

FORMULAE USED TO COMPUTE TAC REDISTRIBUTIONS FOR THE WEST COAST ROCK LOBSTER FISHERY

Symbol Glossary

- T TAC for 2006 (in tons), after “Off the Top” deduction
- p^i Applicant i 's proportional share of the 2005 TAC
- 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 who had previous rights in this fishery
- n^* Number of unsuccessful applicants
- $m = n + n^*$ Total number of applicants who had previous rights in this fishery
- n^+ Number of successful new entrants (the translations)

“Off the Top” Deduction

Before reallocation, 50 tons were deducted from the 2006 TAC for West Coast rock lobster to allocate to successful applicants who were previously part of the nearshore (limited commercial) sector.

Deductions to Create Pool 1

Constituents of formulae:

- x The percentage of the 2006 TAC (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 who had previous rights in the fishery (not just the successful ones) to create Pool 1 is equal to $x\%$ of the TAC 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 the applicant would have received in the absence of any redistribution that is placed in Pool 1.

The specific parameter values chosen for the West Coast rock lobster fishery were:

$$\begin{aligned} x &= 5 \quad (\text{i.e. } 5\% \text{ of the TAC to Pool 1}) \\ s_c &= 50 \\ v &= 2 \end{aligned} \quad (4)$$

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

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

$$R^i = \lambda^i p^i 0.05T / \left\{ \sum_{j=1}^m \lambda^j p^j \right\} \quad (6)$$

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 (with previous rights in the fishery) which 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 <i>successful</i> applicants
w^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:

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

except that:

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

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

Then:

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

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 for either score close to the A percentile, but increases smoothly to 1 as both scores approach the B percentile.

The specific parameter choices for the West Coast rock lobster fishery were:

$$y = 0.008 \quad (\text{i.e. applicants with more than } 0.8\% \text{ of the TAC for the sector in 2005 could not benefit from Pool 1)}$$

$$A = 30\% \quad (10)$$

$$B = 70\%$$

Creation of Pool 2

Pool 2 is made up of two 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.

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

$$T_2 = nD + \sum_{i=1}^{n^*} (p^i T - R^i) \quad (11)$$

The specific parameter choice for the West Coast rock lobster fishery was:

$$D = 1.5 \text{ tons} \quad (12)$$

Redistribution of Pool 2

Note the Pool 2 is to be redistributed amongst all successful applicants (with previous rights in the fishery) 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^i A weight accorded to applicant i in effecting reallocation

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

The weight w^i was calculated as follows:

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

Then:

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

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:

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

The specific parameter choices for the West Coast rock lobster fishery were:

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

i.e.

$$w^i = \begin{cases} 50[1 - \sqrt{1 - s^i/50}] & \text{for } 0 \leq s^i \leq 50 \\ 50[1 + \sqrt{s^i/50 - 1}] & \text{for } 50 \leq s^i \leq 100 \end{cases}
\tag{17}$$

Distribution of “Off the Top” Deduction to New Entrants

The 25 successful applicants who were previously part of the nearshore (limited commercial) sector were each given 2 tons, from the “off the top” deduction of 50 tons.