A selection of tagged tables[1]

by Ross Moore

August 2022

REAL-WORLD TABLES — FISHERY DATA

The basic style adopted for tabular material is in accordance with the booktabs[2,3] package. Supported rules are `\toprule`, `\midrule`, `\bottomrule` which can inherit a semantic meaning, instead of being for aesthetic appearance only. This extra semantics takes the form:

- `\toprule` indicates the start of a ⟨THead⟩ block of rows;
- `\midrule` indicates the end of a block, with the following row starting a new ⟨TBody⟩;
- `\bottomrule` indicates the end of the tabular; closing the final ⟨TBody⟩ block of rows.

Extra considerations are as follows.

- When more than one `\toprule` and/or `\midrule` is used within the table, it indicates that a related block of rows occurs. These rows will have their own ⟨TBody⟩. The PDF/UA format allows multiple ⟨TBody⟩s to occur in a tabular, but only a single ⟨THead⟩. Furthermore the previous row most likely contained header cell(s).

  – When just a single header cell is present spanning all the columns, this can be presumed to be a header whose data augments the meaning of the following row headers; we call this a 'row super-header'.

  – When single cells occur in each column, these will be new column headers for the data in the following block of rows. Since a 2nd ⟨THead⟩ is not allowed, this row and any preceding rows containing header cells spanning multiple columns, can be custom-tagged, provided this is Role-mapped to ⟨TBody⟩.

- Any usage of `\multicolumn` is presumed to indicate a related group of columns; the cell is then a 'column super-header' for the header cells of single cells in the columns beneath. Normal header cells for these columns might be in the next row, or sometimes in the preceding row.
- Use of `\cline` and/or `\cmidrule` helps clarify a hierarchy of headers, especially within the ⟨THead⟩; such that column header or super-header cells are found in both the row above and that below.
- Any usage of `\multirow` is presumed to indicate a related group of rows. Similarly to with `\multicolumn`, normal row headers likely occur in the next column.
- With no usage of `\toprule` nor `\midrule`, and no `\multicolumn` nor `\multirow`, the top row in a table is presumed to contain column headers, and the 1st column is presumed to contain row headers. This need not be the case in 'toy' examples (e.g., containing just a single row or single column); but in completed 'real-world' tables, this should not occur.
- The role of the top-left cell can be ambiguous. Usually it is a column-header for the row-headers in the 1st column. Alternatively it can be a row-header for the column headers in the 1st row; or be applicable to both rows and columns. It is also commonly empty, in which case it must not be designated as a header for any other cell.

---

[2]"The principal is that enforced structure of presentation enforces structured thought in the first instance."

[3]U.S. Government Style Guide, 2000; tabular material

Normal Table

Table 1: Comparison of reference points estimated in an earlier assessment and from the current assessment update. The overfishing threshold is the $F_{MSY\,proxy}$ ($F_{40\%}$). The biomass target, ($SSB_{MSY\,proxy}$) was based on long-term stochastic projections of fishing at the $F_{MSY\,proxy}$. Median recruitment reflects the median estimated age-1 recruitment from 1982–2017. Intervals shown reflect the 5th and 95th percentiles.

	2019 M=0.2	2019 M-ramp	M=0.2	M-ramp
F_{MSY}	0.173	0.175	0.173	0.175
SSB_{MSY} (mt)	42,692	63,867	39,912	60,010
	(27,916–62,785)	(46,144–84,098)	(25,472–59,589)	(41,916–80,517)
MSY (mt)	7,580	11,420	7,171	10,873
	(4,853–11,366)	(8,149–15,268)	(4,462–11,023)	(7,439–14,841)
Median recruits	4,377	8,464	4,677	9,249
(age-1) (000s)	(1,161–14,434)	(2,353–15,934)	(1,064–16,392)	(2,129–18,031)
Overfishing	Yes	Yes	Yes	No
Overfished	Yes	Yes	Yes	Yes

Each non-blank ⟨TD⟩ data cell has a well-defined row- and column-head cell, ⟨TH⟩, as indicated by the blue lines in the following annotated image.

Normal Table with 1st column header: super row-header

When the top-left cell is non-empty, it is usually a column-header for the 1st column, which consists of row-headers. This is an example of a '**super header**'; that is, *a header cell for other header cells*. The /Scope value for this header cell is /Column, since it is a descriptor for the cells in the column placed below it. We call this a 'row super-header' cell, as it is located from a data-cell by tracing the headers of its row-header. Typically a row super-header cell will occur within the 1st column, though need not always be in the 1st row of the table.

When the rows would be too wide for a page, the table can be turned sideways. See the next page for the table resulting from the following LaTeX source. It is rather unfortunate that Acrobat Pro cannot correctly find the bounding boxes of the cells when a table is rotated. Although the PDF is correctly tagged, screen-reading and navigation using Assistive Technology may be affected.

Source code for a sideways table with all row and column headers

```
\begin{sidewaystable}[htp]
\caption{Stocks reviewed at
 September 2021 Management Track Assessment Peer Review meeting}
\centering
\Cut{columnRowComment}{\columnRowTypes{1}{2}{1}{2}}%
\begin[\Paste{columnRowComment}]{tabular}{p{3.75cm} p{4.5cm} p{7.75cm}}%
\toprule
 Stock  & Lead Analyst/Presenter & Peer review conclusion
\\\midrule
 \relax\hyperlink{AtlanticCod}{Gulf of Maine cod}\newline~\enDash\,Enhanced review
 & \newline Charles Perretti
 & Under retro-adjusted $\M\!=\!0.2$ model stock is overfished and overfishing
 is occurring. \newline
 Under \Mramp\ model stock is overfished but overfishing is not occurring.
\\[28pt]
 \relax\hyperlink{AtlanticCod}{Georges Bank cod}\newline~\enDash\,Expedited review
 & \newline Kathy Sosebee
 & \newline Stock is overfished but overfishing unknown
\\\bottomrule
\end{tabular}
\end{sidewaystable}
```

Table 2: Stocks reviewed at September 2021 Management Track Assessment Peer Review meeting

Stock	Lead Analyst/Presenter	Peer review conclusion
Gulf of Maine cod – Enhanced review	Charles Perretti	Under retro-adjusted $M = 0.2$ model stock is overfished and overfishing is occurring. Under M-ramp model stock is overfished but overfishing is not occurring
Georges Bank cod – Expedited review	Kathy Sosebee	Stock is overfished but overfishing unknown

(Acrobat's Table Editor seems to be confused by the rotation.)

Acrobat seems to have difficulty correctly indicating the tagged material with rotation in effect. There is no problem with the actual tagging tree; so not with text extraction for accessibility, etc.

Multiple Row Blocks

Here the data rows are divided into blocks (3 of them) each with a header cell that spans a whole row, using the \multicolumn{9}{...} command, which includes the 1st column. This creates a header cell which is essentially the column header for the 1st column (consisting of row-headers). Having a blank 1st cell in the top row is necessary for this interpretation.

Table 3: **Catch and status table for Gulf of Maine Atlantic cod. All weights are in (mt), recruitment is in (000s), and F_{Full} is the fishing mortality on fully selected ages. Note terminal year SSB and F_{Full} is not retro-adjusted in this table.**

	2012	2013	2014	2015	2016	2017	2018	2019
Data								
Recreational discards	103	195	151	168	334	617	340	111
Recreational landings	1,245	1,524	796	11	187	169	11	43
Commercial discards	97	54	27	14	8	16	17	7
Commercial landings	2,759	951	832	227	320	376	398	335
Catch for Assessment	4,204	2,723	1,806	420	850	1,177	766	497
Model Results (M=0.2)								
Spawning Stock Biomass	3494	1826	1145	1184	1736	2126	2314	3083
F_{Full}	1.66	2.16	2.37	0.43	0.59	0.61	0.32	0.16
Recruits (age-1)	1606	667	2119	804	530	966	3141	1298
Model Results (M-ramp)								
Spawning Stock Biomass	4174	2288	1655	1859	2485	2776	2726	3223
F_{Full}	1.46	1.85	1.74	0.3	0.44	0.49	0.28	0.17
Recruits (age-1)	3285	1484	4739	1699	1024	1717	5160	1981

For greater emphasis of the different data blocks, a \midrule can precede the super-head cell, as shown below. Notice also how the /Scope of a super row-header is /Column, as its content is a qualifier for the row-header cells in the same (that is, the 1st) column, at least for the rows within the following ⟨TBody⟩ block.

Table 4: Catch and status table for Southern New England Mid-Atlantic winter flounder. All weights are in (mt), recruitment is in (000s), and F_{Full} is the fishing mortality on fully selected ages (ages 4 and 5). Model results are from the current updated ASAP assessment.

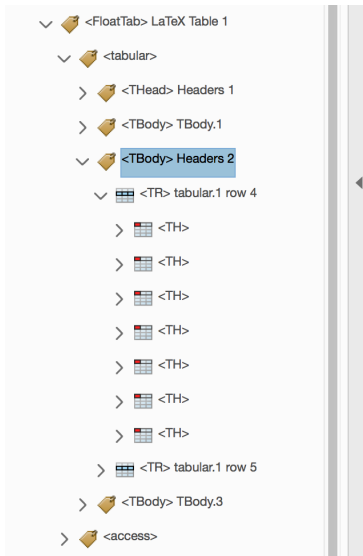|	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Data										
Recreational discards	24	18	11	8	4	13	3	2	4	2
Recreational landings	119	155	126	15	99	39	61	10	10	1
Commercial discards	153	298	482	206	64	82	125	101	108	105
Commercial landings	173	149	134	859	660	661	516	495	326	202
Catch for Assessment	469	620	752	1,087	827	795	704	608	449	310
Model Results										
Spawning Stock Biomass	5,586	6,577	6,585	6,318	5,209	4,592	3,897	3,667	3,851	3,638
F_{Full}	0.076	0.094	0.117	0.189	0.176	0.178	0.186	0.158	0.111	0.077
Recruits	6,448	4,579	4,251	2,321	4,219	4,955	5,238	3,211	6,185	3,293

Multiple Header Blocks

This example has multiple data blocks, where there is a header block explicitly specified for each. For comparison of different model results, groups of columns are associated with the different models. This gives 'super' column header cells, with text $M{=}0.2$ and M-ramp, spanning multiple columns using \multicolumn commands. Notice that the 1st column entry is blank on the rows where these occur, and that a \midrule comes afterwards, rather than before (as in the previous example).

Table 5: Short term projections of total fishery catch and spawning stock biomass for Gulf of Maine Atlantic cod based on a harvest scenario of fishing at the $F_{MSY\,proxy}$ ($F_{40\%}$) between 2022 and 2024. Catch in 2020 and 2021 has been estimated at 409 (mt) and 523 (mt), respectively. For the $M{=}0.2$ model, a retrospective adjustment has been appiled. For the M-ramp model, projections are shown under the assumption of $M{=}0.4$ short-term natural mortality.

Year	Catch (mt)	SSB (mt)	F_{Full}	Catch (mt)	SSB (mt)	F_{Full}
		$M{=}0.2$			$M\text{-}ramp$	
2020	409	2,635	0.162	409	3,925	0.119
Year	Catch (mt)	SSB (mt)	F_{Full}	Catch (mt)	SSB (mt)	F_{Full}
		$M{=}0.2$			$M\text{-}ramp$	
2021	523	3,599	0.137	523	4,759	0.113
2022	821	4,508	0.173	919	5,254	0.175
2023	959	5,488	0.173	1,017	5,707	0.175
2024	1,244	7,279	0.173	1,306	6,802	0.175

A 'super header' row occurs within the ⟨THead⟩ block, having a \midrule beneath. The 2nd header block is tagged as ⟨TBody⟩, with a \toprule above and \midrule below. As these 'super header' cells come *after* their column-header cells, their presence must be recorded in the history/auxiliary file. This enables them to be specified as a header for the real column headers on the next run.

Hierarchical column headers

This next example is taken from [TeX StackExchange](#). It has a binary tree of column-header cells.

Table 6: Overzicht van de concentraties en hun standaardeviaties van pesticiden in mg/kg in de (on)behandelde wortelen en de meelwormen gekweekt op deze wortelen. Bij NA lag de concentratie onder de detectielimiet van de LCMS-MS.

Pesticiden	Concentraties pesticiden (mg/kg)					
	Onbehandeld			Behandeld		
	Wortel	Meelwormen		Wortel	Meelwormen	
		voor gut-loading	na gut-loading		voor gut-loading	na gut-loading
2,4-D	$(2.55\pm2.60)\cdot10^{-4}$	$(9.73\pm6.39)\cdot10^{-4}$	$(8.24\pm2.77)\cdot10^{-4}$	8.36 ± 0.84	$(5.01\pm0.54)\cdot10^{-4}$	$(6.77\pm1.86)\cdot10^{-4}$
Bentazon	NA	NA	$(1.59\pm2.76)\cdot10^{-5}$	0.92 ± 0.12	NA	NA
Bifenthrin	$(1.66\pm0.15)\cdot10^{-3}$	$(2.84\pm1.15)\cdot10^{-3}$	$(3.04\pm1.30)\cdot10^{-3}$	0.81 ± 0.10	$(2.22\pm0.77)\cdot10^{-3}$	$(1.93\pm0.15)\cdot10^{-3}$
Clopyralid	$(9.18\pm0.15)\cdot10^{-5}$	NA	$(4.61\pm7.99)\cdot10^{-5}$	1.75 ± 0.16	$(1.07\pm0.69)\cdot10^{-2}$	$(6.84\pm2.40)\cdot10^{-3}$

Use of `\multicolumn` within the ⟨THead⟩ in such a (binary) tree-like fashion allows the whole structure to be deduced in a single pass. Subsets of columns for one row are refined into smaller subsets on the next row. Each larger subset establishes a 'super-column header' for all the header cells below it. Singleton sets define the column-header for the data cells in that column. Thus each cell, head or data, has a well-defined column header at the time it is processed.

Multiple row-header columns

A calendar, or Meeting schedule, also has structured row headers, but only needs a single ⟨TBody⟩ block. Row headers occur within the 2nd column, with the 1st column having the occasional 'super' row-header amongst mostly blank cells.

| Day/Date	Time	Activity	Lead
Monday, September 13	9:00 am	Welcome/Introductions	Michele Traver
	9:15 am	Background/AOP Review	Russ Brown
	10:00 am	Gulf of Maine Cod	Charles Perretti
	11:00 am	Review/Discussion	Review Panel
	11:15 am	Public Comment	Public
	11:30 am	Lunch	
	12:30 pm	Gulf of Maine Cod cont.	Charles Perretti
	2:30 pm	Public comments	Public
	3:00 pm	Adjourn	
Tuesday, September 14	9:00 am	Welcome/Logistics	Michele Traver
	9:15 am	Georges Bank Cod	Kathy Sosebee
	10:30 am	Break	
	1:00 pm	Georges Bank Cod cont.	Kathy Sosebee
	2:30 pm	Adjourn	
Wednesday, September 15	10:30 am	Review Panel findings	Review Panel
	12:00 pm	Georges Bank Cod	Kathy Sosebee

Redundant/weak column headers

It is poor style to have long-winded headers, perhaps using multiple cells instead of just a single cell. However, this is not a good reason for failing to correctly identify what is a header for what other cell(s).

Here is such an example, based upon one of the earlier tables (now set in portrait).

Table 7: Stocks reviewed at September 2021 Management Track Assessment Peer Review meeting

Fishing Stock	Lead Analyst or Presenter	Peer review conclusion from this meeting September 2021
Gulf of Maine cod – Enhanced review	Charles Perretti	Under retro-adjusted $M=0.2$ model stock is overfished and overfishing is occurring. Under M-ramp model stock is overfished but overfishing is not occurring.
Georges Bank cod – Expedited review	Kathy Sosebee	Stock is overfished but overfishing unknown

The figure below shows how there are really 3 rows of headers, having content that looks like a single phrase when read vertically. With each new successive row, each non-empty cell inherits the rôle of being a column header, from the cell immediately above.

11
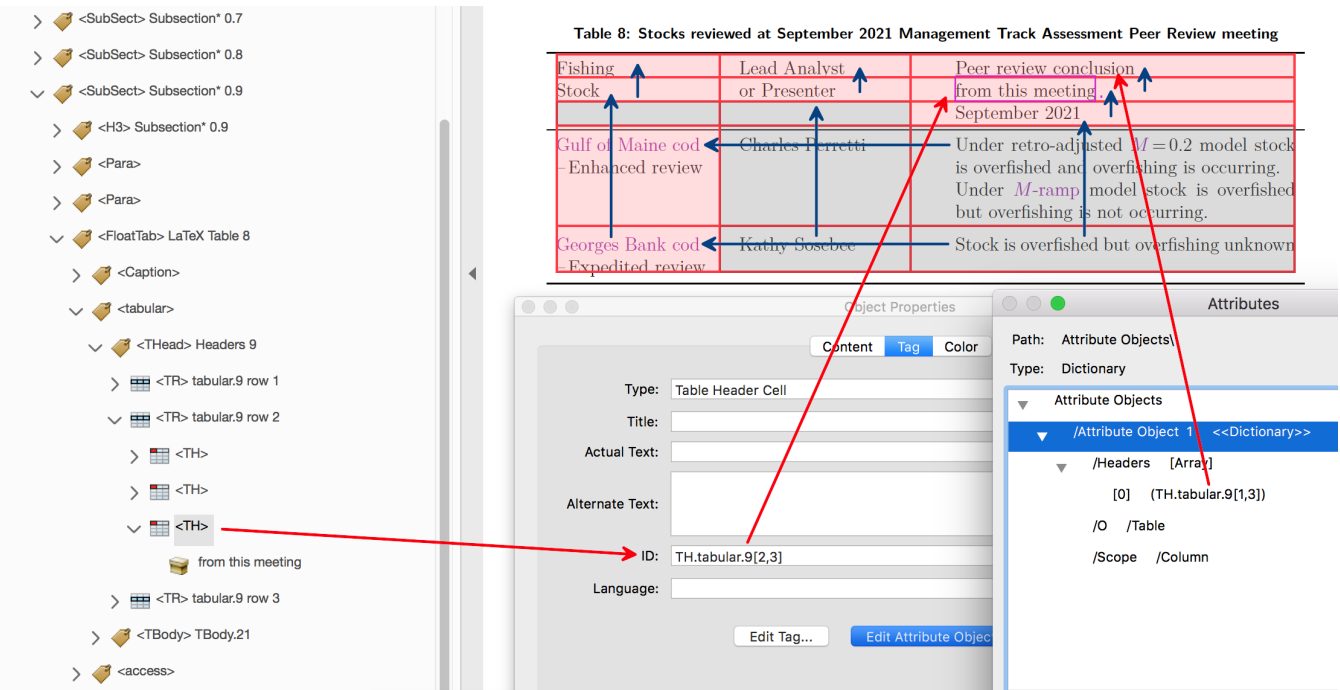
A drawback with this approach is that the information from these (weak) header cells is collected in reverse of the natural reading order. Thus it would be conceptually better to use single p-style cells, within a single row of header cells.