

FURTHER IMPLICATION ON BOUNDARY BETWEEN NORTH AND SOUTH ATLANTIC STOCKS OF THE SWORDFISH (*Xiphias gladius*)

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ABSTRACT

This paper describes further implications on the boundary between north and south Atlantic stocks of the swordfish using genetic analyses.

RÉSUMÉ

Le présent document décrit de nouvelles implications sur la délimitation entre les stocks d'espadon de l'Atlantique nord et sud à l'aide d'analyses génétiques.

RESUMEN

Este documento describe las nuevas implicaciones de la línea divisoria entre los stocks de pez espada del Atlántico norte y sur utilizando análisis genéticos.

KEYWORDS

Atlantic swordfish, nuclear gene locus, stock boundary

Large genetic difference between north and south Atlantic stocks of the swordfish (*Xiphias gladius*) has been revealed, and it has been suggested that the boundary zone between the stocks may locate around between 10°N and 20°N (Chow and Takeyama, 2000; Chow *et al.*, 2001). In order to further investigate the boundary zone, we have continued sampling of swordfish in the Atlantic in collaboration with Federation of Japan Tuna Fisheries Co-operative Associations and Fishery Agency of Japan.

During the first quarter of 2002, tail samples of swordfish caught in the northwest (NWA02)(31°N to 36°N and 59°W to 58°W), tropical north (TNA02) (7°N to 15°N and 24°W to 35°W), and tropical south (TSA02)(7°S to 11°S and 1°E to 11°W) were collected by observers and transferred to the laboratory. Analysis of genetic variation at the calmodulin gene locus (*CaM*) of these samples was performed as described by Chow and Takeyama (2000). The genotype and allele frequencies of these three samples with those of eight samples reported by Chow and Takeyama (2000) and Chow *et al.* (2001) are shown in **Table 1**, and pie graph representation in **Fig. 1**. The results obtained in the present study confirmed previous finding that the genetic differentiation between north and south stocks is substantial and there is little differentiation among samples within each stock (Chow and Takeyama, 2000; Chow *et al.*, 2001). Furthermore, TNA02 sample, which was collected in 7°N-15°N, apparently belonged to the south stock. Thus, the results of this analysis indicate that the boundary zone between the north and south Atlantic stocks of the swordfish may locate at least north of 15°N. As previously recommended (Chow *et al.*, 2001), intensive Atlantic-wide sample collection around 20°N followed by the genetic analysis using the *CaM* gene marker is necessary for further delineating the boundary zone.

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LITERATURE CITED

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- CHOW, S., K. Nohara and Y. Takeuchi. 2001. Boundary between north and south Atlantic stocks of swordfish (*Xiphias gladius*): An implication from nuclear DNA analysis. ICCAT SCRS/01/146.

Table 1. Genotype and allele frequencies at *CaM* locus of eleven Atlantic swordfish samples.

	sample	Lat. Long.	genotype			Sample size	allele	
			<i>AA</i>	<i>AB</i>	<i>BB</i>		<i>A</i>	<i>B</i>
Northwest Atlantic	NWA02	31N-36N 59W-58W	0	12	4	16	0.375	0.625
	NWA98*	35N-43N 45W-71W	15	27	14	56	0.509	0.491
	NWA97*	37N-41N 48-67W	5	6	5	16	0.5	0.5
	NWA93*	20N-30N 57W-90W	8	14	7	29	0.517	0.483
	NWA90*	38N-40N 59W-72W	5	16	7	28	0.464	0.536
Tropical north to south Atlantic	TNA02	7N-15N 24W-35W	23	5	0	28	0.911	0.089
	TNA99*	2N-10N 21W-33W	68	15	1	84	0.899	0.101
	TNA97*	5N-8N 8W-21W	25	5	0	30	0.917	0.083
	TSA02	7S-11S 1E-11W	24	6	0	30	0.9	0.1
	TSA97*	5S-11S 2E-8W	34	11	2	47	0.840	0.160
	Brazil94-96*	20S-33S 28W-50W	101	25	2	128	0.887	0.113

Data with asterisk are derived from Chow and Takeyama (2000) and Chow *et al.* (2001).

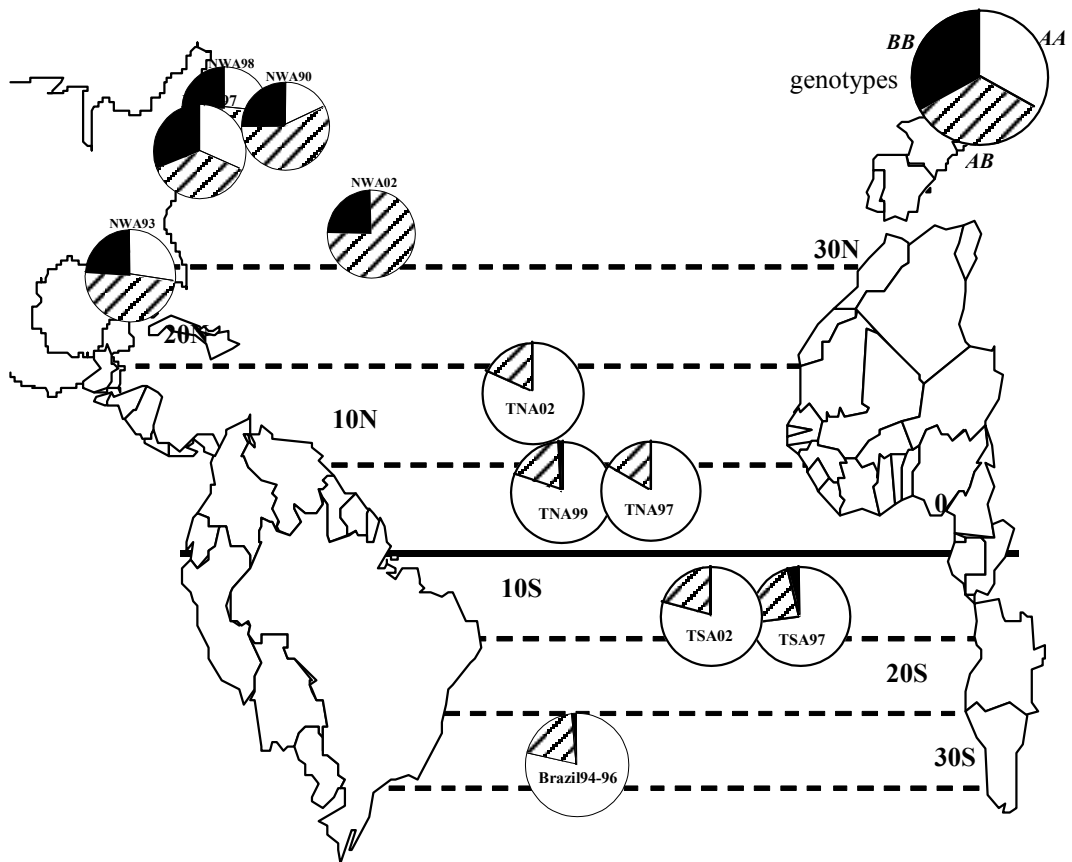


Fig. 1. Pie graph representation of genotype frequency at *CaM* gene locus of eleven swordfish samples.