

# 国際漁業研究

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## 中国における水産物需給均衡の動向 —フード・システムの視点による分析—

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【要約】中国政府は、長年にわたって農業を非常に重要視し、食糧需給均衡の実現のために専念していたが、漁業を農業の副次的な位置に置き、水産物需給均衡への取り組みが無効であった。そのため、水産物は供給不足に陥り、水産物消費は1983年まで低水準で推移し、そして横這い状態にあった。改革開放が本格的に推進される中で、政府は、深刻な水産物需給問題に対して、一連の政策を打ち出すと共に様々な措置を講じた。その結果、水産物需給均衡は大きく改善され、需給構造にも変化が起きている。こうした中国における水産物需給均衡問題を「フード・システム」という新しい視角から考える。

【キーワード】水産物需給均衡、水産物需給構造、フード・システム

【Abstract】 Chinese government had long emphasized agriculture production policy and devoted herself to achieve a balance of food supply and demand. Accordingly, the government treated fisheries as a secondary interest and was powerless to deal with the supply and demand balance of fisheries commodities. As a result, China faced a supply shortage and remained low and stagnant consumption of fisheries commodities until 1983. However, the government took a series of policies to improve the supply and demand balance since 1978 when China adopted an economic reform. As a result, the supply and demand balance of fisheries commodities has improved greatly. This paper discusses these recent structural changes from a food system point of view.

### 1. 研究の目的

中国では、漁業の自然条件や社会・経済条件は地域的な差異が存在し、特に、内陸地域と沿海地域との差異が非常に大きい。また、各地の生態類型も様々で水産物の生産構造も大きく異なっている。そのため、水産物の生産量や種類についても需給不均衡の問題が生じている。どのようにすれば、全国的にも地域毎にも水産物の需給均衡が図れるのか、という問題は中国が絶えず直面している経済的課題である。

こうした水産物の需給均衡問題を解こうとする場合、従前のような川上＝漁業及び「みずうみ」に喩えられる最終需要を基軸にした論述では不十分で、川中＝水産物卸売業・水産加工業、さらには川下＝水産物小売業・外食産業をも視野に収めなければ、全体像が描けないと考えられる。そこで、「フード・システム<sup>1)</sup>」という新しい視角から水産物需給均衡に接近する必要がある。

本稿では、中国における水産物需給均衡の動向を究明することを目的とした。具体的には、「フード・システム」という新しい視角から、①計画経済体制の下で水産物需給均衡はどうなっていたのか、②市場経済体制の下で水産物需給均衡はどう変わっていったのか、③水産物需給構造には何か変化が起こったのか、この3点を中心に考えて見たい。この作業を通じて、水産物需給均衡の過去と現在を明らかにし、水産物需給均衡の未来について問題提起してみたい。

### 2. 計画経済体制下の水産物需給均衡

改革開放(1978年)前の30年間、先ず、川上＝漁業が発展するための自然条件は比較的優れていたが、合理的で有効な開発利用や安定的で持続的な繁栄発展を実現できなかった。その重要な原因の一つとしては、マクロ的指導上の問題がある。すなわち、長年にわたって海洋、捕獲漁業、生産



の量、生産が重視され、その逆に、淡水、養殖漁業、生産の質、管理が軽視された風潮が存続した。

したがって、船や網などの漁獲努力量を増加することで水産物生産量を引き上げようとした動きが固まり、近海や内水面における主な漁業資源は著しく破壊された。同時に、穀物の生産をかなめとした「以糧為綱」という主食生産重視主義の方針は、養殖漁業に大きなインパクトを与え、養殖漁業の展開が困難となる局面を作ってしまった。

それゆえ、1966年から1980年までの第3・4・5次の「5ヵ年計画期」における水産物生産量は、それぞれ年平均0.93%、5.97%、0.49%と成長した。なお、第4次5ヵ年計画期は増産といっても乱獲によって実現されたものである。

したがって、1960年から1980年までの全国水産物の増加量は178.57万トンに留まり、年平均増加量はただ8.93万トンであった。そして、1人当たり水産物割当量は、1960年の5.12kgから1970年の4.32kgに減少し、その後、1980年は5.24kgと持ち直されたものの、依然として低水準にあった。

また、この時期は統制流通体制下にあるため、非公有制経済は排斥され、国営商業の独占地位は強固されていた。したがって、川中＝水産物卸売業から川下＝水産物小売業までは、基本的に国営水産供給・販売企業により独占経営され、水産物は産地から消費地まで単一のチャンネルで流れていた。それゆえ、水産物供給は市場反応が遅く、市場適応能力が弱く、「親方赤旗」（＝「大鍋飯」）意識が強く、経営効率が悪く、需給不均衡の状況にとって「泣き面にハチ」であった。

さらに、この時期では、川中＝水産加工業は加工方法や鮮度保持技術の面で非常に立ち後れていた。1950年代では、塩干しを加工の重点とし、鮮度保持は主に天然の氷に頼っていた。「大躍進運動」が始まって冷凍、製缶、苦汁漬け、煮熟、燻製、かす漬けなどの加工方法が出現した。1960年代では、「三年経済困難」と「文革」の影響で水産物加工よりは大きな進歩を見せず、「包丁一本、塩一握り」の局面には変化がなく、水産加工業の発展は極めて緩慢であった。1970年代では、冷蔵庫・冷蔵車・冷蔵船といった“三冷”建設を推進し、1978年の末までは、42社の国営水産加工企業を

建設した。

なお、ウマズラハギは新しい漁獲対象として大量に登場したが、生鮮販売に向かなかったため、それを原料とする食品加工が呼び起こされ、それ以降の水産加工業の新たな発展に土台を築いた。それでも鮮度保持や加工の設備は依然として少なく、冷凍品は総生産量の5%に達せず、低質な塩干し物の比重が大きい。そして、毎年30～40万トンの魚介類は変質し腐っていた<sup>2)</sup>。

最後に、「みずうみ」＝最終需要を見ると、1人当たり水産物消費量は、1960年の4.8kgから1970年の4.5kgに減少し、その後、1980年は5.2kgと増加している。1人当たりでの水産物消費量をその割当量と比較してみれば、消費量が割当量にかなり近い。そして、割当量はあくまでも割当量で食用供給量に等しくなく、それには非食用向けの用途やロスなども含まれていることから、水産物供給は如何に逼迫したか明白であろう。

このように、1970年代初頭において水産物供給は日一日と逼迫していった。1970年代後半になって、近海における漁業資源は過度に利用され、経済的に重要な魚類の生産量は激減し、漁獲物の質が非常に悪くなる一方、内陸水面、浅海や干潟の養殖資源利用は不十分であるため、養殖漁業の発展は緩慢であった。それゆえ、水産物需要の増大を満たすことは難しくなり、全国の北から南まで水産物需給の不均衡がもっと傾斜し、特に、大・中都市では水産物の供給不足と価格高騰が発生した。こうした水産物供給に対して消費者は不満を漏らし、「魚を食べるのは難しい」という声が高まっていった。

### 3. 市場経済体制下の水産物需給均衡

改革開放後の20年間、先ず、川上＝漁業を含めた水産業に関しては、1979年から「①資源の保護と増殖及び合理的利用、②養殖の発展に力を入れる、③鮮度保持と水産加工を改善し、加工物の質を向上させる<sup>3)</sup>」という3つの調整重点に従うよう内部調整を図った。そして、1985年には「養殖を主とし、養殖、漁労、加工を並行して進め、各地区の条件に応じてそれぞれ重点と補助点を定める<sup>4)</sup>」という発展の方針を実行した。それから、



1997年には、新しい時期において漁業の持続的発展を実行する戦略的方針を確立し、資源管理と環境保護を漁業管理の一つの重点として位置づけた<sup>5)</sup>。

上述の正確な指導思想と方針及び適正な方向づけは、中国の水産物生産量と生産構造を短期間に根本的に変化させた。1981年から2000年までの第6・7・8・9次の「5ヵ年計画期」における水産物生産量は、それぞれ年平均10.95%、11.13%、17.05%と6.86%と成長した。1980年から2000年までの全国水産物の増加量は3,761.13万トンと大きく、年平均増加量が179.10万トンになる。そして、1人当たり水産物割当量は、1980年の5.24kgから1990年に12.48kgと上昇し、さらに、2000年には33.80kgと急増した。

なお、養殖漁業の水産物生産量に占めるシェアは、1987年に捕獲漁業とほぼ相半ばし、その後シェア拡大が増し、2000年には60.18%と逆転した。こうして水産物生産の力点は「捕獲漁業」から「つくり育てる漁業」へ移行し、生産構造の大きな変化として見られる。

また、この時期に入って流通体制の改革が行われ、政府は水産物に対する「割り当てによる買い上げ」の比例を次第に縮小し、1985年に至って全面的に廃止させ、水産物価格は市場の需給関係によって決めることを認めた。一方、水産物経営は国営商業企業の独占を打破し、国営、集団、個人共に営むように改変された。したがって、川中＝水産物卸売業から川下＝水産物小売業において、新たな流通の担い手として集団及び共同商業企業、私営及び個人商業企業、水産加工企業、漁民や農民の直販が登場してきた。

なお、1990年代に入って国営企業の競争力は弱くなり、私営企業の優勢は非常に大きくなっている。現在では、都市と田舎の市場や定期市は繁栄し、商品は充足し、ネットワークが広がり、開放的水産物市場は基本的に形成し、水産物需給均衡の実現へ大きく寄与している。

さらに、この時期では、川中＝水産加工業は大きな進展が見られる。水産加工専門企業は、水産冷蔵冷凍企業、食用水産物加工企業、魚粉飼料加工企業、薬品保健品製造企業と水産皮革及び工芸

品企業などの多岐に発展した。2000年末の時点では、水産加工業は6,922社（うち国営が455社）を数え、その内、集団企業及び私営企業が約8割を占める。そして、水産物の加工方法や鮮度保持技術の面でかなり進歩し、食用水産物加工品の品目としては、冷凍品、塩蔵・薫製品、缶詰、袋包装、すり身、調味加工品などに及ぶ。これらの水産加工品は、各階層の需要ニーズを満たし、多くの消費者に好まれている。

最後に、「みずうみ」＝最終需要を見ると、1人当たり水産物消費量は、1980年の5.2kgから1990年に11.5kgと上昇し、さらに、2000年には25.0kgまで急増している。1人当たりでの水産物消費量をその割当量と比較してみれば、水産物需給均衡問題は、1980年代はやや改善されたものの、依然として厳しいが、1990年代は大きく改善され、需給均衡問題は基本的に解決できたと言える。

実際、改革開放前に発生した水産物供給が需要に応じきれない矛盾は、1980年代の初頭にわたって存続し、水産物は割り当て買い付けが難しく、移入調達が難しく、都市における公定価格の魚の供給はさらに難しかった。1985年以降、養殖漁業の躍進、並びに「菜藍子プロジェクト<sup>6)</sup>」の実施によって、水産物需給均衡の傾斜は大きく正された。そして、1990年代に入って水産物供給は地域によって、季節によって、品種によって過剰状態を呈し始めている。

#### 4. 水産物需給構造の変化

1980年代末から、水産物需給構造には幾つかなの変化が起こっている。

1つ目に、水産物消費の位置づけの大きな変化である。1980年代末から、所得水準の向上に伴って、主食たる穀物、生鮮野菜の消費量は減少に転じ、その反面、肉卵類や水産物の消費量は増加している<sup>7)</sup>。

2つ目に、水産物消費の高度化・多様化である。例えば、鮮魚・活魚の消費は、1980年代初頭に淡水品種のコイ、フナ、ライギョ、ケツギョ、モクズガニ、ソウギョ、ナマズなどを中心とし、海水品種はノコギリガザミなど少なかったが、1990年代に入って淡水品種のスッポン、カメ、スズキ、



マスなど、海水品種のイセエビ、サケ、アワビ、ウグイ、アカメなどにシフトした<sup>8)</sup>。以前は最低限の需要量さえ満たされていなかったため、水産物生産は量的発展が重視され、水産物の質はあまり問題にされなかった。ところが、水産物供給の充足や所得の向上に伴って、質の問題が浮上し、低品質の水産物は消費者の需要に向かなくなっている。

3つ目に、水産物消費の普及化傾向である。水産物流通体制の調整及び水産物卸売市場の建設により、内陸部の広域にわたって水産物流通が展開され、従前の水産物を入手しにくい地域も買いやすくなっている。例えば、チベットのラサ農産物市場に並べている水産物には、地元のラサ魚、チベットナマズ、それに奥地から輸送してきたコイ、フナ、タウナギ、スッポンなどの鮮魚・活魚がいる。その価格は奥地より高くても供給が充足しており、チベット消費者の需要をある程度満たし、水産物市場が日一日と繁栄に向かっている<sup>9)</sup>。

4つ目に、急速な都市化に伴う水産物の需要増加である。中国では、都市人口の比率は1980年の19.39%から1990年の26.41%に上昇し、さらに、2000年には36.22%と急増している。そのうち、多くの大中都市は沿岸地域または揚子江辺りに位置している。都市部では所得水準が高く、消費性向が強く、そして物流が発達しているため、水産物消費が絶えず拡大されている。

こうした水産物需給構造の変化に対して、生産と流通のどちらかがうまく対応できなければ、供給の緊迫あるいは不足を招き、価格が高騰する危険性が高い。なお、水産物生産は相対的に特定の地域に集中しているため、水産物流通の更なる拡大が時代に要請されている。そのため、道路網の整備及び低温輸送の発展が必要であろう。

## 5. 水産物需給均衡の達成へ向かって

最後に、中国における水産物需給均衡の達成のため、幾つかの点において問題提起し、その対策も指摘しておきたい。

第1は、水産物の供給保障問題である。それは水産資源の持続的利用に関わる問題でもある。中国における水産物総需要は莫大な国内生産量の

97%を占めている。このような水産物需要を満たすためには、水産物供給を保障することが必要であり、延いては適切な水産資源保護と管理が必要になる。

改革開放以来、水産物供給サイドでは急激な国内市場拡大、性急な外貨獲得目的、並びに競争的外国企業の集荷によって、資源状況を見放した生産競争が行なわれてきた。このため、渤海、黄海、東海、南海の魚群密度は激減し、漁獲物の質も劣化し、乱獲問題が指摘されている。水産資源の減少は、水産物供給に脅威をもたらし、水産物需要を圧迫することは言うまでもない。

1999年、政府は捕獲漁業生産において「ゼロ成長」増産抑制策を打ち出し、近海漁業資源の保護と持続的発展に向けて第一歩を踏み出した。これによって、今後は養殖主導の安定成長期に移行することは明らかになった。ところが、これだけではまだ問題解決には至らない。さらに、養殖生産も含めた水産資源の管理が時代に要請されている。

第2は、水産物の需要創出問題である。換言すれば有効な水産物需要を引き出すことである。中国の水産物需給均衡状況は、1990年代を迎えて季節的、地域的な供給過剰に転じている。それにも関わらず、有効な水産物需要が未だに生まれていない。

その原因は何であるかを突き詰めると、消費主体の購買力に関わる所得水準のほか、消費客体における流通と加工システムの問題も挙げられる。中国では、未だに市場情報は閉塞し、流通システムは完備されず、加工と総合利用水準は高くない状態が続いている。これらの要因が相俟って水産物消費を客体的に妨げている。

それゆえ、新たな水産物需要創出、なかでも特に中部・西部内陸の消費需要に応えていくための工夫が必要である。そこで方策として登場するのは、①低温流通機構の展開に取り組み、生鮮魚介類を産地から内陸の消費地まで運搬する、②消費者に好まれる水産加工品、特にブランド品の製造に取り組み、便利な即席食品のほうへ傾斜する人々の消費習慣に応える、のことである。このような方策の実施に当たって、検討すべき政策的課



題として、①流通・加工システムの整備への助成と投資、②企業のマーケティング機能を強化させるための職業訓練、人材育成への支援、が挙げられる。

なお、2001年12月11日、中国は143番目の加盟国として正式に世界貿易機関に加盟した。WTO加盟は、水産物需要の増大には二つのメリットがあると思われる。1つは、中国の水産物価格は国際市場のそれより低く、価格上競争優勢を具有するため、輸出水産物（外需）が増加する。もう1つは、中国の水産物加工能力は低くて劣勢になるが、外国からの水産物加工品の流入が中国市場の不足を補填し、水産物需要（内需）を促進する。

である。その内容は食肉・鶏卵・乳類生産、水産物生産と蔬菜生産の三つの総合的企画を含む。当のプロジェクトは、1989年1月より実施された。

- 7) 国家統計局『中国統計年鑑2001』中国統計出版社、2001、p.308、p.330を参照。
- 8) 「我国鮮活水産品市場状況」『<http://www.ifishery.com/>』（中国水産信息网、2001）を参照。
- 9) 陳藍蓀「中国水産品貿易的現状和趨勢(八)」『<http://www.cafs.ac.cn/>』（中国水産科学技術信息网、2002）を参照。

#### 引用文献

- 1) 「フード・システム」の概念は日本で提起され、フード・システム研究会が1994年5月に創立された。それは、川上の農水産業、川中の食品製造業・食品卸売業、川下の食品小売業・外食産業、それに最終需要の食料消費に至る全体の流れを“フード・システム”として捉えるものである。フード・システム研究については一連の作品があるが、特に日本フード・システム学会編『水産物のフード・システム』（農林統計協会、1999）を参照。
- 2) 宮明山・塗逢俊主編『当代中国的水産業』当代中国出版社、1991、pp.284-288を参照。
- 3) 1978年3月に設立された国家水産総局は、翌年の2月に「全国水産工作会議」を開催し、同3点の調整重点を提案した。
- 4) 1985年3月、中共中央・国務院から出した「水産業の発展を加速させる緩和政策についての指示」の第一条に掲げている。
- 5) 1997年、農業部から出した「漁業発展をいっそう速めることについての意見」に確立されている。
- 6) 「菜藍子」とは、“副食物の買い物籠”のこと、穀物（主食）供給を表す「米袋子」に対応し、副食物の供給を意味する。なお、「菜藍子プロジェクト」とは、中国農業部が1988年5月9日に国務院に提出した「副食物の生産促進と都市部への供給確保に関する建議」の略称



## 東南アジア・マグロ缶詰産業の発展過程 —多国籍企業論・開発経済論の視点から—

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### 【要約】

マグロ缶詰は国際的なアグリビジネスをベースとした製品の典型例である。缶詰生産は、原料になるカツオ・マグロを漁獲し水揚げする開発途上国において行われることが多く、その生産は調理方法、味付け、サイズなどの点で一定の規格に従って行われ、主要消費地である欧州と北米に向けて輸出されてきた。1990年代末になって、インドネシア、フィリピン、タイにおいてこれとは異なるマグロ缶詰の生産-消費パターンが出現した。マグロが郷土料理の風味に味付けされ、生産国内で惣菜缶詰として販売されるようになったのである。さらに近年では、中国市場開拓を意図して、中国人の好みに合う味付けのものが開発され輸出されている。この点で、マグロ缶詰ビジネスは国際的なアグリビジネスがどのように展開していくかを示す好例である。すなわち、製品はまず輸出向けに生産され、やがて生産国の一人当たり所得が上昇するにつれて国内市場が開発されてゆく。一方、こうした消費パターンの変化は、先進国での需要が飽和期を迎えると、途上国市場を開発するようになるという多国籍企業の巧妙な経営戦略の結果であるとも解釈できる。本稿では、アグリビジネスの展開の一事例としてマグロ缶詰を取り上げ、生産-消費パターンの変化がなぜ生じたのか、その理由を理論的枠組みに従って検討する。

【キーワード】 マグロ缶詰、多国籍企業論、開発経済論、タイ、インドネシア、フィリピン、惣菜缶詰

**【Abstract】** In this paper, we examine the development process of the Southeast Asian tuna canning industry in the context of the theories of multinational firm and development economics. Countries we survey are primarily Indonesia, the Philippines and Thailand although reference is made also to other countries. Essentially, tuna canning industries in Southeast Asia have acquired a unique pattern of development paths but hold certain differences in development paths among countries. By applying different theories to different phases of their development, we can achieve a better understanding of their current situation and help to predict their future prospects.

In the first section, we review theories of multinational firm and development economics. These are the theory of the product cycle, theory of comparative costs, theory of unbalanced growth and resource exploitation practices for Japanese import. In the second section, we observe the long-term trend of the tuna canning industry of Southeast Asian countries within the context of the world trend. In the third section, we examine the development process of each surveyed country and characterize the trend in each country as well as Southeast Asia as a whole. In the fourth section, we shed light on the production and trade of flavored canned tuna that has been developed and distributed recently in Southeast Asian countries. We categorize the products according to their taste and predict the future direction of such development. In the fifth section, we refer to the possibility of spillover effects from the tuna canning industry that might contribute to economic growth.

### はじめに

本稿ではマグロ缶詰産業の発展過程を多国籍企業論や開発経済論の文脈に照らして説明する。対象とする国は主として東南アジア三カ国、タイ、

フィリピン、インドネシアであるが、必要に応じて他国についても言及する。

結論から言えば、東南アジア諸国の缶詰産業の発展過程は国ごとにユニークな特徴を持つ部分と



共通する部分とがある。発展の段階や様相に応じて説明力のある理論を援用し、現状を分析するとともに将来展望を試みる。今後東南アジア三カ国はマクロに野菜や米を加えた調理済み缶詰の世界的供給基地として発展し、これが内生的経済成長の牽引役となる可能性がある。

1. ではまず、援用する多国籍企業論、開発経済論をレビューする。それらはプロダクトサイクル理論、比較生産費説、雁行形態論、日本型開発輸入論である。2. ではマクロ缶詰産業の長期トレンドを概観し、その中での東南アジア三カ国の位置づけを確認する。3. では国別に見た発展の特徴をたどり、そこから東南アジア三カ国のマクロ缶詰産業の特徴を浮き彫りにする。4. では東南アジア三カ国で展開している惣菜マクロ缶詰の商品展開を、郷土料理型とユニバーサルテイスト型に分け、その発展過程を整理し、今後の展望を行う。5. ではまとめとして、東南アジアの缶詰産業の発展が国内経済に波及効果をもたらす可能性について述べる。

## 1. 多国籍企業論、開発経済論のレビュー

本節ではまず、多国籍企業論、開発経済論の理論を四つレビューする。これらは第2節以降の現状分析に理論的検証を加えるために用いるものである。

### 1.1 プロダクトサイクル理論

第1はVernon (1966) らによるプロダクトサイクル理論である<sup>1</sup>。これは1960年代、米企業が多国籍企業化していく状況を説明するために考案された。製品にはライフサイクルがあり、それらは新生期、成長期、成熟期に分けられる。先導国は新生期に新製品を開発し、成長期を通じてそれを国内で販売するが、余剰分は他の先進国へ輸出する。輸入した国では新生期の需要を輸入によって賄うが、やがて国内生産を開始する。この頃、先導国ではすでに製品は成熟期に入っており、国内需要は輸入によって賄われることになる。

同製品はやがて途上国に輸出され、途上国でも輸入から輸入代替の国内生産、そして輸出というサイクルが繰り返される。後年、Krugman (1979)

はプロダクトサイクル理論をより精緻化し、このサイクルが先進国による新製品開発と途上国による技術模倣のいたちごっこによって起き、さまざまな製品についてこれが生じているとした。

### 1.2 比較生産費説

第2はRicardo (1913) が提唱した比較生産費説である<sup>2</sup>。プロダクトサイクル理論は国によって生産費が異なるために生産国の移転が生じるのだと述べている。これに対して比較生産費説、ないし比較優位の原理は、生産費の違いが二国間貿易ないし国際分業の源泉であることをより明示的に表わしている。そのエッセンスは、生産要素が相対的に豊富な国が、それを使った製品を生産して輸出し、代わりにそうでない製品を輸入するというものである。リカードの説を受けて、生産要素の賦存比率の違いが貿易の発生源であるとしたのはヘクシャー＝オリーンのことからこの理論はヘクシャー＝オリーンの定理とも呼ばれる。

ところで、この生産要素は通常、労働と資本と仮定されているが、その一つを天然資源に置き換えると、経済発展の理論となる。ステーブル理論 (Staple Theory) によると、経済を先導するような天然資源に基づく輸出産業が存在すると、この産業から次第に他産業へと波及効果が生じ、全体として一国の経済成長が促進されるという。しかし天然資源の賦存は諸刃の剣でもある。オランダでは1970年代から1980年代初めにかけて長期の不況に見舞われ、近隣諸国より景気回復が遅れたが、石油資源が豊富な国でこれをてこにした製造業がなぜ景気の牽引役にならないのかという点が議論となり、この謎の不況は「オランダ病」と名づけられた。「オランダ病」の例が示すように、天然資源—オランダの場合は石油—の豊富さが経済成長の足かせになって、他の製造業が縮小してしまうというケースもある。

### 1.3 雁行形態論

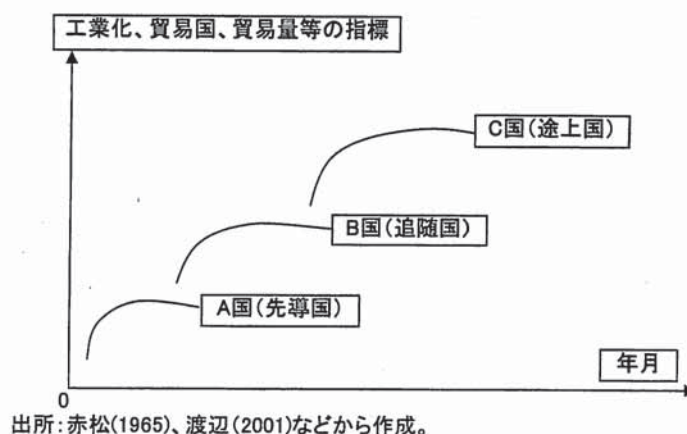
第3、第4の理論は日本人研究者による貿易と経済発展の理論である。その一つが赤松 (1965) による雁行形態論であり、そのエッセンスは、輸入から輸入代替の国内生産、そして輸出という一



連のプロセスが様々な製品について次々と起こる様子を示すものである<sup>3</sup>。時間の経過とともに、労働集約的な軽工業品から始まって資本集約的な重工業製品や資本財というように、次々と生産の主役が入れ替わっていく様子を図示すると、図表1の概念図に示すように、その軌跡があたかも雁が群れをなして飛ぶさまに似ているというのである。この理論は、プロダクトサイクル理論をより長期的に、またキャッチアップする途上国の側か

ら眺めたものとも解釈できるが、このプロセスの中でこの国が経済成長していくのである。

この理論は後続する経済学者に受け継がれ、拡大解釈されていくようになる。たとえば一つの産業について見れば、後発の国が次々生産拠点を受け継いでいくさまを説明できる。渡辺(2001, pp. 102-103)はその様子を日本、NIES、東南アジアへと受け継がれる重層的追跡構造であると説明している。



図表1 雁行形態論の概念図

#### 1.4 日本型開発輸入論

第4として、小島(1981, pp. 334-335)によって展開された日本型の開発輸入パターンに言及しておきたい<sup>4</sup>。開発輸入とは、もっぱら自国への資源産品の輸入を目的として他国に進出することと言う。日本の場合、進出に当たっての資本参加はせいぜい10%~30%と最小限に留め、現地企業と長期購買契約を結んで自国への安定的な輸入を確保することが一般的だというのである。これが欧米型の自社開発(captive mine)と異なる点である。欧米型では相手国に100%所有支配会社を設立する。販売先も自国とは限らず、利益のあがるところならばどこへでも販売するのが特徴である<sup>5</sup>。

ここで想定されている天然資源は石油や鉄鉱石だが、農業や水産資源にも示唆を与えている。

#### 2. 長期トレンドからみたマグロ缶詰生産と貿易

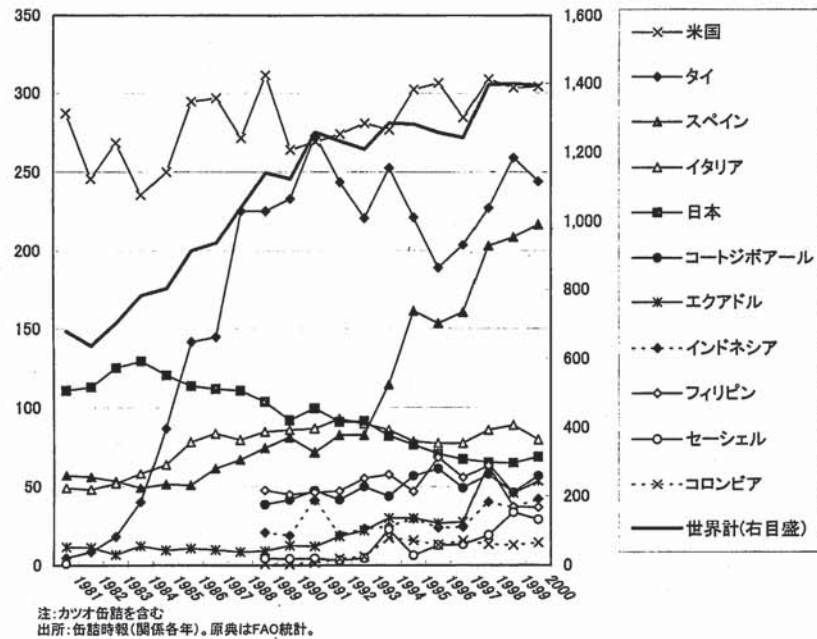
本節ではマグロ缶詰の生産や貿易の長期トレ

ンドを概観することによって、現在の東南アジア三カ国が置かれている状況を確認することとする。

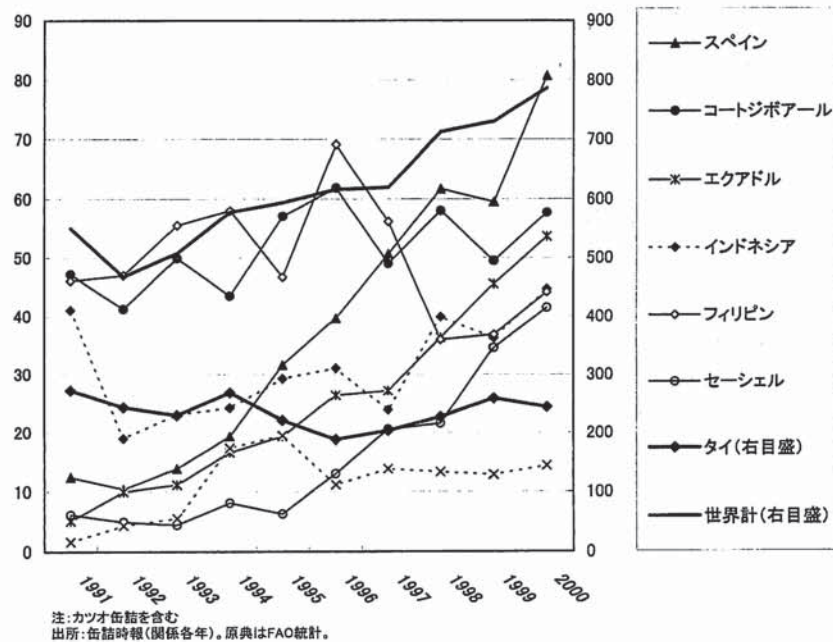
缶詰には二百年の歴史があり、マグロ缶詰だけをとってもすでに百年の歴史がある(Laurs et al. (1992) p. 136)。その中で、図表2に見るように、マグロ缶詰の世界需要は1980年代には依然増加していたが、1990年代に入るとその伸びが鈍化している。ライフサイクル理論を当てはめれば、すでにマグロ缶詰の世界需要は成熟期に入っている。

図表2から国別の生産量を、図表3から国別の輸出量を見てみると、雁行形態の様相が見てとれる。たとえば生産量で見れば(図表2)、1980年代中盤、日本の低落に代わってタイが驚異的な立ち上がりを見せ、1990年代になるとフィリピン、インドネシアが横ばいとなるなかでエクアドル、セーシェル、コロンビアなどの生産量増加が観察できる。また1990年以降の輸出量を見てみると(図表3)、輸出量総計が増加しているなかでタイ





図表2 主要国のマグロ缶詰生産量の推移(単位: 1,000トン)



図表3 主要国のマグロ缶詰輸出量の推移(単位: 1,000トン)

のシェアは漸減し、フィリピン、インドネシアの輸出量は極めて不安定な動きを示している<sup>6</sup>。そしてセーシェル、エクアドルは増加している。こう

して、東南アジア三カ国はより後発のアフリカや南米諸国にキャッチアップされようとしている。さらに同表にはまだ現れていないアジアの大国、



中国がこの後に続いてくる可能性もある。

ところでプロダクトサイクル理論はライフサイクルの成熟期ないし衰退期にはその国での需要が後発国からの輸入によって賄われると述べている。そこでは暗黙のうちに、国内生産が消滅するかのように説明をしている。比較生産費説を援用しても、いったん貿易が始まれば国内生産は一定

の時期をもって終了すると考えるのが妥当であろう。しかし実際には図表2に見るように、すべての先進諸国で国内生産が完全消滅したわけではない<sup>7</sup>。図表4に示すように、先進国である日米の自給率は2000年、米国で71%、日本で67%とかなりの量が国内生産されている。これらの国々ではマグロ缶詰が輸入も国内生産もされており、いわ

図表4 主要国のマグロ缶詰生産・貿易量の指標（2000年、単位%）

	世界生産量に占めるシェア	国内供給量の世界シェア	自給率	国内供給の国産依存度	国内生産の輸出依存度
米国	21.82	30.18	70.57	99.56	0.62
タイ	17.50	0.00	∞	0.00	100.00
スペイン	15.55	11.25	134.91	66.55	37.26
イタリア	5.74	9.83	56.95	89.25	21.15
日本	4.98	7.28	66.80	99.49	0.77
コートジボアール	4.10	0.00	∞	0.00	100.00
エクアドル	3.85	0.00	∞	0.00	100.00
フランス	3.19	6.29	49.47	58.12	145.65
インドネシア	3.01	0.00	∞	0.00	100.00
フィリピン	2.62	0.00	∞	0.00	100.00
セーシェル	2.06	0.00	∞	0.00	100.00
ガーナ	1.80	0.00	∞	0.00	100.00
モーリシャス	1.31	0.05	∞	3.84	96.16
コロンビア	1.03	0.46	216.79	31.57	100.00
ベネズエラ	0.72	1.35	51.84	100.00	0.00
セネガル	0.63	0.00	∞	0.00	100.00
コスタリカ	0.31	0.00	∞	0.00	100.00

注：自給率＝国内生産量／国内供給量

国内供給の国産依存度＝国内供給量／国内生産量＋輸入量

輸出依存度＝輸出量／国内生産量

出所：缶詰時報（関係各年）（原典はFAO）から作成。

ゆる産業内貿易が行われているのである。

この理由として、関税などによる国産品保護政策の影響も否定できない。しかしむしろ、マグロ缶詰といえどもバラエティがあって同質財ではなく、国産品と輸入品が補完財として共存しているためと考えられる<sup>8</sup>。マグロ缶詰に家庭用と業務用の二つの市場が存在することを勘案すると、図表5に示すように品質・価格面で高級な国産品は主として家庭用に、品質・価格面で低級な輸入品は主として業務用といった市場のセグメンテーションがあると考えられる。家庭用の場合、消費者は店頭でブランド名を頼りに製品を選ぶので、知名度の高い国産品は消費者へのアピール力の点

で有利である<sup>9</sup>。一方、業務用の場合、最終消費者が食材の製造メーカー名にまで関心を寄せることはない。なお、高品質・高価格の高級品を自国で供給し、低品質・低価格の低級品を途上国から

図表5 輸入国の缶詰市場における市場のセグメンテーション（概念図）

	高品質・高価格	低品質・低価格
国産品	家庭用	
輸入品		
	業務用	



輸入することについては、その理由が必ずしも技術水準の差異に起因するとはいえないであろう。原料の魚は同質であり、マグロ缶詰生産基地のある途上国は漁場から近い場所に立地しており、より新鮮な魚を加工できるはずだからである。むしろ、相対的に生産費の高い先進国が価格弾力性の低い高級品の生産に特化し、価格弾力性の高い低級品の生産は価格競争力のある途上国に委ねていると解釈するのが妥当であろう。

なお、スペインは統計上は自給率が100%を越えているが(図表4)、だからといって輸入が皆無ではない。輸入している以上に輸出しているのであり、その仕向け先は主として欧州域内である。これについては次節で改めて検討する。

### 3. 国別にみた発展の特徴

本節では国別に、マグロ缶詰産業がどのように発展してきたかを述べる。まず、タイ、フィリピン、インドネシアの発展を概観したのち、貿易で代替・競合関係にある他の諸国についても概観する。

#### 3.1 タイ

タイのマグロ缶詰産業はきわめて短期間のうちに急激に立ち上がり、その後今日に至るまで世界第二位の生産レベルを維持し続けている。しかしその歴史は意外に浅い。山尾(2000、p.169)によると1980年代前半からタイのまき網漁業においてカツオ・マグロ類の水揚げが増え、また外国企業との合併や技術提携をてこに有望な輸出産業に育っていったという<sup>10</sup>。1984年にはマグロ缶詰産業も、エビやプロイラーと並んで政府の輸出奨励産業の一つとなることが決まった(末広(2000)p.18)。マグロ漁業の育成自体は政府の振興策に入らなかったが、すでにマグロ漁業が盛んにおこなわれていたフィリピンやインドネシアなどから輸入したマグロ原魚を使って、タイ国内で生産が行われた。図表2にみるように、わずか数年で生産量は米国に次ぐ世界二位に、輸出量(図表3)も世界一位となり、2001年現在その地位を保持している。

原魚を輸入に頼る点、急速な発展スピード、そ

して競争優位の持続性がタイ独特の缶詰産業発展の特徴と言える。これはしかし、第1節でレビューしたどの理論にもそのままでは当てはまりにくい。そこで一つずつ掘り下げて検討していこう。第一の特徴である原魚の輸入について、山尾(2000、p.174)は、加工企業が国内原料基盤に制約を受けない道を選んだと述べ、これが企業としての戦略であると指摘している。菊地・長谷川(1994、p.84)もまた、タイが国際的水産加工基地として特化し機能していくことによって、むしろ逆に自国原料の不足ならびに漁業生産体制の不備という制約から解放され、産業的発展の新たな条件を確保しつつあると述べている。これはサバ加工の文脈において述べられたものであるが、マグロ缶詰にも同様に当てはまるだろう。第1節でレビューしたステープル理論は、天然資源の賦存が輸出産業の発展する原動力となると述べているが、タイのケースは産業の立ち上がり時点はともかく、その後の発展はこの理論の反証ともいえる。天然資源を国際市場で調達することで国内漁業生産の制約から逃れ、第二の特徴である急速な規模拡大が可能となったのであり、第三の特徴である加工基地としての競争優位を獲得できたのだとも解釈できる。後述するインドネシアとは対照的なケースである。

第二の特徴である急速な発展スピードについては、日本の産業政策を模倣したものだという説もある。鉄鋼、石油などの天然資源に恵まれなかった日本は、戦後通商産業省が主導するターゲット化した産業振興政策によって産業を興し、経済成長を牽引したことが定説となっているが、佐野・多屋(1994、p.131)は、タイの水産缶詰加工の発展とその製品輸出振興は日本の発展を模倣したものであると述べている。

第三の特徴である競争優位の持続性については、比較生産費説を援用すれば、労働集約的な缶詰生産についてタイは比較優位を持っていたと言えるだろう。末広(2000、pp.18-19)によると、タイのマグロ缶詰工場と日本のそれとを比較すると、労働と資本の集約度に違いがあると言う。日本では製造工程の機械化が進んでおり、人手は極端に省力化されている。そのため魚体サイズが一



定でなければたちまち対応できなくなる。一方タイでは数多くの作業員が手作業で魚の加工を行う。そのため魚体サイズが不ぞろいであっても一つの製造ラインで対応でき、魚肉の焼けや傷も目視で発見して手作業で除去できる。このことから、同一の製品を生産する場合でも、労働集約的な生産方法と資本集約的な生産方法があり、マグロ缶詰の場合は、労働集約的な生産方法が結果的に国際競争力を有していたと言えるであろう。

ただしこの場合にも、比較優位は先進工業国に対して有しているのであって、豊富な労働力、低い賃金などの点でタイはフィリピンやインドネシアに比べて特に優位にあるわけではない。タイの人々は手先が器用であると定評があり、マグロ缶詰以外にも日本市場向けの食品加工業が数多く存在する。それ以外の今ひとつの手がかりは第一の特徴、すなわち国内漁業に縛られることなく加工業が発展できたことに求められるだろう。つぎに述べるように、フィリピンとインドネシアは豊富な漁場を有しており漁業も盛んである。

なおタイ国内にはマグロ類の消費習慣があまりなく、マグロ缶詰産業はひたすら輸出特化型産業として存在していた。

### 3.2 フィリピン

フィリピンは欧米型の開発輸入が行われた場所として典型的である。すなわち、同国の漁業は1950年代には米国のマグロ缶詰会社への原料供給基地として開発され、米国資本のまき網会社も設立された。1970年代になると、民族資本の缶詰工場が立ち上がり、ピーク時には米国の輸入シェアの70%をフィリピン産が占めるほどに成長した (Aprieto (1995) p.168, Thomas (1999) p.23)。しかし1980年代後半からタイが生産を伸ばし始めると、市場をタイに奪われる形となった。それまでフィリピンでは缶詰原料としてのマグロ輸入を禁止し、原料供給は国内漁業に任せることとしていた。ステーブル理論の実践版である。しかし1986年、国内缶詰業者の強い要望を受けてこれを解禁したものの、その後も生産量がタイ並みになることはなかった。フィリピン国内でもタイと同様、限られた地域を除けばマグロは国内消費して

いなかったが、次節で紹介するように、1990年代末からは国内市場の開拓も始まった。しかし国内市場への供給量は微量とみえ、図表4に見るように、タイやインドネシアと同様、統計上は国内消費が顕在化していない。

### 3.3 インドネシア

インドネシア政府は自国の海洋資源の重要性を認識しており、缶詰会社も、そこへ原魚を供給する漁業も政府の計画下にある。そのこと自体をことさら政策の失敗だと決め付けられないが、そのために自由な立地や操業ができにくい状況にある (Yamashita (2001) p.220)。缶詰工場はバリ、ビトンなどマグロ漁業基地の5カ所に配置され、タイに先行して1984年から本格的に稼働しているものの、必要なとき必要な原料が供給されないという問題を抱えている (RBI (2001) p.12)。自国には豊富なマグロ資源と強いマグロ漁業があり、数量の面で供給不足になることは考えられない。しかし、RBI (2001, p.12) によると、価格面で折り合いがつかず、国内供給をあきらめるといふ。国内向け価格と国際価格が同一ではないということからも、インドネシアの缶詰産業が国際的な市場原理の下に運営されていないことが明らかである。その結果として、インドネシアが原料供給基地となってしまっているが、RBI (2001, p.12) は、缶詰加工することでより付加価値を得ることができるにも関わらず漁獲量の1%しか缶詰となっておらず、残りのほとんどが原魚として輸出され、他国で缶詰加工されているという事実について、惜しいことだと述べている。

豊富な資源があることで、かえって自国の製造業が縮小してしまう状況は、比較生産費説の項で紹介した「オランダ病」の一例であると言えるだろう。インドネシアは石油、森林など水産資源以外にも豊富な天然資源を有しているが、総じてオランダ病の呪縛にとらわれているのかもしれない。

インドネシアの国内でも、小型カツオを除けばマグロ類を国内で食用にする習慣はなかった。マグロ漁業とマグロ缶詰産業が国内での需要の受け皿がないままに展開されていくこと、言い換え



ば輸出特化型の産業展開が行われた点が、東南アジア三カ国に共通した特徴である。しかし第4節で紹介するように、国内用にマグロ缶詰が開発されるようになる。すると惣菜マグロ缶詰はタイ、フィリピンと比べてもインドネシアが最もバラエティに富んでおり、またマグロの品質の面でもこれら二国に遅れをとるものではない。また、刺身の生鮮・冷凍マグロを日本に輸出しているが、この品質についても高いと評価されている<sup>11</sup>。問題は品質ではなく、缶詰供給能力にあるようだ。

### 3.4 日本

日本のマグロ缶詰産業の始まりはフィリピンのそれと類似している。フィリピンに先行する1930年代、米国への原料供給基地として発展し、やがてマグロ缶詰が輸出されるようになった。岩切(1982、p.405)によれば、大資本を主力とする合弁企業が欧米諸国へ水産物を輸出していた。しかし1960年代後半から、こうした合弁企業がタイ向けの輸出へと移行していったという。欧米への輸出市場はより賃金の低い東南アジア諸国に奪われ、やがて日本国内市場向けに輸入も始まってい

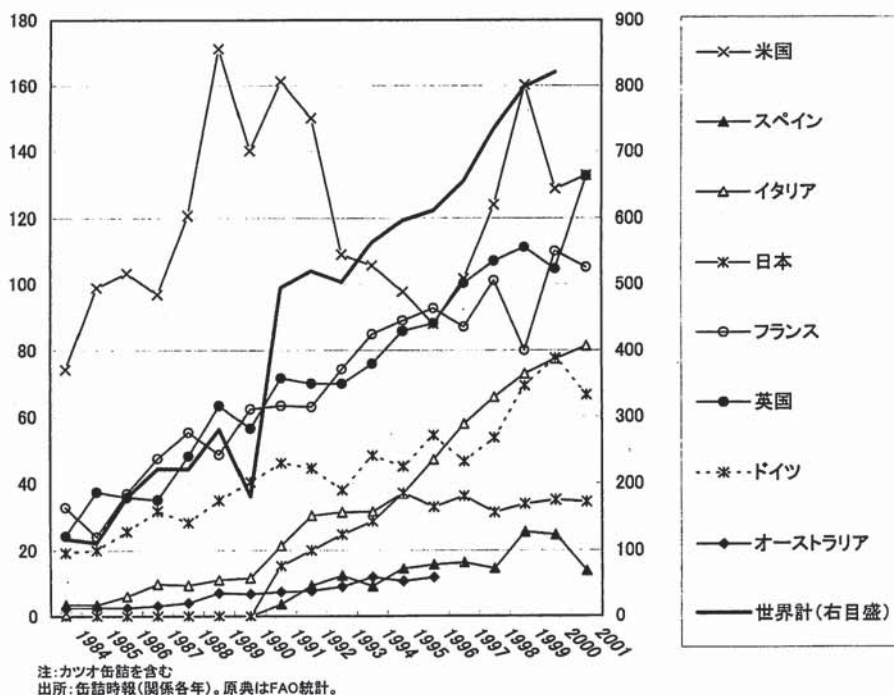
く。

日本では、国内生産を開始してから国内消費も始まったところに特徴がある。やがて後発国での生産が開始され、そこからの輸入が開始されるプロセスはプロダクトサイクル理論に当てはまる。ただし日本では国産品選好が強いいため、家庭用国内供給はほぼ自給する体制が続いている。統計上は自給率が67%であるから、輸入品が33%存在するはずであるが、小売市場の店頭で輸入品を見かけることはほとんどない<sup>12</sup>。缶詰時報(2001年11月、pp.14-16)によると、業務用では輸入品の割合が高いと言う。

次のスペインやフランスと異なり、輸出はほとんどない。わずかに存在する輸出の仕向け地は中東などで、主として災害援助物資としての輸出である(缶詰時報2001年11月、p.15)。

### 3.5 スペイン、イタリア、フランス

スペインやフランス、イタリアは国内生産、輸出とも堅調で、しかも輸入も行われている(図表2~4、図表6)。この背景にはEUが共通市場となり、域内ものとしてスペイン製やフランス、イ



図表6 主要国のマグロ缶詰輸入量の推移 (単位: 1,000トン)



タリア製の製品がEU内を自由に流通するようになったことで、生産と輸出がかえって拡大したという要因がある（水産新潮社（1997）p.217）<sup>13</sup>。

特に生産、輸出とも1994年以降のスペインの伸びが著しい（図表2、3）<sup>14</sup>。2002年現在ではスペイン産のマグロ缶詰はEU全体の輸入量の約10%を占めている（図表7）。欧州各国にとってスペイン製のマグロ缶詰が国産品の近い代替財としてのポジションを得ており、それらの国々で国産高級品との輸入代替が生じているためと考えられる。EU域内で新たに高級マグロ缶詰のプロダクトサイクルが発生していると解釈することもできる。なお、イタリア産、フランス産のマグロ缶詰も同様に生産に大きな縮小はなく、欧州の中ではスペイン型の生産国として残っている。

図表7 EUのマグロ缶詰輸入量と国別割合（2002年）

輸 入 先	輸入量(トン)	輸出シェア
セーシェル	56,472	12.0%
コートジボアール	52,387	11.1%
スペイン	44,837	9.5%
タイ	40,345	8.5%
フィリピン	39,186	8.3%
エクアドル	27,278	5.8%
モーリシャス	26,625	5.6%
イタリア	25,503	5.4%
フランス	23,762	5.0%
ガーナ	22,620	4.8%
マダガスカル	15,390	3.3%
インドネシア	10,432	2.2%
セネガル	8,478	1.8%
その他	79,151	16.8%
EU計	472,466	100.0%

出所：水産新潮社（関係各年）（原典はFood News）から作成。

### 3.6 米国

米国は世界最大のマグロ缶詰消費国であり、世界市場への影響も大きい。その経緯をたどると、1900年代初頭になって、サケ缶詰の代替品としてマグロ缶詰が生産され始めたが、1930年代にははや米国沿岸のマグロ資源では国内の旺盛な需要を満たすことはできなくなり、マグロ缶詰の原料を求めて、世界の海とその沿岸国へ進出していった（Laurs et al. (1992) p.136）。この影響でさまざ

まな国がカツオ、マグロという自国の天然資源の存在とその商品価値を認知することとなり、米国という大消費市場へ向けた輸出志向型マグロ缶詰産業を立ち上げることになった。米国こそがマグロ缶詰産業のプロダクトサイクルの起点なのである。とはいえ2000年時点でも米国の自給率は71%で、相当量の国内生産が輸入代替されずに残っている。国内生産は近年減少トレンドにはないため（図表2）、今後も国産缶詰というジャンルが残っていくと予想される。米国のマグロ缶詰に対する品質要求は、ヨーロッパ諸国より厳しいと言われている<sup>15</sup>。そこで今後とも、高品質な国産缶詰と低品質な輸入缶詰が共存する形で残るであろうと推察される。

### 3.7 アフリカ諸国

アフリカ西海岸のコートジボアールは、漁場に近いこともあり、フランスが早い段階から漁場を開発して現地での缶詰生産を開始した（水産新潮社（2003）p.433）。これは典型的な欧米型の開発輸入である。同様の開発輸入はフランスの影響下にある同国のほか、セネガル、そして英国の影響下にあるセーシェル、ガーナ、モーリシャスなどでも行われている（図表7）。これらの国々は、かつて植民地であったという歴史的経緯もあり、暗黙のうちにも旧宗主国への輸出ルートが保証されており、特惠関税が適用されている。その意味では、日本型の長期契約に基づく開発輸入に準じる形態であるということもできる。

### 3.8 中央・南アメリカ

近年、この地域からの米国向け輸出を目的とした生産がはじまっている。エクアドルへは1990年代末、米国の缶詰工場が進出している（水産新潮社（2001）p.440、同（2003）p.433）。コロンビア、ベネズエラも生産量を伸ばしている。

これらの国の特徴として、すでに国内消費が相当量存在していることが上げられる（図表4）。これは、東南アジア諸国が輸出特化型の生産を行っていることとは対照的な特徴である。その意味で、マグロ缶詰生産において、プロダクトサイクル理論がよく当てはまるのがこの地域である



う。すなわち、米国とスペインからの食文化・食習慣輸出の一環としてマグロ缶詰の輸入が始まり、国内にマグロ消費が定着し、やがて太平洋東岸や大西洋西岸のマグロ資源にも恵まれて国内での生産が立ち上がるという構図である。ただし、中南米のマグロ産業について筆者が得た情報は限られており、統計からの推察に留まる。

#### 4. 惣菜マグロ缶詰製品の展開

東南アジア諸国のスーパーマーケットのマグロ缶詰売り場で目を引くのは、惣菜マグロ缶詰の種類の豊富さである。これらの国々においては小売

店の店頭を見る限り、マグロ缶詰は調理用素材ではなく調理済み食品として扱われていることがわかる。そこで筆者は1999年から2004年まで、外国を訪問した際にスーパーマーケットでマグロ缶詰を購入・収集し、2004年に開缶・試食した。その数は84点に上るが、これでも網羅的と言えるわけではない。以下ではこれらのデータ及びインターネットなどで得られる商品情報を元に、惣菜マグロ缶詰の動向を分析する。なお、業務用のマグロ缶詰製品を入手することはできないため、以下の分析は家庭用缶詰を中心として行う。図表8はその要約である。

図表8 東南アジア諸国におけるマグロ缶詰のジャンル、味付け、輸出の展開

ジャンル		味付け	輸出仕向け先	国内消費	特徴および今後の展開
調理用素材		油漬け、ブライン、水煮、野菜スープ煮	米国、欧州		<ul style="list-style-type: none"> <li>・本ジャンルの製品がなお主流をなす（特に業務用）</li> <li>・業務用においてもユニバーサルテイスト（伝統的味付け）が代替する可能性が考えられる</li> <li>・輸出志向型の国においては、一部の地域を除いてマグロの食習慣がなかったため、このジャンルの製品はそれほど普及しないと予想される</li> </ul>
惣菜	ユニバーサルテイスト：伝統的味付け	マヨネーズ、マヨネーズと野菜		タイ	<ul style="list-style-type: none"> <li>・クラッカー、飲料、ナプキン、スプーンなどがワンセットになっている</li> <li>・レトルトパウチなど他の容器も利用されている</li> <li>・鮭（熱帯の住民にとって新種の魚）、鶏肉（マグロ缶と味は似ているがより安価）など他のバラエティも並列的に販売されている</li> </ul>
	郷土料理	アドボ		フィリピン	<ul style="list-style-type: none"> <li>・輸出リジェクト品の仕向け先として国内市場開拓が始まる</li> <li>・血合いの色や臭気を消すため、濃い色・濃い味付けで調理されている</li> <li>・先行普及していたイワシ缶詰、サバ缶詰用の調理法をマグロ缶詰にも適用</li> <li>・インドネシア製国内向け缶詰は焼き飯のタレなどバラエティが豊富</li> <li>・中国ではまだマグロ缶詰の生産は行われていない</li> </ul>
		ナンプリック		タイ	
		サンバル・ゴレン		インドネシア	
		ピカンター・ドレッシング	ドイツ		
		豆チ（トウチ）	中国		
	ユニバーサルテイスト：新味	スモーク	オーストラリア、ニュージーランド		・スモークサーモンの応用
		ツナ入り健康食	オーストラリア、ニュージーランド 米国、欧州		<ul style="list-style-type: none"> <li>・低カロリーで栄養バランスの良いスナック</li> <li>・ドライ缶でイージーオープン缶</li> </ul>

出所：各種缶詰（現物）などをもとに作成。



#### 4.1 素材用缶詰

マグロ缶詰は調理素材としての缶詰と惣菜としての缶詰に二分できる。素材としての缶詰に分類したのは、キハダ、ビンナガ、カツオなどの油漬け、ブライン、水煮、および野菜スープ煮である。マグロそのものの味しかついていないものから、ある程度マグロ以外の味がついているものまであるが、いずれも開缶後そのまま食べるというよりはマヨネーズで和え、さらには野菜を加えてサンドイッチの具にしたり、サラダのトッピングとして使用したりする。米国やヨーロッパではこの形態での缶詰流通が主流であり、日本でも同様である。

#### 4.2 郷土料理味の惣菜缶詰：国内市場の開拓

東南アジアでは、郷土料理の味付けがされたマグロ缶詰が数多く売られている。一例として、図表8に挙げたような種類があり、フィリピンのようにさまざまなメーカーが同一料理のマグロ缶詰を販売している場合もある<sup>16</sup>。これらはマグロ缶詰メーカーが国内市場用に開発したものである。もともと食習慣が存在しなかった商品が海外から輸入され、国内消費が定着するということであれば、プロダクトサイクル理論が適用できるが、東南アジアのマグロ缶詰の場合はそうではない。以下にみるように、開発輸入の加工残滓の有効利用という形でマグロ缶詰が国内に浸透していく。これはきわめてユニークな発展過程であり、この部分については第1節で検討したい。いずれの国際貿易論、開発経済論によっても説明できるものではない。さらに惣菜マグロ缶詰を素材用缶詰とは異なる新製品と見るならば、これは追随者であったはずの途上国が新製品を開発したということになり、Krugman 流の途上国模倣論からも外れる発展のパターンである。残念ながら国際的な統計を見る限り、これら三カ国にはマグロ缶詰の国内市場は存在しない（図表4）。しかしスーパーマーケットの棚には、イワシ、サバ缶詰と並んで、相当数のマグロ缶詰がこうした惣菜缶詰として並べられているのである<sup>17</sup>。

マグロの惣菜缶詰が国内に流通することになったのにはいくつかの段階とそれに応じた必然性が

ある。そもそも国内用マグロ缶詰に用いられている身は輸出用の品質を満たさないものであった<sup>18</sup>。良質の身であっても血合い部分の色の濃い身は価値が低く、白身部分でも焼けや傷がついていると輸出には向けられない<sup>19</sup>。また鮮度が低く臭気強いものも輸出用から除外される。タイではこれらを集めて輸出用のキャットフードを製造してきた（上智大学・世界食糧デーグループ・ペットフード班（1996）p.55）。一方フィリピンではこれらを国内市場で販売しようとしたのである<sup>20</sup>。国内市場で販売する際、味付けにした理由の一つはここにある。すなわち色の濃い身や臭気強い身であるから、濃い色や濃い味で調理して色や臭気をかき消す必要があった。味付けにした理由はもう一つあり、それは国内ではマグロの食習慣がほとんどないため、素材として提供しても需要が見込めなかったからである。そこで、開缶後そのまま惣菜として食べられるような形態に調理して販売する必要があった。

味付けには、郷土料理と後述するユニバーサルテイストがあるが、マグロ缶詰の国内市場開拓初期には郷土料理の味付けが行われた。それは、すでにイワシやサバの缶詰に使われていた郷土料理をそのままマグロに適用したものである。これにも二つの理由がある。第一に、イワシやサバも臭みのある魚であり、その臭気をかき消す料理は輸出に向かないマグロの調理方法として適していたからである。もう一つの理由は、イワシやサバの惣菜缶詰を食べ慣れている消費者にとって、味は同じで素材が新しいという特徴をもつマグロ缶詰ならば、味も素材も新規な商品より消費者が手に取りやすいだろうからである。

以上の段階までは、少なくともフィリピンにおいて観察された現象である<sup>21</sup>。しかしその後、さらに二つの経済的要因によって、マグロ缶詰の国内市場開拓はこれら三カ国でより強く推進されることになる。その一つは、国際市場において、後発国の生産と輸入の追い上げに直面したという、生産者側の要因である。第2節で見たように、アフリカや中南米諸国は自国近辺に豊富な資源があり、輸出仕向け国と政治的・経済的に親密な関係もあり、有利な環境条件の下でマグロ缶詰生産と



欧米への輸出を増やしてきている。コスト面でも、東南アジア諸国は不利になってきた。そこでメーカーとしては、芽生えつつある国内需要をさらに促進し、輸出代替としての国内市場の育成をはかる必要が出てきたのである。

一方、消費者側でも栄養価の点で、マグロ缶詰の消費を積極的に受け入れる素地ができつつあった。所得水準の上昇に伴い、人々はバランスのとれた食生活や栄養価の高い食品、さらにダイエット効果のある食品を選択して消費するようになる。これに呼応して、タイ、フィリピン、インドネシアの缶詰ラベルには、「オメガ3含有」<sup>22</sup>との標語が強調され、インドネシアの場合はこれに加えて「低コレステロール」と「DHA」が強調されている<sup>23</sup>。

このように、いくつかの外的・内的要因が段階的に重なり合った結果、国内向けとして郷土料理の味付けをベースとした惣菜缶詰が定着していった。

#### 4.3 郷土料理味の惣菜缶詰：海外展開

東南アジア三カ国を起源とする郷土料理味の惣菜缶詰の開発は、その後プロダクトサイクル理論や雁行形態論で説明可能な発展経路を示すようになる。その一例が、中国への進出である。フィリピンの缶詰会社は自国内での市場開拓の成果を踏まえ、巨大な未開拓市場である中国への進出を狙い、これを果たしている<sup>24</sup>。北京のスーパーマーケットには、フィリピンの缶詰会社 Century 社によるマグロの豆チ（トウチ）煮、香辣マグロ、タイ Ayam ブランドによる唐辛子マグロなど、いわゆる中華料理味のマグロ缶詰が並んでいた<sup>25</sup>。中国においてもマグロの食習慣はないので、今後、どの程度輸入マグロ缶詰が普及していくかは不明である。また、2002年時点で、中国はまだマグロ缶詰生産を行っていない。もし輸入が国内生産に切り替わり、さらに郷土料理味のマグロ缶詰を東南アジア向けに輸出することになれば、これは東南アジアを基点としたプロダクトサイクルの例となるであろう。

もう一つの海外展開の例は、タイ産の惣菜マグロ缶詰のドイツでの販売である。もともとタイは

ヨーロッパ諸国のなかではドイツへの輸出比率が高い（図表9）。ドイツのスーパーマーケットでは、ドイツの郷土料理であるピカンター・ドレッシング和えのマグロ缶詰が売られていた。この店には、ドイツの缶詰会社 la Perla ブランドの OEM 製品として水煮、野菜スープ煮、油漬けなど5種類のマグロ缶詰が並べられていたが、そのうちのひとつ、唯一の惣菜マグロ缶詰がピカンターであった<sup>26</sup>。すでに素材缶詰の輸出実績のある国に対して、惣菜缶詰を追加的に輸出するということである。これはより付加価値の高い製品を生産して輸出しようという試みで、雁行形態型の経済発展に伴って貿易財がより付加価値の高い財へと刷新されていく例であると解釈することができる<sup>27</sup>。

図表9 タイのマグロ缶詰輸出量と国別割合（2002年）

輸出先	輸出量（トン）	輸入シェア
米国	73,634	23.0%
カナダ	25,523	8.0%
オーストラリア	23,683	7.4%
日本	23,496	7.3%
エジプト	21,216	6.6%
英国	17,248	5.4%
サウジアラビア	12,407	3.9%
ドイツ	10,406	3.2%
リビア	9,540	3.0%
イスラエル	7,635	2.4%
その他	95,481	29.8%
輸出計	320,269	100.0%

出所：缶詰時報（関係各年）（原典はFAO）から作成

#### 4.4 ユニバーサルテイスト：伝統的味付け

惣菜マグロ缶詰のもう一つの形態として、マヨネーズで和えてから缶詰にするタイプがある。コーン、たまねぎなどの野菜が入っているものもある。マヨネーズ和えは素材型缶詰の用途として最もポピュラーな調理方法であろう。その調理の部分まで缶詰製造工程に取り込んでしまうものであり、これは素材缶詰から一歩踏み込んだ付加価値型の缶詰生産形態であるといえる。本稿ではどの国の人でも食べられるものという意味で、ユニバーサルテイストと名づけた。

このタイプの缶詰は、タイの国内市場向けの缶詰として売られていた。「サンドイッチスプレッ



ド」]として缶詰単体で売られるものに加えて、クラッカーや飲料まであらかじめパッケージに含まれているものもある。アニメキャラクターがついていたり、鮮やかな彩りのパッケージにデザインになっていたりするものが多く、子どものスナック用に開発されたと推察される。

容器も缶詰のみならずレトルトパウチを使用するものがある。また、同様の調理方法・パッケージを使いながら、素材としてマクロではなく鶏肉や鮭を使っているものもあり、これらが同じ商品棚に並べられている。サンドイッチスプレッドというジャンルのなかでの素材や容器の広がりがある。

欧米市場向けにも、素材型缶詰の代替財として、今後、マヨネーズ和えの輸出が始まることは想像に難くない。東南アジア諸国が付加価値型製品の輸出を目指すならば、当然の動きとして予想される<sup>28</sup>。

#### 4.5 ユニバーサルテイスト：新味

今後ともマクロの惣菜缶詰として新しい味が開発され、それが欧米への輸出に向けられていくであろう。ここでは伝統的なマヨネーズ以外の味ということで新味と名づけたが、筆者が知る限りすでに存在する惣菜缶詰としては、スモークツナ味と野菜やコメと合わせたドライ缶がある。いずれもタイ製で、オーストラリアブランドとドイツブランドのOEM製品があった。東南アジアの郷土料理で味付けされた惣菜缶詰のなかには、味覚の嗜好が違いすぎて日本人である筆者らの誰も二口目に手が出ないようなものも多くあった。しかし、東南アジアで生産されたものであっても、欧米（オーストラリア、ニュージーランドを含む）向けに作られた惣菜缶詰は郷土色がなく万人向けの薄味の味付けがされており、食べやすかった。そこでこうした新味のものをユニバーサルテイストのジャンルとした。

野菜やコメなどマクロ以外の素材を組み合わせる万人の好む味を志向するという方向での新製品開発は、副惣菜の手当てや栄養価、栄養バランス、添加物・含有物の規制、食習慣など幅広い研究が必要となるのでアグリビジネスとしての体をな

し、川上の農業や川下の食品工業への広がりがある<sup>29</sup>。ステーブル理論は輸出が関連産業への波及効果をもたらし、ひいては経済発展に結びつくような形で貿易が存在すると述べているが、ユニバーサルテイストの開発はまさにその典型例と言えるだろう。

#### 5. まとめ—内生的経済成長の起点としてのマクロ缶詰産業

本稿では東南アジア三カ国を中心として、マクロ缶詰産業の展開過程を様々な角度から俯瞰してきた。マクロ缶詰産業の発展のパターンは、その段階や様相に応じて多国籍企業論や経済発展論の文脈の中で理解することができる。それによると、東南アジア諸国はかつて欧米の生産を代替したが、いまや後発国であるアフリカ・中南米からの追い上げに直面している。

そのかわり、付加価値型の製品として、惣菜マクロ缶詰という商品ジャンルが開発された。この商品でもって国内市場を開拓し、また外国市場への進出もはじめている。外国市場としては、既得市場である欧米への高付加価値型製品供給を目指す方向と、未開拓市場である中国の市場開拓という両面をもつ。また、惣菜の内容にも二種類あり、一つはその国の郷土料理、もう一つはユニバーサルテイストである。缶からレトルトパウチへの容器の変更やクラッカーなどとの組み合わせ、マクロから鶏肉、鮭への素材の多様化も見られる。ここに東南アジアのマクロ缶詰産業が模倣の段階を終えて、新製品開発へとステップアップした兆しがある。

マクロという素材を起源として展開される、このような多方向へのダイナミックな動きは、東南アジアの缶詰産業が国際競争に直面する中で多国籍に展開し、多角化を図っている証である。生産と貿易の波及効果が内生的経済成長の一つの起点となっている可能性がある。



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- <sup>1</sup> 本節(プロダクトサイクル理論)は、Hoogvelt (1987) p.179、小島(1981) p.236、木村(2000) p.228に基づき記述した。
- <sup>2</sup> 本節(比較生産費説)は、小島(1981) pp.33-34、木村(2000) pp.48, 50, 74-77, 224に基づき記述した。
- <sup>3</sup> 本節(雁行形態論)は、赤松(1965) pp.170-172、木村(2000) pp.218-220、小島(1981) pp.259-260に基づき記述した。
- <sup>4</sup> 本節(日本型開発輸入論)は、小島(1981) pp.334-335に基づき記述した。
- <sup>5</sup> 長谷川(1988) pp.56-57は、日本の大手水産会社、総合商社の水産物輸入へのかかわり方として、資本投下・合併・開発輸入を行う直接進出と、生産は現地企業に任せ、資本を貸しついたり生産資材を販売し、見返りとして魚を買い付けたりする迂回的進出の二通りがあると述べている。小島流の日本型開発輸入論の定義はこうした長谷川氏の観察と必ずしも一致しないが、長谷川氏の述べる二つのパターンを併せ持つものと解釈することもできるだろう。いずれにせよ日本型は、欧米型の自社開発とは経営の支配や生産物の仕向け先という点で対照的である。
- <sup>6</sup> 山尾(2000)、p.174は、雁行形態的な成長過程をたどってきたタイの水産業に対して、アジア経済危機を乗り越えるために輸出ドライブがかかったと指摘している。しかし図表2、図表3を見るかぎり、1997年の経済危機を境とした生産・輸出動向の変化は見られない。
- <sup>7</sup> オーストラリアの国内生産量は、1990年の4,000トンを最後に日本缶詰協会の世界統計か

ら除外されており、生産が消滅したかごく微量となったと想像される。

- <sup>8</sup> バラエティのうち、味付けのバラエティについては第4節で述べる。ここでは素材用マグロ缶詰の中での、主として品質の差からくるバラエティを指す。
- <sup>9</sup> 特に日本では国産品に対する強い選好があることもあり、小売店の店頭に並ぶマグロ缶詰はほとんどすべて、日本のブランドである。注12, 13参照。
- <sup>10</sup> 菊地・長谷川(1994) p.98によると、タイの缶詰会社の資本関係としては、非財閥系独立新興資本、ユニリーバ系列、ネスル系列などがあるが、日系はない。
- <sup>11</sup> たとえば1999年のインドネシア産生鮮キハダマグロの通関価格は830円/kgで、タイ、フィリピンからの輸入価格よりも高く、千トン以上の輸入量がある国からの平均輸入価格785円を上回っている。これはインドネシア産マグロの品質が高いと評価されている証拠である。
- <sup>12</sup> 堀口(1987) p.73によると、1986年当時の日本のマグロ缶詰市場では、輸入はマグロ缶詰原料輸入の段階から半製品・完成品の輸入へと広がっており、タイ産のマグロ油漬缶詰をCGCジャパンが輸入し始めたとりポートしている。一方、2004年7月、千葉県のエトヨーカ堂新浦安店における筆者の目視によると、3ブランド4種のマグロ缶詰のなかに明らかに外国産とわかるものはなかった。外国産であることが一見しただけではわからないような表示がされている缶詰は1種あった。また2004年12月、東京都の西友東陽町店における筆者の目視によると、AYAMブランドの「タイのトムヤムクン風ツナ」と「インドネシアのサテ風ツナ」と名づけられた惣菜缶詰(いずれも原産国はタイ)が売られていた。ただし缶詰売り場ではなく、エスニックフードの売り場である。
- <sup>13</sup> イタリアは日本と同様に、国産品嗜好が強いことが特徴である。これはオリーブオイル漬けという、独特の国内市場が存在するからだという(水産新潮社(1997) p.206)。
- <sup>14</sup> 前年比の伸びがこれらの年に際立って高いの



で、その背景にEU内での規制緩和など制度的要因があると予想されるが確認できていない。

- <sup>15</sup> 1999年9月、フィリピンの缶詰会社S社のマネージャーからのヒヤリングによる。

- <sup>16</sup> ツナ・アドボ (Adobo: アドボは酢醤油味の郷土料理) は少なくとも Century, 555, Swift Blue Bay という三つのブランドで販売されている。

- <sup>17</sup> 2004年8月、タイのスーパーマーケット、TOPs (マープンクロン店) での目視によると、マグロ惣菜缶詰は惣菜缶詰棚の約10%を占めていた。また、JETRO バンコク事務所でのヒヤリング (2004年8月) によると、マグロ缶詰の国内消費は生産量の10%未満であるとのリポートがあるが出所は不明とのことであった。山尾 (2000) p. 180によるとマグロ缶詰の99%は輸出されるとのことであるため、生産物の1%が国内市場に向けられるということになる。

- <sup>18</sup> フィリピンの Century 社製缶詰のラベルには、Export Quality と強調文字で書かれている。これが逆説的な証拠である。

- <sup>19</sup> 輸出に向かない製品、いわゆるリジェクトをどう扱うかということについて、濱田 (1989) p. 90は輸入側が定質・定形水産物を要求することによって、輸出国では必ず規格外の水産物を発生させることになるだろうと述べている。また古い文献にも論考がある。吉木 (1974) pp. 78-79は天然エビについて次のように述べている。すなわち、オーストラリアにはリジェクトを消化する国内市場が存在するため、オーストラリア産の輸出向けエビは品質・価格とも高い。対してインドネシア、タイでは、国内消費市場が未発達のため漁獲されたほぼ全量が日本に仕向けられるので、品質の差が大きく輸入価格が低くなると分析している。これらはいずれもマグロの缶詰の貿易を念頭に置いた論考ではないが、輸出特化型産業に共通の示唆を含んでいる。

- <sup>20</sup> V. Aprieto (1997年9月), フィリピンのマグロ漁業会社S社マネージャー (1999年9月) からのヒヤリングによる。

- <sup>21</sup> 同様の展開がタイやインドネシアでも行われていたのかについては確認できていない。

- <sup>22</sup> オメガ3とはDHA、EPA、 $\alpha$ -リレイン酸の

総称。「健康の辞典メガデータネット」より (<http://www.megadeta.net/omega3.html>)

- <sup>23</sup> これに加えて、タイ、インドネシアの惣菜缶詰ラベルの多くにハラール (Halal) の表示があった。ハラールとはイスラムの律法にのっとった食べ物のことを言い、ハラール食品をとることはすべてのイスラム教徒の義務と言われている。

「AZHAR HALAL FOODS」(<http://www.azhar.jp/info/halal-towa.html>) より。インドネシアはイスラム教国であるからハラール食品が流通するのは当然として、タイ製缶詰の場合は国内のイスラム教徒用の需要に応えるという意味もあろうが、近隣諸国 (マレーシア、インドネシア、シンガポール) のイスラム教徒による消費も意識したものと見られる。というのはこれらの缶詰ラベルのブランドや原料表示はタイ語と英語の完全併記になっているからである。こうした惣菜マグロ缶詰は中東諸国へも輸出されているのかもしれないが筆者は確認できなかった。

- <sup>24</sup> 1999年筆者がフィリピンの缶詰会社S社を訪問した際、マネージャーから、「今後中国への進出を考えている。マグロの豆チ煮 (tuna with black bean) の試作品を持ち込んでいるところだ」との話があった。

- <sup>25</sup> 2003年8月、スーパー発北京店における目視による。

- <sup>26</sup> 2000年7月、カッセルの食料品店 Todenhufer における目視による。Pikanter Dressing はドイツの郷土料理でピリ辛の味付け。なお、la Perla ブランドのマグロ缶詰は、タイでOEM生産されたものとフィジーでOEM生産されたものがあったがピカンターはタイ製である。

- <sup>27</sup> ただし、このマグロ惣菜缶詰の価格はDM1.21で、同一ブランドの素材型マグロ缶詰の価格DM1.19~DM1.20とほぼ同額であった。いずれも185g缶ではあるが、素材型は固形重量が150g、惣菜缶詰はマグロ重量が100gであった。

- <sup>28</sup> 業務用ですでに存在している可能性があるが、筆者には確認できなかった。また、マヨネーズの味自体にバラエティと好みがあるため、タイ国内向けのマヨネーズ味付けがそのままユニバーサルテイストとして流通しうるとは考えに



くい。マヨネーズ和えという一つのジャンルが素材型缶詰を代替していくという可能性である。

<sup>29</sup> 山尾 (2000) p.174はタイの水産食品企業の

なかには輸出指向型の農産、畜産食品企業との結びつきを強め、総合食品企業へと脱皮するケースが見られ(る)と述べているが、本ジャンルの缶詰はその典型例であろう。



## 国際的漁業管理と生態系アプローチ

### International Fishery Management and the Ecosystem Approach

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#### 【要約】

漁業における生態系アプローチとはいかなるものかについて整理することを目的として、ストックホルム宣言から国連魚種協定に至るまでの国際的文書に反映された生態系アプローチを分析した。そして、さらに、国連食糧農業機関による漁業生態系アプローチの指針も確認した。漁業生態系アプローチは、生態系それ自体を保存管理する、すなわち、資源の分布域全体を視野に入れて、漁獲対象種のみならず、それと同一の生態系に属する種またはそれに関連もしくは依存する種についても保存管理措置をとることなどを求めている。こうした方向性は、国連海洋法条約に基づく体制下では達成困難な場合も考えられるが、実際には、生態系の境界内での管理の動きはさまざまに進展している。わが国としても、生態系アプローチの定着に努力していく必要があるだろう。

#### 【キーワード】

生態系アプローチ、国連海洋法条約、広域海洋生態系 (LME)、海洋法 (Oceans Act)、生態系の境界

#### 【Abstract】

With intent to analyze what the ecosystem approach to fisheries is, the ecosystem approach reflected in the international instruments, such as the Stockholm Declaration, the Convention for the Conservation of Antarctic Marine Living Resources, the U. N. Convention on the Law of the Sea, the Rio Declaration, U. N. Fish Stock Agreement, was investigated. The guideline for the ecosystem approach to fisheries produced by Food and Agriculture Organization was also checked. With the ecosystem approach to fisheries, it is required that States shall adopt, where necessary, conservation and management measures for target stocks, and species belonging to the same ecosystem or associated with or dependent upon the target stocks, taking into account the maintenance of the integrity of marine ecosystem. However, it would appear that fisheries management within ecologically meaningful boundaries is difficult, under the regime based on the U. N. Convention on the Law of the Sea. Since it seems that the movement toward management within ecosystem boundaries is progressing internationally and regionally, we have to continue the examination of the ecosystem approach to fisheries.

#### はじめに

生態系とは、簡単にいえば、非生物的環境を加えた生物群集と表現できる。すなわち、物質やエネルギーの移動といった相互作用をする自然環境を含めた特定区域のあらゆる生物をすべて包含する自然のまとまりということができる<sup>1)</sup>。そのようなひとまとまりの自然を一体的に管理していこうとするのが、生態系アプローチの基本的な考え方である。このような生態系アプローチは、とり

わけ最近では、漁業の分野にもかなり浸透してきたと思われる。そこで、本稿では、まず、漁業に関係する国際条約等の国際的文書における生態系アプローチの反映を確認していく。国際的文書は、法的拘束力のあるなしに関わらず、生態系アプローチの内容の形成に影響を及ぼしたと思われるものをいくつか取り上げた。つづいて、生態系アプローチの運用のための具体化の動きを概観する。国連食糧農業機関は、栄養水準、農業生産性、



農村の生活水準の向上等を目的とする国連の専門機関であるが、そこでの最近の生態系アプローチの運用指針の策定について概観していく。さらに、アメリカ国内の動きではあるが、最近、とくに注目できる生態系アプローチに関連する動きがあったので、簡単に確認する。これらのことから、生態系アプローチの内容を整理し、問題点を指摘するとともに、生態系の境界という枠組内で管理していくことに関連して若干の論評を加えてみたい。

### 1. 国際的文書における生態系アプローチ

生態学における生態系という語の起源としては、1935年にタンズリー (Alfred George Tansley) によって世界に紹介されたのが最初であるといわれている<sup>2)</sup>。この用語は、その後、国際的な資源管理のなかにしだいに取り入れられ、生態系アプローチとして定着していくことになる。ここでは、まず、主要な国際的文書に直接的または間接的にあらわれた生態系アプローチを確認していく。

#### 1.1 国連人間環境会議

天然資源管理の文脈で国際的に生態系という用語が使用されたのは、少なくとも1972年のストックホルム人間環境会議にまでさかのぼると指摘されている<sup>3)</sup>。同会議は、初めての環境問題全般にわたる大規模な国際会議であるが、その結果、人間環境宣言 (ストックホルム宣言) および行動計画が採択されている<sup>4)</sup>。この指摘は、行動計画において、関係する政府等と協力して国連事務総長が準備するものとして、「国際的に重要である代表的な生態系における天然資源開発計画の系統的な評価」があげられていることによる<sup>5)</sup>。

また、生態系の特定の構成要素ではなくて、生態系それ自体を管理していくことが重要であるとする認識の決定的ステップとなったのがストックホルム宣言であると、同宣言原則4をとりあげて指摘されてもいる<sup>6)</sup>。原則4は、人が「野生生物およびその生息地という相続財産を保護し、賢明に管理する特別な責任をもつ」とする。ただし、原則4は、生態系という語に直接言及しているわけではなく、むしろ、原則2で言及されている。す

なわち、「水、土地、動植物およびとくに代表的な例である自然生態系を含む地球の天然資源は、注意深い計画もしくは管理を通じて現在および将来世代のために保護されなければならない」という。

生態系それ自体を管理対象と捉える発想がこの会議を契機として国際的に生じたかどうかについては若干捉え方が異なっているようであるが、これらの指摘の双方ともが、この会議によって、もちろんごく一般的にはあるが、生態系という自然的管理枠組を重視することになったと認めているようである。これらの指摘を受ければ、少なくとも、国連人間環境会議は、生態系アプローチの国際的受容の進展にとって画期的であったといえるだろう。

#### 1.2 南極の海洋生物資源の保存に関する条約 (CCAMLR)

1980年にはCCAMLRが採択された(1982年4月発効)<sup>7)</sup>。CCAMLRは生態系アプローチのモデルとしてよく指摘されている<sup>8)</sup>。CCAMLRの適用範囲は、南緯60度以南の海洋生物資源、および南緯60度と南極収束線との間の海洋生物資源である(第1条1項)。それらの海洋生物資源には、魚類、軟体動物類、甲殻類および鳥類を含めたすべての生物種が含まれる(第1条2項)。なお、南極収束線とは、南極の寒流が北からくる暖流と接し、多くの種の交錯にとって自然環境上の障壁となっており、南極の個体群の北限境界をなしていると思われる移行帯のことをいう<sup>9)</sup>。

CCAMLRは、漁獲される資源の量を安定した加入が確保できる水準に維持すること、漁獲される資源とこれに依存し、関連する資源の間の生態学的関係を維持すること、ならびに、漁獲およびその関連活動の影響、外来種の導入の影響、環境の変化による影響に関する知識の確実性の度合いを考慮に入れて、海洋生態系における復元不可能な変化を防止しまたは最小限にすることといった原則に基づいて(第2条3項)、南極海洋生態系に属するすべての海洋生物資源を保存し、また、合理的に利用していくことを目的としている(第2条1項および2項)。



したがって、CCAMLRの生態系アプローチは、南極収束線によって比較的へと隔絶された自然的な生態系境界内に含まれるすべての種について、その種間関係およびそれらと自然環境との関係を考慮して、南極海洋生態系自体とその構成要素を保存管理していくものといえる。ただし、すべての種とはいうものの、アザラシは、南極のあざらしの保存に関する条約によって、また、鯨類は、国際捕鯨取締条約によって規律されている。

### 1.3 国連海洋法条約

1982年の国連海洋法条約（1994年11月発効）<sup>10)</sup>は、前文において、その目標のひとつとして、海洋資源の効果的利用、海洋生物資源の保存、ならびに海洋環境の保護および保全を促進することを掲げている。同じく前文において、「海洋の諸問題が相互に密接な関連を有し及び全体として検討される必要があることを認識」するとも規定している。これらの規定は、海洋生態系の管理という複雑な問題に対処するためには統合的な生態系アプローチが最適であるとの見解を支持しており、それゆえに、生態系に基づく管理という概念と合致するといわれている<sup>11)</sup>。

国連海洋法条約は、また、第61条（排他的経済水域）および第119条（公海）で、「環境上の関連要因」および「資源間の相互依存関係」を考慮に入れて漁獲される種の資源量を最大持続生産量を実現できる水準に維持または回復する保存措置をとることを求めており、その際、「漁獲される種に関連し又は依存する種の資源量」が脅威を受けないような水準に保たれるよう考慮することを求めている。そして、第194条では、海洋環境の汚染防止等の措置について、それらの措置には、「希少又はぜい弱な生態系及び減少しており、脅威にさらされており又は絶滅のおそれのある種その他の海洋生物の生息地を保護し及び保全するために必要な措置」が含まれると規定する。こうした資源間の相互関係の考慮、ならびに生態系および生息地保護の規定も生態系アプローチと関連づけられている<sup>12)</sup>。

さらに、第63条（二以上の沿岸国の排他的経済水域内に存在する種等）、第64条（高度回遊性の

種）、第66条（溯河性資源）、第67条（降河性の種）について、これらの規定は、越境資源の生態学および地理的全体性（integrity）、ならびに排他的経済水域と公海の保存管理措置の相互関係を承認し、関係国にそれら資源の保存管理に協力するよう求めているとされている<sup>13)</sup>。そして、とくに高度回遊性の種の場合には、関係する地域全体で保存および最適利用に協力するよう規定することによって、事実上、生態系アプローチの観点でその資源を扱っていると指摘されている<sup>14)</sup>。これらの指摘は、資源の回遊範囲全体を視野に入れた保存管理という点に生態系アプローチの発想を見出しているといえる。

### 1.4 国連環境開発会議

1992年の国連環境開発会議の成果である環境と開発に関するリオ宣言および21世紀に向けた人類の行動計画であるアジェンダ21においても、生態系アプローチに関連する言及が見られる<sup>15)</sup>。まず、リオ宣言では、前文において「地球の全体的および相互依存の性質」を認識し、また、原則7において「各国は地球の生態系の健全性および全体性を保存、保護および回復するために世界的なパートナーシップの精神で協力しなければならない」としている。

アジェンダ21では、その前文において、人間の生存基盤である「生態系の継続的悪化」を問題視し、環境と開発を統合することが「よりよく保護および管理された生態系」につながると述べている（1.1）。また、海洋問題を扱う第17章では、海洋および沿岸環境ならびにその資源の保護および持続可能な開発のために「内容において統合され、範囲において予防的かつ先行的なアプローチ」が必要であるとする（17.1）。そのうち、海洋生物資源の持続可能な利用および保存については、公海と排他的経済水域（EEZ）のそれぞれについて別立てであるが、類似した規定を有している。すなわち、各国は、種間関係を考慮にいれ、種の個体群を最大持続生産量を実現することのできる水準に維持または回復すること、非対象種の混獲を最小限にする選択的な漁具の利用を促進すること、絶滅のおそれのある種を保護し、回復するこ



と、ならびに生息地およびその他の生態的に敏感な水域を保存すること等を行なうものとされている（17.46および17.75）。

こうした国連環境開発会議での成果に関しては、リオ宣言は生態系管理原則を取り入れた<sup>16)</sup>、アジェンダ21によって海洋生態系および陸上生態系の双方に対する全体的アプローチが確固として支持された<sup>17)</sup>、国連環境開発会議の発想に見られる全体的要素は生態学的認識に、かくして海洋管理の単位としての生態系に特別の重みを与えている<sup>18)</sup>等の評価がなされている<sup>19)</sup>。

### 1.5 責任ある漁業の行動規範（行動規範）

行動規範は、1991年に国連食糧農業機関（FAO）の水産委員会（COFI）によって、責任ある、持続可能な漁業に導く新たな概念の作成が要請されたことに始まる。行動規範は、その後、いく度かの国際会議や専門家会議を経て1995年10月にFAO総会において採択されている<sup>20)</sup>。行動規範は、国際協定およびその他の法文書の制定と実施に使用されうる指針を提供することを目標のひとつとする任意的な文書である（1.1および2.d）。規範は、また、あらゆる漁業の保存、管理および開発に関する広範な原則および基準を定めており、漁獲、加工および貿易、操業、養殖、水産研究、沿岸域管理への漁業の統合をもカバーしている（1.3）。

行動規範は、一般原則（第6条）として、各国および資源利用者は水界生態系を保存する（6.1）、管理措置は漁獲対象種のみならず、同一の生態系に属する種、または漁獲対象種に関連もしくは依存する種の保存をも確保する（6.2）、多くの水界生態系の越境的性質を認識して国家間協力を促進する（6.4）、選択性があり、環境上安全な漁具および慣行をさらに開発し、適用する（6.6）、海洋および淡水生態系におけるすべての重要な漁場生息域は保護および回復される（6.8）、各国は、国家管轄権下の水域とそれを越える水域において一貫性のある措置が必要であることを考慮して、その分布域全体にわたって水産資源の効果的な保存および保護を確保するよう協力する（6.12）、等の規定を有している。さらに、

こうした一般原則を受けて、漁業管理（第7条）、漁業操業（第8条）、養殖業（第9条）、水産研究（第12条）等の項目においてより具体的な関連規定を有している。

これらの規定、とりわけ一般原則については、生態系管理アプローチに直接的に関係するか、またはそれを支持するものである<sup>21)</sup>、生態系に基づき漁業を見る視点を組み込んだ<sup>22)</sup>との評価がなされている。

### 1.6 ストラドリリング魚類資源及び高度回遊性魚類資源の保存及び管理に関する1982年12月10日の海洋法に関する国際連合条約の規定を実施するための協定（国連魚種協定）

とりわけ1992年の国連環境開発会議前後に公海漁業の規制問題が国際的に注目されるに至り、アジェンダ21では、国連海洋法条約第63条2項および第64条を効果的に実施するために、ストラドリリング魚種（公海と国家管轄権下の水域にまたがって回遊する魚種）および高度回遊性魚種の保存管理問題に関する政府間会合を開催することが勧告されている（17.49）。その後、2年余りの交渉を経て、国連魚種協定は、1995年8月に政府間会合においてコンセンサスで採択され、同年12月に署名のために開放された（2001年12月発効）<sup>23)</sup>。

国連魚種協定は、前文において、海洋生態系の全体性を維持する必要があることを認識している。一般原則としては、漁獲、その他の人間活動および環境要因が、漁獲対象資源、漁獲対象資源と同一の生態系に属する種、または漁獲対象資源に関連もしくは依存する種に与える影響を評価する（第5条（d））、必要な場合には、漁獲対象種と同一の生態系に属するか、漁獲対象資源に関連もしくは依存する種について、その再生産が著しく脅威を受けることのない水準以上に維持または回復されるように、保存管理措置を採択する（第5条（e））、選択性を有し、環境上安全な漁具等の開発および使用を含む措置を通じて、非漁獲対象種の漁獲、関連もしくは依存する種への影響等を最小化する（第5条（f））、海洋環境における生物多様性を保護する（第5条（g））等



の規定を有している。また、沿岸国および公海漁業国は、ストラドリング魚類資源および高度回遊性魚類資源の全体的な保存および管理を確保するために、公海について定められた保存管理措置と国家管轄権下の水域について採用された保存管理措置が一貫性のあるものとなるよう協力しなければならないとされている（第7条2項）。

以上のような国連魚種協定については、たとえば、第5条（d）および（e）等に関して、広域海洋生態系（Large Marine Ecosystems = LME）の概念を反映しているとの評価がある<sup>24)</sup>。また、第5条が生態系アプローチの必要性を承認しているともいわれている<sup>25)</sup>。さらに、前文、第5条、第6条（予防的アプローチの適用）、第7条、第8条（保存および管理のための協力）等に言及しつつ、国連魚種協定が生態系アプローチを採用しているとする評価もある<sup>26)</sup>。

## 2. 国際的文書における生態系アプローチの具体化

ここまで、主要な国際的文書に直接的または間接的にあらわれた生態系アプローチを確認してきた。つづいては、国連食糧農業機関（FAO）による生態系アプローチのさらなる具体化の動きを見ていく。なお、FAOによって作成された漁業管理政策文書は、加盟諸国の行動に規範的な影響を与えるので重要であるとも評価されている<sup>27)</sup>。

### 2.1 国連食糧農業機関（FAO）による具体化の動き

FAOの水産委員会（COFI）は、主要な国際漁業問題を検討し、政府、地域的漁業機関等に向けて定期的に勧告する唯一の世界レベルの政府間フォーラムである。そうした役割をもつCOFIにおいて、とくに最近、生態系アプローチの具体化に関わる動きが見られる。すなわち、COFIでは、生態系管理の重要性が指摘され<sup>28)</sup>、生態系アプローチの検討の促進が合意され<sup>29)</sup>、海産哺乳動物と漁業の相互関係に関する調査の実施が合意されている<sup>30)</sup>。

つぎに、とりわけ注目できるのが、2001年10月にFAOとアイスランド政府等との共催で開催さ

れた海洋生態系における責任ある漁業に関するレイキャビク会議である。この会議の最終日には、責任ある持続可能な漁業に向けて、漁業管理に生態系考慮を組み込む作業を個別におよび集合的に行なうことを宣言したレイキャビク宣言が採択されている。この宣言において、FAOに対して、漁業管理に生態系考慮を取り入れることに関する実践のための指針を作成することが要請されている。なお、レイキャビク宣言は、その後、2002年8/9月に開催された持続可能な開発に関する世界サミットに送られた。同サミットでは、持続可能な開発に関する世界サミットの実施計画を採択したが、この計画において、海洋の持続可能性を確保するために、レイキャビク宣言に留意して、2010年までに生態系アプローチの適用を奨励する行動をとることが要求されている<sup>31)</sup>。

レイキャビク宣言を受けて、指針の準備のために、FAO水産局は、生態系に基づく漁業管理（Ecosystem-Based Fisheries Management = EBFM）に関する専門家会議を計画し、同会議は2002年9月にレイキャビクで開催されている<sup>32)</sup>。ところで、用語に関することであるが、専門家会議は、生態系に基づく漁業管理に代えて、漁業に対する生態系アプローチ（Ecosystem Approach to Fisheries = EAF）を採用することを決定している<sup>33)</sup>。これは、2001年のレイキャビク会議においてEBFMにコンセンサスが得られなかったことによるという。この点に関して、EBFMでは、生態系が漁業管理の新たな「基盤」となることを意味するといくつかの国が捉えたためであろうと推測されている<sup>34)</sup>。

専門家会議では、その協議の大半が、現行の管理プロセスが生態系アプローチによってどのように変更されるのかに費やされた。その結果、管理プロセスは、本質的には現行のプロセスと同様であるが、広範な利害関係者との協議が必要であると合意された<sup>35)</sup>。また、法的制度的側面の検討において、会議は、生態系アプローチに関する基本的な原則および概念はすでに合意されている国際的文書にかなり含まれているが、運用上の詳細な要求は、拘束的な国際漁業法では十分にカバーされていないと結論づけている<sup>36)</sup>。



なお、EAF 指針は、現段階では経験が限られているため、「仮の」ものであり、定期的に改訂されるべきことに合意されている<sup>37)</sup>。

## 2.2 漁業に対する生態系アプローチ (EAF) 指針の概要

FAO は、1997年に責任ある漁業の行動規範の第7条 (漁業管理) の実施支援のために技術指針 (technical guideline) を発行した<sup>38)</sup>。EAF 指針は、この技術指針の補遺として読まれるべきものとされている<sup>39)</sup>。

EAF は、「海洋生態系によって提供されるあらゆる種類の財とサービスから利益を得る将来世代の選択肢を損なうことがないように、社会の多様な欲求や願望に対処する方法で漁業を計画、開発および管理すること」を目的とすると、多くの国際的文書等から推論されている<sup>40)</sup>。こうした目的を達成するためには、複雑な性質をもつ生態系を特定した上でその構成要素に対応すること、生態系における社会的利益を承認すること等が必要とされており、それらのことから、EAF とは、「生態系の生物的要素、非生物的要素、人間的要素の知識および不確実性を考慮することによって、ならびに生態学的に意味のある境界内で漁業に対する統合的アプローチを適用することによって、多様な社会目的間のバランスを保とうとする」ことと定義されている<sup>41)</sup>。

また、さまざまな文書および条約等から、EAF に基づく漁業管理の尊重すべき原則が指摘されている。すなわち、漁業は可能な範囲で生態系への影響を制限するよう管理される、漁獲種、依存種、関連種の間の生態学的関連が維持される、管理措置は資源の全分布範囲にわたって (管轄権および管理計画をわたって) 一貫性をもつ、生態系の知識が不完全であるため予防的アプローチが適用される<sup>42)</sup> 等である<sup>43)</sup>。

EAF 指針には、こうした原則を実施に移していくプロセスが漁業管理計画の策定プロセスとして示されている。これらのプロセスは EAF 特有のプロセスというわけではないが、おもな段階は次の通りである。

まず、対象となる漁業と地理的範囲を特定する

段階である。管理計画の空間的範囲は、生態系の境界と合致することが望まれるが、その明確な画定が困難であることから、利害関係者を特定するためにも、仮の境界確定が必要とされる。実際的には現行の漁業、管理実体および管轄権を承認した上で、生態系の全体的管理に必要とされる追加的措置を管理計画に組み込む必要がある旨述べている<sup>44)</sup>。

つぎに、目標設定の段階である。目標には、一般的目標 (broad objectives)、運用目標 (operational objectives) 等がある。一般的目標としては、たとえば、乱獲を避ける等により漁獲種の資源量を生態学的に存続可能なレベルに維持すること、混獲種の資源量等を生態学的に存続可能なレベルに維持すること、純収入を最大化すること、地域の雇用を支えること等があげられる<sup>45)</sup>。運用目標としては、たとえば、漁獲種に対する漁獲努力量の削減、生態学的バランスの維持、国家経済や地域社会への漁業の貢献の維持および増大、漁獲および加工部門における雇用の維持および増大等があげられる<sup>46)</sup>。このように、これらの目的には、資源的、生態的、経済的および社会的要素が含まれる。また、目標の到達度を測るための指標等も設定される<sup>47)</sup>。

目標設定につづいては、規則の制定の段階を迎える。この段階では、設定された目標を達成するために管理措置が選択される。また、管理措置がどのように決定されるか、どのようなデータが収集され、措置を決定する際にどのようにデータが利用されるかといった決定規則も決められる<sup>48)</sup>。

ところで、管理措置についてであるが、EAF に基づく管理措置は、対象種指向の管理アプローチにおいて従来使用されてきた措置の延長線上にあるとされる<sup>49)</sup>。こうした措置には、たとえば、漁具に関する措置、空間的および時間的規制措置、漁獲規制措置、生態系の操作 (ecosystem manipulation) 等がある。漁具に関する措置としては、幼魚、ウミガメ、海鳥、イルカ等の混獲を防止するために漁具の改良および選択性の向上がよりいっそう求められている。空間的および時間的規制措置である禁漁区および禁漁期は、脆弱なライフステージにおける対象種または非対象種の死亡率の低減、



または重要な生息地の保護のために利用されうる。こうした措置は、個々の対象漁業についてのみではなくて、種および生息地の範囲を保護するために調整されることが望まれている。漁獲規制措置は、複数種対象漁業においては、さまざまな種の脆弱性と生産性を考慮に入れ、対象種と混獲種にわたり一貫性のある漁獲制限を課し、望ましい生態系関連目標（たとえば食物網の維持）に対応するとされている。生態系の操作に関しては、その経験や知識は不十分であり、操作の予測結果に関する十分な調査研究を経て実施するという慎重さを条件とするが、たとえば、対象種の生産量を増加させる等のために捕食種もしくは同一の栄養資源を争う種を減少させる等のことが魅力的な選択肢となりうるとしている<sup>50)</sup>。

プロセスの最後は、監視、評価、再検討の段階である。再検討では、効果的な監視プログラムによって収集され、専門家によって分析されたデータをもとにして、対象種の生産性、他の生態学的側面への漁業の影響、運用目標および一般的目標の達成度等を含み、プロセス全般にわたり短期的および長期的に評価される<sup>51)</sup>。

以上が漁業管理計画策定のおもなプロセスであるが、こうしたプロセスのあらゆる段階で利害関係者との協議が求められている<sup>52)</sup>。EAF 指針は、こうしたプロセスを適用することで、よりよい漁業管理が促進されるとしている<sup>53)</sup>。

### 3. アメリカ国内の生態系アプローチの展開

この項では、これまでの国際的な生態系アプローチにかかわる動きを補足する意味で、アメリカ国内の連邦レベルでの生態系アプローチに関する動きをごく簡単に確認しておく。世界で最大の管轄海域を有するアメリカは、国内的に積極的に生態系アプローチを導入している。ちなみに国際的局面でも、国連環境開発会議の準備委員会において、アジェンダ21、第17章の主要な構成原理として広域海洋生態系（LME）概念を提案している<sup>54)</sup>。また、持続可能な開発に関する世界サミットに向けての準備の一環として、統合的な流域および海洋生態系管理（Integrated Watershed and Marine Ecosystem-based Management）を広域カ

リブ海（メキシコ湾を含む）において促進するためのイニシアティブに着手し、そのことを同サミットにおいて公表している<sup>55)</sup>。こうしたアメリカの国内的な動きを確認することで、生態系アプローチが国際的レベルのみならず、さまざまなレベルで適用、実施されていることの一端を指摘しておきたい。

アメリカにおいては、天然資源を景観規模で管理するための生態学および体系的アプローチの考えは新しいものではないとされている。たとえば、すでに1930年代の初期に、アメリカ生態学会は、個々の種はもちろんのこと、自然地域を保護することの重要性も認識していたという<sup>56)</sup>。その後、1980年代末になると、多くの連邦政府機関の職員、科学者等が国有地および天然資源を管理するためのアプローチとして、生態系管理を主張するようになっていく<sup>57)</sup>。そして、ほとんどの連邦所有の土地を管理している4つの機関、すなわち内務省の国立公園局（National Park Service）、土地管理局（Bureau of Land Management）、魚類野生生物局（Fish and Wildlife Service）および農務省の森林局（Forest Service）<sup>58)</sup>は、1992年頃から生態系管理政策を採用し始めている。また、同年以降、これら4機関と他の16連邦機関からの職員が生態系管理に関する情報交換等のために非公式に会合しており<sup>59)</sup>、1993年には、クリントン政権のもと、生態系アプローチの実施のために機関間生態系管理特別委員会（Interagency Ecosystem Management Task Force）が設立されている<sup>60)</sup>。

海洋漁業の分野でも、しだいに生態系アプローチは取り入れられている。1996年の漁業保存管理法の持続可能な漁業法修正によって、漁業保存管理活動への生態系原則の適用に関する諮問委員会を設立することが求められている<sup>61)</sup>。この要求に応じて、商務省国家海洋大気庁（National Oceanic and Atmospheric Administration）の海洋漁業局（National Marine Fisheries Service）は、生態系原則諮問委員会（Ecosystem Principles Advisory Panel）を設立し、同委員会は、1999年に議会に報告書を提出している。

「生態系に基づく漁業管理」と題するこの報告書は、まず、「生態系に基づく漁業管理が現行の漁



業管理アプローチの重要な補完となりうる」とし、また、「包括的な漁業管理アプローチは、対象種と捕食種、競争関係にある種および被捕食種とのあらゆる相互関係、天候および気候の漁業生物学および生態学の影響、魚種とその生息地との相互関係、ならびに漁業資源およびその生息地に対する漁業の影響を考慮することを漁業管理者に要求する」と述べている<sup>62)</sup>。報告書は、つづいて、いくつかの基本的な生態系原則および政策を述べた上で<sup>63)</sup>、それら原則および政策等を実施するために、地域漁業管理委員会 (Regional Fishery Management Council) が漁業生態系計画 (Fisheries Ecosystem Plan) を作成するよう勧告している。

地域漁業管理委員会とは、1976年漁業保存管理法によって設立された連邦水域の漁業資源の管理保存および利用者間での配分等に責任を有する機関である。連邦水域を区分して、8委員会が設立されている。沿岸から3海里までの漁業については原則として沿岸各州の当局が管理するため、基本的に地域漁業管理委員会は3海里から200海里までを管轄している<sup>64)</sup>。地域漁業委員会は、各漁業について漁業管理計画を策定することを通じて管理を行なうが、漁業保存管理法における漁業の定義が、「保存管理目的で構成単位として扱いうる、地理的、科学的、技術的、娯乐的、および経済的特徴に基づき特定された1以上の魚類資源」および「そのような資源の漁獲」とされているため<sup>65)</sup>、漁業保存管理法のもとでの漁業保存管理は、1もしくは非常に少ない数の密接に関連する魚種に焦点を当てていたとされている<sup>66)</sup>。

報告書の勧告した漁業生態系計画は、地域漁業管理委員会が各管轄下の主要な生態系について作成するものであり、個々の漁業についての漁業管理計画に横断的に適用される管理措置を含むものである。また、計画には、食物網のモデル、保存管理措置における生息地への配慮、特定漁具との関連での混獲、不確実性を生み出す要因、生態系の健全性の指標、長期的な監視プログラム、漁業に影響を与える地域漁業管理委員会の権限外の重大な要素等についても含まれる<sup>67)</sup>。

たとえば州の水域と連邦の水域というように海

洋管理において地理的な分断が見られること、そうした地理的分断に基づいて、たとえば沖合の石油およびガス開発という同一の行動に対して異なる規制主体が許可をするという組織の縄張りが保持されていること、ならびに、アメリカの法律が生態系を考慮することなしに、海洋資源を資源ごとおよび種ごとに規制している<sup>68)</sup>ということ等の政策および法律の欠点を認識して、2000年には海洋法 (Oceans Act) が制定されている<sup>69)</sup>。同法に基づき、協調的かつ包括的なアメリカ海洋政策に関する勧告を行なうために海洋政策委員会 (U.S. Commission on Ocean Policy = USCOP) が設立された<sup>70)</sup>。USCOPは、2001年9月にその作業を開始したが、2004年9月には、海洋政策に関する勧告を含む報告書を大統領と議会に提出している。そして、同年12月には、USCOPからの報告書を受けて、大統領は、大統領府の環境問題諮問委員会 (Council on Environmental Quality = CEQ) の一部門として海洋政策委員会 (Committee on Ocean Policy = CEQCOP) を設立する大統領命令に署名し、また、その委員会の設立を含むアメリカ海洋行動計画 (U. S. Ocean Action Plan) を公表している<sup>71)</sup>。

まず、「21世紀の海洋の設計図」と題するUSCOP報告書については、海洋および沿岸政策のあらゆる側面に関する212の勧告が含まれているが、次のような制度の創設に関する勧告に注目できる。すなわち、海洋統治に関する原則および国の目標等を策定し、国の海洋政策の策定および実施に関して大統領に勧告し、また、海洋に関連する連邦政府機関の活動を調整する等の役割を果たす国家海洋委員会 (National Ocean Council) を大統領府内に設立することが勧告されている。この委員会には、生態系に基づく管理の原則を採用すること、連邦政府機関がその方向に向かうよう支援することが求められている<sup>72)</sup>。

このような連邦レベルでの政策調整に加えて、生態系の規模で海洋関連問題に対処する地域的アプローチの重要性も指摘され、国家海洋委員会は、議会、大統領府および州等と協力して、地域海洋委員会 (Regional Ocean Council) を設立する柔軟かつ任意的なプロセスに取り組むことを求められ



ている。地域海洋委員会は、地域的な海洋関連問題への協調的および協力的な対応を促進し、地域の目標および優先順位を策定する等の役割を担う。地域海洋委員会の境界は、LME もしくはその他の適当な生態系に基づく領域を基礎とし、沿岸流域 (coastal watersheds) の内陸限界から排他的経済水域の沖合境界までの領域を含むものとされている。また、地域海洋委員会は、たとえば地域漁業管理委員会等にとって代わるものではなく、当面、両者は協力的に活動していくものとされているが、地域海洋委員会の委員（あらゆるレベルの政府代表および非政府利害関係者等を含む）が委員会決定の実施の公式なメカニズムを選択する可能性があるとも指摘されている<sup>73)</sup>。

つぎに、アメリカ海洋行動計画は、導入において、ブッシュ政権が、地方および州の権限を侵害することなく、また、地方の状況に対応する柔軟性をもつ方法で、水、土地および資源管理に関する意思決定において、生態系に基づくアプローチに向けての取組をつづけると述べている<sup>74)</sup>。つづいて、行動計画は、大統領命令によって設立されたCEQCOPについて述べている<sup>75)</sup>。CEQCOPは、海洋関連事項に関係する行政部門間の活動の調整、連邦と州等との間での調整および協議の促進という政策を実施するために、大統領、行政部門の長に助言をする役割を果たし、海洋関連事項に関する政府行動の共通原則等の策定および実施、ならびに海洋関連情報の収集および普及の促進等の役割も担う。また、海洋関連事項に関する任意的な地域的アプローチの促進のために助言をすること等もその役割とされている<sup>76)</sup>。

なお、行動計画は、「国際的な海洋政策および科学の推進」の項目において、国連環境計画の地域海計画および国際的な漁業機関において、国境を越えて生態学的に画定された領域内での協力的な資源管理アプローチのために、(1982年国連海洋法条約に反映された国際慣習法に矛盾しないように) LME 概念の利用を促進する旨述べている<sup>77)</sup>。

以上、アメリカにおける生態系アプローチの展開過程をごく簡単に見てきた。アメリカは、国際的局面において一貫して LME 管理を主張しているが、国内的にもその素地が形成されたといえる。

何人かの科学者は、州と連邦水域の一体的管理が、生態系に基づく漁業管理に移行するもっとも重要なステップであると指摘したということである<sup>78)</sup>。漁業生態系計画が地域漁業管理委員会の管理プロセスに組み込まれ、さらに、USCOP 報告書にいう任意的な地域海洋委員会設立プロセスが進展した場合、より生態的に意味のある境界内で魚種間の関連等を考慮した漁業管理を達成できる可能性が高まることになる。その意味で、アメリカ国内における生態系アプローチ実施の今後の進展は注目に値する<sup>79)</sup>。

#### むすびにかえて

本稿は、漁業における生態系アプローチとはいかなるものかについて整理する目的で、主要な国際的文書に見られる生態系管理アプローチ関連規定とその評価を確認し、また、FAO における生態系アプローチの具体化の動き、さらには、主要な海洋国であるアメリカの動きについても概観した。

主要な国際的文書に見られる漁業生態系アプローチは、漁獲およびその関連活動の影響、ならびに環境の変化による影響等を考慮した上で、生態系の特定の構成要素とともに生態系それ自体を保存管理すること、すなわち資源の分布域全体を視野に入れて、漁獲対象種のみならず、それと同一の生態系に属する種、またはそれに関連しもしくは依存する種についても保存管理措置をとり、さらには絶滅のおそれのある種および生息地についても保護措置をとることを求めるものである。非漁獲対象種の混獲を最小限にするためには、選択的な漁具を使用することが要求される。また、多くの生態系の越境的性質を考慮して、国家管轄権下の水域とそれを越える水域において一貫性のある保存管理措置をとるよう国家間で協力するものとされている。生態系アプローチのこのような内容は、とりわけ CCAMLR 以降、国連魚種協定、さらにはレイキャビク宣言に至る間に形成されてきたものだといえるが、これらの国際的文書等に基づいて、生態系に基づく海洋環境および資源の管理を遵守する義務が、国際法において確立されたと結論づけられるという指摘がなされてい



る<sup>80)</sup>。ここでは、この指摘に対するかたちで、本稿のまとめにかえて、生態系アプローチの今後の国際的展開について若干のコメントをしておきたい。

FAO が2002年の生態系に基づく漁業管理に関する専門家会議の参考資料として準備した文書では、生態系の地図を作成することがその管理の前提条件のひとつであるが、生態系の地理的境界を決定することは簡単ではないとされ<sup>81)</sup>、また、生態系と管轄権の境界が合致しないことが生態系アプローチの実施に際して直面する困難のひとつであると述べられている<sup>82)</sup>。この文書の指摘は、直接的には、生態系の境界画定自体や生態系の管理のための国家間協力(あるいは連邦と州との協力)の困難さを述べているのだろうが、同時に、生態系の境界内で保存管理していくことが生態系アプローチの根幹をなすと認めていると読むこともできる。さらに、その専門家会議の結果作成されたEAF 指針においても、現状の管轄権等を承認しつつも、生態学的に意味のある境界内での保存管理を提案しており、その漁獲規制等の措置も、可能な限り生態系全体にわたることが合理的であると考えられるのである。したがって、EAF 指針においては、意図的か否かは別として、漁獲対象種と同一の生態系に属する種等に対する保存管理措置、絶滅のおそれのある種等に対する保護措置、混獲を最小限にする選択的な漁具の使用等といった個々の生態系アプローチの内容にかかわる措置もさることながら、相対的には、生態系の境界全域にわたる統合的管理が強調され、かつ重視されていると見ることもできるだろう。

これに対し、国際的な漁業管理体制を定める国連海洋法条約は、排他的経済水域 (EEZ) と公海という区分を保持している。そして、生態系アプローチの国際的展開に大きな役割を果たしたと思われるアジェンダ21(たとえば17.3、17.44)、責任ある漁業の行動規範(たとえば1.1)、国連魚種協定(たとえば第4条)のいずれも、国連海洋法条約と合致するように解釈される。国連海洋法条約では、EEZの生物資源について沿岸国の主権的権利を認めており、生態系がEEZと公海に広がる場合においても、資源のEEZ部分について沿岸

国独自の保存管理措置をとることが可能である。

次のようなごく単純な想定ができる。たとえば、EEZに存在する経済的に価値の低い魚種を経済的に価値の高いストラドリング魚種が捕食している場合であり、かつ、沿岸国にとってはストラドリング魚種の価値が相対的に低い場合、沿岸国は、ストラドリング魚種の資源量の安定のため、EEZに存在する魚種を混獲する漁業に対して混獲防止措置等の保存措置を導入するだろうか。EEZ内の資源が経済的により価値の高い魚種であった場合では、ストラドリング魚種に対する考慮なしに、当該EEZ種に漁獲を集中させてしまうことはないのだろうか。また、絶滅のおそれがあるかどうかに関わらず、EEZ内の特定種が保護されてしまうことはないのだろうか。その保護の結果、特定種の捕食する種が脅威を受けないような水準を保てなくなり、いずれその影響が生態系全体にわたることはないのであろうか。なお、特定種の保護に関連しては、たとえば、レイキャビク宣言の採択に際して、わが国の政府代表が、宣言において海産哺乳動物という文言が拒否されたために、コンセンサスによる採択に加わることはできないと表明したことに注目できる<sup>83)</sup>が、希少性とは別の基準で、特定種の保護が求められるとすれば、とりわけ問題は複雑となる。こうした生態学的要因と経済的要因のどちらを優先させるか、あるいはどの種をとくに保護するかなどといった管理決定は、生態系の全体的バランスを視野に入れてなされることが望ましい場合もあろうが、そうした方向で諸決定が下されるよう義務づけられているわけでもない。

以上のことから、EAF 指針にいう生態系アプローチを実施することを考える場合<sup>84)</sup>、現行の体制下では、同アプローチの重要な側面が実施されない可能性が高いと評価することも可能であろう。その意味で、選択的な漁具の使用、非漁獲対象種に対する保存管理措置等に関する義務は別として、生態系に基づく管理が義務的になったという見解は成立し得ないのではないかと思われる。

こうした問題関心を踏まえて、生態系アプローチの今後の進展を考えると、前提として、世界的レベルで各地域的漁業機関等の管轄範囲を調整す



ることが必要とされるだろう。すなわち、たとえばLMEに基づき、各地域的機関の管轄範囲を世界的に整理し直すことを要するのである。しかし、そもそも生態系の境界を画定するための科学的データが不十分である場合もあるだろうし、また、各地域的漁業機関の管理対象種の問題、すなわち補食魚と被補食魚がそれぞれ異なる地域的機関によって管理されるといった問題もあり<sup>85)</sup>、前提となる条件整備は、事実上かなり困難であろう。しかしこのことは、不可能を意味するわけではない。

実際に、生態系の境界に基づく管理に関連するいくつかの進展が見られる。すなわち、国際機関等によるLMEプロジェクトへの資金拠出、地域的漁業機関と国連環境計画地域海条約との協力である。まず、地球環境ファシリティー (GEF) とは、地球温暖化防止、生物多様性保全、国際水域の汚染防止等の地球環境問題に開発途上国が取り組むための資金を供給する国際的資金メカニズムであるが、1995年にGEF評議会は、沿岸および海洋資源の生態系に基づく管理の促進の手段としてGEF活動戦略の中にLME概念を含めている<sup>86)</sup>。つづいて、EAF指針においても、農業等に由来する沿岸水域の富栄養化、集水域における農林業等からの堆積負荷等の漁業に対する漁業外の部門からの影響に関心が示されているが<sup>87)</sup>、最近では、漁業管理に責任を有する地域的漁業機関と陸上起因汚染の影響評価等の活動を実施する地域海条約機構との協力が進められ、さらに協力強化が謳われている<sup>88)</sup>。

こうした国際的および地域的レベルにおける生態系アプローチの進展に加えて、上述のように、アメリカにおいて明確にLMEに基づく管理体制が整えられていくと、今後、生態系に基づき画定された領域の管理体制が整備され、その体制内でより緊密に国家間協力が行なわれるという方向に進むこともあながち考えられないわけではない。わが国は、より明確に生態系アプローチを採用したと評価される国連魚種協定をようやく本年になって批准した。今後は、わが国としても、中長期的には、こうした方向性への条件整備を指向しつつ、当面は、この協定の枠組等を通じて、EEZ体制のもつ問題点を補正するかたちで生態系アプ

ローチが定着していくように努めていく必要があるだろう。

(注)

- 1) John M. Blair, Scott L. Collins and Alan K. Knapp, "Ecosystems as Functional Units in Nature," *Natural Resources & Environment*, Vol.14 (2000), p. 151.
- 2) Frank Benjamin Golley, *A History of the Ecosystem Concept in Ecology - More Than the Sum of the Parts* (Yale University Press, 1993), pp. 8-9.
- 3) Ludwik A. Teclaff, "Evolution of the River Basin Concept in National and International Water Law," *Natural Resources Journal*, Vol.36 (1996), p. 378.
- 4) スtockホルム宣言および行動計画については、国連環境計画のウェブサイトから入手した (<http://www.unep.org/>)。
- 5) Ludwik A. Teclaff, *op. cit.*, p. 378; Action Plan for the Human Environment, Recommendation for Action at the International Level, Recommendation 60.
- 6) 原則4とともに、1980年に国際自然保護連合(IUCN)が公表した世界保全戦略もそうした認識の進展に影響したとされている。David Freestone, "The Conservation of Marine Ecosystems under International Law," in Michael Bowman and Catherine Redgwell eds., *International Law and the Conservation of Biological Diversity* (Kluwer Law International, 1996), p. 100.
- 7) CCAMLRについては、同条約のウェブサイトから入手した (<http://www.ccamlr.org/>)。
- 8) たとえば次のような指摘がある。すなわち、「資源の保存および管理に対する生態系アプローチの先駆的な例としてCCAMLRに言及するのが通例であることに間違いはない」。Catherine Redgwell, "Protection of Ecosystems under International Law: Lessons from Antarctica," in Alan Boyle and David Freestone eds., *International Law and Sustainable Development- Past*



- Achievements and Future Challenges* (Oxford University Press, 1999), p. 205.
- 9) R. Tucker Schully, "The Convention on the Conservation of Antarctic Marine Living Resources," in Kenneth Sherman, Lewis M. Alexander and Berry Gold eds., *Large Marine Ecosystems, Stress, Mitigation, and Sustainability* (American Association for the Advancement of Science, 1993), p. 244.
  - 10) 国連海洋法条約については、外務省経済局海洋課監修『英和对訳国連海洋法条約〔正訳〕』（成山堂書店、1997年）を参照した。
  - 11) Hanling Wang, "Ecosystem Management and Its Application to Large Marine Ecosystem: Science, Law, and Politics," *Ocean Development & International Law*, Vol. 35 (2004), p. 48.
  - 12) *Ibid.*, p. 49; 拙稿「海洋法における海洋生態系アプローチ—漁業資源配分に関する一考察—」、『法学研究論集』（西南学院大学大学院）第14号（1996年）、73-75頁。
  - 13) Hanling Wang, *op. cit.*, pp. 48-49.
  - 14) *Ibid.*, p. 49; Francisco Orrego Vicuna, "The International Law of High Seas Fisheries: From Freedom of Fishing to Sustainable Use," in Olav Schram Stokke ed., *Governing High Seas Fisheries: The Interplay of Global and Regional Regimes* (Oxford University Press, 2001), p. 28.
  - 15) リオ宣言およびアジェンダ21については、国連環境計画のウェブサイトから入手した (<http://www.unep.org/>)。
  - 16) Hanling Wang, *op. cit.*, p. 50.
  - 17) David Freestone, *op. cit.*, p. 94.
  - 18) Hanling Wang, *op. cit.*, p. 51; Douglas M. Johnston, "UNCLOS III and UNCED: A Collision of Mind Sets?," in Lorne K. Kriwoken et al. eds., *Oceans Law and Policy in the Post-UNCED Era: Australian and Canadian Perspectives* (Kluwer Law International, 1996), p. 15.
  - 19) 国連環境開発会議において157か国が署名した生物多様性条約の枠組においても生態系アプローチは議論されているが、この条約は直接漁業問題を扱うものではないので、本稿では取り上げない。
  - 20) 責任ある漁業の行動規範については、FAOのウェブサイトから入手した (<http://www.fao.org/fi/default.asp>)。
  - 21) Hanling Wang, *op. cit.*, p. 53.
  - 22) Lawrence Juda, "Rio Plus Ten: The Evolution of International Marine Fisheries Governance," *Ocean Development & International Law*, Vol.33 (2002), p. 117.
  - 23) 国連魚種協定については、国際連合法務部・海洋問題および海洋法部門のウェブサイトから入手した (<http://www.un.org/Depts/los/index.htm>)。
  - 24) D. H. Anderson, "The Straddling Stocks Agreement of 1995 - an Initial Assessment," *International and Comparative Law Quarterly*, Vol.45 (1996), p. 469; André Tahindro, "Conservation and Management of Transboundary Fish Stocks: Comments in Light of the Adoption of the 1995 Agreement for the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks," *Ocean Development & International Law*, Vol.28 (1997), p. 7. なお、LME とは、1980年代初期に初めて明確に示された概念であり、最小のものは約20万平方キロ程度の、捕食と被捕食の関係で結びついた魚類個体群の集合体である。Lewis M. Alexander, "Large Marine Ecosystems—A new focus for marine resources management," *Marine Policy*, Vol.17 (1993), pp. 186-187. これまでに世界中で64のLMEが特定されている (<http://www.edc.uri.edu/lme/default.htm>)。
  - 25) P. W. Birnie and A. E. Boyle, *International Law and the Environment- Second Edition* (Oxford University Press), p. 675.
  - 26) Lawrence Juda, *op. cit.*, p. 122; Hanling Wang, *op. cit.*, p. 49, 67.
  - 27) Stuart M. Kaye, *International Fisheries Management* (Kluwer Law International, 2001),



- pp. 205-206.
- 28) Report of the twenty-second session of the COMMITTEE ON FISHERIES, Rome, 17-20 March 1997, para. 22. なお、FAO 関連文書については、FAO のウェブサイトから入手した。
  - 29) Report of the twenty-third session of the COMMITTEE ON FISHERIES, Rome, 15-19 February 1999, para. 71.
  - 30) Report of the twenty-fourth session of the COMMITTEE ON FISHERIES, Rome, 26 February- 2 March 2001, para. 39.
  - 31) Plan of Implementation of the World Summit on Sustainable Development, para. 30(d). 実施計画については、ヨハネスブルクサミットのウェブサイトから入手した(<http://www.johannesburgsummit.org/index.html>)。なお、同項は、レイキャビク宣言に加えて、生物多様性条約締約国会議で採択された生態系アプローチに関する決議にも留意して、その適用を奨励する行動をとるよう求めている。
  - 32) Report of the Expert Consultation on Ecosystem-Based Fisheries Management, Reykjavik, Iceland, 16-19 September 2002, FAO Fisheries Report No. 690 (FAO, 2003), para. 2, 3.
  - 33) *Ibid.*, para. 9.
  - 34) EAF は、管理という狭い範囲に限定されず、行動規範の範囲により適合するとの理由も指摘されている。Garcia, S. M. et al., *The Ecosystem Approach to Fisheries- Issues, terminology, principles, institutional foundations, implementation and outlook*. FAO Fisheries Technical Paper, No. 443 (FAO, 2003), p. 6.
  - 35) Report of the Expert Consultation on Ecosystem-Based Fisheries Management, *op. cit.*, para. 17.
  - 36) おもに行動規範のような任意的文書に反映されているという。*Ibid.*, para. 18.
  - 37) *Ibid.*, para. 25.
  - 38) FAO Fishery Resources Division and Fishery Policy and Planning Division, *Fisheries Management*, FAO Technical Guidelines for Responsible Fisheries, No. 4 (FAO, 1997).
  - 39) FAO Fisheries Department, *Fisheries Management: The Ecosystem Approach to Fisheries*, FAO Technical Guidelines for Responsible Fisheries, No. 4, Suppl. 2 (FAO, 2003), p. 4.
  - 40) *Ibid.*, p. 14.
  - 41) *Ibid.*
  - 42) 予防的アプローチは、リオ宣言、アジェンダ 21、行動規範、国連魚種協定等にも取り入れられている。なお、生態系アプローチと予防的アプローチの関連性については、たとえば、Stuart M. Kaye, *op. cit.*, pp. 273-274を参照。
  - 43) FAO Fisheries Department, *op. cit.*, p. 15.
  - 44) *Ibid.*, p. 46.
  - 45) *Ibid.*, p. 48.
  - 46) *Ibid.*, pp. 95-97.
  - 47) *Ibid.*, pp. 53-55.
  - 48) *Ibid.*, pp. 55-57.
  - 49) *Ibid.*, p. 29.
  - 50) *Ibid.*, pp. 29-37.
  - 51) *Ibid.*, pp. 57-59.
  - 52) *Ibid.*, pp. 46.
  - 53) *Ibid.*, pp. 43. なお、ここまでに示したものは、そもそも2003年6月に開催された環境法政策学会で報告した「漁業管理における生態系アプローチの最近の動向」における問題関心を具体化するために、大幅に加筆したものである。
  - 54) William T. Burke, "UNCED and the Oceans," *Marine Policy*, Vol. 17 (1993), p. 552; Biliiana Cicin-Sain and Robert W. Knecht, "Implications of the Earth Summit for Ocean and Coastal Governance," *Ocean Development & International Law*, Vol. 24 (1993), p. 339.
  - 55) Mary Beth West, "International Challenges in Addressing Marine Environmental Problems," in Myron H. Nordquist, John Norton Moore and Said Mahmoudi eds., *The Stockholm Declaration and Law of the Marine Environment* (Kluwer Law International,



- 2003), p. 459. また、当該生態系アプローチ関連イニシアティブのウェブサイトも参照 (<http://www.international.noaa.gov/ww2bw/>)。
- 56) Richard Haeuber, "Setting the Environmental Policy Agenda: The Case of Ecosystem Management," *Natural Resources Journal*, Vol.36 (1996), pp. 3-4; Victor E. Shelford, "The Preservation of Natural Biotic Communities," *Ecology*, Vol.14 (1933), pp. 240-245.
- 57) General Accounting Office, *Ecosystem Management: Additional Actions Needed to Adequately Test a Promising Approach*, GAO/RCED-94-111 (1994), p. 12. この文献はアメリカ会計検査院(現在の名称は、Government Accountability Office)のウェブサイトから入手した (<http://www.gao.gov/>)。
- 58) *Ibid.*, p. 12. なお、この文献によると、連邦政府は全体の30%の土地を所有しており、4機関でそのうちの97%を管理しているとされている。
- 59) *Ibid.*, pp. 28-30.
- 60) *Ibid.*, p. 35.
- 61) Sustainable Fisheries Act, SEC. 207. 海洋漁業局のウェブサイトから入手した (<http://www.nmfs.noaa.gov/sfa/index.htm>)。
- 62) National Marine Fisheries Service, *Ecosystem Based Fishery Management: A Report to Congress by the Ecosystem Principles Advisory Panel* (April 1999), p. 1. ただし、初期の段階では、ひとつの種の漁獲が生態系の他の種にどのように影響するかを考慮することのみを求めているとしている。なお、この報告書は海洋漁業局のウェブサイトから入手した (<http://www.st.nmfs.gov/st7/index.html>)。
- 63) 生態系原則としては、たとえば「生態系の動態を予測する能力は限られている」、「生態系の構成要素は相互に関連している」、「生態系の境界は決定的なものではない」等の8原則が示され、一般的な生態系管理政策としては、たとえば「挙証責任の転換」、「予防的アプローチの適用」、「政策および管理における参加、公正および衡平の促進」等の6政策が示されている。*Ibid.*, pp. 13-21.
- 64) Magnuson-Stevens Fishery Conservation and Management Act, SEC.306(a)(1),(a)(2)(A) <http://www.nmfs.noaa.gov/sfa/index.htm> から入手); Eugene H. Buck and Daniel A. Waldeck, *The Magnuson-Stevens Fishery Conservation and Management Act: Reauthorization Issues*, CRS Report for Congress (Congressional Research Service, Updated September 8, 2004), p. 25 (<http://www.ncseonline.org/NLE/CRS/index.cfm> から入手)
- 65) Magnuson-Stevens Fishery Conservation and Management Act, SEC. 3 (13)(A)(B). なお、持続可能な漁業法によっても「漁業」の定義自体は修正されていない。
- 66) Robin Kundis Craig, "Taking the Long View of Ocean Ecosystems: Historical Science, Marine Restoration, and the Oceans Act of 2000," *Ecology Law Quarterly*, Vol.29 (2002), p. 669.
- 67) National Marine Fisheries Service, *op. cit.*, pp. 27-33. なお、2004年に、国家海洋大気庁は、ニューイングランド、中部大西洋、南大西洋およびメキシコ湾の各地域漁業管理委員会に対し、生態系管理の試験的な計画のための資金を拠出しているという (<http://www.nmfs.noaa.gov/docs/developing.pdf>)。
- 68) ただし、次のような指摘もある。すなわち「乱獲、混獲および重要な生息地の保護のような現行のアメリカ漁業管理の多くの問題は1996年持続可能な漁業法によって対処された。これらの各規定は、漁業管理において生態系原則を利用することに向けての重要なステップとなっている」。National Marine Fisheries Service, *op. cit.*, p. 27.
- 69) Robin Kundis Craig, *op. cit.*, pp. 658-672.
- 70) 海洋法等を含む海洋政策委員会関係の基本的情報については、同委員会のウェブサイトから入手した。 (<http://www.oceancommission>.)



gov/ )。

ところで、海洋政策の包括的な再検討は、ストラットン委員会以来だとされている。ストラットン委員会（海洋科学、工学および資源に関する委員会）は、1969年に報告書を大統領と議会に提出しているが（<http://www.lib.noaa.gov/edocs/stratton/title.html>）、この報告書の提案をもとにして、国家海洋大気庁の設立という制度変更が行なわれている。

- 71) 大統領命令およびアメリカ海洋行動計画については、環境問題諮問委員会の機構間海洋政策グループのウェブサイトから入手した（<http://ocean.ceq.gov/>）。
- 72) U.S. Commission on Ocean Policy, *An Ocean Blueprint for the 21st Century* (University Press of the Pacific, 2004), pp. 48-49.
- 73) *Ibid.*, pp. 55-59.
- 74) U.S. Ocean Action Plan-The Bush Administration's Response to the U.S. Commission on Ocean Policy, p. 3.
- 75) *Ibid.*, p. 4, 6, 7.
- 76) Executive Order: Committee on Ocean Policy, Sec. 1, 4.
- 77) U.S. Ocean Action Plan, *op. cit.*, pp. 36-37.
- 78) Eugene H. Buck and Daniel A. Waldeck, *op. cit.*, p. 25.
- 79) アメリカについて管轄海域が広いといわれるオーストラリアは、1998年12月に海洋政策を公表している。この政策に基づき、連邦政府は複合的な海洋利用に関する統合的な生態系に基づく計画および管理に責任をもつことになった。オーストラリア海域をいくつかの海域に区分し、海域ごとに地域海洋計画を策定することを通じて、海洋政策は実施されるが、その海域区分は、LMEに基づいている。オーストラリア海洋政策に関連する情報については、国家海洋事務所のウェブサイトから入手できる（<http://www.oceans.gov.au/home.jsp>）。

また、カナダは、1997年に海洋法（Oceans Act）を制定し、同法に基づき2002年に海洋戦略を策定している。この戦略のなかに、海洋

資源管理に対する生態系アプローチが取り入れられている。関連情報については、カナダ海洋漁業省のウェブサイトから入手できる（[http://www.dfo-mpo.gc.ca/canwaters-eauxcan/oceans/index\\_e.asp](http://www.dfo-mpo.gc.ca/canwaters-eauxcan/oceans/index_e.asp)）。

- 80) 本稿で取り上げた国際的文書以外では、たとえば、1973年絶滅のおそれのある野生動植物の種の国際取引に関する条約、1979年移動性野生動植物種の保全に関する条約、1995年陸上活動からの海洋環境の保護に関する世界行動計画が、また、地域的なレベルでは、国連環境計画地域海条約等があげられている。Hanling Wang, *op. cit.*, p. 54.
- 81) Garcia, S. M. et al., *op. cit.*, p. 8.
- 82) *Ibid.*, p. 2.
- 83) Report of the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, Reykjavik, Iceland, 1-4 October 2001, p. 117.
- 84) EAF 指針はもちろん任意的な文書ではあるが、2003年のFAO・COFIの第25会期において、多くのメンバーからEAF実施における重要なステップととらえられたということである。Report of the twenty-fifth session of the COMMITTEE ON FISHERIES, Rome, 24-28 February 2003, para. 92.
- 85) たとえばOlav Schram Stokke, *Governing High Seas Fisheries*, *op. cit.*, pp. 338-340を参照。
- 86) Alfred M. Duda and Kenneth Sherman, "A New Imperative for Improving Management of Large Marine Ecosystems," *Ocean & Coastal Management*, Vol.45(2002), pp. 803-804.
- 87) FAO Fisheries Department, *op. cit.*, p. 42.
- 88) The Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem, para. 3; *Ecosystem-based Management of Fisheries: Opportunities and Challenges for Coordination between Marine Regional Fishery Bodies and Regional Seas Conventions* (UNEP, 2001), para. 3, 106, 116, etc; Report of the Second Meeting of FAO and Non-FAO Regional



Fishery Bodies or Arrangements, Rome, 20-21 February 2001, para. 51; Report of the

Third Meeting of Regional Fishery Bodies, Rome, 3 - 4 March 2003, para. 29.



## Marine Fisheries in Vietnam

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**[ABSTRACT]** From 1991 to 2003, number of fishing boats increased from 43,940 to 83,122. The average power per boat increased from 18HP/boat to 49.3HP/boat. Fishing productivity seems to be gradually decreased from 0.89ton/HP to 0.35 ton/HP. In this period, the yield of marine fisheries has been constantly increased with an annual average of 5.73%. Last year, it reached 1.426 million tons in which 873,000 tons was from coastal fishing while the limit is about 600,000 tons. That means there was a fishing overcapacity from coastal waters.

The current situation of development and management of Vietnam marine fisheries is presented.

Its disadvantages and weaknesses are clearly identified. Vietnamese government determined to improve its existing fisheries management to obtain a sustainable one. Well planned strategies to make its fisheries better are clearly stated. Important policies like Zero and preservative policies will be enforced. The government even gives up some its controls to private sectors. More detailed suggestions are presented.

**[Keywords]** sustainable development, open asset, fishing productivity, Tonkin gulf, fishing capacity, community-based fisheries management.

### THE CURRENT SITUATION OF DEVELOPMENT AND MANAGEMENT MARINE FISHERIES IN VIETNAM

#### The yield of marine fisheries

From 1991 to 2003, marine fisheries continuously developed at the speed, which increased an average of 5.73% per year (Table 1). In 2003, the yield of the whole country's fisheries was 2.536 million tons in which the marine fisheries got 1.426 million tons equivalent to 56% of the total fisheries yield. The offshore fisheries gained 0.553 million tons or 38.8% and the coastal fisheries reached about 0.873 million tons or 61.2%.

Some tendencies of the development are recognized during the past years:

- + The annual increase in the marine fisheries yield is not because of the richness of fisheries resources but of the increasing number of fishing boats.
- + The mechanized level of fishing boats has been rising quickly, but the marine fisheries yield has not increased as the same ratio.

+ The reduction in the fishing productivity has reflected the retrogression of the fisheries resources and environment. (Figs. 1 and 2)

#### Labor force in marine fisheries

Labor force in coastal regions are abundant. The number of people who make the living through fisheries was about 1.608 million (in 1999), which equaled to 2.11% of the country's population. Now, that number is about one million. The majority of fishermen are poor (their average GDP is 160 USD per person). They work mainly by their own experience, have a low level of education and limited awareness of fishing regulations. However, they are highly aware of the community and willing to help each other.

The number of qualified captains and chief engineers is small, just about 10,000. Their knowledge and skills to use modern equipment are limited.

The above references about the labor force limit the efficiency of well equipped fishing boats.



Table 1. Yield and export turnover of Vietnam (1991-2003)

Year	Yield(ton)	Marine fisheries(ton)	Aquaculture(ton)	Export turnover (USD1000)
1991	1,066,330	730,420	335,910	252,000
1992	1,086,800	737,150	349,630	305,300
1993	1,166,169	793,324	372,845	368,604
1994	1,211,496	848,474	333,022	458,200
1995	1,344,140	928,860	415,280	550,100
1996	1,373,500	962,500	411,000	670,000
1997	1,570,000	1,078,000	492,000	776,000
1998	1,668,530	1,130,660	537,870	858,600
1999	1,827,310	1,212,800	614,510	971,120
2000	2,003,704	1,280,591	723,113	1,398,170
2001	2,248,700	1,369,600	879,100	1,760,610
2002	2,410,361	1,434,800	976,100	2,014,000
2003	2,536,361	1,426,223	1,110,138	2,216,694
T (%)	107.48%	105.73%	110.47%	119.86%

From Annual report of Ministry of Fisheries (1991-2003)

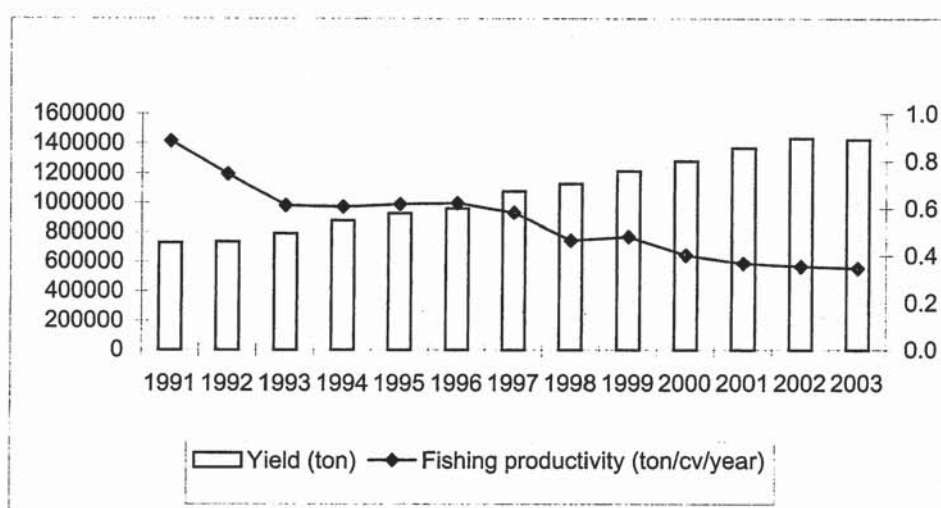


Fig. 1. Relation between fishing productivity and yield

When small boats operated along the coastal areas, these limitations may be not much. However, when operating big boats with modern equipment, the lack of knowledge about advanced technology, fisheries resources, and fishing techniques will lead to the limitation of using this equipment. Thus, the economic efficiency is low.

#### Marine fishing boats

In 2003 there are 83,122 engine boats with the total power of 4,100,000 HP (Table 2). It was reported that the number of boats has increased 1.89 times and 4.97 times the engine capacity compared with these in 1991. Each boat's average power used to be 18 HP and now it mounts up to 49 HP. The total of offshore operating boats has been 6,258 so far with the total power of over 1 million HP.



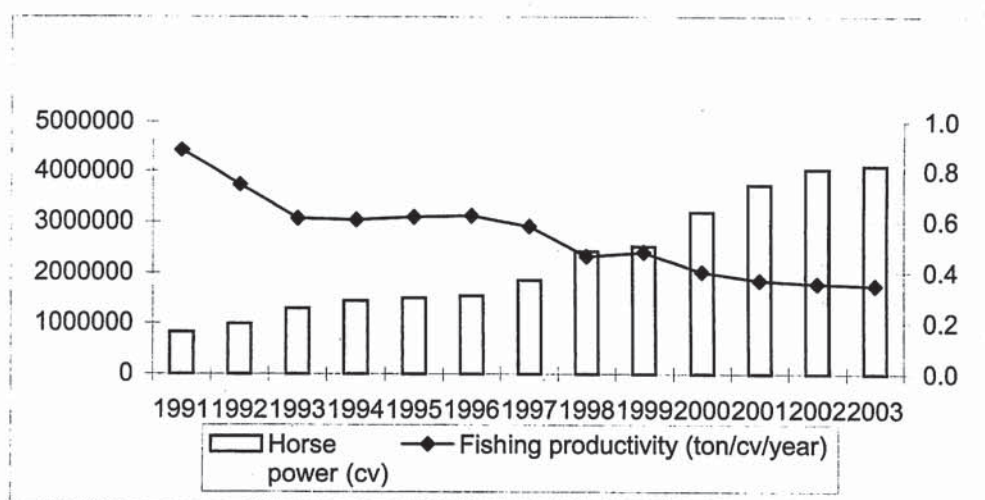


Fig. 2. Relation between fishing productivity and horsepower

Table 2. Number of boats and fishing productivity in Vietnam (1991-2003)

Year	Number of boat(unit)	Total horse power(cv)	Yield(ton)	Average fishing productivity(ton/cv/year)
1991	43,940	824,438	730,420	0.89
1992	54,612	986,420	737,150	0.75
1993	61,805	1,291,550	793,324	0.61
1994	67,254	1,443,950	878,474	0.61
1995	69,000	1,500,000	928,860	0.62
1996	69,953	1,543,163	962,500	0.62
1997	71,500	1,850,000	1,078,000	0.58
1998	71,779	2,427,856	1,130,660	0.47
1999	73,397	2,518,493	1,212,800	0.48
2000	75,928	3,185,558	1,280,590	0.40
2001	78,978	3,722,577	1,369,600	0.37
2002	81,800	4,038,365	1,434,800	0.36
2003	83,122	4,100,000	1,426,223	0.35
T (%)	105.45%	114.30%	105.73%	92.51%

From Annual Report of Ministry of Fisheries (1991-2003)

In recent years, although number of big boats tends to increase, the number of small boats with under 23 HP still contributes a high percentage (about 50%). Big boats with over 300 HP get only 2% and most of them are operated in South Viet Nam.

The number of boats operating in coastal areas is 85% and offshore areas are just 15%.

Most equipment is simple, especially safe equipment. Some big boats, which are recently built and able to operate offshore, are equipped

with communication and safety equipment accordingly to the regulations. Most small boats equip with no equipment that follows the regulations.

The operating range of fishing boats is relatively wide and the fishing regions are not fixed.

However, some big fishing areas with a lot of fishing boats have been formed in Tonkin gulf, the Southern Central, and the South West. These areas are only 50-70 kilometers away from the shore.



### **Kinds of marine fishing**

Kinds of marine fishing are diverse. According to the current statistics, there are over 20 different kinds classified into 5 categories as follows:

- + Trawling: 31.9%
- + Purse seine: 6.9%
- + Gill net: 14.5%
- + Long lining: 19.5%
- + Others: 27.2%

In terms of offshore fishing there are:

- + Trawling: 33.1%
- + Gill net: 23.8%
- + Long lining: 21.1%
- + Others: 22%

### **Fishing ports**

By the end of the year 2002, sixty three fishing ports have built; 47 of them are in coastal provinces and 16 are on islands.

On the whole, the logistic at these fishing ports is unsuitable and hardly synchronous; their form of activity is just "market," which bears the characteristics of exchanging fish for other goods such as ice, gasoline, food, etc...

The followings are some weaknesses in these fishing ports.

- + Scattered and locally operating, lacking the cooperation with other localities
- + No essential support for fishermen to sell their products with true value and to provide useful services according to their requirements
- + Lacking credits activities to help fishermen.

### **Managing marine fisheries in Vietnam**

Since 1991, the Organization of Fisheries Resources and Environment Conservation has been established and has horizontally operated from Fisheries Ministry to Fisheries Service in each province to monitor fishing boats.

At present, the system of fishing boat management consists of the Department of Fisheries Resources And Environment Conservation (which belongs to Fisheries Ministry) and 36 branches of 28 coastal provinces and 8 other ones.

Most of these branches have only been equipped with one or two fishing-monitor boats. Some provinces have fishing-monitor offices at the estuaries to control the boats' activities. However, most of them don't have proper facilities to make the monitoring efficiently.

The total number of boat managing staff is 700 in which there is 170 staff in charge of boat management and over another 500 responsible for conserving fisheries resources. Most of them are non-professional; they have hardly been trained well.

### **Boat registration**

The number of fishing boats, mainly big boats, already registered is about 70% of the total of current boats. Small boats operating along the coastal waters haven't been able to be managed yet.

With respect to the management, only administrative management is essentially done. Technological management is still illogical; technicians do not have enough knowledge and skills. Therefore, the technology control is just like a symbolized step in a procedure to allow fishermen to fish at sea. The quality control, especially the technological control of newly built boats, is weak. There haven't been any criteria about equipment appropriate for each fishing boats' characteristics.

The quantity and quality of the crewmembers haven't been determined yet.



### **Issuing fishing permits**

Issuing fishing permits for boats has been done since 1991. In 2000 together with the government's permit cancellation, fishing permits were also cancelled. Re-issuing fishing permits was done in 2002.

In the 1990s, the Fisheries Sector had a lot of decrees of the Fisheries Ministry related to fishing permits. For example, the regulations banned destructive fishing methods, limited fishing areas, and managed fishing areas and species (Table 3). In reality, these regulations have had certain effects on the management of marine fisheries in Vietnam.

### **Monitoring the operations of fishing boats**

In the past few years, the staff of local Fisheries Resources and Environment Conservation has become one of the main monitoring forces at sea. Every year, thanks to the forces' activities, thousands of law violations about conserving fisheries resources have been administratively fined, and many others have been brought to justice.

At the moment, our country has just directly monitored fishing boats (and it has not indirectly monitored by means of cameras yet), so there are a lot of problems, such as:

- + Some provinces have not regularly monitored due to the lack of money and staff.
- + The staffs in charge of monitoring do not cooperate well.

Consequently, violations identified and settled down are much lower than actual incidences.

### **Supporting fishermen**

The marine fisheries in Vietnam is in a small scale; over 95% of the marine fisheries yield is done by local fishermen. There are 6 central State

enterprises and 15 local State enterprises, but 463 cooperatives and 4,300 groups of fishermen.

The support for fishermen is very limited. The trade, consumption and provision of fisheries services are mainly done by private sectors. They loan fishermen money to pay expenses, such as gasoline, ice, raw materials, and food. In return, the private lenders are the only buyers of their loan fishermen. Of course, they quite often buy at unreasonable price, which is unfair to fishermen.

### **Conclusion**

We can evaluate the current status of developing marine fisheries in Vietnam as follows:

- + There have not been any appropriate fishing strategies in Vietnam resulting in many problems and illogicalities in the fishing process.
- + Fishing in Vietnam is still done by the people, mainly in the fishing household size. Most of the fishing boats are wooden ones with low power, operating in coastal waters, and the fishing technology is not updated.
- + The offshore fishing boats are not synchronously invested. The boat owners and crewmembers lack the knowledge of management, fisheries resources, as well as advanced fishing technology.
- + The logistic services (fishing ports, fish marketing facilities, ice making factories, cold storage etc) have not yet met the standards; therefore, the offshore fishing boats have been operated inefficiently.
- + The assignment and devolution of management in the basis branches and regions and that of economic components have not been well organized. So, the fishing still bears the spontaneous characteristics.
- + The awareness of a sustainable fishing has not been emphasized. Most fishermen do not recognize that efficient fishing must be done together with the protection of ecological environment.



**Table 3. List of species banned from catching in Vietnam**

No.	Scientific name	No.	Scientific name
1	<i>Pteria maxima</i>	11	<i>Balaenoptera musculus</i>
2	<i>Hilsa toli</i>	12	<i>Neophocaena phoca enoides</i>
3	<i>Anguilla Pacifica</i>	13	<i>Dugong dugon</i>
4	<i>Notopterus chitala</i>	14	<i>Catlocarpio siamensis</i>
5	<i>Semilabeo notabilis</i>	15	<i>Crinidens sarisso phorus</i>
6	<i>Pangasianodon gigas</i>	16	<i>Chelonia mydas</i>
7	<i>Paramesotriton deloustali</i>	17	<i>Dermochelys coriacea</i>
8	<i>Crocodylus porosus</i>	18	<i>Lepidochelys olivacea</i>
9	<i>Crocodylus siamensis</i>	19	<i>Eretmochelys imbricata</i>
10	<i>Lipotes vexillifer</i>	20	<i>Scleractinia</i>

From Circulation No. 01/2000/Ministry of Fisheries dated 28/04/2000

+ Due to so many boats fishing in coastal waters, fisheries resources have been reduced rapidly. That leads to low productivity.

+ Vietnam Sea is in the region of monsoon tropical climate; therefore, it is directly influenced by weather changes like storms, whirlwinds, or high tides. When a storm is coming, marine fisheries is the first sector suffered from bad consequences and has the most damage.

### **SUGGESTIONS FOR VIETNAM FISHERIES MANAGEMENT TO OBTAIN SUSTAINABLE FISHERIES**

Vietnamese government will do the followings to develop sustainable fisheries:

#### **Planning the fishing strategies:**

These strategies must be compatible with the rules of sustainable development. Based on the understanding of fisheries resources and fishing characteristics in Vietnam, those strategies will give out rational plans for different fishing areas.

#### **Executing the principles of input-fishing management:**

It means to manage the quantity and the size of

fishing boats. It also means to stop the open asset for both the offshore and coastal fishing. According to these rules, it is crucial to manage the registration and fishing permits for fishing boats. However, we need suitable regulations and assignments on the basis of decentralization.

#### **Managing on the indices of fishing:**

Vietnam is in a tropic region, so its fishing areas have multi-species. Thus, its fishing boats must have multi-gears. The management on the indices of the fishing needs to be done. They consist of the number of fishing boats, the fishing productivity, the yield, the revenue, and the permissible kinds and sizes for fishing. The constant checking of the above indices of fishing production has helped us to achieve a right evaluation of fishing in each period. By doing so, we will have modern suitable management.

#### **Applying the "Zero" developing policy for marine fisheries:**

It means to not increase the yield over the years. Executing responsibly the fishing principles is the main content of this policy. Besides, it is necessary to establish the Marine Preservation Areas (MPA), the Artificial Coral Reefs (AR), and Re-Stocking.



**Carrying out the preservative fishing policies:**

Some solutions are minimizing the fishing by the means of destruction (by banning completely the use of explosives and Cyanure for fishing), determining the banned-fishing areas and time, as well as kinds of nets and sizes of mesh.

**Applying the management principles of decentralization:**

The current ways of fisheries management in Vietnam are still centralized. The management offices are not the local representatives, so they do not get any support from the concerned people in the region. This has a strong influence on the plan of development and execution.

Decentralization has reflected not only by the policies but also by the structures and organizations of fisheries management office at all levels.

**Improving knowledge and skills for the work force:**

The advanced technology helps to refine the technological procedures in forecasting fishing areas, making a plan of controlling production, fishing techniques, improving fishing gears, logistic services, cold storage, and processing sea products. Thus, training the work force to update with the advanced technology is one of the most important aspects to develop marine fisheries in Vietnam. The work force includes managers, technicians, fishermen, and workers.

**Investing synchronously the system of logistic services:**

On the islands and ports that close to important fishing areas, conditions of facilities need to be

improved and services need to be broadened. Facilities include quays, oil tanks, and ice factories. Services consist of sales, cold storage, semi-processing, anchorage, and storm prevention.

**Increasing the awareness of a sustainable fishing concept:**

It needs to be done by all managing levels, as well as common fishermen. Up to now, this modern principle has been quite new to Vietnamese. Therefore, only by enhancing the awareness for the whole society, from policy makers to executors, desired results can be achieved. This can be done through workshops for people working in the field, public broadcasting, school lessons, brochures at related location.

**Applying the community-based fisheries management:**

By entitled to share responsibilities and benefits, fishermen determine to catch and conserve properly fisheries resources. The community-based fisheries management helps them to realize that the sea is closely connected to their lives and their future generations.

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## Decentralized Management: The New Approach of Thai Coastal Fishery Management

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**[ABSTRACT]** In the last three decades coastal fishery has created employment, provided a supply of good quality animal protein for Thai people. The fishery resources of Thailand are treated as common property, anyone can take benefit from these resources. They are, therefore, heavily exploited by fishers who employ various types of fishing gear. Arising from the development of Thai coastal fishery and the increasing in number of coastal fishers, two severe problems, i.e., the fishery resources depletion problem and the conflicts among fishers problem now exist.

So far, the management of coastal fishery is centralized. The Department of Fisheries (DOF) is the sole agency in managing coastal fishery and all of the management measures has established by the DOF without consulting with the fishers or other stakeholders. Thus, the DOF is hardly to get a satisfy success in coastal fishery resources conservation and management. Therefore, in order to achieve the sustainable development of coastal fishery, a new approach of management should be considered.

In late 1993, with the financial support of the Asian Productivity Organization (APO), Prof. Tadashi Yamamoto is invited to Thailand for providing technical assistances on community-based fishery management, fishing right and decentralization management to DOF officials and instructors of the Faculty of Fisheries. In early 1994, the DOF set up several committees for establishing a decentralize management system. Owing to the reshuffle of the DOF Director General and the economic crisis of the country, the progress of the development is very limited although the present Constitution is clearly mentioned that the government has to manage the natural resources and environment through decentralization.

In late 2003, with political reason, the DOF is pushed by the Deputy Minister of Agriculture and Co-operatives to implement decentralized fishery management through fishery co-management and fishing rights system for coastal fishery. Then, several committees again have been established and each committee has his own assignment. Many instructors from universities and stakeholders are invited to be a member of committees. To support the decentralization approach, a Provincial Fishery Management Committee is established in every coastal province with the mandate of managing the fishery in provincial fishing ground. The members of provincial committee include small-scale fishers, commercial fishers, chairman of Tambon (Sub-district) Administrative Organization (TAO), instructors from universities, DOF officials and other stakeholders. Instructors and officials act as technical advisor only and they will not engage in committee voting. At present, Thai Fisheries Cooperatives are not active in fishery management due to the constraints on legal framework and fisheries cooperatives management. To develop the decentralized management in Thailand may require time and considerable cost because there are many problems to be solved. This is the great challenges to everybody concern.

**[Keywords]** Thai coastal fishery, Decentralized management



## INTRODUCTION

Thailand is a typical tropical country with a total area of 513, 115 sq. km. of which about 35 per cent can be classified as mountainous areas. The large and varied interior of the country possesses rich aquatic resources. In addition, Thailand's coast line of 1,875 km includes the Northern and Western reaches of the Gulf of Thailand (GoT) which are relatively shallow waters rich in marine life, and the Southwestern coastline extending 740 km along the Andaman Sea. These comprise essential nursery areas for juvenile marine and brackish water organisms of significant economic importance, and offer good potential for coastal aquaculture development (1).

Thailand has 24 coastal provinces which are classified into 5 coastal zones as follows [5]: Coastal Zone I-Eastern part of the GoT; Coastal Zone II-Inner part of the GoT; Coastal Zone III-Central part of the GoT; Coastal Zone IV-Southern part of GoT; and Coastal Zone V-Andaman Sea.

For fishery management and statistic collection purpose, the fishing grounds of Thailand are divided into 12 fishing areas of which seven are within the EEZ of Thailand (2).

### Roles of coastal fisheries to national economy

Coastal fishery is one of the important sectors of Thai fishery industry. Its roles in the national economy are as follows (3):

*To provide high quality animal protein for the Thai people.* In the past, fish were treated as the cheapest animal protein. Coastal fishery is the main source of fish supply for domestic consumption. At present, the fish per capita consumption in Thailand is being around 30 kg.

*To create national income.* In 2000, the gross domestic production (GDP) of fisheries sector

was 2.8 billion US\$ which accounted for about 2.5 per cent and 27.6 per cent of national GDP and of agricultural GDP, respectively.

*To create employment.* Fishery industry can absorb a considerable number of labors for capture fishery, aquaculture, fish processing and fish marketing. From 1995 Marine Fishery Census, the total number of fishers was about 320,000 comprised of 70,000 full-time commercial fishers; 180,000 small-scale fishers; and 70,000 engaged in fisheries related activities. The coastal fishery could absorb a number of labor forces in the rural areas and results to the declining of social problems in the country.

*To earn foreign exchange.* Thailand is a major export country on fishery commodities that earn around 3 billion US\$ annually from 1995. The major fishery commodities are fresh and frozen, canning and salted, dried and smoked. The important exported fishery products were frozen fish and frozen cuttlefish. The relative shares were approximately 14-19 per cent and 11-14 per cent of total fishery export, respectively. The coastal fishery contributes the main portion of raw material for frozen fish and cuttlefish as well as canned crab due to the high quality of the catches.

*To create linkage industry.* Along with the development of coastal fishery, many linkage industries ; i.e., ice plant, net making factory, cold storage and processing plants have been established. This result to the increasing of national income and employment.

### Structure of Thai coastal fishery

#### Fishery households

In 2000, there were 53,112 marine fishery households in the country of which 98.7 per cent of them are small-scale fishery households. The small-scale fishery household is the household that operate fishing without boat, with non-



powered boat, out-board powered boat and in-board powered boat of less than 10 GT. The total number of fishery households decreased by 18.8 per cent from 1995 but total number of small-scale fishery households increased by 12.0 per cent. The majority of the small-scale fishery households was in Coastal zone IV and V (NSO, 2001). These reveal that the coastal fishery resources will be overexploited particularly in the Southern of GoT and Andaman Sea. Thus, the cases on fishery conflict normally appear in these two areas.

#### Fishing boats

Fishing boats that operate in the coastal area can be divided into three groups, i.e., non-powered boat, out-board powered boat and in-board powered boat. All of them are wooden boats. The 2000 Intercensal Survey of Marine Fishery results reveal that the total number of fishing boats in the country was 58,119. Out-board powered boats were the largest group in the country with 72.7 per cent. The second largest group was in-board powered boats accounting for 22.8 per cent. Non-powered boats were the smallest group which constituted only 4.5 per cent. Thus, the total number of fishing boats that operate in coastal areas were 51,078 boats.

#### Fishing gears

The major fishing gears employed by Thai coastal fishers are fish gill net, crab gill net, fish trap, crab trap, long line, bamboo stake trap, push net, baby trawl, set bag net and other manual gears. In the past, the small-scale fishers use low efficiency gears and small in scale that result in their low catches. However, with the rapid development of the fishing technology, the efficiency of fishing gear of small-scale fishers has increased and resulted in a high total amount of fishing effort. The small-scale fishers normally employed more than two fishing gears due to fishing season and available of fishery resources.

### **Problems of Thai coastal fishery**

The fishery resources in Thailand are treated as common property anyone can take benefit from these resources. They are, therefore, heavily exploited by fishers who employ various type of fishing gears. Arising from the development of Thai coastal fishery in the last three decades, many serious problems now exist. The two most severe problems are (4):

*Fishery resources depletion.* This is the most severe problem of coastal fishery. Studies on the assessment of many important economic species found that the fishery resources in coastal areas are being overfishing and the fish stock is being depleted. Furthermore, the catch composition of marine fishery products has higher trash fish. The small-scale fishers have less catch and the size of caught fish is become smaller. The catch per unit of effort is reduced more than half in the last decade. These result from overfishing and degradation of aquatic environment.

*Conflicts among fishers.* Owing to limited fishery resources, the fishers who employ different types of fishing gear and use the same fishing ground, compete with each other in exploiting the resources. This leads to conflicts among fishers both small-scale fishers and commercial fishers. This problem is becoming serious as the number of cases and degree of conflicts are increasing day by day.

In the next decade, if these two problems cannot be solved the coastal fishery of Thailand may collapse.

### **COASTAL FISHERY MANAGEMENT PROGRAM**

So far, the DOF is the agency that take responsibility on coastal fishery management of the country. The DOF realize the problems of coastal fishery which is why many management



measures have been implemented to protect and develop the coastal fishery resources. The important measures so far taken are as follows (3): *Area and seasonal closures.* This measure is mainly aimed at recovering the Indo-Pacific mackerel (*Rastrelliger brachysoma* Bleeker), or "Pla Too" in Thai, which is an important economic species in the country. The DOF conducted a long-term study on this species and found that the coastal areas are the spawning and nursery grounds of the species for the period from February to May. As a result, the declaration of 28 November 1984 of the Ministry of Agriculture and Cooperatives prohibits trawling and purse seining in upper south of the GoT for two periods, 15 February to 31 March and 1 April to 15 May. The gill netters that operate in this area must use nets with mesh size of 4.7 cm and above. For the same reason, the Ministry announced another declaration on 11 April 1985, which prohibits trawling, purse seining and gill netting with mesh size of less than 4.7 cm in the Andaman Sea Area from 15 April to 15 June.

*Gear restriction.* In order to preserve the coastal fishery resources, the Ministry declared a regulation on 20 July 1972 which prohibits trawling and push netting within 3,000 m from shore. These gears are considered to be destructive in that they catch a big amount of trash fish, more than half of which are juveniles of economic importance. Furthermore, these gears disturb the sea bed, resulting in a decline of fishery resources.

*Limited entry.* Owing to the limited fishery resources, in 1980, the DOF made an announcement regarding the registration of trawlers and push netters in an attempt to control the number of these gears. No more licenses were issued to fishing vessels. Only the fishers who have fishing licenses can apply for an annual extension of their fishing licenses. The fishing licenses are non-transferable to other operators

except when these are children of fishers.

*Mesh size limitation.* For the protection of small-size pelagic resources, fishing with light-lure and net with mesh size of less than 2.5 cm are prohibited by the declaration of Ministry of 14 February 1977. For squid fishing with light from electric generator, the mesh size must be 3.2 cm and above, as declared on 5 November 1981.

Although these measures have been implemented for more than two decades now, the coastal fishery resources have yet to recover to a satisfactory level for the following reasons:

1. The DOF is not the only agency implementing fishery management program. There are several agencies concerned with the program. Thus, it is very hard for the DOF to implement any measures efficiently.
2. The collaboration by fishers is limited. As mentioned above, fishery resources are treated as common property and coastal fishery is open access fishery. The fishers are not willing to collaborate with the DOF for the fishery management program. They just want to catch as much as they can each day because they believe that if they follow the DOF fishery program, they will be the losers.
3. The law enforcement cost is very high. The construction and operation costs of patrol boats are considerable; the DOF provides quite a big budget for them each year in the past two decades but it is still inadequate. Furthermore, it is doubtful whether the benefit from recovery of fishery resources can meet the cost of law enforcement.
4. Low efficiency of enforcement. The limited number of staff and patrol boats versus the coastal length of 2,614 km allows the huge number of fishing boats to operate various



types of fishing gears. Other reasons for the poor enforcement of laws in Thai waters are as follows:

- Lack of motivation by field staff to enforce laws;
- Lack of appropriate and effective penalties;
- A view that many illegal fishers have no alternative source of income;
- Pressure brought to bear by influential persons who include owners of fishing boats, creditors of fishers, middlemen (who may also be owners and creditors), and sellers of fishery inputs such as fuel, nets, ice, etc.;
- Lack of appropriate equipments on the part of law enforcement units;
- Lack of staff in law enforcement unit; and
- Cultural attitudes relating to enforcement prohibitions.

## DEVELOPMENT OF DECENTRALIZED COASTAL FISHERY MANAGEMENT

Decentralization is the delegation of power, authority and responsibility from the central or national government to lower levels, or smaller units of government, such as states or provinces, or to local-level institutions, such as community organizations. Decentralization can be operationalized in four ways:

- Deconcentration: the transfer of authority and responsibility from the national government departments and agencies to regional, district, and field offices of the national government.
- Delegation: the passing of some authority and decision-making powers to local officials. The central government retains the right to overturn local decisions and can, at any time, take these powers back.
- Devolution: the transfer of power and

responsibility for the performance of specified functions from the national to the local governments without references back to central government. The nature of transfer is political (by legislation), in contrast to decentralization's administrative transfer, the approach is territorial or geographical rather than sectoral.

- Privatization: the transfer of responsibility for certain governmental functions to NGOs, voluntary organizations, community associations, and private enterprises (6).

The development of decentralized coastal fishery management of Thailand can be classified into phases as follows.

### Preparation Phase.

The failure of the fishery management program in the past has pushed the DOF to rethink on managing the coastal fishery of the country. A concept that has received much attention is decentralized management. The coastal fishery should be managed by the stakeholders and communities. The essence of such system is that fishers or fisher institutions, rather than the government, should be responsible for the management and regulation of fishery. It is generally believed that if fishers or fisher institutions were given management responsibilities, they would be committed and responsive to management and conservation measures (7).

In 1993, the DOF with the collaboration of the Department of Fishery Management (DFM), Faculty of Fisheries, Kasetsart University, established a community-based fishery management (CBFM) program for Thai coastal fishers. However, the understanding on CBFM concepts of concerned people is very limited. Thus, the DFM, with the financial support of the Asian Productivity Organization, invited Professor Tadashi Yamamoto to Thailand in December 1993. Professor Yamamoto spent one month with



researchers from DOF and DFM, a one week seminar was organized at DFM in order to convey a clear concept of CBFM for researchers and instructors. Then a ten-day field trip was made to three provinces in Southern Thailand to meet the provincial fishery officials and heads of several fishing communities to explain the concepts of CBFM to them.

In early 1994, the DOF set up several committees for establishing the CBFM in Thailand. The urgent tasks are (a) drafting a new fishery law to incorporate the CBFM and (b) pilot project preparation. Unfortunately, due to the economic crisis of the country and the reshuffle of the DG of DOF, this program has a slow movement only three pilot projects have been implemented and most of the coastal fishers misunderstood on the concepts of CBFM.

The present Constitution that enacted in 1997 provided many sections for decentralized management. In Section 76 of the Thai Constitution has mentioned that "The State shall *decentralize powers to localities* for the purpose of independence and self-determination of local affairs ..... The State shall promote and encourage *public participation* in laying down policies, making decision on political issues .....". This means that the government has full responsibility to promote decentralization and public participation. In addition, Section 79 stipulates that "The State shall promote and encourage *public participation in preservation, maintenance and balance exploitation of natural resources and biological diversity* and in the promotion, maintenance and protection of the quality of environment in accordance with the persistent development principle as well as the control and elimination of pollution affecting public health, sanitary conditions, welfare and quality of life".

Result from the Section 76 and 79, a Tambol Administrative Organization (TAO), the local

organization at sub-district level is established in each Tambol for the whole country. It has given a mandate on local environment protection and natural resources conservation and management. However, most of the TAO officials can not carry out their mandates due to their low position and to the fact that the TAOs are controlled mainly by local influential groups.

#### Legal framework preparation phase

In order to provide legal support to decentralized management of coastal fishery and to accord with the above Sections of the Constitution, a new fishery law is drafted with participation of all stakeholders. This law consists of 16 chapters as follows:

- Chapter I: Principles
- Chapter II: Definitions
- Chapter III: Zones
- Chapter IV: Management of Aquatic Resources
- Chapter V: Community-Based Fishery Management
- Chapter VI: Inland Fishery Zone
- Chapter VII: Coastal Marine Fishery Zone
- Chapter VIII: Commercial Marine Fishery Zone
- Chapter IX: Overseas Marine Fishery Activity
- Chapter X: Foreign Fishing Activity in Thai Waters
- Chapter XI: Aquaculture
- Chapter XII: Protected Species and Protection Areas
- Chapter XIII: Health, quality and Export
- Chapter XIV: Monitoring, Control and Surveillance
- Chapter XV: Jurisdiction and Penalties
- Chapter XVI: Miscellaneous

There are many sections that related to decentralized coastal fishery management through fishery co-management and community-based fishery management systems. The key contents of those sections can be summarized as follows.

1. Encourage fishermen, fishing communities, the public, and provincial and local



authorities to work together to create Local Fishery Committee for the purpose of better managing, conserving and developing the aquatic resources (Section 18).

2. Establish a Local Fishery Committee (LFC) and designate an area of waters within coastal marine fishery zone which is under jurisdiction of the LFC. The LFC has exclusive authority to issue local fishing permit (Section 19).
3. An area of coastal marine fishery shall designate as a designated community fishery area. Members of the public can initiate and participate in decision-making regarding the establishment of criteria for and creation of a designated community fishery area (Section 51).
4. No person shall harvest aquatic resources within the Coastal Marine Fishery Zone unless the person engaged in the harvesting is registered small-scale fishers or the person who has a permission written from LFC (Section 59).

Although the draft new fishery law is a comprehensive fishery law that covers all aspects of fishery industry, but it requires a long procedure for getting approval from the parliament. So far, the law is under the considerations of agencies concerned.

#### Implementation phase

In September 2003, with the political reasons, the Deputy Minister of Agriculture and Cooperatives Ministry pushed the DOF to implement decentralized coastal fishery management with the following procedures.

- 1) A Fishery Management Committee (FMC) is established in every coastal provinces. The members of the committee comprise of representatives of small-scale fishers and commercial fishers (equal number),

chairman of TAO in the province, fish monger, fish processor, representative of governor, 2 instructors from university and Provincial Fishery Chief is chairman of the committee. According to the advice of Professor Yamamoto, the instructors and other officials will not engage in any voting. Their main task is to provide technical advice and other assistances.

- 2) The mandate of FMC is to designate the provincial fishing ground and establish fishery management measures for this fishing ground. However, the management measures that establish by FMC should not overrule any fishery management measures of the DOF. In addition, FMC has authority in granting a fishing right to a fisher. At present, all coastal provinces have finished the establishment of their provincial fishing grounds and some provinces have overlapping areas. Base on the proposed fishing ground of each province, the DOF will be the agency to finalize the provincial fishing ground of each province. For the management regulations and measures, some FMCs have proposed some measures but these measures are not implemented due to lack of legal support.
- 3) All fishers both small-scale and commercial fishers have to register with the Provincial Fishery Office. Only the registered fishers can apply for a fishing right. The registration covers number and size of management of fishing vessel and types of fishing gear and their number. The Provincial Fishery Office provided a registration service for every fishing community. So far, there are a number of fishers that did not registered owing to lack of information.
- 4) When the new fishery law is enacted, the FMC members will be authorized on law enforcement. They can arrest any poachers



who operate fishing in their own provincial fishing grounds.

- 5) In order to understand the attitudes of small-scale fishers and other stakeholders on decentralized management, the DOF with the collaboration of Coastal Development Centre (CDC), Kasetsart University conducted a survey in 22 coastal provinces from February to April 2004. The interviewed samples are 2,200 samples of which the majority are small-scale fishers and the others are commercial fishers, NGOs, researchers, officials and instructors from universities. The collected data is analysis by the researchers of CDC and the report of the study will be available in June 2004. The outcome of the study will be used for next step implementation.

#### **Pilot projects**

In order to gain an experience of decentralized management, the DOF implemented two pilot projects one in Phang-Nga Bay (Andaman Sea) and the other in Bangsaphan Noi (GoT). The first one is semiclose sea model and the second one is open sea model. The Phang-Nga Bay project has a good progress because there was a good support on budget and assistances from the DOF, Bay of Bengal Program and Italian NGOs. Furthermore, the small-scale fishers in Phang-Nga Bay are very active to participate in decentralized management. The followings are the activities of the project.

*Management of Mangrove Resources.* The coastal fishing communities have realized that mangrove forest is the home of aquatic animal juveniles and the abundance of fishery resources has a close relationship with the available mangrove forest areas. Therefore, in most fishing communities notice boards "Do not cut the mangrove trees" have installed in mangrove forest areas. Apart from the conservation campaign, mangrove reforestation and forest activities have also been performed in these areas. Mangrove reforestation

program is one of the main activities that the people (including students) in the fishing communities have fully participated. Because the fishers have realized that if the mangrove forests in their communities are rich they can assure that they will have a good catch. In addition, the fishers can earn more money from eco-tour in the mangrove forest areas. A committee has established in many fishing communities, this committee has an authority to set up regulations for the sustainable utilization of mangrove forest.

*Management of Sea-Grass Resources.* Similar to mangrove forest, the sea-grass areas are the good habitat for aquatic animals, especially blue swimming crab the target species of small-scale fishers. The sea-grass areas are destroyed by trawlers and push net as well as by pollution. Sea-grass transplantation that was conducted in some areas in the South of Thailand showed good results with the subsequent appearance of commercially important aquatic animals as well as dugong in the sea-grass beds. Some fishing communities have an agreement to declare the sea-grass area as a marine protected area and they are not allow anyone to fish in that area. The enforcement has been practiced by the member of the communities.

*Releasing Gravid Female Blue Swimming Crab.* A large number of gravid female blue swimming crabs were sold daily in the markets. In order to avoid the resources depletion problem, the fishers have established a program on releasing the gravid female crab. In Phang-Nga Bay two sets of cage 2x2x2 m were distributed to the fishing communities in the target areas. The caught gravid female crabs were stocked in the cages until they spawned and were then sold. The money from selling the crabs was kept as a revolving fund for the group. At present, the revolving funds of the fishers groups in Phang-Nga Bay is more than 100,000 baht. In some fishing communities, the money is donated to the



temples, mosques or schools.

*Sea Ranching Activity.* In order to enrich the coastal fishery resources, the DOF has provided seeds of shrimps, fish and crabs for releasing them to coastal areas particularly the areas where close to fishing communities. This activity can encourage a sense of ownership and responsible fishing behavior within the fishing communities for their fishery resources and aquatic environment in coastal waters. The fishing communities have a willing to pay for the seeds and fry in the future because they learned that they can get better catches from this activity.

*Determination of Conservation Zones.* To secure the coastal fishery resources, the small-scale fishers have requested the DOF to use buoys to marks areas for the conservation of aquatic resources in coastal areas and also requested a notice board to warn against fishing operations in these areas.

*Surveillance Measures.* In order to protect their fishing grounds from the poachers, the fishers have grouped themselves and requested the provincial governor to designate or appoint them as "Volunteer to protect the aquatic resources". Monitoring, control and surveillance were conducted continuously at night with the competent authority, i.e., policeman, DOF officials. In order to strengthen their capability in surveillance practice, the DOF with the collaboration of Thai Royal Navy has provided a training course on "Marine Protection Volunteer" for them. The training covers military practices and knowledge on fishery law and regulations.

*Fishing Gear Replacement.* Since trawlers and push net are treated as the destructive fishing gear, therefore the fishers in the fishing communities who employ these gears will be convinced or pushed by the other fishers to change their destructive gear to the non-destructive gears (gill nets, traps, hook and lines, etc.) The DOF has provided a compensation fund

for the one who want to replace the gears.

*Community Fish Market Establishment.* In general, the small-scale fishers have to sell their catches to the local middlemen or money lenders and they normally obtained the low price. Thus, if the fishers need more money they have to catch more and more that results to the depletion of the coastal fishery resources. Therefore, for getting higher income from the same amount of catch, the fishers have grouped together and established a community fish market in the fishing community. The members of the group accumulate their daily catches with the group and once the amount of catches reach the target the group will call for an auction. With the big amount of fish, there are many fish mongers join in the auction and then the price of catches has increased 30 per cent from the individual sell.

The pilot project in Bangsaphan Noi has less progress due to the inadequate number of staff to implement the project and the assistances from outside are rather limit. In addition, the fishers in this area have less attention in project participation than the fishers in Phang-Nga Bay and the open sea has more difficulties in management. However, from both pilot projects the DOF can gain both success and failure experiences for further improvement.

### **Constraints of the development**

The development of decentralized management through CBFM in Thailand is slowly making process owing to the following reasons:

1. The key persons of DOF lack a clear understanding of the concept of CBFM, thus leading to lack support on the decision makers of DOF.
2. The present fishery law and fisher institutions law are not in accord with the CBFM.
3. Since fisher institutions are the main mechanism for the development of CBFM,



the fisher institution in the country is not well organized and weak in actions.

4. The small-scale fishers in many areas hardly to accept CBFM due to their low level of socio-economic conditions and knowledge on CBFM.
5. Most of the fishery officers and other officials concerned with the CBFM have inadequate understanding of the concept of CBFM.
6. Lack of external agents. The number of competent NGOs, academic and research institutions that can assist in defining the problem; provide independent advice, ideas and expertise; guide joint problem solving and decision making; initiate management plan; and advocate appropriate policies are rather limited.

## CONCLUSION AND RECOMMENDATIONS

Decentralized coastal fishery management aims at sharing authority and responsibility to manage the fishery between government, the community of local fishers, and other resource stakeholders. Decentralized management addresses the crucial management issues of who controls the rights to use the fishery resources and who obtains the benefits from these resources. Decentralized management shows promise for addressing many of the requirements of sustainable, equity, and efficiency in small-scale fishery management. However, it should keep in mind that decentralized management requires compromise, respect and trust between all stakeholders. Therefore, the DOF should provide adequate personnel and budget for continuous development of decentralized management.

In order to achieve a rapid progress of decentralized management, the followings should be done.

1. The new fishery law should be enacted as soon as possible then the decentralization has full legal support.
2. Since the fishers institutions such as fishery cooperatives which are the key body for decentralized management are rather weak due to inappropriate of the present laws. Thus, a fishery cooperative law should be drafted urgently for strengthening the fishers institutions.
3. It is revealed that the majority of the fishers and fishery officials lack of understanding on the concepts of decentralized management that including FCM and CBFM. Thus, the DOF with the collaborations of NGOs, and academic and research institutes conduct short-term training course and information transfer through available media for common understanding of resources stakeholders and public on decentralized management.
4. The collaborations of all stakeholders should be strengthen and encourage them to work together as partners not competitors.
5. Adequate financial resources should be provided for decentralized management. The sustained funding is crucial to the sustainability of decentralized management.

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## Community Based Fisheries Management as the Future Fisheries Management Option for Small-Scale Fisheries of Bangladesh

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**[ABSTRACT]** Fisheries resources are resource is a great natural asset to this planet and ensuring the responsible use of these resources can enrich the lives of its people. However, global fishery resources are under high and mounting pressure which is severe, particularly in the developing countries. Until recently, traditional fisheries management failed to prevent over-exploitation and degradation and often ignored the socio economic aspects in the case of small-scale fisheries. Moreover, many developing countries face major constraints in capacity and the ability to promote implementation of long-term sustainable policies. International concern about people and their resources has significantly impacted thinking about how fisheries should be managed and the need for greater responsibility by fishers and managers is becoming more frequently heard. Bangladesh, a reverine developing country of South East Asia where more than 70% of the population lives in flood plain and coastal situations, fisheries resources suffer from severe over-exploitation so resource protection is important in sustaining the contribution of aquatic products to food security and livelihoods for the people. This situation urgently requires effective management measures. This This can be best achieved by involving all user groups and the national fisheries agency, as the leader of the managers, for long term success oriented ultimately towards societal well-being, and based upon economic and resource sustainability. The purpose of this paper is to provide background information on the fisheries of Bangladesh and to justify the implementation of community-based fisheries management (CBFM) as vital if sustainable solutions are to be found.

**[Keywords]** CBFM, Potentials, Inland Fisheries, Bangladesh.

### INTRODUCTION

Aquatic resources is a great natural asset to a country and ensuring the responsible use of these resources can enrich the lives of its people. The long-term economic prospects of a country largely depend upon the sustainable use of its unique natural resources. Nevertheless, resources are finite and there are competing uses for them. Moreover, the challenges for sustainable multiple

use of these resources are evident globally. There will continue to be a need for it to be managed responsibly for a variety of purposes.

Until recently, traditional fisheries management has resulted over-exploitation, degradation, low level of compliance (1, 2) and often ignored the socio economic aspects in case of small-scale fisheries (3). The most significant issues arising from existing fisheries management changes will be the resource protection and the equity in the



allocation of access to the resource, both between and within the various users groups. In order to accomplish such targets it is important that the future management arrangements be designed in an integrated manner. Moreover, many developing countries face major constraints in capacity and the ability to promote implementation of long-term sustainable Policies (4).

For instance, Bangladesh is a small riverine developing country which covers an area of 144,000 square kilometers with a population of 140 million and has a high population density (about 800 persons per km<sup>2</sup>, or only 0.57 ha per head). More than 70% of the population of the country lives in flood plain and coastal situations and they have a perception about the fish and aquatic resources as a natural capital asset resource which needs no care but requires only exploitation. As a result, the country suffers from rampant over-exploitation and implementation overload of its aquatic resources. However, still there is excessive centralisation, fisheries development strategies are obsolete, the legal framework for fisheries is not strong enough, and there is a little provision for fisheries research in the country.

Hence, as has been seen over the last 30 years, fisheries are still marginalized in public development policy: small-scale fisheries are scarcely mentioned in national development plan. This may be mainly due to a lack of knowledge and communication concerning the role played by small-scale fisheries particularly in the case of food security, poverty alleviation, and employment generation in the rural society of the country. However, it may be partly due to institutional factors, including the weak capacity of the fisheries sector to express, define and defend its interests. Finally, it may also be a result of 'psychological' factors linked to the perception which policy-makers, civil society in general, and some donors have about the small-scale fisheries.

Therefore, the socio-economic conditions in small-scale fisheries communities are relatively alarming(4), where the aquatic resource protection is an important ingredient in sustaining the contribution of aquatic products to food security and livelihoods for the people; this urgently requires effective management measures to be introduced (5).

There is great potential in the small-scale fisheries of the country when it can be managed in a participatory manner, and this needs to be demonstrated to provide greater understanding by the all concerned and create a positive image of small-scale fisheries particularly their economic and social benefits. The purpose of this paper is to provide background information of the inland fishery of Bangladesh and justify the implementation of CBFM activities as vital if sustainable solutions are to be found.

## **SMALL-SCALE CAPTURE FISHERIES OF BANGLADESH**

Bangladesh is a South Asian country located between latitude 20° 34' and 26° 39' north and longitude 80° 41' and 92° 41' east. It is bordered by India to the west, north and the northeast, Myanmar to the southeast and the Bay of Bengal on the south (Fig. 1.).

Bangladesh is a land of rivers and its mostly flat territories are crisscrossed by rivers. Rivers connected with the oxbow lakes (Beels & Haors), floodplains, marshes and deltas constitute its inland water bodies and associated wetlands that are the home of a wide variety of aquatic plants and animals(6, 7). They sustain thousands of communities with a wide range of benefits including communication facilities, irrigation facilities, drinking water etc. Particularly, the floodplains of Bangladesh, however, provide interplay of social, environmental resource



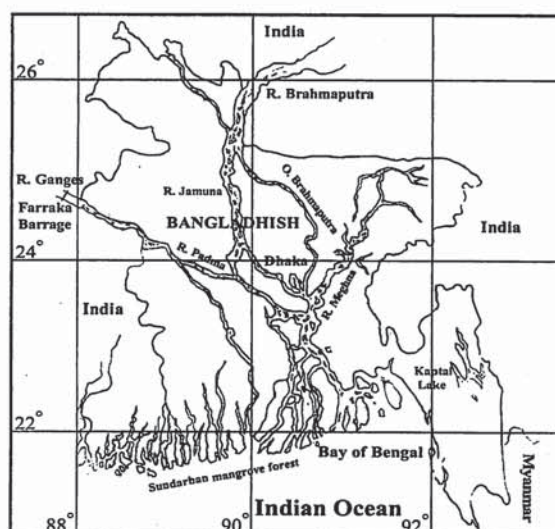


Fig. 1. Map of Bangladesh

management and developmental concerns. Unfortunately, the aquatic resources of Bangladesh are in critical situation such that their sustainable economic development is a priority issue for the country in coming decades. Small-scale fisheries of the country - mainly capture fisheries of the floodplains and rivers - contribute greatly to the livelihoods of the rural people owing to the very high productivity of the country's vast nutrient-rich inland water areas, enhanced by the tropical climate, and very fertile soil. The major river system, along with their hundred

of tributaries, carry huge volumes of nutrient-rich runoff from their catchments areas - water which is enriched further with nutrients from soil and vegetation during its way across the numerous flood plains in the monsoon season, when much of the country remains under water (8, 9). Varieties of aquatic organisms are including 260 indigenous freshwater bony fish species that belongs to 145 genera and 55 families (10) making a very rich aquatic bio-diversity in the inland aquatic area of Bangladesh (Table 1).

In addition, hilsha (*Tenualosa ilisha*) is an

Table 1. Aquatic bio-diversity in inland open water fisheries resources of Bangladesh

Kinds of species	Number of species
Finfish	260
Endemic	1
Prawn	63
Turtles & tortoises	31
Chelonia	25
Exotic fish	13
Fresh water mollusk	20
Aquaculture	6
Crabs	Few
Aquatic mammal	2
Threatened	25

Source: National Water Policy(11), Baer (12) and FAO (13)



important single species of the country, which is a highly demanded fish in the local market and the annual catch of over 200 000 t accounts for 20% of national fisheries production of Bangladesh (14, 15). Besides the large number of fish species, the coastal and mangroves also support 24 species of shrimps belonging to five families with high commercial value which play an important role in the economy (16, 17).

Unfortunately, there are conflicting demands on the floodplains. The demand for agricultural production, particularly rice, encourages attempts to dry out the floodplains with a reduction in the open water areas and their fisheries resources.

The fish stocks are under threat of depletion due to indiscriminate and uncontrolled harvesting (6). This situation has further been complicated by the physical loss, shrinkage and modification of aquatic habitats and threatened at least 25 riverine and floodplain fish species of the country (Table I). Increased use of pesticides and fertilizers in agriculture and growing industrial pollution are also contributing to the deterioration of the aquatic environment (18, 19).

On the other hand, artisanal fishermen of Bangladesh caught a large quantity of "Jatkas" (hilsha fry) in river system and in estuary by using small meshed gill nets (20). The research survey carried out by the Bangladesh Fisheries Research Institute at Chandpur in 1997-98 shows that some 0.04 million metric ton (Mmt) of Jatkas numbering about 5100 million were caught in 1998 and the total yearly demand for fish in the country is 2.30 Mmt of which about 0.50 Mmt are short of supply (21).

In addition, the impacts of the present shrimp culture practice are quite alarming, since it is mostly dependent on wild sources of tiger shrimp (*Penaeus monodon*) fry that causes the death of many other aquatic organisms. The conversion of mangrove areas to shrimp farms has obviously resulted in huge economic gains but also creating

a long-term harmful impacts to the coastal communities. A number of authors have reported on the worst problems encountered by communities including the loss of access to ownership by the poor, reduction in employment opportunities, impacts on biodiversity from mangrove utilization, reduction in fruit trees, difficulty in poultry farming, scarcity of drinking water and percolation of salts in the surrounding soils (22, 24)

However, by the commencement of the East Bengal State Acquisition and Tenancy Act of 1951, all inland fisheries resources (rivers, canals and permanent water bodies), except those from privately owned fish ponds that are relatively small and closed, have fallen under the state jurisdiction, with legal ownership held by the Ministry of Lands (MOL), and to a lesser extent, sub-district councils (25). Furthermore, around 12000 public water bodies, that are usually very high productive and provides the livelihoods for many surrounding communities, have been leased to the highest bidders.

Although preference has been given to the fisher's co-operatives, either directly or by bidding through a cooperative, control remains to in the hands of rich and influential people (26). The value of formal access arrangements to these resources, such as leasing (centrally managed), has increased rapidly, providing a little revenue for the government but encouraging more complete depletion of the resource by leaseholders (27). In many cases the state-established systems have proved to be ill-adapted to the needs and aspirations of small-scale fisheries communities (4) and have not made it possible to initiate activities to bring sustainable improvements to their livelihoods (28, 29).

Despite the many initiatives undertaken over the last 3 decades, the lack of an appropriated and sustainable management system, which meets the specific needs of small-scale fisheries, to facilitate



community access to aquatic resources homogenously and sensibly, has been a recurrent problem in Bangladesh. Although the New Fisheries Management Policy, 1986 (NFMP) has appeared to be a good initiative to address the associated problems. This policy has represented the first steps towards promoting CBFM approach and attempted to ensure the long-term sustainability of fisheries resources as well (25). Again, with respect to resource utilization, the fishing communities had unlimited access to the open water area which are the ideal natural breeding ground for many commercial and non-commercial fish species, the result being over-fishing and severe resource degradation. In fact, these kinds of mounting demand and short of supply have merged to make the population of these fisheries-dependent riverine communities very vulnerable. Continuing failure in fulfilling the ever increasing demands for fish in the country only increasingly threatens the livelihoods of the people and destroying the aquatic resources. Under these circumstances, there is an immediate need for a rapid and substantial evolution of existing fisheries management strategies to support sustainable resource use. There must evolve a more dynamic partnership using the capacities and interest of the local community and resource users, complemented by the ability of the national government to provide enabling legislation and administrative assistance for greater participatory approach. Therefore, the prospects of introducing community based fisheries management, in the small-scale capture fisheries of Bangladesh, to improve management efficiency particularly in relation to resource protection, food security and socio-economic development have been highlighted to draw increase attention for the need of greater involvement of stakeholders.

### **Resource protection**

A series of measures has been introduced in the fisheries sector since independence in 1971, mainly to support training for individual farmers as well grass-roots organizations on aquaculture but a few to partly provided a supportive environment for the implementation of fisheries management. The conservation and protection of the aquatic resources has been stated as the main national objectives (30) but counter productive development strategy plans, centralized policy of leasing the public water bodies and open access to public water bodies have become a major constraint for the development and implementation of a sound national fisheries strategy (8).

The needs and aspirations of the fisheries communities have been hardly taken into account in the formulation of previously implemented projects. As a result, the situation concerning resources degradation and poverty in small-scale fisheries communities is now relatively alarming (8).

The Department of Fisheries (DOF) in Bangladesh has 845 technical officers and 3278 supporting staff with very limited funds available. Its ability for monitoring, control and enforcement over a large area of isolated water bodies and catch activities of over 3 million fishermen is distinctly limited (31). The fishing communities, for their part, see the government's regulatory efforts as an attack on their means of subsistence since their livelihoods are increasingly threatened. The fact is that governments have not been successful in solving the present crisis affecting most important fisheries such as hilsa (21) and compliance with rules and regulations by fishers has generally been low. The current situation suggests that the government and public are jointly responsible for the present resources degradation and it also predictable that if the sector policies do not change, more crises and



conflicts will appear.

At the centre of the solution, the government needs to encourage the formation of fishermen's organizations at community level and the facilitation of their representation at local, regional and national levels, thereby creating a sense of ownership and accountability by the small-scale stakeholders in the decision-making and enforcement process. Simultaneously, the fisheries communities themselves need to play an active role in the whole management process, in order to ensure that the objectives identified are as close as possible to their own aspirations and ownership of the resources. At this stage, NGOs can play an important role by supporting community for successful establishment of the whole process.

Furthermore, it has been also confirmed that the participants had an opportunity to see that the co-management systems established, for instance, in the jointly implemented community based fisheries management pilot project (CBFM-1) area of the country, had made it possible to better protect resources and the most vulnerable groups (such as landless people) and that they proved profitable (32-34)

If the effective resources protection measures are to be built up to give sustainability and to ensure equal access to resources, partnership for the management of the inland fisheries resources must be promoted, together with capacity strengthening for the stakeholders.

### Food security

It is important to take into account that inland small-scale fisheries are entrenched in larger aquatic resource, social, economic and political systems of the country. Particularly, the nutritional contribution of the small-scale fisheries of Bangladesh is very important to the life of the rural people of the whole of Bangladesh and fish alone supplies about 60% of animal protein intake (35).

The present annual per capita fish consumption in rural areas is 4.4 kg for low-income people (36). However, the target of the current Fifth Five-Year Plan (31) is to raise this per capita daily consumption to the level of 25.6-34.4g by the terminal year 2002.

To achieve this target, based on an estimated total population, the required production of fish should

Table 2. Inland open water fisheries resources of Bangladesh

(Unit: Metric Ton)

INLAND FISHERIES	Water Area (Hectare)	Percent of total inland waters	Annual Total Catch		Increase (A) (B)	Percent Increase
			2000-2001 (A)	2001-2002 (B)		
(a) Inland Open water (Capture)						
(1) River & Estuaries	1,031,563	23.13	150,129	143,592	-6537	-4.35
(2) Sundarban			12,035	12,345	310	2.58
(3) Beel (Depression)	114,161	2.56	74,527	76,101	1,574	2.11
(4) Kaptai Lake	68,800	1.54	7,051	7,247	196	2.78
(5) Flood Lands	2,832,792	63.52	445,178	449,150	3,972	0.89
Capture Total	4,047,316	90.75	688,920	688,435	-485	-0.07
(b) Inland Closewater (Culture)						
(1) Ponds & Ditches	265,500	5.95	615,825	685,107	69,282	11.25
(2) Baors (Ox-bow Lake)	5,488	0.13	3,801	3,892	91	2.39
(3) Coastal Shrimp & Fish Farms	141,353	3.17	93,014	97,605	4,591	4.94
Culture Total	412,341	9.25	712,640	786,604	73,964	10.38
INLAND TOTAL	4,459,657	100	1,401,560	1,475,039	73,479	5.24

Source: DOF (41)



be raised to 2.30 Mmt whereas the reported catch in the inland area amounts only 1.40 Mmt [36] with a continued shortage in the catch in the River & Estuaries (Table 2).

Data presented in Table II display one of the most important features about the uneven fish catch in the countries fisheries resources. On the other hand, the total catch of the inland fisheries had been estimated on the basis of a Frame Survey conducted in 1981-83 (37) which is too old to use to make an assessment of the present catch status since presently there is a severe scarcity for fish in the whole country.

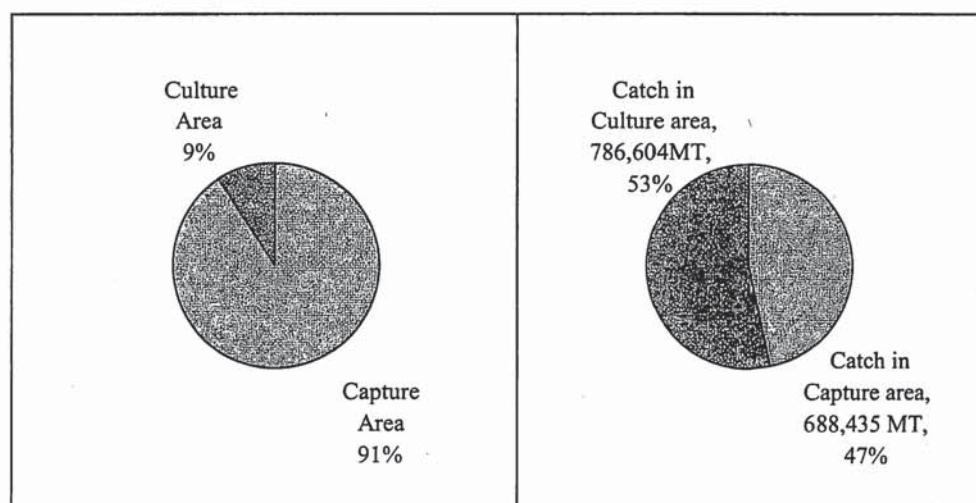
In practice, there have been many changes that have already taken place or are in progress such as the increase of fishing effort and the increase of total demand for fish. Increasing emphasis should be placed on to identify the recent species status in the open water area since it have been reported that of among the 260 inland fish species, 54 face different categories of threats, of which 12 are critically endangered, 28 are endangered, 14 are vulnerable and 35% of the wetland-dependent mammal, amphibian, and reptile species are also either extinct, threatened, or commercially threatened (38). Moreover, there is no evidence

that the comparison of the real resources status and the exploitation rate have been made with in the socio-economic context of the country which is very important for policy makers to asses the performance of the existing activities.

On the other hand, it have been also identified that the national statistics are somehow poor and often conflict with the actual situation and with each other which is one of the basic problem for fisheries analysis, planning and evaluation in the country (35). It is also particularly unrealistic, to make a judgement, based upon this 21 years old technique, because it may not properly reflect the present rate of exploitation and may resulted weakly based future projections and targets for fisheries policies.

It has also been reported that in the early sixties the inland fisheries of Bangladesh contributed about 90% of the total production of the country but presently account for around 36% only (31). Although inland open water area of the country in which fish capture takes place comprises over 90% of the total area but contributes less to the total catch than fish cultivation which takes place in only 10% of the total area (Fig. 2.).

The continued fall in catch and income linked to



Data from DOF (41)

Fig. 2. Area and catch of Inland open water area by hectare (H) and metric ton (MT)



the high level of exploitation of resources due to open access and increased risk from the growing difficulty of access to the resources due to leasing of public water bodies has resulted in insecure livelihoods for fisheries communities, ultimately contributing to increased poverty. In fact, the target fish species are becoming a scarce resource due to increased fishing effort resulted from open access to the public water bodies, including the major rivers, by the fisher's community lacking alternative job opportunities.

On the other hand, the country has a fairly very large area of open water area that covers over 4,047,316 ha that remains with out or a little management measures. By the introduction of CBFM approach to theses vast area can offer an estimated 0.20 Mmt additional fish for the country. There is a wonderful difference in the recorded catches in different management regime including the catch reported in the CBFM-1 project sites (Fig. 3.).

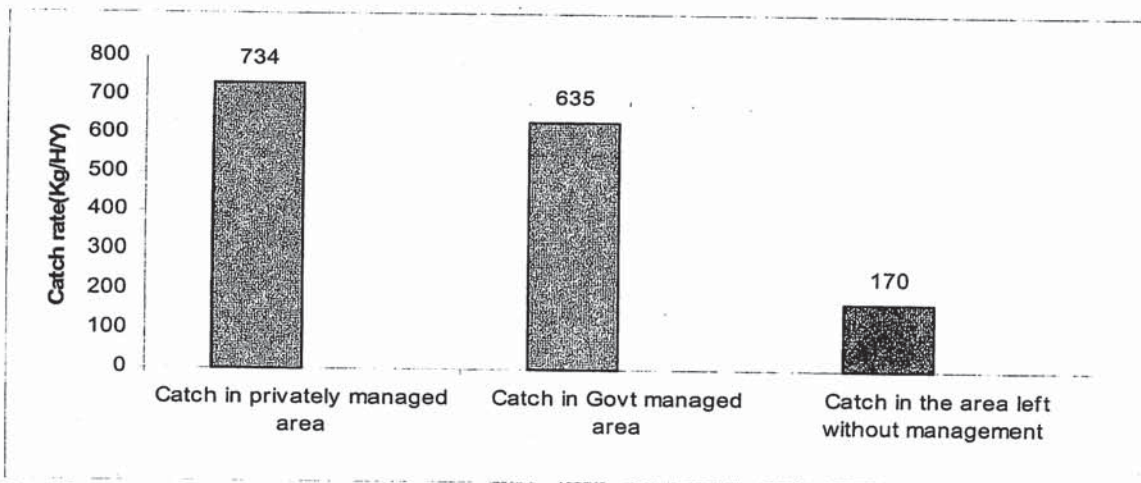
It is believed that there are considerable prospects for the CBFM approach in case of the inland open water areas of Bangladesh. A number of case studies reported that, particularly in the CBFM-1 project area, the communities have succeeded in

ensuring their own food security through increased protein intake and the use of the income from fishing activities(40).

It has been also reported that in field trial sites in Bangladesh, annual per capita income increased by about 16 percent during three years of project period, and fish consumption rose by about 2 percent [30]. It has been also been recorded that yearly yield increased from 3,932 kg to 17,40kg and the number of fish species increased from 46 to 64 in seasonal and perennial and wetlands as result of the community-based fish habitat restoration and management in a wetland in north-central Bangladesh (39).

Under these prevailing socio-economic conditions, it is unlikely that the government initiative alone will guarantee the protection of the fisheries resources and better nutrition for the majority of the people.

Therefore, the introduction of community-based fisheries management would provide the most appropriate measures for the food security of the fisher communities and for the promotion of sustainable management of fisheries resources of this densely populated country.



Data from DOF (37) and Rahman, et al., (39)

Fig. 3. Fish catch rates in different management regime



## Employment and economy

Fishing is the traditional occupations for most of the rural communities of Bangladesh. Fisheries have been an integral part of the life of the people of Bangladesh, and play a major role in the national economy, particularly in foreign exchange earnings. Over 73% of all households of the country are involved in the inland fisheries (41) with the contribution to Gross Domestic Product (GDP) over 5% (42), to Gross Agricultural Product (GAP) about 14% and represents around 9% of the total export earnings (43).

Like other developing countries, small scale fishing has become the occupation of last resort for many rural poor people in Bangladesh. Of course, this opportunity resulted from the open access policy relating to inland open water and coastal fisheries of the country with the exchange of over-exploitation. However, the sector alone provides an opportunity of employment for over 2 million fishermen through fish catching, fish trading, fish transport and related business facilities (44), and over 10 million people engaged as part time fishers or subsistence fishers for family consumption (45).

Nevertheless, the country suffers from a very high rate (27.95%) of unemployment (46) which urgently requires a solution, if the country is to secure economic and social well being.

Unfortunately, the persistent poor status of fisheries resources and inadequate fisheries management together with the lack of alternative employment opportunities creates an ever increasing pressure on the fisheries resources of the country.

On the other hand, based upon a variety of case studies, it can be estimated that a CBFM approach can also contribute significantly to the livelihoods of 48 million households of the nearby areas and can create an opportunity of additional full time employment for over 7 million people of the

country which can be a significant step forward towards the attainment of the national policy objectives (47).

In addition, it has been also reported by a number of authors that through the participatory approach, individuals have managed to be employed and more income generated, which has helped the fisheries communities set up a functional savings and credit association in the CBFM-1 project area (32, 34).

Furthermore, it is a fact that the social organisation set up under fisheries co-management is generally well adapted to the small-scale fisheries sector. This can resolve the present socio-economic crisis of the country effectively, since it is primarily based on the principles of proximity, accessibility, sustainability, partnership and the involvement of the beneficiaries.

Most importantly, the failure to prevent over-fishing of important stocks, the opportunities of obtaining the national policy objectives without jeopardizing the equity issue and to increase the overall management efficiency, are among the main reasons why the government of Bangladesh has to aim for a CBFM approach.

It is also very important for a fishery dependent community to emphasize the relationship between the prevailing crisis in the fisheries sector and fisheries management within the context of the Code of Conduct for Responsible Fisheries (CCRF) and to identify suitable remedial measures in fisheries through a range of actions from participatory planning to implementation of community-based fisheries management activities. Finally, a recent endorsement by FAO member states regarding the need for greater support to small-scale fisheries towards community based management has generated legitimate grounds for the country to be convinced for the introduction and implementation of CBFM approach, given the scale of employment and income it provides, and its role in food security (48).



## CONCLUSION

National and international experience increasingly suggests the need of participatory management measures for the sustainability of fisheries resource. These lessons must be learned and capitalised on without delay for the grater interest of the people and government of Bangladesh. If they are to improve their living conditions and livelihoods, the existing fisheries resource management problems need to be resolved with urgency. The introduction of a CBFM approach in the inland fisheries of Bangladesh is vital, for the protection and the sustainability of the country's fisheries resources, to resolve the present management crisis in a realistic way and to offer a better life for the people.

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## Management Strategies in a Capture Fishery: Experience under Community Based Fisheries Approach

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**[ABSTRACT]** Ashurar beel, an open perennial capture fishery of 400 ha, and located in north west Bangladesh was familiarized as indiscriminant and uncontrolled fishing by in-migrant people before being brought under Community Based Fisheries Management project in 1996. Caritas, a nongovernment organization and a lead partner of the project undertakes various extensions and process of empowering fishers to carry out their own development and manage their renewable resource.

Village based groups with 527 fishers and 77 women were organized. A Beel Management Committee was formed representing all the fishers and women groups. Training to enhance skills, awareness of sustainable fishery management, adult literacy, micro credit and other support for improving the reality of life have been provided. Fishers established a permanent sanctuary in 8 ha deepest part of the beel and enforced a ban on fishing during selective months in the whole beel so that brood fish could spawn and fry could grow and spread throughout the beel. As a result catch per unit fishing effort, restore bio-diversity and fish consumption are all reported to have increased substantially.

The paper summarizes the experiences of Caritas in management strategies in terms of community development and to enhance the fish production in beel. Enhancement by conservation (sanctuary) measures for natural fish by the fishing communities has given a new impetus to management. Project support has enabled fisher communities to establish management committee. These have taken within their means and are appropriate to the nature of the waterbody.

**[Keywords]** Capture fishery, community development, fishery management, sanctuary, and bio-diversity.

### INTRODUCTION

Bangladesh possesses rich and diverse aquatic resources in its extensive inland open waters with over 250 fish species, numerous flora and fauna and generates livelihood for millions of rural people. Fish, fisher and the fisheries are indissolubly linked to each other and influence the social and economic activities of the country. About two million people are engaged in commercial fishing and associated activities.

Around 75% of rural families are engaged in seasonal consumption fishing from floodplains, *khals* (canals) and *beels*. Fish constitutes 5.3% of the GDP and more than 12% of the country's export earnings. The annual average growth of fish is 6-8%. The nutritional survey revealed that 63% animal protein in the diet comes from fish and intake of fish rose to 33 gm/person/day.

Inland open water fisheries are major aquatic common property resources in Bangladesh covering over four million hectares and produces

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plentiful of fish. The total fish production of the country is 1.78 million metric tons (mmt), where 1.30 mmt came from inland fisheries (1).

The fish populations and stocks were under threat of depletion in terms of both quantity and species diversity due to indiscriminate and uncontrolled fishing. The physical loss, shrinkage and modification of aquatic habitats have further complicated this situation.

In Bangladesh, most of the inland open-water fisheries exploitation activities are small-scale and traditional. Since the British colonial period several policies were adopted as management tools for inland open water fisheries. Nonetheless, any of the options did not fully prove to be a success and sustained. In view of the priority on poverty reduction, especially of the fisher community, Bangladesh government has taken initiatives to ensure their access to fisheries resources not only for the improvement of their livelihood but also for augmenting the resource.

There is every prerequisite to meet the conditions to increase inland fisheries production significantly involving fisher community which should be an important approach for sustainable management of fisheries in Bangladesh. At the present time and common with other country, a new concept namely, Community Based Fisheries Management (CBFM) has been launched since 1995 for improvement and management of inland open-water fisheries. Department of Fisheries (DOF) initiated this approach highlighting the relationship between fisher communities with fisheries resources in an integrated system ultimately developing sustainable fisheries management based on scientific norms. This proposition forms the basic concept of CBFM project.

### **The case study site**

Ashurar beel, a criss crossed river like perennial waterbody of 400 hectares is situated within Nawabgonj and Birampur upazilas under Dinajpur district in northwest Bangladesh. Geographically the waterbody is located between 25°25' to 25°29' N and 89°00' to 89°05' E. The beel has been brought under the project for development. The beel is bounded on the south by metalled road. On the north, northeast and west there are 14 villages and earthen road. The forest *Shorea robusta* is located along the southern side of the beel. Seasonally the water depth ranges from 0 to 10 meters in different parts of the beel. During the dry season water is left isolated in eight deeper depressions locally known as *dahas*. People from the distant villages also occasionally fish in the beel. Most of the households are Muslim and majority of them fish for income (2).

### **The community based fisheries management project**

The activities for development of the beel under the CBFM project have been in progress since 1996. The project has been aimed to develop a framework, by testing alternative models of GONGO-Fishers collaboration in fisheries management. The program was designed to achieve a greater efficiency, equity and sustainability of open water fisheries resources by its surrounding community. However, the specific objectives of the project are to:

- Ensure more sustainable exploitation of open water fish resources, including protecting natural recruitment of indigenous species to the fisheries.
- Promote equitable distribution of benefits from fisheries to community people.
- Provide alternative income for people to reduce pressure on the fisheries.



- Develop capability of local institutions for sustainable management practice.

Under the project model, administrative responsibility for the water bodies would be handed over from the Ministry of Land to the Ministry of Fisheries and Livestock and then on to the Department of Fisheries. The latter then responsible for taking government revenue from the fishing community. Field staff of DOF at the district and upazila levels also involves in supporting management initiatives by the communities.

The NGOs have prime responsibility for assisting fishing communities to strengthen their organizations and to develop alternative income sources. WorldFish Center conducts research activities and surveys. The Ford Foundation funded the first phase of the project while the second phase is funded by the Department For International Development (DFID) since 2001. This collaborative initiative gave a momentum towards the productivity, sustainability and distribution of benefits. Caritas, a non-government organization engaged with the project since 1996 to support fishers' mobilization and to perform the following objectives:

- To organize and motivate fishers surrounding each waterbody towards a greater understanding and development of initiatives to implement CBFM practices into the particular fishery.
- To diversify occupations of fishers through the creation of new income generating opportunities.
- To strengthen the process of community development, through the formation of people's organization at each location through which community access to the local fishery and CBFM will be enhanced.

## PREVIOUS MANAGEMENT STRATEGY

Historically, Ashurar beel has been a capture fishery. Fishing rights were leased out but there was also free access for small-scale fishing during monsoon. People of two different tribes (*Saontal and Orao*) claim to be the original fishers in the area. People displaced by the river erosion from different parts of the country, migrated to the beel area during 1960s and become dependent on fishing in the beel. People of some villages have privatized the nearby *dahas* by placing *Kathas* (brush piles) and thus used to keep hold of their mastership in the locality. People of one village could not get entry for fishing into the *dahas* close to another village and resulted conflict in case of violating this norm. There were 17 *kathas* in the beel, which often caused contention among the resource users. Respect and neighborly attitude were rarely followed among the villagers because of different cultures and customs. Fishers from outside the locality also fished in the beel.

Once the beel was blessed with an abundant and diverse fish fauna. The most common fishes were *Mystus tengra*, *Puntius shophore*, *Channa striatus*, *Channa marulius*, *Channa punctatus*, *Wallago attu*, *Clarius batrachus*, *Heteropneustes fossilis*, *Aorichthys aor*, small shrimp, smaller number of major carps and common carps. Fishers used different gears either individually or collectively including current net, cast net, seine net, gill net, bottom trawl, dip net, bamboo trap, long line, hook and spear. In 1989-90, an outbreak of fish disease caused mass mortality of fish and the existence of some indigenous fishes were under threat.

During the regime of Pakistan, the beel was leased out for Rs. 5000 a year and the fishers paid Rs. 5/net/year for fishing. In 1975, a group of 7-8 people who used to fish in the beel formed a cooperative society and took the lease through auction and other fishers then paid the society for



the right to fish. Leasing continued up to 1986 when the beel came under New Fisheries Management Policy and the DOF issued fishers with individual licenses against payment. In 1995-96, the beel came under the Third Fisheries Project of DOF. The project released a huge number of carp fingerlings into the beel largely through subsidy and added part of the costs of this to fishers license fees.

In 1995, after the stocking, DOF announced and imposed a fee that 20% of the total value of the stocked fish should be collected as cost recovery from the listed fishers. The fishers were disappointed of the message and explained that they caught the stocked fish as soon as it released and before being grown out to a marketable size. Moreover, there was a severe flood into the region, which swept away the fish through the openings. There are about fifteen major openings in the beel through which the fish escape away from the beel during monsoon. Again in 1996 stocking, a fee of 30% of the total value (Tk. 600,000) of the stocked fish was imposed on the fishers, but the fishers were unable to pay because of insufficient harvest. Thus stocking program resulted poor performance. Fortunately the revenue collected by the government from this fishery is lower. The annual lease increased from Tk. 5,798 in 1992 to Tk. 11,798 in 1998. Even at the present moment the beel is treated as an open water fishery and some disputes continue over fishing access among the people around the beel.

#### **THE COMMUNITY DEVELOPMENT APPROACH**

The speciality of newly introduced project CBFM is to listen and perceive the opinion of the local people with great importance so that the people can analyze their experience, lifestyle and ecological knowledge with regard to resource

management and associate themselves with the planning to implementation process of the project. The process is thus termed as bottom up approach. At the beginning, Caritas has made extensive motivational drive in disseminating project's concept, objectives and familiarized activities for management of the beel. Initial concentration was paid to identify the genuine fishers through regular visits to the community, from available fishers lists of the Fishers Cooperative Societies and from respective Fisheries Offices. This was in addition to the application of different tools of Participatory Rural Appraisal (PRA) techniques in identifying the genuine fishers. Fig. 1 describes the process of selecting the project beneficiaries. Discussion sessions were held with respective Union Parishad Chairman and his associates to appraise on the new initiatives that would have been taken through CBFM. Once the selection process is continued and the community people were appraised on the aims and objectives of the project, there organized groups following certain criteria such as their economic condition, occupation, education, age and the extent of their dependency on the resource. Caritas maintained the notion that since the beneficiaries would be the prime stakeholders of the initiative, their agreement to the process is of most important. Regular interactions with the groups associated with demonstrated willingness of the field workers, the beneficiaries agreed to participate in the process of many activities. After the formation of the groups, the beneficiaries were adequately briefed on the necessity of building up their own capital. The groups on the basis of their capacity fixed the rate of savings and started depositing savings during their group meetings. Developing savings habit by the members has multiple purposes. First, building up of their own capital, the sense of ownership would be developed and secondly, this capital accumulation process would



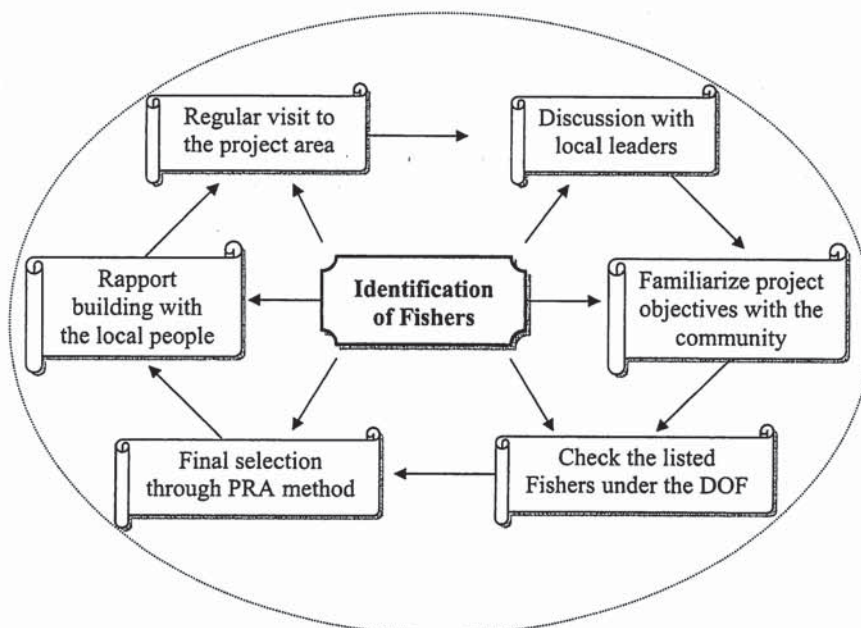


Fig. 1. Strategy in identifying beneficiaries

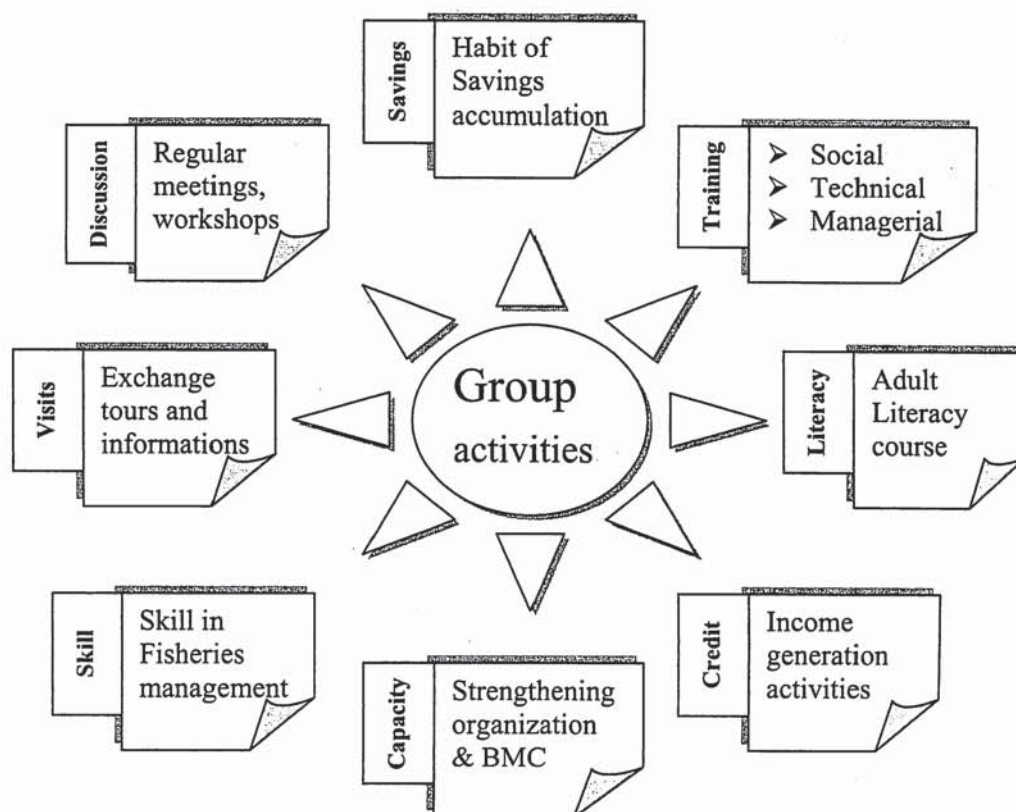


Fig. 2. Activities in organization development



enhance their capacity to embark upon economic activities, either by individual or groups.

The training was provided looking at the aptitude of a member and analyzing the need of the recipient. The training was basically divided into two broad areas such as (a) General awareness that includes awareness building and motivation, women development, leadership development and (b) Skill development that included accounts keeping, resources management, fishery, poultry, gardening etc (Fig. 2).

For resource management the beneficiaries had to follow a series of activities, which included closure period, compliance with fish acts and guideline prepared by them. These initiatives compelled the fishers away from fishing during the closure period. Credit support was provided to the project beneficiaries to reduce their dependency on moneylenders, compensate loss of income during close season. Credits were seen supplementary initiative in addition to the normal fishery related activities. To support their livelihood a number of income generation activities (IGAs) both fisheries and non-fisheries have been offered from the project.

### **Institution building**

From the very beginning of CBFM it was a notion to build up an institution that would activate the work to look after the interest of the fishers and to ensure sustainable management of the resources. The Beel Management Committee (BMC) was formed during 1997 after the process of dialogue and interaction with the groups. The composition of the BMC was done in a democratic way so that each of the groups can put their representative (President) in the BMC.

BMC has got 25 members from all the organized groups. The BMC has an executive body. The present BMC has been comprised of seven members (President, Vice-president, Secretary,

Cashier, and two general members). The election for the executive members of the BMC takes place at every three years. There is an advisory committee of that includes Upazila Nirbahi Officer (UNO), Upazila Fisheries Officer (UFO), UP Chairman and Officials from Caritas.

Activities of BMC are guided by a set of rules and roles and functions of the office bearers were in accordance with the procedures. After formation of BMC they started to develop fisheries management plan including conservation measure, payment, guarding, harvesting and arrangement of sharing cost and profits.

### **FISHERIES MANAGEMENT**

After a year of mobilization and extension efforts, the fishers came to a consensus to conserve natural fish by establishing a sanctuary in the deepest part of the beel, which retains water through out the year. By collective agreement, the fishers in May 1997 declared an area of over 8 hectares, *Burir daha*, as a Fish Sanctuary for residence of brood fish and with a hope of enhancing natural fish production. Several measures were undertaken including announcement, signboard and hoisting red flags to caution the people not to fish in the sanctuary. The fishers further enforced a ban on fishing for 3 months during pre-monsoon period in the whole beel with a view to give brood fish a chance to spawn and allow the juvenile fish to spread throughout the beel and grow. They further decided to refrain from using small meshed net. The fishers removed all the small *Kathas* from the beel voluntarily and placed the trees and bamboo into the *Burir daha*, i.e. sanctuary. Now the beel has only a large *Katha* in the *Burir daha* and with this initiative, fishers of one village have access to fish anywhere in the beel (3).



## Guiding principles

The principles that guide the fishers of Ashurar beel for sustainable use of the resources are as:

- There will be no fishing for 3 months (May-August) in anywhere of the beel.
- Fishing by current net is banned and building dykes across the beel is restricted. Fishing is allowed using only agreed mesh sized gears.
- Fishing in the sanctuary is banned. Fishing may take place once at every three years interval for 7 days. No one can place *Katha* in anywhere of the beel except the sanctuary. None can fish within 100 yards of sanctuary boundary.
- Outside and subsistence fishers can only fish for home consumption but not for sale.
- The president of each of the organized groups will be the member of the Beel Management Committee. After 3 years there will be an election for new BMC.
- During ban period the fishers will make alternative livelihood arrangement through undertaking of credits from the Caritas and afterwards by increasing individual savings in the group.
- Necessary measures will be made in conservation of fisheries resources and limit harvest.
- Fishers will access their rights over the beel by depositing fixed lease fees through BMC.
- The group members voluntarily guard the beel from their village in a cyclic manner to keep the beel from unwanted fishing by the outsiders
- The BMC has the power to impose fines, punishment, and even cancellation of membership from the organized groups in case of violation of the agreed rules.

## ACHIEVEMENTS

### Community organization

Since the beginning of 1996 Caritas has organized 25 fisher groups with 527 members and 4 women groups with 77 members respectively. These groups have accumulated TK. 735,585(US\$10,660) as savings at the end of July 2006. Sixty two training courses (Awareness, Leadership, Group management, Accounts, skill on income generating activities, Fisheries management, Strengthening institution etc.) for 1,482 participants (most participants attended 2 or 3 courses). In addition, some group leaders participated exchange visits to other community-managed waterbodies to gather and exchange knowledge and experiences with other fishing communities to help them plan for the sustainable management of their natural resource.

Nineteen adult literacy courses were arranged for the illiterate members of the groups. Besides, fishers were provided 22 tube-wells, 238 set of pit latrines and 3,125 saplings (fruits and timbers) to improve their quality of life. Twelve domestic ponds have been re-excavated for fish culture and the fishers took initiatives in rice-fish culture. Four fishers took nursery ponds as an employment opportunity. Over Tk. 2,767,000 of credit has been disbursed to support both fisheries and non-fisheries types of income generating activities and Tk. 2,071,034 have been recovered. Apart from the built in mechanism within the provision of the project, the savings of the groups are also used for the purpose of credit. Almost all the fishers contributed in rebuilding the sanctuary by giving a bamboo or branches of tree every year. \*Moreover, one community centre has been constructed with TK121,000 (sharings between project and BMC are TK90,000 and TK31,000) in December 2005 for the resource users where BMC holds its daily activities.



Table 1. Major species caught (% by weight) in Ashurar beel

Sl	Fish (Scientific name)	1997	1998	1999	2000	2001
1	<i>Puntius sophore</i>	24	26	32	36	38
2	<i>Mystus tengra</i>	16	12	5	3	6
3	<i>Mystus styliferu1</i>	14	15	16	24	29
4	<i>Mystus pancalus</i>	7	11	8	4	4
5	<i>Parambassis ranga</i>	6	7	7	9	8
6	<i>Gudusia chapra</i>	6	2	2	3	7
7	<i>Salmostoma bacaila</i>	5	6	6	8	5
8	<i>Amblypharyngodon mola</i>	5	3	3	1	6
9	<i>Channa punctatus</i>	4	2	1	1	8
10	<i>Wallago attu</i>	2	7	8	8	18
11	<i>Heteropneustes fossilis</i>	2	2	1	0	3
12	<i>Aorochthys seenghala</i>	1	3	0	3	4
13	<i>Hypophthalmichthys molitrix</i>	0	1	3	0	0
14	<i>Labeo rohita</i>	0	0	2	0	0
15	<i>Catla catla</i>	0	0	2	0	0
16	Others	8	3	4	3	4

### Species richness in the fishery

**Production in the beel:** The results following the intervention of the project and the sanctuary have been unprecedented. The fishers have reported a tremendous production as well as increased consumption of fish from the beel. Catch composition has changed relatively little over the past years monitored (Table 1).

Most of the catch remains small fishes particularly

*Puntius sophore*. It was observed that the catch of *Wallago attu* has increased over the years and it was even higher (18%) in 2001. Major changes were observed in catches, species compositions and the contribution of species to total production (Fig.3). In 1997, small fish species represented 77.2% of catch (801.7 kg) and ranked first in terms of contribution to production. In 2001, the same species made up of 52.5% of catch (757kg) and also ranked top in contribution to production.

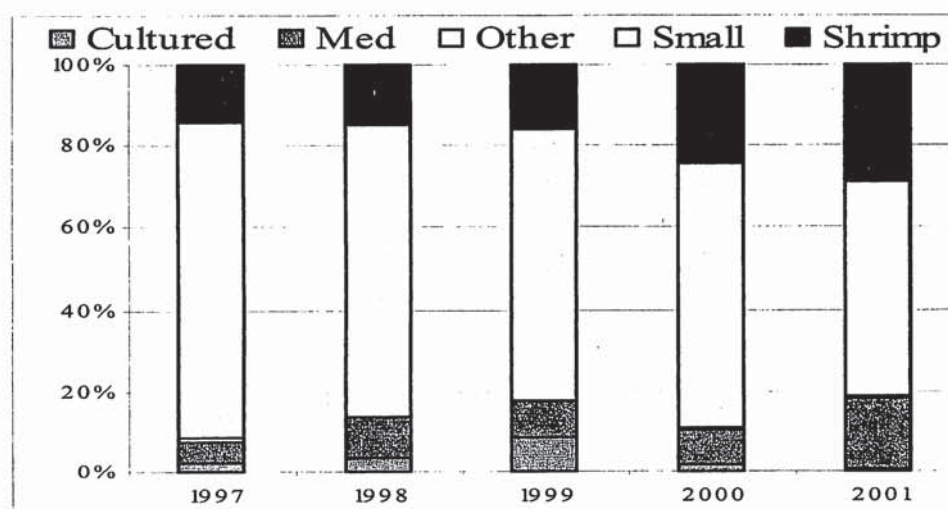


Fig. 3. Species composition by shortened category



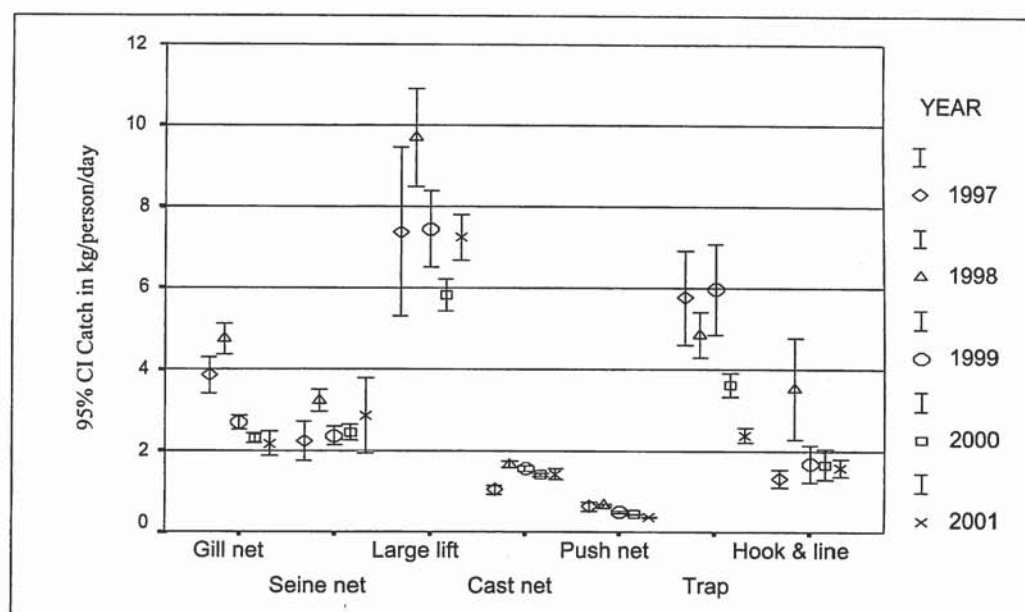


Fig. 4. Catch per unit effort in Ashurar

Similarly Shrimp and prawn also ranked second throughout the years contributing over 14% of catch (146.4kg) in 1997 to 29% of catch (418.4kg) in 2001.

Medium to large sized native catfish, which were, represented less than 5% of the catch (49.8kg) in 1997, was found contributing more than 17% of the catch (255.9kg) in 2001. However, small fish, shrimp & prawn and medium to large catfish make up the bulk of the catch over the years. Almost small number of cultured carps was caught in 1999 and 2000 suggesting that they are escaped from the nearby domestic ponds or the stocks are likely to be left from the past project. However, the gradual abundance of fish *Ompok pabda*, *Channa striatus*, *Channa punctatus*, *Aorichthys seenghala*, *Gudusia chapra*, *Anabas testudineus*, *Notopterus notopterus* following the conservation measure (sanctuary, ban on fishing period and gear restriction) indicated successful recovery of the threatened fishes. The measures that are adopted at the community level found positively contributed to increase fish production and bio-diversity.

Figure 4 indicates that catch per person day has fallen significantly over 5 years for gill nets, large lift nets and traps. The use of seine net has been increased from 1997 to 2001 as Caritas provided financial support to the groups to accommodate more members in team fishing. There are also great differences between gear types with large lift nets, seine nets and traps being particularly efficient. The use of traps over the years has been reduced, as building dykes across the beel where this traps were placed, was restricted to a great extent.

**Production in the sanctuary:** Compliance with the guiding principles, the BMC made partial harvest from the sanctuary during March-April 2000 and March 2002 respectively. In the first spell 2,875 kg and in the second spell 688 kg fish was harvested from the sanctuary. The selling price of the harvested fish from both the spells amounted Tk. 286,395. Taka 189, 720 has been distributed among the group members while Tk. 96,675 was deposited into a bank for investment in improving the sanctuary. From the harvest of 1<sup>st</sup> spell it was observed that the fish *Wallago attu* contributed



Table 2. Fish consumption by category

Category	Fish consumption (gm/head/day)				
	1997	1998	1999	2000	2001
NGO members	15	20	23	16	14
Non-NGO members	11	25	17	12	11
All types	13	22.5	20	14	12.5

bulk quantity (89%) of the total catch. The fishers could not complete the harvest of second spell due to sudden flooding in the beel. The other species found in the sanctuary were *Labeo rohita*, *Catla catla*, *Mystus tengra*, *Ompok pabda*, *Aorichthys seenghala*, *Macrognathus pancalus*, *Cyprinus carpio*, and *Pseudentropius atherinoides*. The production was increased but species diversity was found limited due to presence of large amount of carnivorous species (*Wallago attu*).

### Fish consumption

The table 2 shows an increase in daily fish consumption for all categories over the years of project intervention. Average per capita consumption of NGO members increased from 13 gm in 1997 to 22.5 gm in 1998 and 20 gm in 1999 respectively. The non-NGO members also increased their fish consumption rate from 11 gm in 1997 to 25 gm in 1998 and 17 gm in 1999. These figures were still away from the national average of fish consumption (30 gm/day). However, there was sharp decline of fish intake by both the categories in 2000 and 2001 respectively. In those years the period of monsoon was short. After spawning there was sudden and heavy draught in the region and the beel was about to dry up. Therefore the fish mortality appeared in major cases or fish could not grow well. The group members consumed more than 50 species of fish. As a group small fish species are eaten more than any other species group. Usually the small fish contributed the highest diet of the villagers in Bangladesh.

## OUTCOMES AND PERFORMANCE OF CBFM

### Efficiency

With proper guidance and having institution like BMC, the fishers mostly restrict themselves in indiscriminant and uncontrolled fishing. This gave the fish a chance to complete its biological behavior in an undisturbed habitat. As a result the community observed instant result of enhanced fish in the beel. The community thus derived greater benefit from such prudent management. Having satisfactory production from the beel, fishers are more enthusiastic than ever and are eager to improve the management of this capture fishery. Ban on fishing during pre-monsoon period throughout the beel and ban on fishing in the sanctuary was an expression of their intent to enhance the fish production. As their consciousness was increased, they put bamboo fencing at some points to prevent escaping of fish from the beel.

### Equity

The quantification of equity was quite difficult to assess, as this is a natural capture fishery. The groups shared the cost of sanctuary, which comes from 20% income of sanctuary harvest. They also shared the income from the sanctuary harvest. *Kathas* restricted who could fish where to earlier management, but now the fishers surrounding the beel fished anywhere in the beel.

Fishers shared their catch from team fishing. Subsistence fishers were allowed to fish for consumption. The group's members were free to



sell their catch in the open market to access better price. BMC has got full power to apply in case of violating the rules in managing the beel and they respected the norms. Therefore the communities were deriving greater benefits from prudent management which was possible because of motivated and rise of management capacity on the beel.

### **Empowerment and institutional changes**

Fishers living around Ashurar beel could fish anywhere in the beel except in the sanctuary and during the closed season. Groups were assisted to purchase seine nets to make access to gear more even. Subsistence fishing has continued during monsoon period. Voluntary establishment and enforcement by the community of a sanctuary and closed season have reportedly increased catches and restored bio-diversity. The fishers implemented their ideas to limit use of harmful gear and stopped fishing when fish are breeding. The BMC representing most of the fishers in the community developed a simple management plan and rules to limit fishing to what it believed would be a sustainable level. However, some people tried to break the rules by using current nets, and instantly these caught nets were burnt and sometimes charged fine. The BMC has benefited from informal local government support in terms of having them as a member of advisory committee, assisted in election of BMC, and as trainer, legal assistance, attending in monthly meetings and different occasions.

The BMC has got registration from the Cooperative Department of the government in 2005. The management of the water body has been handed over from 11 branches of DOF to the BMC in October 2005. The BMC holds regular meetings, more compliance of the guidelines to all fishers and assure equal distribution of profit to its members.

### **CURRENT SITUATION OF ASHURAR BEEL**

The fishers have got legal access of the beel from the concerned govt. department. The Lease money has been fixed at 20,000 taka/year. They had to pay their dues from 1400-1410 Bengali years for 10 years as they enjoyed the beel without any payment during that period. Thus the total payment reached to 108,000 taka. The fishers have paid entire amount to the concerned. Moreover, they practice paying lease value in regular basis and paid up to 1414 Bengali year. This has been given from the savings of BMC, which they have kept from the selling of fish in every year.

The BMC has re-excavated *Pir daha* with a view to make another sanctuary. A number of *Nandus nandus* species, which is vulnerable in the region have been brought from a distance of 35 km away, and released into the Ashurar Beel during late 2003 to enhance its population in the beel. The fishers reduced tendency of undertaking credit from Caritas as savings in each group have substantially increased by this time and using effectively. The project is planning to re-excavate the passages between the *dahas* to maintain water flow during the dry season.

### **CONCLUSION**

The concept of community management practices in open water capture fishery like Ashurar beel has been demonstrated and there obtained well progress. The fishing communities were unorganized and scattered during past initiatives and now they work together, take local initiatives to conserve fish stocks, limit fishing and obey the new restriction. The fishers have shown that given tactical and government support, they can bring about tangible improvements both in their own lives and in the management of common property resource. With NGO support fishers rights can be



established resulting in more sustainable and productive fishery management.

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## Teaching to Fish or Learning Not to Finish? Reinventing a Responsible Marine Fisheries Extension System in India

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**[ABSTRACT]** The marine fisheries sector in India is currently going through a phase of socio-economic cum ecological turbulence.

The rate of growth in marine fisheries production, as evidenced by recent studies, is plateauing, if not, declining. The need for initiating management options that promote sustainable resource utilization and stable livelihood security to the coastal community through well-planned and massive efforts in making the fisher folk imbibe the message of the FAO Code of Conduct for Responsible Fisheries (FAO CCRF) through Extension initiatives is never felt so urgent as of now. Extension science is construed as the discipline that raises strategic questions and finds ways in bridging the research system and the client system. But unlike the farming sector, the extension system in the case of marine fisheries sector is confronted with a number of epistemological and methodological problems.

Based on the experiences and insights gathered during the implementation of a WB funded research project titled "Designing and Validation of Communication strategies for responsible fisheries-A Co-learning approach" at Central Marine Fisheries Research Institute (CMFRI) during 2001-04, this paper argues that the Transfer of Technology-based extension paradigm dominant in the country is insufficient to infuse an ethos of responsible fisheries among the stakeholders and therefore it is necessary to reinvent a new extension system, probably built on the logic of constructivism rather than positivism. The potential of the rich research database on the resource base, along with Fisheries Indigenous Knowledge system needs to be effectively utilized. A Responsible Fisheries Extension Module (RFEM), *first of its kind in the country*, consisting of a number of well-validated communication tools which includes the translation of the FAO CCRF into Malayalam, animation films etc., developed under the project through participatory co-learning methodology is a stepping stone in this direction. A theoretical model of a new extension approach is also proposed after diagnosing various parameters in the current extension system like information flow, strategic gaps in the research-extension interface *vis a vis* an ideal system and constraints (logical, epistemological and institutional).

**[Key words]** Extension science, FAO CCRF, Responsible Fisheries Extension, Constructivism)

### INTRODUCTION

*Give him a fish  
He will live for a day.  
Teach him how to fish  
He will live for ever...*

Though the figurative meaning of this famous Chinese proverb has been used extensively by development thinkers to emphasize the need for

education / extension interventions to empower the marginalized, it doesn't hold good when juxtaposed with the current status of the marine resources of the world. The situation in India is no different.

With a total capital investment of about \$ 1 billion, the marine fisheries sector in the country provides a \$2.1 billion worth domestic market; earns an annual foreign exchange to the tune of \$1.3 billions; and offers direct livelihood to about



3.5 million people. However, the estimated potential yield from the Indian inshore waters (0-50 m depth zone), which is incidentally the most productive one, has already reached a plateau (1). Out of the total potential annual yield of 3.93 million t from the Indian Exclusive Economic Zone (EEZ) the inshore contribution is to the tune of 2.21 million t and the rest 1.69 million t is from the region beyond 50 m depth. Though there is a potential of 2.2 million tons left the major concern is the lack of scope for expansion in the inshore waters. The growth has been phenomenal with the total harvest reaching 2.7 million tons from a mere 3.73 lakh tons in 1947. But the annual relative growth rate which was 3.73 in 1981 has declined to 2.71 in 2001.

The decline in growth rate *per se* may not be sufficient to pass a judgment that there is a crisis looming because health of a fishery cannot be assessed on the basis of catches, (or more correctly landings) alone. But fisheries scientists take other measures, which are considered as warning signals to get a clearer picture. According to a comprehensive study (2), many of those parameters (like i) a perceptible decline in Catch Per Unit Effort, ii) widely reported incidents of high fishing mortality due to wanton destruction of juveniles, discards and by-catches, and iii) deviations noticed in landing pattern i.e., changes in size composition and mean length at capture) prove ominous for Indian waters. A recently published review (3) on the Status of Exploited fishes of India indicates that out of the 47 commercially important species 55% have reached optimum level of exploitation and 30% are over exploited.

The fact that the current harvesting capacity of fishing fleets far exceeds the estimated biological sustainability of most commercial stocks makes matters worse.

### **Responsible fisheries, extension and search for a new logic...**

From the resource point of view it is beyond doubt that the sustainability of our marine fisheries sector is under severe threat. It is imperative that we heed to the warning signals if we want to ensure livelihood security to the millions who depend on it. There now is a global consensus on the need for taking proactive measures in this regard.

But the response in our country so far has focused on implementation of regulatory measures by government caveats. It is being increasingly realized that marine fisheries management by administrative measures alone will not yield viable solutions. It would be a Herculean task to bring such a huge sector, which is riddled with extreme degrees of socio-economic polarization under an effective mechanism of a "command and control regime".

The marine fisheries scenario is dominated by the typical phenomenon of 80:20 divide. A minority has cornered the fruits of the sector leaving a large majority to get embroiled in the vicious cycle of penury and exploitation. To make matters worse the process of marginalisation faced by the small-scale sector, composed mainly by the artisanal fisherfolk, has been abetted by technological modernization and capital penetration. The inherent problems of entitlement and distributive justice are only to get aggravated by the irredeemable trends of resource depletion. But do we have *alternatives*? It is here that the concept of Responsible Fisheries being advocated by Food and Agriculture Organization becomes relevant. It underscores that '*the right to fish carries along with it obligations to do it responsibly*'. The point of departure it makes is in the conventional conceptualization of problems in marine fishing as mere resource issues. There cannot be fisheries management without the



active participation of fishermen or rather the stakeholders of the system. *Humanizing the praxis of fisheries management* implies a very radical shift not only in the way we do fishing but also in the way we think about fishing.

The scope of this paper is placed at this juncture. *Will the strengthening of an extension system help us in mitigating the problems we now face in our marine fisheries sector? If so, in what way?* This paper, the culmination of a search for finding answers to these questions, is largely based on the insights and field experiences gathered during the implementation of the WB/NATP funded research project "Designing and validation of communication strategies for Responsible fisheries-A co-learning approach". Thus the paper has two parts, one giving a brief review of the major processes and outcomes of the Project and the other deliberating on the need for reinventing a Responsible Marine Fisheries Extension System based on a constructivist reading of the insights derived from the project. The paper is organized under the following heads i) A Review of the Project-objectives, communication rationale and methodology ii) Meta analysis on the outcome, processes and learnings of the project and its implications iii) A constructivist perspective (4, 5) on reinventing a responsible fisheries extension and iv) Post-project developments and Conclusions.

#### **A REVIEW OF THE RESEARCH PROJECT "DESIGNING AND VALIDATION OF COMMUNICATION STRATEGIES FOR RESPONSIBLE FISHERIES -A CO-LEARNING APPROACH".**

This pioneering project with the major objective of *designing and validating communication tools and strategies meant for Responsible/Sustainable Fisheries* was conducted during 2001-2004 in five of the maritime states of India viz., Kerala, Andhra

Pradesh, Tamil Nadu, Orissa, and Maharashtra. What made the project unique was the methodological innovativeness it adopted in consonance with the demands of the communication rationale upon which the project was conceived.

#### **Communication rationale**

The spirit behind the FAO Code of Conduct for Responsible Fisheries (CCRF) is voluntary action. This implies that extension intervention has to go beyond mere supply of information. The typical extension approach of creating awareness among fisher folk about the need of responsible fisheries using centrally designed communication messages would not be sufficient. The process of designing the communication tools itself is equally important as that of the act of communication. Thus the main communication strategy was to convert the very process of designing various communication tools into *conscientisation episodes*. When the intended audience themselves get a chance to actively participate in the process of message construction it becomes an experience of *metacommunication*.

It also offers a shared learning experience to all the participants. The co-learning in turn provides a unique empowerment experience. The dynamics of this process is captured in Fig.1 and communication strategies were attempted accordingly in the project.

The major strategies composed of a) Designing and validation of communication tools as conscientisation episodes b) Mass contact through telecast of animation films through television and outreach through radio talks on responsible fisheries followed by feed back studies, c) Popularization of the code of conduct through fisheries-related niche media, d) Individual and "group contacts with the FAO CCRF" as a dialogue platform and e) Co-learning workshops



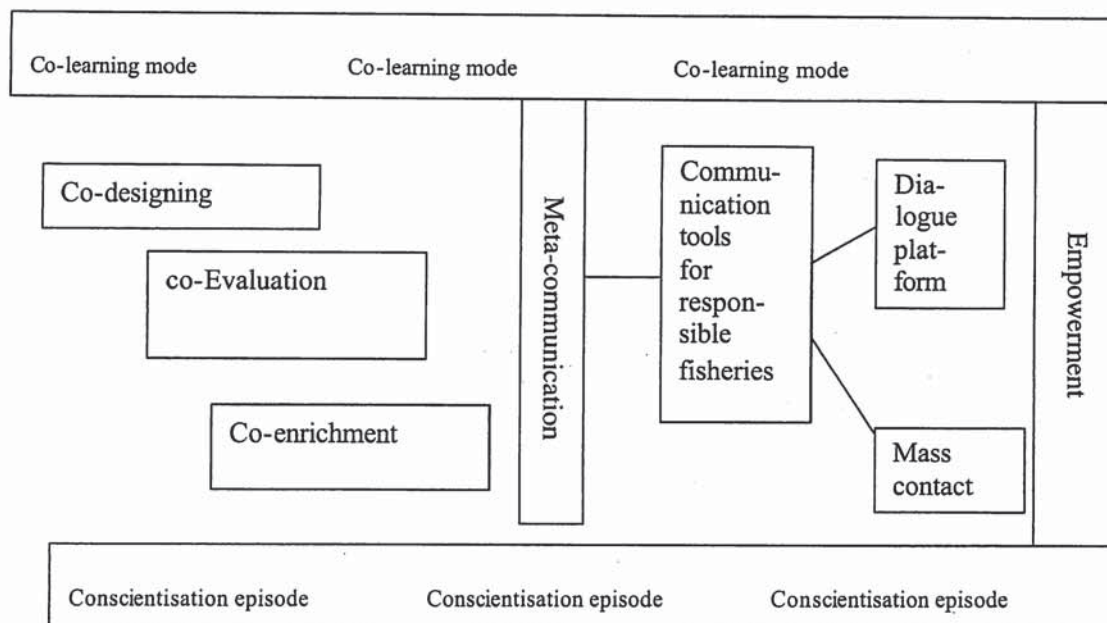


Fig. 1. Communication rationale for responsible fisheries interventions

and Campaigns on responsible fisheries.

### Co-learning methodology

The characteristic feature of the methodology was the emphasis given on setting the entire process in a decentralized, co-learning mode. The project progressed through eight phases or steps in the methodological ladder.

A combination of different research strategies like survey, case study, PRA, media development & testing and impact assessment has been utilized in each of these phases. The major phases of the methodology are recaptured below:

#### Phase 1 Assessment of responsible fisheries information needs (ARFIN):

The information needs regarding responsible fisheries were collected using a set of schedules developed for the study. A combination of research methods like survey, PRA tools, focused group interactions etc., was utilized. The data

were collected from selected locations in the five maritime states of the country. The main objective was to assess various parameters like the extent of mass media contact, the media preference, and conservation orientation existing among the stakeholders.

The criteria and reference points for responsible fisheries were based on the CCRF as well as the technical guidelines of FAO. The guidelines were suitably reinterpreted to suit the peculiarities existing in the Indian scenario.

#### Phase 2 Identification, analysis and documentation of cases :

Cases of mismanagement /unsustainable fisheries as well as successful management initiatives were identified with the help of the regional research centers of CMFRI, located in five of the Indian maritime states viz., Kerala, Tamil Nadu, Karnataka, Maharashtra and Gujarat.

The selected cases were studied in detail and documented. A number of cases for unsustainable



fisheries as well as successful initiatives were documented. Detailed case studies were prepared on various initiatives/events like *Kadakkodies* (sea courts) -an indigenous *sui-generis* co- management institution of Malabar coast, initiatives of an NGO namely "Green Seas" located at Munambam, Kochi (in getting the fisher folk take a collective stand against night fishing and the detrimental effects of mini trawling- an innovation brought out by fishers themselves in Kerala (For a detailed case study on *Kadakkody* as well as stakeholder - induced initiatives of Green seas see (6)).

### Phase 3 Content analysis :

The phenomenological database thus obtained was subjected to content analysis by a selected group of stakeholders as well as extension experts from the State departments /Agricultural Universities /NGOs to decide the nature, content and treatment of the tools and message constructs which were to be designed under the subsequent phases.

### Phases 4 -8 :

This included i) Designing the Responsible Fisheries Extension Module (RFEM) in a co-learning mode, ii) Validation of the tools through

media mix studies, iii) Demonstration of RFEM through campaigns, iv) Evaluation of behavioural responses, and v )Enrichment and Release of the Module for Scaling Up. The RFEM was officially released in two phases. The tools like Malayalam translation of the FAO CCRF and related tools were formally released by Hon. Minister of Fisheries and Tourism, Govt. of Kerala, 2nd December, 2002 at CMFRI, Kochi. And the rest of the tools were released by the Director General of ICAR on 2nd December 2004. These functions were given extensive mass-media coverage by national dailies as well as TV News channels (7) .

### Major findings of ARFIN

The response on different variables like awareness of the concept of responsible fisheries, conservation orientation, awareness about fisheries regulations, media preference etc., showed variation across locations in study states (Table 1). The preference for visual media as well as animation movies was markedly high. A very significant observation was the absence of the FAO CCRF in any of the maritime vernaculars but for Tamil. Similarly the extension agency contact was rated to be poor indicating the lack of attention being given to the issues related to responsible fisheries in an extension perspective.

Table 1. Comparative response pattern across ARFIN study states

S. no	Variable	Kerala	TN	AP	MR	Guja rath
1	Awareness of the concept of responsible fisheries	poor	low	poor	low	poor
2	Conservation orientation	medium	low	low	low	poor
3	Preference for visual media	high	high	high	medium	low
4	Preference for animation /films	high	high	high	high	high
5	Preference for print medium	high	low	low	low	poor
6	Awareness about regulations	medium	low	low	low	low
7	Availability of translation of FAO CCRF	No	Yes	No	No	No
8	Extension agency contact	low	poor	poor	poor	poor

(TN=Tamil Nadu; AP=Andhra Pradesh; MR=Maharashtra)



The mass media preference indicated that the use of TV was highly prevalent followed by news papers. Since the most preferred media identified were TV and print media they were given priority while designing the communication tools.

#### **META ANALYSIS ON THE OUTCOMES, PROCESSES AND LEARNINGS OF THE PROJECT Responsible Fisheries Extension Module (RFEM)**

The final outcome of the project was a well-validated extension module for Responsible Fisheries (Fig. 2). The details of the different tools in the module are given in Table 2. The module consists of combinations of audiovisual tools like books (in Malayalam, English, and Hindi), brochures, animation films (in all the maritime vernaculars of India) and campaign materials. *One of the major achievements of the project* was the publication titled “*Utharavadithuvapara Matsyabandhana Perumattachattom*” which is the translation of the FAO Code of Conduct for

Responsible Fisheries into Malayalam which was brought out in collaboration with FAO, Rome, based on the *Local Language Co-publishing Agreement* (FAO ref: No IN 17/9 (Malayalam-India) LL/2002/3 dated 22/5/2002) signed between FAO and CMFRI. The publication filled a long-felt need of having a translation of this landmark document of the global fisheries scenario in Malayalam language, thus making it the second Indian vernacular after Tamil to have this document. A fisher-friendly version of the Code explaining its spirit through illustrations was also brought out. The demand for copies of both these books was so stupendous that they were to be reprinted in 2004. In fact these publications acted as a fulcrum to the conservation extension activities conducted under the project by way of providing a topic to open the dialogue with the stakeholders. Copies were sent to NGOs, State Department of fisheries officials, other government agencies like *Matsyafed*, Aquaculture Development Agency of Kerala (ADAK), Marine Product Export Development Agency (MPEDA), 102 coastal *panchayats* (the grass root level local

**Table 2. Components of the responsible fisheries extension module (RFEM)**

No	tool	Title
1	Book in Malayalam	“ <i>Utharavadithuvapara Matsyabandhana Perumattachatto</i> ” FAO CCRF translated into Malayalam
2	Illustrated booklet	“ <i>Utharavadithuvapara Matsyabandhanam-enthinu? what ,why and howCCRF</i> )
3	Illustrated booklet	“ <i>Sagar sada bahar</i> ” (Ever green seas) (In Hindi)
4	Illustrated brochure	Need for responsible fisheries (in Malayalam)
5	Animation film	“Little fish and Tiny Nets” in English and 9 Indian maritime vernaculars (Film short listed in World Environmental Film Festival, Tokyo 2003)
6	Animation film	The Greedy fish Farmer (theme-responsible aquaculture)
7	Video film	“Colorful voices for Responsible Fisheries”
8	Video film	<i>Kadakkody (Sea Courts)</i> of Malabar Coast
9	Participatory paintings	“We are for responsible fisheries”
10	Books in English	1) “Teaching Not to Fi(ni)sh-A constructivist perspective on reinventing a responsible marine fisheries extension system” 2) “On designing communication tools for responsible fisheries”
11	Campaign materials	T Shirts, wall hangers, posters etc with messages



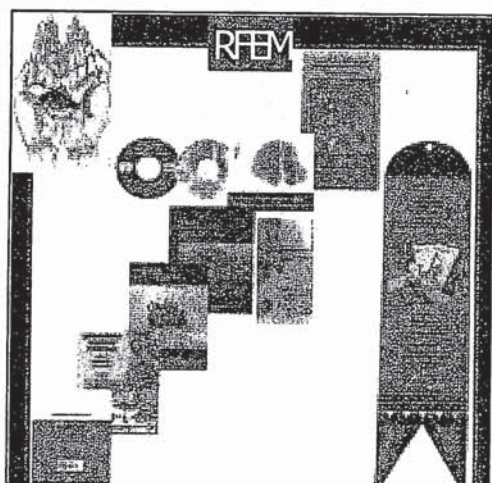


Fig. 2. Responsible fisheries extension module

administrative body of Kerala), Fisheries-related educational institutions, scientists, extension workers, etc., located in different parts of Kerala State. In general, there was more demand for the illustrated booklet indicating its popularity. The details of the dissemination are indicated in Table 3. A contextualised version of it was made in the national language i.e., Hindi and distributed to meet the requirements of the Hindi speaking fisherfolk in the five maritime states of the country.

Another unique tool developed under the project was animation films on Responsible fisheries. The first film titled *Kunjumeenum kothukuvalayam* (Little fish and Tiny Nets) which poignantly and with a touch of humour deals with the issue of juvenile fishing, was short-listed in the prestigious Global Environmental Film festival (Earth Vision) held in Tokyo in 2003. The Film was dubbed into all the nine maritime vernaculars (viz., Hindi, Gujarati, Marathi, Kannada, Malayalam, Tamil, Telugu, Oriya, and Bengali) of the country. The second film, "The Greedy Fish Farmer", deals with the issue of excessive dependence on chemicals like antibiotics in aqua/mari culture activities, is devoid of dialogue and thus language

is not a barrier. These films were made purely using a Participatory Media development methodology. The various steps in the development of the film like i) selection of theme (e.g., the highly destructive practice of juvenile fishing which was estimated to cause a loss of about \$0.1 million every year in Kerala alone) ii) development of story board iii) development of prototypes iv) pre-testing of the prototypes and v) finalisation of the version were conducted through Co-learning sessions in which various stakeholders like fisherfolk, extension workers, and scientists participated. The prototypes were subjected to a participatory feedback evaluation at two coastal villages, Chellanam and Vypin in Ernakulam district. A total of 45 active fishermen participated. The suggestions made by fishers like representative ness in picturisation (i.e. to include all major crafts, especially the trawlers, rather than a typical symbolic one. Interestingly this demand was emphatically made by the traditional fishers) were incorporated in the final version which was telecast through 'Doordarshan', the official TV channel of Govt. of India during June-July 2003. These months were selected for the telecast on the assumption that there would be more viewer ship due to the monsoon trawl ban imposed during these months. It was telecast at a frequency of weekly twice at 3 P.M. and 6.30 P.M. A feedback study was conducted at selected locations in all the coastal districts. The results indicated that the film effectively conveyed the message and it was a new experience for the fisherfolk (7). The timing of the telecast had varying impact by way of viewer ship. There was more viewer ship for the late evening slot compared to the afternoon slot. This was mostly attributed to the fact that the evening slot preceded a serial, which had a theme related to the lives of fisherfolk. It is to be noted that the total estimated viewer ship of *Doordarshan* is about 2 million. The film and a few other tools in



the RFEM have been made available through internet at [www.aticcmfri.org](http://www.aticcmfri.org) lead with link titled "Responsible fisheries extension-CMFRI Initiatives in India".

Though these tools can be considered as important *products* of the project, it is equally important to consider the *co-learning process* that went behind them. It is the process part of the project that has given more valuable insights from the extension point of view. The process learnings originated in the various strategies followed in the design, validation and scaling up of these tools. A meta analysis on the outcomes, process learnings and impact indicators of the project has been attempted in Table 3. Major implications of the meta analysis are discussed below:

### Implications

1. The most important portent of the meta-analysis of the project is the affirmation of the potential utility of a communication model, which has been vindicated during the implementation of the project, in the context of Responsible Fisheries Extension. The model, as given in Fig1, is built on the proven possibility of making use of the very process of designing any communication tool as a conscientisation episode in a co-learning mode, which engenders a phase of meta communication in the cognitive domain of the communication actors. Since this augurs well for the active participation of the stakeholders in a decentralised mode of message construction the consequent tools go beyond the mere function of communication means (either as individual contact or mass contact points) but act as empowering platforms. This is one way to overcome some of the strategic communication gaps existing in the interface between marine fisheries research and fisherfolk like dichotomy between scientific validity and livelihood necessity, scale gap (For e.g., the concept of

average stock, the fundamental unit of observation in fisheries science is a problem for scientists because it does not represent the stock mean and hence to be overcome by appropriate sampling design, where as for the fishers it is an opportunity for a profitable harvest (8) and opportunistic use of knowledge claims.

2. From the available indicators it is reasonable to conclude that the project interventions and the tools in RFEM made significant impact in creating awareness on the necessity to have an ethos of responsible fisheries among the fisheries stakeholders of Kerala state (which is considered as the harbinger in fisheries development initiatives in the country) in particular and the other eight maritime states (four states directly as study locations in the project and the rest through mass media interventions especially TV). Though the potential of mass media like Television channels is immense in this endeavour, rampant commercialization casting disincentives against mass media taking up social responsibilities, as indicated by the reluctance of commercial channels to telecast the film free of cost, must be overcome.

3. When the marine fisheries extension system as a whole is taken into scrutiny, as revealed by the ARFIN, it is seen that the logic and logistics of the existing structure is not conducive for scaled up interventions in responsible fisheries across the country. That only two of the maritime states in the country have translated the FAO CCRF into their vernaculars, even a decade after the release of the Code, betray the commitment of the State towards implementing the FAO CCRF. The impediments in the policy climate and institutionalisation need to be removed.

In the next section a conceptual model, built on the logic of constructivism, is proposed towards remedying these lacunae.



Table 3. A meta analysis on the process, outcomes and learnings of the project

Outcome(Tool/Strategy developed)	Targeted audience	Development process	Process insights	Dissemination/impact
1. The FAO Code of Conduct for Responsible Fisheries(FAO CCRF) translated into Malayalam	Fisherfolk, Extension workers, Activists, NGOs, Policy makers, Political workers	Co-learning; Translated version verified for readability and comprehension by fishers, scientists, extension officials of the Fisheries Department	Linguistic challenges like absence of exact words made verbatim translation difficult. It implies lack of corresponding concepts in the collective cognition of the fisherfolk and thus the need for awareness interventions using Neuro-Linguistic Programming; Need for fisher friendly version of the Code Was realised	1000 copies distributed among various stakeholder groups in 2002;second edition of another 1000 copies in 2004;All the 102 Coastal panchayats in Kerala and offices of the line departments of fisheries now have a copy each ; Full text was serialised in magazines and weeklies meant exclusively for fishers like <i>Coastal times</i> and <i>Alakal</i> during 2002-2004.
2. Illustrated book in Malayalam (What, Why and How of the FAO CCRF)	-do- but fisherfolk in more focus	Co-learning; Illustrations, syntax were pretested by fisherfolk	The main message /spirit of the Code in a fisher-friendly, illustrated version has more extension utility than the full text of the code; But only very few articles of the code amenable for individual level application.	-Do- All copies exhausted High Demand from fishers;
3. Illustrated brochure in Malayalam "Need for responsible fisheries"	-do-	-do-	The outreach is more as more copies could be printed; Easy to make copies by the extension agencies to meet local demand	5000 copies distributed among fisherfolk in all the 222 coastal panchayats; Locally made copies estimated to be 20,000.
4. Illustrated book in Hindi (national language of the Country)	-do- Useful for Hindi speaking fishers esp.. in five maritime states	-do-	Modifying the metaphors, text and illustrations sensitive to suit the cultural ethos of Hindi speaking fishers improved message penetration. This was enabled through co-learning methodology	10,000 copies distributed in selected villages of five maritime states of the country; Demand high, needs more copies
5. Video film (English "Colourful Voices for Responsible Fisheries (Duration 13 minutes)	Children and students of fisheries related courses	Documentary on the "All Kerala Painting competition on Responsible fisheries", a first of its kind event in the state	Motivation tool for fisheries students, especially the students of Fisheries Technical Schools (which are exclusively for children of fisherfolk ).	CDs supplied to all the fisheries-related institutions in the state(9 Fisheries technical schools, 10 Vocational Schools, 1 Fisheries college and 5 fisheries-related colleges
6. Painting competitions	-do-	Participatory	Creating awareness among fisheries-students and children of fisherfolk	Paintings used during state-wide campaigns



7. Animation films on Responsible Fisheries 1. Theme: Juvenile fishing titled "Little fish and Tiny Nets" in 10 Indian languages 2. Responsible Aquaculture 'The Greedy Fish Farmer' Theme- Injudicious use of antibiotics, (Duration 3 minutes), Version- DVD/CD and Betacam)	Fisherfolk and other stakeholders in all the 9 maritime states of the country	Co-learning, Participatory Media development process; Telecast through the National TV Channel ("doordarshan") and regional networks across the country	Participation of fishers from the very beginning of the designing process improves acceptability of the treatment and content of the film; Potential of mass media like TV networks can be immensely tapped as duration is only three minutes	The estimated total viewer ship of "Doordarshan" channels across the country is 2 billion. More than 75% of fisherfolk was covered. But commercial channels reluctant to telecast; Institutional hurdles in adopting the message fully (see discussion) International utility of the medium (Film can be dubbed into any language as dialogue portion is hardly five seconds) Telecast ready versions made available to all Fisheries Departments of 9 maritime states of the country.
8. Participatory painting (PP) on Responsible fisheries	Fishers and school children	Participatory Media development, Unique event where fishers and school children together made a painting on a big canvas	Tapping creativity in a collective way and potential for involving active participation of various stakeholders with divergent views, Useful in activating Multi-stakeholder Processes	PPs created in coastal villages during the campaigns act as symbol of their willingness to form multi-stakeholder platforms for participation
9. Two day Co-learning Workshops and campaigns materials (T shirts, wall hangers etc)	Fishers and school children	Participatory	Freewheeling interactions supplemented with panel discussions of experts more useful, Presence of fishers who are ambassadors of responsible fisheries effective in motivation and improving legitimacy during the workshops	Four such sessions held in three regions, one exclusively for women, All in collaboration with local NGOs, State agencies, other research institutions like CIFT; Total participants 636.
10. Books in English (2)	Policy makers, activists, scholars academicians extension workers	Non- Participatory	Participation in the International Training programme at IAC, the Netherlands proved useful for the investigator.	Appreciated by International experts like Dr. van Den Ban, copies sent to all the 13 fisheries colleges of the country, major libraries, FAO /WFC and other institutions all over the world
11. Utilization of mass media and internet	-do-	Do-	The involvement of important public figures in the events ensure mass media attention. Internet has limited utility among fishers	Events like official release of the tools got extensive media coverage. Tools available at <a href="http://www.atccmfri.org">www.atccmfri.org</a>



## REINVENTING A RESPONSIBLE MARINE FISHERIES EXTENSION SYSTEM-A CONSTRUCTIVIST PERSPECTIVE

The fisheries extension system in India, being under the administrative control of a Central Ministry of Agriculture, is unable to appreciate the peculiarities of the marine capture fisheries sector. More over, the production/yield oriented policy climate, that is more congenial to the agricultural research-extension system, fails to understand the necessity for sustainability-ensuring interventions, which the neo-liberal economic logic of the policy makers seldom may find finance worthy as the yield has reached a plateau. The pitfalls in the current extension scenario have been contrasted with an ideal scenario (in the context of responsible fisheries) in Table 4 as a prelude to the model proposed in Fig. 3.

The conceptual model in Fig. 3 represents the epistemological and methodological means to realise the ideal extension scenario. The model tries to capture the dynamics of the processes involved through constructivist learning loops, at three levels viz., marine fisheries research, extension and policy making with each level conceived as temporally and spatially interconnected Learning cycles. The extension system is conceived as distinct but not independent machinery under the Department of Fisheries. The major functions of the extension system would be 1) to *facilitate* the creation and maintenance of a multi-disciplinary Responsible Fisheries Research Platform at the research system level, 2) to *facilitate* the creation and maintenance of a multi-stakeholder Responsible Fisheries Platform at the client system level and 3) to *facilitate* the convergence of the two systems so as to enable building and evaluating, responsible fisheries scenarios. The new knowledge is utilized to build a consensus on the

most acceptable scenario, taking care of the concerns for sustainability through contested negotiations. What is aimed at here is an informed consensus which is arrived through a participatory decision making structure that makes Responsible Fisheries Management Plans by incorporating inputs from the four knowledge /technology base(biological, statistical, socio-economic and technological) after demonstrating the relative attributes of various management choices. The basic challenge here is to translate the negotiated positions into management actions like effort reduction and mesh size regulations. It is extremely difficult to reach complete agreement among competing interests. But, a participatory evaluation of the alternative scenarios, if done more on an analytical basis keeping previously - agreed management objectives in focus, than on the basis of political concerns, would help to reduce divergence among the stakeholders. The advantages of occupational pluralism existing among the fisher folk, availability of alternative livelihood options etc., can be effectively utilized here.

The country is yet to come out with a cogent policy statement for marine fisheries. At present the fisheries policy climate is dominated by the logic of higher production so as to justify the investment being made by the government. Export promotion is clearly the priority and the State has not fully recognized the importance of taking proactive measures for ensuring the sustainability of the resource. The most important job for members of the bodies empowered to provide legitimacy for the plans would be to take part in the level I and level II Learning loops. An important prerequisite envisaged in the model is the creation of a separate ministry for marine fisheries that consider sustainable utilization as the policy focus, at the center. The unfortunate situation of the research system and the fisheries management system running parallel needs to be



**Table 4. Marine Fisheries Extension System(MFES) current vs ideal scenarios**

MFES Factor	Current scenario	Ideal scenario
Focus	Welfare and Regulatory measures	Welfare and Regulations as one wing supplemented by another wing for Responsible Fisheries Extension;
Logic	TOT, ministerial approach based more on positivism	HRD+Co-management+ positivism combined with constructivism
Linkages	Very poor with research and clientele system	Client, extension, and research systems holistically embedded
Policy climate	Production/yield orientation (more suitable to agriculture)	Sustainability orientation
Central Ministry	Agriculture	Fisheries/NRM
State ministry	Fisheries	Marine Fisheries/NRM
Epistemological base	Fisheries Biology, Taxonomy, Stock assessment, Harvest /post harvest technology on disciplinary and institutional grounds	Convergence of the formal knowledge system with Fishers' knowledge system as interdisciplinary, inter-institutional and participatory learning loops
Integration of NGOs	Poor	Strong; encourage multi-stakeholder processes
Research system focus	Techno-biological	Socio-economical +techno-biological
Communication rationale	Awareness through centralized message production	Empowerment through Decentralized message construction
Regulatory focus	Government regulations imposed (e.g. seasonal bans)	+traditional systems (e.g., <i>sea courts</i> ) arrived through consensus and reconciliation
Resource management system	MSY focused  ;research system and management system running parallel	Ecosystem based Precautionary approaches  Scientifically informed interventions by a unified research-management system having control over management regime
Extension personnel	No professional background in extension	Professionally trained cadre, special focus on conservation
Fisheries Educational system	No PG level specialization in Fisheries extension (nor Fisheries social sciences)	PG level specialization in Fisheries extension/social sciences

avoided by brining these two systems under one institutional structure armed with enough administrative control over the regulatory regime it dispenses with. The grave difficulties being faced by the policy makers cannot be ignored in this context. Though there are marine fisheries regulation acts in all the maritime states serious interventions are required to get them reoriented towards the goal of sustainability. The FAO CCRF

needs to be contextualised to suit the peculiarities of each state.

## POST-PROJECT DEVELOPMENTS

Though the project officially ended in 2004 some of the post project activities and consequent developments are worth mentioning. In 2005 the



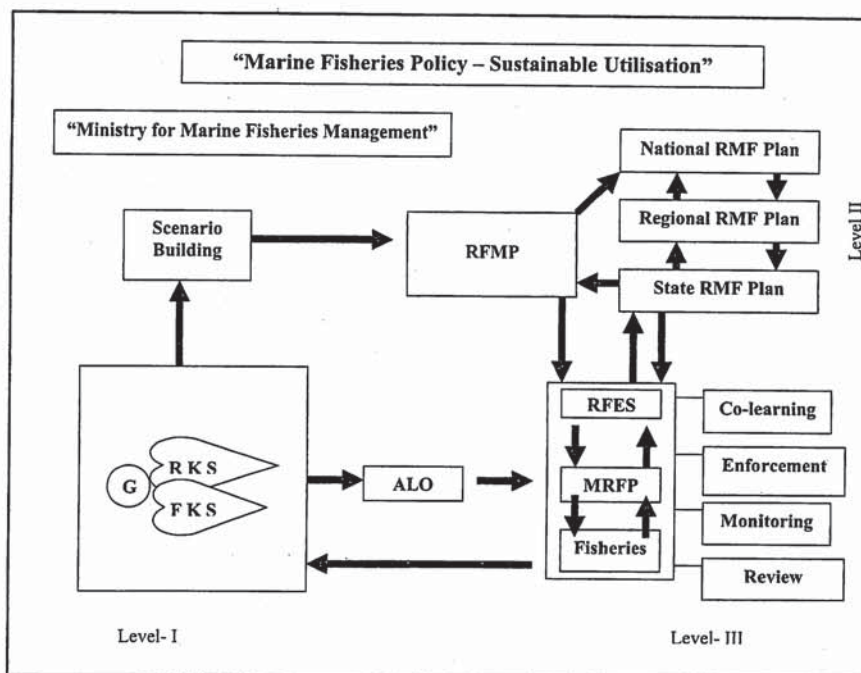


Fig. 3. Reinvented Responsible Marine Fisheries Extension System

Note: (RFMP: Responsible fisheries management plan; RFES: Responsible fisheries extension system; MRFP: Multistakeholder responsible platform; ALO: Alternative livelihood options; RKS-Research generated knowledge system; FKS: Fisher's knowledge system; G: Governance system)

state fisheries department of Kerala came forward to include a special training package on FAO CCRF in their regular training programmes meant for fisheries functionaries. The programme is regularly being conducted and so far 210 of their field level officials were given training. Similar requests have been made by Fisheries departments of four other states. Regional campaigns on responsible fisheries were held in three maritime states during 2005 under the auspices of the CMFRI research centers located in the respective states and the RFEM was widely used. The outcomes of the project were nominated for the prestigious Indira Gandhi award for popularization of science. The communication tools like films are regularly utilized during International Fisheries Training programmes conducted by IAC (recently changed as Wageningen International(WI)), the

Netherlands. A total of about 2100 stakeholders who visited CMFRI were exposed to the animation films during 2004-2005. All the State Fisheries Departments of the country have procured these tools and are being utilised during their training programmes and other interventions.

## CONCLUSIONS

The project, which can be considered as first of its kind ever undertaken in the country, has clearly established not only the necessity but also the possibility of undertaking extension interventions by way of designing communication tools and strategies in a participatory mode and putting them into massive use for creating an awareness on the concept of responsible fisheries among the



stakeholders of marine fisheries sector in the country.

The marked preference for, as well as the effectiveness (as indicated by the results of the feedback studies) of animation films indicate that these tools, especially when designed in a co-learning, participatory mode have very big potential in bridging the communication gap existing between research/ extension institutions and fisher stakeholders.

Each communication tool or product is accompanied by a process consisting of various dimensions like the genesis of an idea, its creative expansion, selection or choice of the treatment/medium, designing, evaluation and enrichment. The overall aim of the project was to make the process as participatory and decentralized as possible. A centralized approach may not be the right one for efforts aimed at development communication. In this approach the various parameters that define the Stimulus-Response praxis would be taken for granted. The antidote to this malady is to make the process democratic and decentralized. Since no *a priori* assumptions are conceived for the Stimulus-Response praxis, contextual learning in a phenomenological sense gets the upper hand. This augurs well for the creation of an enabling space for dialogue and collective learning. The animation film, which has been made in all the maritime vernaculars, signifies a very important step in the process of responsible fisheries extension in our country. The periodic telecast of this film through the regional Television channels can play a big role in making the fishers refrain from harmful practices like juvenile fishing.

It is to be noted that the FAO Code of conduct for responsible fisheries till date is available, even after its original release in 1995, only in two of the Indian maritime vernaculars. The very process of translating the code can be undertaken in a participatory mode, and it is more effective as has

been shown through this project. Along with assuring active participation by the stakeholders, the location specific niche media, if any, being utilized by the fisher folk should be effectively made use as a communication partner.

The need of the hour is to undertake similar exercises all along the length and breadth of the maritime states of the country so that the credo of responsible fisheries, as being promulgated by FAO, can be realized as a lasting moral obligation among the stakeholders. Institutional reinvention and professional reorientation as outlined in the suggested model assumes much significance in this regard. It is hoped that the insights and experiences of the project could be translated anywhere in the world, especially the developing countries of the tropics, in the efforts to ensure a sustainable future for the global marine fisheries scenario.

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## Milkfish (*Chanos chanos*) Fry Production in Gerokgak District, North of Bali Indonesia: A Geography-Economic Aspect

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**[ABSTRACT]** Fry production of milkfish (*Chanos chanos*), which is called "*Milkfish Backyard Hatchery*" or MBH in Gerokgak District, North of Bali had been famous since 1995. The coastal area of the district is the largest place for *backyard hatcheries*.

The research was conducted in Gerokgak District in the year of 2004. A "*Purposive Sampling*" Technique was used to collected the samples, which is combined among perception technique, document analysis, and interview. The primary data was obtained from the interview with the farmers of Incomplete Hatcheries (IH) as the respondents, covered the number milkfish (*Chanos chanos*) larvae tanks (unit), total fry production, and the fry price. The references study and observation results were conducted and used as secondary data.

The objectives of this research was to describe a geography-economic aspect of MBH in Gerokgak District covered the geographic condition of Gerokgak District, which was used for backyard hatcheries (coastal area), the production process, the contribution of MBH to the development of Buleleng Regency, the issues which were faced by the farmers and also the development strategy from the government. The data and document analysis presented qualitatively descriptive.

MBH is an economic effort which is combined between nature power in a geographic area and production factor to get fry with a proper number. Gerokgak District, the central place of MBH in Bali Island has 12 coastal villages which border directly with Sea of Bali. It made those coastal areas is suitable for MBH location. It has dry climate type, with the average of rainfall in the driest month  $< 3.94-r/25$ ; whereas  $r$  is the average of annual rainfall month (in inch).

The milkfish fry production during 1994-1999 was very profitable effort, with the price of each fry was Rp. 40.00- Rp. 90.00. However, since the year of 2000, it has been declining year by year. Later on, in the year of 2004, the fry price range was only between Rp. 3.00-10.00. The main issues were: there was no fry price controlling association, and the market was monopolized by the whole seller assembler to East Java.

Many advantages from the backyard hatcheries, i.e.: coastal area development, aquaculture technique development, fry supplying, increasing income for fishermen and farmers, an alternative job for fishermen, create new business (fish culture tools, fish feed supplier, fish transportation, and workshops) and increasing the number of investors (foreign and domestic).

Although the farmers of MBH encountered fry price fluctuation, the number of IH units and fry production has been increasing year by year. There were approximately 2700 IH units with total fry production was 2,423,882,468 fries in Gerokgak District in the year of 2004. It showed that the MBH is an enthusiastic effort for the coastal community of Gerokgak District. Thereby, the government should pay more attention to over come the marketing and make a development strategy.



Learning from the milkfish (*Chanos chanos*) fry price deterioration, the marketing of fish fries needed to be arranged. Involving the producer and fish fries marketing perpetrators needed to identify the issues and publish the policy of "intelligent market" as a first strategy that should be done.

**[Key words]** milkfish, fry production, geography-economic aspect

## INTRODUCTION

The hatchery system in coastal area is basically classified in two categories, i.e.: Complete Hatchery (CH) and of Incomplete Hatchery (IH). CH provides the matured brood stocks, eggs, post larvae in various stages, natural food, and fingerling size of cultured fish. While the IH only produce fish fry and its' activity began from fertilized egg or growth the larvae which was derived from CH. The milkfish backyard hatchery (MBH) is an example of IH.

The development of MBH in a coastal area can be as a growth point for the economic activity in order to develop the coastal area and labor involving which was purposed to build the area with environmental view (Research and Developing Centre of Fisheries. 1993).

As the declining of the prawn demand from Bali Island in the beginning of the year of 1990s, the investor did not interest anymore to conduct prawn hatchery. They rather chose to conduct MBH rather than the prawn because the cost of milkfish production is by far cheaper than the cost for prawn production. The production technique of milkfish (*Chanos chanos*) is relatively easier than the production of prawn. and the milkfish production could be done in various scales.

The management technique of milkfish represented an effort to produce milkfish fry, which was recognized with "nener" in Indonesian. This effort showed various attainments, i.e.: provide an alternative field working in a coastal village, especially for people around coastal area, and improved the income of fisherman which was directed to cope with the poorness. The largest

impact is that MBH is an easy operational effort and can be done over the year because the eggs from CH can be stocked every day.

Alexander in Muliahati (1996) expressed that geography-economics is a science which focused on the studying various area and its' economic activity related to the production, consumption, and distribution. C.F. Jones and G. Darkenwald in Muliahati, (1996) described definition of the geography-economics that is science about relationship between environmental factors and economic condition to the production efforts and distribution of its result. The Geography-economics connected between the economic elements and the geo-science. Therefore, MBH represented an example of the economic productivity of human being by giving more attention to the existing factors to obtain the persistent product in a certain geographical area. This paper describes the aspect of geography-economics of the milkfish (*Chanos chanos*) production in Gerokgak District, North of Bali, Indonesia.

## METHOD

A study case method was used, which combined among perception technique, document analysis, and interview. The data was collected with a Purposive Sampling technique, whereas the samples were determined pursuant to a certain criterion (Sugiyono, 2002).

The primary data was obtained directly from the interview result with the IH owners as respondents, covering the number of larvae tanks,



fry production, and fry price. The secondary data needed to strengthen the primary data by observed from literatures and location. The respondents were all owners of the Incomplete Hatcheries (IH) in 8 villages in Gerokgak District in the year of 2004.

The geography-economics aspect in this paper covered the geographical condition of Gerokgak District, where was the basis for MBH, fry production of milkfish, the contribution of MBH to the development of Buleleng Regency, the issues which is faced by the farmers, and the development strategy from the government. The data and document analysis presented qualitatively descriptive.

## RESULT AND DISCUSSION

### Geographical condition of Gerokgak District

Astronomically, Gerokgak District is located at: South latitude (SLatd) between:  $8^{\circ} 5' 29''$  and  $8^{\circ} 15' 31''$ ; East longitude (ELotd):  $114^{\circ} 25' 53''$  and  $114^{\circ} 52' 59''$  (The government of Buleleng Regency, 2004)

The boundaries of the district as follows:

1. West side: Jembrana Regency
2. South: Jembrana Regency
3. East: Seririt Regency
4. North: Java Sea

Gerokgak District is one of 9 (nine) districts in Buleleng Regency, Bali Island. It consists of 12 coastal villages and 2 rural villages; 56 cluster, and 13 custom villages. Gerokgak District is passed by the main road of Singaraja-Gilimanuk. The total area is  $356.57\text{km}^2$  or  $1/5$  of total area of Buleleng Regency. It extends from East to the West side with the coastal length of 72km (50% of total coastal length of Buleleng Regency) and the total main road is 60km with 9 capes and 12 bays. One of the bays is Sumberkima Bay, which is a suitable

area for marine aquaculture. According to its' height from sea water level, Gerokgak District is divided to 3 area, i.e.: a.  $298.79\text{km}^2$  is located between 0-499.9m; b.  $5.543\text{km}^2$  is located between 500.999.9m; c.  $235\text{km}^2$  is located above 1000m from sea water level. Eight (12) coastal villages in Gerokgak District located between 50-100m from sea water level. The map of Gerokgak District and the distribution pattern of backyard hatcheries covered 8 villages in the year of 2004 can be seen in fig 1. and fig 2.

### The climate in Gerokgak District

There are two rainfall stations in Gerokgak District. There are in Sumber Klampok, and Tetelan villages. To obtain the climate in Gerokgak District, the rainfall data and its temperature had to be known.

The criterion of Mohr was used to determine the wet month (WM), namely: a. Wet month (WM), which accepting rainfall more than 100mm; b. Humid month (HM), which accepted rainfall between 60-100 mm; c. Dry month (DM), which accepted rainfall less than 60mm (Kartasapoetra, 1986). The average of the total annual rainfall of Gerokgak District in the year of 1996-2005 was 1075.75mm. The highest rainfall was on January (289.75mm) and the driest was on August (1.3 mm). The average of rainfall for the WM was 4.0 mm; for the HM was 0.9mm; and for the DM was 7.4mm.

Pursuant to the average number of WM and DM, the value level of Q in Gerokgak District can be determined, according to Schemid-Fergusson, as the equation below:

$$Q = (\wedge\text{DM} : \wedge\text{WM}) \times 100\% \dots \dots \dots (\text{Eq.1})$$

Whereas:  $\wedge\text{DM}$  = the average number of DM

$\wedge\text{WM}$  = the average number of WM

From the (Eq.1), the value of Q in Gerokgak District can be determined as follows:

$$Q = (7.4 : 4.0) \times 100 = 185\%$$



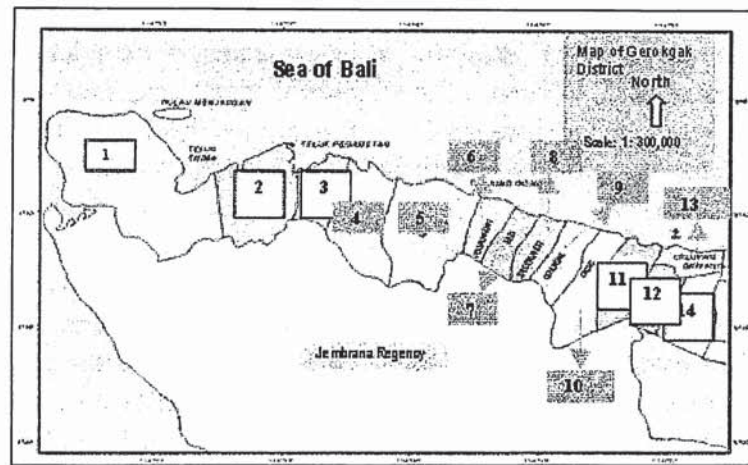


Fig. 1. Map of Gerokgak District and the distribution pattern of milkfish (*Chanos chanos*)

(Source: The government of Buleleng Regency, 2004) The name of villages and their tanks number)

1. Sumber Klampok	:	-	9. Gerokgak	:	1,115 tanks
2. Pejarakan	:	-	10. Patas	:	170 tanks
3. Sumberkima	:	-	11. Pengulon	:	-
4. Pemuteran	:	106 tanks	12. Tinga tinga	:	-
5. Banyupoh	:	708 tanks	13. Celukan Bawang	:	301 tanks
6. Penyabangan	:	1,463 tanks	14. Tukad Sumaga	:	-
7. Musi	:	822 tanks	Total	:	5,379 tanks
8. Sanggalangit	:	694 tanks			

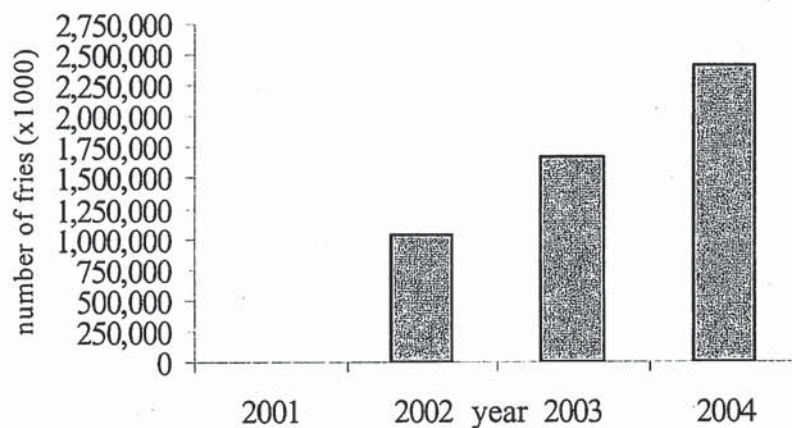


Fig. 2. The number of milkfish (*Chanos chanos*) fry production from IH in Gerokgak District for 2001-2004

$Q = 1.85$

Schmit-Fergusson classified the climate in the world pursuant to the value of "Q" as follow:

1. $0 < Q < 0.143$	A = Very wet
2. $0.143 < Q < 0.333$	B = Wet
3. $0.333 < Q < 0.600$	C = Rather wet
4. $0.600 < Q < 1.000$	D = Mid wet



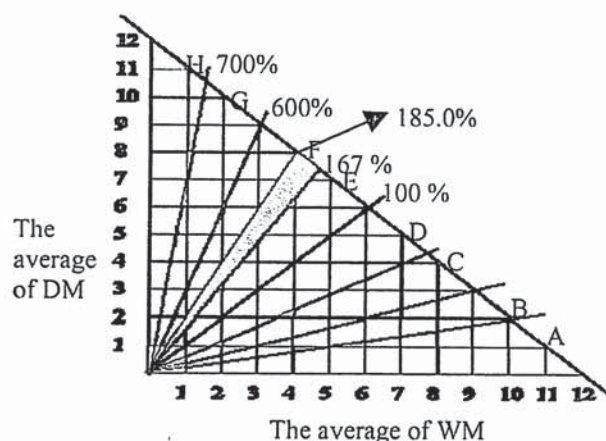


Fig. 3. Climate type in Gerokgak District according to Schemidt-Fergusson

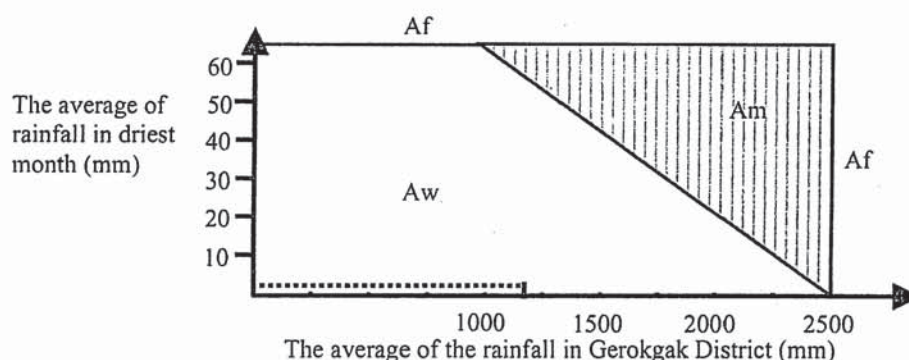


Fig. 4. The Climate Type in Gerokgak District according to W. Koppen

- |                        |                       |
|------------------------|-----------------------|
| 5. $1.000 < Q < 1.670$ | E = Rather dry        |
| 6. $1.670 < Q < 3.000$ | F = Dry               |
| 7. $3.000 < Q < 7.000$ | G = Very dry          |
| 8. $7.000 < Q$         | H = Extraordinary dry |

According to Schemidt-Fergusson, Gerokgak District has F (dry climate) type, as shown in fig.3.

To determine the climate type in a region, the annual rainfall and temperature data have to be known. To determine the temperature of an area, according to Kartasapoetra (1986), the following formula is used:

$$T = (26.3 - 0.6 \times (h / 100))^\circ\text{C} \dots\dots (\text{Eq.2})$$

Whereas:

T = the average temperature of a determined area

h = the height of an area from seawater level (height/100)

26.3 = the average temperature in the tropical coast

0.6 = tropical constant, every going up 100 m, temperature is going down  $0.6^\circ\text{C}$

Hendayani (2002) expressed according to a research result, the temperature in a coastal area is equal to  $27.6^\circ\text{C}$ , hence the temperature of MBH location in Gerokgak district, with the height of 5 m from sea water level can be calculated as follows:

$$T = (26.3 - 0.6 \times (5/100))^\circ\text{C} = 26.27^\circ\text{C}$$

According to W. Koppen, Gerokgak District has an "A" or tropical rainy climate type. Whereas in this type, the temperature of the driest month >



64.4° F or >18 °C. Pursuant to the average rainfall in the driest month, W. Koppen divided the "A" type into 3 (three) types, i.e.: a. Af (tropical rainy forest) type, if the average > 60mm; b. Am (monsoon climate) type, if the average < 60 mm but > 3.94-r/25; c. Aw (savanna climate) type, if the average < 3.94-r/25, whereas r is the average of annual rainfall in inch (Kartasapoetra, 1986)

As it mentioned above, the average of the total annual rainfall of Gerokgak District for 1996-2005 was 1075.75mm with the average rainfall in August as the driest month was 1.3mm. According to W. Koppen, Gerokgak District has "Aw" climate type, as it shown in fig 4. and the data of annual rainfall (mm) in Gerokgak District for 1996-2005 can be seen in appendix 1.

According to Schmit-Fergusson and W. Koppen climate analysis showed that Gerokgak District has dry climate type.

#### Land usage of Gerokgak District:

The total area of the district was 356.57km<sup>2</sup>. General farming was over than 50% from the total area (including fisheries, agriculture, and animal husbandry). The government land was 38% from total area. The rest was for: non irrigated dry farming, plantation, home yard, fishpond, rice field, etc. The composition of land usage in Gerokgak District can be seen in fig. 5.

Fig 5. showed that the largest land usage is for general farming (50.12%) and the tightest is for rice field (0.46%). It can be said that the dominancy of land usage is dry land, because Gerokgak District has dry climate type.

The quantity and quality of water resources as the technical requirement occupied the first sequence in choosing the location for the hatcheries. Other aspects are needed as the non technical

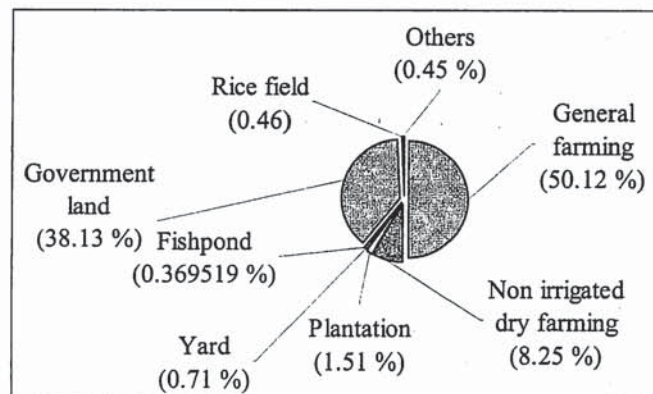


Fig. 5. The percentage of land usage in Gerokgak District in the year of 2004

(Source: The Government of Buleleng Regency, 2004)

Table 1. The requirement of water quality in milkfish (*Chanos chanos*) larval rearing in MBH

No	parametre	suitable range
1	Temperature	26.50-31.00 °C
2	Salinity	10-35 ppt
3	pH	6.50-8.50
4	(Dissolved Oxygen) DO	4.00-8.500 ppm
5	Ammoniac (NH <sub>3</sub> )	< 0.02 ppm
6	Nitrit (NO <sub>2</sub> )	< 0.5 ppm
7	Total Organic Matter (TOM)	< 95.00 ppm

(Source: Brachishwater Institute of Jepara, 1995)



requirement to attest the larval rearing. The water quality parameter which is required in milkfish (*Chanos chanos*) fry production can be seen in table I. below:

The coastal villages of Gerokgak District are suitable for MBH location and its' border directly with Sea of Bali. It gave an amenity to get the suitable in quality and quantity sea water for larval rearing of milkfish (*Chanos chanos*). The range of sea water quality according to some measurement in Gerokgak District in the year of '2005, i.e.: salinity:  $34 \pm 1$  ppt; temperature:  $29.40 \pm 2.30^{\circ}\text{C}$ ; pH:  $7.50 \pm 1.00$ ; DO:  $7.35 \pm 1.10$  ppm;  $\text{NH}^3$ :  $0.0034 \pm 0.002$ ;  $\text{NO}^2$ :  $0.005 \pm 0.001$  and TOM:  $21.43 \pm 2.16$ . The main road of Singaraja-Gilimanuk gave an amenity in fry transportation to local market in Java Island.

Thereby, it can be said that the Geographic condition of Gerokgak District attest the existence of MBH.

#### **Production process of milkfish (*Chanos chanos*) fry**

The production process can be seen in appendix 2.

##### **A. Eggs stocking**

The farmers got the eggs from CH around the district. The eggs were sold in one sack packing. Each sack contained of 75,000-100,000 eggs. The price was around Rp. 1-2 each egg or was equal from Rp. 75,000.00-200,000.00 per-sack.

##### **B. Larvae rearing**

There are some requisitions for rearing the milkfish larvae, i.e.: the range of water salinity must be between 33-34 ppt; *Nannochloropsis* sp. and *Brachionus plicatilis* supply were the main lived food in the early stages of larvae; good aeration; orange wall tank color; yolk eggs and rice powder for the fry;

For the successfulness of harvest, hence the monitoring of water quality and larva growth is

exactly required to be done. If the farmers encounter the mass death of larvae, hence they have to be thrown out the dead larvae from the tank immediately. They have to clean of the bottom of tank continuously.

All MBH farmers conducted the appropriate rearing technique. They can produce fries in satisfied numbers.

##### **C. Harvesting and marketing**

The 21-25 day (D21-D25) larvae were strong enough to be harvested. One Household scale of hatchery can produce 3-10 reans of milkfish fries. One rean is equal to 5000 milkfish fries.

Marketing means the human activity related to the market. Market facilities cooperated with market to create the exchanging to fulfill the demand. The exchanging involved working process, the effort of seller to find the proper buyer, identified what buyer needed, posting the proper product, promote the product, saving and accommodate, negotiate the price, etc. The main activities of marketing are: developing product, communication research, distribution, price decision, and services (Kottler, 1999). In a distribution process, the marketing sequences had to be known, covered: producer, whole seller assembler, whole distributor, retailer, peddler, and consumer.

The marketing process of milkfish fry began from the whole seller assembler. The activity started from packaging until releasing the fries to the buyer, so that farmers didn't pay anything which related to marketing and they did not have any risk of death of larvae.

The milkfish fries distributed trough Gilimanuk harbor, to the local market in East Java (Lamongan, Gresik, and Situbondo), Central Java, and West Java. While for the export, the fries distributed trough Ngurah Rai Airport.

The issue in marketing is the fry fluctuation price, which described furthermore in another part of this paper below.



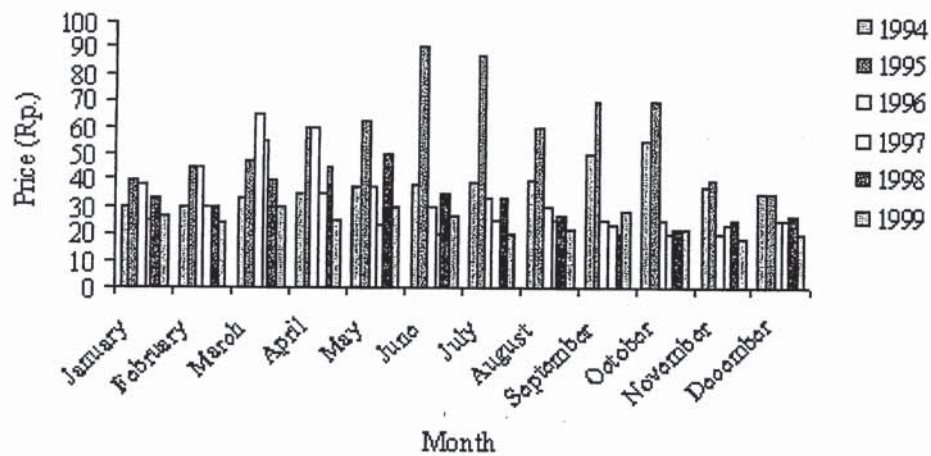


Fig. 6. Milkfish (*Chanos chanos*) fry price fluctuation in Gerokgak District for 1994-1999  
(Source: A survey report on the situation of milkfish hatcheries in North-Western Bali, 1999)

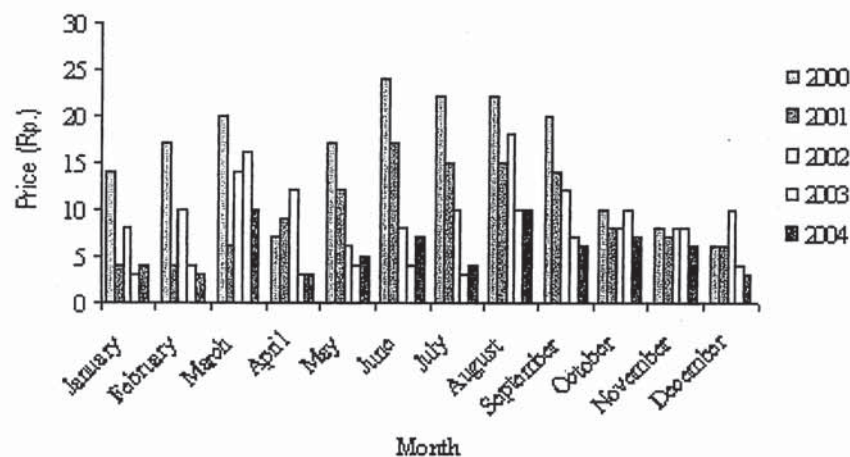


Fig. 7. Milkfish (*Chanos chanos*) fry price fluctuation in Gerokgak District for 2000-2004  
(Source: The annual report of Marine and Fisheries Office of Buleleng Regency, 2000-2004)

### The issues

The possibility competition had been anticipated by inviting all owners of MBH to merge into a business enterprise in the year of 1995, but it did not work as well. The marketing system was directly conducted by each hatchery that was act both as a producer and a whole seller. An association forum for the coastal fisheries farmers in Penyabangan village that was formed in the year of 2002 got failure because the farmers

couldn't coalescent each other and it caused the whole seller assembler monopolized the fry price. The marketing is a complicated problem and became a famous topic in every scientific and business meeting. The fry selling price deteriorated the household farmers of MBH. During the year of 1994-1998, the average selling price could reach Rp. 40.00-90.00 per-fry. Later on since the end of 2000 until present, the average selling price was getting worse until Rp. 3.00 per-fry. The comparison chart of milkfish fry price



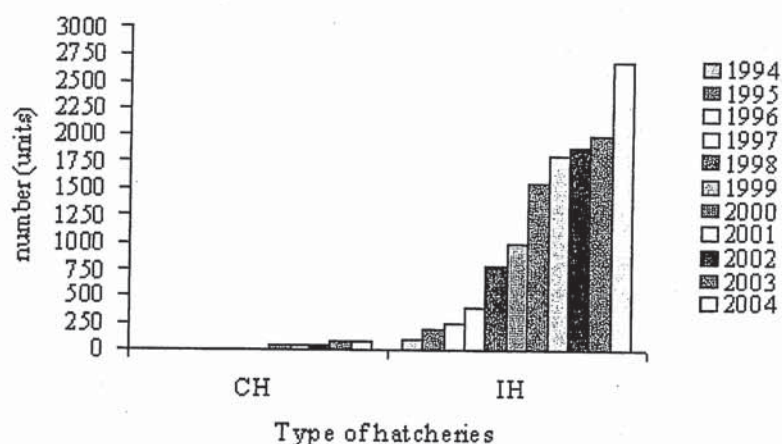


Fig. 8. The change number of CH and IH in Gerokgak District for 1999-2004

(Source: A survey report on the situation of milkfish hatcheries in North-Western Bali, 1999; The annual report of Marine and fisheries Office of Buleleng Regency, 2000-2004)

fluctuation for 2001-2004 and 1994-1998 can be seen in fig. 6 and 7 below:

Various negative impacts started to arise as the effect of the milkfish (*Chanos chanos*) fry price deterioration, i.e.: the activity of milkfish (*Chanos chanos*) fry drowned and caused many MBH bankrupted; many empty hatcheries intruded the coastal area site plan of Gerokgak District; the income of Buleleng Regency from milkfish fry production decreased. The farmers of MBH progressively deteriorated to the bad corner. The bigger scale farmers were luckier than the smaller scale farmers. They changed over their businesses into other commodities, i.e.: sea weeds, ornamental fish, and the groupers. For others, who have not enough capital, changed their attitude, i.e.: working in their previous job in other sector (farming, rice field or fishing).

#### MBH development in Gerokgak District

The Incomplete Hatchery (IH) of MBH in Gerokgak District is known as the household scale MBH. It started in the year 1992 with the number of hatchery only 5 units. One unit of IH is

assumed consists of 2 larval tanks. In the year of 1994 it became 94 units, and in the year of 1996 it flourished until 250 units (Kartikaningsih, 1996). The simple technology was used and became expand year by year. Later on, Gerokgak District definitely had represented as the biggest production place of milkfish fries in Indonesia for 1994-1998.

The fry production number has been increasing in Gerokgak District year by year. It was attested by the developing technology in marine finfish production.

An important benefit that was directly felt trough MBH developing in Gerokgak District was financial return. Even all capital could return in only second production cycle. The management pattern of MBH effort should be conducted with good cooperation with CH for eggs distribution and price stabilization (Research and Developing Centre of Fisheries. 1993).

Fig 2 and 8. showed that although the farmers faced the fry price fluctuation, the number of MBH units and fry production progressively increased. These circumstances indicated that milkfish (*Chanos chanos*) fry production is an



enthusiastic effort for the society of Gerokgak District.

Therefore, the government have to pay more attention more to overcome the marketing and the furthermore conduct research about marketing of milkfish (*Chanos chanos*) should be conducted.

### **The contribution of MBH to the development of Buleleng Regency**

The MBH license was given from the local government of Buleleng for some reasons, i.e.:

1. To create the good situation,
2. To guarantee the certainty of fisheries business
3. To control the optimum fisheries resources with pay more attention to the sustainability of resources and environment as the impact of fisheries activity
4. To arrange the fisheries business
5. To improve the farmers and fisheries businessmen conscious in giving their contribution to support the development of Buleleng Regency.

According to the Regent of Buleleng decision letter no. 283/2003 related to "other income and regency's income from fisheries sector, there are some rules for the farmers, i.e.:

1. The annual contribution from Complete Hatchery (CH) owner is equal to Rp. 100,000.00 for each brood stock tank and Rp. 15,000.00 for each larvae tank.
2. The annual contribution from Incomplete Hatchery (IH) owner is equal to Rp. 10,000.00 to each tank. In the year of 2004, it was equal to Rp. 53,790,000.00
3. The annual contribution from the whole seller assembler is equal to Rp. 100,000.00.

Another important rule is the explanation letter of fry providing area, which explained where the fries derived from, which was known as Surat Keterangan Asal or SKA in Indonesian. The rule

was based on the decision letter of Ministry of Marine and Fisheries Affairs Republic of Indonesia no. Kep.04/MEN/2003 dated on March 20, 2003 which described the requisition of milkfish exported from Republic of Indonesia. The rule of SKA for the whole seller assembler according to the destination as follow:

1. Export, SKA was equal to Rp. 0.5.00 per-fry
2. Domestic, SKA was equal to Rp. 0.3.00 per-fry

Those rules above give a hint about the contribution of MBH in Gerokgak District to the economic growth of Buleleng Regency. If 10 % of total milkfish fry production was assumed to export market, so that the incomes from SKA in the year of 2004 as follow:

1. From the export market :  
Rp. 1,211,941,234.00
  2. From the domestic market :  
Rp. 6,544,482,664.00
- Total income from SKA in 2004 :  
Rp. 7,756,423,898.00

### **Development strategy of MBH**

Gerokgak District is a part of Buleleng Regency, which represented as the centre of milkfish fry production in the era of 1994-2000. Based on the Planning of Marine Site Location of Buleleng Regency and the Pattern of Developing Area, Gerokgak District is divided into:

1. The industrial area I : Tukadsumaga, Tinga tinga, Celukan Bawang, and Pengulon.
  2. The capital of district: Patas, Gerokgak, and Sanggalangit.
  3. The industrial area II : General agriculture: Musi, Penyabangan, and Banyupoh.
  4. Tourism area: Pemuteran, Sumberkima, and Pejarakan.
  5. The forest supporter area : Sumberklampok
- The local government of Buleleng Regency tried to expand the area, namely:
1. Cooperative developing with Research



Institute for Mariculture Gondol, Bali.

2. Formed an association forum for the coastal fisheries farmers in Penyabangan village in the year of 2002.
3. Conducted some businesses meetings and open forums among farmers, investors, buyers, and stakeholders.
4. Built the central market place for fish fries in Sanggalangit Village in the year of 2004.
5. Built an oceanic laboratory in Celukan Bawang Village.

All owners of household scale MBH have to coalesce and cooperate with the relevant institutions so that they can improve their management; produce fry with high quality; predict the fry number which is produced and get the competitive fry price.

The duty of Fish Quarantine Institute of Bali Province has to be improved so that the quality of milkfish fry from Gerokgak District can be justified. The implementation of a good integration among institutions which related to household scale finfish fries production needed to strengthen the position of Indonesia in a global market.

According to a survey which was conducted by Ahmad *et. al.* in the year of 2005, that in Gerokgak District there were some policies that were expected from the government to overcome the debility of fries production, especially the milkfish fry, i.e.: develop of segmented market area; empower the smaller farmer with "step father" system and develop the domestic market. The first strategy could be done is the "market intelligent", whereas the production target had determined to each effort segment (Ahmad, *et.al*, 2005).

## CONCLUSION

1. Geographically, the coastal area of Gerokgak District is suitable for marine fish culture.

2. The MBH (MBH) is an enthusiastic effort for the society of Gerokgak District.
3. The main issue was the price fry fluctuation.
4. The government should pay more attention to overcome the marketing.
5. The good cooperation among government, stakeholders, and farmers is the keyword for the successfulness for the milkfish and other finfish fries production.

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Appendix 1. The annual rainfall (mm) in Gerokgak District for 1996-2005

Month	YEAR										Total	Average
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005		
Jan	222	278	113	192	314	348	733	441	136.5	120	2897.5	289.75
Feb	395	287	284	466	144	140	364	319.5	357	35	2791.5	279.15
Mar	69	8	335	173	106	98	194	123	139	96	1341	134.1
Apr	44	4	206	28	57	98	84	32	0	127	680	68
May	2	17	84	26	199	0	29	4	0	42	403	40.3
Jun	6	0	200	47	109	32	17	0	0	40	451	45.1
Jul	0	0	113	8	0	3	0	0	0	0	124	12.4
Aug	0	13	0	0	0	0	0	0	0	0	13	1.3
Sep	0	0	36	0	0	0	0	0	18	0	54	5.4
Oct	0	1	99	49	116	13	0	0	0	0	278	27.8
Nov	12	14	34	110	91	30	0	47.5	4	0	342.5	34.25
Dec	194	163	234	273	155	109	37	90	127	0	1382	138.2
Total	944	785	1738	1372	1291	871	1458	1057	781.5	460	10757.5	1075.75
average	94.4	78.5	173.8	137.2	129.1	87.1	145.8	105.7	78.15	46	1075.8	-
WM	3	3	7	5	7	3	3	3	4	2	40	4.6
HM	1	0	2	0	1	2	1	1	0	1	9	0.9
DM	8	9	5	7	5	7	8	8	8	9	74	8

Remarks: WM = Wet month

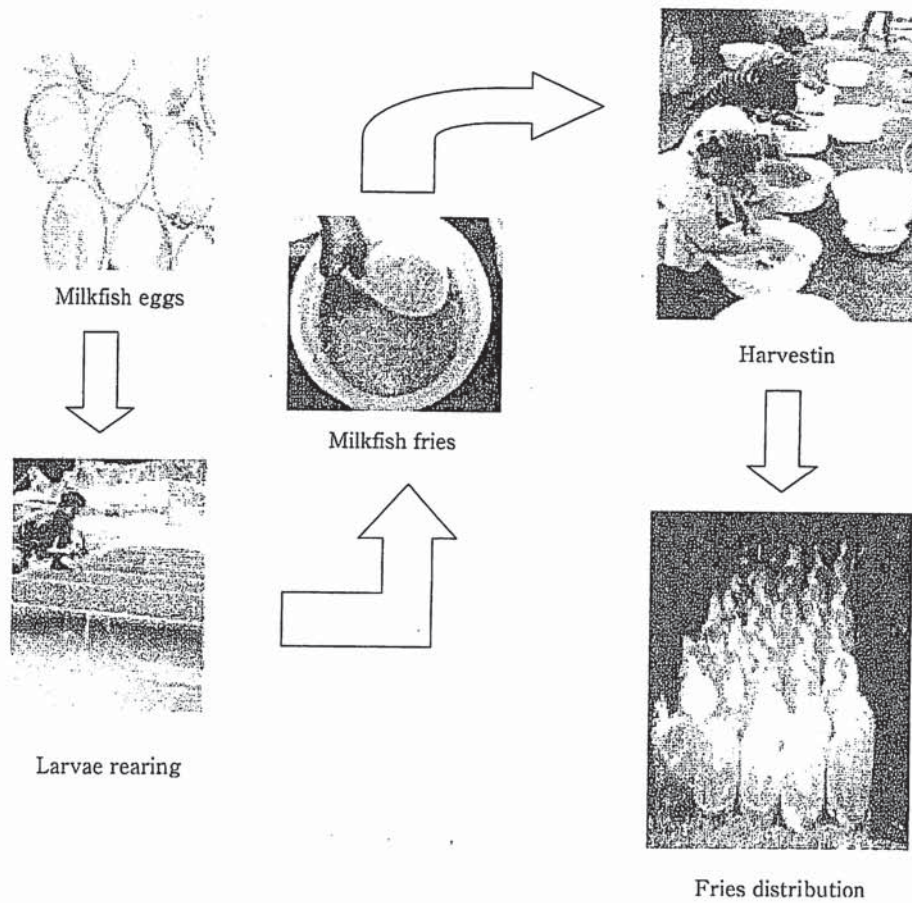
HM = Humid month

DM = Dry month

(Source: Agricultural Institute of "Palawija" Seed of Banyupoh, 2005)



Appendix 2. Milkfish (*Chanos chanos*) fry production process



(Source: Research Institute for Mariculture Gondol, Bali documentation, 1999)