Korean proposal on AHL and INQ in 2000

I. The First Option

In accordance with the Article 7.1 of the Convention, at the 3rd Annual Conference of the Parties to the Convention on the Conservation and Management of pollock Resources in the Central Bering Sea held in Tokyo, Japan in 1998, the Republic of Korea proposed AHL and INQ for 1999 as in the S&T Attachment 5 of the 1998 S&T report. At the meeting **the Parties also agreed that the Korean proposal will continue to be considered at furture meetings.**

According to the decision of the 3rd Annual Conference, the Republic of Korea proposes that AHL and INQ in the Convention area should be establish by consensus for 2000 under the present biomass level of pollock in the Aleutian Basin as follows;

1. AHL of Pollock is **0.13 (A)** million metric tons at **1.67 (B)** million metric tons in the Aleutian Basin to reopen in accordance with the Annex Part `1 (d) of the Convention.

2. Total biomass in the Special Area of the Annex Part 1, (b) of the Convention in 1999 will be **0.39** million metric tons.

3. Total biomass of pollock in the Aleutian Basin in 1999 is **0.651 (C)** million metric tons.

4. **AHL** : (C)/(B) = **39% (D)**
   (A) x (D) = **50,700** metric tons **(E)**

5. **INQ** : (E)/6 Parties = **8,450** metric tons

II. The Second Option

In accordance with the Article 7.1 of the Convention, based on the exploitation rate, Korea proposes that AHL and INQ in the Convention area should be establish by consensus for 2000 as follows;

1. Exploitation rate is **25% (A)**

2. AHL of Pollock is **0.13 (B)** million metric tons at **1.67 ~ 2.0 (C)** million metric tons in the Aleutian Basin to reopen in accordance with the Annex Part 1 (d) of the Convention.

3. Total biomass in the Special Area of the Annex Part 1 (b) of the Convention will be **0.39** million mertic tons in 1999. In the Aleutian Basin it is **0.651 (D)** million metric tons.

4. **A x C = 0.418 ~ 0.5 (E)** million metric tons

5. **A x D = 0.163 (F)** million metric tons

6. **B/E = 31.1 ~ 26 % (G)**

7. **AHL : F x G = 50,693 ~ 42,380 (H)** metric tons

8. **INQ : (H)/6 Parties = 8,449 ~ 7,063** metric tons

Japanese idea for the AHL of 2000 in CBS

1. Japan tried to calculate the amount of AHL in CBS for the year 2000 in case of which the pollock biomass in Bogoslof Area is estimated even less than one million ton.

2. The estimated values of AHL are as follows;

   Ⅰ : 5.3 thousand ton

   when recruitment of 27 thousand ton(average value of 1995-99) will be expected.

   Ⅱ : 9.7 thousand ton

   when recruitment of 104 thousand ton(average value of 1997-99) will be expected.

3. Base of estimation of AHL

   ① Operational Definition, Summary of the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan 1997, published by North Pacific Fishery Management Council.

   ② Tier 3(b) used to determine the ABC as U.S. uses this category for estimating the ABC for the Bogoslof region.

   ③"FABC" is calculated in accordance with Tier 3(b)

   $F_{ABC} = F_{40\%}(B_{2000}/B_{40\%} - 0.05))/(1-0.05)$

   "FABC" means the fishing mortality rate for ABC.

   "F40%" means the fishing mortality rate that reduces spawning biomass per recruit to 40% of its unfished value.

   "B40%" refers to the long-term average biomass that would be expected under average recruitment and F=F40%

   "F40%" and "B40%" were estimated by SSC and are 0.27 and 200 million ton respectively.

   ④ Recruitment should be included to estimate the biomass of the beginning of the next year. Therefore we tried to modify the U.S. method partially at the calculation for AHL in CBS.

4. This level of AHL mentioned above, under the best available scientific information, shall be recognized as being safe enough to maintain the sustainable yields even in the recent level of biomass.

Japanese idea for the establishment of AHL for the year 2000 in CBS

1. Japan tried to calculate the amount of AHL in CBS for the year 2000 in case of which the pollock biomass in Bogoslof Area is estimated even less than one million ton.

2. US estimates the Acceptable Biological Catch(ABC) for pollock in Aleutian Basin-Bogoslof Island Area on the basis of biomass in these Area.

We understand that US, at least, makes these estimation in recognition of which the level of these biomass are enough to maintain their sustainable yields.

3. We tried to calculate the ABC in the Convention area taking into consideration the provisions of the Annex part I(b) of the Convention that the pollock biomass for the Specific Area shall be deemed to represent 60% of the Aleutian Basin biomass.

4. We understand that the recruitment should be included in the biomass of next year. Therefore we tried to modify the U.S. method * partially and used this modified US method at the calculation for AHL in CBS.

* : US method is mentioned in Tier 3(b), Operational Definition, Summary of the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan 1997, published by North Pacific Fishery Management Council.

5. AHL calculation formula

①How to estimate the biomass(B) of 2000

$$B2000=R2000+B1999 \cdot e^{(-Z)}$$

" B2000 ", "R" and "Z" mean the "biomass", "recruitment" and "total mortality" respectively.

Numerals show calendar year.

Fishing mortality is equal to zero, as fishing has been moratorium since 1984 and, therefore, $Z=F+M=M$

"M=0.2" was determined by SSC(Scientific and Statistic Committee in NPFMC)

②How to estimate the recruitment

$R = Bt+1 - Bt \cdot e^{(-M)}$ (see table 1 in appendix)

"t" means the year. The figures of estimated recruitment are shown in table in Appendix.

③"FABC" is calculated in accordance with Tier 3(b)

$FABC = F40\%(B2000/B40\% - 0.05))/(1-0.05)$

"FABC" means the fishing mortality rate for ABC.

"F40%" means the fishing mortality rate that reduces spawning biomass per recruit to 40% of its unfished value.

"B40%" refers to the long-term average biomass that would be expected under average recruitment and F=F40%

"F40%" and "B40%" were estimated by SSC and are 0.27 and 200 million ton respectively.

④How to calculate the exploitation rate (E)

$E = 1 - e^{(FABC)}$

⑤ABC in the Specific Area is calculated as follows;

$ABC = E \cdot B2000$

⑥AHL in the Convention Area is estimated as follows;

$AHL = ABC/0.6/3 = 0.55 * ABC$

ABC in Bogoslof Area is equal to ABC in the Specific Area and it is deemed to represent 60% biomass in the Aleutian Basin Area. This Area includes US EEZ, Russian EEZ and CBS and, therefore, AHL in CBS is calculated by dividing ABC in the Aleutian Basin Area into three portions equally.

6. Used parameters and data for AHL calculation

①The amount of average recruitment (see table 1 in appendix)

The amounts of average recruitment for recent three and five years are used, and they are 27 thousand ton and 104 thousand ton respectively.

②M=0.2

③Biomass of 1999 is estimated as 392 thousand ton from Kaiyo-maru survey in 1999.

④F40%=0.27

⑤B40%=2,000,000 ton

7. AHL calculation in the Convention Area

①Model Ⅰ : M=0.2 , "the value of recruitment "=27 thousand ton.

②Model Ⅱ : M=0.2 , "the value of recruitment" =104 thousand ton.

8. Most of juvenile fish in the Navarin Area is estimated to recruit in the Eastern Baring Sea as spawning adults stock.

However, the distribution of young fishes, which will spawn in the Bogoslof Area, and migration routes of adults, which will spawn in the Bogoslof Area, have not been clarified, and this made it quite difficult for us to study and predict recruitment so far.

We cannot help but consider our calculations of AHL using many hypothesis and we understand that clarification of these factors and further improvement of our calculation model are much required.

The calculation of AHL for the year of 2000

(1) Model I : M=0.2, R=−5 thousand ton

Biomass of survival from 1999 is calculated as;

B1999 * e^(−0.2) = 392 * 0.819 = 321

Estimated biomass for 2000 is calculated as;

B2000 = B1999 * e^(−0.2) + R

= 321 − 5 = 316

FABC = F40%(B2000 * e^(−M) + R) / B40% − 0.05) / (1 − 0.05)

= 0.27((321 + (−5)) / 2000 − 0.05) / 0.95

= 0.27 (316 / 2000 − 0.05) / 0.95

= 0.0307

E = 1 − e^ (− FABC) = 1 − e^ (−0.0307)

= 1 − 0.970 = 0.030

ABC for 2000 is 3.0% of biomass of 2000

ABC2000 = 316 * 0.030

= 9.5 thousand ton

ABC in the Convention Area is calculated as;

ABC = 9.5 / 0.6 / 3 = 5.3

<u>AHL for the Convention area should be established as 5.3 thousand ton</u>

(1) Model II : M=0.2, R=86 thousand ton

Biomass of survival from 1999 is calculated as;

B1999 * e^(−0.2) = 392 * 0.819 = 321

Estimated biomass for 2000 is calculated as;

B2000 = B1999 * e^(−0.2) + R

= 321 + 86 = 407

FABC = F40%(B2000 * e^(−M) + R) / B40% − 0.05) / (1 − 0.05)

= 0.27((321 + 86) / 2000 − 0.05) / 0.95

= 0.27 (407 / 2000 − 0.05) / 0.95

= 0.044

E = 1 − e^ (− FABC) = 1 − e^ (−0.044)

= 1 − 0.957 = 0.043

ABC for 2000 is 4.3% of biomass of 2000

ＡＢＣ2000＝407＊0.043

＝17.5 thousand ton

ABC in the Convention Area is calculated as;

ＡＢＣ＝17.5／0.6／3 ＝ 9.7

<u>AHL for the Convention area should be established as 9.7 thousand ton</u>

APPENDIX TABLE 1

The amount of Recruitment

(Ten thousand ton)

Year	Biomass	M=0.2	M=0.3
1988	240		
1989	213	16.44	35.16
1990			
1991	129		
1992	94	−11.65	−1.59
1993	64	−12.99	−5.65
1994	54	1.58	6.58
1995	110	65.77	69.99
1996	68	−22.09	−13.51
1997	39	−16.69	−11.39
1998	49	17.06	20.10
1999	39	−0.93	2.89
2000			
AVERAGE (RECENT 5 YEARS : 1995-1999)		8.62	13.62
AVERAGE (RECENT 3 YEARS : 1997-1999)		−0.56	3.87