

Table S1. Bulk carbon and nitrogen stable isotope signatures for killer whale skin samples used in the GAMs, including individual identifier, date of sample collection, and estimated ages of animals.

Animal	Sex	Estimated age	Date collected	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$
J1	M	55	5/19/06	-15.7	16.3
J16	F	40	10/28/12	-16.2	15.7
J17	F	36	1/2/13	-16.8	16.1
J17	F	38	9/12/15	-15.6	16.3
J19	F	27	6/15/06	-15.2	16.3
J2	F	80+	9/17/12	-16.5	16
J22	F	22	6/10/07	-15.8	16.5
J26	M	17	9/18/08	-16.6	15.8
J27	M	15	5/19/06	-16.0	16.6
J28	F	14	11/7/07	-16.6	15.9
J28	F	22	9/24/15	-15.9	16.6
J30	M	16	9/30/11	-16.2	16.5
J31	F	13	9/18/08	-16.7	16.5
J32	F	12	9/18/08	-16.7	15.9
J35	F	17	9/12/15	-16.2	16.7
J36	F	17	6/9/16	-15.8	16.9
J37	F	10	10/2/11	-16.5	16.6
J37	F	14	9/15/15	-15.8	16.6
J38	M	4	6/8/07	-15.7	16.7
J39	M	3	5/23/06	-15.8	16.1
J39	M	12	2/13/15	-16.4	15.7
J40	F	8	9/7/12	-16.7	16.4
J41	F	8	10/29/13	-16.4	16.0
J42	F	8	9/24/15	-15.7	16.6
J44	M	7	6/9/16	-15.9	16.0
J45	M	6	2/13/15	-15.9	16.5
J47	M	5	9/12/15	-15.8	16.4
J47	M	5	9/22/15	-16.0	16.9
J49	M	3	9/15/15	-15.9	17.1
J50	F	2	9/11/16	-15.9	17.6
J51	M	1	9/10/16	-15.8	17.4
J52	M	1	9/14/16	-16.1	17.1
J53	F	1	6/5/16	-15.5	17.6
K12	F	41	9/19/13	-16.4	15.8
K12	F	44	9/25/16	-16.5	16.5
K13	F	35	12/14/07	-16.2	15.9
K13	F	43	9/24/15	-15.6	17.2
K14	F	39	9/11/16	-15.3	17.1
K16	F	28	3/4/13	-16.0	16.1
K20	F	26	9/17/12	-16.1	16.2
K21	M	21	12/14/07	-16.2	16.1
K21	M	27	3/4/13	-15.6	15.9

Animal	Sex	Estimated age	Date collected	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$
K22	F	24	9/30/11	-16.4	16.2
K22	F	26	3/4/13	-15.7	15.7
K22	F	28	9/14/15	-15.9	16.2
K25	M	24	9/14/15	-16.4	16.4
K26	M	19	10/28/12	-16.1	15.6
K26	M	22	11/2/15	-16.7	16.9
K27	F	14	9/15/08	-16.4	16.0
K33	M	10	9/30/11	-16.5	16.2
K34	M	6	12/14/07	-16.5	15.7
K34	M	12	1/17/13	-16.5	16.1
K35	M	10	11/27/12	-16.9	15.8
K36	F	4	12/14/07	-16.4	16.0
K37	M	13	9/25/16	-16.0	17.0
K38	M	8	11/27/12	-17.5	15.2
K42	M	4	11/27/12	-16.7	16.0
K43	F	5	2/17/15	-15.9	16.1
K44	M	2	9/19/13	-16.8	16.2
K7	F	80+	12/14/07	-16.8	16.0
L100	M	12	9/26/13	-16.7	16.0
L103	F	6	9/15/09	-16.4	16.3
L105	M	9	9/21/13	-16.6	16.1
L106	M	8	9/21/13	-16.7	16.4
L108	M	9	9/29/15	-16.0	16.8
L109	M	6	9/21/13	-16.7	16.0
L110	M	8	9/18/15	-15.7	16.5
L113	F	4	9/26/13	-16.6	16.0
L115	M	4	9/6/14	-16.3	16.1
L116	M	5	9/23/15	-15.9	16.6
L118	F	4	9/22/15	-15.7	16.8
L119	F	1	9/26/13	-16.4	17.3
L12	F	76	3/26/09	-15.7	16.9
L2	F	48	9/13/08	-16.5	15.8
L21	F	57	6/13/07	-16.0	16.3
L22	F	42	9/25/13	-16.3	15.9
L26	F	51	9/6/07	-15.9	15.8
L27	F	46	10/1/11	-16.2	16.6
L95	M	15	10/2/11	-16.6	16.4
J34	M	15	10/29/13	-16.6	15.8
L47	F	42	9/18/16	-16.3	16.5
L5	F	45	9/17/09	-16.3	16.2
L53	F	31	9/12/08	-16.5	15.6
L54	F	36	9/26/13	-16.5	15.6
L55	F	36	9/20/13	-16.5	15.8
L55	F	38	9/18/15	-15.4	16.5
L57	M	29	5/22/06	-16.0	16.5

Animal	Sex	Estimated age	Date collected	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$
L67	F	22	9/11/07	-15.9	15.8
L67	F	23	9/13/08	-16.5	16.0
L72	F	25	10/2/11	-16.0	16.6
L72	F	29	9/22/15	-15.6	16.6
L73	M	21	9/6/07	-16.3	16.1
L77	F	26	9/25/13	-16.4	16.0
L77	F	28	9/27/15	-16.1	16.9
L79	M	20	2/20/09	-15.7	16.9
L82	F	18	9/13/08	-16.4	16.1
L82	F	26	9/10/16	-16.1	16.8
L83	F	23	3/9/13	-15.9	16.0
L83	F	26	9/25/16	-16.3	16.7
L84	M	21	9/29/11	-16.7	16.7
L85	M	15	6/14/06	-15.6	17.0
L86	F	24	2/17/15	-15.8	16.3
L86	F	25	9/21/16	-16.1	17.2
L87	M	15	12/14/07	-16.1	16.4
L88	M	15	9/13/08	-16.2	15.8
L89	M	20	3/4/13	-15.7	17.2
L90	F	18	10/1/11	-15.9	16.4
L92	M	17	10/25/12	-16.8	15.9
L94	F	14	7/28/09	-16.1	16.3

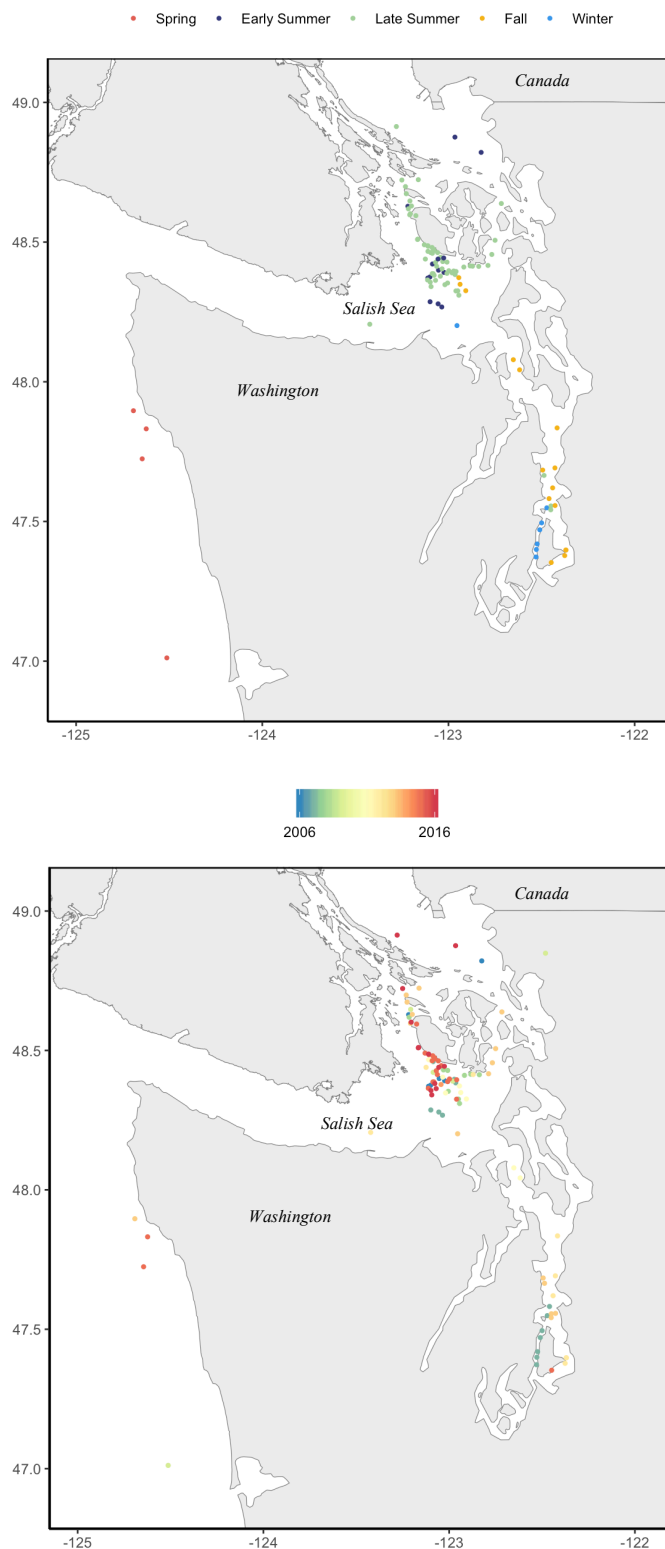


Figure S1. Individual Southern Resident killer whale skin stable isotope sample locations in the Salish Sea and outer Washington coast by (a) season and (b) year. Five samples from 2013 in the winter and spring taken from along the Oregon coast were excluded for visual clarity.

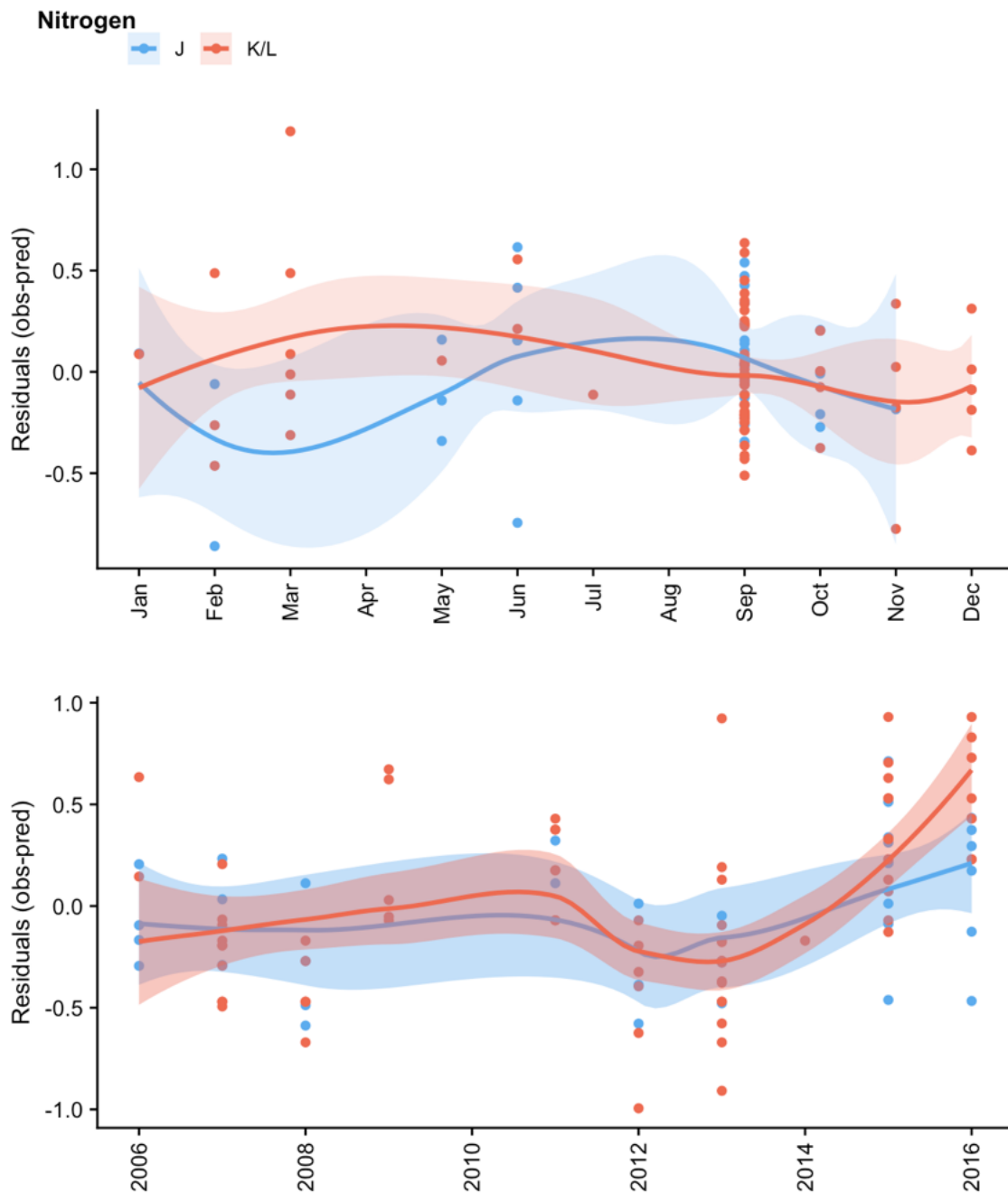


Figure S2. Residuals from GAMs for  $\delta^{15}\text{N}$ . To isolate the effects of year and season, we re-fit the best model with and without the year and seasonal smooths. The residuals from these models are shown (points) with a loess smooth line to demonstrate the trend in the mean. Both pods are overlaid to show variation on a similar scale.

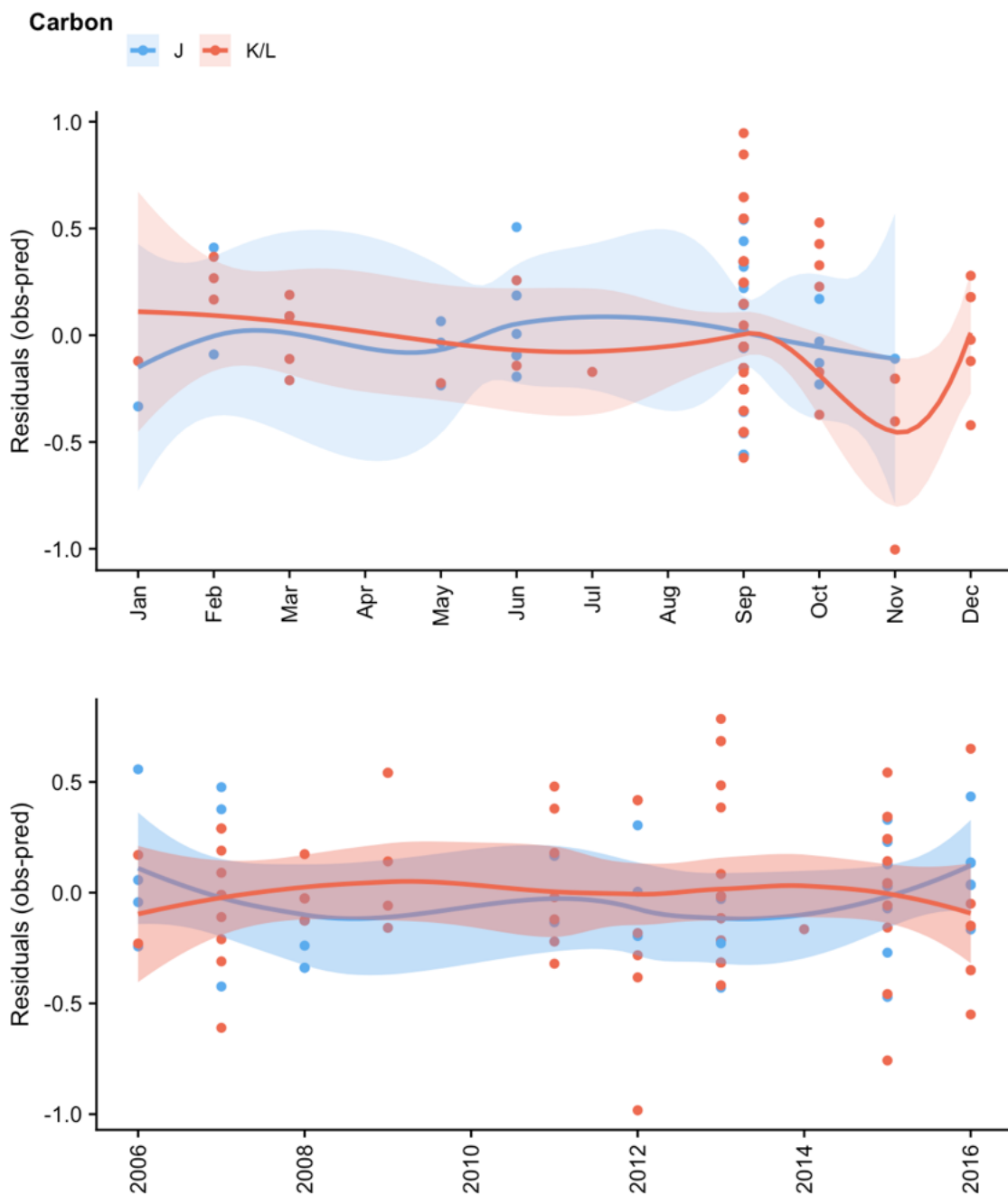


Figure S3. Residuals from GAMs for  $\delta^{13}\text{C}$ . To isolate the effects of year and season, we re-fit the best model with and without the year and seasonal smooths. The residuals from these models are shown (points) with a loess smooth line to demonstrate the trend in the mean. Both pods are overlaid to show variation on a similar scale.

Text S1. Code that implements the SI mixing model.

```
library(MixSIAR)

# Load mix data
mix <- load_mix_data(filename="data/killerwhale_consumer.csv",
  iso_names=c("d13C","d15N"),
  factors=NULL,
  fac_random=NULL,
  fac_nested=NULL,
  cont_effects=NULL)

# Load source data
source.filename <- "data/killerwhale_sources.csv"
source <- load_source_data(filename=source.filename,
  source_factors=NULL,
  conc_dep=FALSE,
  data_type="means",
  mix)

# Load discrimination/TDF data
discr <- read.csv("data/killerwhale_discrimination.csv")
discr <- load_discr_data(filename="data/killerwhale_discrimination.csv", mix)

# Define model structure and write JAGS model file
model_filename <- "MixSIAR_model_kw_uninf.txt"
resid_err <- TRUE
process_err <- TRUE
write_JAGS_model(model_filename, resid_err, process_err, mix, source)

# uninformative prior on simplex
prior = rep(1,5)

# Run the JAGS model
jags.model <- run_model(run="normal",mix,source,discr,model_filename,
  alpha.prior = prior, resid_err, process_err)

# Process diagnostics, summary stats, and posterior plots
save(jags.model, file="model.Rdata")
output_JAGS(jags.model, mix, source)
```