**Equations used for purse-seine “species composition sampling” estimates of catch and size composition (species: BET, YFT, and SKJ; for years 2000 →)**

Source for equations (and most notation) and methodology: Tomlinson, P.K. 2004. Sampling the tuna catch of the eastern Pacific Ocean for species composition and length-frequency distributions. IATTC Stock Assessment Report 4, pages 311-333. <http://www.iattc.org/PDFFiles2/StockAssessmentReports/SAR4_sampling_ENG.pdf>

For estimation procedures see the document: “spp comp\_overview\_notes.rtf” and the R functions in the workspace: “spp comp\_R\_functions.RData”

Subscripting: *i* indexes species, *j* indexes wells, *k* indexes 1 cm bins of fish length, and *s* indexes splits within a well. The subscript *k* is only used for sample quantities that are collected per fish (*e*.*g*., length), and the subscript *s* is only used in the within-well section on split-well estimation.

**Within-well estimates for an individual catch stratum** (used by R functions: *well.estimates.f* and *well.miss.f*)

*Non-split (non-sorted) samples*

Estimate of total catch in well *j* and species *i*:

Estimate of the total number of fish in the *j*th well (all three species combined):

Estimate of the total number of fish of species *i* in well *j*:

Estimate of the total number of fish of species *i* in length bin (1cm) *k* in well *j*:

Well-level sample summaries are defined by:

where *wij* is the sum weights of measured fish of species *i* in well *j* (from lengths converted to weights), *mij* is the number of fish of measured for length of species *i* in well *j*, *mijk* is the number of fish of species *i* in 1-cm length bin *k* measured in well *j*, and *nij* is the number of fish of species *i* in the fish count for well *j*. *Wj* is assumed known (from observer and/or logbook information).

*Split (sorted) samples*

Estimate of the weight (mt) of fish of species *i* in split *s* from well *j* (*pcntis* is the percentage of total well catch that belongs to split *s*; it is assumed known):

Estimate of the weight of species i in well j:

Estimate of the number of fish of species *i* in split *s* of well *j*:

Estimate of number of fish of species *i* in well *j*:

Estimate of the number of fish in well *j* (all three species combined):

Estimate of the number of fish of species *i* in 1-cm length bin *k* of well *j* (*mijks* is the number of fish of species *i* in 1-cm length bin *k* of split *s* of well *j*):

**Catch stratum-level estimates for an individual catch stratum** (used by R functions: *stratum.estimates.f* and *substitute.f*)

Estimate of the weight of fish (mt) of species *i* in the stratum (equation 58 of Tomlinson 2004):

where W is the total catch for the stratum (all three species combined; from R function get.strat.unloads.f) and *q* is the number of wells sampled for the stratum.

Estimate of the number of fish of species i in 1-cm length bin k for the stratum:

**Stock assessment ‘fishery’ estimates** (used by R function: *fishery.estimates.f*)

Estimate of the weight (t) of catch of species *i* in stock assessment ‘unit’ (= quarter x area-gear combination, Qu-Ar-Gr):

Estimate of the proportion of fish (from numbers) of species *i* in 1-cm length bin *k* in stock assessment ‘unit’, **constructed using only those catch strata in *Qu*-*Ar*-*Gr* with at least the minimum number of samples (and with presence of species *i*), denoted by *cs\****:

The estimate of the proportion of fish in numbers by size above is based only on catch strata that had at least the minimum number of wells sampled (*i*.*e*., given by the parameter min.sampsize used by stratum.estimates.f).

The sums above are over months with quarter Qu, catch areas within stock assessment area Ar, and catch gears within stock assessment gear Gr (e.g., catch gears 2 and 5 make up stock assessment gear “FO”).

**Substitution rules**

<need to add text here; see get.sub.f for details>