

FORMULAE USED TO COMPUTE TAC REDISTRIBUTIONS FOR SARDINE AND ANCHOVY PELAGIC FISHERIES

Symbol Glossary

T	TAC for sardine or initial TAC for anchovy for 2006 (in tons), after “Off the Top” deductions
p^i	Applicant i 's proportional share of the 2005 TAC for the fishery concerned
s_p^i	Applicant i 's score for performance (jobs and investment)
s_T^i	Applicant i 's score for transformation
s^i	Applicant i 's total score
n	Number of successful applicants
n^*	Number of unsuccessful applicants
$m = n + n^*$	Total number of applicants

“Off the Top” Deductions

Before reallocation, the following amounts were deducted from the 2006 TAC for sardine and the initial TAC for anchovy:

- i) 0.3769% of the sardine TAC to allow for applications during the year for bait;
- ii) 0.0780% of the initial anchovy TAC to allow for applications during the year for bait;
- iii) 1.8825% of the sardine TAC for allocation of 0.3765% to each of five successful new sardine rights applicants;
- iv) 0.7530% of the initial anchovy TAC for allocation to one successful new anchovy rights applicant.

Deductions to Create Pool 1

Constituents of formulae:

x	The percentage of the remainder of the 2006 TAC or initial TAC after “Off the Top” deductions (T) which is to be placed in Pool 1
s_c, v	Parameters of the formulae
R^i	Amount in tons by which the amount which applicant i would have received in the absence of any redistribution ($p^i T$) is reduced to contribute to Pool 1.

$$\lambda^i = \begin{cases} 0 & \text{if } s^i \geq s_c \left(1 + \frac{1}{v}\right) \\ 1 - \frac{s^i - s_c}{s_c} v & \text{if } s^i \leq s_c \left(1 + \frac{1}{v}\right) \end{cases} \quad (1)$$

$$R^i = \lambda^i p^i \frac{x}{100} T / \left\{ \sum_{j=1}^m \lambda^j p^j \right\} \quad (2)$$

so that:

$$\sum_{i=1}^m R^i = \frac{x}{100} T \quad (3)$$

i.e. the sum of reductions from *all* applicants (not just the successful ones) to create Pool 1 is equal to $x\%$ of the T as required.

Equations (1) and (2) are formulated such that the higher an applicant's total score (s), the lesser the percentage of the allocation which the applicant would have received (in the absence of any redistribution) that is placed in Pool 1.

The specific parameter values chosen for the sardine and anchovy pelagic fisheries were:

$$\begin{aligned} x &= 10 \text{ (i.e. 10\% of } T \text{ to Pool 1)} \\ s_c &= 50 \\ v &= 2 \end{aligned} \quad (4)$$

so that the equations (1) and (2) become:

$$\lambda^i = \begin{cases} 0 & \text{if } s^i \geq 75 \\ 1 - \frac{s^i - 50}{25} & \text{if } s^i \leq 75 \end{cases} \quad (5)$$

$$R^i = \lambda^i p^i 0.1T / \left\{ \sum_{j=1}^m \lambda^j p^j \right\} \quad (6)$$

Note that formula (5) means that any applicant with a total score of 75 or more would make no contribution to Pool 1.

Redistribution of Pool 1

Note that Pool 1 is to be redistributed amongst only those “*small*” applicants (“small” in terms of proportional holding of the 2005 TAC for the fishery concerned) who scored well on *both* performance and transformation.

Constituents of formulae:

- y Size exclusion criterion
- A, B Parameters of the formulae (both percentiles)

- p_p^i / p_T^i Applicant i 's percentile on a distribution of performance/transformation scores (s_p / s_T) over all *successful* applicants
- w_1^i A weight accorded to applicant i in effecting allocation
- A_1^i Allocation (in tons) from Pool 1 to successful applicant i .

For the purpose of this exercise, percentiles ($p_{p/T}$) for scores ($s_{p/T}$) were computed as follows:

- i) the scores were arranged in ascending order;
- ii) the lowest score was accorded a percentile $100/n$, the next lowest $200/n$, and so on so that the highest score was accorded a percentile of 100;
- iii) if two or more applicants achieved identical scores, all were accorded the same percentile, this being taken as the associated average (e.g. say entries 5 and 6 on the list of scores in ascending order had identical scores, both would be accorded a percentile of $550/n$).

The weight for applicant i was then computed as:

$$w_1^i = \begin{cases} 0 & \text{if } p_p^i \leq A \text{ and } p_T^i \leq A \\ \frac{p_p^i - A}{B - A} \frac{p_T^i - A}{B - A} & \text{if } A \leq p_p^i \leq B \text{ and } A \leq p_T^i \leq B \\ \frac{p_p^i - A}{B - A} & \text{if } A \leq p_p^i \leq B \text{ and } p_T^i \geq B \\ \frac{p_T^i - A}{B - A} & \text{if } p_p^i \geq B \text{ and } A \leq p_T^i \leq B \\ 1 & \text{if } p_p^i \geq B \text{ and } p_T^i \geq B \end{cases} \quad (7)$$

except that:

$$w_1^i = 0 \quad \text{if } p^i \geq y \quad (8)$$

i.e. “big” applicants whose proportion of the 2005 TAC in the fishery concerned exceeded y may not receive any allocation from Pool 1.

Then:

$$A_1^i = \left(\frac{x}{100} T \right) w_1^i / \sum_{j=1}^n w_1^j \quad (9)$$

The effect of equation (7) for successful applicants is as follows:

- i) those whose performance or transformation scores are less than the A percentile receive no allocation from Pool 1;
- ii) those whose performance and transformation scores are both greater than the B percentile receive a maximum allocation;
- iii) those scoring between these two extremes receive a proportion of the maximum such that the proportion is small if either score is close to the A percentile, but increases smoothly to 1 as both scores approach the B percentile.

The specific parameter value choices for the sardine and anchovy pelagic fisheries were:

$$\begin{aligned}
 y &= 0.02 && \text{(i.e. applicants with more than 2\% of the TAC for the fishery concerned in 2005} \\
 &&& \text{could not benefit from Pool 1)} \\
 A &= 0.4 && \text{(i.e. 40\%)} \\
 B &= 0.6 && \text{(i.e. 60\%)}
 \end{aligned}
 \tag{10}$$

Creation of Pool 2

Pool 2 is made up of two or three contributions:

- i) D tons subtracted from each successful applicant irrespective of the size of their allocation;
- ii) Amounts which unsuccessful applicants would have received had they been successful, less any reduction therefrom for Pool 1;
- iii) In the case of sardine, an amount (E) which one previous rights holder who did not re-apply would otherwise have received initially prior to redistribution.

Hence the total amount in tons in Pool 2 (T_2) is given by:

$$T_2 = nD + \sum_{i=1}^{n^*} (p^i T - R^i) \quad [+ E \text{ in the case of sardine}]
 \tag{11}$$

The specific parameter value choices for the sardine and anchovy pelagic fisheries were:

$$\begin{aligned}
 \text{Sardine} & \quad D = 600 \text{ tons} \\
 \text{Anchovy} & \quad D = 600 \text{ tons} .
 \end{aligned}
 \tag{12}$$

Redistribution of Pool 2

Note that Pool 2 is to be redistributed amongst *all* successful applicants taking account of their total scores (s), but independent of the size of their allocations.

Constituents of formulae:

X, r, k Parameters of the formulae

w_2^i A weight related to total score accorded to applicant i in effecting reallocation

A_2^i Allocation (in tons) from Pool 2 to successful applicant i .

The weight w_2^i was calculated as follows:

$$w_2^i = \begin{cases} 0 & \text{for } 0 \leq s^i \leq X \\ 50 \left[1 - \left(\frac{1 - s^i/50}{1 - X/50} \right)^r \right]^k & \text{for } X \leq s^i \leq 50 \\ 50 \left[1 + \left(\frac{s^i/50 - 1}{\frac{100 - X}{50} - 1} \right)^r \right]^k & \text{for } 50 \leq s^i \leq (100 - X) \\ 100 & \text{for } (100 - X) \leq s^i \leq 100 \end{cases} \quad (13)$$

Then:

$$A_2^i = T_2 w_2^i / \sum_{j=1}^n w_2^j \quad (14)$$

The purpose of equations (13) is to accentuate the difference in allocations to higher and lower scoring applicants, by making them greater than would be the case were allocations made directly proportional to total score (s). This is effected by some combination of $X \geq 0$, $r \leq 1$ and $k \geq 1$. Note that if $X = 0$, $r = 1$ and $k = 1$, equations (13) simplify to direct proportionality:

$$w_2^i = s^i \quad \text{for } 0 \leq s^i \leq 100 \quad (15)$$

The specific parameter value choices for the sardine and anchovy pelagic fisheries were:

$$\begin{aligned} X &= 0 \\ r &= 0.5 \\ k &= 1 \end{aligned} \quad (16)$$

i.e.:

$$w_2^i = \begin{cases} 50 \left[1 - \sqrt{1 - s^i/50} \right] & \text{for } 0 \leq s^i \leq 50 \\ 50 \left[1 + \sqrt{s^i/50 - 1} \right] & \text{for } 50 \leq s^i \leq 100 \end{cases} \quad (17)$$

Further Redistribution of “Over-Allocations”

For some successful applicants, the process of Pool 2 redistribution resulted in that applicant receiving more tons than requested in one of the fisheries. Their allocation was then reduced to the amount they had requested for the fishery in question. The resultant excess was pooled for all such “over-allocations” for each fishery, and was then redistributed amongst the successful applicants who had received less than they had requested. This procedure was repeated iteratively until no applicant received more in tons than they had requested for either fishery.

End Note

The culmination of this process left one successful applicant for sardine and anchovy with a negative (by a few tons) allocation of anchovy. This applicant's anchovy allocation was then set to zero, with the allocation reserved for applications during the year for anchovy for bait correspondingly reduced so that the sum of all final allocations for anchovy remained equal to the TAC.