

## Supplementary Material

### Gas chromatography-mass spectrometry analysis on effects of thermal shock on the fatty acid composition of the gills of the Antarctic teleost, *Trematomus bernacchii*

Cristina Truzzi,<sup>A,B</sup> Anna Annibaldi,<sup>A</sup> Matteo Antonucci,<sup>A</sup> Giuseppe Scarponi<sup>A</sup> and Silvia Illuminati<sup>A</sup>

<sup>A</sup>Department of Life and Environmental Sciences, Università Politecnica delle Marche, via Brecce Bianche 60131 Ancona, Italy.

<sup>B</sup>Corresponding author. Email: [c.truzzi@univpm.it](mailto:c.truzzi@univpm.it)

**Table S1.** Mean  $\pm$ SD of body weight and length of specimens divided *per* group.

**Table S2.** Nomenclature of fatty acids cited in the text.

**Table S3.** FAs composition (% *vs* total FAs, mean $\pm$ SD) of the gills tissue of *T. bernacchii* held at different temperatures for different time.

**Figure S1.** Influence of temperature and exposure time on the percentage of FAs in gills of *T. bernacchii*. Only statistically significant changes ( $p < 0.05$ ) with respect to the control group C1 (gray, decrease; black, increase) are reported.

**Table S1.** Mean  $\pm$ SD of body weight and length of specimens divided *per* group.

Group	Weight, g	Length, cm
C0	260 $\pm$ 72	26 $\pm$ 2
C1	250 $\pm$ 85	26 $\pm$ 3
0-1d	226 $\pm$ 69	25 $\pm$ 2
0-5d	235 $\pm$ 78	25 $\pm$ 2
0-10d	207 $\pm$ 84	25 $\pm$ 3
1-1d	266 $\pm$ 46	26 $\pm$ 2
1-5d	243 $\pm$ 43	27 $\pm$ 2
1-10d	276 $\pm$ 44	26 $\pm$ 1
2-1d	289 $\pm$ 56	26 $\pm$ 1
2-5d	280 $\pm$ 70	27 $\pm$ 2
2-10d	236 $\pm$ 52	26 $\pm$ 2

C0, control fishes as captured; C1, control fishes after acclimation. Other labels indicate groups exposed to the temperature indicated (0, 1 or 2 °C), followed by the time of exposure; for example: 0-1d, 0-5d and 0-10d indicate animals exposed at 0 °C for 1, 5, and 10 days, respectively.

**Table S2.** Nomenclature of fatty acids cited in the text.

FA	IUPAC name	Other names
12:0	Dodecanoic acid	Lauric acid
13:0	Tridecanoic acid	Tridecylic acid
14:0	Tetradecanoic acid	Myristic acid
14:1n5	(9Z)-Tetradec-9-enoic acid	Myristoleic acid
15:0	Pentadecanoic acid	
15:1n5	(10Z)-Pentadec-10-enoic acid	Cis-10-Pentadecenoic acid
16:0	Hexadecanoic acid	Palmitic acid
16:1n7	(9Z)-Hexadec-9-enoic acid	Palmitoleic acid
17:0	Heptadecanoic acid	Margaric acid
17:1n7	(10Z)-Heptadec-10-enoic acid	Cis-10-heptadecenoic acid
18:0	Octadecanoic acid	Stearic acid
18:1n9	(9Z)-Octadec-9-enoic acid	Oleic acid
18:2n6c	(9Z,12Z)-9,12-Octadecadienoic acid	Linoleic acid
18:2n6t	(9E,12E)-Octadeca-9,12-dienoic acid	Linolelaidic acid
18:3n6	(6Z,9Z,12Z)-Octadeca-6,9,12-trienoic acid	$\gamma$ -Linolenic acid
18:3n3	(9Z,12Z,15Z)-Octadeca-9,12,15-trienoic acid	$\alpha$ -Linolenic acid
20:0	Eicosanoic acid	Arachic acid
20:1n9	(11Z)-Icosa-11-enoic acid	Gondoic acid
20:2n6	(11Z,14Z)-Icosa-11,14-dienoic acid	Eicosadienoic acid
20:3n6	(8Z,11Z,14Z)-Icosa-8,11,14-trienoic acid	Dihomo- $\gamma$ -linolenic acid
21:0	Heneicosanoic acid	Heneicosanoic acid
20:4n6	(5Z,8Z,11Z,14Z)-Icosa-5,8,11,14-tetraenoic acid	Arachidonic acid
20:3n3	(11Z,14Z,17Z)-Icosa-11,14,17-trienoic acid	Eicosatrienoic acid
20:5n3	(5Z,8Z,11Z,14Z,17Z)-Icosa-5,8,11,14,17-pentaenoic acid	Eicosapentaenoic acid
22:0	Docosanoic acid	Behenic acid
22:1n9	(13Z)-Docos-13-enoic acid	Erucic acid.
23:0	Tricosanoic acid	Tricosylic acid
24:0	Tetracosanoic acid	Lignoceric acid
22:6n3	(4Z,7Z,10Z,13Z,16Z,19Z)-Docosa-4,7,10,13,16,19-hexaenoic acid	Docosahexaenoic acid
24:1n9	(15Z)-Tetracos-15-enoic acid	Nervonic acid

**Table S3.** FAs composition (% vs total FAs, mean±SD) of the gills tissue of *T. bernacchii* held at different temperatures for different time.

FAs	C0	C1	1day			5 days			10 days		
			0 °C	+1 °C	+2 °C	0 °C	+1 °C	+2 °C	0 °C	+1 °C	+2 °C
12:0	0.28±0.01	0.18±0.02	0.25±0.05	0.20±0.01	0.18±0.02	0.19±0.02	0.18±0.01	0.25±0.03	0.22±0.02	0.15±0.03	0.19±0.02
13:0	0.03±0.01	0.04±0.01	0.03±0.01	0.05±0.01	0.03±0.01	0.03±0.01	0.03±0.01	0.04±0.01	0.03±0.01	0.03±0.01	0.03±0.01
14:0	6.5±0.2 <sup>c</sup>	7.6±0.3 <sup>a</sup>	6.0±0.3 <sup>d</sup>	6.8±0.6 <sup>b,c</sup>	6.7±0.2 <sup>b,c</sup>	7.0±0.3 <sup>b</sup>	6.2±0.3 <sup>d</sup>	6.7±0.2 <sup>b,c</sup>	6.6±0.2 <sup>c</sup>	5.7±0.2 <sup>e</sup>	6.5±0.3 <sup>c</sup>
15:0	0.34±0.01	0.50±0.03	0.40±0.02	0.53±0.03	0.46±0.01	0.38±0.02	0.43±0.03	0.44±0.03	0.43±0.03	0.45±0.03	0.53±0.02
16:0	13.2±0.6 <sup>b,c</sup>	11.6±0.5 <sup>a</sup>	12.8±0.4 <sup>b</sup>	13.6±0.7 <sup>c</sup>	14.2±0.4 <sup>c,d</sup>	13.4±0.8 <sup>b,c</sup>	13.4±0.4 <sup>b,c</sup>	12.6±0.4 <sup>b</sup>	12.1±0.4 <sup>a,b</sup>	13.3±0.4 <sup>b,c</sup>	14.1±0.5 <sup>c,d</sup>
17:0	0.27±0.01	0.24±0.02	0.33±0.03	0.34±0.03	0.30±0.03	0.27±0.02	0.34±0.01	0.27±0.01	0.27±0.01	0.27±0.01	0.35±0.03
18:0	8.3±0.4 <sup>e</sup>	3.9±0.2 <sup>a</sup>	6.9±0.4 <sup>c,d</sup>	5.8±0.4 <sup>b</sup>	8.0±0.4 <sup>e</sup>	7.0±0.7 <sup>c,d</sup>	9.2±0.7 <sup>f</sup>	7.5±0.3 <sup>d</sup>	5.6±0.5 <sup>b</sup>	5.5±0.4 <sup>b</sup>	6.6±0.3 <sup>c</sup>
20:0	0.17±0.01	0.17±0.01	0.23±0.03	0.15±0.02	0.17±0.02	0.19±0.02	0.24±0.01	0.19±0.01	0.14±0.01	0.15±0.01	0.17±0.01
21:0	0.05±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.01±0.01	0.01±0.01
22:0	0.07±0.01	0.03±0.01	0.04±0.01	0.03±0.01	0.07±0.02	0.03±0.01	0.03±0.01	0.03±0.01	0.03±0.01	0.03±0.01	0.03±0.01
23:0	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl
24:0	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl	<dl
<i>Total SFAs</i>	29.1±0.6 <sup>d,e</sup>	24.3±0.6 <sup>a</sup>	27.1±0.91 <sup>c</sup>	27.5±0.7 <sup>c</sup>	30.1±0.7 <sup>e</sup>	28.5±0.6 <sup>d</sup>	30.1±0.9 <sup>e</sup>	28.0±0.6 <sup>c,d</sup>	25.4±0.7 <sup>b</sup>	25.5±0.6 <sup>b</sup>	28.4±0.7 <sup>d</sup>
14:1n5	0.30±0.01	0.47±0.02	0.26±0.02	0.37±0.02	0.35±0.03	0.34±0.02	0.28±0.03	0.31±0.02	0.34±0.03	0.32±0.02	0.32±0.03
15:1n5	0.02±0.01	0.02±0.01	0.03±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.02±0.01	0.03±0.01	0.01±0.01	0.03±0.01
16:1n7	11.2±0.5 <sup>d,e</sup>	13.6±0.4 <sup>b</sup>	10.5±0.5 <sup>c</sup>	12.7±0.5 <sup>c</sup>	13.6±0.5 <sup>b</sup>	11.8±0.5 <sup>d</sup>	11.6±0.6 <sup>d</sup>	12.1±0.4 <sup>c,d</sup>	13.3±0.4 <sup>b,c</sup>	14.5±0.5 <sup>a</sup>	13.2±0.4 <sup>b,c</sup>
17:1n7	0.65±0.06	0.94±0.05	0.92±0.03	1.19±0.06	0.79±0.07	0.79±0.03	0.87±0.05	0.82±0.12	0.89±0.05	0.82±0.09	1.07±0.07
18:1n9	26.7±0.7 <sup>a</sup>	26.9±0.7 <sup>a</sup>	21.9±0.5 <sup>d,e</sup>	21.7±0.6 <sup>d,e</sup>	23.7±0.7 <sup>c</sup>	23.0±0.9 <sup>c,d</sup>	22.4±0.6 <sup>d</sup>	24.9±0.5 <sup>b</sup>	23.3±0.85 <sup>c,d</sup>	21.4±0.5 <sup>e</sup>	24.8±0.5 <sup>b</sup>
18:1n7	6.5±0.2 <sup>b,c</sup>	6.8±0.2 <sup>b</sup>	6.2±0.2 <sup>c</sup>	6.3±0.2 <sup>c</sup>	7.4±0.2 <sup>a</sup>	6.5±0.2 <sup>b,c</sup>	6.1±0.3 <sup>c</sup>	6.4±0.2 <sup>c</sup>	6.5±0.3 <sup>b,c</sup>	5.6±0.2 <sup>d</sup>	6.7±0.3 <sup>b</sup>
20:1n9	3.9±0.2 <sup>d</sup>	5.4±0.1 <sup>a</sup>	5.1±0.3 <sup>a,b</sup>	4.4±0.1 <sup>c</sup>	4.0±0.3 <sup>d</sup>	4.8±0.3 <sup>b</sup>	4.4±0.3 <sup>b,c</sup>	5.0±0.2 <sup>b</sup>	4.9±0.2 <sup>b</sup>	4.9±0.2 <sup>b</sup>	4.9±0.2 <sup>b</sup>
22:1n9	1.5±0.1 <sup>b</sup>	1.4±0.1 <sup>b</sup>	1.7±0.2 <sup>ab</sup>	1.4±0.2 <sup>b,c</sup>	1.2±0.1 <sup>b,c</sup>	1.3±0.1 <sup>b,c</sup>	1.2±0.1 <sup>c</sup>	1.4±0.1 <sup>b</sup>	1.6±0.2 <sup>ab</sup>	1.3±0.1 <sup>b,c</sup>	1.5±0.1 <sup>a,b</sup>
24:1n9	0.86±0.07	0.57±0.03	0.71±0.08	0.50±0.10	0.57±0.05	0.65±0.07	0.52±0.03	0.61±0.06	0.72±0.02	0.62±0.01	0.66±0.06
<i>Total MUFAs</i>	51.5±0.5 <sup>b</sup>	56.1±0.5 <sup>a</sup>	47.4±0.8 <sup>d</sup>	48.6±0.6 <sup>c</sup>	51.6±0.6 <sup>b,c</sup>	49.3±0.8 <sup>c</sup>	47.5±0.6 <sup>d</sup>	51.6±0.5 <sup>b,c</sup>	51.7±0.9 <sup>b,c</sup>	49.5±0.9 <sup>c</sup>	53.2±0.5 <sup>b</sup>
18:3n3	0.39±0.02	0.54±0.06	0.64±0.04	0.74±0.09	0.52±0.02	0.51±0.12	0.52±0.02	0.70±0.04	0.64±0.05	0.70±0.01	0.47±0.02
20:3n3	0.01±0.01	0.09±0.01	0.03±0.01	0.12±0.02	0.12±0.01	0.08±0.02	0.07±0.01	0.07±0.01	0.09±0.02	0.15±0.02	0.08±0.01
20:5n3	6.1±0.8 <sup>f</sup>	9.1±0.2 <sup>c</sup>	11.3±0.2 <sup>a</sup>	10.8±0.3 <sup>a,b</sup>	8.6±0.2 <sup>d</sup>	8.9±0.6 <sup>c,d</sup>	10.5±0.2 <sup>b</sup>	9.5±0.2 <sup>c</sup>	10.7±0.6 <sup>a,b</sup>	11.2±0.3 <sup>a</sup>	8.3±0.2 <sup>e</sup>
22:6n3	9.7±0.7 <sup>f</sup>	5.6±0.4 <sup>b</sup>	8.8±0.3 <sup>f</sup>	7.9±0.3 <sup>e</sup>	4.5±0.3 <sup>a</sup>	8.3±0.3 <sup>e,f</sup>	6.5±0.3 <sup>c</sup>	5.7±0.4 <sup>b</sup>	7.2±0.3 <sup>d</sup>	8.1±0.3 <sup>e</sup>	5.7±0.5 <sup>b</sup>
<i>Total n-3 PUFAs</i>	16.1±0.9 <sup>a,b</sup>	15.3±0.3 <sup>b</sup>	20.7±0.6 <sup>c</sup>	19.5±0.2 <sup>d</sup>	13.8±0.2 <sup>a</sup>	17.8±0.4 <sup>c</sup>	17.6±0.4 <sup>c</sup>	15.9±0.2 <sup>b</sup>	18.6±0.6 <sup>c,d</sup>	20.2±0.5 <sup>e</sup>	14.5±0.2 <sup>a</sup>
18:2n6	1.7±0.1 <sup>b,c</sup>	1.8±0.1 <sup>a,b</sup>	1.8±0.2 <sup>a,b</sup>	1.9±0.1 <sup>a</sup>	1.7±0.2 <sup>a,b</sup>	1.7±0.1 <sup>b,c</sup>	1.5±0.2 <sup>c</sup>	1.8±0.1 <sup>a,b</sup>	1.7±0.1 <sup>a,b</sup>	1.6±0.2 <sup>c</sup>	1.5±0.2 <sup>c</sup>
18:3n6	0.10±0.01	0.22±0.03	0.27±0.04	0.30±0.06	0.26±0.07	0.20±0.08	0.24±0.02	0.26±0.03	0.31±0.02	0.33±0.06	0.23±0.01
20:2n6	0.39±0.06	0.67±0.06	0.80±0.13	0.63±0.09	0.99±0.09	0.77±0.08	0.84±0.09	0.63±0.04	0.77±0.07	1.03±0.04	0.55±0.04
20:3n6	0.12±0.02	0.18±0.03	0.19±0.02	0.20±0.02	0.15±0.01	0.25±0.02	0.18±0.02	0.20±0.01	0.29±0.03	0.21±0.03	0.15±0.01
20:4n6	0.9±0.1 <sup>e</sup>	1.4±0.1 <sup>c</sup>	1.7±0.2 <sup>a,b</sup>	1.3±0.2 <sup>c,d</sup>	1.3±0.2 <sup>c,d</sup>	1.5±0.1 <sup>b,c</sup>	2.0±0.2 <sup>a</sup>	1.5±0.1 <sup>b,c</sup>	1.1±0.1 <sup>d</sup>	1.6±0.1 <sup>b</sup>	1.4±0.3 <sup>b,c</sup>
<i>Total n-6 PUFAs</i>	3.2±0.2 <sup>d</sup>	4.2±0.2 <sup>b</sup>	4.8±0.1 <sup>a</sup>	4.3±0.2 <sup>b</sup>	4.3±0.1 <sup>b</sup>	4.4±0.3 <sup>a,b</sup>	4.8±0.3 <sup>a</sup>	4.4±0.2 <sup>a,b</sup>	4.3±0.2 <sup>b</sup>	4.8±0.3 <sup>a</sup>	3.8±0.2 <sup>c</sup>
16:2n7	0.05±0.01	0.08±0.01	0.07±0.01	0.08±0.01	0.07±0.01	0.07±0.01	0.07±0.01	0.06±0.01	0.08±0.01	0.06±0.01	0.07±0.01
<i>Total PUFAs</i>	19.4±0.9 <sup>a,b</sup>	19.6±0.4 <sup>b</sup>	25.6±0.6 <sup>e</sup>	23.9±0.3 <sup>d</sup>	18.2±0.4 <sup>a</sup>	22.2±0.5 <sup>c</sup>	22.5±0.5 <sup>c</sup>	20.3±0.3 <sup>b</sup>	22.9±0.7 <sup>c,d</sup>	25.0±0.6 <sup>e</sup>	18.4±0.3 <sup>a</sup>

**Figure S1.** Influence of temperature and exposure time on the percentage of FAs in gills of *T. bernacchii*. Only statistically significant changes ( $p < 0.05$ ) with respect to the control group C1 (grey, decrease; black, increase) are reported.

FAs	1d			5d			10d		
	0 °C	1 °C	2 °C	0 °C	1 °C	2 °C	0 °C	1 °C	2 °C
14:0									
16:0									
18:0									
total SFA									
16:1n7									
18:1n9									
18:1n7									
20:1n9									
22:1n9									
total MUFA									
20:5n3									
22:6n3									
n3									
18:2n6									
n6									
total PUFA									