

The logo for the Chilean Jack Mackerel Workshop is a dark blue rounded rectangle with a textured, wavy pattern. The text "Chilean Jack Mackerel Workshop" is centered in white, with "Chilean Jack Mackerel" on the top line and "Workshop" on the bottom line.

## **Short review of natural mortality and size at first maturity on jack mackerel (*Trachurus murphyi*) in the southeastern Pacific**

Luis Cubillos(1), Claudio Gatica(2), Rodolfo Serra(3)

1. Laboratorio de Evaluación de Poblaciones Marinas. Departamento de Oceanografía, Facultad de Ciencias Naturales y Oceanográficas. Universidad de Concepción, Casilla 160-C, Concepción, Chile. E-mail: [lucubillos@udec.cl](mailto:lucubillos@udec.cl).
2. Departamento de Pesquerías, Instituto de Investigación Pesquera, Casilla 350, Avenida Colón 2780, Talcahuano. Chile.
3. Departamento Evaluación de Recursos. Instituto de Fomento Pesquero. Avenida Blanco N° 839, Valparaiso.

### **Abstract**

This manuscript presents a short review of natural mortality parameters and size at first maturity to jack mackerel (*Trachurus murphyi*). In summary, this specie is characterized by a slow growth with early maturity. In this context the jack mackerel has the better growth performance that others carangids. The natural mortality parameters better associated with the size structure presents in the fishery were in the range between 0.3-0.33 year<sup>-1</sup>. The size at first maturity fluctuates between 21.6 to 30 cm FL (fork length), this high variability is mainly related with the school structure and capture zone. However, most of these values are concentrated between 23 and 27 cm FL.

### **Introduction**

In marine populations under exploitation, the natural mortality is related with all possible causes of death with the exception of death associate with the fishery effects (Haddon, 2001). Several researches have been focused in biological characteristic of this resource (Arcos et al. 2001; Grechina et al. 1998; Serra, 1991). In this sense we analyzed different research and document to give a short summary with the topics related with natural

mortality and size at first maturity on jack mackerel (*Trachurus murphyi*). The used information comes from varied sources and periods.

### Method

Data and research of biological parameters mainly related with natural mortality and size at first maturity were obtained from the literature and research project. Some results are related with the work of [Arcos et al \(1995\)](#), where the natural mortality was estimated using an *ad hoc* method analyzing the size fish distribution getting in 1973 in the research survey (B/I Academic Knipovich) assumed that structure represent a incipient exploitation pattern in the population (Table 1). In this research the growth parameters of [Nekrasov \(1987\)](#) and [Schcherbithch \(1980\)](#) were that explain in better way the size frequency of jack mackerel.

Table 1. Summary parameters to jack mackerel (extracted from Arcos et al. 1995).

Author	$L_{\infty}$ (LH,cm)	$k$ (año <sup>-1</sup> )	$t_0$ (year)	$M$ (year <sup>-1</sup> )	$A$
Nekrasov (1987)	96,0	0,060	-2,617	<b>0,33</b>	20,073
Shcherbithch (1991)	79,5	0,123	-0,032	<b>0,30</b>	22,392
Araya et al (1993)	73,7	0,161	0,086	0,34	23,062
Nosov et al (1989)	77,8	0,077	-1,613	0,25	23,112
Kochkin (1994)	74,2	0,111	-0,809	0,21	24,378
Gili et al (1995)(a)	79,9	0,068	-2,369	0,15	25,817
Nekrasov (1982)	74,3	0,086	-2,676	0,13	27,682
Abramov & Kotlyar (1980)	72,3	0,093	-1,214	0,12	28,393
Gili et al. (1995)(b)	72,0	0,094	-2,205	0,10	32,263

In relation with the spawning the jack mackerel is a heterosexual species without visible sexual dimorphism and had a partial spawning. The size at first maturity begins around 21.3 cm FL, with an average length at first maturity of 31 cm.

Table 2. Maturity size in jack mackerel related with different periods and method (extracted from Cubillos 2008).

Area	$L_m$ (LH,cm)	Period	Method	Author
Coastal waters front off Chile.	36,0	1963-1964	Macroscopic	Kaiser (1973)
Coastal waters front of Perú.	25,0 <sup>a</sup>	1972-1973	Macroscopic, first maturity	Abramov & Kotlyar (1980)
Northern zone Chile, coastal waters.	31-32	1978-1981	Macroscopic, 50% observed	Aranis (1981)
Oceanic and coastal waters front off Perú.	39	1972-1973	Macroscopic, 50% observed	Andrianov (1985)
Oceanic waters front of Peru and Chile	23-27	1980-1983	Microscopic	Adrianov(1990) fide Grechina et al. (1998)
Coastal waters front Talcahuano, Chile	22.3-22,8 <sup>a</sup>	1982-1984	Histology, first maturity	Oyarzún et al. (1998)
Coastal waters front Perú	21,3 <sup>b</sup>	1986	Histology, fit logistic model	Dioses et al. (1989)
Coastal waters Arica-Mejillones, Chile	21,6	1993-1994	Histology, fit logistic model	Alegria et al. (1989)
Coastal waters Arica-Mejillones, Chile	23,0	1993-1994	IGS increment between sizes	Alegria et al. (1989)
Coastal waters, northern Chile	24,0	1989-1990	Histology, maturity smallest female	George (1995)
Coastal waters, northern Chile	24,5-25,0	1989-1990	IGS increment between sizes	George (1995)
Northern zone off Chile, coastal waters	23,1	1999-2000	Histology, fit logistic model	Oliva (2004)
South center zone off Chile, oceanic waters	25,4	1999-2000	Histology, fit logistic model	Oliva (2004)
Northern and southern zone off Chile	24,3	1999-2000	Histology, fit logistic model	Oliva (2004)

## DISCUSSION

The jack mackerel is characterized on his history life by present a differential use of the coastal and oceanic habitat (Cubillos et al. 1998). The classic methods used to estimate biological parameters like natural mortality and size at first maturity are based in data as function of length. By this reason is necessary to put in context the values used to analyze the population dynamics of the stock when they are influenced by the size structure and capture zone at different periods.

## REFERENCES

- Arcos, D.A., Cubillos, L.A., Núñez, S.P. 2001 .The jack mackerel fishery and El Niño 1997-98 effects off Chile. *Progress in Oceanography* 49, 597-617.
- Arcos, D., L. Cubillos., A. Sepúlveda., A. Grechina., H. Peña., R. Alarcón., A. Hernández., L.Mirando., L. Vilugron. 1995. Evaluación del jurel a nivel Sub-regional. Informe Final FIP 95-09, 219 p.
- Cubillos, L., A. Sepúlveda & D. Arcos. 1998. Producción primaria requerida para sustentar el desembarque de peces pelágicos en Chile. *Investigaciones Marinas*, Valparaíso, 26:83-96.
- Cubillos, L. y A.S. Grechina. 1998. Crecimiento del jurel, *Trachurus symmetricus murphyi* (Nichols) del Pacífico Suroriental mediante análisis de progresión modal. In: "Biología y ecología del jurel en aguas chilenas", D. Arcos (Ed.), Instituto de Investigación Pesquera, Editora Anibal Pinto, Concepción, p. 151-161.
- Cubillos, L., Arancibia, H. 1995. Comparative growth performance of horse mackerel of the genus *Trachurus*, with emphasis on *T. symmetricus murphyi*. In: "International symposium on middle-sized pelagic fish", C. Bas, J.J. Castro y J.Ma. Lorenzo (Eds.), *Scientia Marina* 59(3-4):647-652.
- Cubillos, L.A, Paramo, J., Ruiz, P., Núñez, S., Sepúlveda, A. 2008. The spatial structure of the oceanic spawning of jack mackerel (*Trachurus murphyi*) off central Chile (1998 – 2001). *Fisheries Research* 90: 261-270
- Cubillos, L. 2008. Talla de primera madurez sexual en el jurel utilizando el consumo relativo de oxígeno. *Revista Investigaciones Marinas* (submitted).
- Grechina, A.S., S. Núñez, & D. Arcos. 1998. Biología reproductiva del jurel (*Trachurus symmetricus murphyi*) en el Pacífico sur. In: D. Arcos (Ed.), *Biología y ecología del jurel en aguas chilenas*. Instituto de Investigación Pesquera, Talcahuano, Chile, p. 77-79
- Haddon, M. 2001. *Modelling and Quantitative Methods in Fisheries*. Chapman and Hall/CRC, Boca Raton.
- Serra, J.R. 1991. Important life history aspects of the Chilean jack mackerel, *Trachurus symmetricus murphyi*. *Invest. Pesq. (Chile)*, 36:67-83.