Supplemental Table 1. *Number of webs in each of the analyzed non-radioactive web collections*

Group	Web Collection	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Araneus cavaticus																																			
Penultimate Instar																																			
Female																																			
	Starving	8	8	8	8	8	8	8	8	8	8	7	5	1	1	1	1	1	1																
	Resumed Feeding	5	4	4	4	4	3	1	1																										
	Feeding	8	8	8	8	7	5	3	3	2	2	1	1	1	1	1	1																		
Male																																			
	Starving	11	11	11	10	9	9	9	8	7	6	6	5	4	3	3	3	3	2	1	1	1	1	1	1	1									
	Resumed Feeding	4	4	3	2	2																													
	Feeding	11	11	10	9	9	8	5	1	1																									
Adult Female																																			
	Starving	10	10	9	9	8	7	6	5	5	5	3	2	2	1	1	1																		
	Resumed Feeding	6	6	6	5	5	4	3	2	2	1	1	1																						
	Feeding	6	8	8	7	6	5	5	5	5	5	5	5	4	3	3	1	1	1																

Argiope aurantia

Adult Female

Starving		11	11	11	11	11	10	10	9	8	8	7	7	7	7	6	4	4																
Resumed Feeding	7	7	7	7	7	7	6	6	6	6	6	6	5	5	5	4	4	4	4	2	2	1												
Feeding		10	11	10	10	10	10	10	10	10	9	9	8	8	7	7	7	6	3	3	3	2	1	1	1	1	1	1	1					
Post-Egg-Sac 1	12	12	12	12	12	12	12	11	11	8	7	6	5	2	1	1	1																	
Post-Egg-Sac 2	5	6	6	6	6	6	6	6	5	5	3	3	1																					
Post-Egg-Sac 3	2	1	1	1	1	1	1	1	1																									

Argiope trifasciata

Adult Female

Starving		8	8	8	8	8	8	8	8	8	7	7	7	7	7	6	6	5	4															
Resumed Feeding	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	4	4	4	4	4	4	3	2	2	2	1					
Feeding		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	6	5	5	4	4	4	4	4	3	3	2	2
Post-Egg-Sac 1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1																		
Post-Egg-Sac 2	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1																		
Post-Egg-Sac 3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1																			

In general, the number of webs per web collection decreased over the series for a given group because different individuals built different numbers of webs before their inclusion in the group ended. In two instances a web of one group was mistakenly added to webs of a different group, resulting in a total of five webs having to be discarded. This is the explanation for the anomalous number of webs in the web 2 collections of the *A. aurantia* feeding adult and *A. cavaticus* feeding adult groups and in the web 1 collection of the *A. aurantia* PES2 group.

Underlining is used to show those web collections that were 'horizontally pooled' prior to NMR analysis (see 'Gravimetric measurements of orb webs' in Materials and Methods).

In all starving and feeding groups, spiders were allowed to recycle their web 1; thus, there is no web collection 1 from these groups.

Supplemental Table 2. *Effect of different pulse repetition and/or acquisition times on LMM quantitation by [1]H-NMR, as determined by analyzing a standard solution containing the 11 organic LMM in equimolar concentration*

Pulse Repetition Time (sec)	Acquisition Time (sec)	% Error in Measured Molar %, Assumption A (Mean ± SEM) *N* = 11	% Error in Measured Molar %, Assumption B (Mean ± SEM) *N* = 11
3.28[a]	3.28	7.3 ± 2.55	6.5 ± 1.80
8.28	3.28	6.1 ± 1.61	3.0 ± 0.73
8.28[b]	6.55	4.0 ± 1.25	3.8 ± 0.77
16.55	6.55	4.3 ± 0.90	2.9 ± 0.77
33.11	6.55	5.4 ± 1.26	—

[1]H-NMR analysis of the equimolar solution was performed four times with each of the five different sets of acquisition parameters. Thus, the measured molar percentage of each of the 11 LMM, used to calculate % error, is the average of four analyses.

In Assumption A, the actual molar % of each LMM is assumed to be 9.09 mole % (100 mole % ÷ 11 LMM). This approach assumes an exactly equimolar standard solution was prepared. In Assumption B, the molar percentages obtained using the longest repetition time (33.11 sec) are assumed to be closest to the true molar percentages.

[a] These acquisition parameters were used in the analysis of all *A. cavaticus* web extracts.

[b] These acquisition parameters were used in the analysis of all *A. aurantia* and *A. trifasciata* web extracts.

Supplemental Table 3. *Linear regression slopes describing the change in the water-soluble percentage of the web over the series of web collections*

Group	Slope	*N*
A. cavaticus Feeding Juvenile Males	-1.598***	7
A. cavaticus Starving Juvenile Males	-0.497***	13
A. cavaticus Resumed Feeding Juvenile Males	3.136	4
A. cavaticus Feeding Juvenile Females	-0.095	10
A. cavaticus Starving Juvenile Females	-0.648**	12
A. cavaticus Resumed Feeding Juvenile Females	-0.461	6
A. cavaticus Feeding Adult Females	-0.591***	16
A. cavaticus Starving Adult Females	-0.442	10
A. cavaticus Resumed Feeding Adult Females	0.119	9
A. aurantia Feeding Adult Females	-0.224*	27
A. aurantia Starving Adult Females	-0.811***	17
A. aurantia Resumed Feeding Adult Females	-0.328***	22
A. aurantia Post-Egg-Sac 1 Adult Females	-1.367**	17
A. aurantia Post-Egg-Sac 2 Adult Females	-0.612***	13
A. aurantia Post-Egg-Sac 3 Adult Females	1.092	9
A. trifasciata Feeding Adult Females	-0.162	33
A. trifasciata Starving Adult Females	-0.504**	17
A. trifasciata Resumed Feeding Adult Females	-0.479**	29
A. trifasciata Post-Egg-Sac 1 Adult Females	-0.976***	15
A. trifasciata Post-Egg-Sac 2 Adult Females	-1.363**	15

A. trifasciata Post-Egg-Sac 3 Adult Females	-1.646***	14

Slope differs significantly from zero, * $P < 0.05$, ** $P < 0.01$, *** P • 0.001.

N, number of web collections water-extracted separately.

Supplemental Tables 4-6 are Microsoft Excel spreadsheets that we would like readers to be able to access as spreadsheets (i.e., be able to copy and paste columns and rows of data to work with). If this is not possible, we will supply the data just as regular tables, albeit very long ones.