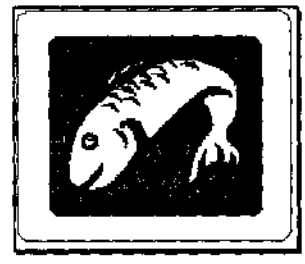
Audun Saudberg
Nordland University Center
March 1990

PAPER presented at the NAVF National Sociology **Conference in Geiranger, Norway ,May 1990.**



Frozen Evolution

The aim of this paper is to treat instances in the development of the aquaculture trade in Northern Norway in the light of theories from evolutionary economics and sociology. Thus it is part of a larger project aiming at a convergence of scholarship in the study of human institutions. At the center of attention lies well-known theories of entrepreneurship (Schumpeter 1934), and further evolution of these done at SPRU (Sussex) and MERIT (Maastricht).(Dosi & al 1988).

The development of aquaculture in Northern Norway started around 1970 and has in the course of 20 years altered most of the strategic rules in a large number of small coastal communities. For scientists working with very long perspectives, e.g. archeologists, the emergence of aquaculture would represent a major shift that compares with the first neolitic revolution. This systemic approach of scholars of culture has much to offer in terms of an understanding of shifts in fundamental rules and relations in human institutions. For the last 9000 years the fishing communities of Northern Norway have basically been founded on hunting technology, thus beeing completely dependent on wild stocks of fish, birds and marine mammals. The whims of nature catered for the living conditions of these stocks and their movements, this in turn determined the fate of coastal communities: aboundance or starvation, poverty or prosperity. The addition of agriculture to the fishing communities from around 400 A.D. and processing-industry from around 1850 did not change the basic dependence on wild stocks - it was still hunting societies.

9-20-90

Like animal hunting technology developed from spears to modern firearms, fisheries has developed from bone angling to modern trawling using electronics and computers. Still it is just refinement of the basic technology. Even the most entrepreneurial purse-seine fisherman
(Barth 1972) cannot alter the fundamental biological process of the fish stock, he can only use skill and technology to harvest more or better than the other hunters. The process of technological innovation and development was not inhibited by environmental considerations, besides - hunting technology has always had a special attraction to engineers. Today the technology is so far developed that it threathens most of the fish-stocks it was based on. This means that in 1990 the fight to be the best fisherman - or the best fishing community - is counterproductive : as long as they try to do what they do (fish !) even better, the crisis will be even greater. The modern marine hunting therefore faces two possible "scenaria":

- o An adjustment of the number of fishermen to a level compatibel with the wild stock; with continued technological development this will be a downward spiralling trend.

- o An efficient national and international management regime of the wild stock - for the benefit of the "aboriginees" of North-Norwegian fishing communities; resulting in a non-use of "best available hunting technology."

Aquaculture has existed in South-East Asia for about 3000 years, mostly in an integrated system with irrigated agriculture. Later the idea of fresh-water fish farming came to Europe and has existed in European monasteries since medieval times. It did not reach Northern Norway until around 1970, one of the main reasons for its late introduction/acceptance was the widespread opinion among southern "experts" that these coastal waters were too cold for the rearing of commercially interesting species like atlantic salmon and rainbow trout.

The typical entrepreneur in northern aquaculture was a true independent. He did not have much respect for the expert's opinion, although he valued his findings. He was independent of banks and parastatal development funds and usually independent of the dominating hunting ideology of the community. Interesting is special cases where biology teachers started keeping salmon in a net as an experiment - then got caught in the business. Around 1972 there was also a massive ideological concern with the survival of small local communities and a "green wave" brought many new brains to small fishing communities. Without traditional inhibitions and driven by a strong will to create additional bases for survival of the many small, but beautiful communities, these early aquaculturalists paved the way for the development of a whole new trade. It could be argued that they were not true entrepreneurs since profit was not their leading motive. It would take a closer sociological analysis to determine who among the early aquaculturalists were driven by which motives. However, they were all soon caught in the bussiness and behaved according to

theory.

When future archeologists do their analysis of the system shift in northern coastal communities in the late 20th. century, they will find that the spread of the new technology had been very rapid during the first 20 years . They would find that the production of fish from fish farms soon came to dominate over the catch of wild fish and that these aquacultural communities had market relations all over the world. But they would also find that the technology at this stage was only partially developed, despite genetic improvement on the bred species , diseases and micro-ecological factors was still a great hazard. The whole trade was also still completely dependent on hunting technology for the gathering of fodder for the growing fish, the fully integrated aquacultrural production system was not developed and accepted before the first half of the 21st century. They would also find that seemingly prosperous aquacultural communities had been abandoned towards the end of the 20th century, while other places which had been abandoned in the 19th century becomes important centers of integrated industrialized aquaculture in the 22nd century.

This is about as far as the tools of cultural analysis would bring us, although the exposition could be refined and elaborated a 100 times. In order to understand how a revolution like the neolitic revolution or the aquacultural revolution is carried forward, it seems nessesary to apply theorethical and analytical tools that explain how waves of innovations are superceeded by long periods of stagnation and crisis whereby the innovations are "digested" and new innovations are accepted. The most obvious toolbox are the theories of evolutionary economics.

The most pregnant contribution to theory formation in this field is still Schumpeters theories of economic development. His agent that links technological change with economic development is the entrepreneur.

In brief, the entrepreneur is the first one to put a technological innovation into full commercial use. He, or she is using a better combination of production factors and increased markets to reap an extra profit ,the entrepreneurial profit which is over and above the usual profit made in this community. A major part of the explanation of this increased profit is the low cost of the crucial factors of production, stemming from their inefficient use in the traditional factor combination. Aquaculture on the north atlantic fringe represents a new combination of these factors of production . As such it is much more profitable than the old factor-combinations in traditional fisheries. The increased value created by the aquaculturalist is mainly explained by the traditionally low price of the important factors of production. Both capelin, fish-cuttings, fish-flour, fish-oil, schrimp-shells, "district-capital" and marginal area labour are cheap because of their heavy tie with the traditional low-productivity fisheries. The only high-priced factors are salmon fry, medicines and "aqua-consultants." In later years even salmon fry and "aqua-consultans" are becoming cheap.

The increased value is therefore a result of the local aquaculturalists' use of these low-priced factors of production in a totally new and better combination. The gain increases further because the predictability of production enables the whole trade through efficient marketing to stimulate demand and thereby increase the price of the product. The aquaculturalist can, in principle at least, choose to produce the kind of fish that gives the highest profit and sell when the market price is at its highest.

For fishing community students, it is also important to note that the gain to the local aquaculturalist does not represent a loss to other economic actors in the community. There is no loser in the game. It is important to understand the underlying theorethical argument: The increased gain is not transferred from the traditional fisheries, but is a gain for the whole fishing community over and above the value created in ordinary
fisheries.

When entrepreneurial profit becomes visible, banks and credit institutions will be eager to switch financial resources away from traditional combinations of factors of production to these new combinations.

However, entrepreneurial profit does not last forever. The internal dynamics of all trades and all innovations is that success is but one step to failure. In stage two the time has come for the copyists, the epigones. Epigones come in big swarms and erode the very profit they were attracted by. This happens because they by their sheer number will bid up the price of the formerly low-priced factors of production and flood the market with their products, thus lowering the price.

The initial entrepreneurs will fight against the epigones, asking for government authorization, licencing, limited entry systems etc., thus trying to maintain the entrepreneurial profit. If they do not succeed in this, we will have a classical boom and burst cycle where profit decreases, the trade goes into stagnation and crisis while the technological change is digested. This will last until new entrepreneurs arrive on the scene and the cycle repeats itself. (Schumpeterl934)

Aguaculture in Northern Norway carries many of the characteristics of this classic model, many observers see the situation in aquaculture since 1985 as the stagnation phase and the situation since 1989 as the emerging crisis. The political struggle over how to regulate the new trade is therefore also a struggle against its own dynamics.

From empirical studies we learn that the early aquaculturalists of Northern Norway were true entrepreneurs, they went into a risky and unknown field mainly because of professional interest or concern with the survival of their local community, most probably also mixed with the hope of some profit, (Sandberg

1983). And they were not inhibited by the concepts and attitudes neccessary to act within traditional logic, that came with the epigones. Experts held the opinion that our northern waters were unsuitable for aquaculture. But our entrepreneurs posessed this rare combination of rational calculation, creative intuition and immense self-confidence neccessary to carry their idea through.

Around 1980, the entrepreneurial epoch is over, the long lists of applicants for fish-farming-licences are comprised of epigones, ordinary people on the coast who by now see no risk in this trade any more and industrialists who want higher profit for their idle capital. Aquaculture is by now also part of the national regional policies. The social-democratic government of 1981 issues licences to ordinary small-scale fishermen, envisaging the growth of a massive smallholder trade in coastal communities. The right-wing governement of 1983 issued licences to fish-buyers envisaging a stabilization of viable coastal communities by giving these an additional comercial basis. The National Association of Aquaculturalists has grown gradually stronger and has in the second half of the 80-ies successfully prevented any increase in number of licences for fish farming. The association has argued that it is better to secure the investments made in existing fish-farms rather than allow new entrants into a trade that so far has managed without government subsidy. Their arguments have carried weight, thus the volume limit per farm is raised from 4000 m3 to 12000 m3 , giving the trade as a whole an enormous increase in production potential.

Up to 1988, government regulations and limited entry was preventing a "burst-situation", thereby securing some entrepreneurial profit also to epigones. In 1988/89 the good prices on the US- and French market together with dramatically lowered prices on salmon fry spurred a record production level - facilitated mainly by the increase in the volume restrictions. When this batch of salmon is ready for the market in 1989/90, the signs of a major crisis are obvious. The National Association together with the Aquaculture Marketing board see the imminent dangers and decides to send 40.000 tons of salmon to the freeze storage.

This last instance in the brief history of north-norwegian aquaculture is important in view of the questions raised at the outset of this paper : Is there an "iron law" in evolutionary economic theory , are crises inevitable - no matter what actions, individual or collective, the actors try to take. Even if the aquaculturalists by collective action have been successful in limiting the number of new entrants to the craft, they seems to have great difficulties with other threats to their trade:

Although numbers of aquaculture licences have not incresed much since 1985, each licence holder has increased his production dramatically, thereby producing to a large extent the same effect on production factor markets as an uncontrolled influx of epigones. With the exception of the salmon fry market, which experienced a real "boom/burst" situation, the increased production locally eroded the fundament

for entrepreneurial profit by bidding up the price of important factors of production: Fodder, good locations, labour etc. Attempts to cut costs did in many instances invite to lax husbandry practices that produced more diseases and low quality fish.

Aquaculturalists also have problems with the limited entry system itself which through the size limit is so closely tied to the present day technology in aquaculture. In fact the system itself increases the vulnerability to diseases in the densely stocked ponds and is one of the main reasons why infectous diseases spread so quickly and have such devastating results. One of the big puzzles in Norwegian aquaculture policy is why members are vigorously fighting to keep a system that actually decreases net return and produce financial disasters. The obvious answer is that they are caught in their own web of protective rules and cannot get out of this until the crisis has become more serious. The answer is also that organizational structures created to produce economic gains are unable to handle the environmental problems inherent in the present technology. With continued positive profit in aquaculture or with a slow stagnation, the trade will stick to present day traditional pond-technology. Whatever technological or biological inventions research institutes come up with that affects the basic ways of keeping and feeding fish, these will not be put to use unless there is a major crisis.

In the course of 20 years aquaculture has become the main economic activity in many coastal communities, making these completely dependent on distant and impersonal markets. Aquaculture has also become an important part of local politics, the hot issues are plans for "sea-use" and location of veterinary services. The new trade has also become a large part of the loan portfolio for local banks, making some of them very vulnerable when profits shrinks or disappears altogether. It is therefore surprising that neither political authorities nor financial institutions have shown much interest in the internal dynamics of the aquaculture trade and its organizations - since it is here that most of the environmental damage, political embarassment and financial losses are produced.

The relationship between the attempts to organize the new trade, the government limited entry system and the brave attempts to protect the markets for farmed salmon - both against competitors and against undisciplined members is worthy of lengthy studies, (Didriksen 1987). When aboundant prices during one period give nearly all members incentives to increase production dramatically, this points to weaknesses in the organization and the discipline of its members. The most obvious explanation is that the long production period of salmon (1 1/2 - 2 yrs) has taught the organization not to worry about future sales. Left to themselves, individual members will try to do what they do even better, i.e. produce more at a lower cost. Some of the more household-inclined aquaculturalist will even try to step up production when prices fall in order to keep the bank and bankruptcy off, thus

deepening the crisis even further.

By freezing down the (expected) surplus production in order to keep the prize up, the Aquaculture Marketing Board think it has solved the problem and the banks who have financed the operation think they have secured their remaining aquaculture portfolio. If the Association disciplines it members to start the production of smaller quantities of salmon at spring 1990, and the EEC does not take punitive actions, the current crisis might be well contained in the freeze box and the neat theories might become muddled by freezing technology. However, sometimes the frozen problem will melt, most probably in small bits and the organization will digest the small bits of crisis and learn from experience that member discipline is a must in the food producing bussiness. This is however the "best case", more dramatic outcomes are also possible. North-norwegian aquaculturalists cannot impose restrictions on coastal dwellers in Scotland, Ireland and Canada who want to copy the success of Norwegian aquaculture. Large quantities of bred salmon will inevitably lower the price of salmon on the world market. Although Norwegian aquaculture holds a majority share in the world market, this international competition is vital enough to offset most disciplinary measures imposed by the Norwegian association on its members.

By freezing down the evolution of aquaculture , the Marketing Board might solve the short term crisis. But our final hypothesis is that this also puts the solutions to the underlying problems into the freeze box. Without bankruptcies and political noise there will not be any changes in the limited entry system and the size limit system. Without breakdowns of some markets, there will not be fundamental shifts in attitudes to fish health and environmental factors. Without a major crisis there will not be sufficient incentive to develop and adopt completely new ways of raising fish with a technology that integrate the production of fodder from primary photosynthesis.

According to our theory of evolutionary economics, the new wave of entrepreneurs should appear when the crisis is immanent. Frozen or not, the signs of crisis should now be strong enough for researchers to start looking for new entrepreneurs. But they will certainly not adhere to the solutions suggested above, most probably they will fool us all - otherwise they would not be entrepreneurs !

REFERENCES:

Barth, F : The Role of the Entrepreneur in social change in Northern Norway, Univ. forl. Bergen 1972.

Didriksen, J : Opplyst egeninteresse eller offentlig omsorg ?

M.A.-theses , Tromso 1987

Dosi,G,Freeman C, & al: Technical Change and Economic Theory
Pinter Publ, London, 1988

Sandberg, A. : Fiskeoppdrettsnaeringa pa Helgeland - rekruttering og lokale virkninger.
NDH-Rapport. 1983:3

Schumpeter J. : The theory of economic development.
Harvard University Press, 1934.