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Evolution and state of the art of fishing capacity management in Peru: The case of the anchoveta fishery

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Abstract. The Peruvian anchoveta fishery began in the early 1950s and has become one of the most important fisheries in the world in terms of landings and fishmeal production. Fisheries management in Peru has evolved from regulated open access to recently introduced individual vessel quota management. This paper aims to examine the evolution of fishing capacity management and identify the management actions that have determined the current levels of fishing overcapacity. A lack of a solid policy to stop fishing capacity accumulation together with management susceptibility to industry pressure are likely the main causes of the historical levels of overcapacity, which has recently encouraged a drastic change in the management system.

Key words: Peruvian anchoveta, fishing capacity, regulated open access, IVQs, ITQs

Resumen. Evolución y situación de la gestión de la capacidad de pesca en Perú: El caso de la pesquería de anchoveta. La pesquería de anchoveta peruana se inició a principios de los años cincuenta y se ha convertido en una de las pesquerías más importantes del mundo en términos de desembarques y producción de harina de pescado. La gestión de la pesquería ha evolucionado desde un acceso abierto regulado a un sistema de cuotas individuales por embarcación. Este artículo tiene como objetivo revisar la evolución de la gestión de la capacidad de pesca e identificar las decisiones que han determinado los niveles actuales de sobrecapacidad. La falta de una política sólida para impedir la acumulación de la capacidad de pesca junto con una gestión susceptible a la presión de la industria serian las causas principales de los niveles históricos de sobrecapacidad que han demandado un cambio drástico en la gestión de la pesquería.

Palabras clave: Anchoveta peruana, capacidad de pesca, acceso abierto regulado, IVQs, ITQs

Introduction

Fishing overcapacity is an acute problem that threatens marine fisheries due to over-fishing while producing significant economic waste (FAO 1999). One notable case of capacity accumulation is that of the Peruvian pelagic fishery. The fishery focuses on the exploitation of anchoveta (*Engraulins ringens*) for fish meal production. Other pelagics are mainly utilised in canning and freezing (Fig. 1). The anchoveta fishery is managed using a 'top-down' approach where the management authority attempts to enforce a Total Allowable Catch (TAC).

High abundance of anchoveta and historical management decisions have allowed the development of a large fleet (Fig. 2). Throughout the history of the fishery, capacity accumulation has been considered detrimental to its sustainability. Overcapacity tends to be more dangerous due to the continuous threat of El Niño. The collapse of the anchoveta fishery in early 1970s shows how a natural phenomenon together with over-fishing, can drive a resource to exhaustion (Boerema & Gulland 1973, Tsukuyama 1983). The crash of the anchoveta fishery has become a paradigmatic case for study and is analysed in several academic texts *e.g.* Hilborn & Walters (1992).

Currently, high levels of capacity are being suggested as the cause of the *race for fish* a situation where 1200 vessels competing for the TAC have reduced the fishing season to 50 days (Fig. 3). The government has recently passed Law 1084 which advocates the implementation a new system to manage the fleet through individual vessel quotas (IVQs). This paper reviews the theoretical concepts behind overcapacity and the *race for fish;* examines the diverse management measures undertaken by the Peruvian government, from the early times of the fishery to the recently introduced management decisions; and assesses the new management scheme as a tool to reduce fishing capacity.

Theoretic background. It is widely recognised that pure and regulated open access are the main causes of overcapacity. Pure open access is defined as the state where access rights do not exist or are poorly defined. In a regulated open access, access rights are weakly defined and the management system attempts unsuccessfully to enforce a Total Allowable Catch (TAC). Due to the common pool characteristic of resource exploitation, individuals have the incentive of taking a bigger share of the TAC. This *race for fish* encourages fishers to invest in larger and more modern vessels to ensure larger individual shares (Grevobal & Munro 1999). Consequently, resources are gradually depleted and the fishing season becomes shorter. Because of rent dissipation, the fishery becomes vulnerable to adverse economic and resource shocks. In this context, fishers may press the government to provide subsidies to alleviate economic distress, increase the TAC or lengthen the fishing season.

Other factors that may lead to overcapacity are *inter alia* the evolution of competitive fishing industries, the rapid development of harvesting technology and the expansion of fish markets (Cunningham & Grévobal 2001). The traditional management of resources that stipulate input (*i.e.* limits on fishing effort, closed seasons and fishing gear) and output restrictions (*i.e.* TACs) may not control capacity efficiently. On the contrary, they may induce redistribution of effort across fisheries or accumulation of capacity (Grévobal & Munro 1999).

Among the management measures to counteract capacity building, Ward and Metzner (2002) outline two types of strategies: incentive blocking measures and incentive adjusting measures. The former measures aim at blocking fleet capacity building. They include limited license programs, vessel buyback schemes, gear and vessel restrictions, individual vessel quotas (IVQs), TACs, and individual effort quotas. The main difficulty in implementing these measures is ensuring compliance. Should a fisher be prevented from increasing profits by a certain regulation, he will have the incentive to circumvent that regulation; hence he will find the means to increase capacity by increasing or substituting inputs. This fact is prone to occur where penalties and mechanisms of enforcement are not strong enough to prevent non-compliance.

On the other hand, incentive adjusting measures offer long-term strategies to control overcapacity by creating a sense of ownership, thus the *race for fish* may be eliminated by fishers themselves through capacity reduction. Even though incentive adjusting measures are the most effective solutions to counteract overcapacity, they are hard to implement since they require a drastic change in the management apparatus. These measures comprise territorial use rights (TURFs), individual transferable quotas (ITQs) and collective fishing rights (Ward & Metzner 2002).

Early fishing capacity management. The production of fishmeal started in Peru in 1950. Landings of Peruvian anchoveta increased rapidly from 1200 tons in 1951 to more than 6.6 million tons in 1963 converting the Peruvian fishmeal industry into the largest in the world (Christy & Scott 1967, Bottemanne 1972). In 1963, the scientific authority, IMARPE (“Instituto del Mar del Perú”) was founded. In 1965, scientists recommended the first TAC of 7 million tons and the first closed season to deter heavy exploitation (IMARPE 1965, Clark 1976). Due to resource abundance and high demand for fishmeal, the fishing fleet experienced fast growth. In 1951, 25 vessels were registered. In 1964, the fleet had expanded to 1744 boats.

This frenzy of shipbuilding persisted throughout the 1960s and early 1970s (see Fig. 2). The fleet was built without clear and strong restrictions since management rules were poorly defined. The administration and formulation of the Peruvian fishery policy was spread amongst diverse ministries, none of which had fisheries management as their main task (Hammergren 1981). In 1965, IMARPE reported that there was evidence of overexploitation and recommended measures to deter the escalating rate of fleet building (IMARPE 1965). In 1969, the military government created the Ministry of Fisheries and empowered it as the national management authority (Guerra 1972). Only restrictions to fishmeal plant installation were devised (Montoya 2003), however, and in 1971, landings reached 12.3 million tons which is the highest level ever experienced for a single-species fishery in the world (see Fig. 1). Then, in 1972, the industry was hit by a particularly strong El Niño event. During 1972-73, the anchoveta population was seriously depressed (Tsukuyama 1983).

Two major causes may have produced the collapse of anchoveta: the El Niño event and over-fishing (Boerema & Gulland 1973). Since 1965 IMARPE recommended TACs but in practice, catches exceeded the scientifically recommended quota. It was obvious that the enforcement system was not strong enough to ensure compliance with the TACs. Because of the fleet size, adherence to a TAC of 7.5 million tons required a shorter fishing season. Few boat owners could afford to tie up their boats due to fishmeal plants demanding raw material to satisfy the high international demand (Laws 1997). After the catastrophic El Niño, the military government nationalised the industry with the aim of rationalizing the activity and preserving the resource (Glantz 1979).

The government created the state owned Pesca-Peru. This large company started its activities with 1154 fishing vessels and 99 fishmeal plants. The government decided to apply corrective measures such as a drastic reduction of the fleet and a moratorium on vessel licensing and construction (Laws 1997). In 1976, the government denationalized the fishing fleet due to the impossibility of subsidizing the fleet during years of poor catches (Glantz 1979).

In early 1980s, the anchoveta stock apparently began to recover but was hit again by the strong El Niño 1982-83 (Tsukuyama 1983). The population of anchoveta was again seriously reduced. Throughout the rest of the 1980s, the stock did not recover to former levels. In this period, few management measures were undertaken in relation to fleet size. One of the most notable measures was the export of idle purse seiners to other countries in Latin-America (Sueiro 1996). The effect of the 1980s crisis was reflected in deterioration and age of the fleet. In late 1980s, 80% of the 373 boats that composed the industrial fleet were poorly equipped and older than 20 years (Garcia Mesinas 1993).

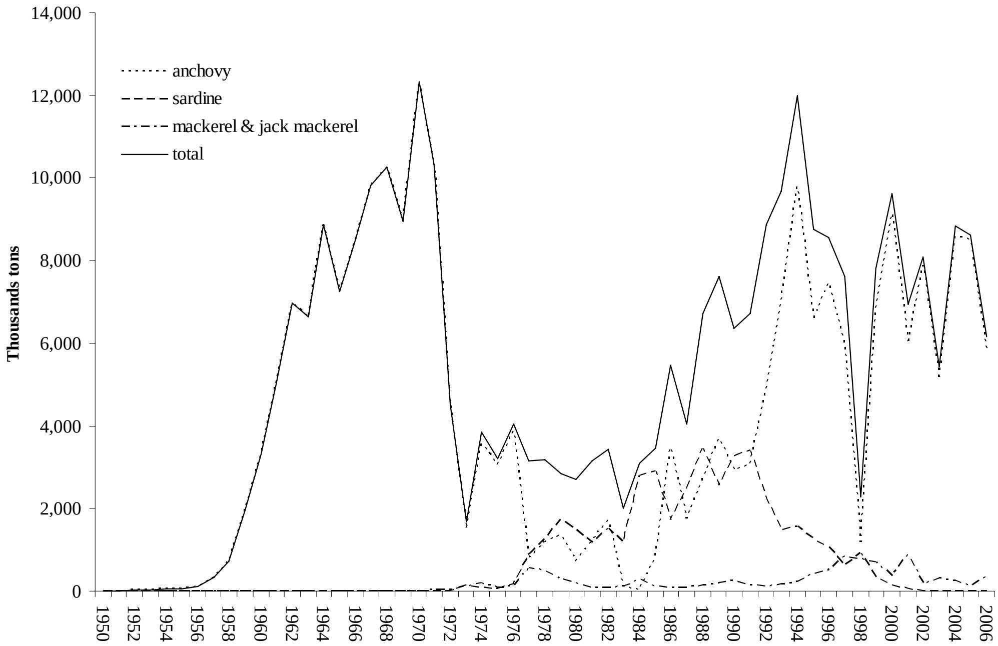

Figure 1. Evolution of the Peruvian pelagic fisheries 1950-2006. Data source: PRODUCE.

The 1990s: a new era of capacity building. Throughout the period 1990-1995 and 1995-2000, a new democratic government adopted neo-liberal economic policies. The most important action was the privatisation of Pesca-Peru. The new policies and the recovery of anchoveta stocks offered an optimal environment for the industry to invest in fleet and processing capacity. Industry's investment in the period 1991-1995 was estimated at $ 400 million. (Aguilar *et al.* 2000). Consequently, the fleet experienced a sharp increase in capacity. In 1990, the fleet consisted of 386 vessels and by 1996 it had increased to 727.

In December 1992, the current General Law of Fisheries (Gobierno del Perú 1992) was promulgated and forms the backbone of fisheries management in Peru. The General Law devised measures to prevent capacity building. Article 24, for example, required new vessel entries to be balanced by decommissioning older boats. Many firms were authorised to build vessels only for the human consumption fishery. These firms found, however, means to divert effort to the anchoveta fishery (Thorpe *et al.* 2000). Consequently, overcapacity levels were again reached.

In 1998, the government passed Law 26920 (Gobierno del Peru 1998) which authorises owners of boats larger than 30 m^3 of fish-hold capacity to harvest anchoveta for the fish meal industry. This segment is known locally as the ‘Viking’ fleet due to the wide shape of the hull. Law 26920 has partially alleviated the economic needs of a sector of the artisanal fleet but has substantially increased fleet size up to 1200 purse seiners (see Fig. 1).

Currently, the pelagic industrial fleet comprises two clearly differentiated segments: the large-scale fleet and the wooden fleet. This fleet sector is comprised mainly of steel vessels, larger than 120 m^3 carrying capacity. It is composed of 608 vessels with a combined fish-hold capacity of circa 180000 m^3. The small-scale fleet ranges from 30 m^3 to 119 m^3 carrying capacity and comprises 592 purse seiners with a combined fish-hold capacity of circa 32000 m^3.

During recent years, great concern has arisen regarding the fishing activities of the latter sector due to the fact that part of the fleet lacks the mandatory satellite-tracking devices. This renders them prone to committing illegal fishing of anchoveta for industrial purposes within 5 nautical miles of the coast. By law, this zone is reserved for artisanal fishing. Both segments of the fleet supply raw material to 140 fishmeal plants scattered along the Peruvian littoral.

Local researchers have realised that the overcapacity of the industrial fleet generates *a race for fish* behaviour that shortens fishing seasons and increases running costs (Chavez 2000).

Overcapacity has also been a concern for the stakeholders. In 1998, the National Society of Fisheries, the most influential association of fishing companies, proposed a decommissioning programme where firms wishing to stay in the fishery had to buy out 25000 m^3 from those firms wishing to leave the trade. They suggested the creation of a fund contributed to by fishmeal producers with a fee of 10 dollars per tone of fishmeal exported (Anon 1998). In 2007 the association of boat owners, which represents the small-scale operators, suggested to the government to buy back capacity from boat owners wishing to leave the activity. They suggest the creation of a fund contributed to by all boat owners with a fee of 2 dollars per landed anchovy (PRODUCE 2007).

Since 2006 the levels of capacity exhibit strong dynamics associated with changes in ownership and the concentration of capacity by the largest operators. For example, the seven largest companies concentrate 50% of fish-hold capacity (Arroyo 2007). As recently as 2007, fishing companies invested \$ 800 million dollars in buying out fishing capacity to increase their participation in the fishery (Anon. 2007).

Implementation of IVQs to enhance capacity control. Incentive-adjusting measures to counteract overcapacity such as Individual Transferable Quotas (ITQs) were first proposed by the World Bank in 1992 (Hidalgo 2002). In 2002, the Vice-ministry of Production (former Ministry of Fisheries) proposed the introduction of an ITQ system in the fishery for anchoveta and sardine. In June 2003, a new fisheries administration confirmed to the local media the government’s willingness to implement an ITQ scheme from 2004 (Anon 2003). The proposal was finally shelved.

These measures have proven to be difficult to implement due to strong opposition by certain factions of fishermen and politicians due to their belief that they will be detrimental to the social fabric. Indeed, theoretically, ITQs may produce a concentration of wealth in a few efficient hands by expelling less efficient agents from the fishing activity (del Valle *et al*. 2006).

In June 2008, the Presidency of the Republic enacted Law 1084 (Gobierno del Perú 2008) entitled ‘Maximum Catch Limits per Vessel’. This new management instrument can be categorised as an incentive-blocking capacity measure which utilises IVQs. It aims to control capacity and deter *the race for fish*. The decision to introduce individual quotas is a potential turning point in the management of this fishery and has been welcomed by the National Society of Fisheries, despite having faced opposition from the Association of Boat Owners of the 26920 (PRODUCE 2007). The recently launched Peruvian IVQ system is described in Aranda (2009).

The large-scale and the small-scale fleets are eligible for initial allocation of a share of the Total Allowable Catch (TAC). The rights allocation is based on the best years of landings since 2004. Rights allocation is carried out on a temporary basis; the validity period of an allocated right is 10 years. Rights are attached to the vessel itself and the fishing license. Should a boat be withdrawn, its remaining rights can be accumulated to other boats belonging to the same boat owner. Should a boat not fully utilise its rights in a given season, it cannot carry over the remaining rights into the following season.

The IVQ scheme assures rights-holders that the management system will not changeby devising the Contract of Permanence of the Management System. This legal instrument may enhance security and provide stakeholders incentives to invest in modernisation of fleets and plants.The government relies on such incentives to motivate stakeholders to eliminate redundant capacity.

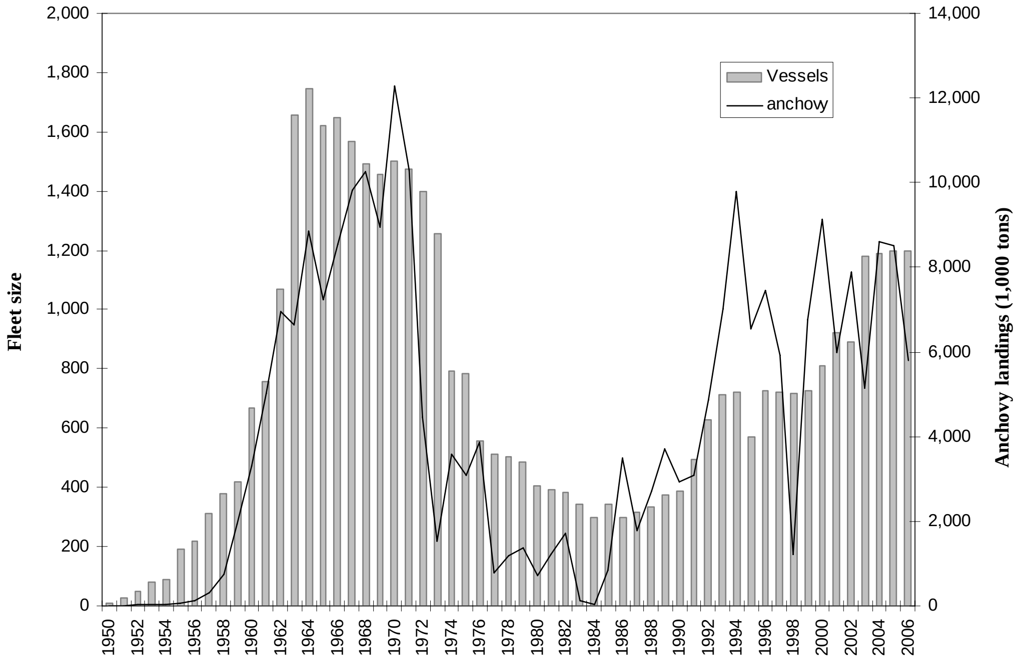

Figure 2. Comparison between fleet size and anchovy landings 1950-2006. Data source: PRODUCE.

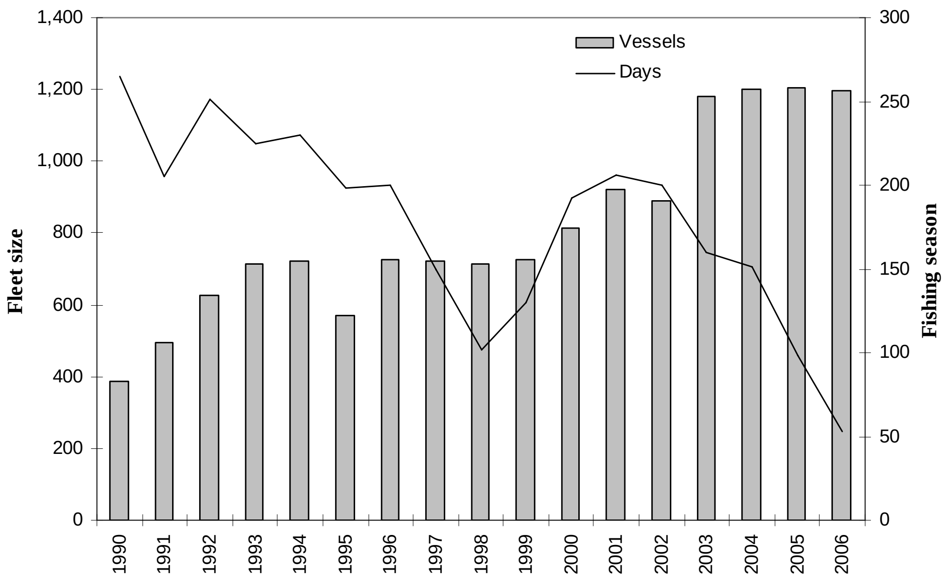

Figure 3. Comparison between fleet size and the length of the fishing season. Source: PRODUCE

The IVQ system enhances the monitoring, control and surveillance system (MCS) by mandatory installation of satellite-tracking devices (VMS) in every single vessel. Costs of the improved MCS are to be recovered from the stakeholders. The new management instrument also devises a variety of provisions to counteract the social distress that may arise from the IVQ approach, such as voluntary retirement of crews and measures to provide labour opportunities for crews outside the fishing activity. The Peruvian IVQ model aims at stopping the *race for fish* without allowing the full transferability of rights and thus concentration of wealth amongst a few operators. The choice of non-transferability, however, may not substantially cut down overcapacity (Arnason 2000).

Conclusions and final considerations

Due to the failure of regulated open access, the management of fishing capacity in Peru has been characterised by the implementation of measures aimed at correcting rather then preventing capacity accumulation. Throughout five decades of history, managers have been unable to deter capacity building in a fishery where resource abundance and high international demand for fishmeal have encouraged investment. In addition, governments in the 1990s allowed capacity building to both support the re-emergence of the industry and alleviate distress in the small-scale fisheries. Due to these measures the fleet has expanded to a size similar to that prior to the big crash in the 1970s (Fig. 2). A lack of a solid policy on the prevention of capacity accumulation and the feeblenesses of the system to withstand pressure from fishers are likely the main causes of capacity accumulation throughout the history of the fishery.

The introduction of the IVQ system is a breakthrough in the management process and establishes a well defined platform for the control of capacity as it allocates rights only to licensed vessels and does not allow new entries. It does not, however, make provisions for voluntary or mandatory withdrawal of redundant capacity either. So, capacity levels may remain fairly constant or only be reduced smoothly if stakeholders decide to withdraw less viable units in order to reduce costs.

The provisions allowing the accumulation of rights in cases of withdrawals of given boats may result in some boat owners deciding to harvest their quotas using fewer vessels. However, this fishery is economically attractive. Large investments in capacity building prove this point. Since the purchase of vessels is the only way outsiders may enter the fishery, it is likely that vessels and their associated rights and licenses will attain high prices. Thus it would be an incentive for rights holders to not decommission their fishing vessels. In this context, if the strict system of control of individual catches fails, it could give raise to a new *race for fish*.

The fear of the concentration of rights has determined the non-transferability of the new system. However, concentration is a phenomenon that has taken place in the fishery anyway, especially during the last 3 years. Complementary measures to allow a certain degree of transferability among boat owners may speed up fleet reduction since more efficient agents will buy out rights and eliminate less viable vessels. The case of the Icelandic management system is a good example of this phenomenon (Arnason 2008). Transferability also provides flexibility to compensate surpasses in the use of individual quotas since boat owners may buy or rent quotas to compensate quota overshooting and thus avoid discarding.

International examples such as the Norwegian IVQ system show that boat owners try to incorporate missing transferability (Hersoug *et al*. 2000). Hence, clear rules should be established to allow accountable transferability. In addition, incentives to decommission and even scrap less viable vessels should be provided to permanently eliminate the threat of a latent *race for fish*.

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References

Aguilar, A., Reid, C., Thorpe, A. 2000. The political economy of marine fisheries development in Peru, Chile and Mexico. **Journal of Latin-American Studies**, 32: 503-527.

Anon. 2003. Perú – cuotas pesqueras a partir del 2004. La Republica, 15 de abril 2003.

Anon. 2007. Peru in $ 800 million buy-up speed. Fishing News International, November 1st 2007, accessible at http://www.intrafish.no/fni/archive/?action=Search. (Accessed at 18/01/2009).

Anon. 1998. Propuesta del sector pesquero empresarial, con relación al sistema de sistema de cuotas individuales transferibles. **Pesca**, noviembre-diciembre 1998: 5-6.

Aranda, M. 2009. Developments on fisheries management in Peru: The new individual vessel quota system for the anchoveta fishery. **Fisheries Research**, 96: 308-312.

Arnason, R., 2008. Iceland's ITQ system creates new wealth. **Electronic Journal of Sustainable Development,** 1 (2): 36–41. Accessible at http://www.ejsd.org/docs/ICELANDS_ITQ_SYSTEM_CREATES_NEW_WEALTH.pdf

Arroyo, E. 2007. Proceso de adquisiciones en el sector pesca. Repercusión en el financiamiento. **Pesca Responsable**, Año X, 47, agosto 2007: 32-33.

Arnason, R. 2000. Property rights as a means of economic organization. Pp. 14 – 25. In: R. Shotton (Ed.). **Use of property rights in fisheries management.** FAO Fisheries Technical Paper 404/1. FAO, Rome, 320 p.

Boerema, L. K., Gulland, J. A. 1973. Stock assessment of the Peruvian anchoveta (Engraulis ringens) and management of the fishery. Journal of the Fisheries **Research Board of Canada**, 30: 2226-2235.

Bottemanne, C.J. 1972. **Economía de la pesca**. Fondo de Cultura Económica, México, 570 p.

Clark, W. G. 1976. The lessons of the Peruvian anchoveta. **California Cooperative Oceanic Fisheries Investigation**, Reports, Volume XIX, 1st July 1975 to 30th July 1976: 57 – 63.

Christy, F.T, Scott, A. 1967. **La pesca oceánica. Explotación de una riqueza común.** Uteha, Mexico, 305 p.

Chavez, C. 2000. Flota pesquera industrial pelágica. **Pesca**, Marzo-Abril, 2000: 15–17.

Cunningham, S. and Grévobal, D. 2001. **Managing fishing capacity. A review of policy and technical issues.** FAO Fisheries Technical Paper 409. FAO, Rome, 60 p.

del Valle, I., Hoefnagel, H., Astorkiza, K., Astorkiza, I. 2006. Right-based fisheries management. Pp. 53 – 84. In: Motos, L., Wilson, D. (Eds.). **The knowledge base for fisheries management.** Elsevier, Amsterdam, 454 p.

FAO. 1999. **International plan of action on the measurement of fishing capacity**. FAO, Rome.

Glantz, M. H. 1979. Science, politics and economics of the Peruvian anchoveta fishery. **Marine Policy**, July 1979: 201-210.

Gobierno del Perú. 1992. Ley general de pesca. Aprobada por Decreto Ley 25977. Publicada en el diario oficial El Peruano, 22 de diciembre de 1992.

Gobierno del Perú. 1998. Ley 26920. Ley que exceptúa del requisito de incremento de flota al que se refiere el articulo 24 de la Ley General de Pesca a aquellos armadores que cuenten con embarcaciones de madera de hasta 110 m3. Publicada en el diario oficial El Peruano, 31 de enero de 1998.

Gobierno del Perú. 2008. Ley 1084. Ley sobre límites máximos de captura por embarcación. Aprobada por Decreto Ley 1084. Publicado en el diario oficial El Peruano, 28 de junio de 2008.

Grévobal, D. and Munro, G. 1999 Overcapitalisation and excess capacity in world fisheries: Underlying economics and methods of control. Pp. 1 – 48. In: D. Grevóbal (Ed.). **Managing fishing capacity. Selected papers on underlying concepts and issues.** FAO Fisheries Technical Paper 386. FAO, Rome, 206 p.

Guerra, A. 1972. Fisheries management in Peru. Marine Pollution Bulletin, Volume 3, Issue 3, March 1972: 39-40.

Hammergren, L. 1981. Peruvian political and administrative responses to El Niño, organizational, ideological, and political constraints on policy change. In: Glantz, M., Thompson, J. (Eds.). **Resources management and environmental uncertainty. Lessons from coastal upwelling fisheries.** Wiley Series in Advance Environmental Science and Technology, John Wiley and Sons, New York, 510 p.

Hersoug, B., Holm, P., Stein, A.R., 2000. The missing T. Path dependency within an individual vessel quota system—the case of the Norwegian cod fisheries. **Marine Policy**, 24: 319–330.

Hidalgo, J. 2002. **Cuotas individuales de pesca: Propuesta de política para la eficiencia pesquera y la conservación de los recursos hidrobiológicos.** Sociedad Peruana de Derecho Ambiental, Lima, 151 p

Hilborn, R., Walters, C. 1992. **Quantitative fisheries stock assessment.** Chapman and Hall Inc., London, 570 p.

IMARPE. 1965. **Efectos de la pesca en el stock de anchoveta**. Informe Instituto del Mar del Perú, Nº 7, 16 p.

Laws, E., 1997. **El Niño and the Peruvian anchoveta.** University Science Books, California, 58 p.

Montoya, I. 2003. Dimensionamiento optimo de la flota de consumo humano indirecto. **Tesis de ingeniero pesquero.** Universidad Nacional Federico Villarreal, Lima, 112 p.

PRODUCE. 2007. Informe final de evaluación y propuestas acerca de la pesquería industrial de anchoveta, Comisión especial, Resolución Ministerial 215-2006-

PRODUCE**.** Noviembre del 2007, Lima.

Sueiro, J.C. 1996. Estimación del Esfuerzo Pesquero en la Flota Industrial de Cerco 1986-1993. **Tesis de economista**. Universidad Católica del Perú, Lima, 120 p.

Thorpe, A., Aguilar, A., Reid, C. 2000. The new economic model and marine fisheries development in Latin America. **World Development**, 28 (9): 1689-1702.

Tsukayama, I., 1983. Recursos pelágicos y sus pesquerías en Perú. **Revista Comisión Permanente del Pacífico Sur**, 13: 25–63.

Ward J. M. and Metzner, R. 2002. **Fish harvesting capacity, excess capacity, and overcapacity. A synthesis of measurements studies and management strategies in marine capture fishery**. FAO Fisheries Report No.691, Rome, 89 p.

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