Marine Aquaculture

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A Historical Perspective

The past two decades have witnessed a dramatic expansion in the culture of marine finfish and crustaceans. Marine larviculture without live feed, or crustacean cultures without microalgae, are rarities in commercial aquaculture. The development of commercial formulated feeds remains today's upcoming challenge. In the meantime, the industry continues the struggle to produce stable quantities of high-quality live feeds. The different species used in marine aquaculture differ in their biology and culture requirements, providing ample challenges for the novice and requiring expertise in a commercial enterprise.

It is difficult to determine exactly where and when marine aquaculture began. Milkfish culture has been conducted in Asia for centuries, based on the capture of fry from the wild (Pamplona & Mateo 1985; Liao 1991), so that modern rearing methods and live feed in the hatchery were not required.

The efforts to repopulate the seas of Europe and North America in the late 1800s may provide a more useful starting point for a brief historical review of the modern methods. In response to the fishery crisis at that time, 'hatcheries' were constructed in several countries for the purpose of providing fertilized eggs, developing embryos and larvae for distribution back into the ocean.

The hope was that these would thrive and be recruited into the commercial fisheries. Given the knowledge of freshwater fish culture in Europe and the Americas, especially of salmonid culture, which had been rapidly developing since the mid-1800s and the attendant propagation, transportation and introduction of salmonid populations, this was not an unreasonable hope for the times. By the 1890s, Britain, France, Canada and the USA all had fish hatcheries devoted to the propagation of commercially important species, such as

1- Cod (*Gadas morhua*)

2- Haddock (*Melanogrammus aeglefinus*)

3- Turbot (*Scophthalmus maximus* = *Psetta maxima*)

4- Winter flounder (*Pleuronectes americanus*) and lobster (*Homarus* sp.).

Table 1. Aquaculture production (tonnes [t]) reported to FAO by country and total value (US$ million) of groupers, 1990–2001.

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Brazil	—	—	—	—	—	—	—	—	1	2	3	~4
Hong Kong SAR	365	265	55	632	627	620	1110	1036	312	280	523	910
Indonesia	—	—	—	—	—	—	—	—	—	1759	1159	3818
Korea, Republic of	—	—	—	—	—	—	9	—	—	5	6	20
Kuwait	—	—	—	—	—	—	—	—	—	5	6	3
Malaysia	144	153	288	1006	931	834	857	799	465	948	1217	1101
Philippines	2363	6765	349	772	2129	715	595	654	135	151	167	136
Saudi Arabia	—	—	—	—	—	—	—	—	1	—	—	—
Singapore	185	198	233	147	133	101	93	82	97	94	111	157
Taiwan	2206	1229	1125	3942	1841	2104	1883	2525	3471	4122	5053	5386
Thailand	415	355	965	755	1078	674	74	795	1390	1143	1332	1442
Tunisia	—	—	2	~1	~1	<0.5	<0.5	<0.5	—	—	—	—
United Arab Emirates	—	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total production (t)	5678	8965	3017	7255	6740	5048	5321	5891	5872	8509	9577	12,977
Total value (US$m)	28.5	64.4	29.4	59.5	81.1	67.5	65.5	73.0	45.7	63.9	67.2	89.9

First, nauplii of the brine shrimp, *Artemia*, were found to be a good food for raising both freshwater and some marine larval fish (Seale 1933; Gross 1937; Rollefsen 1939). This allowed the culture of at least some fish species (those with mouths large enough to ingest *Artemia* nauplii as a first food). The use of *Artemia* nauplii as a convenient live feed, not only for fish, but also (and especially) for crustaceans, has perhaps done as much for the explosion of marine aquaculture in the late 1900s as any other development.

Secondly, in the 1930s, Japanese researchers, beginning with Dr M. Fujinaga, began research on the culture of the kuruma prawn, *Penaeus japonicus*, which subsequently led to the development of the shrimp industry that we know today. That research, interrupted unfortunately by World War II, continued through the 1960s, when commercial culture of *P. japonicus* was finally achieved.

المقدمة:استعراض تاريخي

•الانسان البدائي *Homo erectus* ← الانسان العاقل *Homo sapiens* ← العصور الحجرية Palaeolithic

(380000 سنة) غذاء ← (100000 سنة) صيد

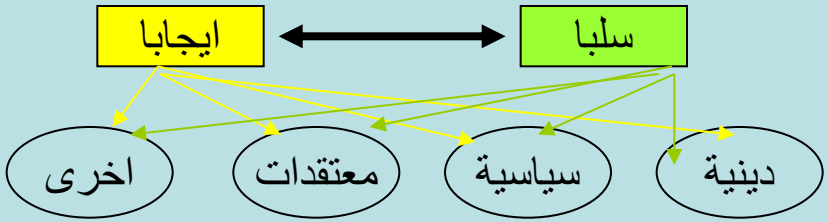
• الصين في 1300 B.C. تسجيل لنوع من الاكلات من اسماك الكارب تسمى Recipe

•الثلج الطبيعي لحفظ الأسماك في 1000 B.C. في الصين واستخدم الرومان الاعشاب البحرية والثلج للمحافظة على طزاجة الأسماك

• التجفيف والتدخين والتمليح منذ حوالي 100 B.C. استخدم الهولنديين تمليح الرنجة على البواخر ← اطالة مدة السفرة ← تقليل الفقد

•تربية الأسماك في الصين بين 2000 – 1500 B.C. (كارب).

• استهلاك الأسماك يتأثر سلبا وإيجابا



•حقوق الصيد في معاهدات السلام بين الدول الاوربية لتنظيم الصيد للمناطق القريبة والمستعمرات

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بداية القرن التاسع عشر ← الحاجة لطرق جديدة لإطالة صلاحية الأسماك ومنتجاتها ← الحروب

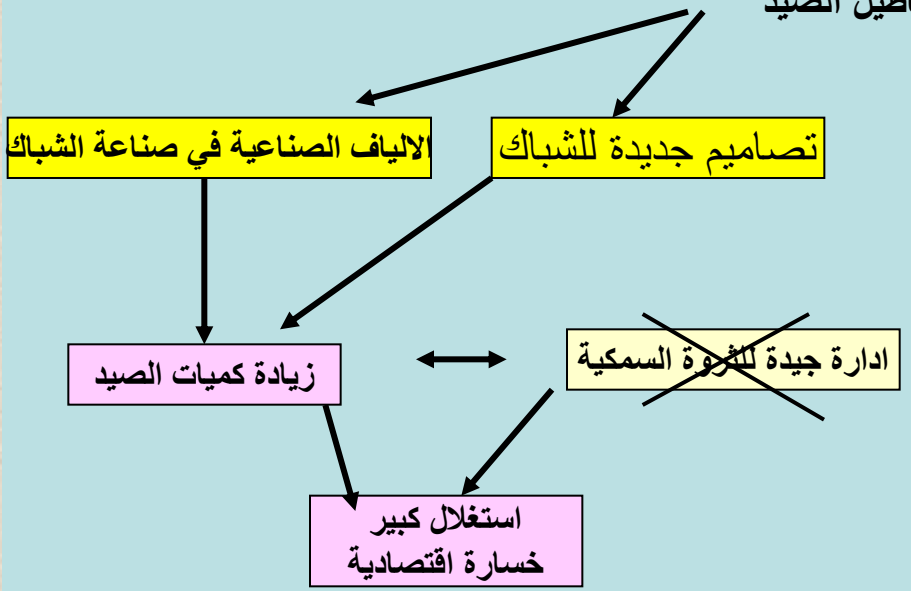
Appert ← 1810 ← تعليب الأسماك واللحوم ← جنود نابليون

1877

Weather freezing طريقة لتجميد الأسماك في ظروف جوية بحرارة تحت التجمد

Carre ← 1859 ← Ice-block machine

بين 1950 و1960 تطورين هامين لزيادة استخدام المكننة في اساطيل الصيد



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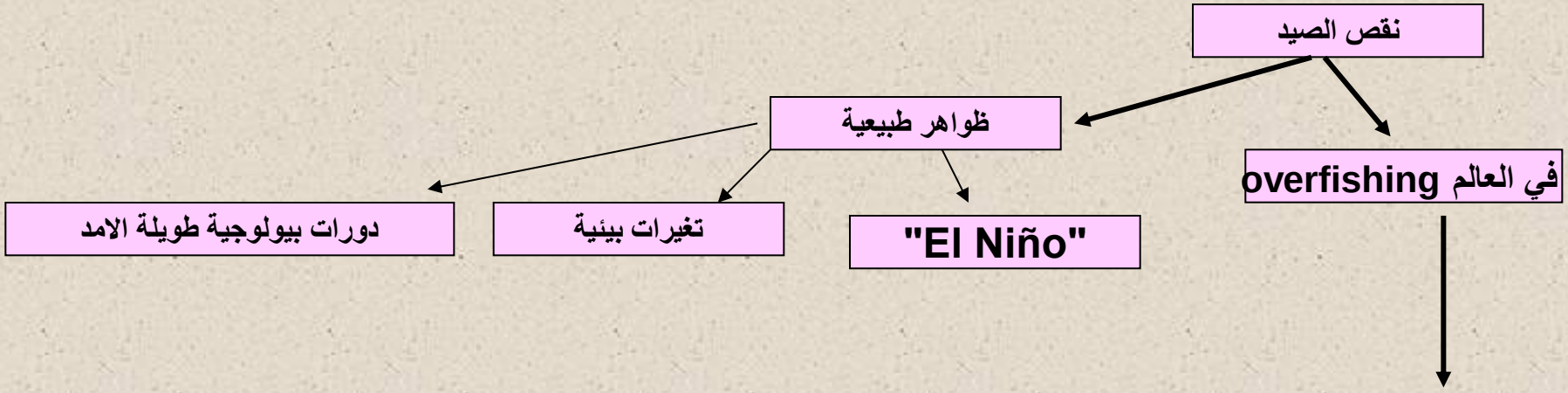
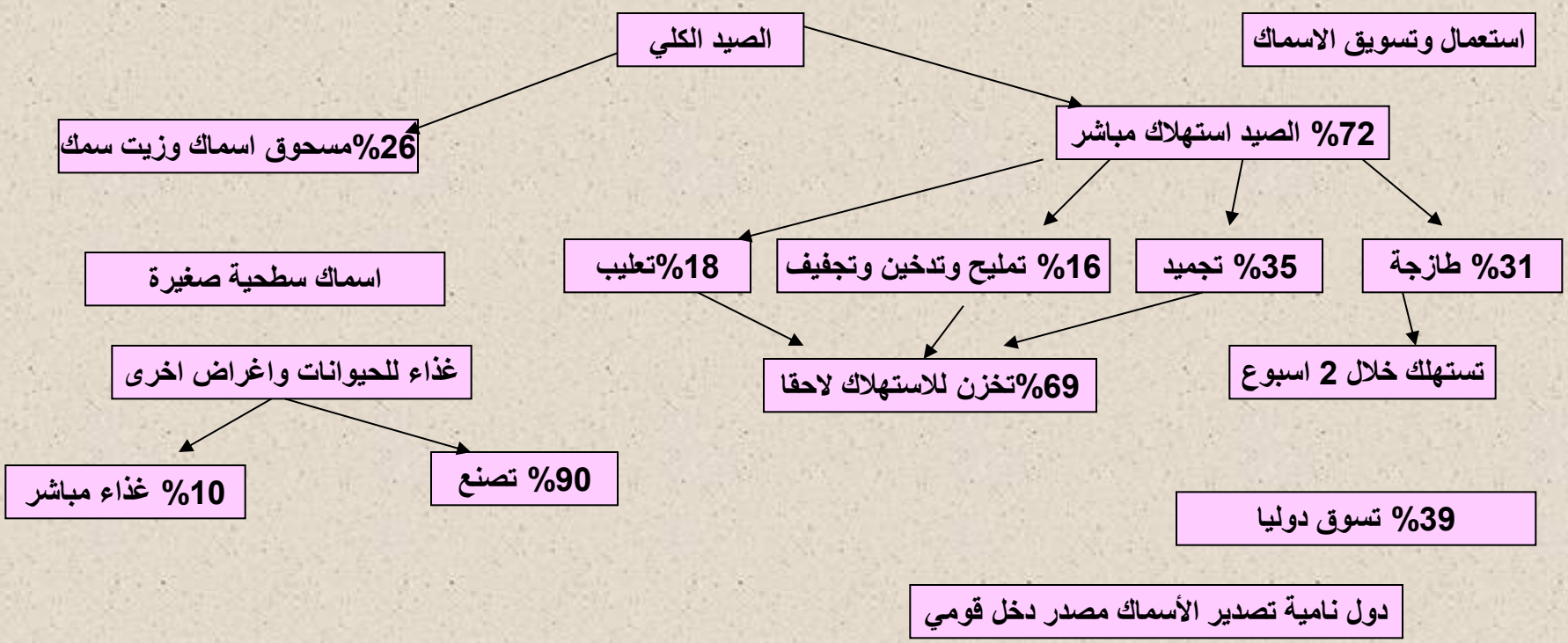


40000 – 50000 صياد وعامل بدون عمل

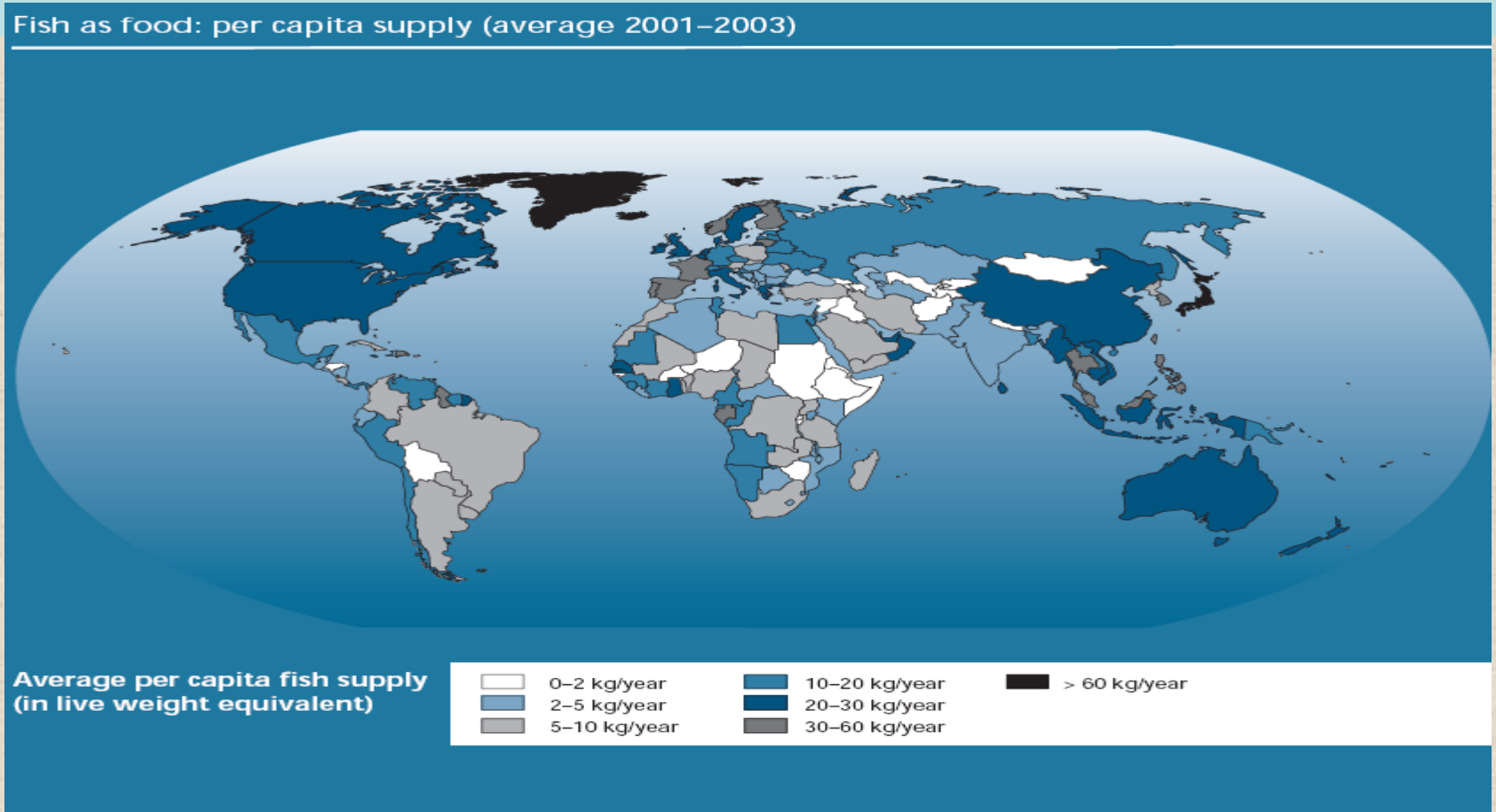
تأثير على الاسواق المحلية والعالمية

الان الصناعة السمكية دخلت مرحلة حيث الادارة الصحيحة للثروة السمكية لانستطيع تجنبها .التطويرات عدا حالات معينة في تربية الأسماك لا يمكن ان تزيد من كميات الصيد.

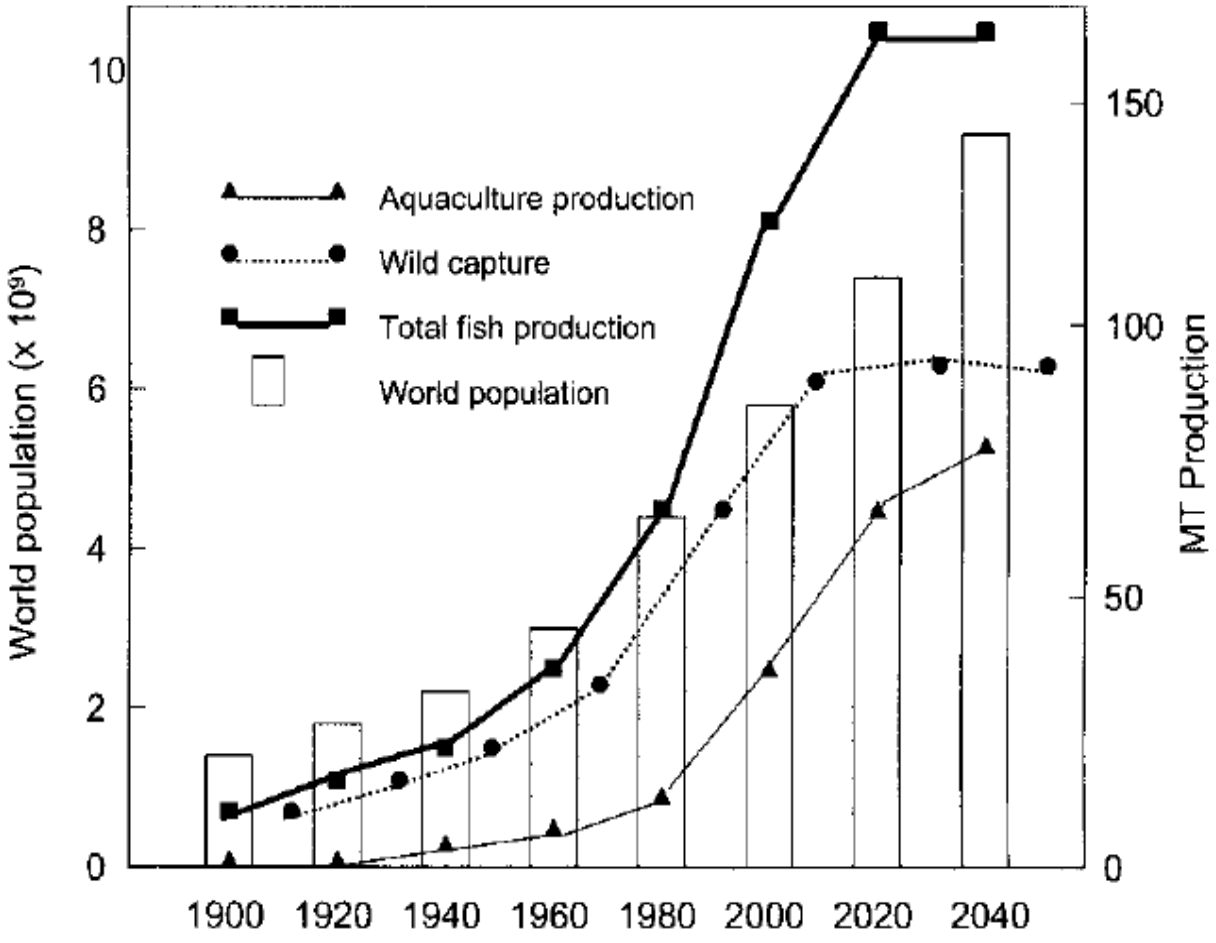
Marine Aquaculture



Spawning and successful larval culture of mussels was not achieved until the early 1950s (Loosanoff & Davis 1963). Investigations of algal feeds for the rearing of molluscan larvae took place in the 1930s at both the Conwy, Wales, Fisheries Experiment Station (Walne1974) and the Milford, USA, Bureau of Commercial Fisheries Biological Laboratory (Loosanoff & Davis 1963). Fertilisation of large tanks of filtered seawater to induce mixed phytoplankton blooms as food for molluscan larvae was carried out continuously beginning in 1938 (Loosanoff & Davis 1963), despite the contention that 'large-scale cultivation of microalgae … was probably first considered seriously in Germany during World War II'.



The culture of algae seems to have its origins in the late 1800s and was enabled by the methods developed by bacteriologists (Bold 1950). Marine algal culture lagged behind its freshwater counterpart, which successfully used uncomplicated media (Pringsheim 1924;Schreiber 1927) in the early 1900s. A significant advance in marine algal culture was reported by Gross (1937), who tried to culture diatoms and dinoflagellates, but whose attention was drawn to 'nannoplankton flagellates, most of them probably unknown systematically' of about 2–10m in size.



Growth, real and projected, in world capture fisheries production, world fish culture and population (data from various sources).