

Methodology for Estimating Forage Fish Usage in Feeds

F3 Team

Required Inputs for Calculation:

(for both the improved diet and typical diet for a given species)

- Species Production Amount (tonnes) - *should be the same amount for both*
- Feed Conversion Ratio
- Fishmeal % in Feed
- Fish Oil % in Feed

Calculation Steps:

For both the improved diet and typical diet, use the steps below to calculate the number of forage fish required by each:

Step 1: Calculate amount of feed needed (tonnes) for production amount
$Species\ production\ amount * Feed\ Conversion\ Ratio$ Amount of Fishmeal needed (tonnes) for production amount $Fishmeal\ rate\ of\ inclusion\ in\ Feed * Feed\ Needed$ Amount of Fish Oil needed (tonnes) for production amount $Fish\ Oil\ rate\ of\ inclusion\ in\ Feed * Feed\ Needed$
Step 2: Calculate limiting ingredient using Forage Fish Dependency Ratio (FFDR)
$Fishmeal\ FFDR = Fishmeal\ rate\ of\ inclusion\ in\ Feed / Fishmeal\ \%\ in\ Forage\ Fish$ $Fish\ Oil\ FFDR = Fish\ Oil\ rate\ of\ inclusion\ in\ Feed / Fish\ Oil\ \%\ in\ Forage\ Fish$ The limiting ingredient is one with higher FFDR.
Step 3: Calculate the amount of Forage Fish Needed (tonnes)
$FFDR\ of\ Limiting\ Ingredient * Feed\ Needed * 0.67^1$
Step 4: Calculate the # of Forage Fish Needed
$Weight\ of\ Forage\ Fish\ Needed / Weight\ of\ a\ Single\ Forage\ Fish^2$



Finally, calculate the number of forage fish saved by subtracting the number of forage fish needed by the improved diet from the number of forage fish needed by the typical diet.

Calculation Assumptions:

1. Use of byproduct in fishmeal and fish oil production has been set to 33%, [as estimated by IFFO](#), thereby reducing the need for whole forage fish by that amount.

2. The forage fish species used in this calculation is Anchoveta (Peruvian anchovy), which has a composition of [24% fishmeal, 5% fish oil](#) and an [average weight of 19.35g](#).



Appendix A:

The Nature Conservancy's Aquaculture Division reviewed our methodology and suggested comparing it to GAA's BAP method of using the Feed Fish Inclusion Factor and Fish in:Fish Out Ratio to calculate the amount of forage fish needed. The results from the GAA methodology are shown on the second tab of each Challenge's calculation sheet.

However, they acknowledged that the GAA methodology does not account for the limiting ingredient in a diet, and as such, felt that our methodology makes more sense to use for the forage fish savings estimates being calculated.

