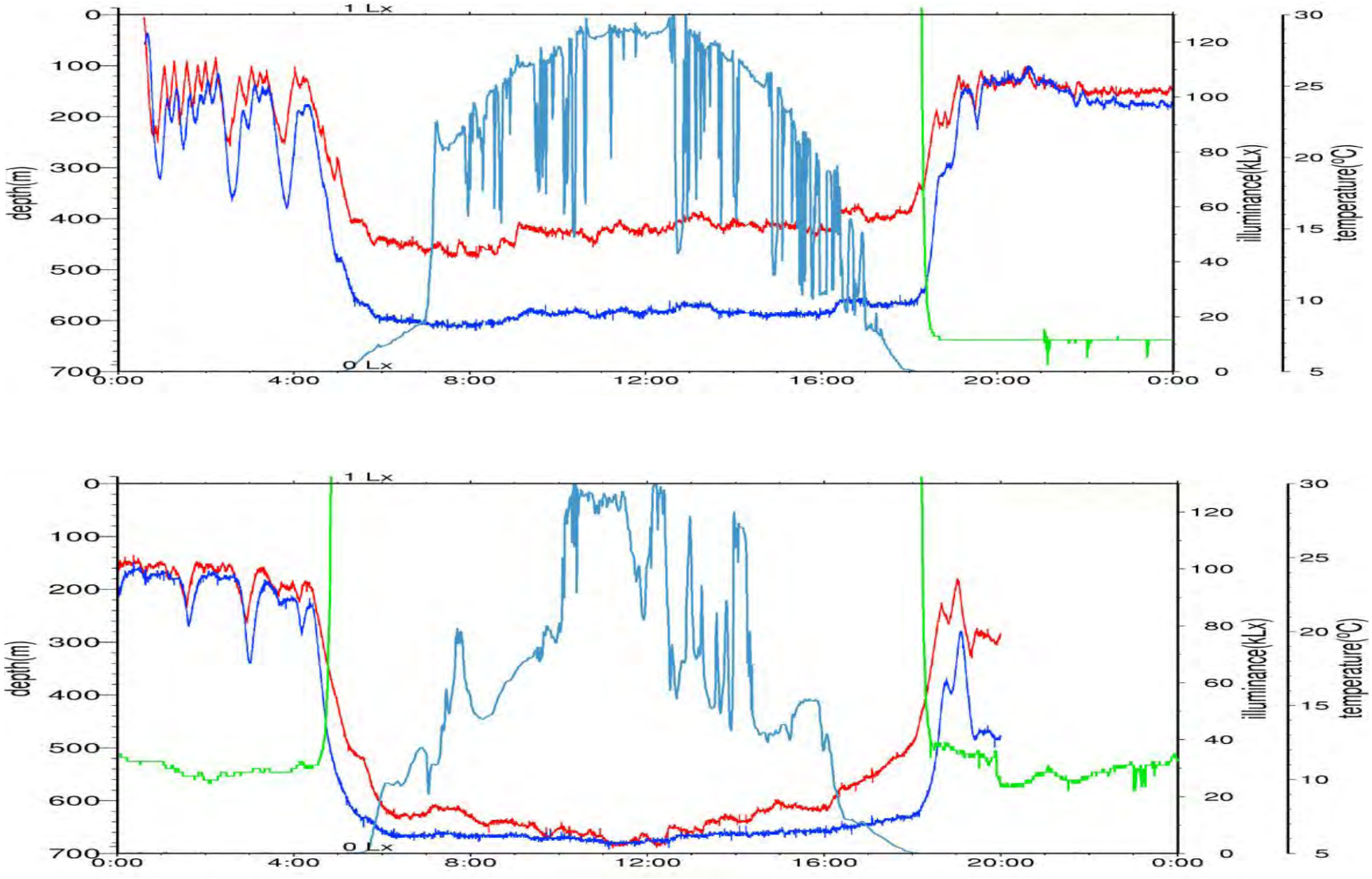
5 cultured eels
6 wild eels

Vertical movement of eels

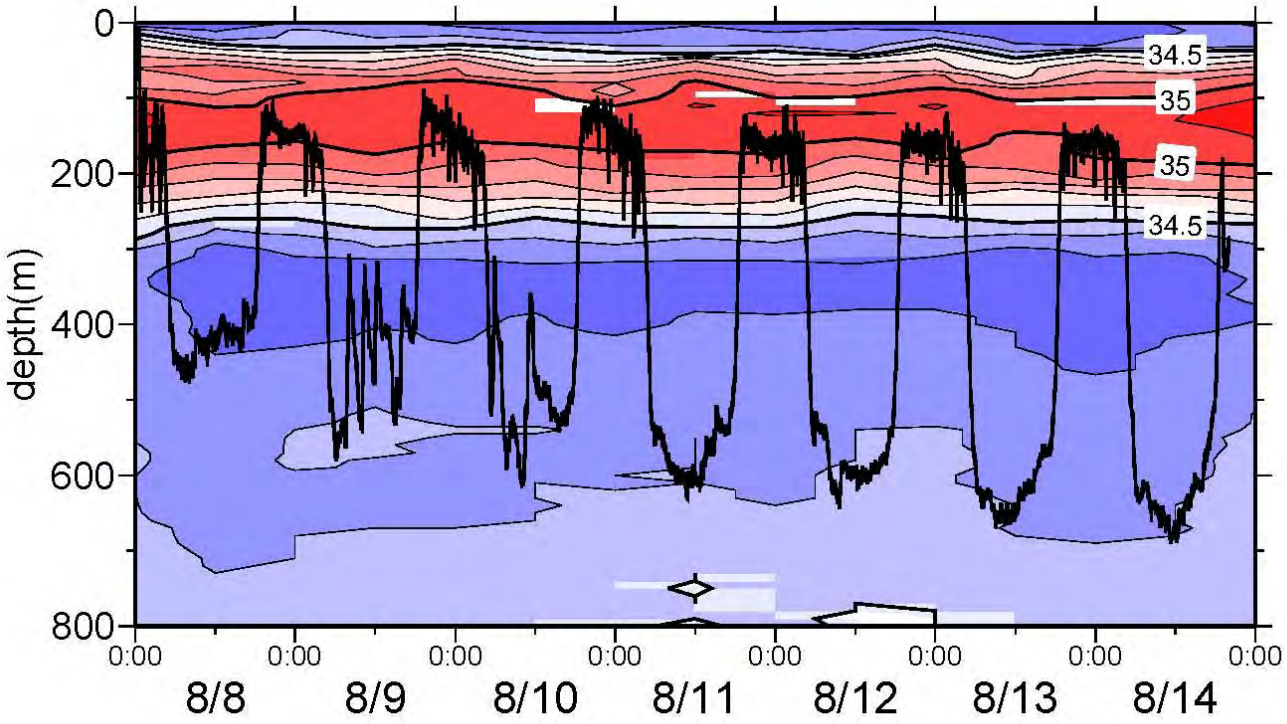


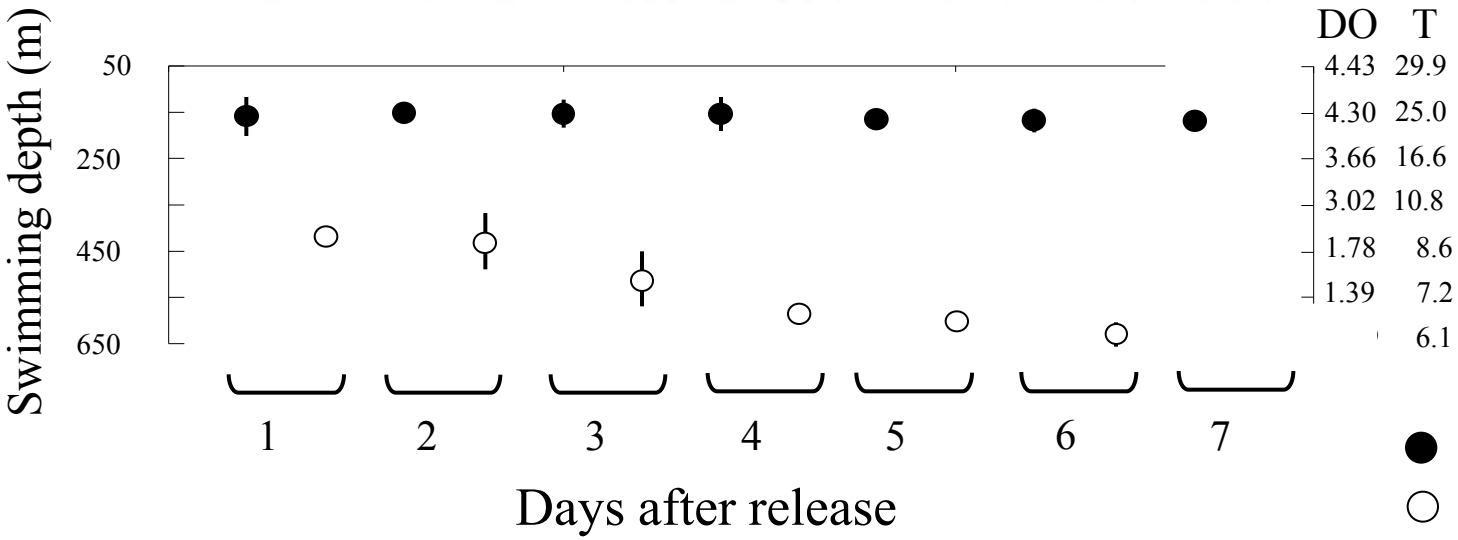
Cultured eels did not dive deep and stayed at shallow layer even during daytime

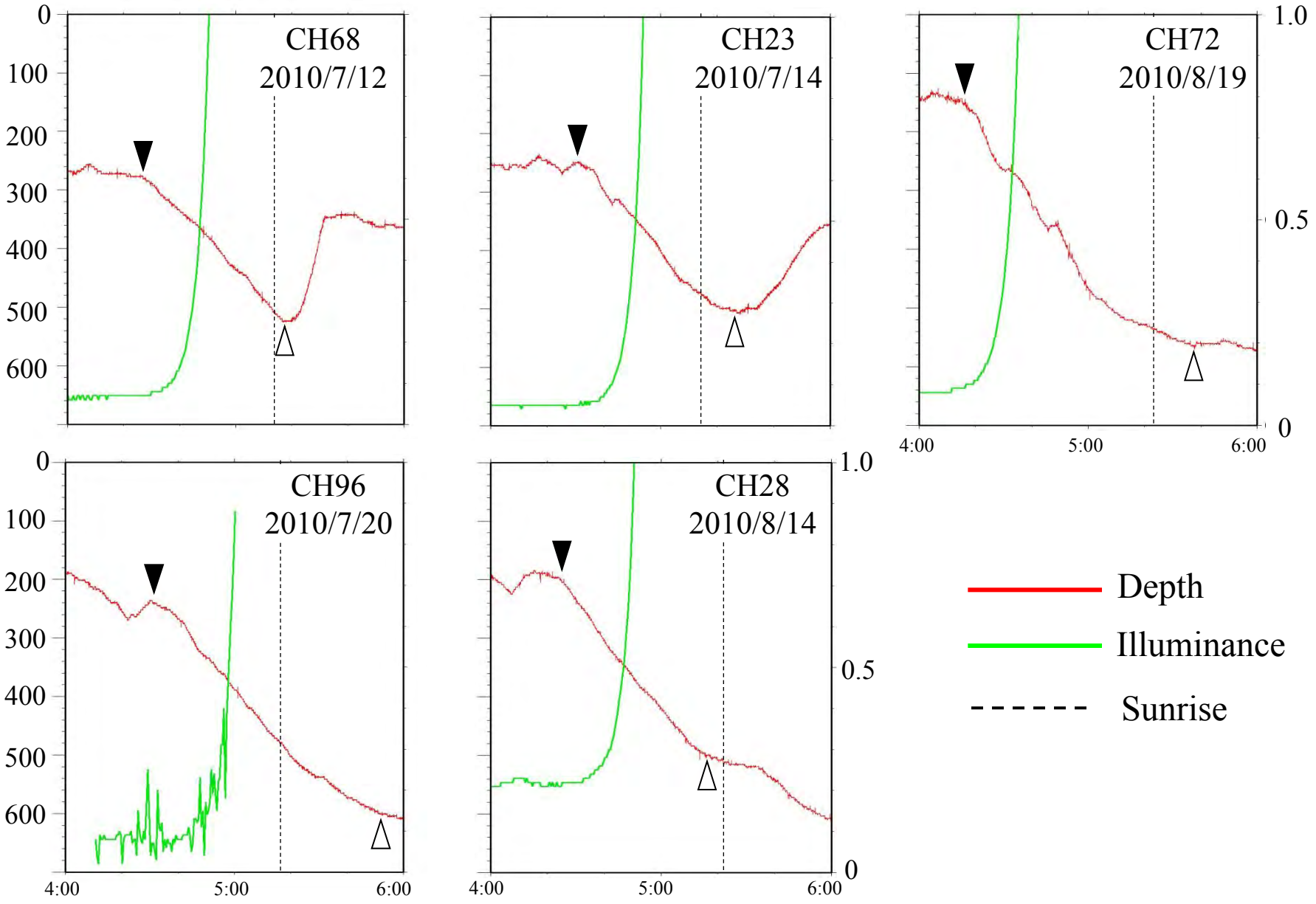
Wild eels represented clear diel vertical migration (DVM)



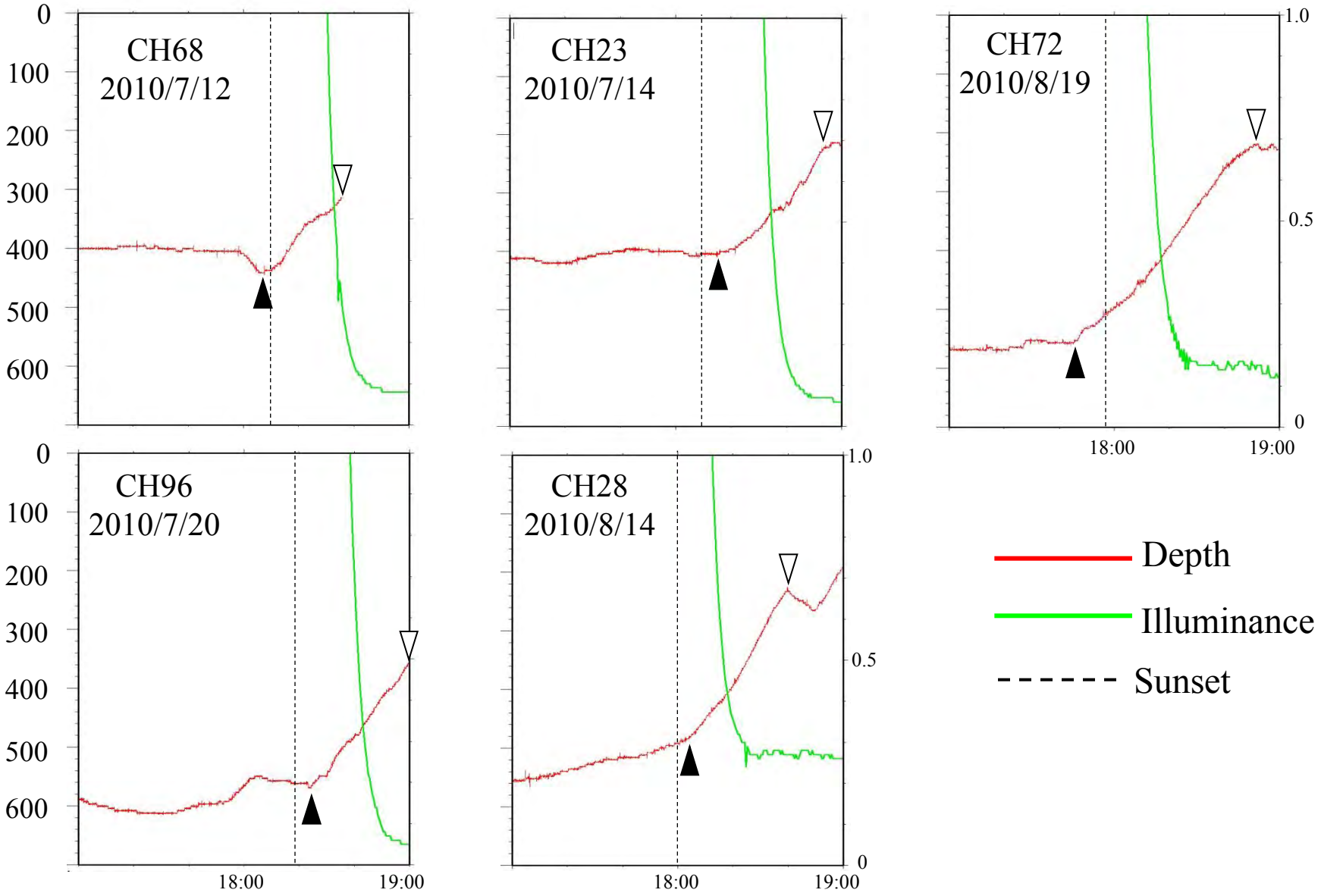
DVM profile for 7 days







Descending profile of 5 wild eels at dawn



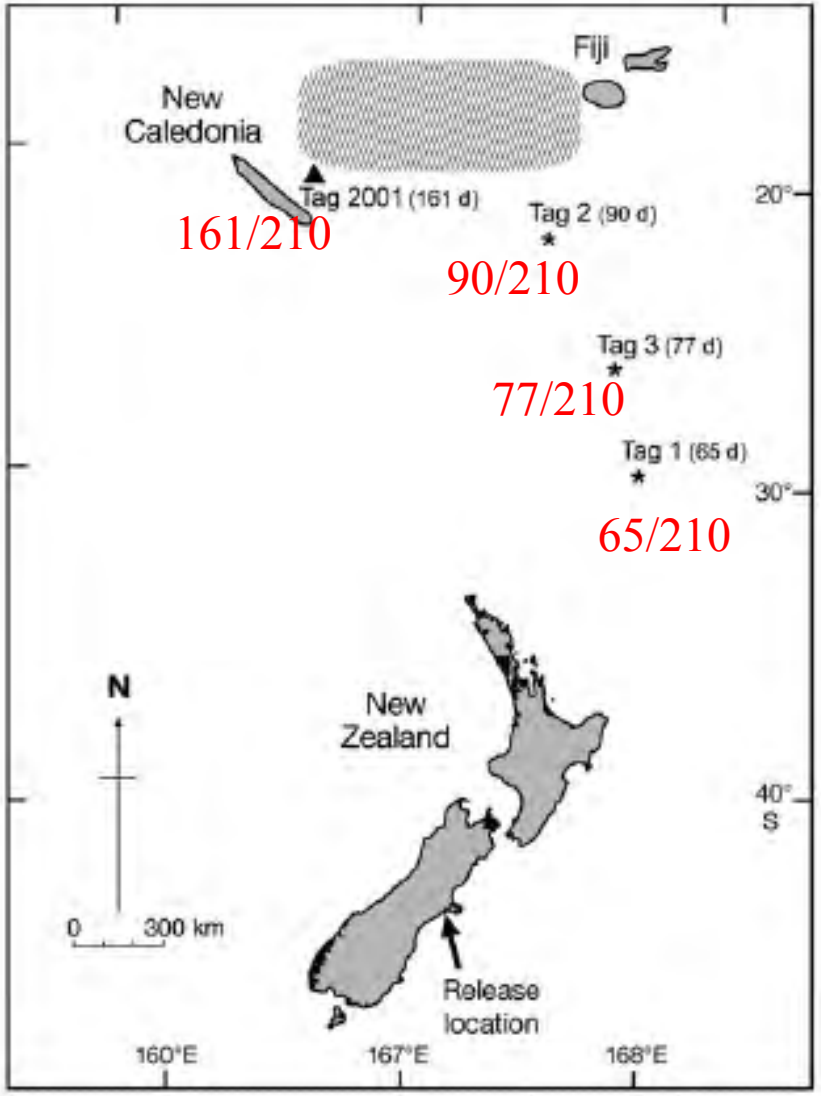
Ascending profile of 5 wild eels at dusk

Horizontal movement of eels

PSAT (Pop-up satellite archival transmitter) is powerful tool to investigate fish migration.

Navigation cue will be left unknown.

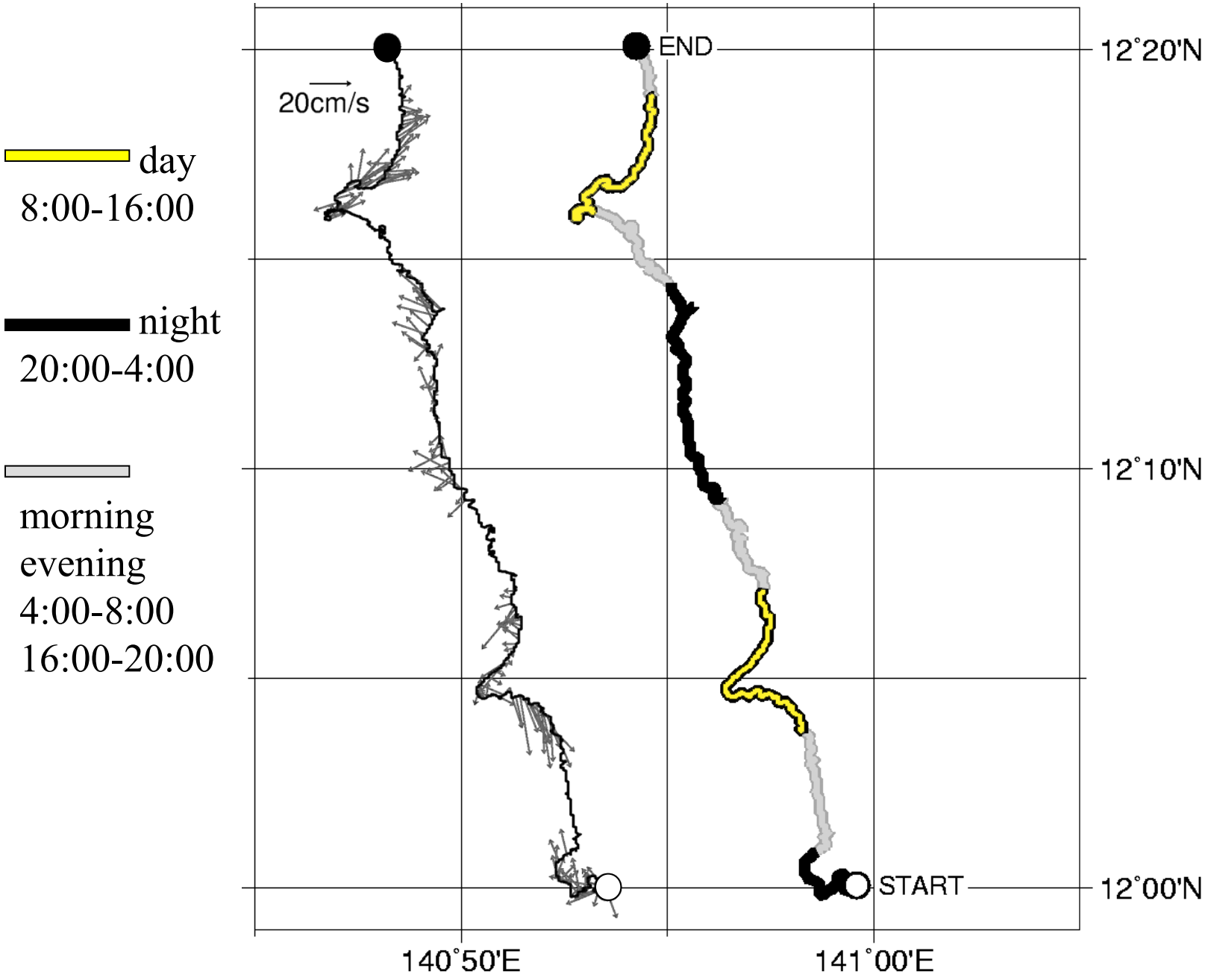
Real time fish movement in relation to ocean environment can be obtained with pinger tracking.

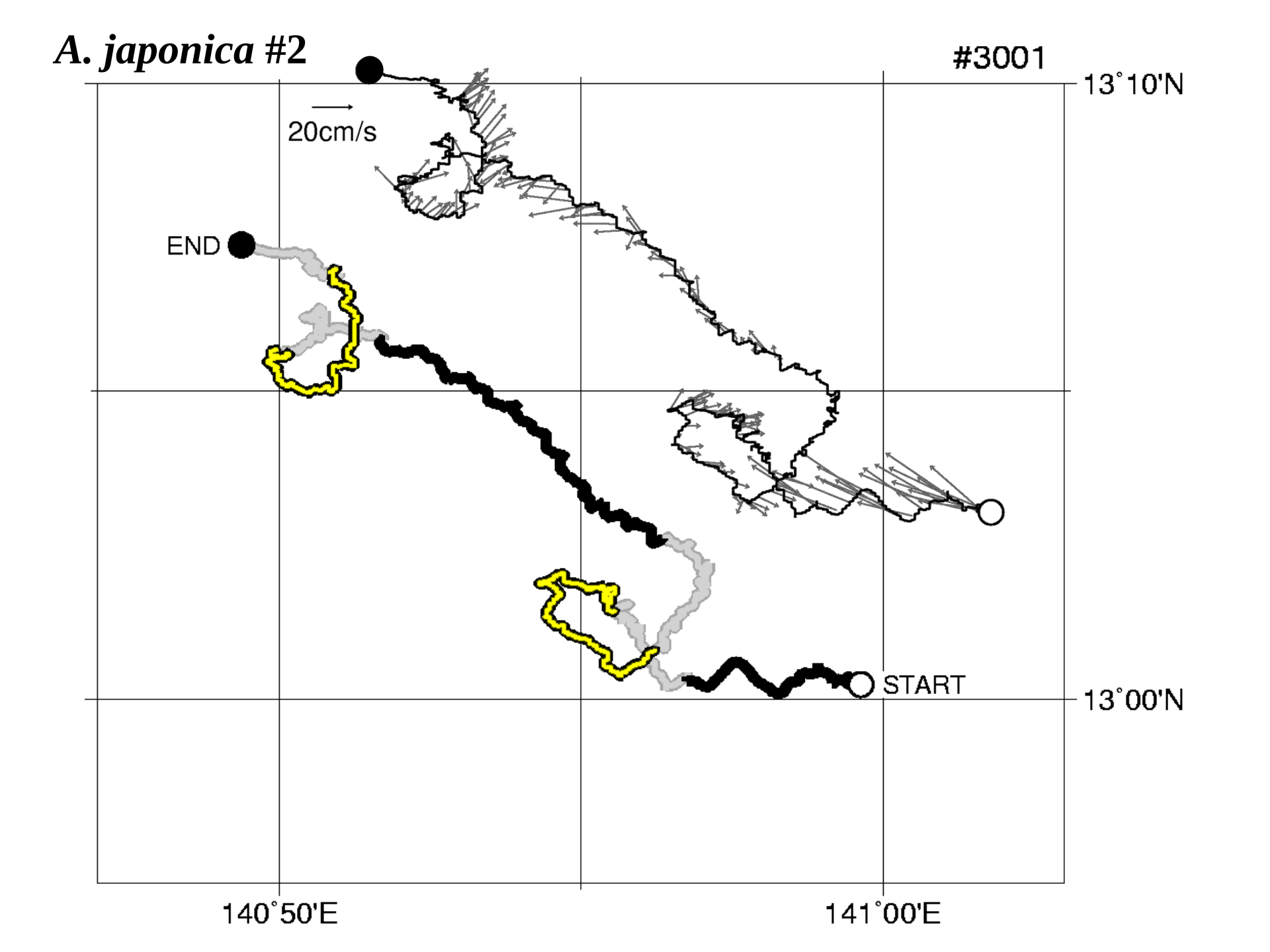


Pop-up location of PSATs attached *Anguilla dieffenbachii*

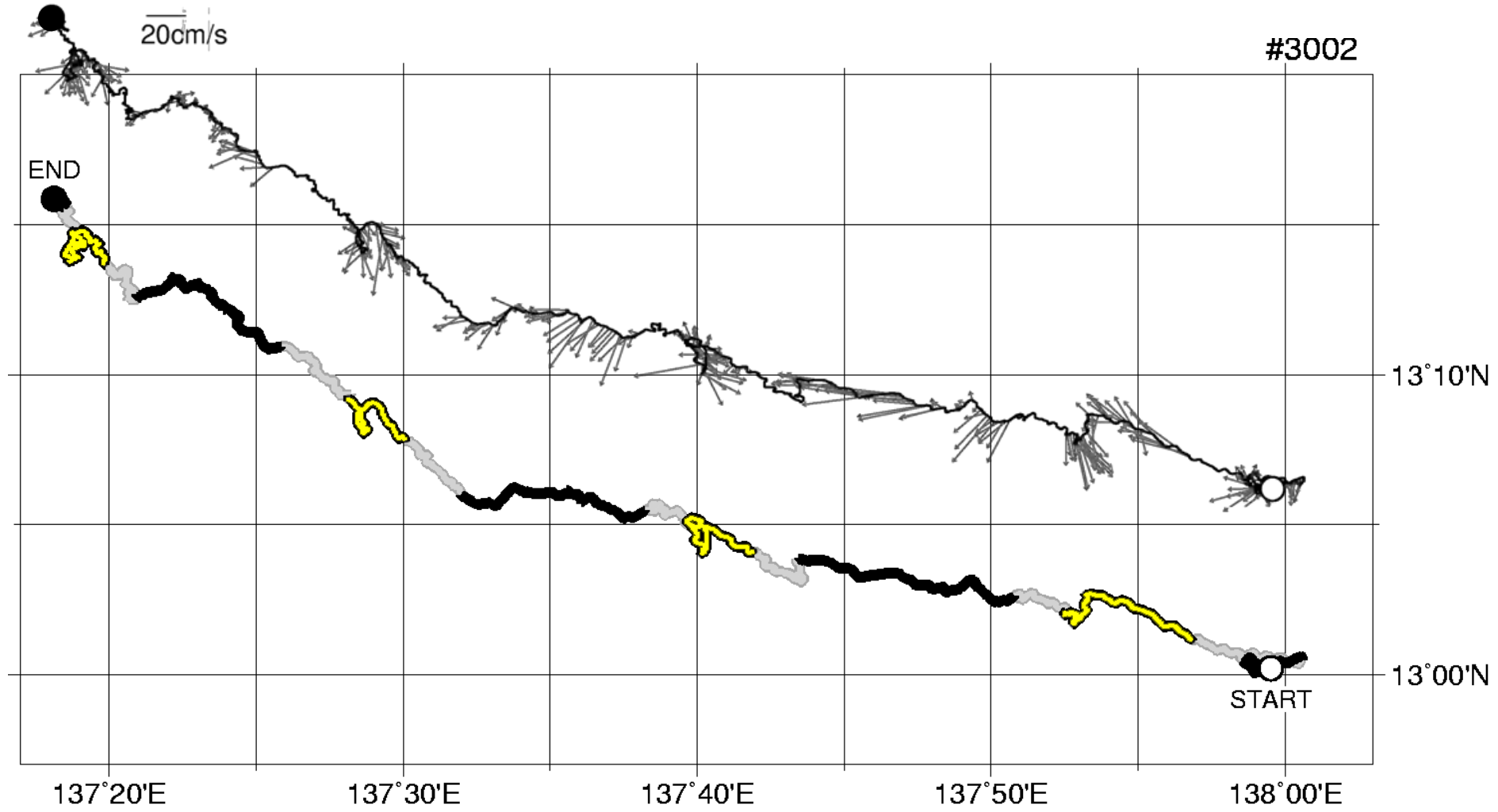
(Jellyman and Tsukamoto, 2010)

Horizontal movement of *A. japonica* #1 obtained in 2010

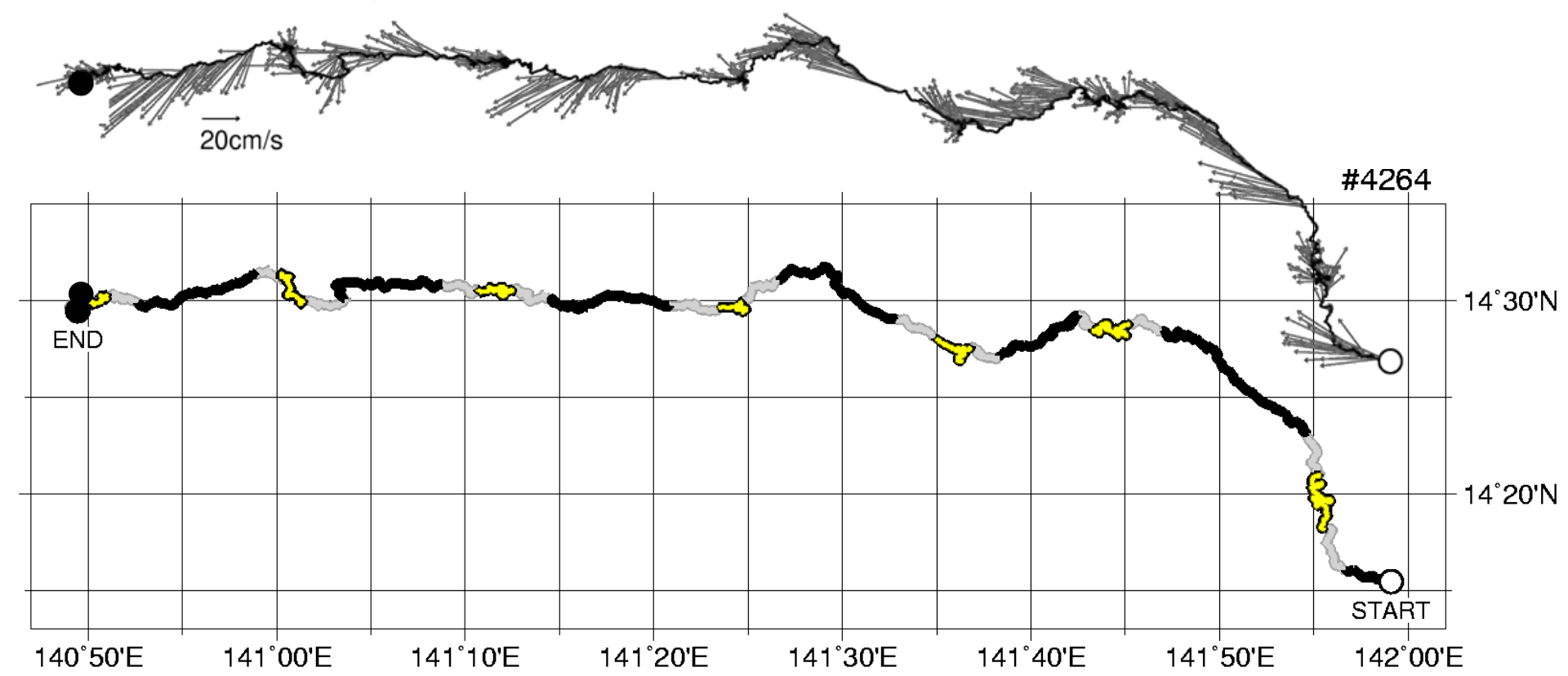



A. japonica #2
#3001
13˚10'N
20cm/s
END
START
13˚00'N
140˚50'E
141˚00'E

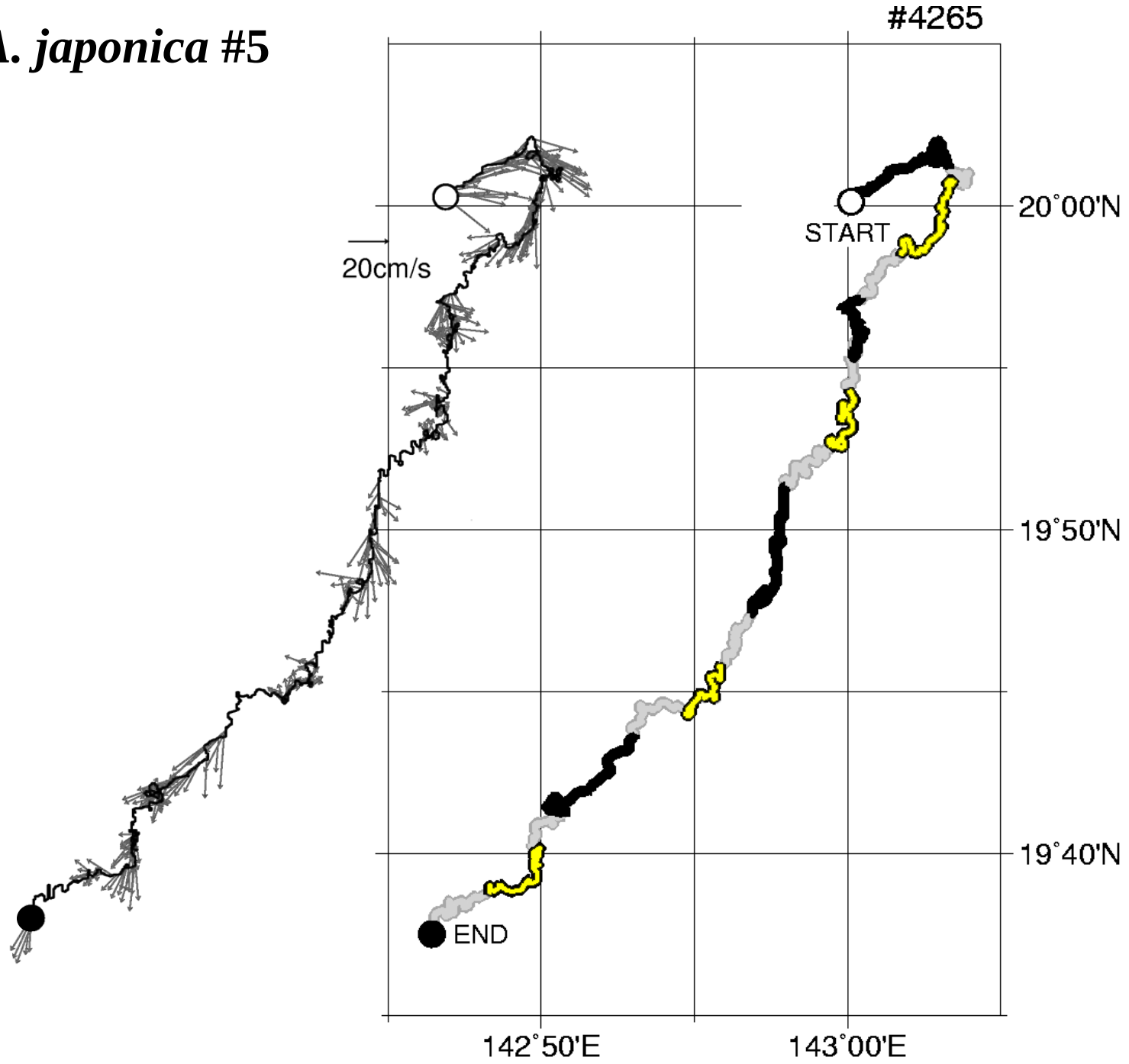
A. japonica #3

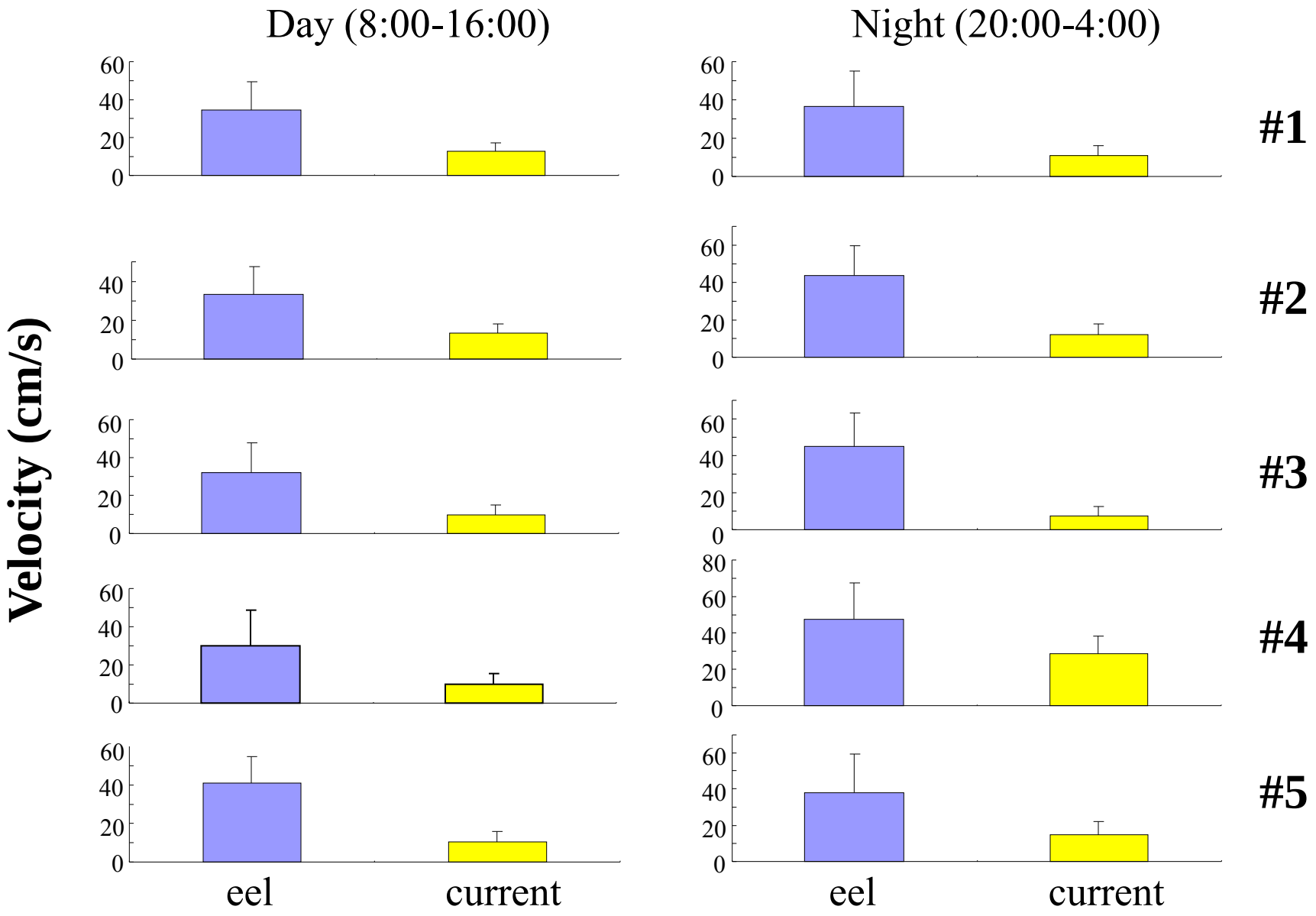

20cm/s
#3002
END
START
13˚10'N
13˚00'N
137˚20'E
137˚30'E
137˚40'E
137˚50'E
138˚00'E

A. japonica #4


20cm/s
#4264
END
START
14˚30'N
14˚20'N
140˚50'E
141˚00'E
141˚10'E
141˚20'E
141˚30'E
141˚40'E
141˚50'E
142˚00'E

A. japonica #5





Velocities of 5 eels and surrounding water current