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CHEMICAL COMPOSITION, STORAGE LIFE ON ICE AND SOME PHYSICAL  
CHARACTERISTICS OF THE ATLANTIC ARGENTINE  
[*Argentina silus* (Ascanius)]

by

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#### ABSTRACT

Wang, J. C. C., E. R. Amiro, and R. Selfridge. 1977. Chemical composition, storage life on ice and some physical characteristics of the atlantic argentine [*Argentina silus (Ascanius)*]. Fish. Mar. Serv. Tech. Rep. 725: 7 p.

Specimens of Atlantic argentine (*Argentina silus (Ascanius)*) have been examined by sex for chemical composition, age of fish and various physical characteristics. Palatability and storage stability of round fish on ice were also studied. Results showed fat content to be 2% in the filets and 7-19% in the belly flaps. The TMAO content of fresh flesh was intermediate between that of herring and smelt. The TMA content of the flesh during iced storage was too low to be useful as an index of quality. Storage life of round fish on ice was found to be 6 days, the main limiting factors being early development of rancidity and a softening of texture. Reaction of taste panel to fresh flesh was ambivalent but the flesh was generally considered to be acceptable. Results indicate that argentine are well suited for industrial purposes but may require prompt handling, good temperature control and protection against rancidity development to be acceptable as a food fish.

#### RÉSUMÉ

Wang, J. C. C., E. R. Amiro, and R. Selfridge. 1977. Chemical composition, storage life on ice and some physical characteristics of the atlantic argentine [*Argentina silus (Ascanius)*]. Fish. Mar. Serv. Tech. Rep. 725: 7 p.

La composition chimique, l'âge et diverses caractéristiques d'échantillons de grande argentine (*Argentina silus (Ascanius)*) ont été examinés en tenant compte du sexe. La saveur et la stabilité du poisson entier conservé sur glace ont également été étudiées. Les résultats indiquent une teneur en matières grasses de 2% dans les filets et de 7 à 19% dans les volets abdominaux. La teneur de la chair fraîche en oxyde de triméthylamine se situait entre celles du hareng et de l'éperlan. La teneur de la chair en triméthylamine durant la conservation sur glace était trop faible pour constituer un indice utile de la qualité. Il a été constaté que la durée de conservation du poisson entier sur glace est de 6 jours, les principaux facteurs limitatifs étant le rancissement précoce et le ramollissement de la chair. Les réactions d'un jury de dégustation à la chair fraîche ont été ambivalentes, mais la chair a généralement été considérée comme acceptable. En conclusion, la grande argentine conviendrait à un traitement industriel mais pourrait exiger un traitement rapide, une bonne régulation de la température et une protection contre le rancissement pour être acceptable à la consommation.



## INTRODUCTION

Argentina silus Ascanius (commonly known as the Atlantic argentine, deep-water smelt or herring smelt) ranges both sides of the North Atlantic as well as the Icelandic area. It has been found from Georges Bank to the Newfoundland Grand Banks, usually in deep water of 70-200 fathoms (Canadian Fisheries and Marine, 1975; Emery and McCracken, 1966).

The sustainable yield of argentine has been estimated to be 30-50,000 metric tons annually (Canadian Fisheries and Marine, 1975). Although exploited in the past by the USSR and Japan, this species is presently considered to be underutilized. Argentine are taken mainly as a bycatch among other species during bottom or deep-water trawling and because of the limited market are predominantly used in the production of fish meal giving a product reported by Jangaard et al. (1974) to be nutritionally comparable to that obtained from herring.

Little information has been published on the chemical composition of argentine taken from North American waters or on its suitability as a food fish. However, Mackie and Hardy (1969) reported that argentine taken from European stocks off the coast of Norway yielded good fish meal, and the flesh, cooked or smoked, was judged very acceptable by taste panel evaluation.

This study of the Atlantic argentine was undertaken to supplement existing information on this species. Specimens caught as a result of exploratory fishing were examined by sex for chemical composition, organoleptic properties, storage life on ice, age and various physical parameters including length and weights of different body portions.

## MATERIALS AND METHODS

Specimens of Atlantic argentine were caught by deep-water trawl at 175 fathoms near the northeastern corner of Georges Bank on October 23, 1976. Within two hours of being caught the fish were iced in boxes. At this time one fish was frozen to serve as a zero-day or control specimen. On October 25 the fish were landed at Lockeport, Nova Scotia, and delivered to the Halifax Laboratory. On arrival at the laboratory the fish were reiced in boxes and held in fiberglass storage cabinets. Fresh ice was added every day during the storage period. The zero-day specimen was received frozen and held at -20°C until needed.

Proximate analysis was performed on individual fillets and belly flaps of three female and three male specimens chosen at random. Moisture content was measured by drying to constant weight at 105°C. Ash was determined by incineration at 525°C for 36 hours. Crude fat was measured by the Bligh and Dyer (1959) technique and crude protein was determined

by the micro-kjeldahl method (AOAC, method no. 47.021, 12th. ed.).

Each day chemical analysis was performed on a composite sample prepared by blending 10 fillets in a Waring Blender. Trimethylamine oxide (TMAO) was measured by the method of Dyer, Dyer and Snow (1952), trimethylamine (TMA) according to Dyer (1959) and dimethylamine (DMA) according to Dyer and Mounsey (1945). Sodium and potassium contents of the zero-day specimen were measured by atomic absorption (AOAC, method no. 18.033, 12th. ed.).

Randomly chosen specimens were removed from ice storage daily for taste panel assessment of whole fish and fillets. Round fish, raw and cooked fillets (baked in foil at 450°F for 10-15 min.) were presented for organoleptic evaluation to an 8 membered taste panel. Judges used a 10-point scale where a score of 10-8 represented highest quality. A score of 7-5 described a bland but still acceptable sample and a rating of 4 or less was assigned to fillets considered inedible. The cooked fillets of the zero-day specimen were also assessed by the taste panel for preference using a consumer-oriented scale of 1-5, where 5 represented well liked and 1 strongly disliked.

A separate group of 25 fish (9 male and 16 female) was randomly chosen for physical examination and age determination. Total specimen weight as well as weights of fillets, head, viscera and offal were determined. Length of specimens was measured from the snout to the furthest point of the caudal fin. Age was determined from the otolith bones.

## RESULTS AND DISCUSSION

The proximate composition of male and female argentine fillets and belly flaps is shown in Tables 1 and 2. Mean results for male and female fillets are quite similar. The mean fat content of fillets of both male and female fish was found to be about 2%, whereas belly flaps showed a substantially higher fat content and a correspondingly lower moisture content. Moreover, the fat content of belly flaps of male fish was higher than that of female fish. Both the fillets and belly flaps from male and female fish had similar protein contents.

In general, the proximate composition of the argentine specimens examined resembled that of smelt (Osmeridae spp) as tabulated by Sidwell et al. (1974). Mackie and Hardy (1969), upon chemical analysis of whole argentine taken from European waters found the whole fish moderately fatty (4.5% lipid) but also found considerable variation among argentine caught at different localities.

Table 3 shows changes in TMAO, TMA and

DMA contents in fillets taken from round fish during storage on ice. The TMAO content of zero-day fillets fell between that of smelt (*Osmerus mordax*) and herring as reported by Dyer (1952). The TMA content throughout the storage period was too low to be useful as an index of quality. Plots of TMA and DMA concentrations versus mean quality score as given by taste panel evaluation showed no obvious correlation. Sodium and potassium contents in the zero-day fillets were found to be 65 and 366 mg/100 gm wet weight respectively.

Taste panel assessment of whole argentine and cooked fillets throughout iced storage is shown in Table 4. After 6 days of storage on ice, the fillets were considered inedible and round fish severely deteriorated. This storage life is similar to that of herring of moderate fat content but only about one-half that of groundfish species such as cod. At the end of the holding period fillets were described by the taste panel as rancid and bitter with a poor, soft texture. Flesh of the control fish (the zero-day sample, frozen for 2 days) was found to be rather oily in taste and also exhibited soft texture. The flesh, particularly the skin, was very susceptible to tearing. When assessed by the taste panel according to the 5 point preference scale, the zero-day fillets were given a mean rating of 3.3. Thus the palatability of fresh flesh was found to be mediocre but not objectionable.

Physical parameters and age of argentine examined are shown in Table 5. Both male and female specimens were found to be similar in age, length and weight. The mean yield of fillets with skin still attached was found to be 52.7% for female and 52.4 for male argentine specimens.

In summary, this study indicates that the Atlantic argentine is probably more suitable for industrial uses than to utilization as a food fish due to rancidity development and texture changes. Certainly its acceptability as food in North American markets will require prompt handling, good temperature control and protection against rancidity development. Of main concern to the fishing industry will be the short storage life of the round fish on ice. Furthermore, the landing and processing of this fish could prove difficult because of its soft texture, making it susceptible to damage during handling.

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Table 1. Proximate composition of argentine fillets from individual fish.

Sample	Moisture	Protein Percent	Fat	Ash
<b>Female</b>				
1	80.24	17.58	1.38	1.09
2	79.08	17.79	2.18	1.07
3	78.89	17.51	2.38	1.11
Mean	79.40	17.63	1.98	1.09
<b>Male</b>				
1	76.88	19.36	1.99	1.21
2	80.56	16.82	1.42	0.87
3	79.24	17.58	2.33	1.18
Mean	78.89	17.92	1.91	1.09

Values given are the results of duplicate analyses.

Table 2. Proximate composition of argentine belly flaps from individual fish.

Sample	Moisture	Protein Percent	Fat
Female			
1	73.90	15.62	8.00
2	71.05	18.58	12.07
3	74.18	17.59	7.70
Mean	73.04	17.26	9.26
Male			
1	62.95	17.20	18.32
2	59.54	21.02	18.75
3	73.78	14.25	11.84
Mean	65.42	17.52	16.30

Values given are the results of duplicate analyses.

Table 3. Changes in amine content of fillets from whole argentine stored on ice.

Holding Time (days)	TMAO	TMA mgN/100 gm wet sample	DMA
0*	48.2	0.06	0
2	46.7	0.07	0.18
3	38.8	0.08	0.22
4	38.4	0.16	0.22
5	44.7	0.24	0.24
6	36.2	0.24	0.30
9	30.8	2.46	0.31

\* Frozen 2 days

Values given are the means of 3 determinations.

Table 4. Taste panel evaluation of round argentine and cooked fillets during storage on ice.

Holding Time (days)	Mean Quality Score	
	Raw Round Fish*	Cooked Fillets
0 <sup>‡</sup>	8.0	8.3
2	7.0	6.8
3	6.7	6.5
4	6.3	5.8
5	6.3	5.3
6	4.5	4.8

Scores given are means of observations from 8 taste panel members.

\* Based on consideration of appearance, odour, and texture

‡ Frozen for 2 days

Table 5. Age and selected physical parameters of randomly chosen male and female round argentine (mean values).

Specimen	Number	Age (yr)	Length (cm)	Weight (gm)				
				Total	Fillets	Head	Viscera	Offal
Female	16	5.4	31.2	263.9	139.1	44.1	19.7	124.8
SD*		1.3	1.7	31.6	20.7	7.3	4.6	15.5
Male	9	4.6	30.0	221.9	116.2	37.2	17.0	105.7
SD*		0.9	1.8	35.7	20.8	6.6	1.4	5.6

\* Standard deviation