Table S1. Individual sample information, sorted by area and size class. Sample ID, date of collection, latitude of capture (decimal degree), straight fork length (SFL, cm),$\delta^{15}N_{bulk}$, $\delta^{15}N_{Phe}$, $\delta^{15}N_{Lys}$. Asterisks indicate individuals classified as recent migrants in the individual-based mixing model.

Area/size class/Sample ID	DATE-mmddyyyy	**n**	**LAT**	**SFL**	**$\delta^{15}N_{bulk}$**		**$\delta^{15}N_{Phe}$**		**$\delta^{15}N_{Lys}$**	
North		**18**			**9.9**	**±1.3**	**8.9**	**±1.9**	**4.1**	**±1.8**
JUV		**5**			**10.1**	**±1.8**	**9.7**	**±2.9**	**5.1**	**±2.3**
SKJ-JC314*	05/19/2017		-26.4	46	13.3		12.5		8.2	
SKJ-KPN-31	03/06/2017		-24.3	42	8.8		7.2		3.6	
SKJ-KPN-60	03/09/2017		-22.7	39	8.9		9.4		3.5	
SKJ-KPN-78	03/09/2017		-22.7	39	9.5		6.7		3.4	
SKJ-KPN-88*	03/14/2017		-24.4	39	10.2		12.8		7.0	
YAD		**5**			**10.4**	**±1.5**	**8.7**	**±1.8**	**4.6**	**±1.3**
SKJ-JC342	06/02/2017		-26.4	50	10.5		7.0		4.6	
SKJ-JC387*	11/16/2017		-26.4	58	12.6		11.3		6.3	
SKJ-KPN-22	03/06/2017		-24.3	47	9.0		6.9		3.7	
SKJ-KPN-9*	01/31/2017		-23.9	54	10.9		9.3		5.5	
SKJ-KPN-93	03/14/2017		-24.4	60	9.0		9.0		3.2	
AD		**8**			**9.3**	**±0.5**	**8.5**	**±1.2**	**3.0**	**±1.2**
SKJ-JC348	06/02/2017		-26.4	69	9.8		8.1		3.7	
SKJ-JC355	06/09/2017		-21.7	80	9.5		8.1		2.2	
SKJ-JC358	06/09/2017		-21.7	71	9.1		8.2		2.4	
SKJ-JC364	06/23/2017		-23.6	68	10.1		11.2		5.0	
SKJ-KPN-103	04/11/2017		-23.8	71	8.6		8.3		1.6	
SKJ-KPN-112	04/11/2017		-23.8	66	9.7		9.2		4.3	
SKJ-KPN-46	03/09/2017		-22.7	80	9.3		7.3		2.4	
SKJ-KPN-82	03/14/2017		-24.4	69	8.7		7.7		2.7	
South		**20**			**12.2**	**±1.2**	**10.6**	**±1.3**	**6.3**	**±1.3**
JUV		**7**			**11.9**	**±0.9**	**10.3**	**±0.8**	**5.8**	**±1.1**
SKJ-JC232	03/17/2017		-34.3	43	12.1		10.4		5.6	
SKJ-JC235	03/17/2017		-34.3	46	13.3		9.1		7.3	
SKJ-JC262	03/31/2017		-34.3	46	11.7		10.9		6.1	
SKJ-JC399*	11/30/2017		-30.3	42	10.2		9.3		4.1	
SKJ-JC84	01/13/2017		-33.5	46	11.9		10.4		5.9	
SKJ-JC85	01/13/2017		-33.5	44	11.5		11.1		4.9	
SKJ-JC-246	03/24/2017		-33.6	46	12.3		11.2		6.8	
YAD		**12**			**12.5**	**±1.1**	**10.6**	**±1.5**	**6.9**	**±1.2**
SKJ-JC105	01/19/2017		-32.1	49	11.3		10.4		5.1	
SKJ-JC143	02/03/2017		-33.3	49	13.0		10.3		6.8	
SKJ-JC190	02/17/2017		-33.6	52	12.9		12.4		8.1	
SKJ-JC202	02/17/2017		-33.6	60	11.4		13.0		6.0	
SKJ-JC222	03/17/2017		-34.3	47	12.0		8.6		8.4	
SKJ-JC223	03/17/2017		-34.3	53	13.4		9.8		7.1	
SKJ-JC224	03/17/2017		-34.3	48	12.3		11.6		6.4	
SKJ-JC372	11/09/2017		-31.0	50	13.6		11.7		7.3	
SKJ-JC408	12/07/2017		-31.0	57	10.4		9.8		4.5	
SKJ-JC425	12/14/2017		-30.4	55	13.0		8.8		7.8	
SKJ-JC430	12/21/2017		-33.2	49	14.0		12.1		7.8	
SKJ-KPN-169	02/10/2017		-31.6	51	13.3		9.0		7.3	
AD		**1**			**9.6**		**11.4**		**3.9**	
SKJ-JC489*	02/08/2018		-34.0	64	9.6		11.4		3.9	

Table S2. Taxonomic list with prey mass percentage quantified in skipjack stomach content analysis (SCA) by size class and area. Trophic position (TP) values and references used to calculate TP_{sca}. JUV (juvenile); YAD (young adult); AD (adult). Sample sizes are shown in parenthesis.

	Northern				Southern						
Class/family	JUV (112)	YAD (187)	AD (56)	Total (355)	JUV (99)	YAD (278)	AD (8)	Total (385)	Grand Total (740)	TP	Reference
Crustacea	15	13	0	8	75	71	59	71	43		
Euphausiidae	14	13	0	8	75	71	59	71	43	2.4	Sogawa et al. 2017, Hannides et al. 2009
Crustacean NI	1	0	0	0	0	0	0	0	0	2.1	Gasalla et al. 2007
Mollusca	5	1	0	1	0	1	41	2	2		
Argonautidae	0	0	0	0	0	0	24	1	0	3.2	Pauly & Christensen 1995
Cavoliniidae	0	0	0	0	0	0	0	0	0	2.0	Gilmer 1974
Gastropod NI	5	0	0	1	0	1	16	1	1	2.0	Gilmer 1974
Ommastrephidae	0	0	0	0	0	0	0	0	0	4.0	Gasalla et al. 2007
Teleostei	80	86	100	91	25	28	0	26	55		
Carangidae	0	3	20	10	0	0	0	0	4	3.0	Pauly & Christensen 1995
Clupeidae	55	49	38	46	1	1	0	1	21	2.8	Pauly & Christensen 1995, Schneider & Schwingel 1999, Yang et al. 2020
Dactylopteridae	1	4	0	2	0	1	0	1	1	3.7	Randall 1967, Froese & Pauly 2021
Engraulidae	1	1	0	1	6	6	0	6	3	3.0	Gasalla et al. 2007
Sternoptychidae	0	1	0	0	5	7	0	7	4	3.1	Gasalla et al. 2007
Teleostei NI	22	28	42	33	13	13	0	12	21	2.9	Average TP from fish families weighted by mass

Table S3. Studies used to derive nitrogen trophic discrimination factors (TDF, $\Delta^{15}N$) for muscle tissue in marine ammoniotelic fish. The mean TDF and standard deviation was used in bulk tissue $\delta^{15}N$ trophic position estimates. The variation around the mean was obtained by subtracting the maximum from the minimum value divided by two.

Publication	Common name	Scientific name	$\Delta^{15}N$ (‰)	± SD	n
Dempson & Power 2004	Atlantic salmon	*Salmo salar*	5.0	0.2	10
Gaston & Suthers 2004	Australian mado	*Atypichthys strigatus*	5.6	0.1	18
Madigan et al. 2012	Bluefin tuna	*Thunnus orientalis*	1.9	0.3	10
Miller 2000	Pacific herring	*Clupea pallasi*	4.5	-	32
Suzuki et al. 2005	Japanese bass	*Lateolabrax japonicus*	3.1	0.3	32
Sweeting et al. 2007	Sea bass	*Dicentrarchus labrax*	4.0	0.4	75
Sweeting et al. 2007	Sea bass	*Dicentrarchus labrax*	3.8	0.3	75
Trueman et al. 2005	Atlantic salmon	*Salmo salar*	2.7	0.3	25
Trueman et al. 2005	Atlantic salmon	*Salmo salar*	2.3	0.3	25
			3.7	1.9	302

Table S4. Trophic position (TP) estimates based on alternative TDF values. TP based on bulk tissue (TP_{bulk}), on glutamic acid-lysine $\delta^{15}N$ analysis ($TP_{Glx\text{-}Lys}$), and glutamic acid-phenylalanine ($TP_{Glx\text{-}Phe}$) for skipjack in the southwestern Atlantic Ocean grouped by area of capture and size class. TDF values taken from Vanderflift & Ponsard (2003) was used for TP_{bulk}. TDF values from Bradley et al. (2014) and Nuche-Pascual et al. (2021) were used for TP-AA.

Area	Size Class	TP_{bulk} Vanderflift & Ponsard (2003)	$TP_{Glx\text{-}Lys}$ TDF Bradley et al. (2014)	$TP_{Glx\text{-}Phe}$ TDF Bradley et al. (2014)	$TP_{Glx\text{-}Lys}$ TDF Nuche-Pascual et al. (2021)	$TP_{Glx\text{-}Phe}$ TDF Nuche-Pascual et al. (2021)
North		4.6 (3.9 – 5.4)	2.8 ± 0.1	2.6 ± 0.2	3.3 ± 0.2	2.6 ± 0.2
	Juvenile	4.2 (3.6 – 5.0)	2.6 ± 0.1	2.4 ± 0.3	3.1 ± 0.1	2.4 ± 0.3
	Young Adult	4.7 (4.1 – 5.6)	2.8 ± 0.1	2.6 ± 0.2	3.3 ± 0.1	2.7 ± 0.2
	Adult	5.1 (4.5 – 5.8)	2.9 ± 0.1	2.6 ± 0.2	3.5 ± 0.1	2.6 ± 0.2
South		4.8 (4.2 – 5.5)	2.7 ± 0.2	2.5 ± 0.3	3.2 ± 0.2	2.5 ± 0.3
	Juvenile	4.4 (3.8 – 5.1)	2.7 ± 0.2	2.5 ± 0.3	3.2 ± 0.2	2.5 ± 0.3
	Young Adult	4.9 (4.3 – 5.7)	2.6 ± 0.2	2.6 ± 0.3	3.1 ± 0.2	2.6 ± 0.3
	Adult	4.3 (3.2 – 5.5)	2.9	2.4	3.5	2.4

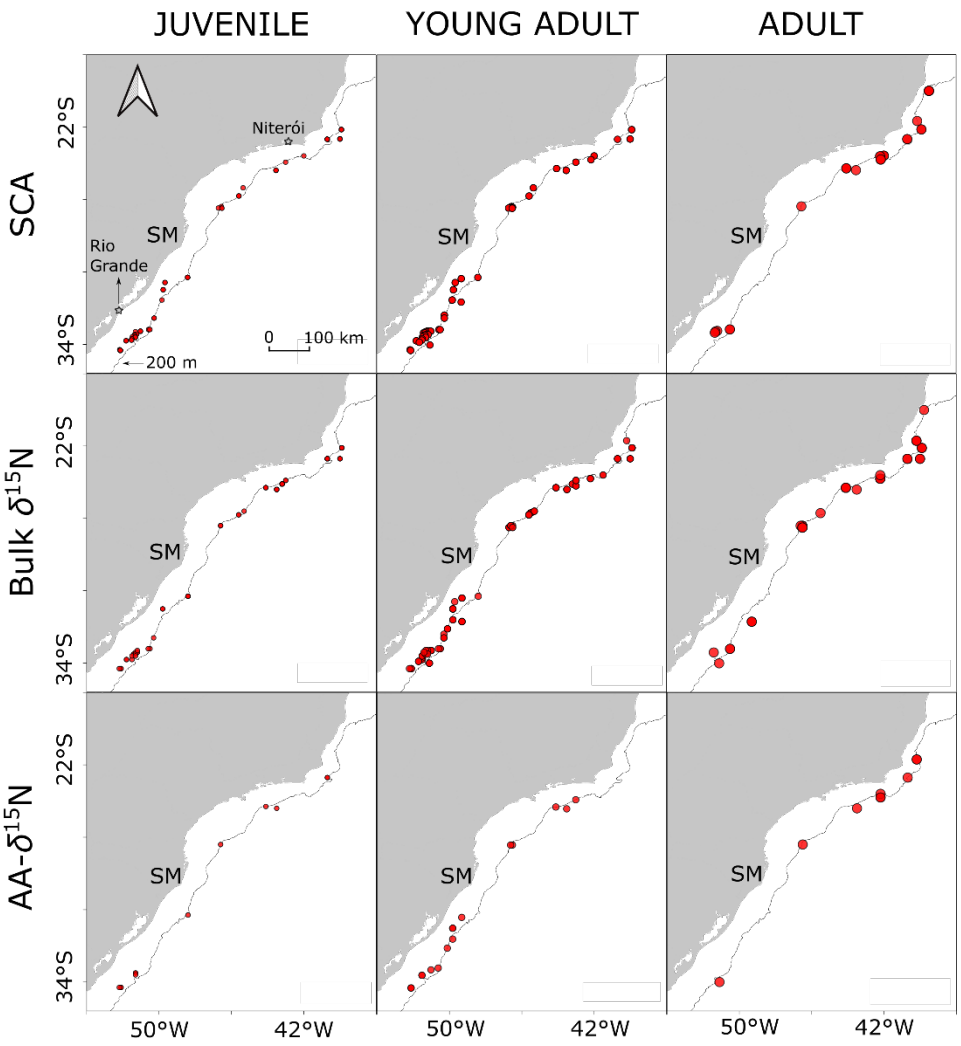

Fig. S1. Distribution of skipjack tuna samples used to estimate trophic position (TP) in the southwestern Atlantic Ocean. Size-classes are indicated in columns, methods used to estimate TP are indicated in rows. Stomach content analysis (SCA); bulk tissue $\delta^{15}N$ analysis (bulk $\delta^{15}N$); and amino acid (AA) nitrogen analysis (AA $\delta^{15}N$). The Santa Marta Cape (SM) is indicated as the limit between the northern and southern areas. The 200m isobath indicative of shelf break position is plotted.

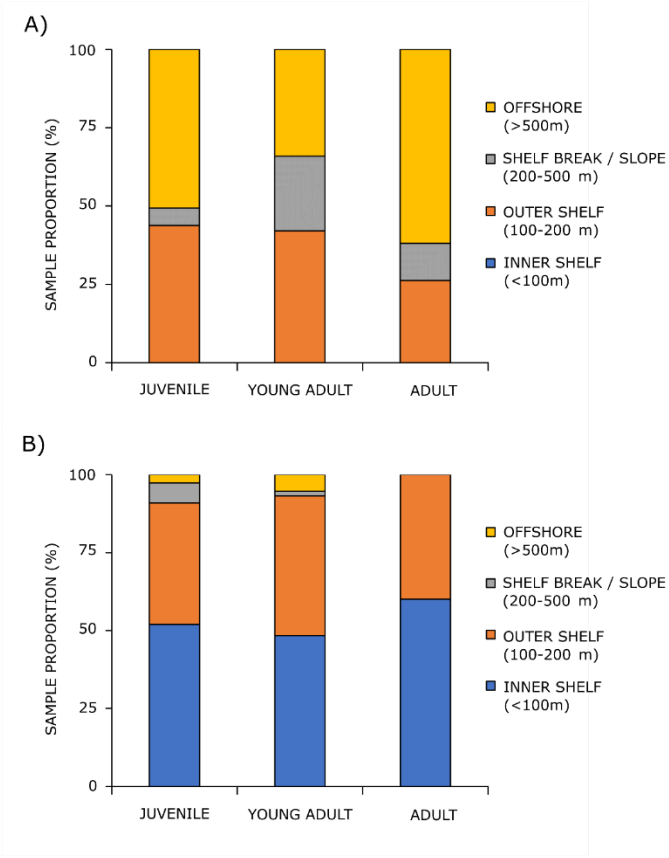

Fig. S2. Proportion of samples analyzed for SCA in relation to depth strata, by size class, for the (A) northern and (B) southern areas of the southwestern Atlantic Ocean.

LITERATURE CITED

Bradley CJ, Madigan DJ, Block BA, Popp BN (2014) Amino Acid Isotope Incorporation and Enrichment Factors in Pacific Bluefin Tuna, *Thunnus orientalis*. PLoS ONE 9:e85818 https://doi.org/10.1371/journal.pone.0085818

Dempson JB, Power M (2004) Use of stable isotopes to distinguish farmed from wild Atlantic salmon, *Salmo salar*. Ecol Freshwat Fish 13:176–184 https://doi.org/10.1111/j.1600-0633.2004.00057.x

Froese R, Pauly D (2021) FishBase. www.fishbase.org (accessed 11 Jun 2021)

Gasalla MA, Velasco G, Rossi-Wongtschowski CLDB, Haimovici M, Madureira LSP (2007) Modelo de equilíbrio de biomassas do ecossistema marinho da Região Sudeste-Sul do Brasil entre 100–1000 m de profundidade. In: Rossi-Wongtschowski CLDB (ed), Série documentos Revizee: Score Sul, São Paulo, p 11–55

Gaston TF, Suthers IM (2004) Spatial variation in $\delta^{13}C$ and $\delta^{15}N$ of liver, muscle and bone in a rocky reef planktivorous fish: the relative contribution of sewage. J Exp Mar Biol Ecol 304:17–33 https://doi.org/10.1016/j.jembe.2003.11.022

Gilmer RW (1974) Some aspects of feeding in thecosomatous pteropod molluscs. J Exp Mar Biol Ecol 15: 127–144 https://doi.org/10.1016/0022-0981(74)90039-2

Hannides CCS, Popp BN, Landry MR, Graham BS (2009) Quantification of zooplankton trophic position in the North Pacific Subtropical Gyre using stable nitrogen isotopes. Limnol Oceanogr 54:50–61 https://doi.org/10.4319/lo.2009.54.1.0050

Madigan DJ, Litvin SY, Popp BN, Carlisle AB, Farwell CJ, Block BA (2012) Tissue turnover rates and isotopic trophic discrimination factors in the endothermic teleost, Pacific Bluefin Tuna (*Thunnus orientalis*). PLoS ONE 7:e49220 https://doi.org/10.1371/journal.pone.0049220

Miller TW (2000) Tissue-specific response of $\delta^{15}N$ in adult Pacific herring (*Clupea pallasi*) following an isotopic shift in diet. Environ Biol Fishes 76:177–189 https://doi.org/10.1007/s10641-006-9020-9

Nuche-Pascual MT, Ruiz-Cooley RI, Herzka SZ (2021) A meta-analysis of amino acid $\delta^{15}N$ trophic enrichment factors in fishes relative to nutritional and ecological drivers. Ecosphere 12:e03570 https://doi.org/10.1002/ecs2.3570

Pauly D, Christensen V (1995) Primary production required to sustain global fisheries. Nature 374:255–257 https://doi.org/10.1038/374255a0

Randall JE (1967) Food habits of reef fishes of the West Indies. Stud Trop Oceanogr 5:665–847

Schneider F, Schwingel PR (1999) Estudo preliminar da ecologia trófica da *Sardinella brasiliensis* na costa sudeste do Brasil. Braz J Aquat Sci Technol 3:67–72 https://doi.org/10.14210/bjast.v3n1.p67-72

Sogawa S, Sugisaki H, Tadokoro K, Ono T, Sato E, Shimode S, Kikuchi T (2017) Feeding habits of six species of euphausiids (Decapoda: Euphausiacea) in the northwestern Pacific Ocean determined by carbon and nitrogen stable isotope ratios. J Crustac Biol 37:29–36 https://doi.org/10.1093/jcbiol/ruw014

Suzuki KW, Kasai A, Nakayama K, Tanaka M (2005) Differential isotopic enrichment and half-life among tissues in Japanese temperate bass (*Lateolabrax japonicus*) juveniles: implications for analyzing migration. Can J Fish Aquat Sci 62:671–678 https://doi.org/10.1139/f04-231

Sweeting CJ, Barry J, Barnes C, Polunin NVC, Jennings S (2007) Effects of body size and environment on diet-tissue $\delta^{15}N$ fractionation in fishes. J Exp Mar Biol Ecol 340:1–10 https://doi.org/10.1016/j.jembe.2006.07.023

Trueman CN, McGil, RAR, Guyard PH (2005) The effect of growth rate on tissue-diet isotopic spacing in rapidly growing animals. An experimental study with Atlantic salmon (*Salmo salar*). Rapid Commun Mass Spectrom 19: 3239–3247 https://doi.org/10.1002/rcm.2199

Vanderklift MA, Ponsard S (2003) Sources of variation in consumer-diet $\delta^{15}N$ enrichment: a meta-analysis. Oecologia 136:169–182 https://doi.org/10.1007/s00442-003-1270-z

Yang G, Sun X, Song Z (2020) Trophic level and heavy metal pollution of *Sardinella albella* in Liusha Bay, Beibu Gulf of the South China Sea. Mar Pollut Bull 156:111204 https://doi.org/10.1016/j.marpolbul.2020.111204