



Patenting Activities in Cage Culture – A Posteriori Approach

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Abstract

Cage aquaculture is growing fast, and various technologies have been developed in different countries of which many have been protected with some form of Intellectual Property Rights like patents. Objective of this study was to examine patenting activities in cage culture. For this, patent search was performed using commercial (Micropat) and free online (www.freepatentsonline.com) database. International Patent Classification code A01K61/00 and word search using Boolean operators were the focus of the search strategy. Information was also collected from Indian Patent Office (IPO) for the period 1910 to 2000. A total of 129 patents related to cage culture were found from 1970 to 2009. Out of these, 46 patents were granted in USA, 41 in Japan, 32 under World Intellectual Property Organization, nine in Europe and one in UK. Number of patents granted from 1970-1994 *viz.*, pre Trade Related Intellectual Property Rights (TRIPS) era were 47 whereas from 1995 to 2009 (post TRIPS era), the number was 82 showing an increase of 74.5%. However, patenting activity has shown a decrease in 2000-2004 (25 patents) and in 2005-2009 (24 patents) compared to 1995-1999 during which maximum patents (33) were recorded. No conclusive reason could be reported for this. The patenting activities have to be documented and brought to broader notice, as cage culture is being given priority by nations across the world.

Keywords: Aquaculture, cage culture, patents, IPR

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Introduction

Cage culture is described by Das et al. (2009) as 'when fish are reared from fry to fingerling, fingerling to table size, or table size to marketable size while captive in an enclosed space that maintains the free exchange of water with the surrounding water body'. In 2007, FAO published a technical paper on 'Cage Aquaculture: Regional Review and Global Overview' and reported that cage aquaculture was growing at a fast pace and was now being practiced even for untapped resources. In this report, FAO stated that no official statistical information existed concerning total global production of farmed aquatic species within cage culture systems. De Silva & Phillips (2007) estimated that cage culture accounted for 80 to 90% of the total marine finfish production in Asia. About one million cages have been distributed in China (Xu et al., 2006) and after 1990s more than 3000 sets of offshore cages were installed along the coastal provinces. However, information on whether these are innovations protected by patents or other forms of IPR is lacking.

It has been reported that cage culture originated in middle reaches of Yangtze River in China some 800 years ago (Hu, 1994) and from 1970s onwards, the techniques have been improved through introduction of advanced techniques of cage culture from other countries (Hu & Lu, 1980). Cage fish culture considered to be an old tradition has been developed into a major sector in aquaculture only in the recent past (De Silva & Phillips, 2007; Tacon & Halwart, 2007). The origins of cages for holding and transporting fish for short periods can be traced back to almost two centuries ago in the Asian region (Pillay & Kutty, 2005).

As regards to commercial cage culture, Beveridge (2004) has reported that in 1970s commercial cage culture started in Norway. Coche (1978) and Beveridge (1987) have reported about cage culturing

practices in freshwater and seawater. Phillips & De Silva (2006) reported that in many parts of Asia, family-scale cage culture was highly successful. The Indian Planning Commission's report (2011) on the working group on 'Development and Management of Fisheries and Aquaculture' reports about open sea cage culture and cage culture in reservoirs. There were also media reports that Norwegian expertise was being looked into to develop cage culture in India (Hindu, 2007). It is generally accepted that cage culture will actively play an increasingly important role in international aquaculture. Even though cage culture existed indigenously, constant changes and innovations have been taking place in the field of cage culture. Different levels of technology must have been in use to raise diverse aquatic species by family owned or commercial operations. These technologies must be in practice in various countries and if these are innovations, these must have been protected with some forms of IPR, especially patents.

This paper addresses the innovations protected by patents in the field of cage culture. Ninan & Sharma (2005) and Ninan et al. (2007) have found that there was only one patent registered in India relating to cage culture till 2000. This patent was granted to an individual from France. Realizing the importance of the subject, a study was undertaken with the objective of documenting the patenting activities in the field of cage culture with 'a posteriori' approach as per the applicant profile, country document types and pre and post Trade Related Intellectual Property Rights (TRIPS), deriving reasoning from compiled set of data and observations to reach and formulate general conclusions.

Materials and Methods

Patent searches can be performed using the International Patent Classification (IPC) search or the word search. The IPC, established by Strasbourg Agreement 1971, provides for a hierarchical system of language independent symbols for the classification of patents and utility models according to the different areas of technology to which they pertain. At present, 59 countries are members of the Strasbourg Union (www.wipo.int). Patents are organized by class and subclass of invention in IPC. By using classification system, one can find and examine patents that are in the same field /class.

Patent search was done using IPC version 8.0. As per the IPC version 8.0 and the classification therein,

section A was found to be relevant for the purpose of this study, as it comprises 'human necessities'. Further class A01K61/00 contains culture of fish, mussels, crayfish, lobsters, sponges, pearls, or the like. Accordingly, the IPC search was limited to IPC code A01K61/00 and the search was carried out with commercial database (Micropat) which is a source for online patent and trademark information and free search engine (www.FreePatentsOnline).

The search was performed with respect to published patents from 1836- 2009 of various countries (www.micropat.com). The software covers granted patents data from United States (US), European Patent (EP), Deutsche (DE), World Intellectual Property Organization and Patent Cooperation Treaty (WIPO/WO and PCT), France (FR), Japan (JP) and Great Britain (GB). The Patent Cooperation Treaty (PCT) is an international patent law treaty with one hundred and forty one countries as members. While using Micropat, search strategy adopted was IPC code and word search using Boolean operators. Word search was performed using keyword and combination of keywords with the help of Boolean operators namely 'and', 'or', 'adj' (adjacent). Keywords used were 'cage and culture', 'cage and aquaculture', 'device and fish adj cultivation', 'fish adj farming and cage'.

With the help of 'FreePatentsOnline' search engine (www.freepatentsonline.com), a search was performed wherein; keyword and combination of keywords along with Boolean operators namely 'and', 'or', 'adj' (adjacent) were used. The search was carried out with respect to United States (US) Patents, European Patent (EP) documents, Abstracts of Japan and World Intellectual Property Organization (WIPO) (PCT). In this search engine also, same word search was used as in Micropat but the information retrieved was not the same as obtained from Micropat and a number of patents not related to cage culture were retrieved implying limitation of the free search engine. Accordingly, search was carried out using IPC code and combination of keywords particularly 'cage and culture', 'cage and aquaculture', 'cage and fish and cultivation', 'cage and fish and culture', 'enclosure and fish and cultivation', where 'and' was the Boolean operator.

The entire set of patents from the commercial database 'Micropat' and the free search engine 'FreePatentsOnline' was compiled and analyzed according to the document types and the applicant profile (individuals or the organizations). As many

patents were common in the commercial database and free database, care was taken to count them only once. However, it was found that the coverage of patents was more in commercial database implying limitation of free search engine.

Results and Discussion

A total of one hundred and twenty nine (129) patents were recorded in the field of cage culture from the commercial database and the free search engine for the period 1970 to 2009 (Table 1). The 'posteriori' approach to the recorded patents in the field of cage culture showed that there were five patents between 1970-1974, six patents during 1975-1979, six patents in 1980-1984, seven patents between 1985-1989, 23 patents in 1990-1994, 33 patents between 1995-1999, 25 patents in 2000-2004 and 24 patents in 2005-2009 (Table 1). A total of 46 patents were granted in the USA, 41 in Japan, 32 under World Intellectual Property Organization, nine in Europe and one in the Great Britain/ UK with individuals outnumbering organizations. Trade Related Intellectual Property Rights (TRIPS) which is a comprehensive multilateral agreement on Intellectual Property came in force since 1995. Number of patents granted from 1970-1994 *viz.*, pre TRIPS era were 47 whereas from 1995 to 2009 (post TRIPS era), the number was 82 showing an increase of 74.5% in post TRIPS era. However, patenting activity has shown a decrease in 2000-2004 (25 patents) and also in 2005-2009 (24 patents) compared to 1995-1999 where in maximum patents (33) have been recorded. No conclusive reason could be reported for this. The maximum numbers of patents, *viz.*, 33 patents were obtained during 1995-1999.

Table 1. Patenting activities in the field of cage culture

Year	Patents (No.)				
	USA	Europe	Japan	WIPO	Great Britain
1970-74	5	0	0	0	0
1975-79	6	0	0	0	0
1980-84	5	0	0	1	0
1985-89	5	0	2	0	0
1990-94	8	1	10	4	0
1995-99	8	5	15	5	0
2000-04	6	1	9	9	0
2005-09	3	2	5	13	1
Total	46	9	41	32	1

It was found that patenting activities in the field of cage culture, ranged from patents on amphibian culture by insect feeding to cage for culturing shellfish. One of the recent patents was related to hanging type cage for sea farming. The United States patent, 'amphibian culture by insect feeding' was published in 1970s. It proposed, a simple, low-cost automatic means for supplementing the diet of insects and commercial food pellets fed to the animals being cultured. Here, a device comprising a cage for enclosing said animals for feeding amphibians has been claimed as an invention. The inventors were Neff and Gregor N. and the patent was filed on 02/20/1976 and published on 04/26/1977 (Patent number US 4019459).

Thereafter in 1980s, the US patent entitled 'apparatus and method for raising lobsters' was published. The invention relates to an apparatus and method for raising lobsters in multi cellular cages in which each cage has a feed port and a food-carrying member is adapted to be inserted into and through the feed port. The method includes lifting the cage out of the water contained in a holding tank, removing uneaten food through the feed port from each cage, washing away any unused food, supplying a food substance to the food-carrying member in such a manner that the food substance is encapsulated thereon, returning the food-carrying member to the cage and then lowering the cage into the water of the holding tank. The inventors are Handrus and Jonathan and the applicant is Davidson. The patent was filed on 30/09/1982 and published on 28/08/1984 (Patent Number US 4467744).

A Japanese patent for fish cage for cultivating fish patented in 1990 describes a fish cage for cultivating fish comprising a hull shaped vessel composed of outer side platings, inner bottom platings, screen bulkheads and a deck. A device for floating the vessel in water is provided, and openings are formed in the outer side platings and inner bottom platings and covered with nets so as to let sea water flow in and out of the hull shaped vessel. The inventors are Nakamune, Hideo and Hirose, Haruki and the applicant is Nippon Kokan Kabushiki Kaisha. The patent was filed on 07/04/1988 and published on 20/03/1990 (Patent number US 4909186).

In the early 2000, the number of patents showed a decrease in relation to previous decade. One of the patents relates to a cage for culturing shellfish. This patent from Japan provides a cage for culturing

shellfish in which operations for taking shellfish in and out can be quickly carried out and the human-hour required for the operations can be decreased. The inventors and the applicants are Yamagami and Takemitsu. The patent was filed on 10/07/1998 and published on 24/05/2002 (Patent Number JP 1998000196296).

One of the patents in 2009 is related to the hanging type cage for sea farming. The purpose of this patent from Japan was to provide a hanging type cage for sea farming, low in cost and excellent in usability and handling. The inventors were Kadowaki, Shusaku; Kasedo, Teruo and the patent was filed on 21/09/2007 and published on 09/04/2009 (Patent Number JP 2007000246190).

It is clear that the landscape of patents has been changing and it can be said that patents have become more sophisticated with time. Information on patents granted in India was not obtained in the two patent search database mentioned in this study. However, information collected from Indian Patent Office and patents for the period 1910 to 2000 revealed that one patent related to cage culture was registered in India. This patent was granted in 1989, on 'an open sea aquaculture installation of the type which comprises at least two submersible floating modules each having a rigid framework and at least a breeding cage' for which the assignee country was France and was granted to an individual. Interestingly, one patent which was granted by Indian Patent Office in 1918 was on 'improvements in or relating to cages for transport of live fish' by an individual, Saraswat Sarit Kumar Lahiri from Hooghly, West Bengal and the assignee country was India (Indian Patent Number 3330). This patent is not related to cage culture but deals with improvements in a cage for transport of live fish.

Though in this study, patents registered in China have not been reported due to unavailability of access to commercial/free database, it was interesting to find from a study by Xu et.al. (2006) that in China, about one million cages have been distributed. This number must have increased further in the last five years. Since 1990s, China has imported offshore cages from other countries like Norway, Japan, US and Denmark. As mentioned, USA followed by Japan and Europe have maximum number of patents in this area. It is highly probable that these patented technologies have been commercialised in China. It is required that such

efforts be documented and brought to broader notice, as cage culture is being given priority by most nations.

As regards to the applicant profile, the number of patents with respect to individual applicants was 72 and the organizations in total owned 57 patents. Amongst the individual applicants, Neff and Gregor from New York were the inventors of four patents.

In the present study, it has been found that maximum number of patents have been registered in the field of cage culture in USA followed by Japan and European countries. Considering the advancements that cage culture has made in some countries, documentation of such efforts is required. It is expected that the patenting activity will show an increase as cage culture is being given priority by nations across the world.

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