

# Sea Lice in Chile

## Integrated Pest Management

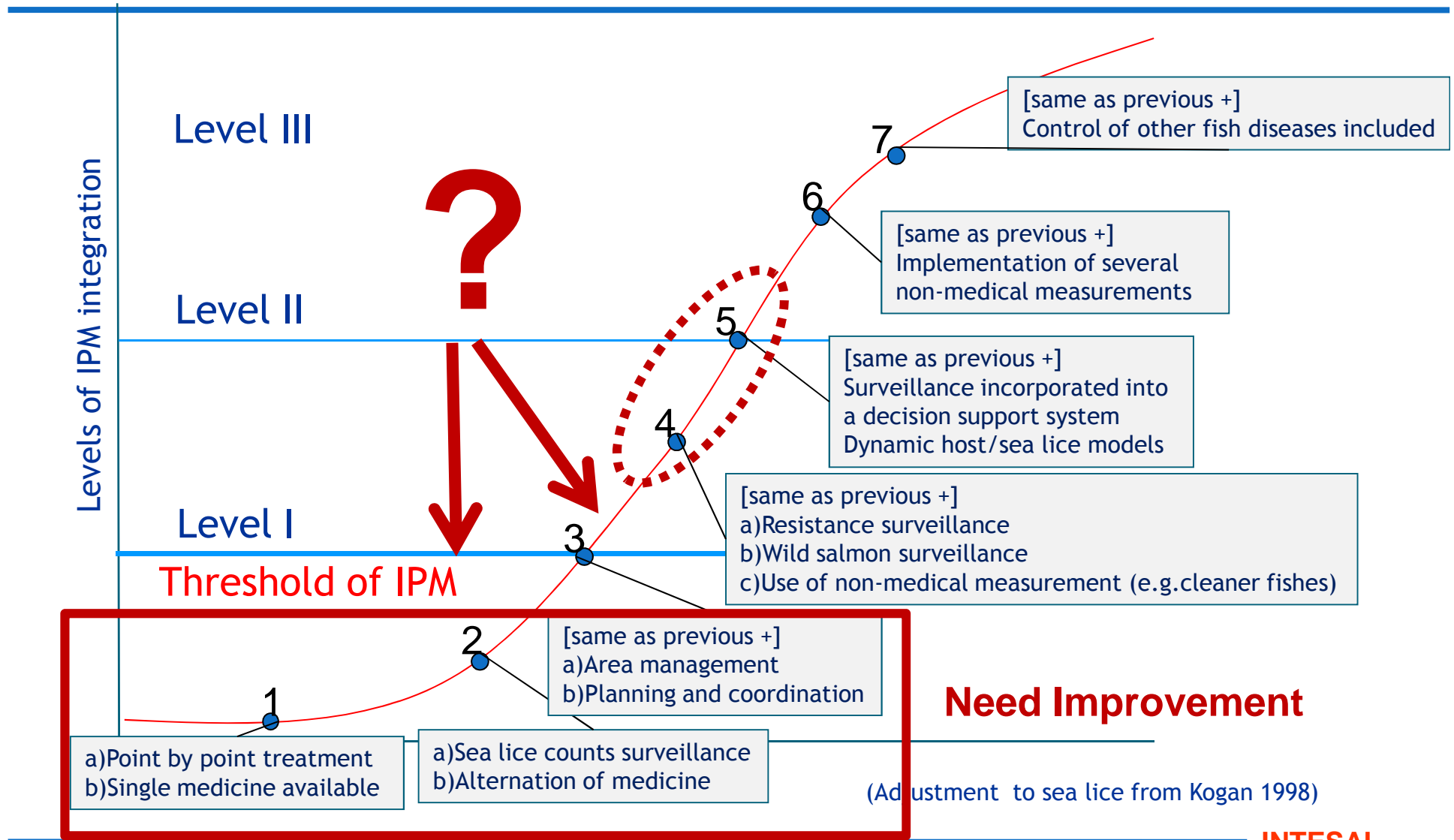
(Integrated Sea Lice Control)

### Where are we?

Instituto Tecnológico del Salmón- SalmonChile  
November 2013

# Levels of IPM Integration

## Where is Chile?



# The Chilean Industry

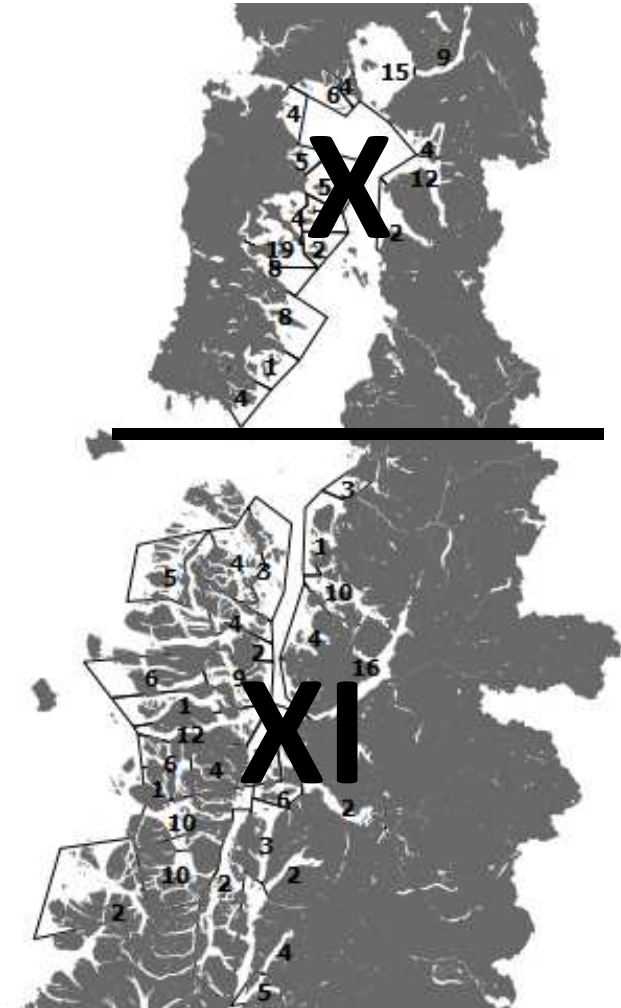
Data from Salmon Research Institute (Intesal)



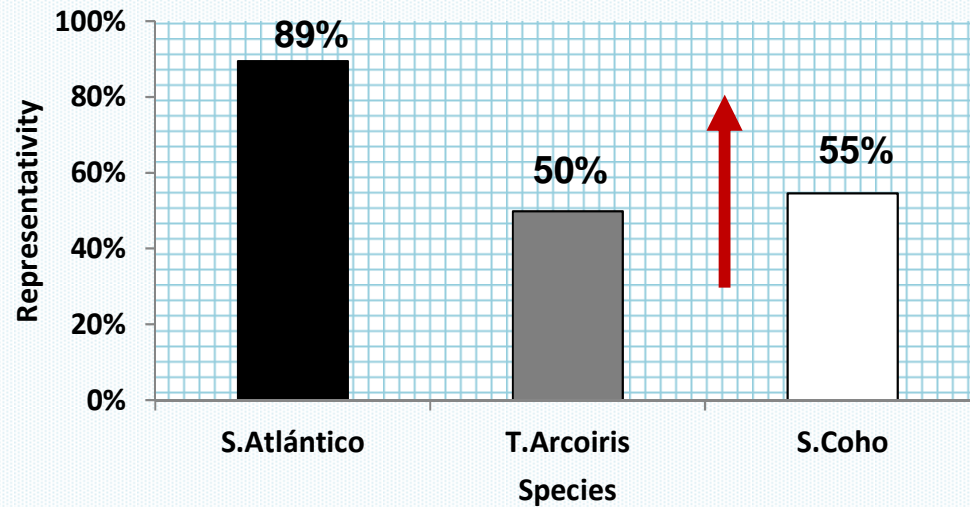
## 280 Sites

- 93 % X y XI Region
- 7% XII Region

N° de Centros Activos



Data Representativity



INTESAL

# The Chilean Industry

## Organization and Administration

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### **Sanitary Area Management (AMS)**

### **Aggregation of Salmon producing sites (ASC)**

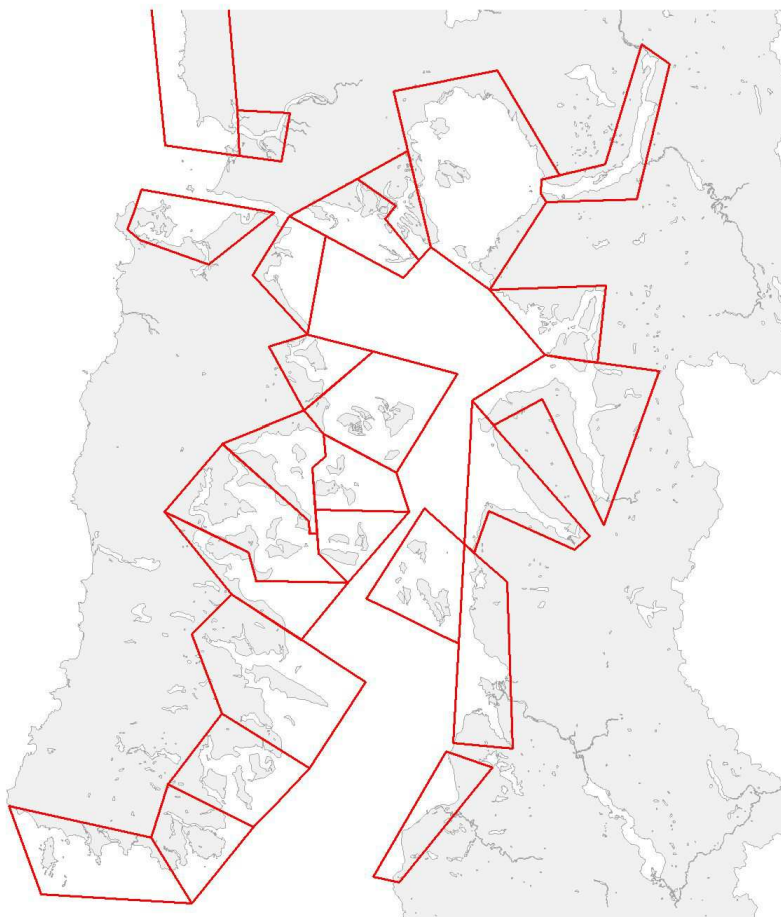
#### ***Barrios- Neighborhoods***

**Group of salmon producing sites within an area that has been declared suitable for the development of aquaculture and is located in a zone that has epidemiological, oceanographic, operational or geographic characteristics that justify its coordinated sanitary management**

# The Chilean Industry

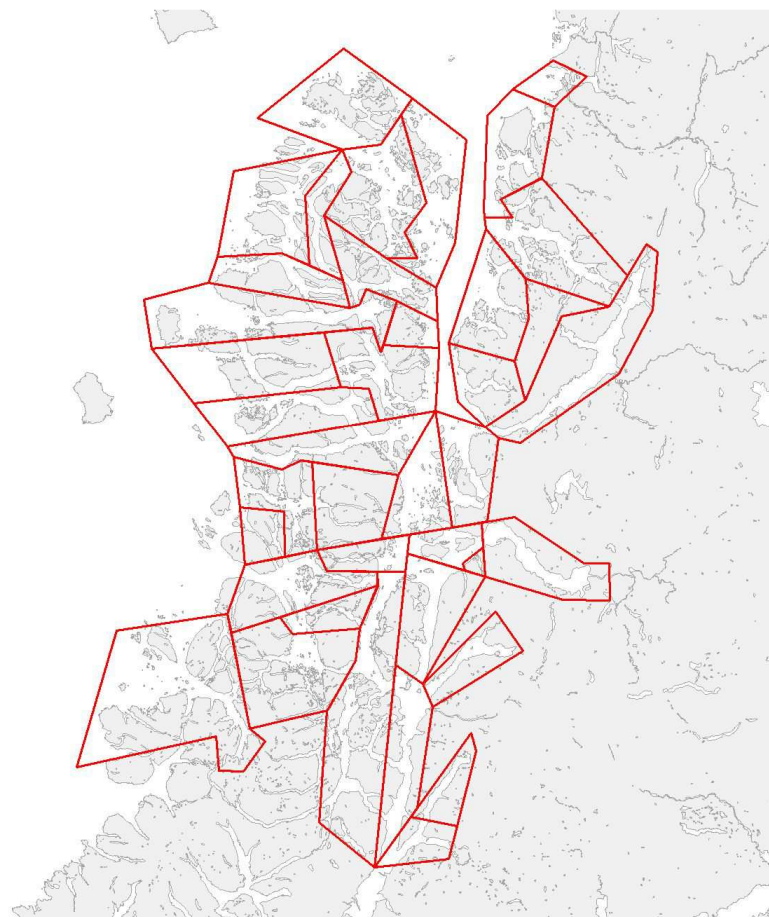
## Organization and Administration

X<sup>th</sup> Region



25

XI<sup>th</sup> Region



38

# The Chilean Industry

## Organization and Administration

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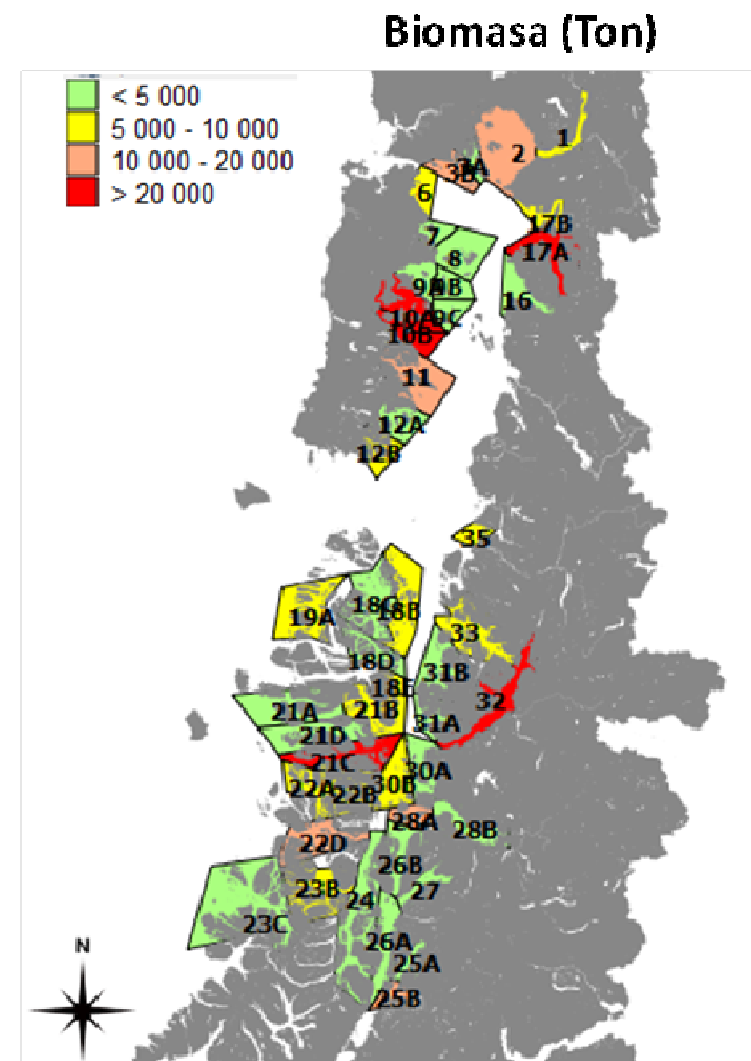
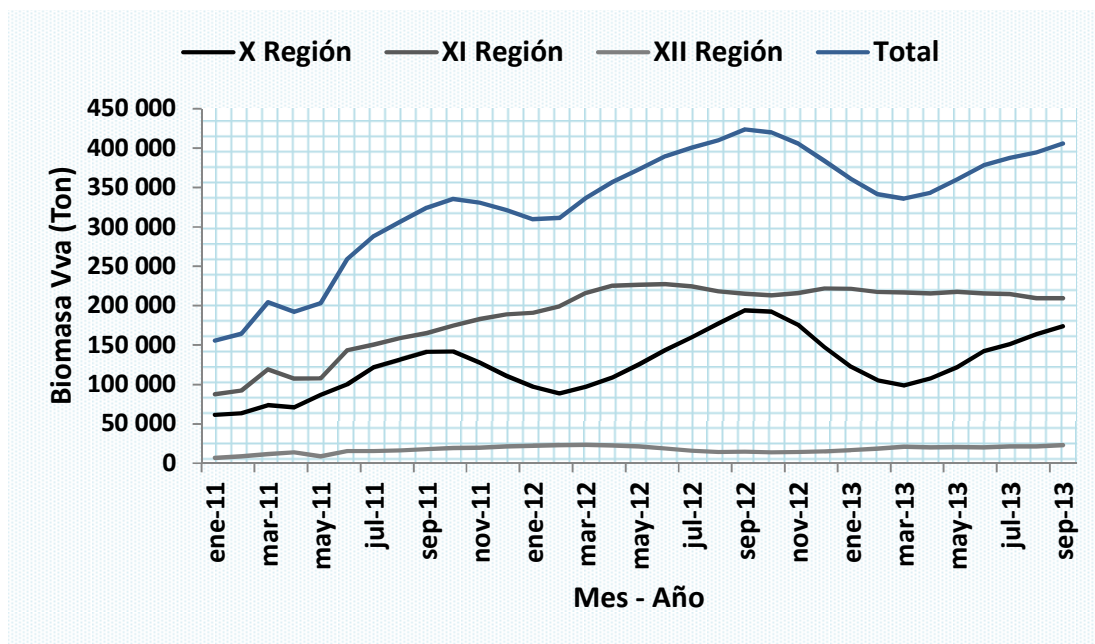
**Neighborhoods have been a contribution to the administration, operation, collaboration and coordinated work in the Chilean salmon industry**

- **Coordinated fallowing (all in all out)**
- **Maximum production period**
- **Contingency plans**
- **Additional sanitary measures (e.g. vaccination)**
- **Coordinated sea lice treatment**

**Neighborhoods have also been a contribution to the management and delivery of information**

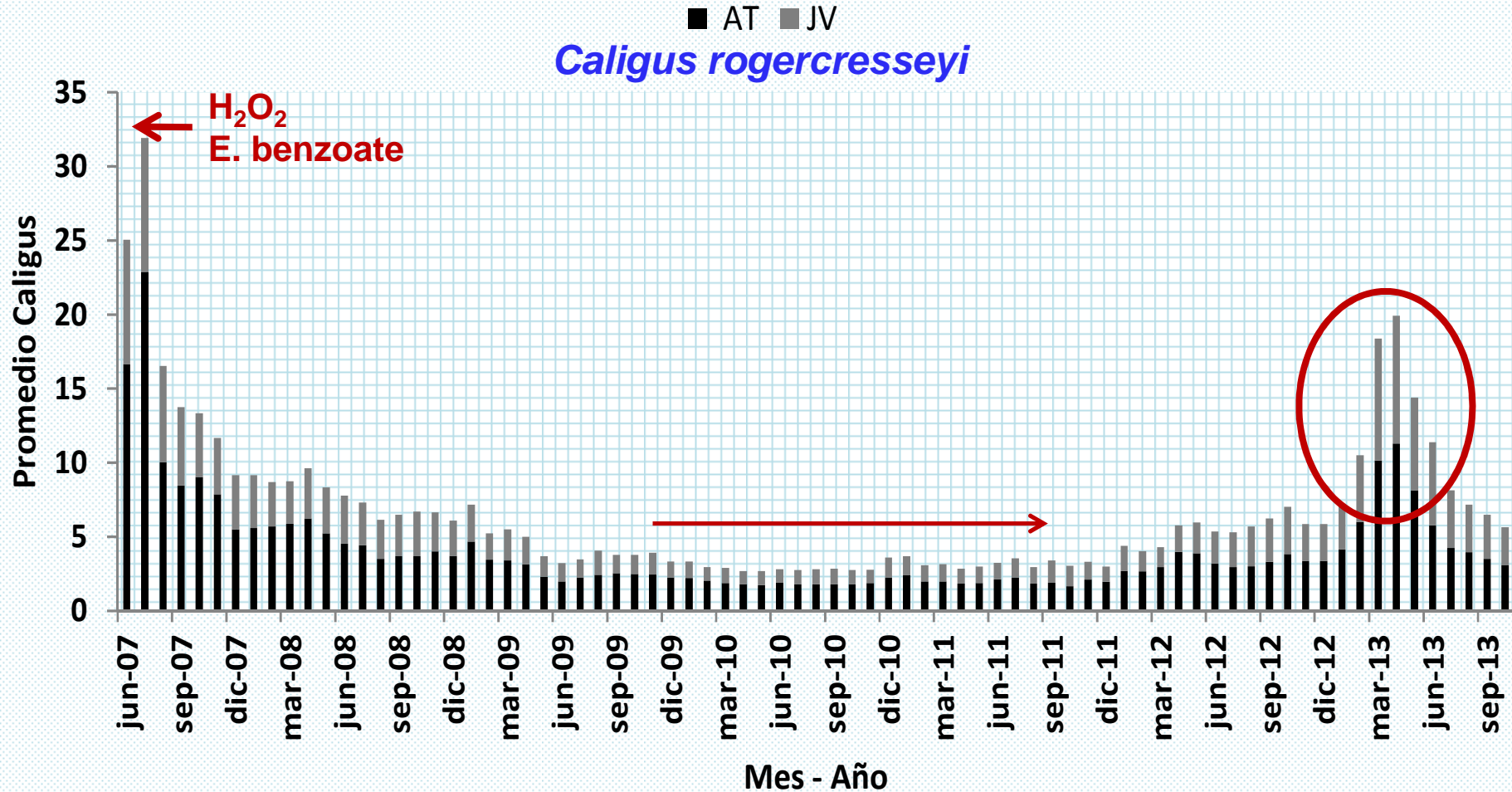
# The Chilean Industry

## Biomass (at sea) September 2013



# Sea Lice in Chile

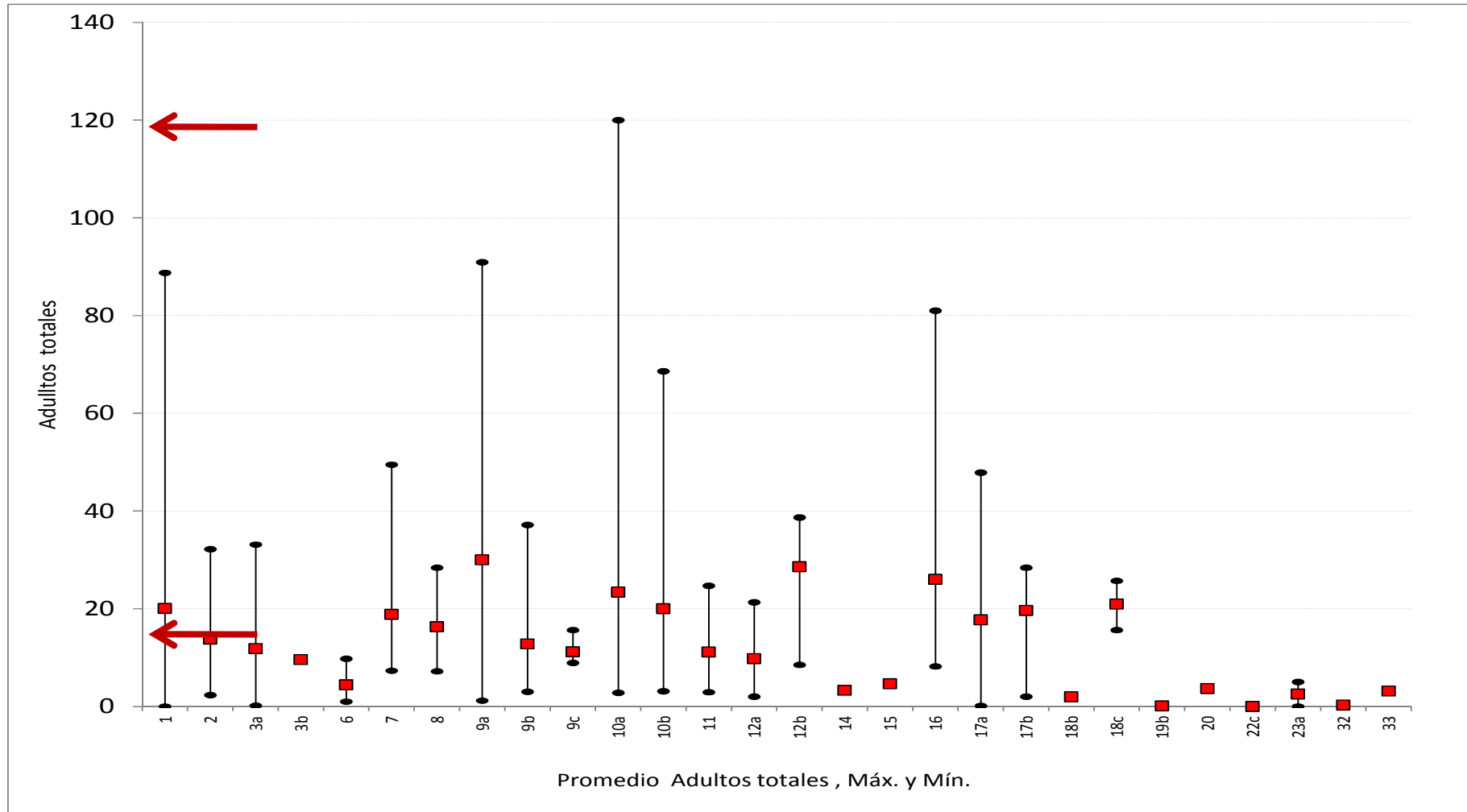
Variation in time (June 2007-Sep-2013)





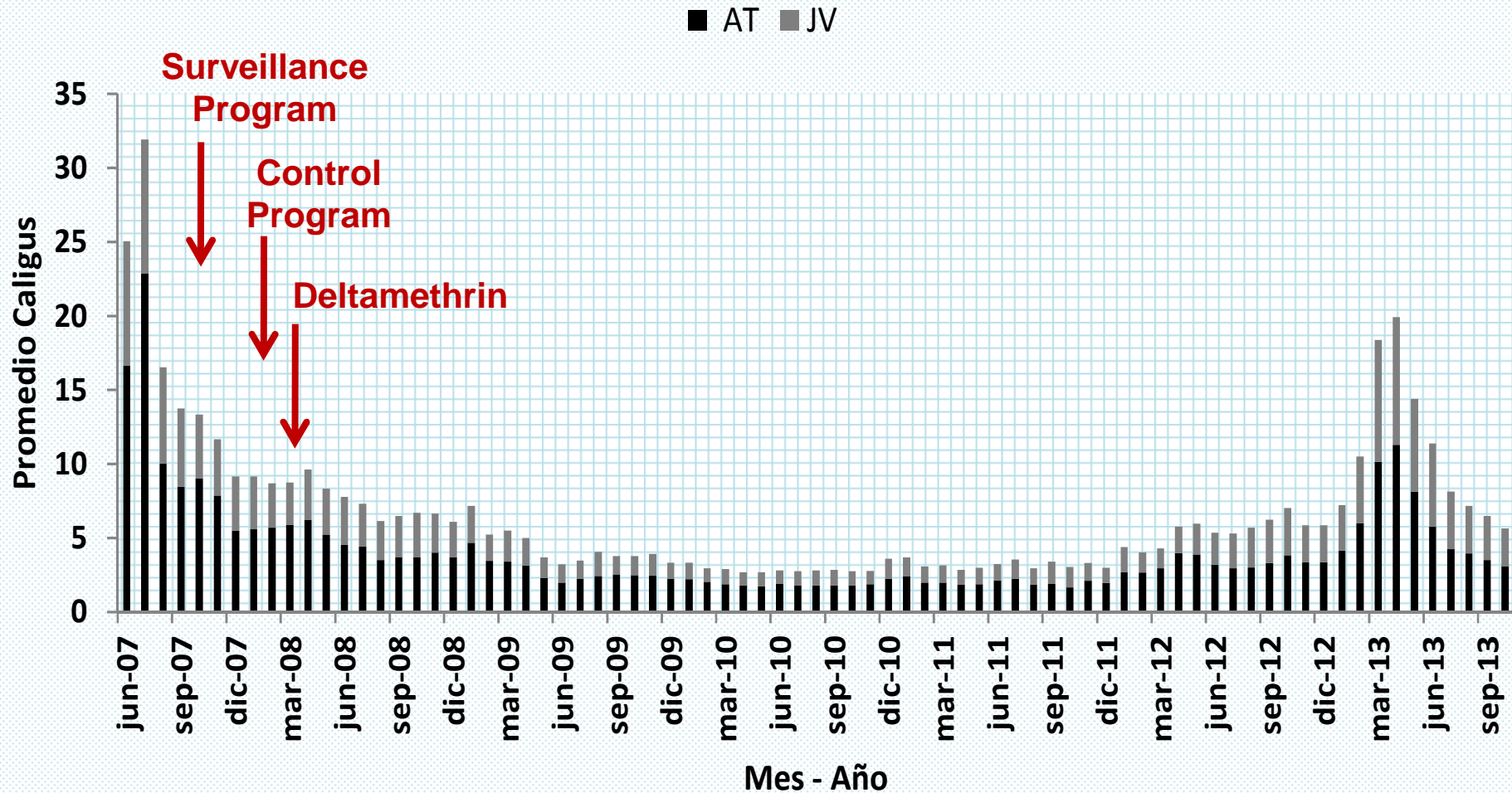
# Sea Lice in Chile

## Neighborhoods, Adults June 2007



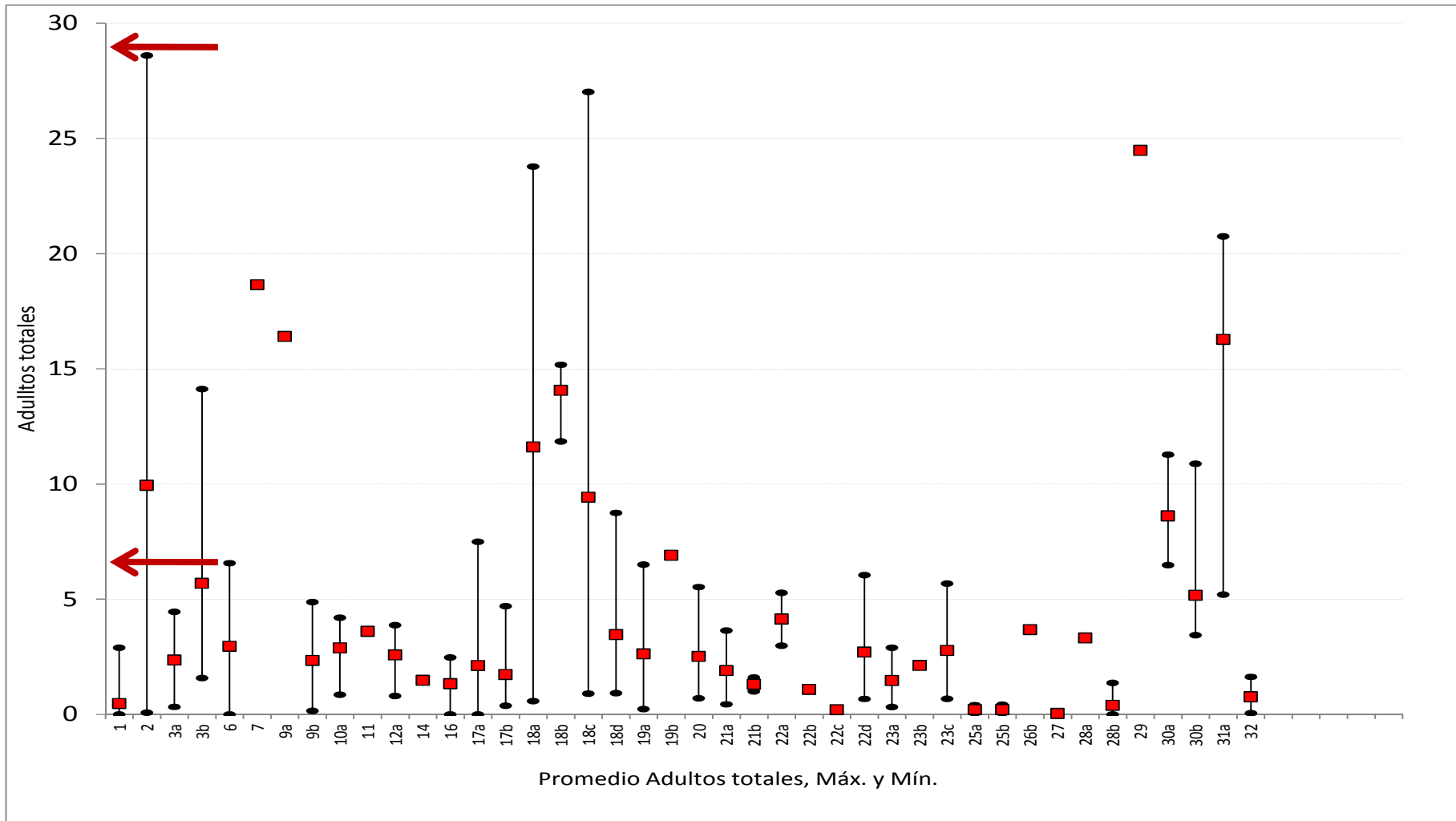
# Sea Lice in Chile

## Surveillance and control Measures 2007- 2008



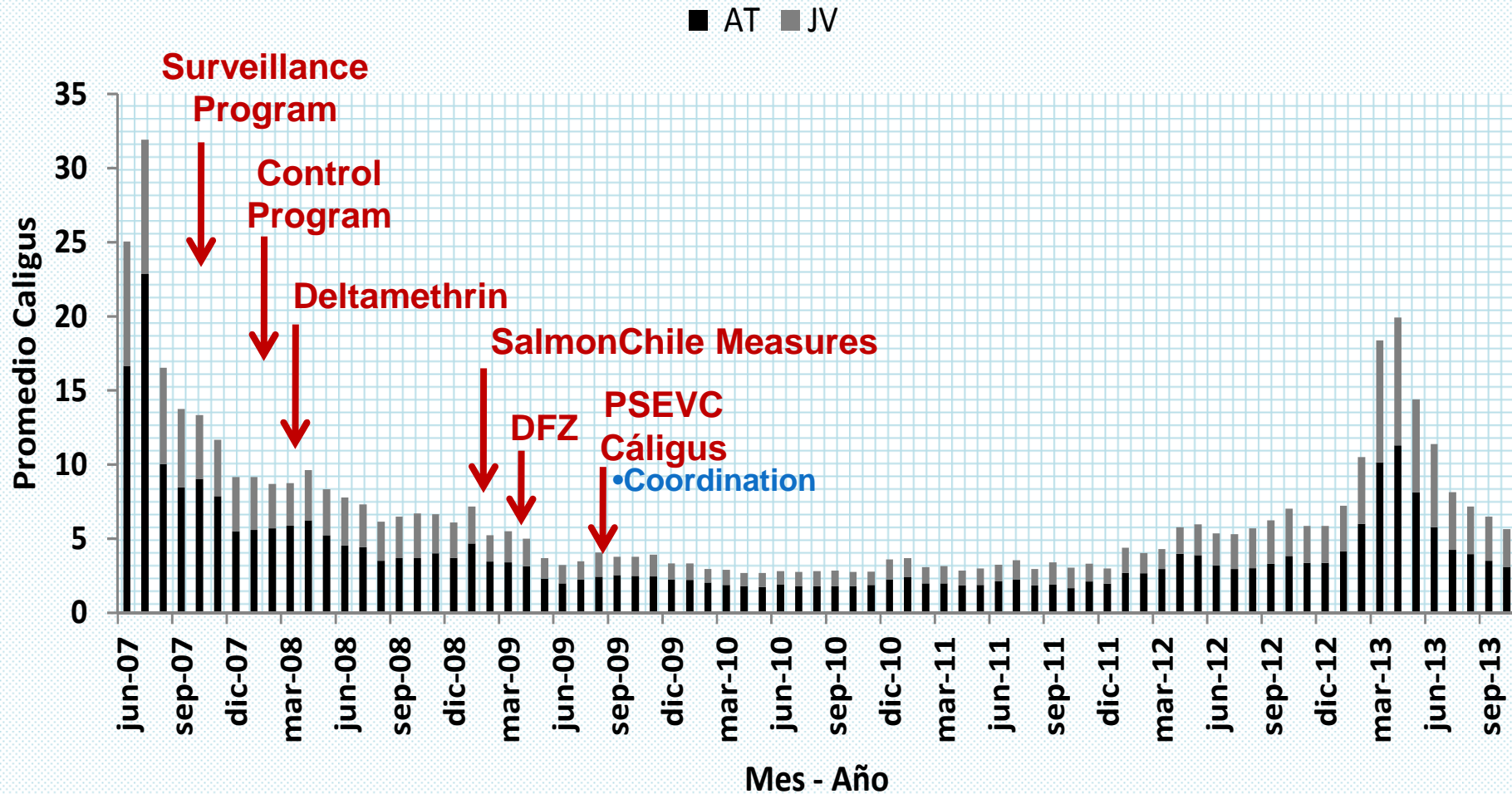
# Sea Lice in Chile

## Neighborhoods, Adults December 2008



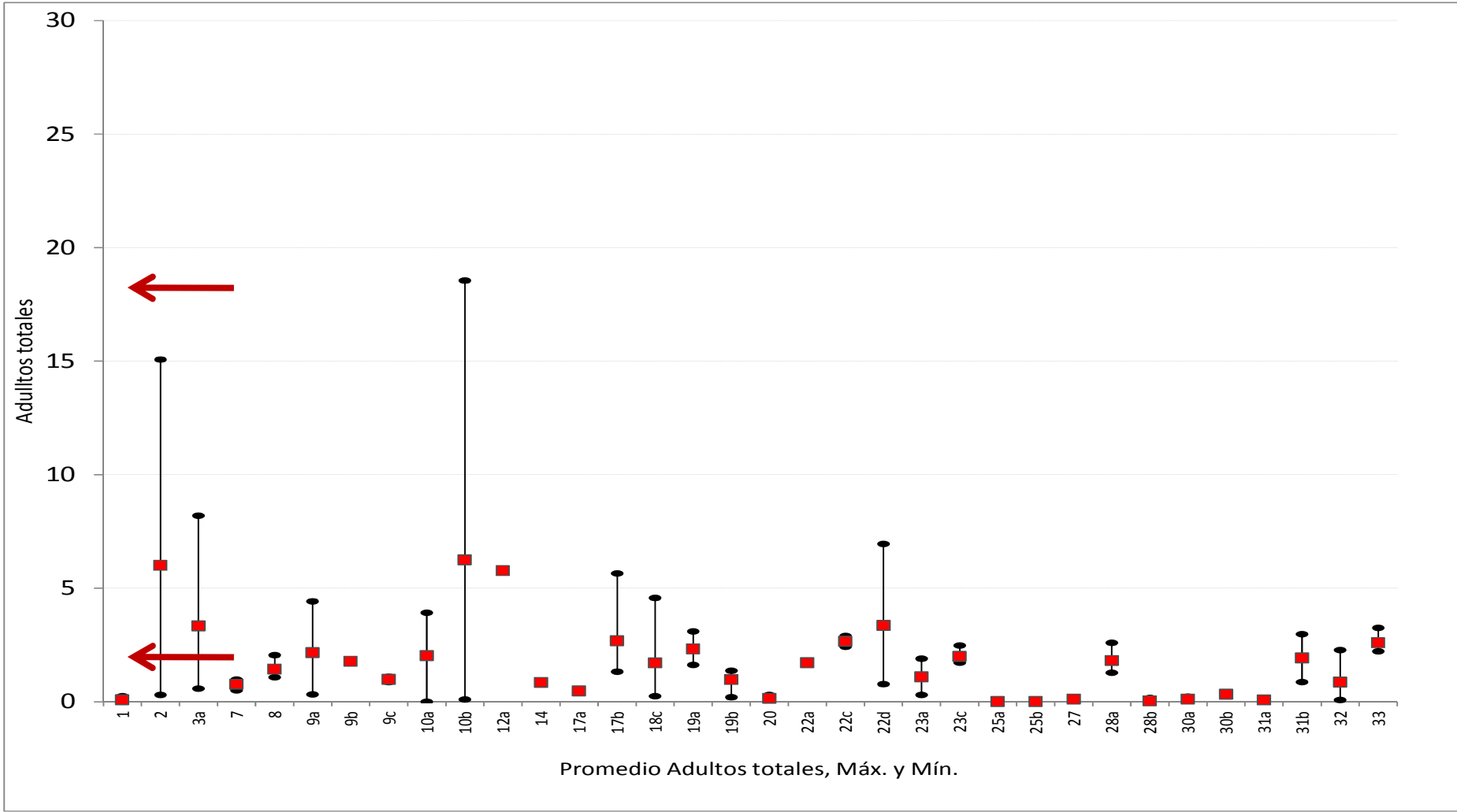
# Sea Lice in Chile

## Surveillance and control Measures 2009



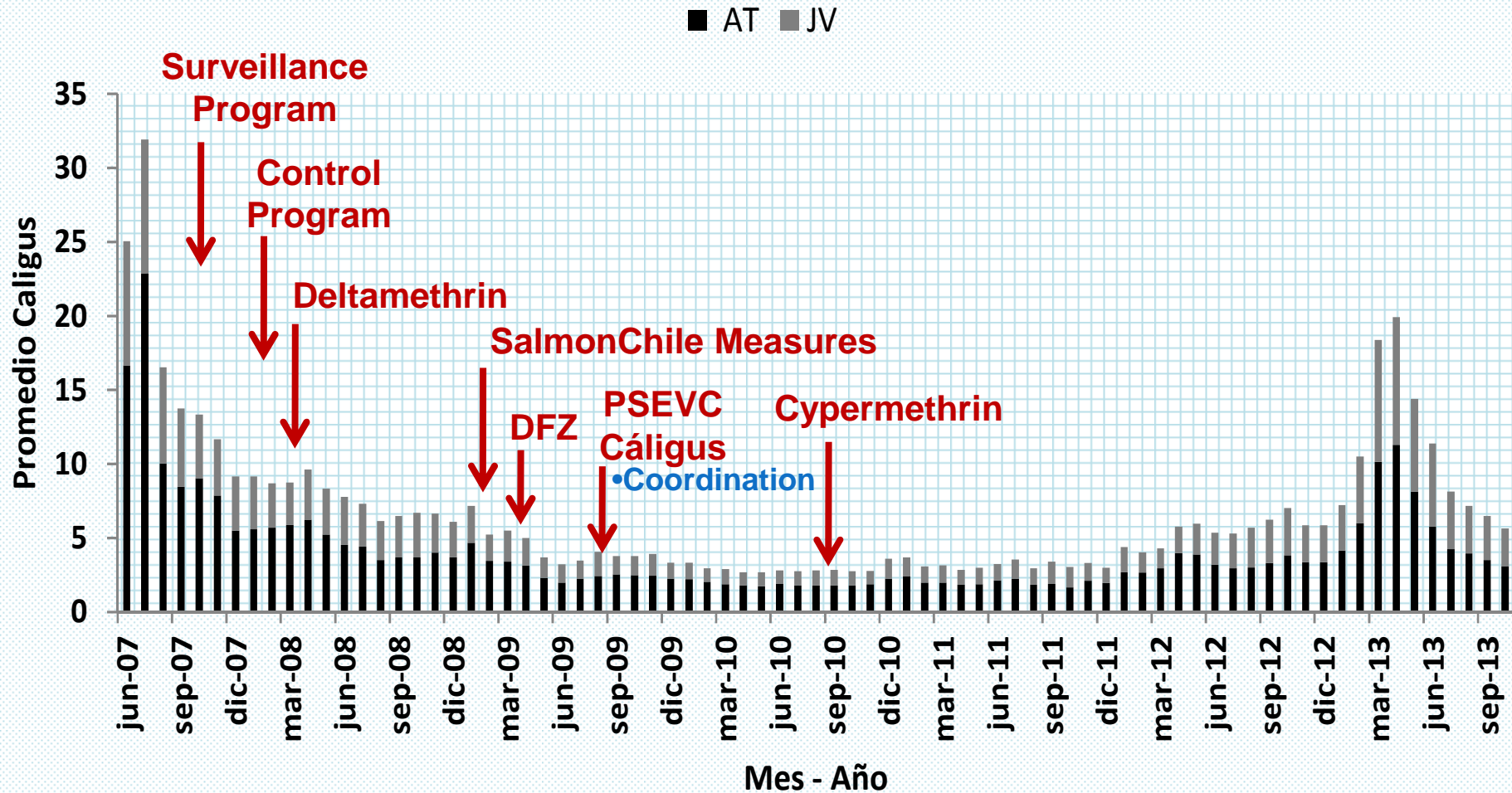
# Sea Lice in Chile

## Neighborhoods, Adults December 2009



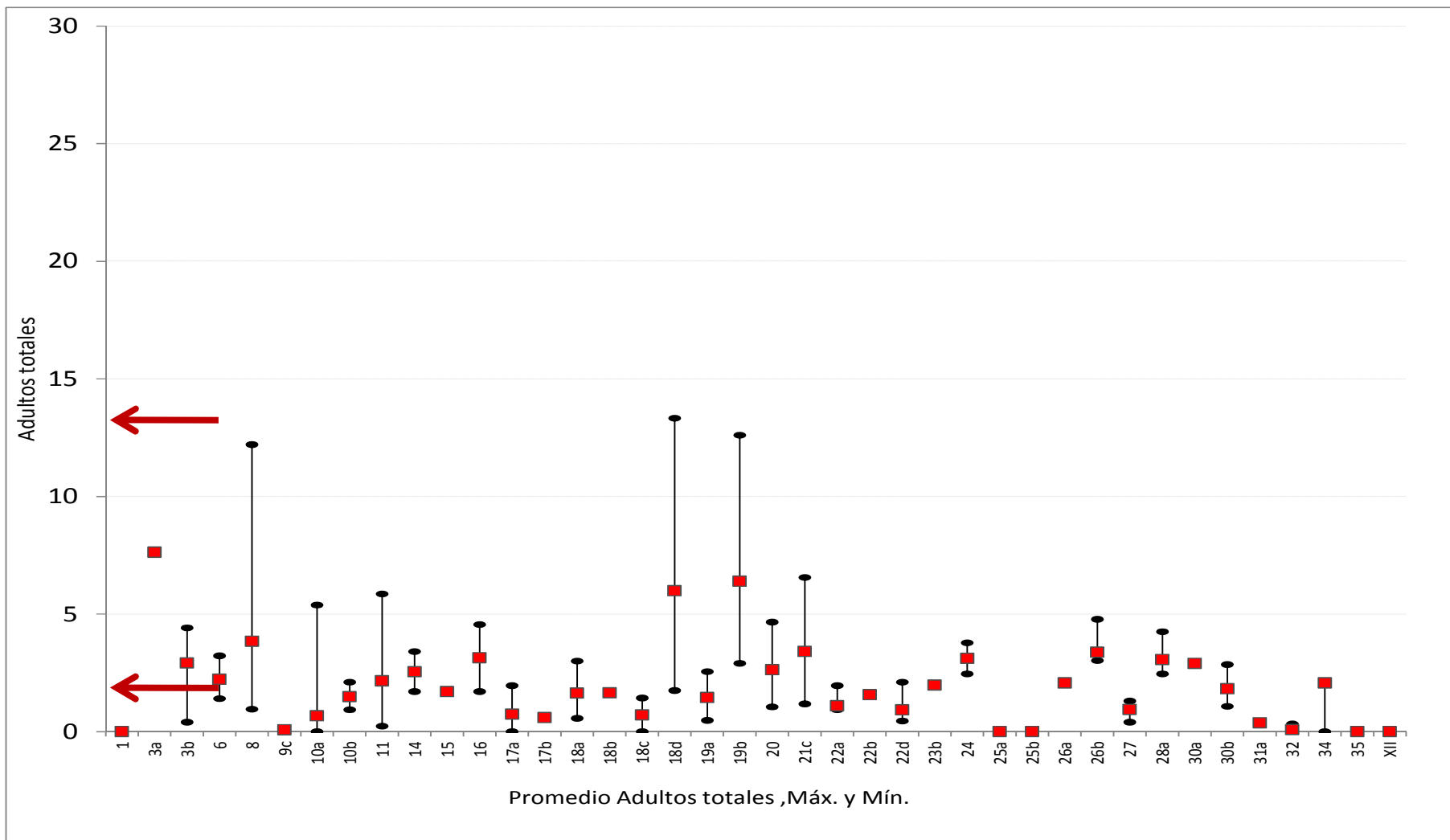
# Sea Lice in Chile

## Surveillance and control Measures 2010



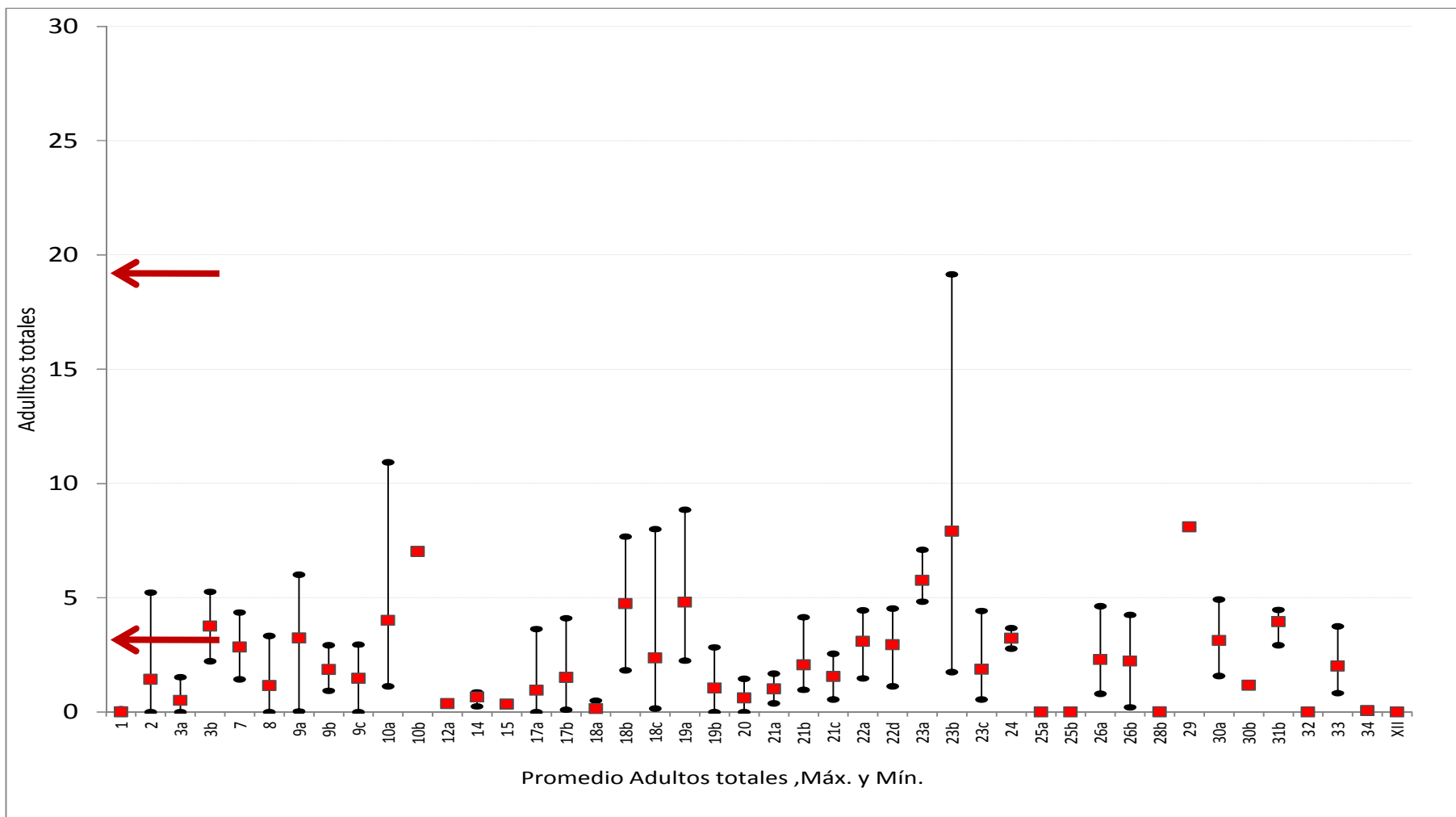
# Sea Lice in Chile

## Neighborhoods, Adults December 2010



# Sea Lice in Chile

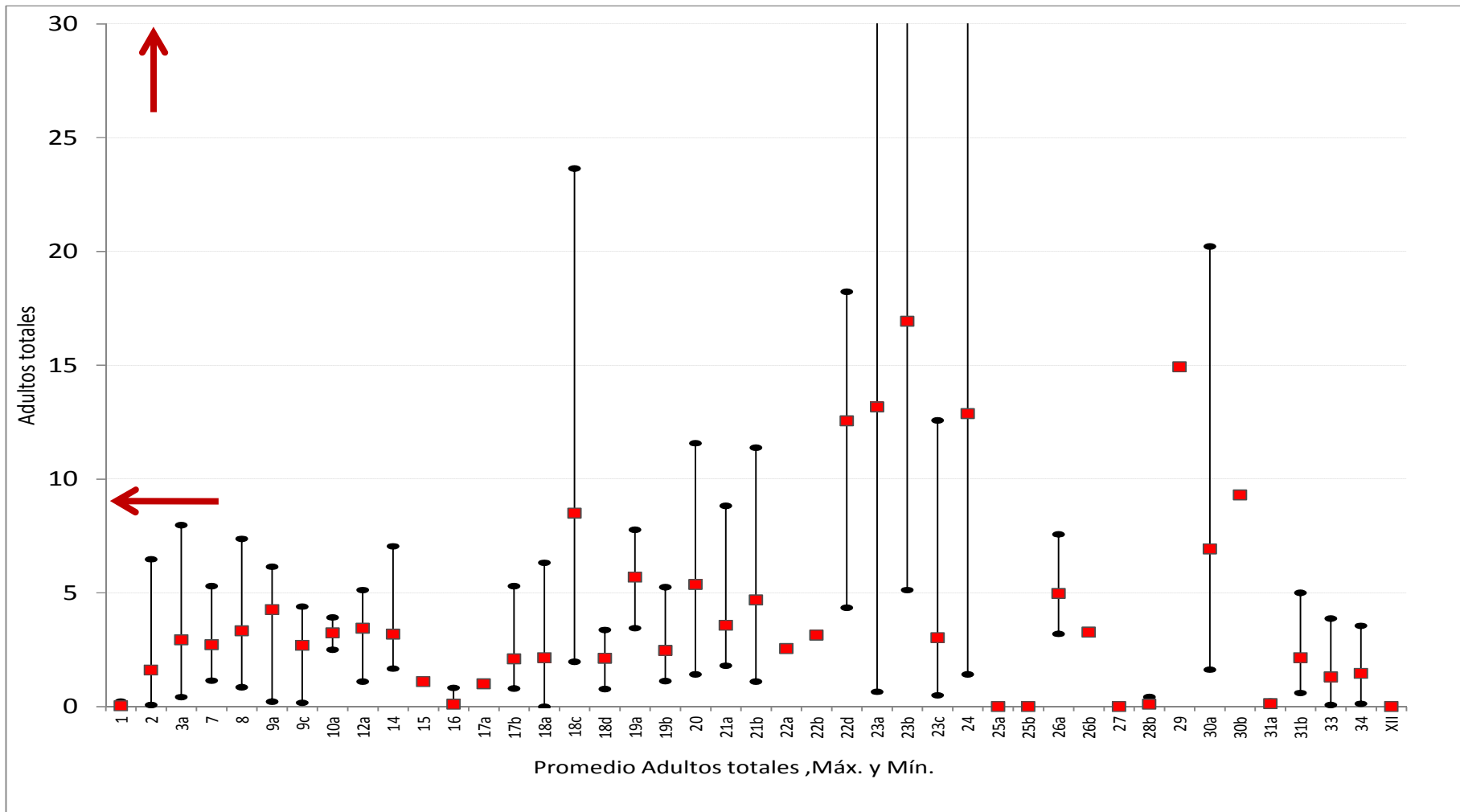
## Neighborhoods, Adults December 2011





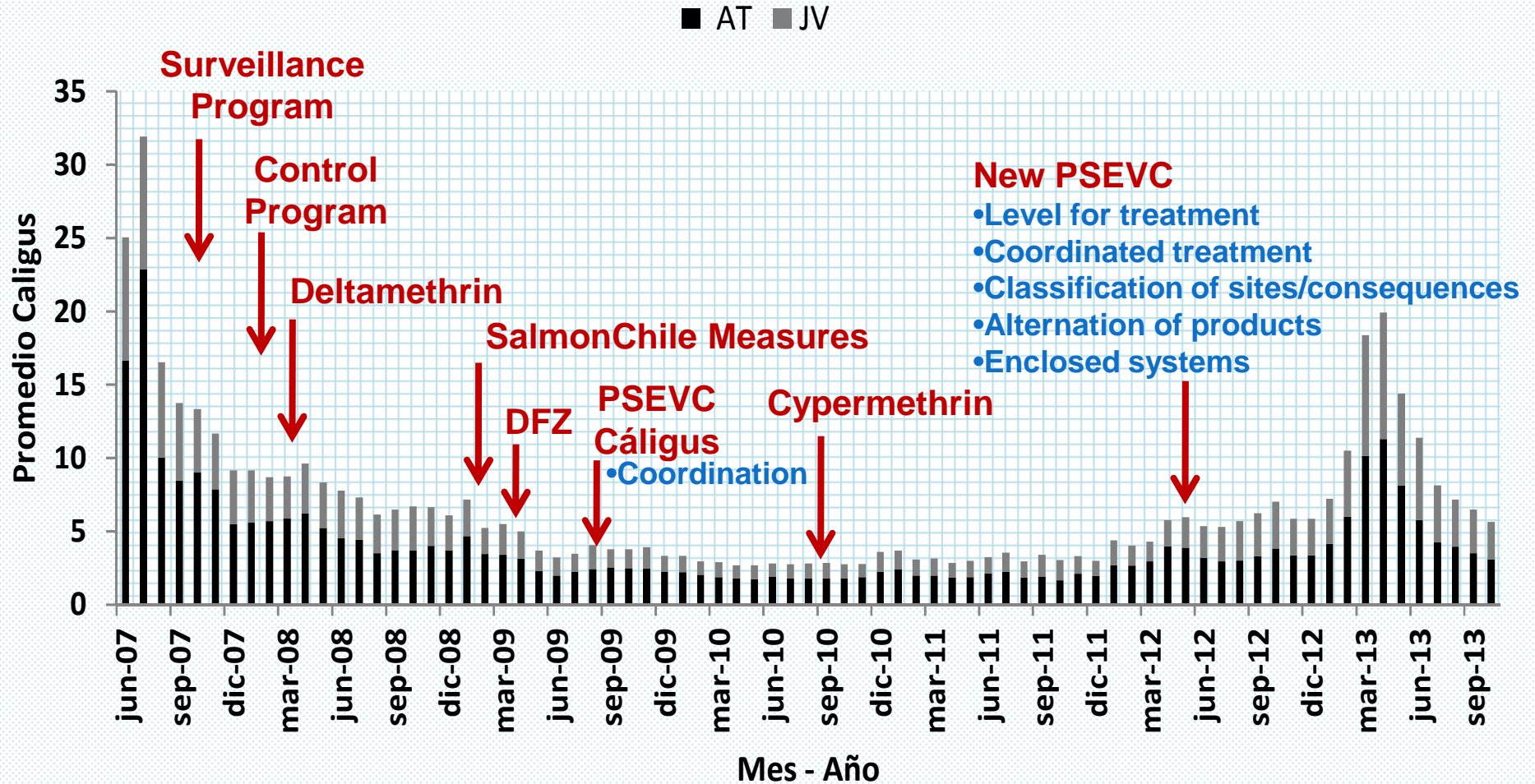
# Sea Lice in Chile

## Neighborhoods, Adults April 2012



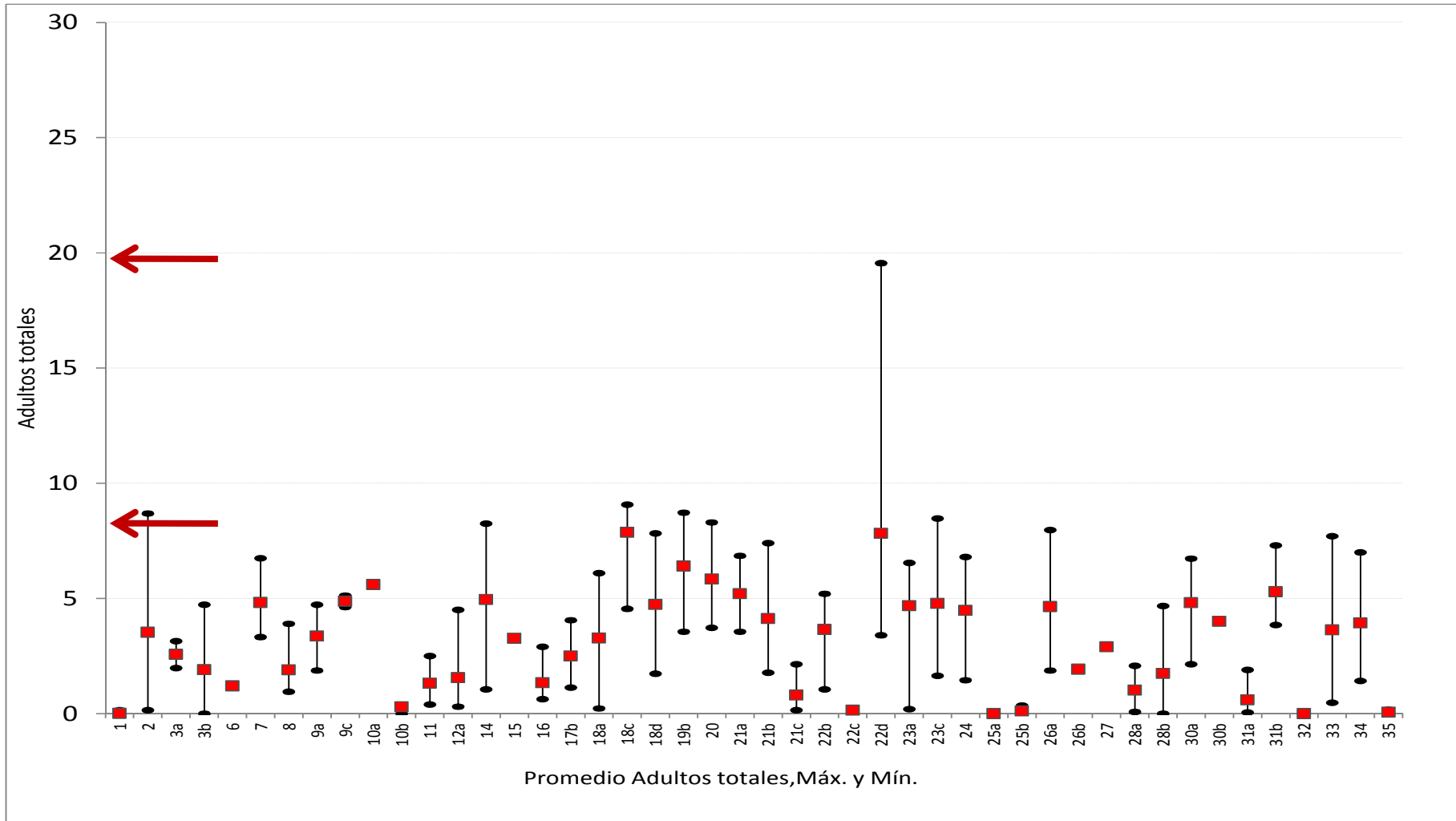
# Sea Lice in Chile

## Surveillance and control Measures 2012



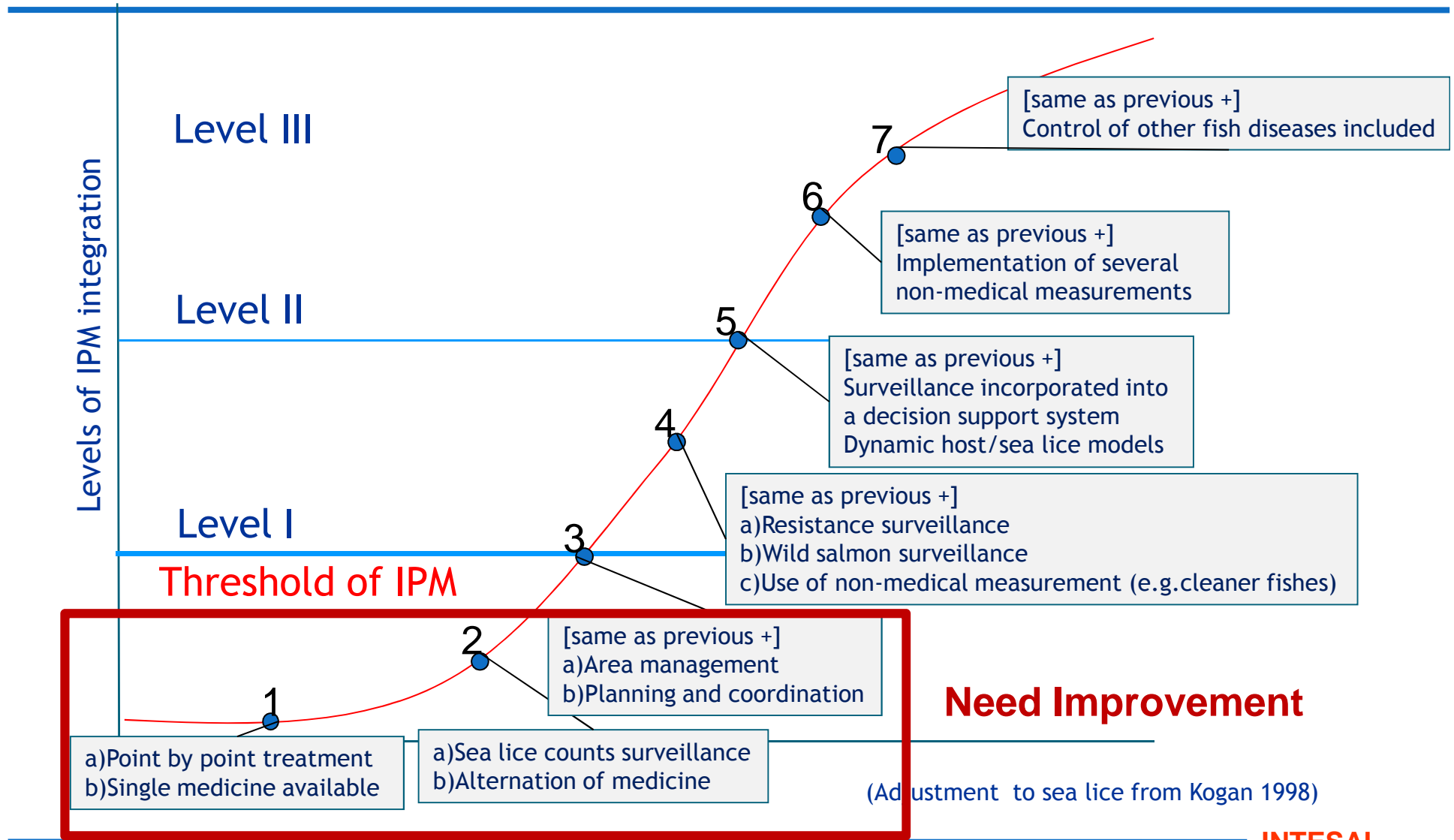
# Sea Lice in Chile

## Neighborhoods, Adults August 2012



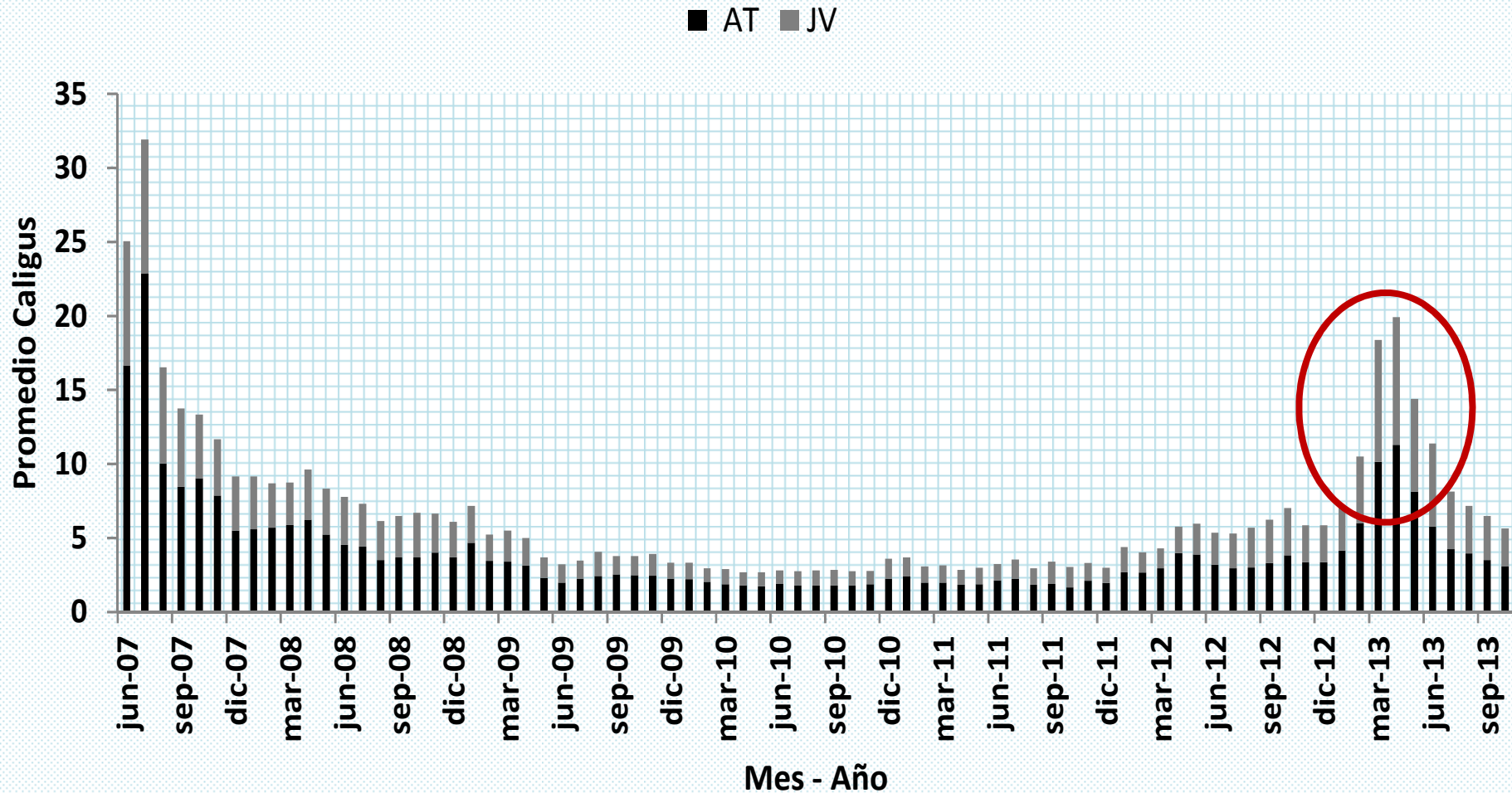
# Levels of IPM Integration

## Where is Chile?



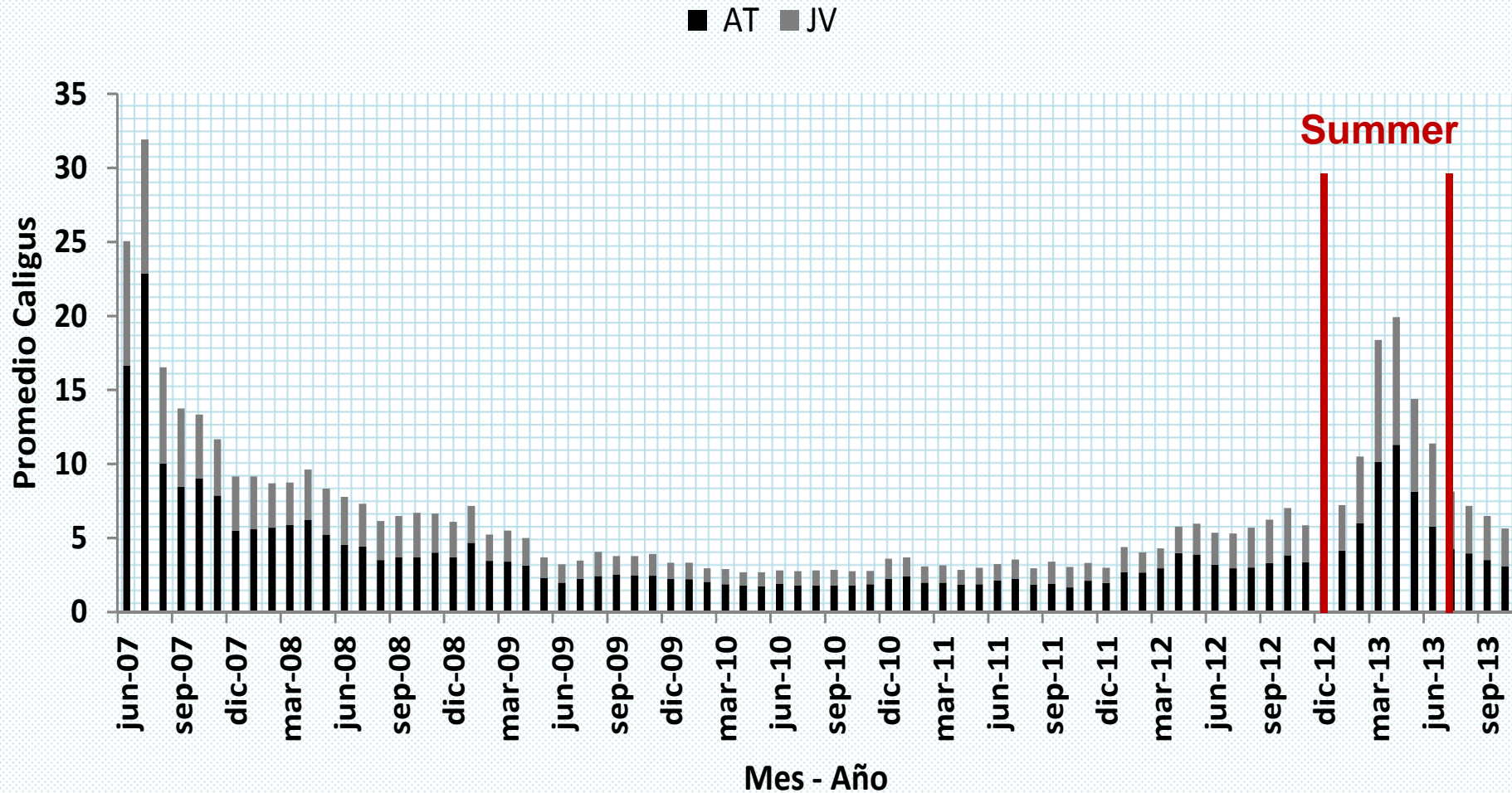
# Sea Lice in Chile

## Variation in time (June 2007-Sep-2013)



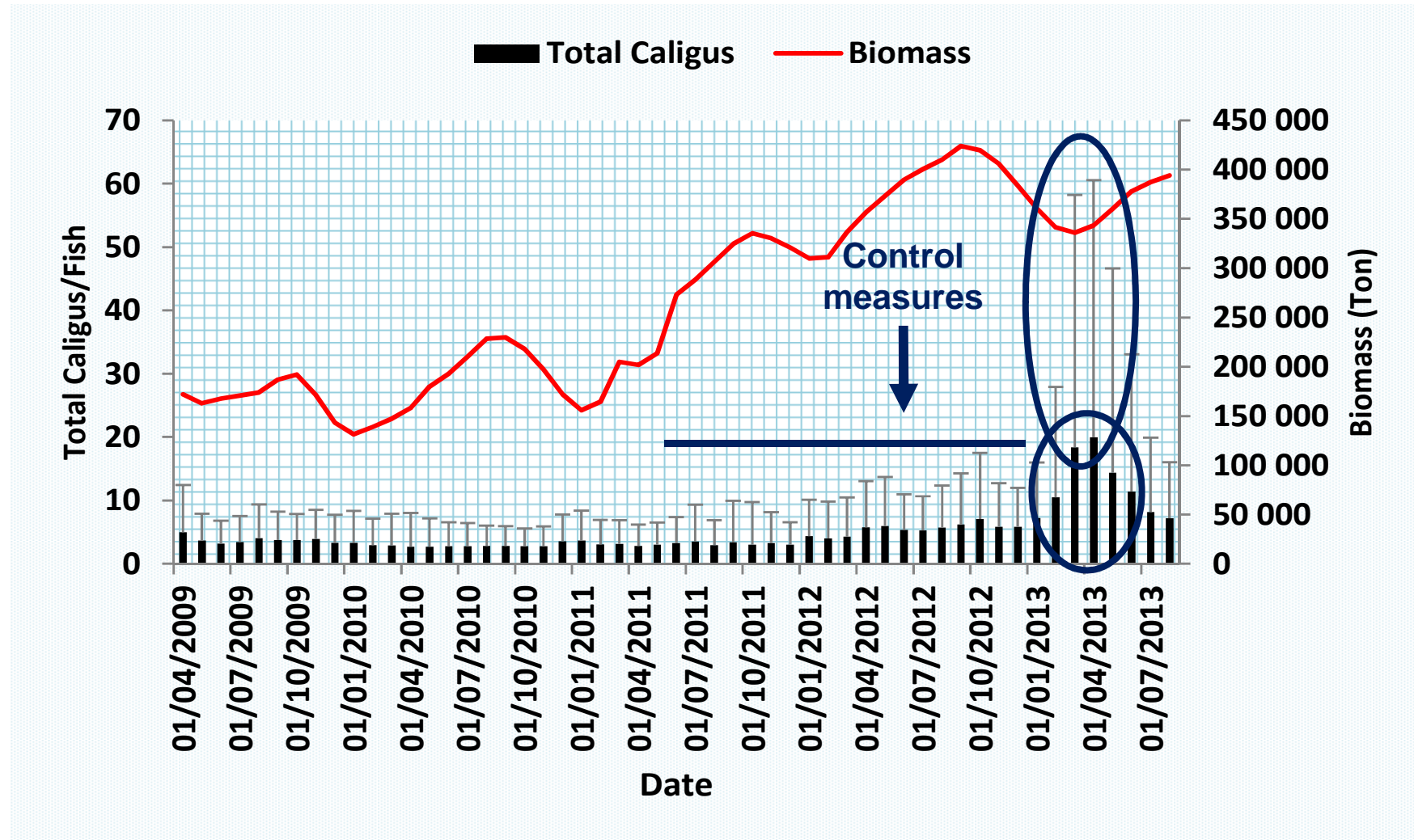
# Sea Lice in Chile

## Variation in time (June 2007-Sep-2013)



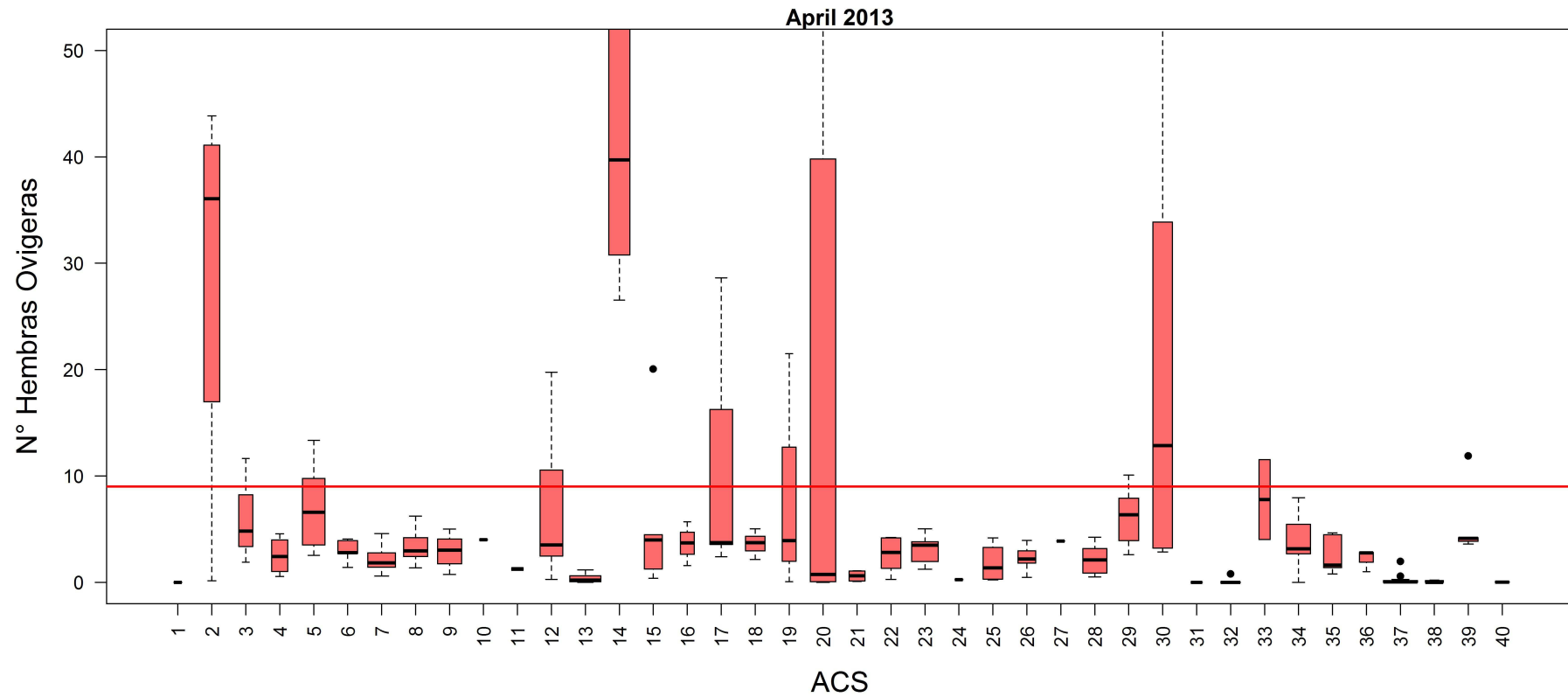
# Biomass and Sea Lice

## Variation in Time (2009- 2013)



# Sea Lice in Chile

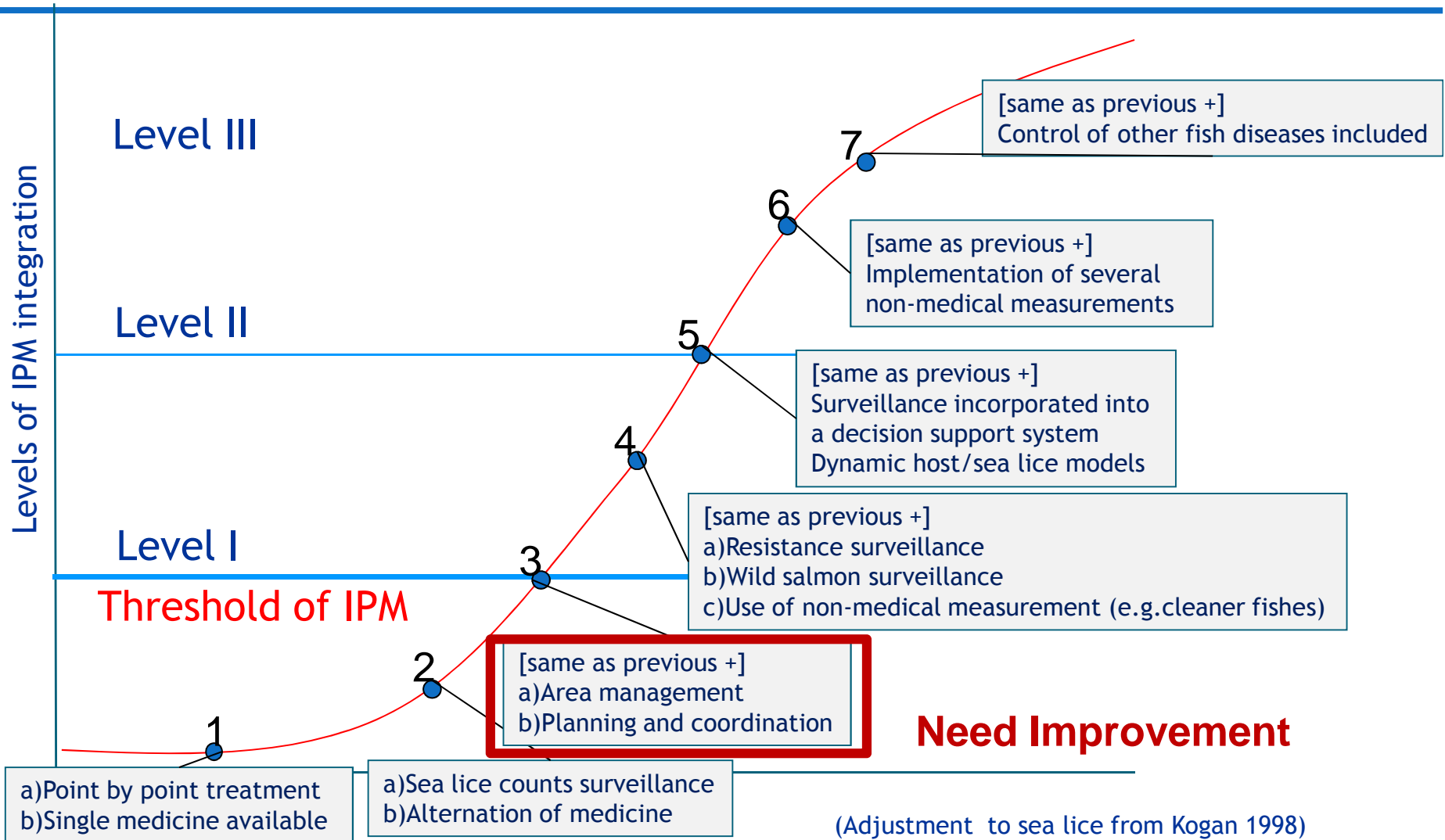
## Neighborhoods, Gravid Female April 2013





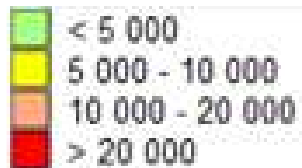
# Levels of IPM Integration

## Where is Chile?

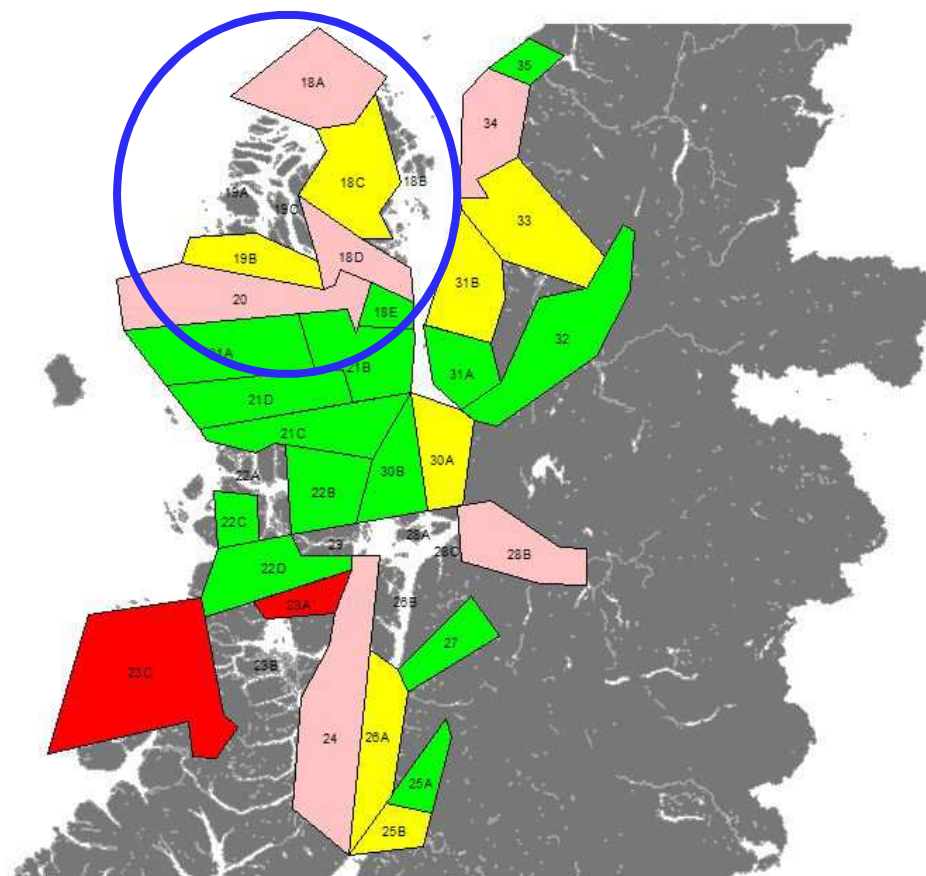
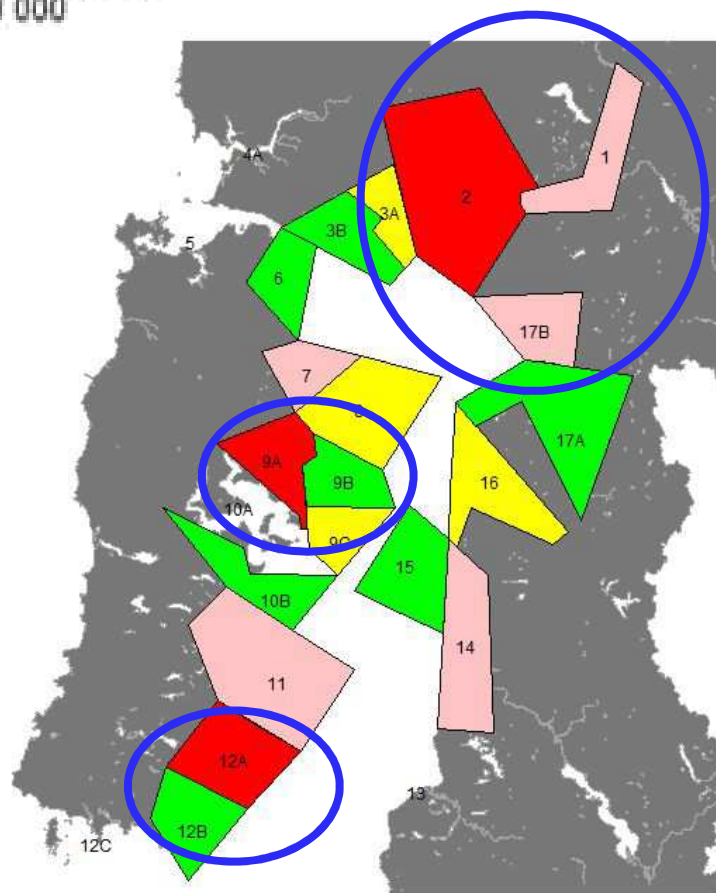


# The Chilean Industry

## Biomass distribution



September 2012

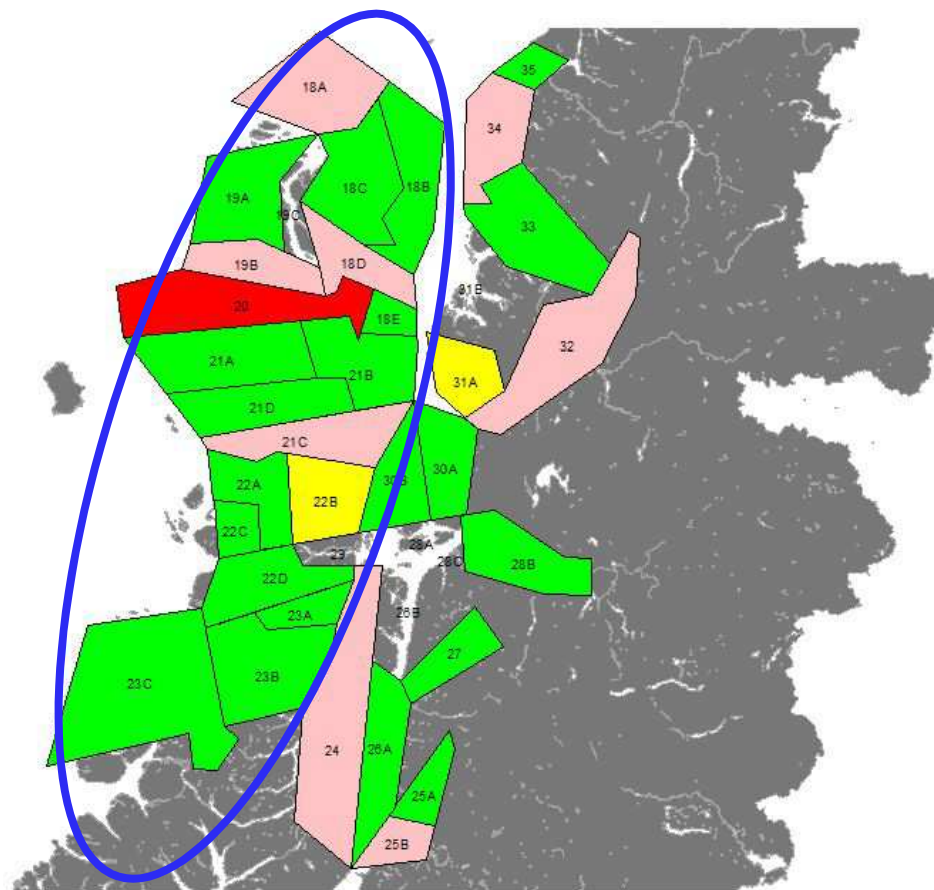
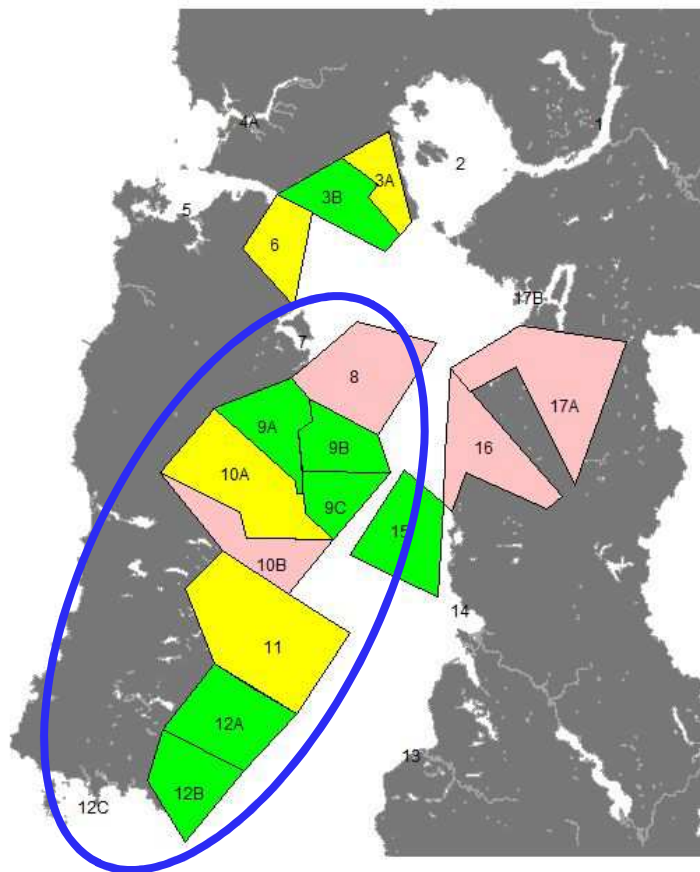


# The Chilean Industry

## Biomass distribution



March 2013

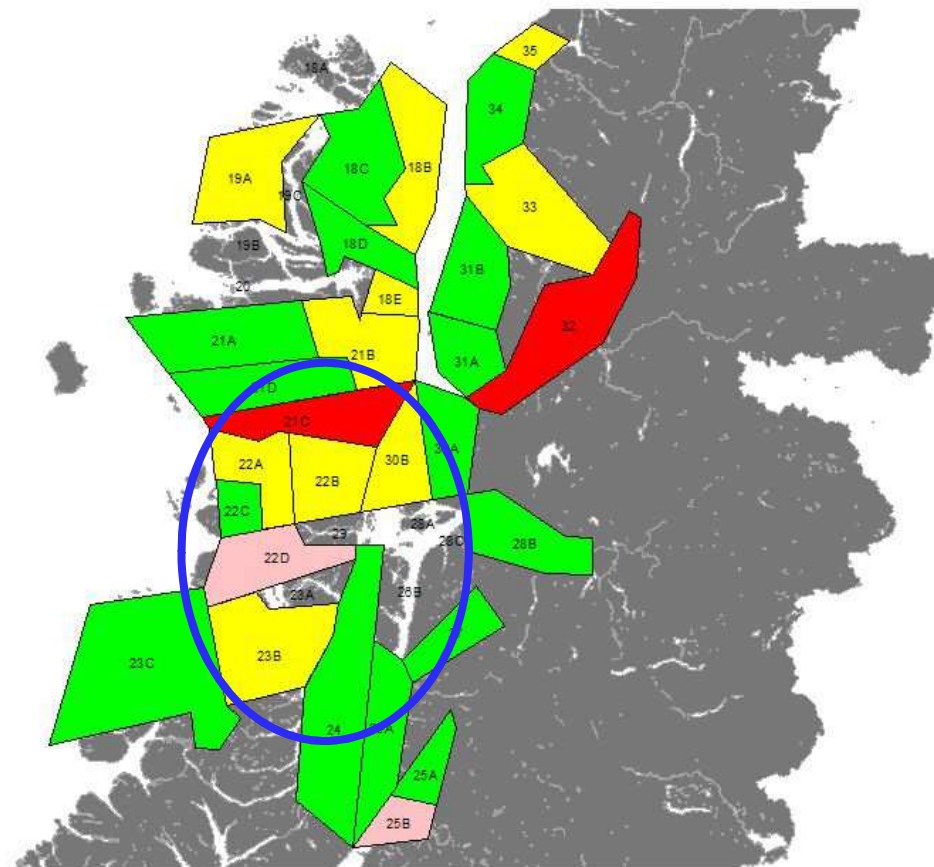
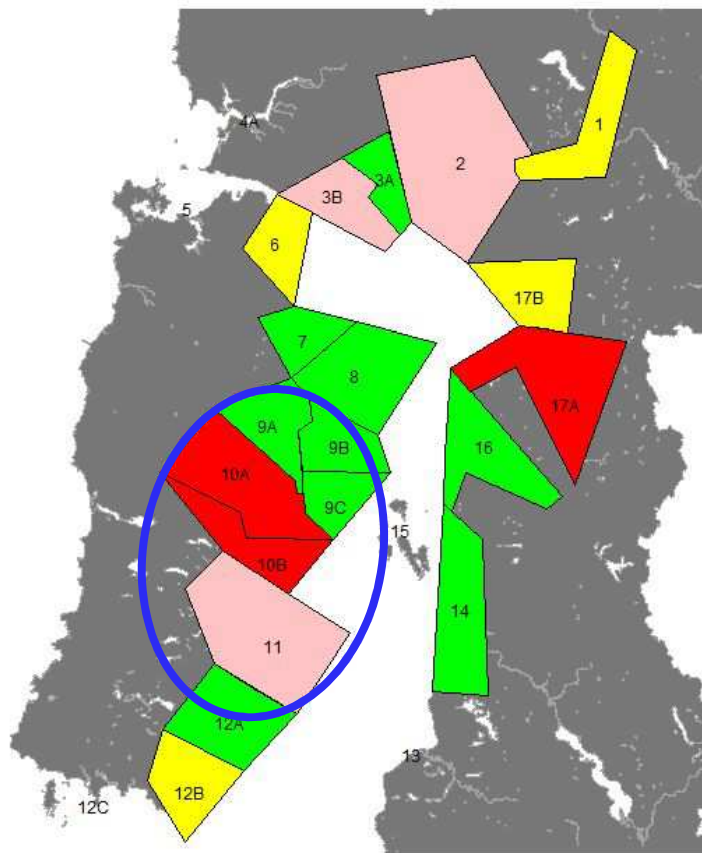


# The Chilean Industry

## Biomass distribution



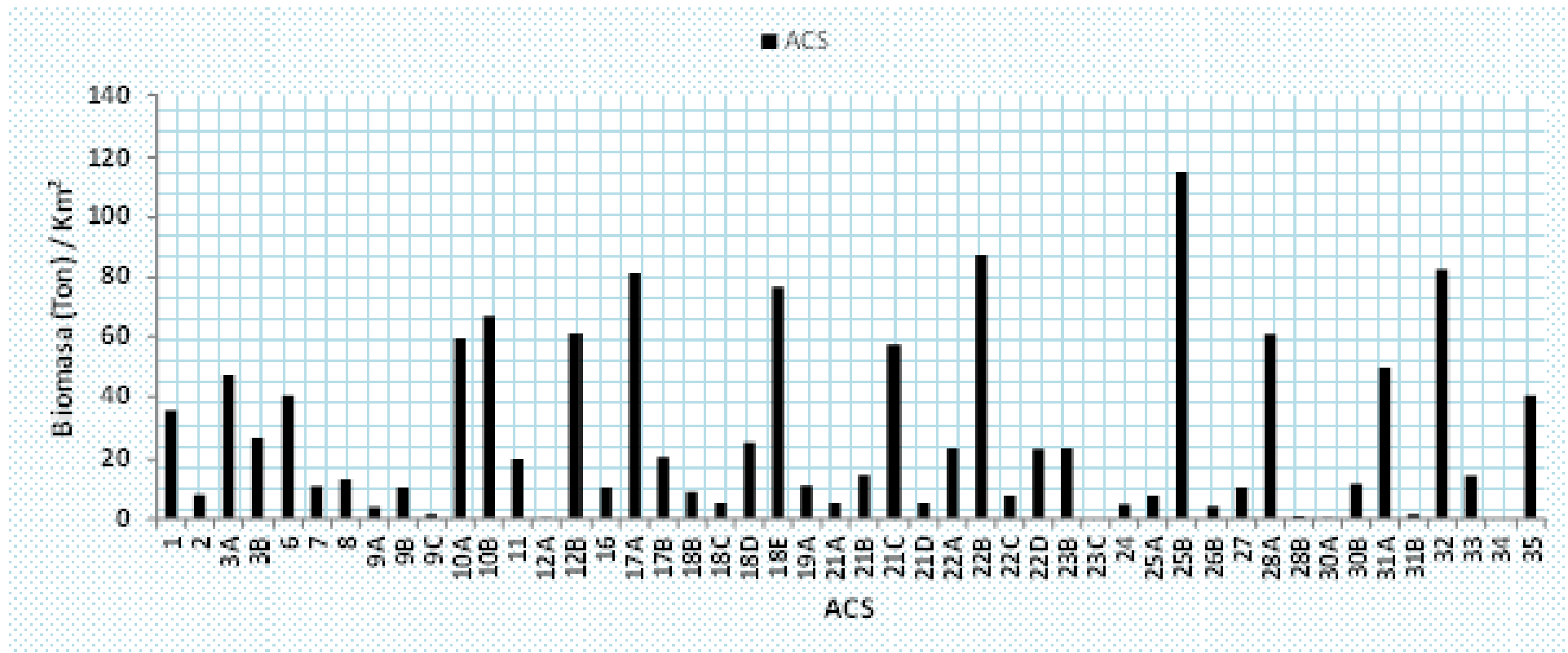
September 2013



# The Chilean Industry

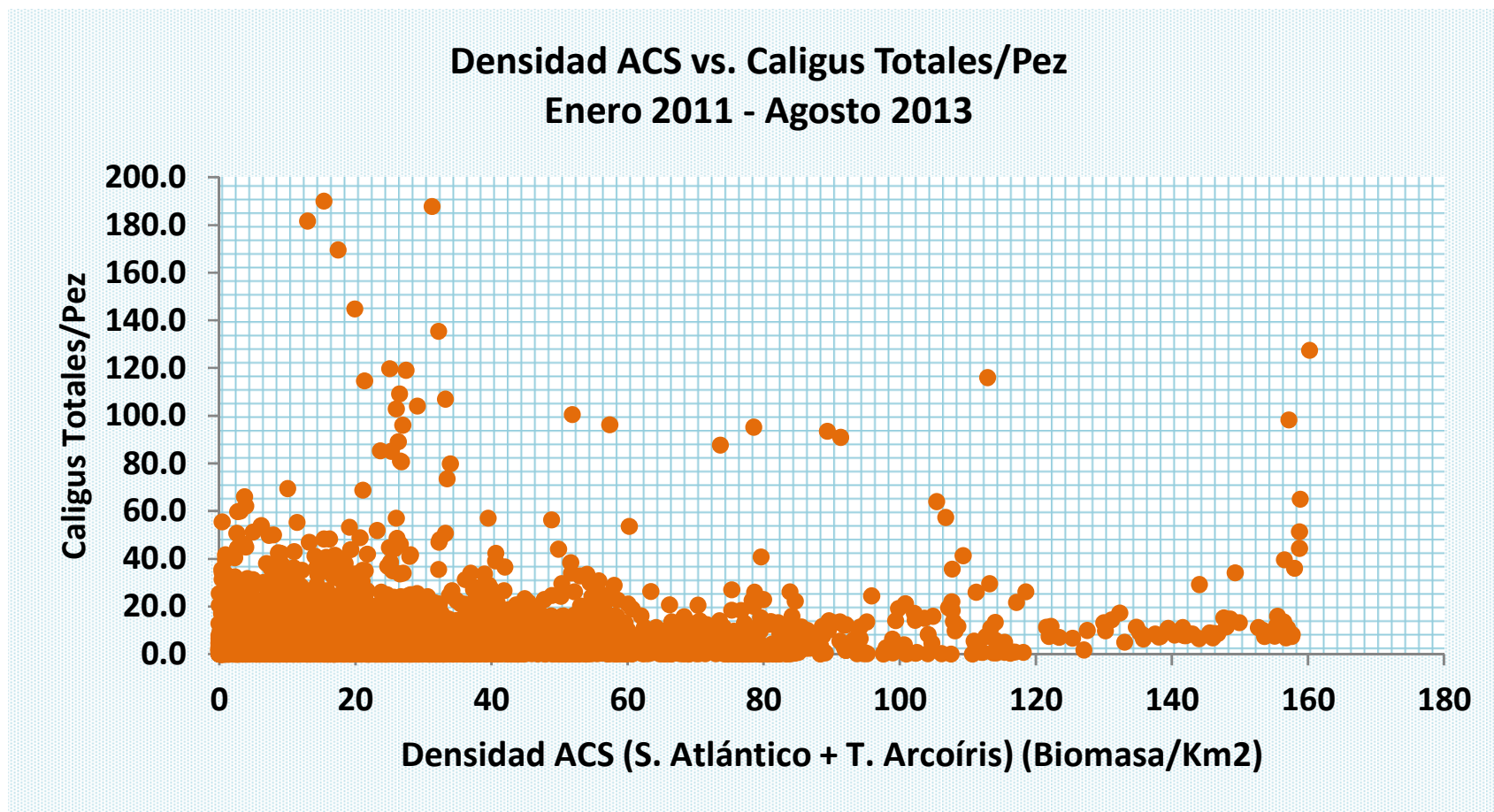
## Density (tons/KM<sup>2</sup> Neighborhood)

September 2013



# The Chilean Industry

## Density (tons/KM<sup>2</sup>) and sea lice



# Sea Lice in Chile

## Area Management

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### Neighborhoods:

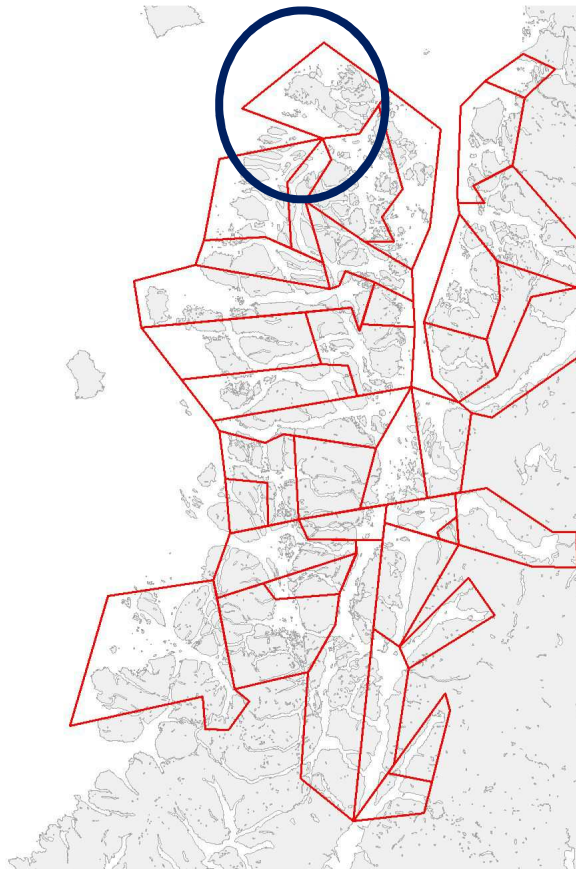
- Not all perform the same way: some are better than others
- There is an evident influence/connection between them
- There is no master plan operating towards controlling sanitary aspects in a coordinated way among neighborhoods
- **Potential contribution of fallowing and coordinated treatments of one single zone (neighborhood) is reduced**

**Needs revision and improvement**

# Sea Lice in Chile

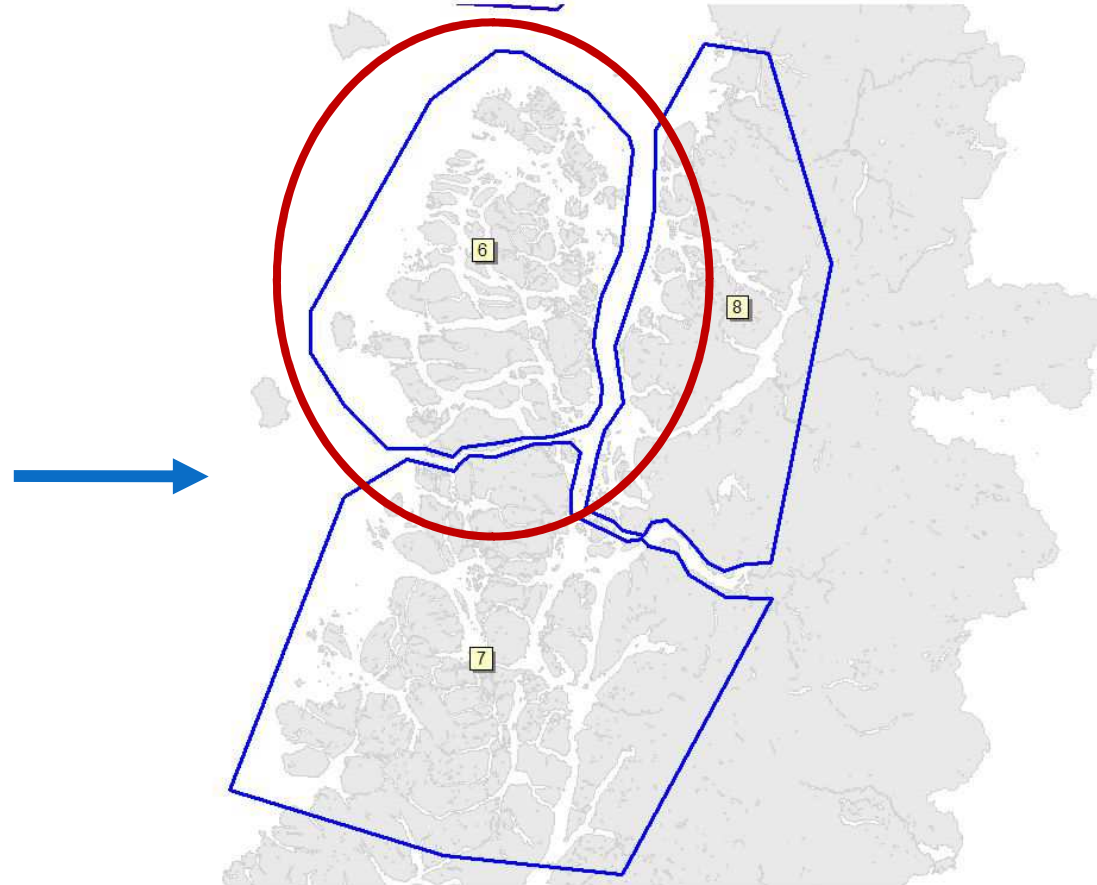
## Increased Area Management

Neighborhoods



38

Macrozones



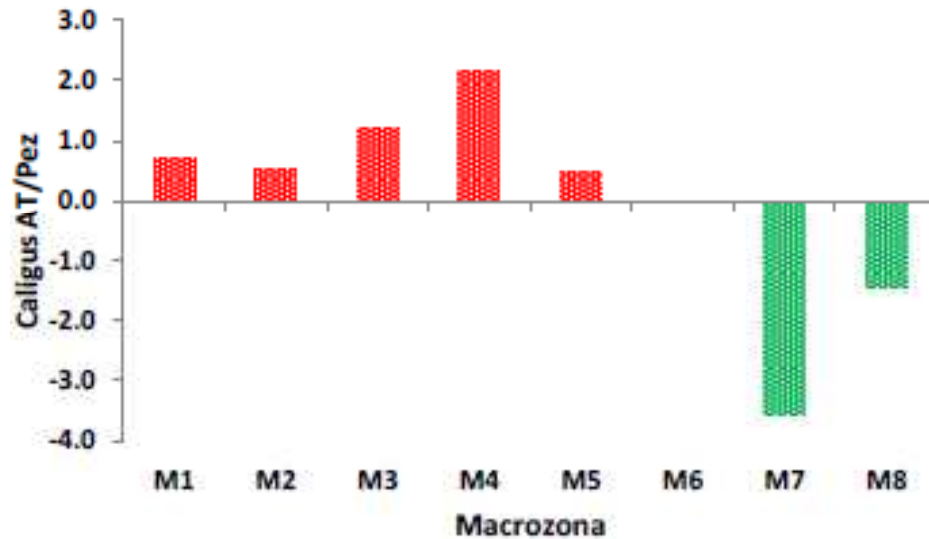
3



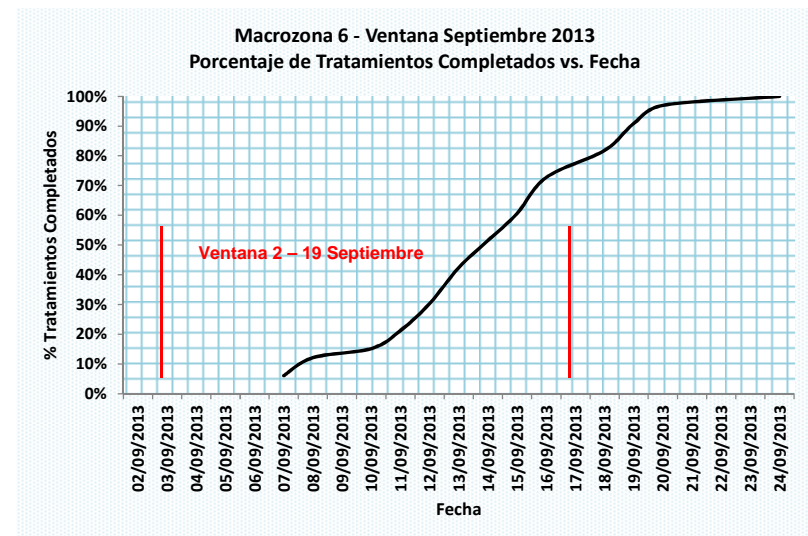
# Sea Lice in Chile

## Increased Area Management

Net variation in TA during last four weeks

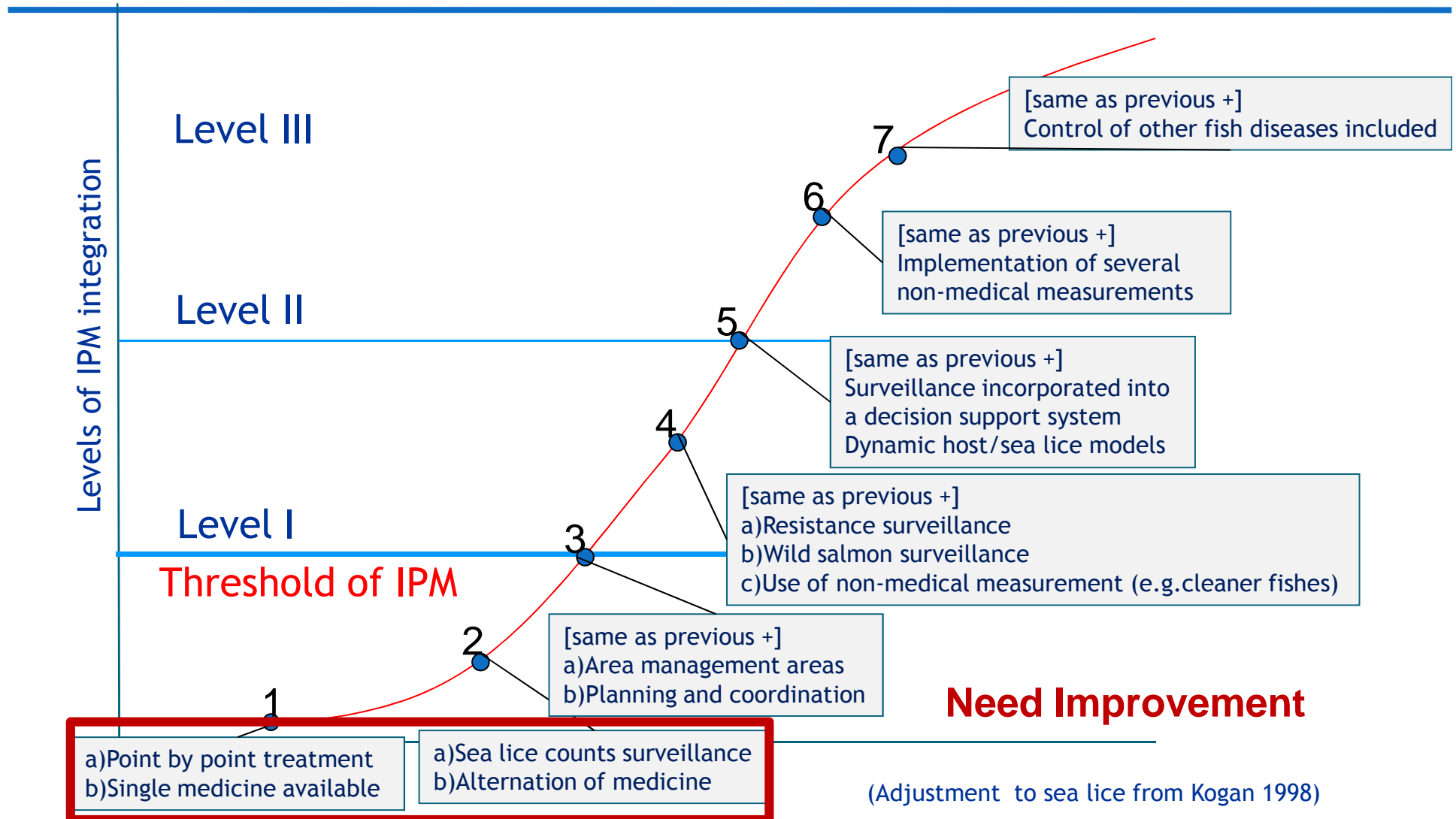


**2-16 September 2013**  
**Preformed treatments = 33**  
**% within treatment period = 73%**



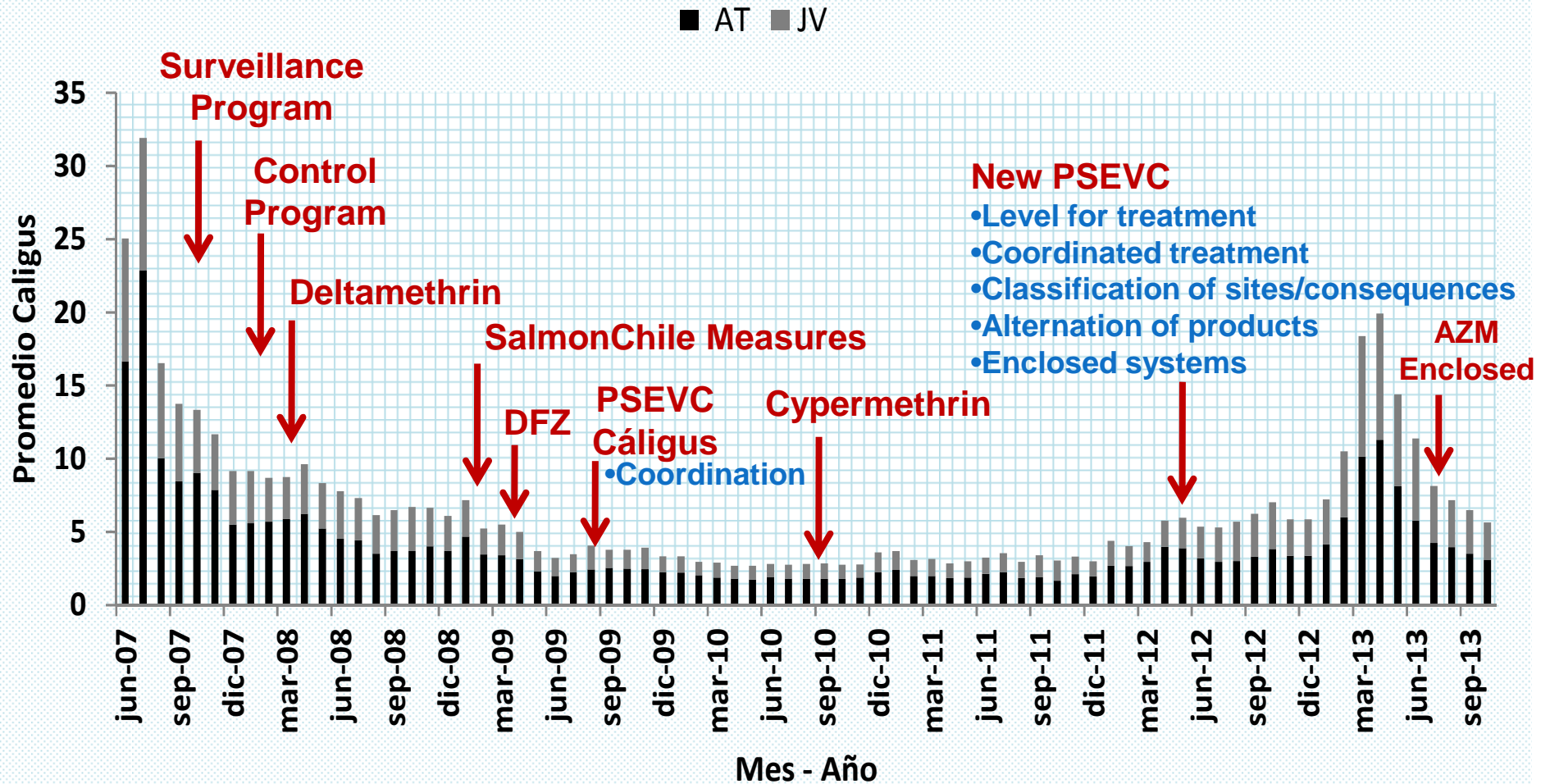
# Levels of IPM Integration

## Where is Chile?



# Sea Lice in Chile

## Variation in time (June 2007-Sep-2013)



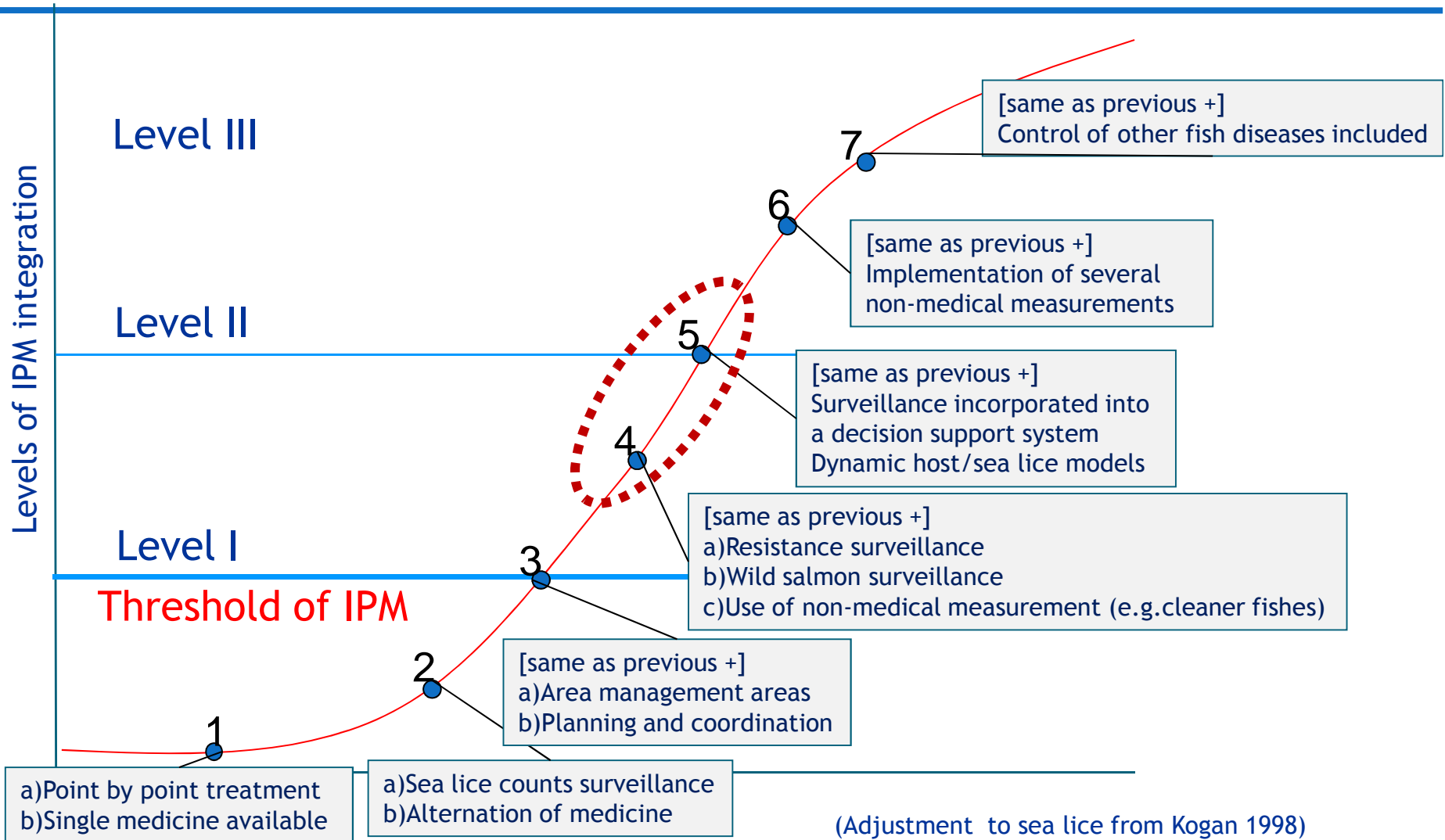
# Sea Lice Treatments

- 
- There is a general tendency to less successful treatments with deltamethrin
  - Some neighborhoods/treatments still show a high success
  - **Zones/treatments should be prioritized according to these type of analysis**
  - **Surveillance of resistance is required**

**Need of revision and improvement**

# Levels of IPM Integration

## Where is Chile?



# Sea Lice in Chile

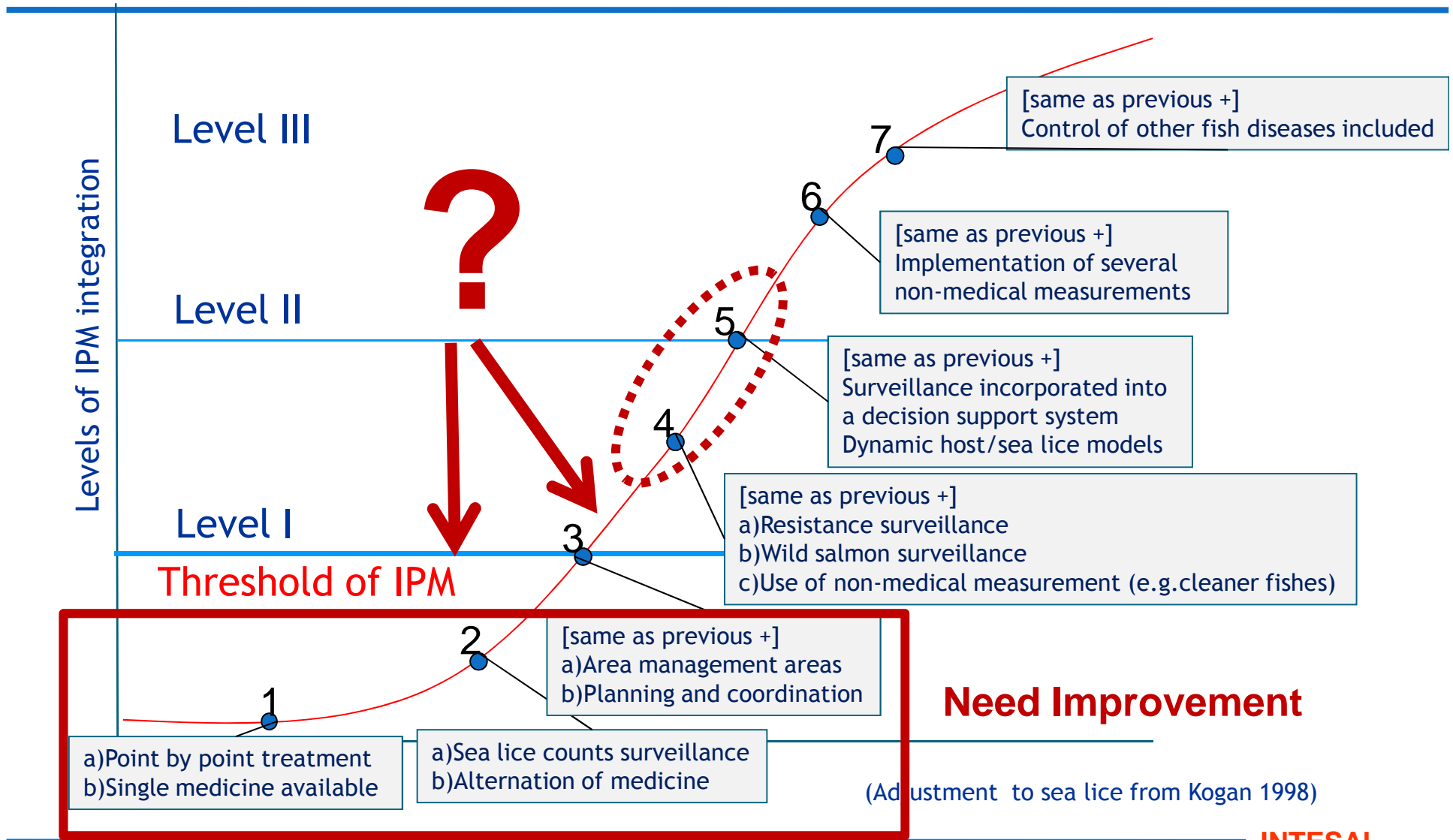
## Recent- other initiatives

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- Weekly publication of “lice spreading sites” (Sernapesca: implemented)
- Weekly publication of Sea Lice Report (INTESAL: implemented)
- Coordinated treatments at macro zone level (Aquabench: implemented)
- New Feed, enhance immune system and rejection of lice (Ewos: on the market)
- Checking site variation in treatment resistance (Marine H, other: implemented)
- 6-8 m surrounding skirts (Mainstream: under implementation)
- Vaccine (Centrovet: waiting for special approval by authority)
- High temperature bath (Delouser- OCEA: being tested on site)
- Ultrasound (private initiative: being tested on site)
- Genetic selection (Aquainnovo, Blue Genomics: under research)
- Sea Lice Management Zones (Intesal: under development)
- Research on life cycle changes (I-mar: under research)
- Cleaner fish (Fundación Chile, Aquabench: under research)
- Understanding epidemiology of Caligus (UPEi- INTESAL: under research)
- Zone variation in resistance to treatments (UACH- INTESAL: under research)

# Levels of IPM Integration

## Where is Chile?



# Sea Lice in Chile

## Integrated Pest Management

(Integrated Sea Lice Control)

# Thanks

Instituto Tecnológico del Salmón- SalmonChile

November 2013

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