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

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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)
Suruga Sea Mount

New Moon
Ship track in eel cruises at 2008

#1
5/21~6/14
(new moon 6/4)

#2
8/20~9/11
(new moon 8/31)

5/26~

8/25~
A large midwater trawl net

Lateral view

Cod end
2cm mesh

buoy

sinker

oblique view

otter board

The moth opening 50m height x 60m wide
Net sonar
Trawl operation around Suruga Sea Mount

5/26~6/1
Large fish aggregation found on the small sea mount
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: GSI 18%

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

#1 TL: 55.5 cm

#2 TL: 66.2 cm
Two vessels operated in the north and south area separately at the same time in 2009.
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

TL74.9cm
BW409g

June 23, 2009
Two eels captured by RV Hokko-Maru in 2009

A. japonica male
58 cm, GSI:29.5%

A. marmorata male
46 cm, GSI:25.3%

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
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

Night: 20:00-4:00
Day: 8:00-16:00

Swimming depth (m)

Days after release

DO  T
4.43  29.9
4.30  25.0
3.66  16.6
3.02  10.8
1.78  8.6
1.39  7.2

● night: 20:00-4:00
○ day: 8:00-16:00
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 a 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 to *Anguilla dieffenbachii* (Jellyman and Tsukamoto, 2010)
Horizontal movement of *A. japonica* #1 obtained in 2010

- **Day**: 8:00-16:00
- **Night**: 20:00-4:00
- **Morning**: 4:00-8:00
- **Evening**: 16:00-20:00

Scale: 20 cm/s
A. japonica #2

END

20 cm/s

START

#3001

13°10'N

13°00'N

141°00'E

140°50'E
A. japonica #3
A. japonica #4

20 cm/s

START

14°20'N
14°30'N

END

140°50'E  141°00'E  141°10'E  141°20'E  141°30'E  141°40'E  141°50'E  142°00'E
Velocities of 5 eels and surrounding water current