

# FORMULAE USED TO COMPUTE TAC REDISTRIBUTIONS FOR THE HAKE LONGLINE FISHERY

## Symbol Glossary

$T$	TAC for 2006 (in tons)
$p^i$	Applicant $i$ 's proportional share of the 2005 TAC
$s_p^i$	Applicant $i$ 's score for performance (jobs and investment)
$n_1$	Number of successful applicants in the “historical 65 tons” group
$n_2$	Number of successful applicants in the “historical 100 tons” group
$n_3$	Number of successful applicants with 2005 quotas greater than 100 tons (the “large” group)
$n^*$	Number of unsuccessful applicants
$m = n_1 + n_2 + n_3$	Total number of successful applicants

## Creation and Redistribution of Pool 1

The creation and redistribution of Pool 1 is carried out separately for each of the three groups of successful applicants (“historical 65 tons”, “historical 100 tons” and “large”).

For each of the three groups  $j$ , Pool 1 is made up of 30% of the total in each group, i.e.:

$$T_j^1 = \sum_{i=1}^{n_j} (0.3 p^i T) \quad (1)$$

Pool 1 is to be redistributed amongst all successful applicants within each group taking account of their performance scores ( $s_p^i$ ).

Constituents of formulae:

$X, r, k$  Parameters of the formulae

$w^i$  A weight accorded to applicant  $i$  in effecting reallocation

$A_j^{1,i}$  Allocation (in tons) from Pool 1 to successful applicant  $i$  in group  $j$ .

The weight  $w^i$  was calculated as follows:

$$w^i = \begin{cases} 0 & \text{for } 0 \leq s^i \leq X \\ 50 \left[ 1 - \left( \frac{1 - s^i/50}{1 - X/50} \right)^r \right]^k & \text{for } X \leq s^i \leq 50 \\ 50 \left[ 1 + \left( \frac{s^i/50 - 1}{\frac{100 - X}{50} - 1} \right)^r \right]^k & \text{for } 50 \leq s^i \leq 100 \\ 100 & \text{for } 100 - X \leq s^i \leq 100 \end{cases} \quad (2)$$

where

$$s^i = \frac{s_p^i}{35} \cdot 100 \quad (3)$$

The purpose of equation (2) 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 (2) simplify to direct proportionality:

$$w^i = s^i \quad \text{for } 0 \leq s^i \leq 100 \quad (4)$$

The specific parameter choices for the hake longline fishery were:

$$\begin{aligned} X &= 0 \\ r &= 0.5 \\ k &= 1 \end{aligned} \quad (5)$$

i.e.

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

For groups 1 and 2 (“historical 65 tons” and “historical 100 tons”):

$$A_j^{1,i} = T_j^1 w^i / \sum_{l=1}^{n_j} w^l \quad (6)$$

For group 3 (“large”):

There were only two applicants in this group with scores of 16 and 8. The best scorer received 100% of  $T_3^1$  and the other one received nothing.

## Creation and Redistribution of Pool 2

Pool 2 is created and redistributed irrespective of previous allocation size. Pool 2 ( $T_2$ ) is made up of the amounts which unsuccessful applicants would have received had they been successful.

$$T_2 = \sum_{i=1}^{n^*} (p^i T) \quad (7)$$

Note the Pool 2 is to be redistributed amongst all successful applicants taking account of their performance scores ( $s_p^i$ ), but independent of the size of their allocations. The weight  $w^i$  is as calculated for the Pool 1 reallocation (eqns 2-5).

Then:

$$A_2^i = T_2 w^i / \sum_{j=1}^m w^j \quad (8)$$

where  $A_2^i$  is the allocation (in tons) from Pool 2 to successful applicant  $i$  (where here  $i$  extends over all groups).