

Establishment of committee for Community Based Fisheries Management (CBFM) and gathering fisheries information through the committee: under so many fishers and fishing villages, low No. of officers and budget

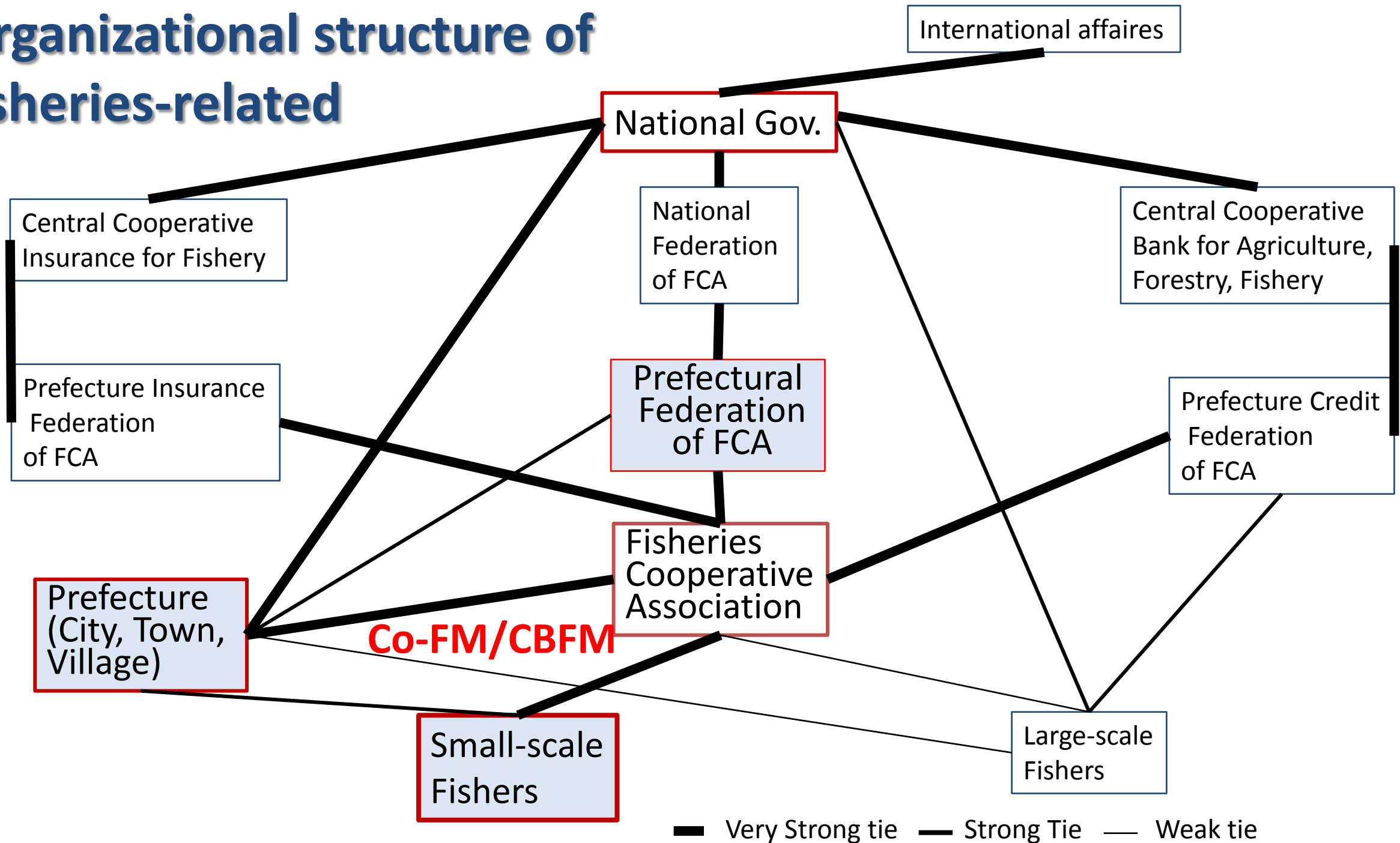
Japan Fisheries Research and Education Agency  
National Research Institute of Fisheries Science

Tsutom Miyata

# Process of Community Based Fisheries Management(CBFM) in the Northern part of Japan, **Iwate Prefecture=local government**

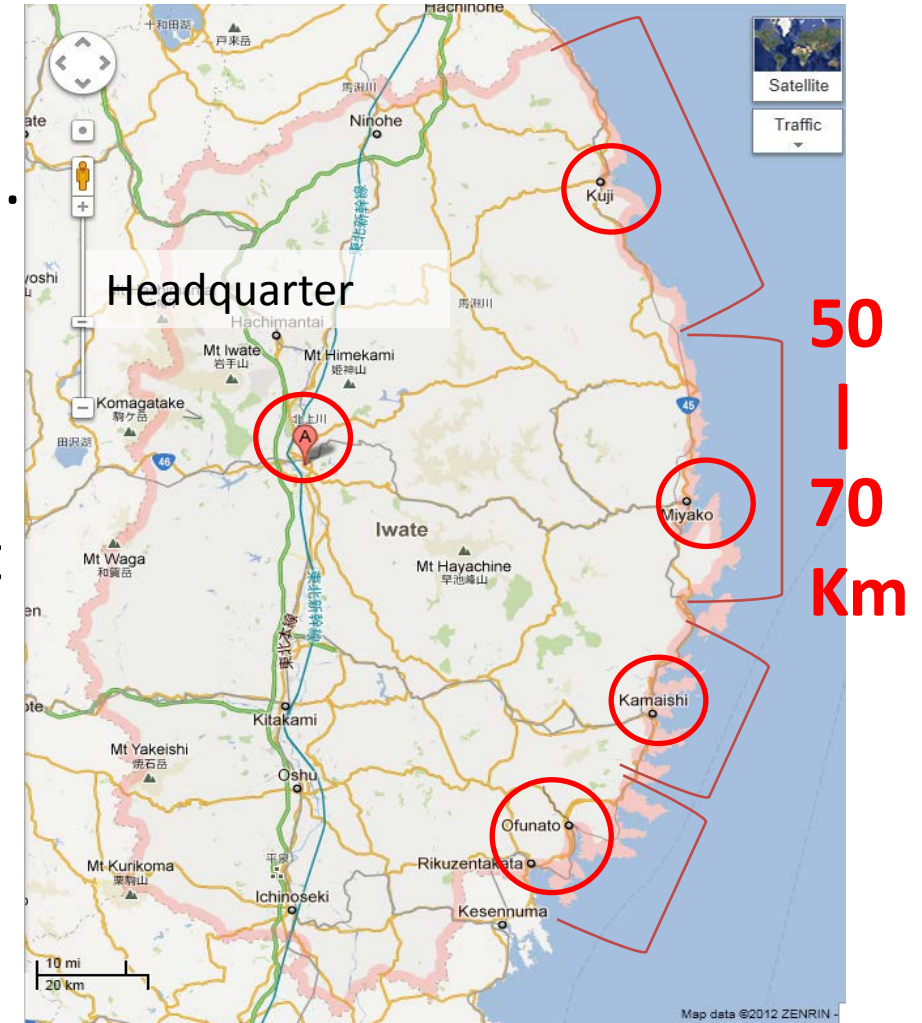


# Organizational structure of fisheries-related



# Decision-making for guideline of FM

1. Establishment of 4 committees  
And establishment of headquarters committee.
2. The members of the committee are the  
(1) representatives for each fishing village,  
(2) managers of each fisheries cooperative  
association, (3) a manager of wholesale market  
of fishing port, (4) prefecural officers and  
researchers.
3. The member of the headquarters is the  
representatives in each local committee.



# Cont'd

4. The each local committee is convened 3 or 4 times per year. The headquarters committee is convened once per year. The committees keep being convened for a fish for several year.
5. At first year, target species is one, next is two....5years later is 5...the guide line of first target sp. FM will be decided after 5 years. The first guideline will be needed a revision after 5 years. It is continuous.
6. Main themes of the committees are results of a resource and an economic survey, an actual condition of fisheries, a trend of fish market, an information of each other's committee.

Major themes of committee are for “improving a fishing household income” based on a sustainable fish resource.

Ex.1; Resources assessment results of target species

Ex.2; Restriction of the mesh size of a net or a pod and operating period for a young fish

Ex.3; Restriction of selling size for best price and operation period for high price

Ex.4; How to develop new fish channel for high price and fish promotion strategy/tactics



# Why is price/distribution analysis so importance?



At a wholesale market near a fishing port



At a wholesale market in urban area

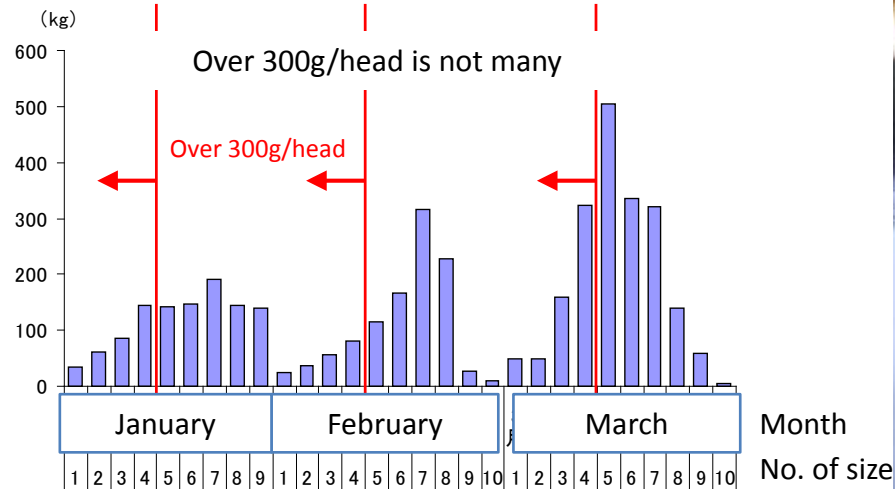
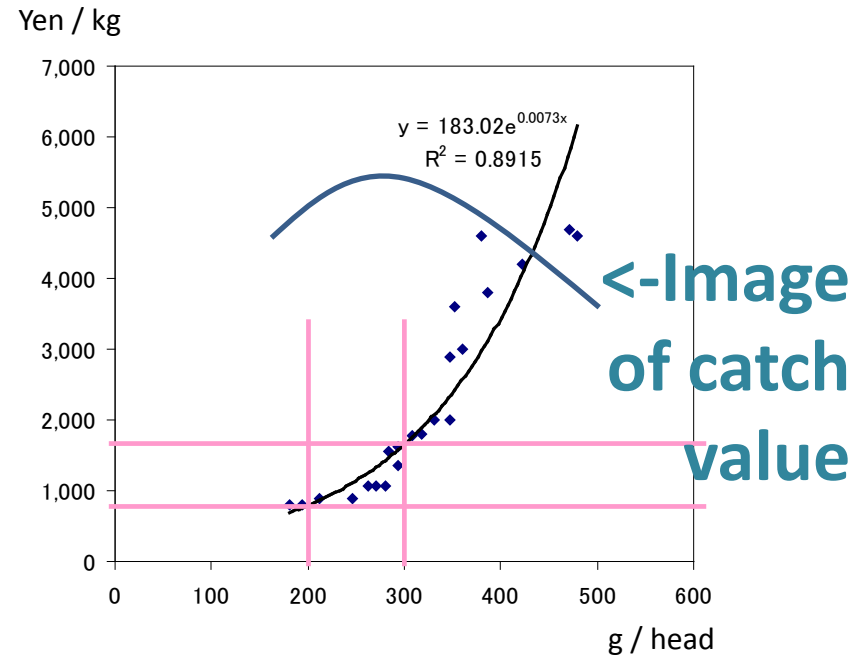


図8 釜石魚市場における月別・銘柄別上場量および価格動向  
資料: 2006年釜石魚市場原票より作成

# Officers should focus on **PROFIT** of fishing household under sustainable resources utilization

If government usually suggests restriction of catch to fishers, nobody hear the suggestion. However, if government suggests how to improve a fishing household income based on a sustainable fish resource, every fishers accept it with applause!

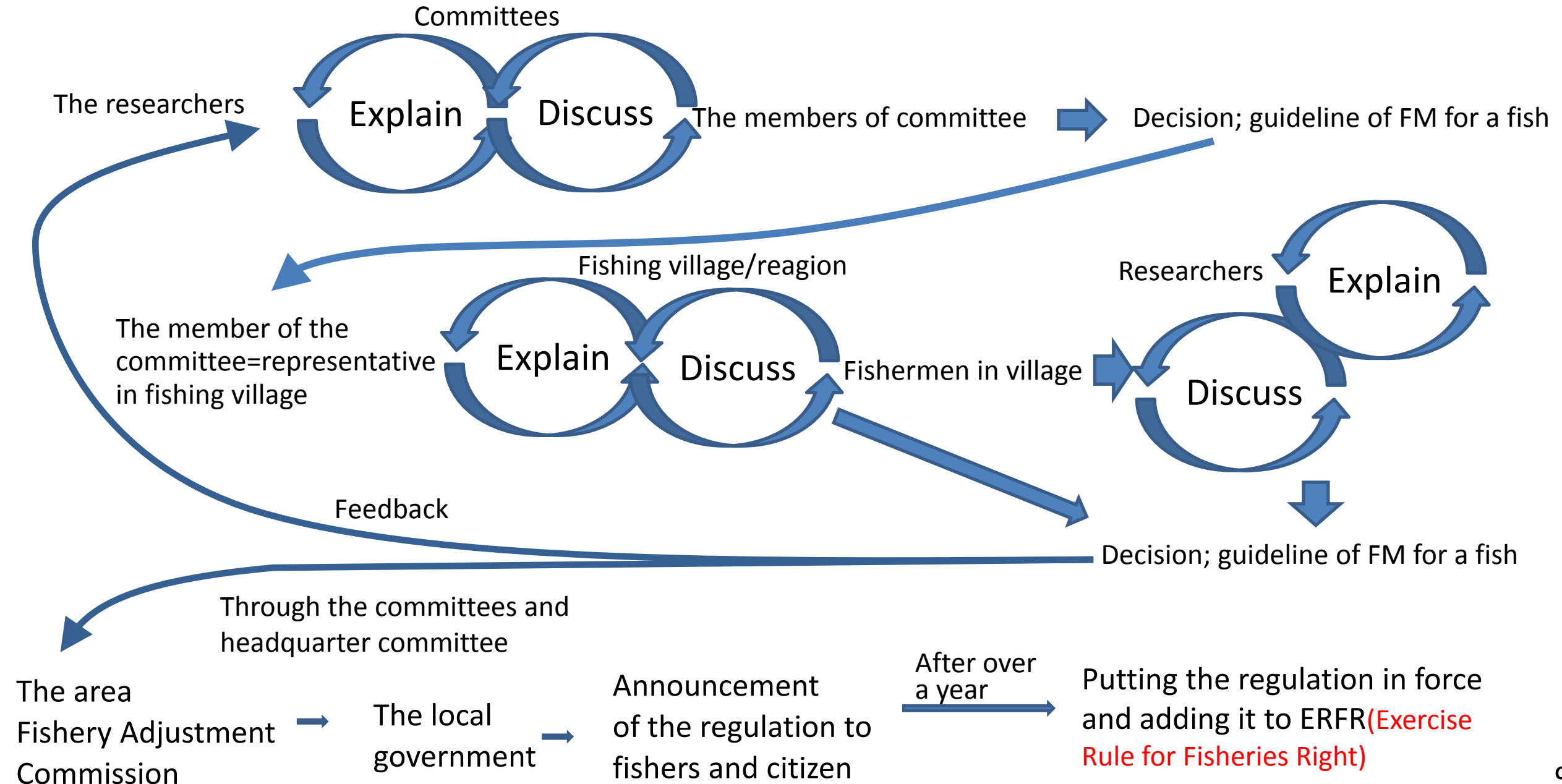
It is not easy, but it is core of CoFM

- ◆ Profit = Value of catch – Operation cost
- ◆ Value of catch = Fish Price × Catch
- ◆ Price = Size × Quality × Season × Market place/Distribution × Quantity in market
- ◆ Operation cost = total cost ÷ operation =  $\beta \times \text{CPUE}$  (total Catch ÷ operation)
- To find out “Big size × Required quality × No-spawning season × Good channel × **Reduced catch**” is **better** than “Now”





# Process of making CBFM



- Regional Committee

Commissioners of middlemen,  
commissioners of fisher=representative  
of fishing village/region



- Explanation and discussion among  
fishers and researchers



# ERFR(Exercise Rule for Fisheries Right)

1. Qualification : Only member excluding associate member
2. Delegation of fishing: Prohibition excepting disease
3. and 4. are written down “Exercise Rule for Fisheries Right (ERFR) Committee”
5. **Allowable Fishery Method: Limit of no. of fishing gear; under 150 gill-nets (from 1<sup>st</sup> Jan. to 15<sup>th</sup> Oct. and from 20<sup>th</sup> Dec. to 28<sup>th</sup> Dec.).....etc.**  
**Input control**
6. **Protected Area: Banten cape and Okido cape....etc.**
7. When EFR Committee decide to set new ERFR, the Committee should consider about fishing household economy.

**8. Limited catch size: under 30 cm Japanese flounder and 20 cm marbled sole**

**Limited boat size: under 10 tons for gill-net**     **Input control**

FCA must inspect the fishing ground as needed

**9. Restricted and prohibited fishing gear: under 7.5cm mesh size gill-net. Under 12.1cm mesh size when the target fish is Japanese flounder.....etc.**     **Technical control**

**10. Members should pay fee for administration of EFR**

**11. Administrative director of FCA is stopped fishing of violator and carry a penalty** <-Rare case because of mutual monitoring     **Administration**

**12. FCA should hear committee's comments in charge of a fishing ground when EFR is revised by FCA administrative board**

# Case of MCS network in Iwate Pref.

MCS for a illegal fishing

- Fisheries patrol boat; 2 local governmental ships  
; over 10 FCA boats
- Surveillance fishermen; 251 people  
Cf. 5,000 households
- Monitoring by ordinary fishermen themselves
- Monitoring in wholesale market



# Why do the fishers follow the FRER?

- FRER is criteria which local government allow, **but the rules were decided by themselves after many discussions among fishers.**
- That's way, they conduct mutual monitoring on violating rules.
- Many fishers live in the fishing village for long term and will live in the village in future. It is very important to maintain harmonization among people in the village. Therefore, it is difficult to violate the rules, it means **OSTRACISIM**.
- Many fishers in Southeast Asia can move to another village easily.....**Key word is fish distribution sector.**

# Promotion goods

小型魚は再放流してください。



| 年 齢 | 全 長  | 体 重    |
|-----|------|--------|
| 1 歳 | 27cm | 190g   |
| 2 歳 | 35cm | 470g   |
| 3 歳 | 42cm | 840g   |
| 4 歳 | 48cm | 1,260g |

Japanese flounder, under **30cm** must release

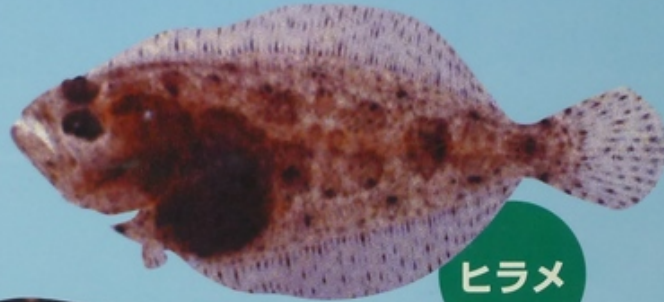


岩手県・岩手県海面利用協議会・岩手県漁連・岩手県沿海地区漁協・岩手県遊漁船業協会・岩手県海釣り団体連合会・(財)日釣振岩手県支部



# 小さな魚は海に帰してください

宮古湾の  
周辺では



ヒラメ



ホシガレイ



クロソイ



ニシン

## の稚魚を放流しています

### ●漁業者、遊漁者（釣り人）の皆さんへ

この海域では、栽培漁業（稚魚の放流）によって魚をふやす努力をしています。放流した稚魚は岸の近くで育つため、浅場で操業する漁具や港・防波堤での釣りによって採捕されやすくなっています。もし、このような場所で稚魚をとったり、釣ったときは、必ず海に帰してあげてください。

Local rules, not local government rules

宮古湾周辺魚類栽培漁業協議会

宮古地方振興局水産部・(独)水産総合研究センター・宮古市・田老町・重茂漁業協同組合・宮古漁業協同組合・田老町漁業協同組合

# Actual situation regarding CoFM/CBFM in JAPAN

Unit : Number

|                                      | 2003   | 2008   | 2013   |
|--------------------------------------|--------|--------|--------|
| No. of FCA etc. conducting CoFM/CBFM | 1, 533 | 1, 738 | 1, 825 |

Target species

Unit: Number of FCA

|                   | 2003 | 2008 | 2013 |
|-------------------|------|------|------|
| Abalone           | 510  | 594  | 614  |
| Turban shell      | 355  | 439  | 457  |
| Sea urchin        | 370  | 428  | 433  |
| Sea cucumber      | 117  | 324  | 410  |
| Japanese flounder | 188  | 318  | 365  |
| Sea bream         | 142  | 214  | 240  |
| Octopus           | 106  | 210  | 302  |
| Flounder          | 166  | 207  | 250  |

Regarding data for CBFM

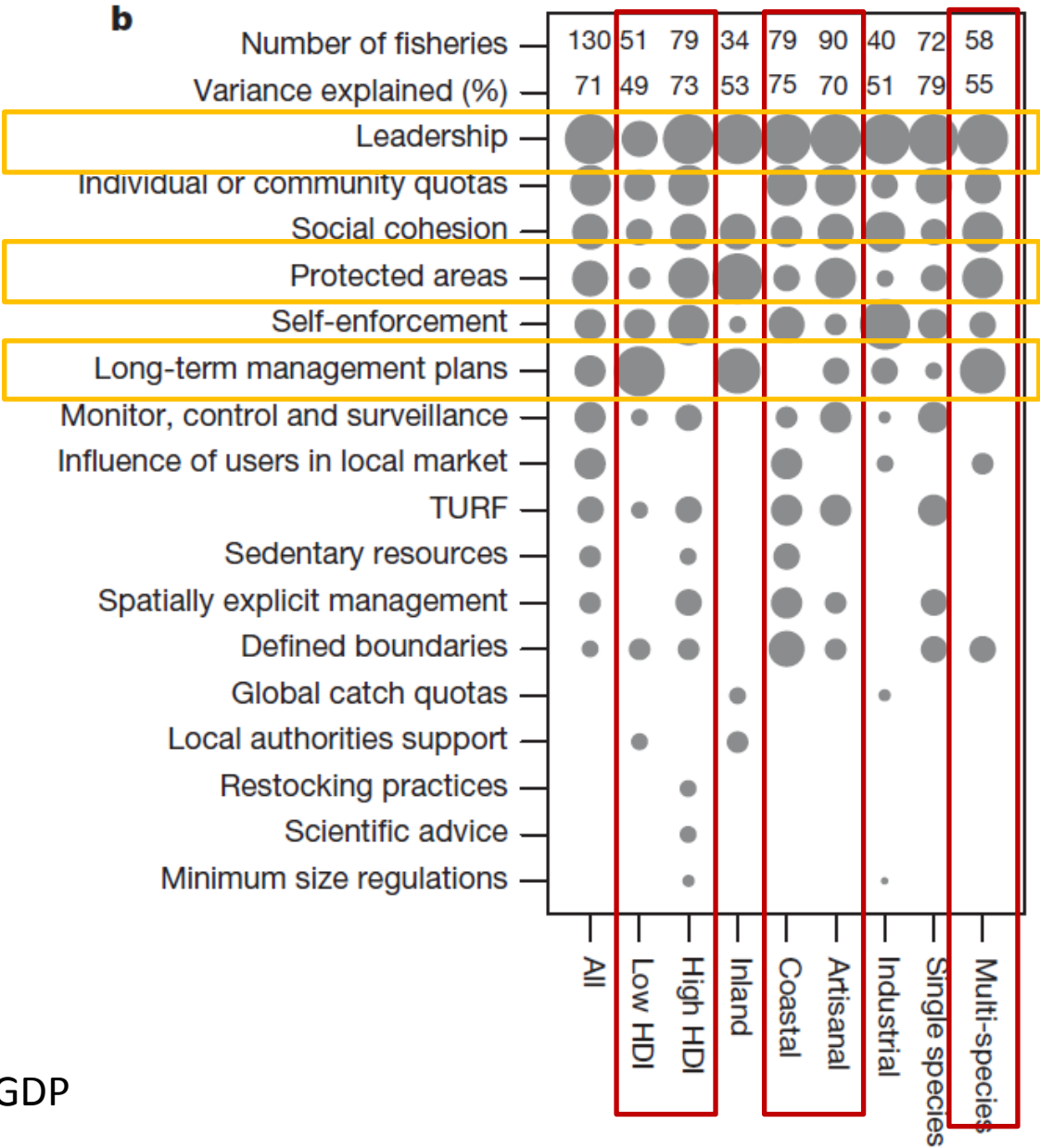


# Leadership, social capital and incentives promote successful fisheries

Not only catch and CPUE, but also social survey are important, but cutting explanation of it

Refer to: Miyata2018, Methodology for Small-scale Fishing Household Surveys Collecting Quantitative Data, Journal of International Cooperation for Agricultural Development

←Google search



Incentives; TURF, IQ, ITQ...  
HDI: Human Development Index; length of life, Education, GDP

# How to collect data?

Who collects catch/fishing effort and price data?



# Who are key informants?

- A leader of fishers in a village

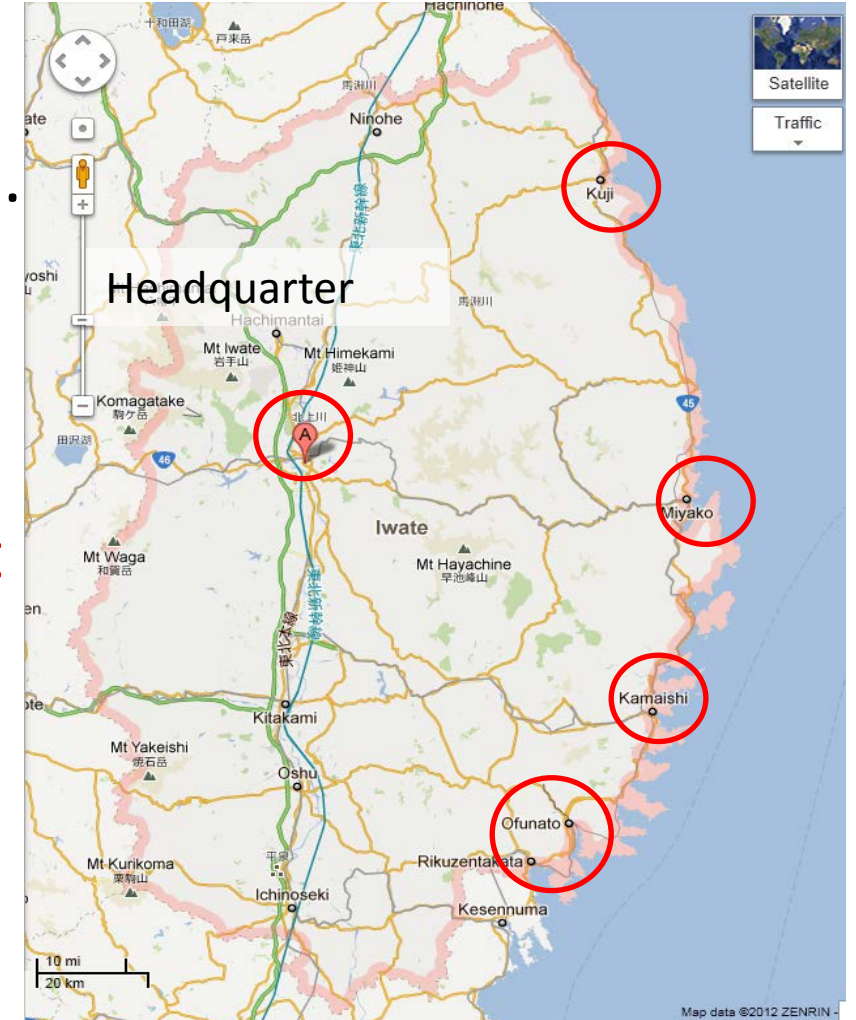
He/she will be the CBFM commissioner and key informant because of interesting sustainable fisheries

- Middlemen

They want to continue their business, therefore they will be involved the CBFM committee and key informant. And major distributors/middlemen are not many, it is easy to identify the key informants

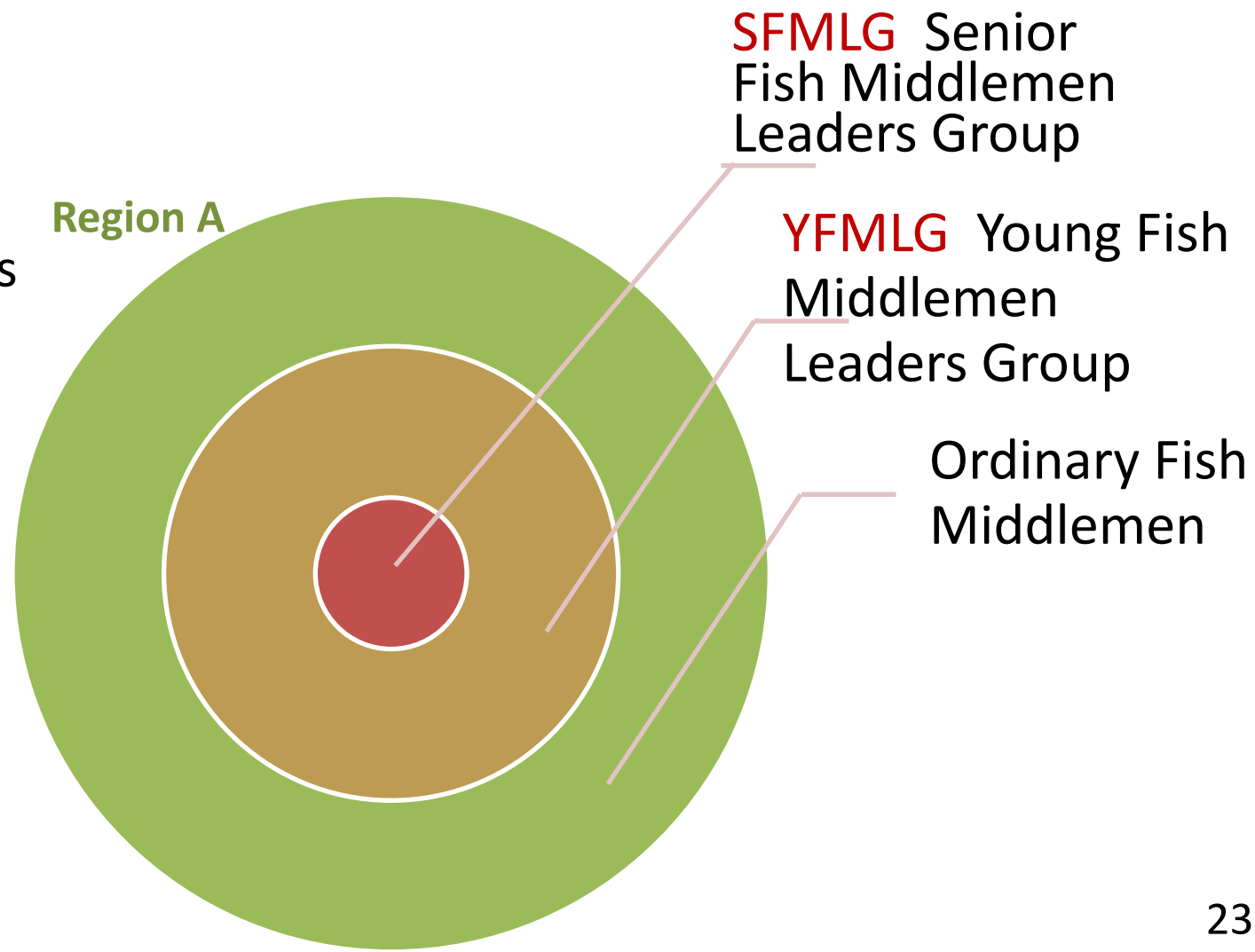
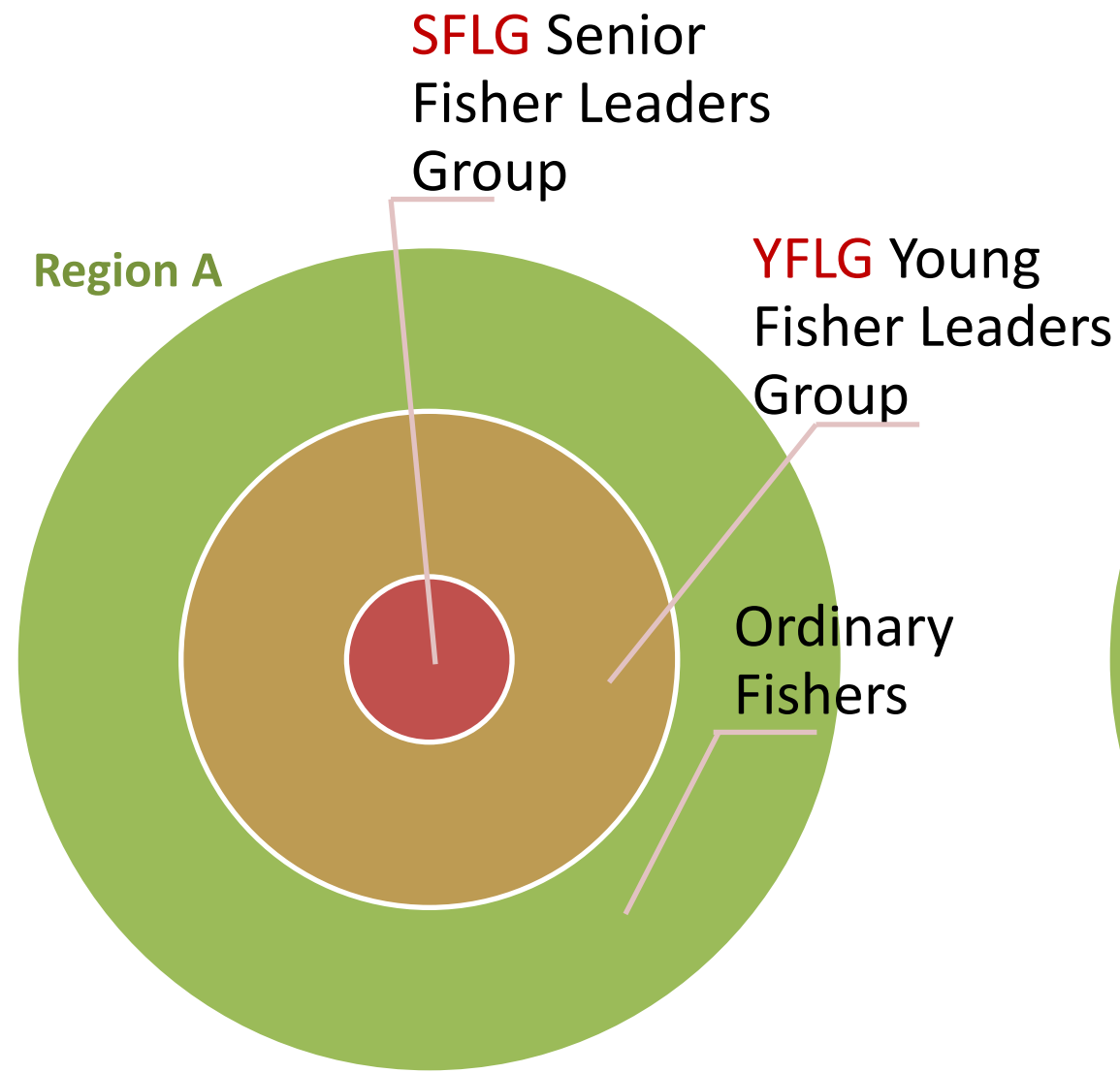
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and researchers.
3. The member of the headquarters is the  
representatives in each local committee.



# Fisher and Middlemen Leaders Group:

Authorized by government or local government





# What are incentives for leader?

- Honor from government
- Prefectural level information
- National level information
- Visiting abroad to learn new technology, etc.
- Discussion with fishers in other region



Quantity(Catch) and price and distribution info.  
from leaders of middlemen

Catch and CPUE data from leaders of fishers

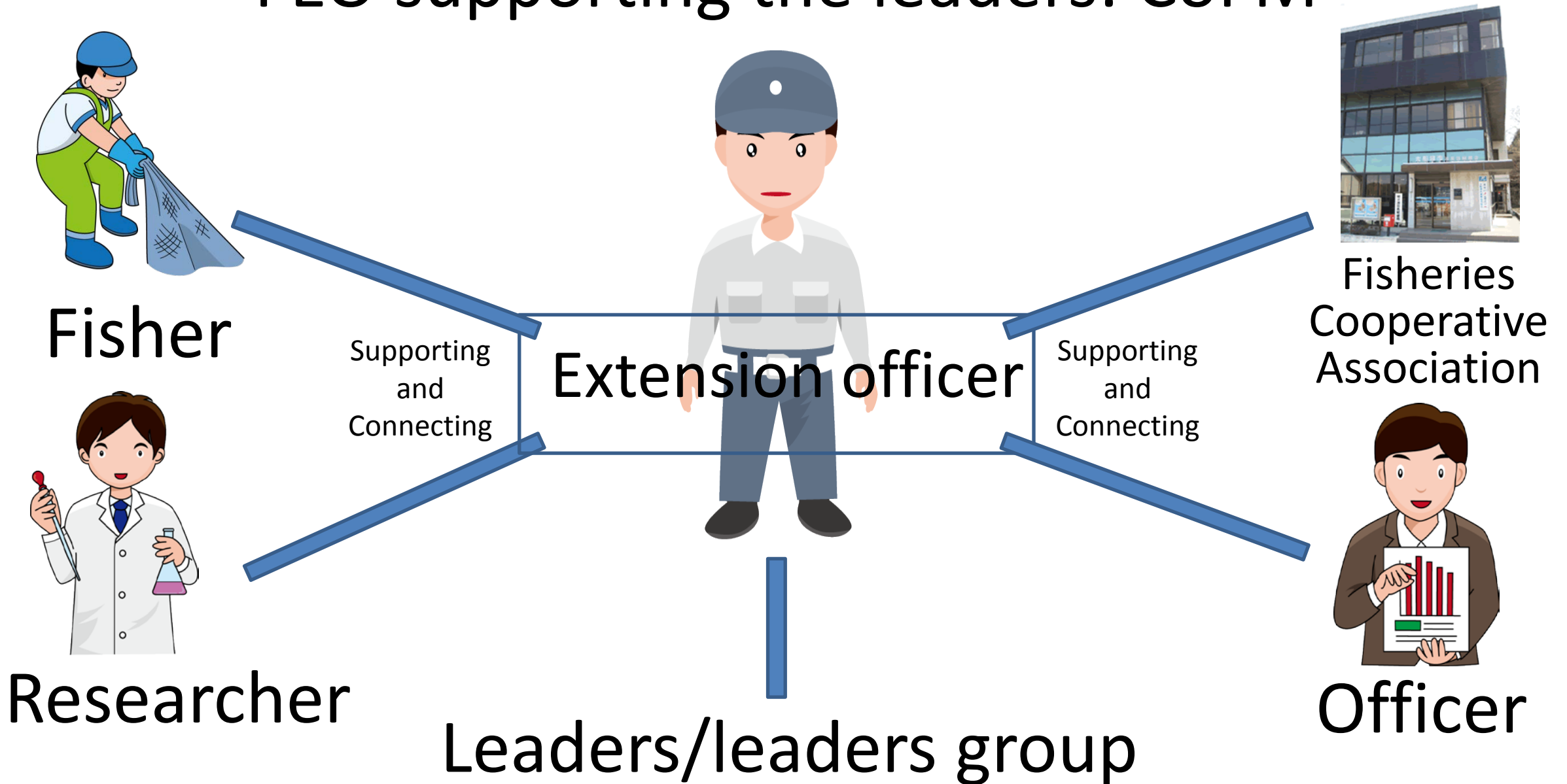
And estimated data from them



If don't this, the leader is excluded  
the leader group by local gov.



# FEO supporting the leaders: CoFM



# Key words

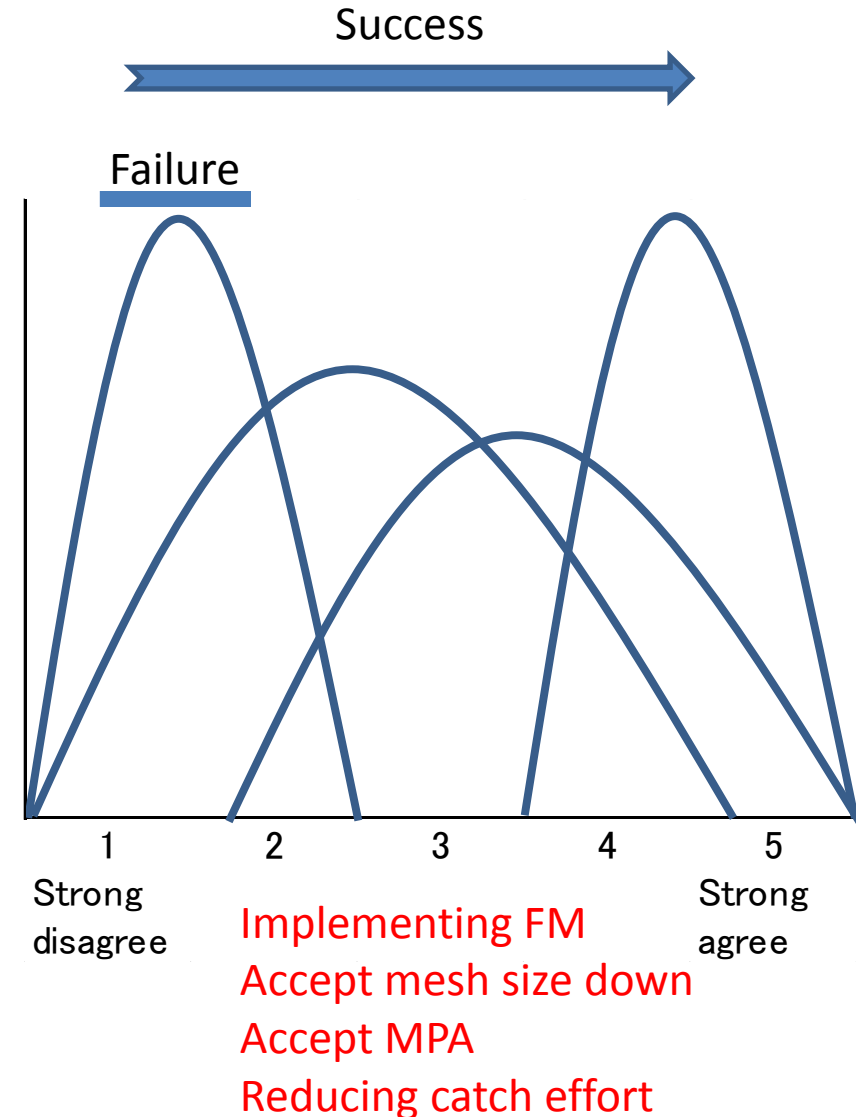
- Autonomic CoFM activities supported by government =low No. of officers and budget
- CBFM committee
- Maintaining profit of fishers under FM restriction
- Fisher Leaders Group and Fish Middlemen Leaders Group
- Budget for the committee and FLGs and FMLGs
- Incentive for group leaders
- Fisheries Extension Officer
- Promotion of CBFM



# How to evaluate the activities

Using easy questionnaire for revising activities

- Likert scale(1,2,3,4,5)
- (Normal) Distribution(t-test)
- AHP(Analytic Hierarchy Process)
- Mixed approach AHP × L.S. × N.D
- :
- :
- It is tentative idea!





# Thank you for your attention



Iwate Prefecture in winter

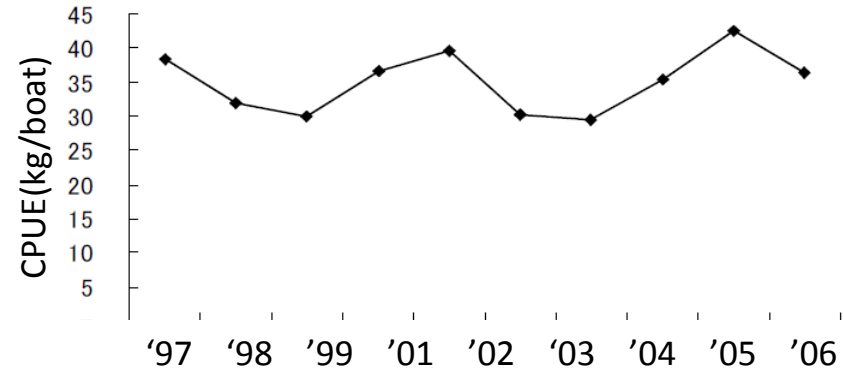
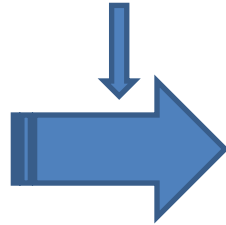


# Resource survey by Local Governmental Fisheries Experiment Station

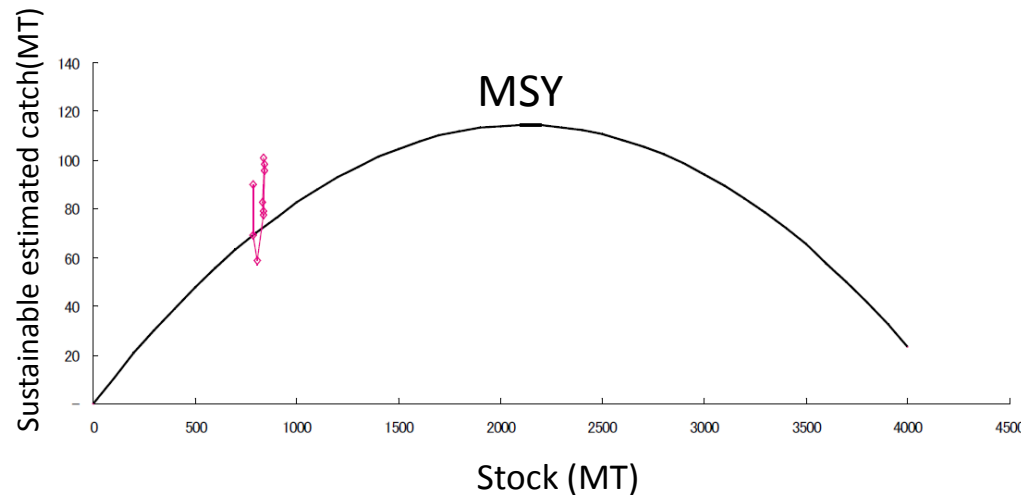


At a wholesale market near a fishing port

Adding  
many  
data



Using survey ship



Source; <http://www.pref.iwate.jp/~hp5507/>

# Production model for estimating MSY, Bmsy, Xmsy

Almost all stock assessments are estimated by VPAs(Virtual Population Analysis) in Japan.

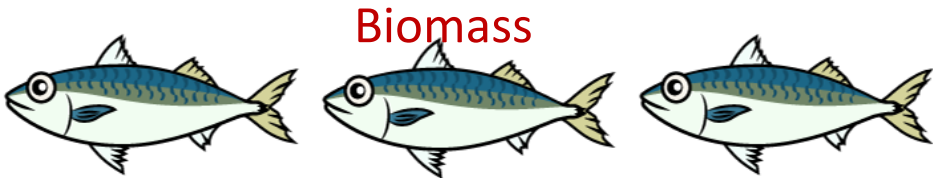
This is easy production model-> But can estimate MSY

| catch | operation days |                |                   | CPUE <sub>t+1</sub> = (1+r)CPUE <sub>t</sub> - (r/qK)CPUE <sub>t</sub> <sup>2</sup> - qX <sub>t</sub> CPUE <sub>t</sub> |                                |                                  |                                      |         |            |
|-------|----------------|----------------|-------------------|---|--------------------------------|----------------------------------|--------------------------------------|---------|------------|
|       | Y <sub>t</sub> | X <sub>t</sub> | CPUE <sub>t</sub> | CPUE <sub>t</sub>   | CPUE <sub>t</sub> <sup>2</sup> | X <sub>t</sub> CPUE <sub>t</sub> | B <sub>t</sub> =CPUE <sub>t</sub> /q |         |            |
| 1934  | 60,913         | 5,879          | 10.361            | 10.361  | 107.353                        | 60,913                           | 846,441                              |         | 重回帰        |
| 1935  | 72,294         | 6,295          | 11.484            | 11.484  | 131.890                        | 72,294                           | 938,203                              |         |            |
| 1936  | 78,353         | 6,771          | 11.572            | 11.572  | 133.908                        | 78,353                           | 945,351                              |         |            |
| 1937  | 91,552         | 8,223          | 11.134            | 11.134  | 123.958                        | 91,552                           | 909,552                              | 1 + r = | 1.8115974  |
| 1938  | 78,288         | 6,830          | 11.462            | 11.462  | 131.386                        | 78,288                           | 936,407                              |         | r=         |
| 1939  | 110,418        | 10,488         | 10.528            | 10.528  | 110.839                        | 110,418                          | 860,077                              | r/qK =  | -0.0730718 |
| 1940  | 114,590        | 10,801         | 10.609            | 10.609  | 112.555                        | 114,590                          | 866,708                              |         | K          |
| 1941  | 76,841         | 9,584          | 8.018             | 8.018   | 64.282                         | 76,841                           | 654,993                              | q=      | -0.0000122 |
| 1942  | 41,965         | 5,961          | 7.040             | 7.040   | 49.561                         | 41,965                           | 575,120                              |         | q=         |
| 1943  | 50,058         | 5,930          | 8.441             | 8.441   | 71.259                         | 50,058                           | 689,619                              |         |            |
| 1944  | 64,869         | 6,475          | 10.018            | 10.018  | 100.368                        | 64,869                           | 818,441                              |         | MSY=rK/4=  |
| 1945  | 89,194         | 9,377          | 9.512             | 9.512   | 90.478                         | 89,194                           | 777,073                              |         | 184,103    |
| 1946  | 127,701        | 13,958         | 9.149             | 9.149   | 83.703                         | 127,701                          | 747,414                              |         | Bmsy=K/2=  |
| 1947  | 160,151        | 20,383         | 7.857             | 7.857   | 61.734                         | 160,151                          | 641,877                              |         | 453,681    |
| 1948  | 206,993        | 24,781         | 8.353             | 8.353   | 69.771                         | 206,993                          | 682,381                              |         | Xmsy=r/2q  |
| 1949  | 200,070        | 24,923         | 8.028             | 8.028   | 64.441                         | 200,070                          | 655,801                              |         | 33,151     |
| 1950  | 224,810        | 31,856         | 7.057             | 7.057   | 49.802                         | 224,810                          | 576,520                              |         |            |
| 1951  | 186,015        | 18,403         | 10.108            | 10.108  | 102.169                        | 186,015                          | 825,752                              |         |            |
| 1952  | 195,227        | 34,834         | 5.604             | 5.604   | 31.410                         | 195,227                          | 457,854                              |         |            |
| 1953  | 140,042        | 36,356         | 3.852             | 3.852   | 14.838                         | 140,042                          | 314,682                              |         |            |
| 1954  | 140,033        | 26,288         | 5.327             | 5.327   | 28.376                         | 140,033                          | 435,174                              |         |            |
| 1955  | 140,865        | 17,198         | 8.191             | 8.191   | 67.089                         | 140,865                          | 669,137                              |         |            |
| 1956  | 117,026        | 27,205         | 4.302             | 4.302   | 18.504                         | 117,026                          | 351,418                              |         |            |
| 1957  | 163,020        | 26,769         | 6.090             | 6.090   | 37.087                         | 163,020                          | 497,507                              |         |            |
| 1958  | 148,450        | 31,135         | 4.768             | 4.768   | 22.733                         | 148,450                          | 389,513                              |         |            |
| 1959  | 140,484        | 28,198         | 4.982             | 4.982   | 24.821                         | 140,484                          | 407,004                              |         |            |
| 1960  | 244,331        | 35,841         | 6.817             | 6.817   | 46.473                         | 244,331                          | 556,915                              |         |            |
| 1961  | 230,886        | 41,646         | 5.544             | 5.544   | 30.736                         | 230,886                          | 452,913                              |         |            |
| 1962  | 174,063        | 42,248         | 4.120             | 4.120   | 16.975                         | 174,063                          | 336,582                              |         |            |
| 1963  | 145,469        | 33,303         | 4.368             | 4.368   | 19.080                         | 145,469                          | 356,843                              |         |            |
| 1964  | 203,882        | 42,090         | 4.844             | 4.844   | 23.464                         | 203,882                          | 395,722                              |         |            |
| 1965  | 180,086        | 43,228         | 4.166             | 4.166   | 17.355                         | 180,086                          | 340,334                              |         |            |
| 1966  | 182,294        | 40,393         | 4.513             | 4.513   | 20.367                         | 182,294                          | 368,686                              |         |            |
| 1967  | 178,944        | 33,814         | 5.292             | 5.292   | 28.005                         | 178,944                          | 432,325                              |         |            |

概要

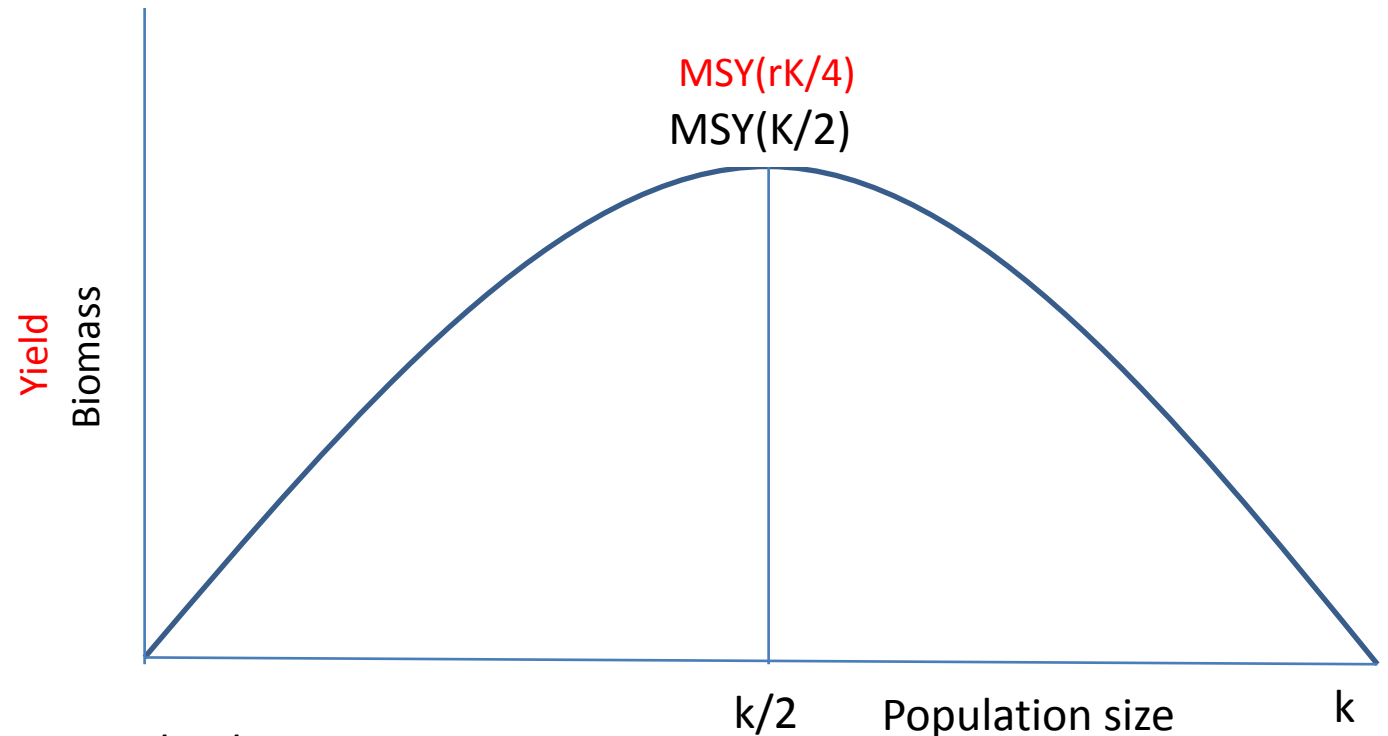
| 回帰統計     |            |
|----------|------------|
| R        | 0.98220618 |
| R2       | 0.96472898 |
| Ajd R2   | 0.92904425 |
| S.E.     | 1.53320437 |
| Ovs. No. | 33         |

|                                  | coef       | S.E.      | t          | P-値       |
|----------------------------------|------------|-----------|------------|-----------|
| Constant                         | 0          | #N/A      | #N/A       | #N/A      |
| CPUE <sub>t</sub>                | 1.8115974  | 0.3370580 | 5.3747353  | 0.0000081 |
| CPUE <sub>t</sub> <sup>2</sup>   | -0.0730718 | 0.0283618 | -2.5764174 | 0.0151481 |
| X <sub>t</sub> CPUE <sub>t</sub> | -0.0000122 | 0.0000057 | -2.1338508 | 0.0411467 |



# Stock assessment

1. Cohort analysis = VPA(Virtual Population Analysis); utilization of No. of fish by each age
2. CPUE analysis: Upper 25% in average CPUE is good, lower 25% in average CPUE is bad
3. Production model  
My recommendation



# VPA(Virtual Population Analysis)

Catch Data

| age | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|-----|------|------|------|------|------|------|------|------|------|------|
| 0   | 40   | 40   | 53   | 53   | 67   | 67   | 83   | 83   | 67   | 45   |
| 1   | 50   | 50   | 60   | 65   | 75   | 81   | 92   | 99   | 75   | 56   |
| 2   | 60   | 58   | 69   | 67   | 84   | 82   | 100  | 98   | 81   | 59   |
| 3   | 58   | 60   | 68   | 65   | 72   | 75   | 82   | 85   | 67   | 55   |
| 4   | 33   | 31   | 37   | 34   | 36   | 32   | 37   | 34   | 29   | 24   |
| 5   | 13   | 13   | 15   | 14   | 14   | 12   | 12   | 11   | 8    | 8    |
| 6   | 7    | 5    | 6    | 5    | 6    | 5    | 4    | 4    | 3    | 2    |

Estimated stock

| age | 1991  | 1992  | 1993  | 1994  | 1995  | 1996  | 1997 | 1998 | 1999 | 2000 |
|-----|-------|-------|-------|-------|-------|-------|------|------|------|------|
| 0   | 1,016 | 1,024 | 1,105 | 1,081 | 1,144 | 1,029 | 928  | 729  | 581  | 423  |
| 1   | 660   | 648   | 654   | 697   | 681   | 712   | 635  | 554  | 421  | 334  |
| 2   | 413   | 402   | 393   | 389   | 414   | 395   | 411  | 350  | 290  | 220  |
| 3   | 215   | 228   | 222   | 207   | 206   | 209   | 198  | 194  | 155  | 128  |
| 4   | 99    | 96    | 104   | 93    | 86    | 79    | 79   | 65   | 60   | 49   |
| 5   | 38    | 39    | 39    | 39    | 34    | 28    | 27   | 22   | 16   | 17   |
| 6   | 21    | 15    | 16    | 14    | 15    | 12    | 9    | 8    | 6    | 4    |



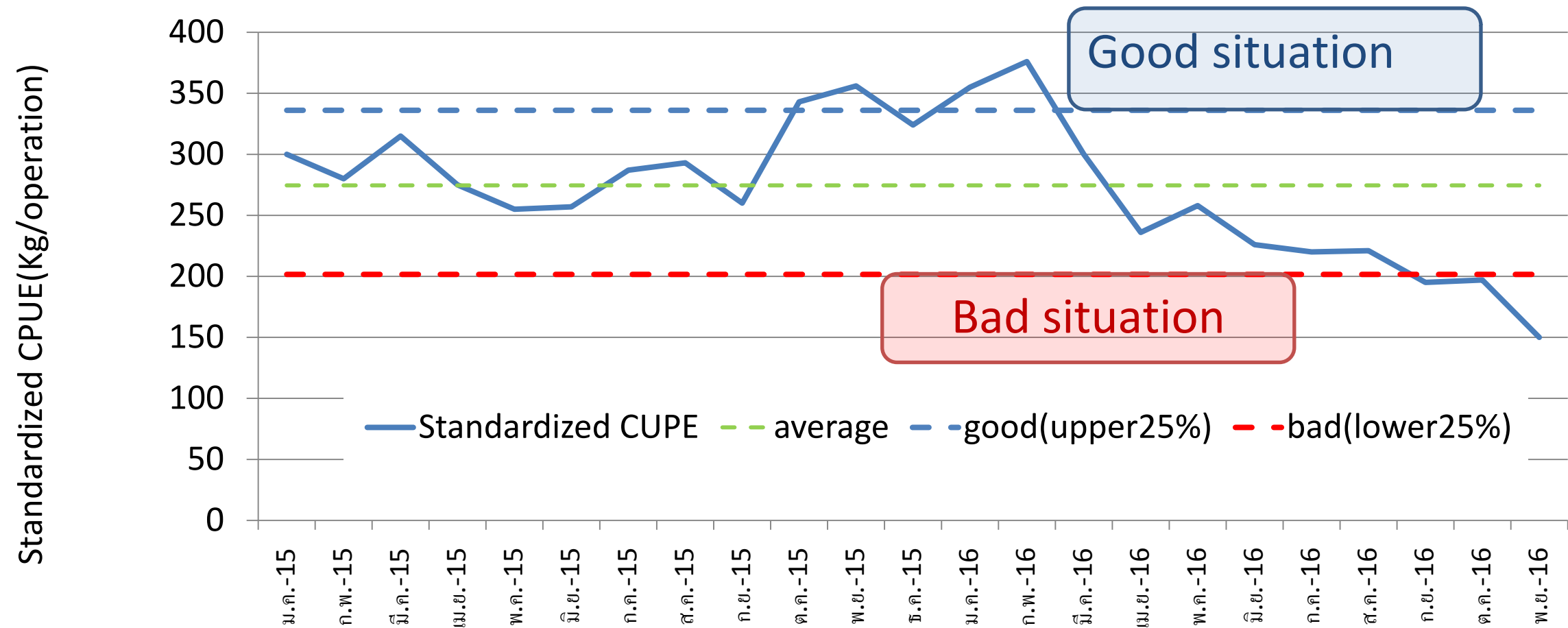
$$N_{a,y} = N_{a+1,y+1} e^M + C_{a,y} e^{M/2}$$

$$N_{a,y} = C_{a,y} e^{M/2} / (1 - e^{-F_{a,y}}) \dots \text{latest year}$$

$$F_{a,y} = \ln(N_{a,y}/N_{a+1,y+1}) - M$$

N: fishery stock (number), a: age, y: year, C: catch,  
 e: natural logarithm, M: natural mortality rate,  
 F: fishing rate

# Understanding actual resources from CPUUE trend





# Production model, recommendation

|      | Y <sub>t</sub> | X <sub>t</sub> |
|------|----------------|----------------|
| 1986 | 60,913         | 5,879          |
| 1987 | 72,294         | 6,295          |
| 1988 | 78,353         | 6,771          |
| 1989 | 91,552         | 8,223          |
| 1990 | 78,288         | 6,830          |
| 1991 | 110,418        | 10,488         |
| 1992 | 114,590        | 10,801         |
| 1993 | 76,841         | 9,584          |
| 1994 | 41,965         | 5,961          |
| 1995 | 50,058         | 5,930          |
| 1996 | 64,869         | 6,475          |
| 1997 | 89,194         | 9,377          |
| 1998 | 127,701        | 13,958         |
| 1999 | 160,151        | 20,383         |
| 2000 | 206,993        | 24,781         |
| 2001 | 200,070        | 24,923         |
| 2002 | 224,810        | 31,856         |
| 2003 | 186,015        | 18,403         |
| 2004 | 195,227        | 34,834         |
| 2005 | 140,042        | 36,356         |
| 2006 | 140,033        | 26,288         |
| 2007 | 140,865        | 17,198         |
| 2008 | 117,026        | 27,205         |
| 2009 | 163,020        | 26,769         |
| 2010 | 148,450        | 31,135         |
| 2011 | 140,484        | 28,198         |
| 2012 | 244,331        | 35,841         |
| 2013 | 230,886        | 41,646         |
| 2014 | 174,063        | 42,248         |
| 2015 | 145,469        | 33,303         |
| 2016 | 203,882        | 42,090         |
| 2017 | 180,086        | 43,228         |
| 2018 | 182,294        | 40,393         |
| 2019 | 178,944        | 33,814         |

$$qB_{t+1} = qB_t + qrB_t (1 - B_t/K) - q^2X_tB_t$$

$$qB_t = (\text{estimated})CPUE_t$$

$$CPUE_{t+1} = (1 + r)CPUE_t - (r/qK)CPUE_t^2 - qX_tCPUE_t$$

||  
Y<sub>t</sub>

$$MSY = rK/4$$

$$B_{msy} = K/2 = r / ((r/qK) \times q) / 2$$

$$X_{msy} = r/2q$$

Y=Catch amount

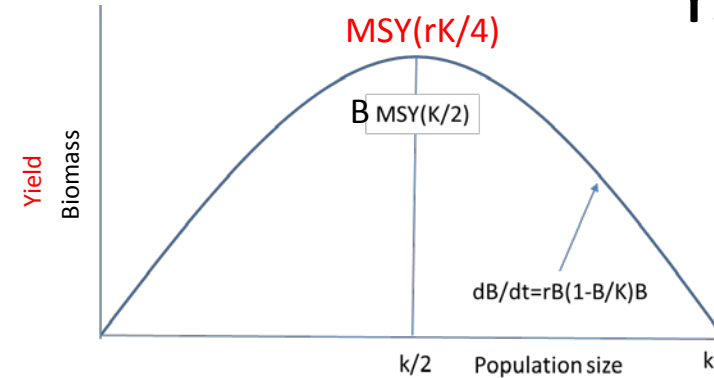
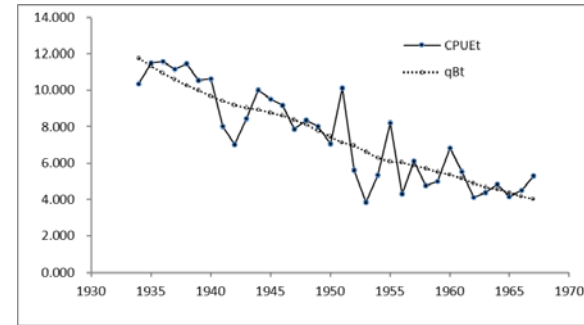
X=Catch Effort

q=fishing gear efficiency (consideration for parameter of area + season)

B<sub>t</sub>=The population size at time t

K=The carrying capacity of the population

r=intrinsic/natural rate of population increase



# Price model

Price = Size × Quality × Season(dummy V) × Market place (dummy V) × Quantity

If you find how to sell the target fish with higher price, the fishers can earn same money when their catches reduce for FM!

This is important tool for implementing CBFM, it's my experience!

# The target fish species in Iwate prefecture

30cm under catch prohibited

20cm under catch prohibited



1. Japanese flounder,
2. Marbled flounder,
3. Fat greenling,
4. Horsehair crab,
5. North Pacific Giant Octopus.



25cm under catch prohibited



7cm under catch prohibited and female catch prohibited



1kg under catch prohibited in Northern part of Iwate pref. and 2kg under catch prohibited in Southern part of Iwate

# National certificate of FEO

FEOs have a license to extend new technique and knowledge for fishers. <- Need to work at government and FCA for 2-10 years

No.345  
第345号

TEST CERTIFICATE

合 格 証 書

Place of registry Iwate Prefecture  
本 籍 岩手県

Tsutomu Miyata 宮田 勉

The day of birth; 8 July 1969 昭和44年7月8日生

平成18年度水産業普及指導員資格試験に合格したことを  
証する。

I certificate the pass of examination of a fisheries  
extension officer in 2006 fiscal year

平成19年1月4日  
4 January 2007

農林水産大臣 松岡利勝

Minister of Agriculture, Forestry and Fisheries  
Toshikatsu Matsuoka

