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捕鯨問題の歴史的変容と将来の展望

Historical Transition of the Whaling Issue and its Future: An Analytical Approach by a Matrix

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【要約】捕鯨問題はその推進派と反対派の間で激しい国際的対立を生んでいるが、その原因に関しては、鯨類資源をめぐる科学的問題、資源管理に関する法制度上の問題、動物愛護運動を含む感情的問題、これらを背景とした国際政治問題等の多様な問題が関係する。他方、これらのどれ一つとして捕鯨問題の全体像を説明しえないため、しばしば混乱が生じる。このように多面性を持つ捕鯨問題を各要素に分解し、時系列的に構築したマトリックスで分析し、その多面性の歴史的変遷と今後の展開を考察する。

【キーワード】捕鯨、持続的利用、商業捕鯨モラトリアム、鯨類資源、資源管理、国際捕鯨条約、国際捕鯨委員会、IWC

【Abstract】The whaling issue is one of the most controversial international issues, involving strong disagreements between pro- and anti-whaling sides. The reasons for the controversy could be described as scientific disputes over whale stocks, legal problems for the resource management, emotional disputes involving animal rights movements, and/or international politics covering all these issues. However, none of these can explain the causes of the whaling controversy in a satisfactory manner and even create more confusion. This study attempts to break down the multi-facet whaling issue into several layers and put them in a matrix with temporal dimension in order to analyze the historical transition of the issue and provide some insights for its future prospects.

1．はじめに

捕鯨問題をめぐる国際的対立の原因に関しては、様々な解釈と説明が行われている。激しい反捕鯨運動、1982年の国際捕鯨委員会（IWC）によるモラトリアム（商業捕鯨一時停止）の採択、その結果としての商業捕鯨の停止、改訂管理方式の完成により持続的捕鯨が可能となったにもかかわらず捕鯨の再開が実現しない現実といった状況をどのように理解し、どのように将来の展望を見つけるのか。鯨を食料資源と見る国と、そうではなく特別な動物とみなす国との文化的、倫理的衝突。鯨類の資源状態に関する科学的不確実性と予防的アプローチの適用基準の相違。環境保護団体の経営資金確保のための活動ターゲットとしての捕鯨問題の維持の必要性。西欧先進諸国における環境問題における得点稼ぎの犠牲等々。

これらのすべてが正しいといえるが、他方、そのどの一つも捕鯨問題をめぐる対立の全体像を代表していない。捕鯨問題は、多面性を持った問題であり、歴史の流れとともにその様相を変えて来ている。歴史の一時点のスナップショットをとってみると、複数の要素の組み合わせがその時代の対立の原因を特徴付けており、時代とともに、その組み合わせに変遷が見られる。この多面性とその時代的変化が時として捕鯨問題の混乱、感情化をさらに促進しているが、他方、各要素を一つ一つ分析し、解決することによって、現時点における問題の本質を明らかにしていくことが出来るのである。

（別添） 捕鯨問題の歴史的変遷に関するマトリックス

切り口	60年代	70年代	80年代	90年代	2000年代
科学	不確実性 →		包括的資源評価 →	改訂管理方式 →	捕食問題
法制度	シロナガス単位 →		新管理方式 →	改訂管理制度	
経済	捕鯨産業の利益 →		産業の消滅 →	ビジネスとしての反捕鯨 NGO	
政治	国連人間環境会議 →		日本たたき →	作られた反捕鯨“世論”	
文化・感情	グローバル化（価値観のおしつけ）→			多様性の尊重	

ここでは、時間の流れを横軸に、科学や経済といった捕鯨問題の各側面を縦軸にとり、マトリックスの形で捕鯨問題の多面性と時系列的な多面性の変容を整理することを試みる（別添図）。さらに、このマトリックスの観点から、将来の捕鯨問題の方向性について考察を加える。

2．マトリックスの枠組

捕鯨問題の発端は、初めて捕鯨モラトリアムが決議された1972年の国連人間環境会議（ストックホルム）に置かれることが多いが、ストックホルム会議でのモラトリアム決議を生む背景となった、第二次世界大戦をはさんだ大規模な近代捕鯨による乱獲の時期を見逃すことは出来ないことから、ここでは、この期間を時間の軸の開始点とする。ただし、この後の時間の区切り方は、着目する捕鯨問題の各要素、あるいは切り口によって異なり、また、明確な区切りが無い場合も多い。したがって、特定の時期を区切って、その期間を特徴付ける何らかのラベルを付けていくといった手法は、ここでは用いない。むしろ、各切り口におけるキーワードを同定し、その変遷により歴史の変遷を特徴付けることを試みる。

マトリックスの縦軸となる要素、または切り口については様々な設定が可能である。また、それぞれの要素の間に重複は避けられないし、捕鯨問題をめぐるすべての問題を整理することも不可能である。ここでは、科学・法制度・経済・政治・文化と感情の５つの要素に分けて捕鯨問題を分析、理解することとしたい。

3．科学的側面

捕鯨の問題をめぐる「科学」という要素を定義することには、必然的に独断が入り込むが、ここでは、IWC 科学委員会が扱いうる問題を「科学」と呼ぶという独断を用いたい。ただし、過激な反捕鯨団体が流布している「鯨は絶滅にひんしている」と言った非科学的プロパガンダと、それへの反論も、広い意味ではここに含まれる問題であるかもしれない。

「科学」と言う切り口から捕鯨問題を見るとき、特に資源管理における科学の役割は、時代の流れとともに増加してきている。他方、時代の流れとともに、科学的知見が蓄積されてきており、過去の科学における不確実性、知見の不足は、減少傾向にあるか、あるいはそれらの不確実性を勘案しつつ資源管理を行う手法が発達してきている（たとえば1992年の改定管理方式（RMP）の開発）。いいかえれば、1993年に IWC が科学的アドバイスを無視することに抗議して科学委員会議長を辞任した英国のハモンド博士の言葉を借りれば、捕鯨が再開できるか否かは「科学の問題としては解決されている」のである。

時系列的には、1972年に国連人間環境会議において商業捕鯨モラトリアムが初めて議論される以前の時期は、科学的な知見も現在に比較すれば極めて限定されており、さらに、その限定された知見の範囲の中で構築された鯨類資源管理の手法（たとえば新管理方式）も十分機能していなかった時期と言える。その結果として各種の鯨類資源が乱獲され、反捕鯨運動を生む下地を作ることとなった。

これに続くのが、1972年から1982年にかけての国際捕鯨委員会による商業捕鯨モラトリアム採択にいたる時期である。IWC でのモラトリアム採択

のもっとも大きな根拠は、科学の不確実性、すなわち、鯨類資源についての科学的知見の不足またはその分析や解釈における不確実性であった(ただし、IWC科学委員会はこの期間も一貫してすべての鯨類の捕獲を禁止する必要はないとの立場をとっていた)。これを受けたかたちで、商業捕鯨モラトリアムの導入を規定した国際捕鯨取締条約付表の規定は、モラトリアムの導入とともに、1990年までに鯨類資源の包括的評価（comprehensive assessment）を行ない、その評価に応じてモラトリアム以外の捕獲枠を決める（すなわち資源状態が良好であることがわかれば商業捕鯨再開のための捕獲枠を設定する）というステップを明示している。建前上は、モラトリアムの導入は鯨類資源に関する科学的知見の不確実性に対応する間の一時的措置を示したものとなっているのである。

この不確実性に対応することを目的として、我が国が鯨類捕獲調査を開始し、科学的知見を蓄積していった時期が、次のフェーズにあたる。鯨類捕獲調査は様々な科学的知見を提供してきたし、またこれからも提供していくこととなるが、その端的な成果は、ミンク鯨を初めとして多くの鯨資源が豊富あるいは回復傾向にあり、これらを持続的に利用することが可能であることを示す科学的情報を提供したことにある。

100年前には南半球ミンククジラの資源量は約85,000頭であったと推定されているが、1990年の包括的資源評価によりこの資源が761,000頭に達しており、約100年間で10倍に増加したことがIWC科学委員会で合意されている。南半球で過去に捕鯨の対象にされた8種類のクジラについてみると、その合計頭数は100年前の8割から9割に回復しており、鯨種によっては十分利用できる範囲である。

この結果の資源管理への具体的利用を「科学」の切り口の次のフェーズとして定義したいが、長年の科学委員会の努力の結果、1992年に完成した改定管理方式（revised management procedure: RMP）がこの時期を特徴付ける。これはコンピューターを用いたシュミレーションを通して、資源を枯渇させること無く持続的に捕獲できる鯨の頭数を計算するシステムである。このシステムでは、環境の激変によって鯨類資源が短期間に半減すると言ったような極端なケースでも、捕獲によって資源を枯渇させないような安全度を見込んでおり、海洋生物資源の管理システムとしては、最先端かつ最もプレコーショナリーなものとなっている。これを用いて南半球ミンククジラの捕獲可能量を計算すると、今後100年間にわたって毎年2,000頭を捕獲しても資源に問題ないことがわかったのである。しかし、反捕鯨国側は、RMPが完成したにもかかわらず、商業捕鯨の再開には国際監視員制度等を含む改定管理制度（Revised Management Scheme : RMS）を完成させる必要があるとして新たなハードルを設定したため、RMPは実用にいたっていない。

また近年別な科学的な問題として注目されているのは、鯨による海洋生物資源の捕食問題である。これは捕獲調査の結果、鯨の食性や海洋生態系における鯨の役割がわかってきたためで、過去の常識ではヒゲクジラのほとんどは動物プランクトンであるオキアミのみを食べると思われてきたが、捕獲調査で胃の内容物を調べた結果、実際には大量の魚も捕食していることが判明している。北大西洋ではナガスクジラがニシンを捕食し、日本近海ではサンマ漁がミンク鯨と競合している。実際、日本鯨類研究所の試算によると、鯨による海洋生物資源の捕食量は全世界での人間の海面漁獲量の3倍から5倍にも達する。減船などを通じて人間が漁獲努力量を減らして漁業資源の回復を図ろうと努力している一方で、鯨は過剰に保護されて増加し、海洋生物資源を大量に消費しているのが現状である。

また、過剰な保護の結果、クジラ資源が環境収容力を超え、むしろ大量死亡が起こっている事例がある。昨年（1999年）北アメリカ大陸の西海岸に、確認されただけでも約300頭のコク鯨が座礁したが、この鯨は初期資源量を上回るレベルにまで回復しており、餌の不足によりこの大量座礁が起こっていることが推測されている。これらの座礁したコククジラを解剖して調べたところ、皮下脂肪が極めて少なく胃も空であって、餓死の状態であることが確認された。さらに、今年（2000年）も座礁が続いており、そのペースは昨年の座礁頭

数のペースを上回っているという。

4．法制度

つぎに鯨問題を法制度の面から時系列的にレビューしてみたい。鯨類資源の保存、管理と有効利用の原則を規定しているのは1947年に締結された国際捕鯨取締条約であり、この条約が打ちたてた原則は50年以上経過した現在でも適切かつ有効である。

この条約のもとで最初に設立された管理方式が、シロナガス鯨から得られる鯨油の量を基準（シロナガス単位、BWU）として、総鯨油生産量を制限したBWU方式である。この方式は、鯨類の保存管理ではなく、鯨油生産量の規制を目的としていたことから、鯨種別管理の概念が無く、結果として多くの鯨油を生産できるシロナガスクジラやナガスクジラなど、より大型の鯨から乱獲を招くと言う結果を招いた。

この事態の反省に基き、次いで鯨種ごとの資源状態を判定し、その管理のレベル（捕獲禁止、捕獲枠のもとでの捕獲等）を決定する新管理法式（NMP）が1975年から導入された。この管理方式は理論的には正しいものであったと言えるが、その実施のための科学的情報の不足、不確実性のために、台頭し始めた反捕鯨勢力からの批判につけいる余地を与えることとなった。

結局新管理方式は十分にその効果を発揮することなく、ついに1982年には、鯨類資源に関する科学的知見の不確実性を口実に、商業捕鯨モラトリアムがIWCにおいて採択された。これが、次のフェーズを構成するわけであるが、ここでは、IWC科学委員会はモラトリアムの導入を勧告していなかったことを特記しておきたい。

商業捕鯨モラトリアムは1990年までに、鯨類の包括的資源評価を完成し、ゼロ捕獲枠以外の枠を設立するとの条件のもとに採択されたことから、その導入を機会に、鯨類資源に関する科学的知見を蓄積するとともに、その知見の不確実性を克服する新たな管理方式の開発が開始された。その結果1992年に誕生したのが、海洋生物資源の管理方式としては最もプレコーショナリーな改定管理方式（RMP）である。しかしながら、反捕鯨勢力は、商業捕鯨の再開を認めるためには、さらに国際監視取締制度などの確立を含む改定管理制度（RMS）の完成が必要として、新たなハードルを設定した。このRMSについては、長年の議論の結果、常識的には十分に持続的捕鯨活動を可能とするレベルまでシステムが完成している。これはクジラを持続的に捕獲できるシステムがほぼ完成したことを意味する。しかし、反捕鯨派の遅延策（過大な数の監視員の配置や国際捕鯨取締条約の権限外である鯨肉市場の取締など常識を超えた要求）により完成が遅れているのが現状である。

5．経済

商業捕鯨モラトリアムの導入により、1988年当初をもって我が国の商業捕鯨が停止するまでは、経済的側面から見た捕鯨問題は、捕鯨産業の経済的利益の確保、存続が命題であった。これは例えば、シロナガス単位を用いたBWU制度に反映されている。これは原油のOPECと同様に鯨油の値段が下がらないようにする経済システムである。

しかしながら、モラトリアムが導入され、鯨類捕獲調査が開始された時点で、経済的利益の追求は目標たりえなくなった。反捕鯨勢力は鯨類捕獲調査を疑似商業捕鯨と決めつけ、批判するが、調査の副産物として国際捕鯨取締条約第8条2項に基づき販売される鯨肉の売上金は、次の年の調査を実施する経費に不足し、差額を政府からの補助金に頼っているのが真の姿である。

むしろ、皮肉なことに、現在、経済的にもっとも捕鯨に頼っているのはグリーンピース等の過激な反捕鯨団体である。この肥大した組織は、その最盛期において年間200億円を上回る多額の寄付金を集めた。主要キャンペーンは反捕鯨と反原子力である。捕鯨問題が解決したからといってすぐにそれらの団体が解散できるものではない。ほかの巨大組織と同様に、その目的が本来の環境問題への対応から、組織の維持にシフトしているのである。したがって、彼等は常に新しい標的を必要とする。すでにマグロはその標的となっており、CITES（絶滅の恐れのある動植物の国際取引きに

関する国際条約)では、1992年の京都での締約国会議以来、会議ごとのマグロなどの商業対象漁業資源をこの条約にとり込む動きが続いている。その意味で、陸上動物を含むすべての生物資源の利用の問題が捕鯨問題とまったく同様の問題であり、これらを広く視野に入れた対応が求められている。

6．政治

捕鯨の問題が、国際政治の舞台に上がったのは1972年ストックホルムにおける国連人間環境会議であり、そこで「クジラが救えずに環境が救えるか」というフレーズが用いられ、人々の心を捉えた。この経緯として、アメリカが当時のベトナム戦争における枯れ葉剤の散布、その結果としての大規模な環境破壊への批判から目をそらすため、クジラの問題を持ち出したといわれている。当時、多くの先進国は、鯨油の需要の消滅を受けて（すなわち鯨類資源の問題ではなく）すでに捕鯨から撤退していたため、捕鯨問題で痛手は受けなかった。鯨肉を利用する小数派であるノルウェーや日本の困窮を糧として、欧米諸国は失うものもなく環境問題における点数稼ぎをすることが出来るものを手に入れたのである。また、1980年代から90年代にかけての日本の急速な経済成長に対する警戒心を背景とした、いわゆる“日本たたき（ジャパン・バッシング)”がその当時のファッションとなってさらに反捕鯨運動に勢いがついた。このようにして反捕鯨運動は欧米諸国において非常な成功を収め、その結果として、クジラは特別な動物であり、殺すべきではないという考えが欧米諸国の一般市民に定着した。人類の歴史の中で最大規模の洗脳が成功したのである。

科学的知見が蓄積した現在、例えば、アメリカの政府関係者の中には日本の主張の科学的正当性を認めているものも多いが、反捕鯨団体から捕鯨問題に関して誤った情報や知識を得ている一般市民や議会が捕鯨に反対することから、米国政府は反捕鯨政策をとりつづけている。ちなみに、米国市民に対し、1997年にレスポンシブル・マネイジメント社が実施したアンケート調査によると、ミンククジラが増えており、これを食用として持続的に利用することができるとの条件のもとであれば、71%の米国人が捕鯨を支持するとの結果が得られている。

しかしながら、反捕鯨の立場に立つ環境保護団体が数百万人の会員を有している限り、政治家はその意見を、たとえ誤りと知りつつも、無視することは出来ないのである。

7．文化または感情論

上記から明らかなように、もはや科学的にも法制度的にも捕鯨を否定する理由がなくなってきていることから、反捕鯨の主張の根拠は尽きるところ文化的・感情的な問題に行きつく。鯨をほかの動物と同様に食料資源として見る見方と、鯨をほかの動物とは異なる特別の存在とみなして食料資源とは考えない思想の衝突である。これが問題の本質であるとするならば、その解決法は限られている。

すなわち、一方の価値観が他方の価値観を駆逐してしまうか、お互いに相違を認めつつ共存するかである。捕鯨の問題については、反捕鯨勢力側が前者の方向を志向している一方で、捕鯨擁護側は後者を志向していると言える。しかしながら、例えば、牛を食べない人口約10億人のインド人が、2.6億のアメリカ人に牛を食べるなと経済制裁をかざして迫ることの愚は明らかであろう。捕鯨問題にしても、反捕鯨国は日本人やノルウェー人がクジラを食べることを感情的には嫌うもしれないが、クジラを食べるなという価値観を経済制裁などの力をもって押しつけるのはおかしいのである。

ただ、この文化あるいは感情論の切り口は、しばしば資源問題や法律問題と混在し、事態の明確な認識が妨げられている観がある。すなわち、反捕鯨側には、日本が資源の保存を無視してまで文化の名の下に捕鯨の再開を主張しているとの誤解や、意図的な事実の歪曲が存在する。他方、すべての対立の原因を文化で説明してしまうことも短絡的であることは自明であろう。

8．将来の捕鯨問題の座標軸

捕鯨問題の様々な切り口を、この限られた紙面で分析することはかなりだいそれた試みであったが、問題の構成の大枠は記述したように思う。

これらの様々な角度から捕鯨問題の将来を見るとき、現在、人口増加や発展途上国における経済規模の拡大により、地球の環境収容力が急速に限界に近づきつつある状況を忘れてはならない。これは捕鯨による鯨肉の供給が世界の食糧問題を解決するという意味ではなく、鯨を特別扱いし持続的利用が否定されることの意味が地球の環境収容力との関連で認識されるべきであるとの意味である。すなわち、鯨の問題は孤立した問題ではなく、より大きな、生物資源の持続的利用の問題の中で扱われるべき問題である。科学的、法制度的に持続的利用が可能な資源については、世界のコンセンサスが無い限り例外が置かれるべきではない。現に、アフリカ象などでは鯨と同様の状況にあるが、これは一部の国の価値観にもとづき、本来利用可能な資源が利用出来なくなるとの事態を意味する。

また、捕鯨問題を含む持続的利用の問題は先進国と発展途上国との関係とも結びついている。いわゆる世界の世論は、実際は極端に言えば米国のCNNと英国のBBCの報道であり、これらは捕鯨に反対しているが、世界人口の大多数を占める発展途上国は、その将来にわたって自国民の食料資源を確保し、経済的繁栄を図っていくためには、例外なき持続的利用の原則を確保することの重要性を認識している。捕鯨問題については発展途上国の支持が強いゆえんであり、捕鯨問題は資源利用をめぐる南北問題でもあることの証左である。

IWC以外の国際会議ではクジラを含む海洋生物資源の持続的利用の考え方は支持されており、例えば150カ国が加盟するCITES（ワシントン条約、絶滅の危機にひんした種の国際貿易に関する条約）の締約国会議でも、過去2回の会議で、豊富なミンククジラの国際取引きの許可を求める提案が、過半数の支持を得ている（ただし、提案が採択されるためには3分の2の賛成が必要なため提案は未成立）。また、FAO（国連食料農業機構）でも、クジラを例外視しない持続的利用の考え方はほとんどの委員会においてコンセンサスで通る状況にある。これらのことからも、本当の意味での世界の世論は、必ずしも欧米の世論ではないことがわかる。捕鯨の問題は、資源の利用に関する一部先進国と発展途上国の対立と言う、より大きな問題の一部でもある。

捕鯨問題の将来の方向性を考えるとき、捕鯨擁護国と反捕鯨国間の根本的な価値観の違い（クジラを食料資源とみなすか否か）をいかに解決していくかが重要となる。科学的な側面から見ても、監視取締制度を含む法制度的な側面から見ても、今や持続的な捕鯨活動を行うことが可能である。このような状況を受けて、国際捕鯨委員会の場においても、反捕鯨国側は、公然と捕鯨は科学の問題ではないと発言している。あるいはそう言わざるをえない状況にある。

他方、捕鯨問題は孤立した問題ではなく、より大きな生物資源の持続的利用の問題として捉える必要がある。その認識が広まり、科学や法律がないがしろにされている国際捕鯨委員会の現状、クジラの資源状態や鯨類の持続的利用を可能とする改定管理方式等各種のメカニズムについて、正しい理解が進み、誤解や歪曲された情報に基づく欧米一般市民の反捕鯨感情が緩和されることが捕鯨問題の解決への方向であろう。

「クジラを守れずして環境は守れない」とのスローガンに端を発した捕鯨問題であるが、捕鯨問題を生物資源の持続的利用問題の一部として捉えるとき、この問題を合理的に解決できるか否かは人類に課せられたテストではないだろうか。言いかえれば、「クジラを持続的に利用することを可能と出来ないならば環境は守れない」のである。

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Why Community-Based Fishery Management Has Been Well Developed in Japan?

なぜ、日本で地域社会に根差した漁業管理が良く発達したのか？

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【Abstract】 It is often said that the reason why Community-Based Fishery Management System (CBFM) in Japan has been well practiced is due to a historical development of a fishing right system, which emerged during her feudal era. This is not always correct. Until August 1945, when Japan was defeated in the World War II, Japanese people served to the emperor under the military government. In those days there was no democracy at all. Thereafter, Japan was occupied by the Allied Forces for seven years until April 1952. During this period, the policy of the Occupied Forces was to make Japan a real democratic country. Within such a fundamental policy, the contents of Japan's fishery law was throughly redrafted in order that fishermen are entitled to participate in the planning with regard to the use of fishing area and fishery resources through a fishery coordination committee at the utmost democratic manner. This gave an ideal circumstance to fishermen to create their own community-based fishery management system.

【Key words】 fishery law, Fishery Coordination Committee, community-based fishery management

【要約】 日本における資源管理型漁業（Community-based Fishery Management : CBFM）がよく発展したのは、徳川時代における漁業権の歴史的発展に起因していると、よく言われているが、この理解はかならずしも、正しくない。1945年8月に第2次世界大戦に負けるまでは,日本の国民は天皇制のもとで、天皇陛下に仕えていた。この時代は、民主主義は全く無かった。日本は、1952年4月まで約7年間連合軍に占領されたが、その間の占領政策は、いかにして日本を真の民主国家にするかであった。

このような基本政策のもとで、1901年に施行された旧漁業法の内容は、徹底的に民主的に書き換えられれ、すべての漁業者は新たに設立された漁業調整委員会を通じて、すべての漁場ならびに漁業資源を最適に利用するための「計画 Plan」の作成に参加することを可能にした。かかる漁業制度は、久宗 高が中心となって、戦前に野村貫一がすでに提唱していた漁業調整制の仕組を土台とし、漁業権の内容に改善を加え、新漁業法として具体化したものである。

新漁業法に基づく漁民参加による漁場と漁業資源の総合的利用制度の実施は、漁業者の創意に基づく資源管理型漁業を生むことになった。このことは、久宗 高が新漁業法を立案したときには、夢想だにされなかったことである。

本稿は、以上の内容を英文として、外国の識者に分かりやすく説明したものである。外国の識者には、本稿と共に、筆者がまとめた "Fundamental Difference in Fisheries Management Between the Western Countries and Japan"をあわせ読んでいただくと参考になろう。

1. INTRODUCTION

Fishery management in Japan has been developed in two ways. One is "community-based fishery management system", which has been developed with the initiative of fishermen and is applied to coastal small scale fishery. The other is "total allowable catch system", which has been developed based on UN Law of Sea and is mainly applied to migratory species such as saury pike, Alaska pollack, horse mackerel, pilchard, mackerels and Tanner crab. The present paper describes how the community-based fishery management system has been developed to the coastal small scale fishery, which is the mainstay of Japanese fisheries.

2. RADICAL CHANGE IN POLITICAL STATUS OF JAPAN AFTER 1945

With the end of the World War II in August 1945, Japan was under the control of the Occupied Forces for seven years. During this period the basic policy of the occupied forces was to make Japan a democratic country. Thus, Japan changed its administrative status completely from a country under military government to a democratic country. Under such a radical change in her administrative status a land reform was carried out with the order of the occupied forces. However, in its implementation, there was no political and methodological difficulty at all, as an idea of land reform was already in existence even in the prewar days. The success of the land reform resulted in no more landless farmer.

Similar to agriculture, in November 1946 the Allied Forces requested the Japanese government to renovate her fishery institution in a democratic manner. However, neither the Occupied Forces nor the Japanese Government had any exact idea as to what to do for this crucial subject. Under such a circumstance, Mr. Takashi HISAMUNE devoted his every effort with his colleagues to find a way to make the democratic use of fishing area and fishery resources. Until the final bill of a new fishery law was approved by the national assembly in October 1949, there were many twists and turns due to different views from the occupied forces, political parties and fishermen's organizations. Under such confused situations, Mr. HISAMUNE always kept in mind that the fishery law for the future must be for the benefit of fishermen, who actually engage in coastal small scale fishery.

3. BACKGROUNDS NECESSITATED FOR THE DEMOCRATIZATION OF JAPANESE FISHERY

For the democratization of Japanese fishery, the following points were fully taken inot account :

3. 1 Specific Feature of Japanese Coastal Fishery

Japan is an island country and is located in a temperate zone with Kuroshio, which is a warm current running up from the area of equator and Oyashio, which is a cold current running down from the North Pacific Ocean. For these reasons, fishery resources in coastal waters of Japan are rich particularly in terms of variety of species. Due to a traditional preference of Japanese people to any sea product, fishermen fish any aquatic animal and plant as far as it is edible.

Thus, even in a same coastal fishing area, it was possible to develop a variety of different fisheries using different gears aiming at different species. However, in the past there was no plan to make synthetic use of these different fisheries resources. As a result, a number of severe conflicts happened among different groups of fishermen, which resulted in over fishing. In the worst case, fishermen killed each other on the sea.

3．2 Fishery Coordination Proposed by Mr. Kanich Nomura

To reduce conflicts among fishermen, to make harmonious use of fisheries resources among fishermen and to improve the productivity of fishermen as referred to (1) above, since 1935 Mr. Kanichi NOMURA, who was a chief for coastal fishery at the Ministry of Agriculture and Forestry, proposed and tried to establish a *fishery coordination committee* with the participation of fishermen, but there was little achievement due to the intensification of the war.

3．3 1901 Fishery Law and Fishery Society

With the enactment of the 1901 Fishery Law, which was the first fishery law in Japan, fishing rights in four different types with a validity of 10 or 20 years were granted to fishery societies (80% of total) or to individuals (20 % of total) with reference to traditional practice of fishing operation in the past. In addition, with the development of new type of coastal fisheries, which occurred after 1901, new fishing rights were also granted to the fishery society in response to their request.

In 1910, with the introduction of trawl fishery, which was an offshore fishery, a fishing license system was added to the 1901 fishery law. The fishing license was issued to individuals, limiting the number of fishing licenses, the size of fishing boat and gear in use, fishing area, fishing season, etc.

An advantage of the 1901 Fishery Law was that the Law gave a motive to all fishermen to organize themselves into fishery societies (FSs), which later on developed into fishery cooperative associations (FCAs).

3．4 Contradiction, which occurred in the Contents of Fishing Rights

Out of the four types of fishing rights in the 1901 fishery law, an exclusive fishing right was the mainstay, which was granted to the entire sea area of a FS and entitled to fish both migratory and sedentary resources. With the progress of time, migratory fishery resources, which were included in the exclusive fishing right disappeared due to oceanic change or some other reasons, which made it meaningless to keep them in the fishing right. In contrast, sedentary resources had remained unchanged, but gathering such non mobile resources such as abalone, lobster, etc. were apt to be monopolized by some prerogative persons. Thus, the democratic redistribution of such sedentary resources to actual fishermen became necessary.

3．5 Motorization of Coastal Fishing Boats

Motorization of coastal small boats began in the latter half of the 1920s. By 1930 the majority of small fishing boats had already been mechanized, resulting in the over use of coastal resources and severe conflict among different groups of fishermen. Toward the end of the World War II, the number of trawlers operating in sea area around Japan's Islands increased so as to secure foodstuff for Japanese consumers. This also resulted in over fishing to resources and severe conflicts with coastal fishermen.

Thus, after the World War II, one of the problems of Japan's marine fishery was to recover the abundance of decreased resources and to increase the productivity of coastal fisher fishermen.

4．1949 FISHERY LAW AND FISHERY CORDINATION COMMITTEE

4．1 1949 Fishery Law

Referring to various situations as referred in 3 above, the 1901 Fishery Law was throughly redrafted with the enormous effort of Mr. Takashi Hisamune, who was a lawyer and the Chief of the Planning Division of the Bureau of Fishery, Ministry of Agriculture and Forestry from 1947 to

1950. In redrafting the fishery law, he tried to make it as democratic as possible and crystallize his idea of the establishment of *a Fishery Coordination Committee*, which was actually the one proposed by Mr. Kanich NOMURA.

Thus, the first article of the 1949 fishery law is described as follows :

> The Fishery Law defines the basic system with regard to the fishery production such as Fishing right and fishing license.
>
> The law aims at :
>
> ① increasing the fishery productivity by synthetic use of all fishery resources available in a sea area on the basis of a plan, which is drawn *through the performance of a fishery coordination committee*, which is represented mainly by fishermen and employed fishermen, and
>
> ② democratization of a fishery.

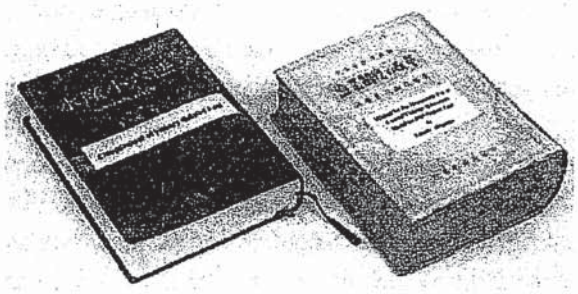
The 1949 Fishery Law is composed of nine chapters with 138 Articles. However, the core of the law was the establishment of a fishery coordination committee to make democratic and optimum use of fishery resources.

For the precise implementation of the fishery law as he had in mind, Mr. HISAMUNE prepared a manual, which is known as "Fishery Reform : Article by Article Explanation of Fishery Law" and distributed it to all persons concerned at national, prefecture, municipal and even fishery cooperative level. The manual was composed of 780 pages. By looking at such a heavy publication, the reader may well imagine how eager Mr. Hisamune was in the optimum and democratic use of fishing area and fishery resources among fishermen. (See Photo. 1 and 2)

Photo 1 . A Man Who Contributed to The Development of CBFM in Japan

Mr. Takashi HISAMUNE
1915 - 1990

Photo 2. Fishery Reform : Article by Article Explanation of Fishery Law



Right : Manual distributed to persons at all levels.
Left : Compendium of Fishery Laws.

4 . 2 Role of A Fishery Coordination Committee

Administratively, Japan is divided into 47 prefectures. A fishery coordination committee (FCC) is established for each prefecture. As seen in Figure 1, the FCC is a legal organization established based on the 1949 Fishery Law and it is located in between a prefecture government and fishermen with the following functions :

Prefecture Government

⇑

Fishery Coordination Committee

(Legal body established based on the fishery law to formulate a Plan to make democratic and optimum use of all fisheries resources available in a prefecture sea area on behalf of fishermen.)

⇑

Fishermen and Employed Fishermen

(Users of Fisheries Resources)

Figure 1 The location of a Fisheries Coordination Committee

① The role of FCC is to formulate "*a plan to make synthetic use of all fishery resources available in a sea area right off a prefecture on behalf of fishermen, taking into account the conservation of fishery resources*". For the establishment of the plan, a fishing right and a fishing license are used as its tool.

② In a principle a FCC is established for each prefecture sea area with fifteen (15) members, of which nine are erected among fishermen. Of the remaining six, four are men of learning and experience, who are acquainted with fishery and fishery resources in the sea area and two represents public interest. These two groups of the FCC members are nominated by the prefecture governor.

③ For the formulation of the plan, the FCC organizes a public hearing as much as possible to listen the voice of fishermen.

④ Based on the plan determined by the FCC, the prefecture governor issues fishing right and license.

⑤ The FCC is authorized to issue an order to regulate fishing operation, whenever necessary.

⑥ The FCC is a permanent organization, and it will amend or adjust the plan in accordance with natural change in the type and size of fishery resources in its sea area. This is done particularly at the time of the renewal of fishing right and fishing license, which is done at an interval of 5 or 10 years

Note 1:
In addition to a FCC at prefecture level, another FCC with more or less similar functions is established at a regional level, when same fisheries resources are fished by fishermen from two neighboring prefectures or more. Apart from these FCCs, there is a natonal council, which examine the size and operational conditions of industrial fisheries, which have been specified by Minister, who is responsible for fishery. These are distant water fisheries operating in high seas and those, which operate in sea areas off several neighboring prefectures. . The members of the council are appointed by the Minister concerned.

Note 2:
All fishing rights granted based on the 1901 Fishery Law became invalid when the new Fishery Law came into operation on March 1, 1950. Then, the first erection of the members of the FCC took place on August 15, 1950, which means that the actual activity of the FCC started in the fall of 1950. To compensate the abolishment of old fishing rights, the government paid a sum of 18 billion Yen to all the owners of fishing rights granted based on the 1901 fishery law by means of "bond" payable in twenty five years. Later on the bonds were cashed and well utilized for the economic rehabilitation of FCAs.

4. 3 Tools Used for the Establishments of the Plan

For the establishment of the plan at prefecture level, fishing right and fishing license are used as tools.

1) Fishing Rights System

With a few exceptions, a fishing right is granted by a prefecture governor to fishery cooperative association (FCA). There are three types of fishing right as follows :

① **Common fishing right** : Out of the three types of fishing rights, this is the fishing right, which is commonly granted to every FCA. The right covers the coastal sea area right off the entire coast of a FCA. The distance from the coast toward sea varies according to the availability of resources and gears as specified below. The right is valid to sedentary resources such as abalone, turban shell, lobster, scallop, sea weeds and non-mobile gears such as set gill net, boat and beach seines, portable trap and small set net. The right is valid for 10 years.

(Note) Unlike the exclusive fishing right in the 1901 fishery law, migratory resources were excluded from the contents of the common fishing right.

② **Aquaculture right** : This right is established for a sea area, which is suitable for aquaculture. Such sea areas are mostly found within the sea area of the common fishing right. The validity is 5 years.

③ **Right for large set net** : This is a right to set a large set net with a depth of 27 meter and above, which aims at catching migratory fishes. A sea area allowing to set the large set net is specified on a map. The validity is 5 years.

2) Fishing License System

Fishing license system is established to fisheries, which are in need of restricting the number of fishing units/boats, the size of fishing boat, fishing area, fishing season, etc. The license is issued to an individual, either fisherman or fishing company. There are two types of fishing licenses as follows :

① **Fishing license issued by Prefecture Governor** : The license is issued to the owner of fishing boat, who operates his fishery within the prefecture sea area. The validity is 5 years.

② **Fishing license issued by the Minister Responsible for Fishery** : The license is issued to the owner of fishing boat, who operates his fishery in sea area off two neighboring prefectures or more or high seas.

(Note) For further detail of fishing right and license, the readers may wish to refer to the author's paper entitled "Development of a Community-Based Fishery Management System in Japan", *Marine Resources Economic*, Volume 10, 21-34

5. EFFECTS OF THE PLAN FORMED BY FISHERIES CORDINATION COMMITTEE

5.1 The Plan Gave an Ideal Circumstance to Fishermen to Create CBFM

Fishing rights granted and fishing licenses issued based on the Plan drawn by the fisheries coordination committee (FCC) brought about an ideal circumstance for fishermen to create their own "Community-based Fishery Management system 'CBFM)". Such a situation was further accelerated by the following three facts :

① As referred under Note 2 of 4.2 earlier, there was no old fishing rights, which was granted with reference to traditional fishing customs developed during the feudal era.

② Fishermen's organization such as FCA, which

could be responsible for CBFM, was already in existence, as it was developed durig the pre-war days.

③ The 1949 Fishery Law created a new article, that a FCA should establish a fishery management committee to make democratic use of fishery resources within its sea area with reference to fishing rights newly granted

5. 2 Organization Responsible for CBFM

Hereunder, a term, FMO is used for a fishermen's organization responsible for CBFM.

According to the Fishery Censuses, the total number of FMOs throughout the country in 1952 was only 359, which increased with the progress of the time, being 1,339 for 1988, 1524 for 1993 and 1,734 for 1998. Since the total number of FCAs in 1998 was 1890, in average a FMO has been developed in almost every FCA.

A variety of different types of FMO have been developed in terms of way of organizing such FMO.

Out of 1,734 FMOs developed in 1998, 460 FMOs (27 % of the total) were FCA itself, 106 FMO (6 %) were those, which were established by two neighboring FCAs or more, 742 FMO (43 %) were fishermen's groups, which have been formed within a FCA, and 90 FMOs (5 %) were those other than the former three respectively. A FCA has normally established several fishermen's groups according to type fishing gear employed or species being fished. Thus, nearly a half of FMOs are fishermen's groups, which have been established within a FCA

It is important to note that these FMOs appeared only after 1950, when the present fishery law was enacted. There was no FMO at all before 1945, when Japan was non democratic country

5. 3 Way of Fishery Management Adopted in the CBFM

There is no standard CBFM in terms of the way of fisheries management. The way of CBFM varies to a great extent from very simple ones to sophisticated ones, as the ideas and way of conserving fishery resources are in many instances created by fishermen.

According to the 1949 Fishery Law, a prefecture governor establishes a fisheries regulation, e.g., by specifying the minimum size of fish to be caught for a certain species, say., 15 cm in length. However, it often happens that fishermen make it larger, say 20 cm for their area. When Lobster set gill net is one of the species component of a common fishing right to a FCA, the FCA may restrict the number of fishing units by issuing a fishing license to specific fishermen to avoid an over fishing. A fishing area of scallop is split into two or three sub-areas, and fishing are allowed by annual rotation, resulting in better harvest. in terms of both size and quantity. The enlargement of the mesh size of a set gill net will lower catch in quantity. However, as the unit price will increase with an enlargement in the size of fish to be caught, the income of fisherman will increase.

Fishing operation without any rule established among fishermen may result in excess of unnecessary fishing effort, wasting operational cost and over supply of fish, which will in turn make the price of fish lower. To overcome such situations, a pool system has been developed for some fisheries under the leadership of an experienced fisherman, who decides days for fishing. Only on the day for which he decided, all fishermen go out for fishing. The size of catch may varies among fishermen. However, sale of every boat is pooled, and fuel expense of every boat ia also pooled. Then, the difference between the total sale and the total cost throughout all fishermen, i.e., profit, is equally distributed to all fishermen. This will greatly reduce the size of fishing effort. Catch limit system has also been

developed, when a prefecture fishery experimental station is capable of providing the size of MSY to fishermen. There is a case that a moratorium is executed at a prefecture level for a particular species until the resources give a sign of recovery.

5. 4 Resources Enhancement

In recent years, with the enhancement of marine ranching a FMO, which cover the entire coast of a prefecture, is being developed in several prefectures. A FMO, which has been developed for the entire coast of Fukushima Prefecture for an increased production of Bastard halibut (*Hirame*) is a typical example. A FMO, which was developed in Akita Prefecture for the recovery of sand fish (*Hatahata*) resources is another case, where the prefecture federation took an initiative with the corporation of its member FCAs.

5. 5 No Compliance Problem

Community-based fisheries management in Japan has been developed with an idea and initiative of fishermen. Therefore, there is no compliance problem in Japan. In either central government or prefecture government, there has been no case that the government is involved in community-based fishery management.

5. 6 Campaign on Resources Management Fishery

It may be worthwhile to mention herein that in connection with the advent of the regime of the 200 miles economic zone, Professors Yutaka HIRASAWA and Akira HASEGAWA of the Tokyo University of Fishery, did a nation-wide campaign to encourage fishermen to develop their own self management with the use of a word of "**Resources Management Fishery**", which is a synonym of "community-based fishery management". Thus, a term "Resources Management Fishery" has become a word, which is commonly used whenever a matter of fishery management is discussed among Japanese people concerned.

6. CONCLUSION

In 1950 when the present fishery law was enforced, no one had thought that the law would be so effective in the development of the community-based fishery management system (CBFM). Even Mr. HISAMUNE, who drafted the 1949 Fishery Law, had no intention that his law could be a base to create the CBFM with the idea of fishermen.

At this moment, it may be appropriate to mention herein that in around 1938 the author was incidentally under Mr. Kanichi NOMURA for two years, and has often heard Mr. NOMURA's idea with regard to "fishery coordination" directly from him. According to one of Mr. NOMURA's lecture materials prepared in 1935, he already had a firm idea to establish a fishery coordination committee for a sea area, such as XXX Bay, YYY Coast, etc. with the participation of representatives of FCAs as its committee members to establish a plan with respect to the synthetic use of fishing area and resources in the defined sea area. Now, his idea has been fully accommodated into the present fishery law.

So far, how fishery coordination committee (FCC) acted to form a plan and how it was the effective to create CBFM by fishermen were detailed under 4 and 5 above respectively. In short, these may be summarized as follows :

"Community-based fishery management system" developed in Japan follows two steps. A Plan formed by FCC is actually a fishery management plan in a broad sense. Using such a broad management plan as a framework, actual fisheries management plan,

which corresponds to CBFM, has been developed as the second step. Particular feature of these two steps are the fact that both two plans are formulated with the ideas of fishermen but not from the manager of fisheries resources. Therefore, no compliance problem has occurred.

The reason for the success in the development of CBFM in Japan is thought to be an existence of legal framework in the fishery law, viz., the establishment of a fishery coordination committee, by which fishermen were fully allowed to participate in the formation of a fishery management plan.

In many instances, the government tries to enforce fishery management plan established by themselves. Conversely, fishermen try to escape from the government enforcement. To ease such a tension of fishermen towards the resources manager, it may be worthwhile to think of establishing an organization like a fishery coordination committee between the resources manager and fishermen as has been developed in Japan.

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Global Warming Could Have a Tremendous Effect on the World Fisheries Production

地球温暖化の結果、世界の漁業生産に大変な変化が起こるかもしれない

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【Abstract】A new evidence for the regime shift has been found as to the tuna populations in the northwest Pacific to show that the regime shift is the universal principle throughout fish groups not only at lower trophic levels but at higher levels. The regime shift has been driven by the cyclic climate change resulting from a shift in the patterns of overturning in the northern North Atlantic. Global warming may shut down one of the two downwelling sites linked to formation of the North Atlantic Deep Water, NADW, and destroy the system of regime shift itself.

【Key Words】 regime shift, tunas, 65-70-year cycle, thermohaline circulation, North Atlantic Oscillation, global warming, world fisheries production

【要約】北西太平洋のマグロ類資源がレジーム・シフトを行っているという新しい事実が見出された。この事はレジーム・シフトが、食性段階の低いイワシやニシンのような魚種のみならず、マグロ類のような高い食性段階の魚種までも含むところの、普遍的な法則であることを示している。レジーム・シフトは、北大西洋北部における海水の対流パターンの変化の結果として生ずるところの気候のサイクル変化によって駆動されているが、地球温暖化は北大西洋深層水（NADW）の形成に関連する2つの沈降域の1つを閉鎖し、レジーム・シフトのシステムそれ自体を破壊するかも知れない。

1. REGIME SHIFT AS A UNIVERSAL PRINCIPLE

Although regime shift, cyclic structural shift on the global, interdecadal scale of the climate-marine ecosystem, has been widely recognized for the marine populations at the lower trophic levels such as zooplankton, sardines, anchovies and herrings, it has been deemed that fishes at the higher levels like tunas are not directly influenced by the climate change but their biomass is controlled density-dependently through the regulation of fishing effort (KAWASAKI, 2000).

In order to examine if the tuna populations are really resistant to the climate change, I have analyzed data for the Japanese small-scale tuna longline fishery operated by fishing boats under a tonnage of 20 in the northwestern Pacific Ocean (KAWASAKI, unpublished). Figure 1 shows interannual changes in catch per day's fishing (three-year-running mean) of four tuna populations between the years 1974 and 1997, which reveal that the biomass of the bluefin and albacore was at a low level in the mid to late 1980s but has been increasing since around 1990, while that of the bigeye and yellowfin had peaks around 1990, with decreasing thereafter. The changes in biomass of the bluefin and albacore and those of the bigeye and yellowfin are almost in phase but of different sign.

The relation between the fluctuation pattern of the former two populations and that of the latter two is similar to that between herrings and sardines which occur throughout the world oceans (KAWASAKI, 1991). The new evidence for the regime shift as to the fishes at higher trophic levels strongly suggests that the climate change has an impact on even the piscivorous fishes directly without passing through the food chain, showing that the regime shift is a universal principle that is common to most fish groups.

2. MECHANISMS CONTROLLING THE REGIME SHIFT

TSUBOI (1986/87) for the Far Eastern sardine and BAUMGARTNER et al. (2000) for the Californian sardine documented very long-term variability and found a significant peak at a period of 65-70 years. SCHLESINGER and RAMANKUTTY (1994) analyzed global mean temperature records and identified a temperature oscillation with a period of 65-70 years which is the results of oscillations for the North Atlantic Ocean. It was suggested that the oscillation arises from predictable internal variability of the ocean-atmosphere system.

According to DICKSON et al. (1996), a convective renewal of intermediate and deep waters in the

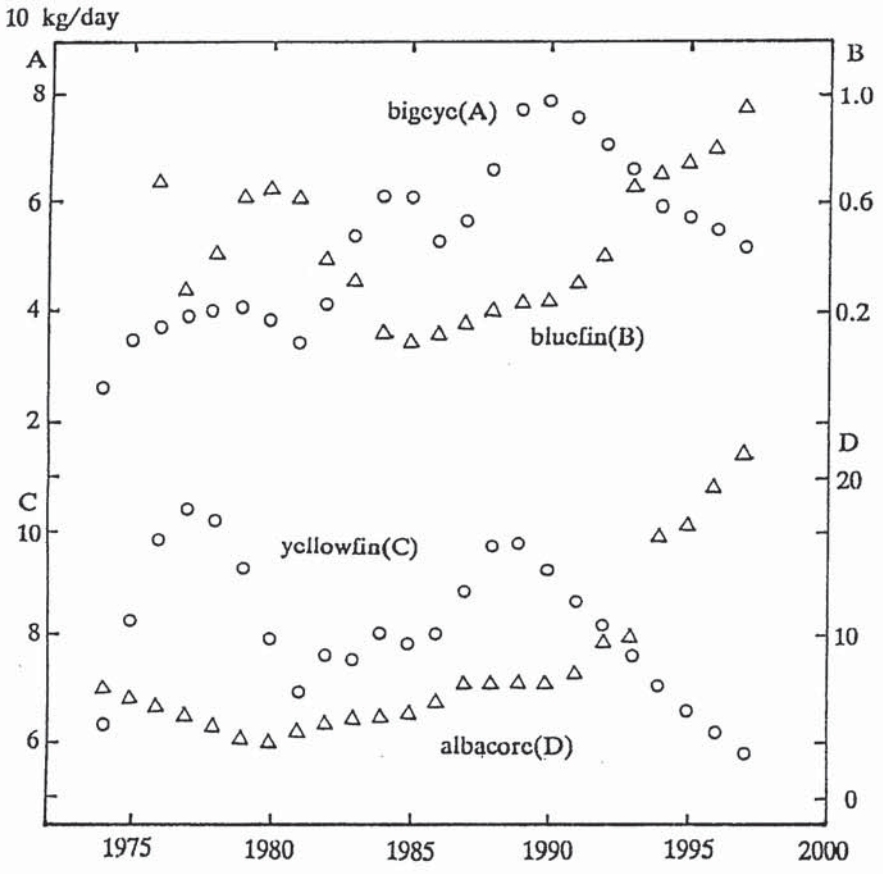

Figure 1. Interannual change in cpue (3-year running mean) of the four tuna populations in the northwest Pacific between the years 1974 and 1997 (KAWASAKI, unpublished).

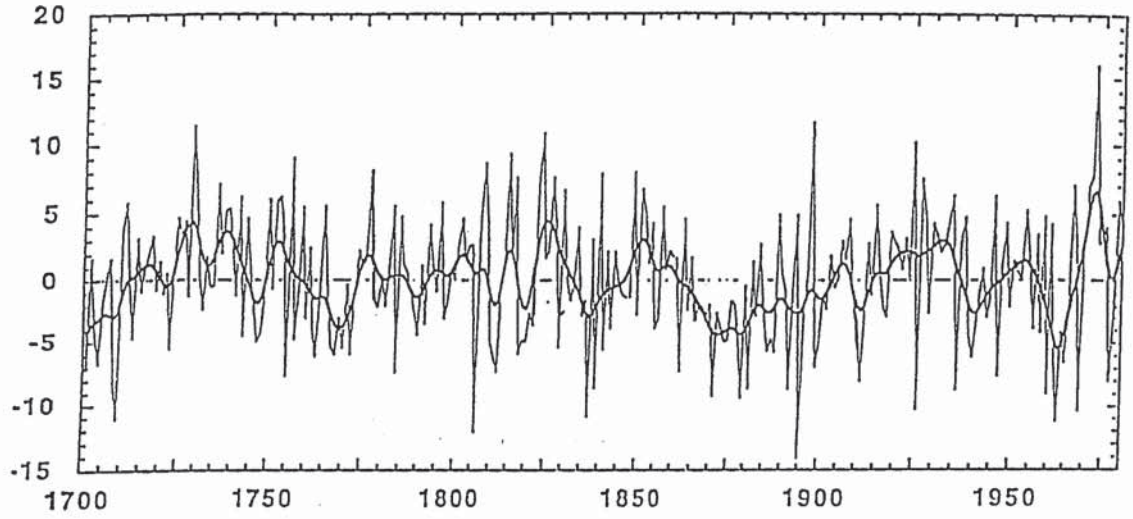

Figure 2. The winter NAO index reconstructed from tree rings.
Source : DICKSON et al. (1996)

Greenland Sea and Labrador Sea contributes significantly to the production and export of North Atlantic Deep Water (NADW), thus helping to drive the global thermohaline circulation. The intensity of convection at each of the two sites and the hydrographic character of their products have been subject to major interdecadal change. The evolution of winter convective activity was in phase but of different sign at the two sites. There is a strong evidence of a direct impact of the shifting atmospheric circulation on the ocean, which is the ocean's response to forcing by the North Atlantic Oscillation, NAO.

The NAO is a large-scale alternation of atmospheric mass between the Icelandic Low and the Azores High centers of action. The index of NAO variability is the difference in pressure between its two cells, measured between Iceland and Azores, which shows signs of a 70-year period (Figure 2). The global synchrony of variations in many fish groups across the trophic levels is supposedly driven by fluctuations in the formation rate of the NADW.

3. GLOBAL WARMING WAY DISRUPT THE ORDER OF NATURE

RAHMSTORF (1999) stated that global warming could switch off one of the two main sites of convection linked to the formation of NADW in the Greenland Sea and in the Labrador Sea. Global warming is expected to warm the surface waters and increase precipitation in higher latitudes, both of which reduce water density and move the Atlantic closer to the threshold. The crucial question is how closer? WOOD et al. (1999) simulated the shutdown in Labrador Sea convection and the associated collapse of the Labrador Current, which occur between the years 2000 and 2030.

The regime shift has been driven by the cyclic climate change resulting from a shift in the patterns of overturning in the northern North Atlantic. Global warming could have a tremendous effect on the regime shift and in turn on the fisheries production throughout the world oceans.

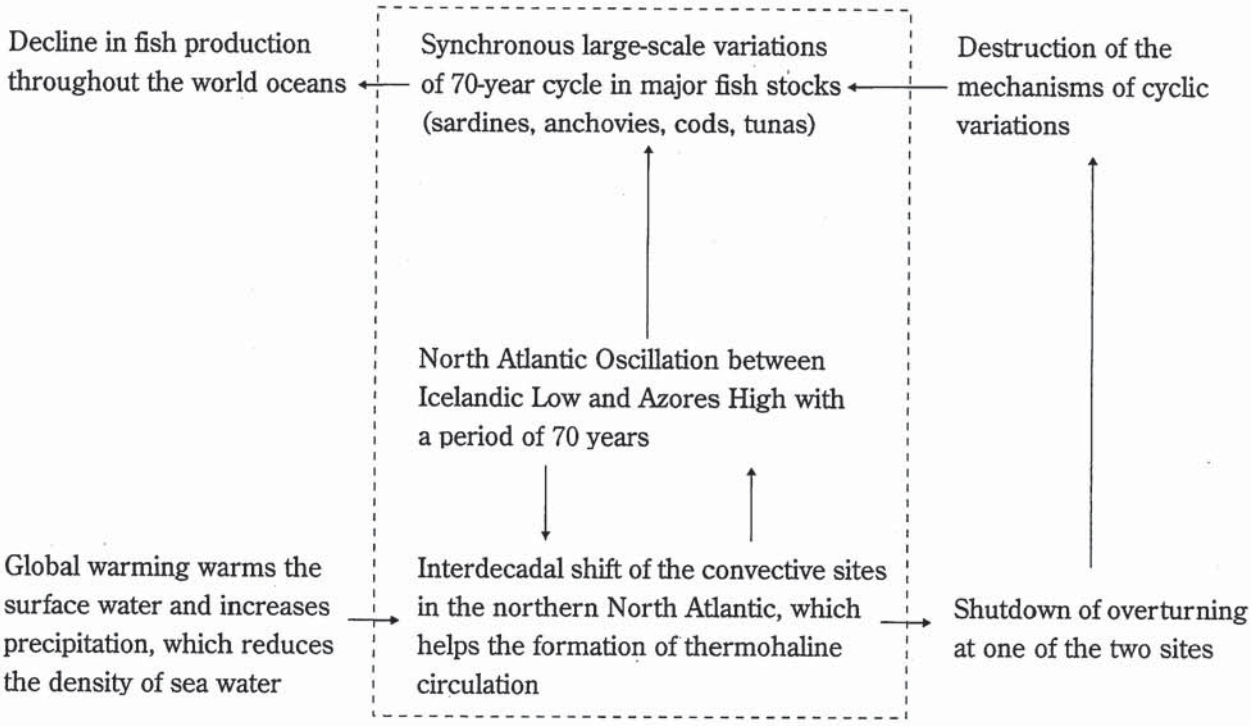

Figure 3. A pathway beginning with global warming and ending in decline in fish production throughout the world oceans.

A suggested pathway which begins with the global warming and ends in the decline in fisheries production is indicated in Figure 3.

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History of Fish Marketing and Trade with Particular Reference to Japan

日本を中心とした水産物市場と貿易の歴史

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【Abstract】 This paper reviews the history of fish marketing in Japan. The Japanese experience is rich in terms of long history, species handled, products forms, cooking methods, ways of utilization, and interaction with domestic fisheries. Along with the change of people's life style from hunting to farming, marketing and trade have developed. The self-sufficiency rate of fishermen was less than that of farmers, resulting in active fishermen's marketing involvement. Salt has been the basic good among tradable fisheries commodities and enriched human life. Processed fisheries commodities have been used as offerings, tax, and military food due to their scarcity and preservability. Traditional marketing and trade include commercialization of dried, smoked, salted, and fermented seafood; seasonings; seasoned boiled seafood; and organic fertilizer. Modern marketing and trade include commercialization of cultured species, fish paste, canned fish, frozen/fresh/live fish, fish oil/fish meal/fertilizer, and potential resource species. Cultural and food diversity is essential for the human survival in the 21st century. Despite the conventional use of fish, most marine organisms are not utilized yet. As healthy food, drugs, raw materials, ornamental use, and contribution to solving environmental problems, there is a great potential in fisheries and fish trade if the resources are wisely managed under the WTO framework started in 1994.

【Key words】 fish marketing, cultural diversity, food diversity, utilization of fisheries resources, and fisheries management

【要約】 本論文は日本の水産物流通の歴史を分析したものである。日本の経験は、その長い歴史、取扱魚介類の豊富さ、商品・料理法・利用法の多様性、さらに国内漁業との繋がりから見ても抜群である。狩猟時代から農耕時代への移行と共に人間の生活スタイルは変り、流通分野も発達した。漁民の自給率は農民の自給率より低かったことが、漁民家族の流通参加を余儀なくさせた。塩は商品として早くから扱われ、食事を豊かにした。水産加工品は保存がきく貴重品として、供物、税、兵糧に供された。伝統的には干物、薫製、塩蔵品、醗酵食品として、調味料として、佃煮として、あるいは肥料として取り引きされた。近年になって、養殖魚、練製品、缶詰、冷凍魚・鮮魚・活魚、魚油・フィッシュミール・肥料、飼料、未利用資源等が注目されるようになった。文化的多様性に基づく食の多様性は、人類が21世紀を乗り越えるための必須条件である。水産資源は現在でも大いに利用されているが、海洋生物資源の殆どはまだ利用されていない。健康食、医薬品、工業原料、鑑賞生物、環境保全機能等海洋生物資源の用途は沢山あり、水産業と水産物貿易の可能性は1994年に始まったWTO（世界貿易機関）のフレームワークの下でそれら資源がどのように管理され、有効利用されるかどうかにかかっている。

1. INTRODUCTION

The United States (USA), Europe, and Japan offer the largest fish import markets in the world and China is catching up. Imports of the United States and Europe are, however, rather limited in species and in the form of products such as canned and frozen goods, and fishmeal.

If we look at Chinese seafood trade, dried sea cucumber, shark fin, and abalone have been important import commodities from all over the world. China has been changing from fish exporter to importer recently, regardless of her remarkable fish production in the 1990s. This will definitely affect the world fish trade structure in the future, but how it will affect is uncertain.

On the other hand, Japan used to be a fish exporting country, but now offers the largest single fish market in the world and imports over 30% of the world fisheries import in value. In 1996, Japan imported 3.45 million mt or US$17 billion of fisheries products while exported 275 thousand mt or US$1.5 billion (ANONYMOUS, 1999). The Japanese fish eating habit created a unique culture characterized by long history, varieties of species consumed, product forms, cooking methods, ways of utilization and marketing, and interactions with domestic fisheries. Japanese information on fish marketing and trade has been rarely written in English. Thus, this article mainly deals with the Japanese case.

1. 1 The Issues

The current food sufficiency rate of Japan is 40% as compared with 140% of France and 125% of the United States (ANONYMOUS, 2000). Food security of Japan under the WTO at present is very fragile from the National Security point of view.

In 1991, the world production of grain was 1,884 million metric tons (mt), while production figures were 179 million mt for meat and 100 million mt for fish production. Since then, food production did not increase dramatically. However, world population already reached 5.5 billion in 2000 and has been estimated to 8.5 billion in 2025. There is not much optimism left to feed world population. Average per capita annual grain consumption is now about 340 kg, ranging from 135-200 kg of Asian people to 1,000 kg of the average American. Maximum populations on earth fed by current level of food production were estimated as 3.4 billion assuming American style by all, while 13.4 billion assuming Indian style by all (NAGASAKI, 1999).

By eating habit, countries are classified by 5 types: 1) Meat dominant country; wheat dominant country; rice dominant country; corn & other grain dominant country; and millet, taro, sweet potato dominant country. Along with their historical background, such as religion, colonization and change in life style, people's original food diversity has been limited by taboos pertaining to food intake. Judaism, Islam and Hinduism are such religions which limit food intake. Some prohibits to eat beef or pig and other prohibits to eat fish without scale and fin (NAGASAKI, 1999).

Facing on the food security problem, the importance of cultural and food diversities or lifting taboos pertaining to food intake is ever-increasing.

1. 2 Shell Mound

Tracing back to the human history, we can easily find shell mounds along the coasts of seas, lakes and rivers all over the world. This indicates people's close association with fisheries in ancient days when people had to live with shells, fish, and seaweed for their hunting life. Of course, the distribution of shell mounds is patchy, not uniform.

In Japan, about 1,900 shell mounds are distributed from Chishima Islands to Ryukyu Islands. Half of them are located in Kanto Region concentrating along Tokyo Bay and Kasumiga-ura. Most of them are found in the Pacific coast and a few in the Japan Sea coast. Most of them were made in the straw-rope pattern era and those made in later years are much less. This indicates that human dependence on seafood has been decreasing as farming has developed. The development of Agriculture has changed people's taste and preference in terms of food intake from protein rich foods to carbohydrate rich foods.

1. 3 Origin of Marketing

Origin of marketing is closely associated with fisheries. Along with the changes of people's life style from hunting to farming, marketing in the form of primitive bazaars based on barter, later monetary trade, were developed. The self-sufficiency rate of fishermen was less than that of farmers, though fishermen eat a lot of seafood. Therefore, it is reasonable to think that fishermen and/or salt traders actively involved in such marketing. They exchanged fisheries commodities for farmed products.

Starting from fresh fish and/or salt trade, fish and salt marketing developed to handle processed ones to preserve fish for a longer period. This primitive processing consists of drying, smoking, salting, and fermenting,. Fresh fish and/or salt as well as those processed ones were frequently used as offerings to gods or super-ordinates. Those preserves were also used as a tax or military food.

In 676, *Nikushoku Kinshirei* (prohibition of eating meat) was at first ordered by Emperor Tenmu. Since then, fisheries products became the major items for offerings. Prohibition of killing animals was repeatedly ordered by succeeded emperors as the buddhism was politically regarded as the national religion.

At the beginning of the 13th century, a famous buddhism priest, Shinran, encouraged to eat fish from the nutritional point of view. This encouraged the Japanese to eat more fish and fish trading. However, commercialization became popular in the middle of the 17th century when money economy developed and merchants dealing with commodities shipped by local loads became active. In 1771, marine transportation developed and an eastern route between Japan Sea coasts and Tokyo was open, while a western route between Japan Sea coast and Osaka as well as *Higaki Kaisen* route and *Taru Kaisen* route between Osaka and Tokyo were open in 1772. Along with the government policy emphasizing commercialization, this triggered the nationwide commercialization in modern times in Japan. Products in Hokkaido were also transported by *Kitamae-sen* not only to Osaka but also to Okinawa. Products of Kagoshima and Okinawa were exported to Osaka and Tokyo. In addition to dried, smoked, and salted seafood, many species were also preserved as pickles or used as ingredients for soy souses and other processed products such as crackers, mashed fish, mashed and seasoned fish, fish paste, shark and whale ointments. In addition, oils from these fish in particular squid and blue fish were also utilized as liver oils and edible oils.

1. 4 Salt Road

World annual consumption of salt is now about 170 million mt and major producing countries are the USA, China, Russia, Germany and India. It is unknown when salt was traded for the first time. However, salt has been an important fisheries product. The name of "rock salt" indicates that there was once sea which was protruded by the earth's crustal change. Although salt has been regarded in many parts of the world as if it is

essential for human survival, it is still a question because there are people who did not know salt. Nevertheless, salt was used to make food's taste better and to preserve food for longer period. Although it is not necessary to take a lot of salt, it is better to take some. However, places of salt production are limited to seacoasts or the area once it was sea.

As a result, salt became an important tradable commodity all over the world and salt road connected people in the mountain with sea. Names of coastal origin are also found in the mountain villages and towns.

The first salt farm recorded in the Japanese history was Oshio Salt Farm in Hyogo prefecture, built in the Nara era (710-794) (HIRASHIMA, 1975). Seto Inland Sea with high difference in tide was suitable to develop salt farms so that this area became the center of salt production in Japan. During the Azuchi/Momoyama era (1568-1600) and the first half of Edo era (1600-1968), many salt farms developed with industrial promotion policies of each fief. Along Seto Inland Sea, developed were the salt farms. These include Oshio and Akaho in Hyogo prefecture; Yuzaki, Akasaki, and Ajimi in Okayama prefecture; Matsunaga and Takehara in Hiroshima prefecture; Hirao, Mitajiri, and Akiho in Yamaguchi prefecture; Muya, Naruto, Takashima and Tokushima in Tokushima prefecture; Sakaide, Yashima and Takuma in Kagawa prefecture; and Takihama and Hatohama in Ehime prefecture. Salt was also produced in Wakayama, Chiba, Ishikawa, and Fukui prefectures.

Salt was important food for warriors. Rice ball and soy bean soups were essential components of their food: 60 *go* (about 180 cc) of rice, 1 go of salt and 2 *go* of soy bean paste per 10 warriors per day. Without salt, there is no fight. Therefore, stopping the salt road was also used as a strategy in the civil war time (1491-1568).

On the other hand, salt is heavy. Therefore, people transported it by using waterways as long as possible, then carried it to the mountain villages on the back. They took often short cuts of mountain roads. In Japan, women carried 100-200 kg per person and earned money by this transportation.

2. TRADITIONAL FISH MARKETING AND TRADE

In Japan, commercialization developed very much during the Edo era when the feudal system was completed in Japan. Tokugawa Shogunate took an isolation policy against foreign countries and gave fiefs to feudal loads in such a way that the closer the relationship with the Tokugawa family, the closer the fiefs from Edo (Tokyo now). In order to secure centralization, the *Shogun* stood the top of the people to keep feudal loads as poor as possible. A social class was established in such a way that the highest social class was the warrior's class, followed by the farmer's, the manufacturer's, and the merchant's in order. The taxation was based on rice and severer to the farmers than the others. The lower the social classes, the lower the socio-political freedom but the higher the economic freedom.

At the same time, each feudal load had to manage a mansion in Edo where his wife and followers stayed there all the time as hostages. In addition, each feudal load had to visit the Shogunate in Edo once a few years and obeyed the Shogun's order of big public works if it was asked for. Management of these economic burdens to feudal loads was a headache and each feudal load had to promote economic activities as well as environmental management. As a result, the merchants belonged to the lowest social class was paid much attention and commercialization was rapidly developed. Dealers of fisheries products as well as shipping industry became the leading

economic sectors in the society. Thus, dried local fisheries products were carried to urban centers such as Edo, Osaka and Kyoto and consumed as processed products. Dried fish and seaweed were the popular form and salt was used to make various preserves, and seasonings.

2. 1 Dried Seafood: *Konbu* (Kelp)

Major dried products include squid, abalone, sea cucumber, shark fin, cod, flounder, herring, sardine, saury, horse mackerel, mackerel, flying fish, red sea bream, yellowtail, Ayu, crucian carp, pearl shell, oyster, other shells and various seaweed. Among them, kelp has been the most popular commodity in Japan. In Hakodate, the oldest crockery with shell pattern was found in about 1974 (OISHI, 1987). This indicates that kelp has been eaten by people since 8,000 years ago. However, there is no record of eating kelp until 658. But, before 8 th century, dried kelp were already used as a soup essence by people, living in Japan Sea coast of Tohoku Region and Niigata prefecture. Annual production at that time was around 10 mt.

Around 1220, Hokkaido was included in the Japanese jurisdiction. Kelp was harvested in the eastward of Hakodate and consumed by people living in all over Japan Sea coast. Kelp was first exported to China in 1225. Annual production at that time was about 100 mt. There are *Nho* dramas of "*Konbu-uri* (kelp peddler) " written in the 13-14th centuries.

Around 1639, kelp was first carried to Osaka and then processed as Tsukudani. Annual production at that time was around 1,000 mt. In 1799, Takadaya Kahei found long kelp in Etorofu and exported to Kyushu and Okinawa. These kelp were directly consumed by people. Annual production at that time was around 10,000 mt.

2. 2 Smoked Seafood: *Katsuobushi* (Smoke-dried Skipjack)

Smoked saefood include skipjack, turtle, yellowfin tuna, mackerel, yellowtail, sardine, eel, salmon, herring, and scallop. Among them, *Katsuobushi* is the most popular commodity and initially called as Katauo (Hard dried fish) which was first recorded in *Kojiki* written in 712 (YAMAMOTO, 1987). Most of smoke-dried fish such as mackerel, yellowtail, and sardine were also called as *Katauo*. This *Katauo* was later called as *Katsuobushi*. The processing methods also changed from directly dried one to boiled-then-dried one. *Taihourei* written in 701 described both and tax for boiled-then-dried one was 40% higher than these of directly dried one. In the Nara era, a basket of *Katsuobushi* was bartered with 37 bundles of rice in *Kyoto*. *Katsuobushi* has been commonly used as a soup essence since the prohibition of eating meat ordered by the Emperor Shirakawa in the late 11th century in order to promote Buddhism in Japan. *Katsuobushi* was also conveniently used as military foods since the civil war period (1467-1573).

Commercialization of *Katsuobushi* was highlighted in the Edo era because the word *Katsuo* was regarded as fish bringing victory. Smoked-dried one was first produced Usa-ura, Kochi prefecture by *Jintaro Kishu* in the 1730s. This improved method was long prohibited to transfer, but extended by *Yoichi Tosa* to Anbo, Chiba prefecture in the 1830s; and Izu and Yaizu, Shizuoka prefecture in the 1840s.

Due to the high capability for preservation, *Katsuobushi* was treated as one of general merchandise goods. The important markets were Tokyo, Osaka, and Kyoto. However, Osaka was the center of commerce in Japan. *Katuobushi* wholesalers started in Osaka in the Edo era. *Katsuobushi* was the major commercial item of Kochi and *Kagoshima* prefectures. From the

warehouses of Kochi and Kagoshima prefectures *Katsuobushi* was transferred to and the sale was consigned to the designated wholesalers, then their sub-wholesalers and distributed to the Osaka Wholesale Market as well as other parts of Japan.
The major *Katuobushi* market in Osaka was *Roku Kaisanbutsu* (fisheries product) Market, the predecessor of Osaka City Central Wholesale Market, developed in the 1620s. The market handled fresh fish as well as salted and dried fish at the beginning, but later concentrated to salted and dried fish. However, *Katsuobushi* wholesalers had a special position at the market because no one at the Roku Market could not deal with *Katsuobushi* from outsiders except for the designated wholesalers. In addition, there was an independent marketing route from the designated wholesalers and middlemen.
In Edo, there were 4 *Katsuobushi* wholesalers in the 1790s. Along with the development of marine transportation, *Katsuobushi* became an important item at Edo port near Nihonbashi on Sumida River. The *Kobune-cho Gumi,* the predecessor of Tokyo *Katsuobushi* Wholesalers' Association, was established in 1797.
Between Osaka and Edo, *Higaki Kaisen* (marine transportation) played an important role in the *Katsuobushi* shipment. Later, *Taru Kaisen* was also used. *Katsuobushi* was transported inside *Taru* (barrel), *Kago* (basket), *Kamasu* (straw bag), *Mushiro Tsutsumi* (straw mat lapping), and *Hako* (wooden box). There was no standard packing. Direct sale of *Katsuobushi* from producing districts started in 1902 after the railroad transportation network was established.

2. 3 Salted Seafood: Salmon

Salted seafood include salmon, trout, loach, cod, red sea bream, skipjack, yellowfin tuna, yellowtail, herring, sardine, mackerel, horse mackerel, mackerel pike, whale, Ayu, shrimp, hair-tail, eel, abalone, and octopus. Among them, salted salmon called *Akiaji* is the most popular form in Japan. People enjoy *Akiaji* during the new year holidays season, particularly in eastern Japan.
Since ancient days, salmon has been popular foods for people including Ainu tribe in northern Japan. In 713, *Fudokis* (descriptions of natural features of various regions in Japan) were completed, but only 5 of them exist at present. Among them, there are descriptions of salmon in three *Fudokis.* These are related to Hitachi (Ibaragi prefecture), Izumo (Shimane prefecture), and Higo (Kumamoto prefecture). In *Engishiki* (Action plan for Code of Conduct: *Ritsuryo* System) published in the early 10th century, salmon was treated as a tax..
Salmon was caught in rivers called as *Sake-gawa* (salmon spawning river) by *Takeda Shingen* in 1547. He treated these rivers as same as rice paddies. Since then the similar treatment became popular all over Japan. Further, fresh or salted salmon were also used as offerings. During Edo era, salted salmon was exported to Tokyo and other prefectures.
Since 1888, Japan has practiced salmon ranching programs and the ranching is one of few successful cases in the Japanese experience in marine ranching. Ironically, the success of the marine ranching together with bulk imports of cultured salmon resulted in extremely low prices under a glut situation in the market.

2. 4 Fermented Seafood: *Sushi*

Among fermented seafood, *Sushi* is the most popular form in Japan. *Sushi* means *Nare-zushi* (salted-then-fermented fish) or *Nigiri-zushi* (rice ball with vinegar and raw fish). *Sushi* in Japan is rooted from Chinese pickles developed among the mountain tribe, Myao, in Unnan province (NAKAYAMA, 1998). A large amount of salted freshwater fish such as carps were got pickled in

boiled millet and rice and fermented, resulting in *Nare-zushi*. This kind of food is available in Thailand, and Taiwan in the Southeast Asia. In China, *Nare-zushi* was popular during the 11th century, but it was disappeared after the So Dynasty was conquered by the *Gen* Dynasty. However, when it was brought to Japan is unkown. The first record regarding *Nare-zushi* in Japan was *Yoro-ritsuryo* written in 718. It was used as a tax at that time. Shells were also used in this record. Ayu fish, crucian carp, catfish, and loach among freshwater species; and red sea bream and various shells among marine species were popular.

Nigiri-zushi first appeared in the early 19th century. There was an evolution from *Nare-zushi* to *Nigiri-zushi* in Japan. Among *Nigiri-zushi*, there are two distinct types: Kanasai type (one with jinger) and *Edomae* type (one with *Wasabi*). Although both use a lot of rice and much shorter time for fermentation than *Nare-zushi* and are relatively instant food, Kansai type such as *Oshi-zushi*, *Hako-zushi*, and *Battera* (*Saba-zushi*) spends more time for fermentation than *Edomae* type.

Kansai type was first introduced to Edo in 1680 and simple *Sushi* restaurants developed in Asakusa area in the 1680s. The first restaurant was open in Tokyo in 1687 and several *Sushi* stands were opened in *Ryogoku* and *Asakusa* areas in 1750. Around 1772, many *Sushi* stands opened and *Norimaki-zushi* (rice bar with vinegar rounded by dried seaweed) first appeared in Tokyo in 1779.

Yohei, opened in 1810, and *Matsunosu* were famous *Sushi* restaurants in Tokyo in the Edo era. But once *Yohei* developed *Edomae-zushi*, all *Sushi* stands and restaurants in Tokyo abandoned the Kansai type and followed the *Edomae-zushi*. However, their prosperity was not normal and *Yohei* and *Matsunosu* were arrested in 1842 because of their extravagance.

2．5 Seasonings: *Miso* (Soybean Paste), *Shoyu* (Soy Sauce) and *Gyoshoyu* (Fish Sauce)

Miso and *Shoyu* made of soybean and salt are the basic seasonings in Japanese dishes. Gyotoku in Chiba prefecture was famous for salt production in Kanto. It supplies salt to Edo as well as Noda and Choshi famous for dark *Shoyu* production. Dark *Shoyu* is popular in eastern Japan. The brewing industry of *Shoyu* in *Noda* started in as early as the 1560s. People involved in *Shoyu* production were involved in *Miso* production at the beginning, then involved in *Shoyu* production when marine transportation of Edo river became easier. In 1891, Tone Canal between Tone river and Edo river was completed and saved the distance about 50km. At present, Noda's production share of Shoyu is one forth of total consumption in Japan.

On the other hand, Takino in Hyogo prefecture is famous for *Amakuchi* (light) *Shoyu* which is popular in western Japan. This has developed in the 1570s taking advantage of water of Ibo river, salt in Banshu (Hyogo prefecture), and Mt. Keiro which stops the north wind.

Gyoshoyu is a kind of sauce made of fish or shells with malted rice and salt, and used just like *Shoyu*, in particular, making dish served in the pot. Popular materials used for *Gyoshoyu* include *Hatahata* (Sandfish, *Aretoscopus Japonicus* S.), sand lance (*Ammodytes personatus* G.), crab, sardine, bonito, mackerel, squid, and oyster. This kind of sauce was usually made and distributed locally, though the origin of marketing was unknown.

2．6 Seasoned Boiled Seafood: *Tsukudani*

Tsukudani is a Japanese favorite preserve seasoned by soy sauce, salt and sugar. Whole body of small fish or seaweed is boiled dry with low heat for a long time until all bones became

soft. In Kyoto, they have developed *Kaiseki* dish using fresh water fish from Lake Biwa and other rivers. *Asakusanori* (seaweed) developed in Tokyo and Konbu (kelp) in Osaka are other famous products of *Tsukudani*. These were developed in Edo era and succeeded today. Varieties of *Tsukudani* using different species are available today all over Japan, though those are comparatively rather expensive than before.

2. 7 Fisheries Products for Fertilizer

In the 16th century, herring fishery developed in Matsumae coast, Hokkaido, and sardine fishery developed in the late 18th century. These fish are mainly used as fertilizer.

Around 1745, there were about 1,000 merchants in Murotsu (Hyogo prefecture) under the jurisdiction of Himeji load. At that time, Murotsu had a good natural port with about 5,000 people. This port was used for both fishing and commerce as a center of gathering commodities from Hokkaido, Japan Sea coasts and western Japan to the Osaka market.

These merchants had to handle all commodities which local loads wanted to sell. Among them, there were whale oil and lees, dried sardine as well as fresh, salted and dried fish. Dried sardine was a good organic fertilizer. In 1653, the dried fish fertilizer market became independent from other salted and dried fish trade in Osaka. At the same time, a similar market was also developed in Tokyo beginning at Uraga, Kanagawa prefecture.

In 1735, those markets developed to 4, but sardine catches fluctuated largely, the rise and fall of these marketing activities were associated with this fluctuation. Good years were from the late 17th century to the early 18th century, from the late 18th century to the early 19th century, and from the early 20th century to 1940. Herring and seaweed were also used as fertilizer. Although seaweed was mainly used locally, but herring caught in Hokkaido were exported to Osaka and Edo and marketed to farmers.

3. MODERN FISH MARKETING AND TRADE

Although traditional fisheries products have been refined and added values, new commodities have been developed in modern times. Along with these development, the structure of fish marketing and trade has been changing.

3. 1 Ornamental Fish and Pearl

Gold fish, fancy carp, and tropical fish are popular ornamental fish with high economic value. Varieties of gold fish used now as aquarium fish are mutations and/or hybrids rooted to crucian carp and were first developed in southern China, Sekko and Kosei provinces in the 12th century. Gold fish were first imported to Japan from China in the 14th century, and markedly commercialized in Edo in the late 17th century. As a part-time job for farmers, gold fish have been cultured in Yamato Koriyama in Nara prefecture, Edo river in Tokyo, and Yatomi in Aichi prefecture. In the 18th century, there were many gold fish wholesalers and peddlers in Edo and Osaka. Peddling of gold fish became features in summer, and gold fish became popular items in fete day and night street stalls in spring, summer, and fall.

Improving the mutation of common carp, fancy carp were developed in Niigata Prefecture in the early 19th century. Fancy carp are suitable to ponds in Japanese gardens, rather than small aquariums. Unlike gold fish, fancy carp became popular among rich people and/or public yards.

Culture of tropical fish was started in France in 1868. Cultured tropical fish as pet fish became popular in the late 19th century in Europe and the United States. Tropical fish were personally

brought back to Japan from the United States in the early 20th century and gained popularity among people in the upper class. Around 1935, pet shops handling tropical fish appeared. It became very popular after World War II, especially after 1950. The use of marine species as home pet started after 1964, owing to the development of air transportation as well as improvement of home aquarium facilities and mass production in captivity.

Pearl has been traded as personal ornaments since the ancient days due to its beauty. Westerners have been fond of it along with the development of wars against Persia and India, and of western civilization. In the 13-14th centuries, it became very popular in Europe, then it's popularity was escalated in the 15-16th centuries. Due to wars and others, it's popularity was declined in the 17-18th centuries, but it became popular again in the 19th century along with the development of new fishing grounds in southern islands and Australia.

According to the development of capitalistic economy, people's life style and preferences have changed from quantity to quality. As a result, pearl was regarded as one of the most precious jewels. From 1910 to 1930, prices of pearl were steadily increased because of short supply. Although cultured pearl were developed by MIKIMOTO in 1894 (semicircular pearl) and 1896 (circular pearl) and his successor, Nishikawa, those were regarded as low quality as compared with natural ones at the beginning, but soon attracted consumers as cheap but high quality commodities. But, this pearl trade was interrupted during World War II.

After the war, the western markets shifted from Paris and London to the USA, Switzerland, and Germany. Japan developed mass production of cultured pearl. As a result, world share of Persian Gulf pearl reduced from 60-70% to 6 - 7 % in 1949 and cultured pearl became a dominant world commodity in pearl trade. Cultured pearl is mainly exported to the USA, Hong Kong, Switzerland, Germany, Taiwan, Korea, Italy and Spain. In 1998, pearl export amounted to US$ 408 million, 35.6% of total fisheries export in Japan, though Japan imported US$ 260 million of pearl from French Polynesia, Australia, Indonesia, Hong Kong, China and others. Recently, production of cultured pearl in Japan has been decreased due to environmental problem and disease problem. Besides, direct marketing routes, not depending on Japan, have been developing.

3 . 2 Fish Paste

Kamaboko, Chikuwa, Hanpen, and *Satsumaage* are popular fish pastes in Japan. These are steamed or broiled or fried products after kneading seasoned mashed fish meat. The word of *Kamaboko* was recorded in the 12th century, but this meant broiled *Chikuwa* with hole in it. In the late 16th century, *Kamaboko* on the wooden plate was made and distinguished from *Chikuwa.* Steamed and handworked Kamaboko for ceremonies developed in the middle of 17th century. Although these are made all over Japan at present, Odawara, Osaka, Uwajima, Senzaki, Wakayama, and Tohoku are famous for these fish paste production, but their ingredients and cooking methods are slightly different.

Along with the development of Alaskan pollack fishery in the north Pacific, massive production of frozen *Surimi* (minced fish) triggered massive production of *Chikuwa* in Tohoku and Hokkaido regions in the 1960s. According to the ingredients and cooking methods, two types of fish paste developed: one is high quality products using lizard fish, croaker, toothed eel, sand borer, flounder, and cod with traditional ways of cooking; and other is low quality products using Alaskan pollack using mechanical cooking. Fall of north Pacific fishery resulted in the severe competition

for the search of ingredients such as shark since the 1980s.

Fried *Hanpen* and *Satsumaage* have been developed in the western Japan. Though the origin of these fried fish paste is unknown, Satsumaage is rooted to fried fish paste in Okinawa imported to Kagoshima in around 1846. *Satsumaage* are served at restaurants in Kagoshima or handled as gift while *Hanpen* is popular at home consumption in Kansai area.

3. 3 Canned Fish

Although canned good has not been popular in Japan, canned fish produced in Japan was largely used as war supplies and/or exported to the USA and Europe. These export markets really enhanced Japanese fisheries. Major markets were England, followed by France, Australia, Holland, Belgium, Italy, Germany, and Sweden for salmon; the USA, followed by England, France, Australia, Germany, Belgium, Manchuria, Denmark, Hawaii, Canada, Holland, Africa, Sweden, Greek, Latin America, and South Pacific for crab; the USA for tuna; and South Pacific for sardine.

The first canned fish production in Japan was canned salmon made in west Kamchatka by *Tsuzumi Shokai* in 1910 (OKAMOTO, 1984). However, at that time better machine made in Sweden was already used in Russia. Japan bought better machine from the USA in 1913. Production increased drastically from 704 boxes (8 dozen of half pound before the war; and 4 dozen after the war) in 1910, to 1,250,000 boxes in 1928. These products were mainly exported to the USA.

King crab canning by Japanese started in Hokkaido in 1905 and in Sakhalin in 1906. Canned king crabs were exported to the USA and Europe. However, over-fishing resulted in decrease in production from 175,000 boxes in 1917 to 85,000 boxes in 1919. In 1919, the first private king crab factory ship was operated off Sakhalin. In 1926, 230,000 boxes were produced on 11 factory ships.

Tuna canning started in 1910 and the production increased from 28,500 boxes in 1931 to 488,300 boxes in 1940 with the peak production of 849,700 boxes in 1937. Sardine canning started in 1915, and the export increased from 7,000 boxes in 1917 to 1,300,000 boxes in 1937.

This rapid expansion of the Japanese fish export along with the Japanese territorial expansion began to be regarded as social dumping since 1927. It led the boycotting movement against Japanese goods in the USA, England, France, China and Russia.

During the war, the fishing industry lost almost everything. However, immediately after the war, food production and export earnings became one of the most important objectives in the occupation policy of General MacArthur. With the government support, the tuna and skipjack fisheries recovered quickly. Canned fish was first exported to the USA: tuna in 1948, salmon in 1949 and crab in 1953. Since then, canned albacore and yellowfin tuna were exported to the United States. By 1959, half of salmon catch in the North Pacific were exported to the United States, then export was reduced due to the reduction of catch under the Russia-Japan and Japan-USA-Canada fisheries agreements. In 1959, about 90,000 mt of canned salmon were exported. As frozen fish trade became popular, canned good export has stagnated.

3. 4 Frozen, Fresh, and Live Fish and Shrimp

No matter how people wanted or not, prices of fisheries commodities in Japan were largely influenced by international trade and economic situation.

A structural change in Japanese seafood trade started in 1973 when imports exceeded exports. Since then Japan experienced 3 stages. The first

stage is from the 1970s to the middle 1980s. It is characterized by rapid increases in frozen fish imports such as shrimp, salmon, and tuna. These are associated not only with the development of super-market, refrigerators, fishing vessels, freezer carriers and cold storage, but also Tokyo round of GATT (1973-79), oil crises, and the development of the 3rd Law of the Sea Conference. The change in taste and preference of people from whole fish to ready-to-cook or ready-to-eat fish and from home cooking to eating out due to the increased income supported by the economic growth also contributed to this trend.

The 2nd stage is from the middle 1980s to the early 1990s. It is characterized by the decrease in imported prices due to yen appreciation. Overseas fisheries investment for fisheries product imports drastically increased since 1985 when the Plaza agreement became effective. Cases of fisheries related overseas investment increased from 130 before 1970 to 287 in the 1970s, and to 328 in the 1980s. The amount of total investment was US$49 million before 1970, US$252 million in the 1970s, and US$ 377 million in the 1980s. During this period, imports of lower priced fish increased remarkably and the fish processing industry increased its dependency on imported fish.

The 3rd stage is from the early 1990s to present and characterized by diversification of import species and an increase in value-added commodities. During this period, processing technology for export in developing countries developed drastically. However, due to the *Heisei* economic crisis, the amount of fisheries import to Japan decreased from 1994 to 1998, except for tuna and prepared fish. These were from 320,000 mt to 282,000 mt for shrimp and from 243,000 mt to 224,000 mt for salmon, while tuna imports increased from 350,000 mt to 372,000 mt..

Now Japan imports from 148 countries 184 fisheries items from live fish to frozen fish. By both air and sea, these include eggs, fingerlings, ornamental species, seaweed, fishmeal and oil, bulk species such as mackerel, high priced fish such as tuna and shrimp; in the forms of live, fresh, dried, salted, smoked, frozen, filleted, other value-added forms. Narita Airport near Tokyo is also called as Narita Fishing Port because of the popularity of receiving air cargo with fisheries commodities. After oil, fisheries commodities are the second important import item in Japan. Thus, fish imports are characterized by that lots are much smaller and varieties are much larger than agricultural commodities.

Domestic market has also changed. After World War II, the Central Fish Wholesale Market in Japan developed to deal with fresh fish marketing characterized by the speedy, stable, safe and fair transaction of bulk and varieties of fisheries commodities. However, the strength of this system has been heavily eroded by the inclusion of frozen fish in fish marketing. The Central Fish Wholesale Market system now faces with restructure problems.

Live fish market in Japan and Korea, where live fish are brought to the retail store or restaurant level, developed along with high economic growth, but is still very limited to fancy retail stores or restaurants. For tourism, this type has been popular all over the world. Apart from *sashimi* and *Sushi,* oyster is eaten raw, but other species are not popular to eat raw in the western countries.

Consumers' awareness on safety food has developed. Fisheries commodities were adopted at first by both EU and the USA when they implemented their new legal framework of HACCP (Hazard Analysis Critical Control Point). FDA's reasons for this were associated problems of food poisoning such as botulism and others caused by bacteria, parasites, virus, and shells; perishables themselves; contamination of heavy metals, PCB and agricultural chemicals; and mal-

sanitation of small-scale seafood processors.

Since 1996, the Japan's tuna market faced with problems of oil contaminated bluefin tuna import from Turkey in winter 1996; the E. coli O-157 epidemics, a food poisoning problem, which broke out in the summer 1996; and CO (carbon mono-oxide) tuna import from Indonesia and the Philippines in May 1997. Use of CO for making fish meat good looking for a long time has been intentionally practiced to attract consumers, though it was illegal. Tilapia culture in Japan suffered from such a commodity from Taiwan in the 1980s.

Japan also started adopting the HACCP system, but this is still a long way to solve the problems of imported fish safety, because of long transportation time, perishability, use of antiseptics and/or food annexes, uncertainty of the production processes and its surrounding environment, and the Japanese inspection system itself. The current checking system does not include measures against problems associated with hormone disturbing substance and dyoxyne.

FAO is now asking the world for issuing the disease free certificate whenever they export live fish such as eggs, fingerlings, ornamental fish, and aquarium species. However, it might be easy to issue the certificate, but difficult to prevent disease transmission actually because fish disease problem is not so simple.

3. 5 Fish-oil, Fishmeal, and Fertilizer

Whaling in the traditional ways was popular among Eskimo, American Indians, and Ainu tribes. They consumed meat, oil, bones and almost everything. However, an industrial whaling for lamp oil and mustache started in Bask Region in France in the 14th century. In the 17th century, European countries involved in whaling in the Arctic circle. However, this whaling terminated in 1913.

On the other hand, an industrial whaling targeting sperm whales for kerosene oil in New England in the United States began in 1712. The sailing mothership was a factory ship to dress the body and extract kerosene oil on board. The operation covered all over the world and was highlighted in the middle of 19th century. After the discovery of oil in the West, this industry declined and terminated in 1925.

Norwegian whaling with steamship also developed in 1864 and targeted fin whale. In 1924, mothership developed. This Norwegian whaling method was imported to Japan in 1899. Japan dispatched the first whaling fleet to the Antarctic Ocean in 1939.

In Japan, meat and skin are used as food. Oil from sperm whale is used for edible oil, while oil from fin whale is used for industrial use (Sato, 1983). Bones and mustaches are used for handcrafts. Extracts from various internal organs are used as drugs, and the rest produces meal and fertilizer.

Fish oil extracted from livers of shark, cod, Alaskan pollack, halibat, tuna, skipjack, and whale contains a lot of Vitamin A and D. As a result, these are used as drugs.

Around 1935, Japan produced 610,000 mt of fishmeal and fertilizer, equivalent to 3 million mt or 64.5% of total fish production of 4.75 million mt in Japan, if we converted the weight to the whole fish. In Japan, dried sardine and herring were used long as fertilizer, but in western countries there were some demand for fishmeal as feeds for livestock and poultry. It was first exported to the USA and Europe in 1930 when the price decreased drastically.

Menhaden was used as fertilizer in corn crop lands by native Indians, before white people settled in the North America. Then, fish oil was removed and the lees were used as fertilizer. In the late 19th century, they already developed fishmeal factory. In 1898, Mr. MORI also developed the first fishmeal factory in the west

coast of the USA and used sardine. In Canada, Mr. IKEDA started herring fishmeal production in 1905, but such non-food production was prohibited after several-years operation. In England, non-edible portion of fish were used for fishmeal production and used domestically as well as exported to Germany. In Russia, fishmeal was produced in the late 19 century and exported to Germany since 1910. In Germany, there was no fishmeal production but the country imported a lot of fishmeal for feeds.

As livestock, poultry, and fish culture industries developed, demand for fishmeal increased. In 1972, anchovy catch off Peru decreased drastically due to *El Nino* and overfishing. As a result, fishmeal import from Peru to the United States was not expected, resulting in soybean embargo by the US government. Consequently, *Tofu* (soybean curd) price in Japan increased 3 - 4 times. Japan imported 432,032 mt or US$ 296 million of fishmeal in 1997. Major exporting counties were Chile, Peru, Equador, Russia and the United States. However, these supplies are greatly influenced by *El Nino* in case of sardine and mackerel based brown fishmeal and over-fishing in case of Alaskan pollack and founder based white fishmeal.

The rise of fish culture in Japan is also associated with the rise of sardine catch in the 1970s and 1980s. This is because sardine and other small pelagic species are directly used as their feeds. Decline in sardine catch hit Japanese fish culture hard in the 1990s.

As people's life style change since the 1960s, pet food became another market opportunity for fish. This is a higher value-added opportunity than ordinary fishmeal.

3. 6 Kelp as Drugs and Resource Enhancement

Many marine species are sources of drugs, but kelp is unique in terms of many other contributions. Kelp (*Laminaria* sp.) contained a lot of iodine. It was essential to prevent iodine deficiency disease in China. Accordingly, dried kelp was used as drugs for a long time in China. Japan exported dried kelp to China since 1821. Although kelp export to China stopped after World War II, China became a largest kelp producing country. In 1969, kelp culture was developed in both China and Japan. In 1972, Japan first imported kelp from China. At present, China produced 400,000-500,000 mt (dry weight) of kelp. This amount is more than 10 times higher than that of Japan. This is because kelp is used in many ways such as drugs, foods, industrial resources as compared with the use as special foods in Japan. In addition, kelp was used in China not only for drugs but also for spawning and nursing beds as well as prevention of eutrophication, red tide and blue tide, resulting in fisheries resource enhancement

China's fisheries production rapidly increased from about 10 million mt in 1987 to 39 million mt by 1998 of which more than 10 million mt were from East China Sea. In the same sea, Japan exploited in the post-war period with the peak of less than one million mt of fish production excluding pelagic species such as sardine. There is no reason of this increase in fisheries production in East China Sea except for the cultured kelp bed stretching for 1 ,300 km from Tairen (north) to Fukken province (south) (SAKAI, 1997). This provided a non-intended man-made marine forest, largest in the world. They plant seeds every December, let them grow from January to June, spawning and nursing periods of all varieties of fish and marine organisms, and harvest them in April through June.

From resource enhancement and environmental impact points of view, mangroves and coral reefs in the tropics have the same functions as kelp in the temperate zone.

3．7 Marine Organisms as Potential Resources

Seaweed has commonly been used as food, drugs, fertilizer and other industrial use (OCHI, 1996). As foods, Kelp (Laminaria sp.), *Asakusanori* (*Porphyra sp.*), *Aonori* (*Entercomorpha sp.*), *Wakame* (*Undaria sp.*), *Hijiki* (*Hijikia sp.*), and *Mozuku* (*Nemacystus sp.*) have been important. *Asakusanori* culture has more than 500 years history, and *Mozuku culture* developed in Okinawa in the 1980s. *Makuri* (*Digenea sp.*) is used to use as santonin while *Funori* (*Gloiopeltis sp.*) is a raw material for textile binder. However, their functions have been recognized more than their traditional use. As a healthy food, dried seaweed salad was first sold in Japan in 1983 and the industry is now about to reach US$100 million business, seeking for *Wakame* (*Undaria sp.*), *Aosa* (Ulva sp.), *Tosakanori* (*Meristotheca sp.*), *Kirinsai* (*Eucheuma sp.*), *Iwazuta* (*Caulerpa* sp.), *Suginori* (Gigartina sp.) all over the world.

Seaweed contains high vegetable fibers, minerals, and vitamins. These have special value to human nutrition and health. Agar made of *Tengusa* (*Gelidium sp.*) has been traditionally eaten as agar. The agar production method was imported from China to Japan in the 8th century. Dried agar was invented in Japan in the 1660s and massively produced in the 1780s and exported to China. In Ireland, agar has been used to produce fruit pudding and emigrants from Ireland to America expanded the market for agar.

Until World War II, Japan produced 95% of agar in the world, but the agar became widely used as raw materials not only for food, but also for beauty aids, medical and other industrial use. World production of agar has increased from 2,800mt in 1939 to 7,000mt at present and Chile now produces 80% of agar. Spain, Turkey, Korea, Taiwan and China also produce agar using *Ogonori* (*Garacilaria* sp.) and *Tengusa.*

Carrageenan extracted from *Kirinsai* (*Eucheuma* sp.) and *Tsunomata* (*Chonbdrus sp.*), and Suginori, is another important source of raw materials for a jelly; stabilizer for ice cream, chocolate, juice, ham and sausage, yogurt and cheese; emulsion; binder; beauty aids; tooth paste; textile size; and capsule of medicines.

Seaweed has potentials for producing pulp, paper, and plastic as chemicals; fertilizer particularly for citrus fruits, apple, cabbage, potato, tomato, strawberry, cucumber, egg plant, melon, water melon, spinach, lettuce, herbs, and rose; feeds; anti-oxidizers of foods; medical use such as sex attractant, agglutinins, antibiotics, and anti-tumor substance.

Many marine organisms such as puffer fish, sea urchin, and lion fish contain high levels of toxin which may be used as medicines. On the other hand, some species become toxic and cause food poisoning when people eat fish during spawning season such as oyster, early spring such as clams and scallop, and in tropical regions such as cigaterra fish eating toxic organisms. Thus, marine organisms require special care if we wish to utilize wisely.

Since the effects of EPA in the 1960s and DHA in 1989 in unsaturated fish oil were reported, fish has been paid much attention as a healthy food (SUZUKI, 1992). EPA prevents or cures circulatory organs' troubles such as arteriosclerosis and myocardial infraction while DHA promotes one's memory by activating activities of brain and retina. These EPA and DHA are also paid much attention because of their effects as carcinostatic substance and anti-allergic substance.

Amino acid such as Taurine, Peptide, and Protein contained in fish are also contributing to the maintenance of health without causing serious secondary effects. Search for drugs curing incurable diseases such as cancer and AIDS caused by HIV, and keeping young is just starting. Sponge, shark, horseshoe crab, and Coelenterata

are paid much attention as candidates for such drugs recently (ANONYMOUS, 1998).
Marine organisms also contain much higher level of organic arsenic than land organisms, though the lower trophic level is, the higher the level of organic arsenic. Most of organic arsenic contained in marine organisms are alsenobetain and not toxic. Thus, marine organisms organize arsenic, resulting in removal of toxin of inorganic arsenic.
This finding has an implication for preventing pollution from high technology industries using arsenic.

4. CONCLUSIONS AND RECOMMENDATIONS

Food security of any nation will be increased by food diversity, including varieties of fisheries species in the people's diet. However, it is a difficult task to increase fisheries production without risk of depletion. Past lessons should be learned. Resource impacts of each action and fare share of responsibility by each actor must be taken into consideration in the management for responsible fishing, marketing and consumption of fisheries commodities.
In addition to the conventional use of fish as food, drugs, and raw materials, most marine organisms are not utilized yet. New utilization will be expected in all areas. Seaweed, coral reefs, and mangroves absorb carbon dioxide, nitrogen and phosphate; prevent eutrophication, red tide, and blue tide; and enhance fisheries resources.
In conclusion, cultural and food diversities are essential for the human survival in the 21st century. As healthy food, drugs, raw materials, ornamental use, and contribution to solutions for environmental problems, there is a great potential in fisheries and fish trade if the resources are wisely managed under the WTO framework.
For further information, it is recommendable to subscribe FAO's INFOFISH and glance at FAO Fisheries Circular No.817, Revision 1 (Marketing in Fisheries: A Selective Annotated Bibliography) (ANONYMOUS, 1995).

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マグロ価格決定要因の計量経済分析
—年次データによるアプローチ—

Quantitative Economic Analysis of Tuna Price Determining Factors: An Approach Using Annual Data

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【要約】日本のマグロ価格決定要因を分析するためのマグロ計量経済モデルを構築し、漁獲量管理のマグロ価格に及ぼす影響を推定することを可能にした。このモデルは、世界のマグロ市場が刺身需要を中心とする日本市場と缶詰需要を中心とするアメリカ等の諸外国市場から構成されており、両市場の価格差と諸外国の漁獲量によって日本の輸入が決まり、それによって再び価格差が調整される構造となっている。シミュレーション分析によって、日本の漁獲量と外国の漁獲量のそれぞれの1割削減は国内の卸売価格をそれぞれ2.6％（41円／kg）、2.2％（35円／kg）上昇させることが示される。このことから、国内価格に対する影響度は、国産の漁獲削減も外国における同率の漁獲削減もほぼ同等の効果を持つと推定される。

【キーワード】マグロ価格決定要因、漁獲量管理、計量経済分析、シミュレーション、年次データ

【Abstract】We constructed an econometric model for analyzing tuna price determining factors , thereby made it possible to estimate impacts of tuna catch controls on the price. The model is composed of two markets; a Japanese "sashimi" market and a canned tuna market of the other countries, where Japanese import depends on the price difference between the two markets and tuna catch of the other countries, and the price difference is re-adjusted by the import. A simulation by the model indicates that 10% reduction in tuna catch by Japan and the rest of the world increases the Japanese wholesale price by 2.6% (41 yen/kg) and 2.2% (35 yen/kg) respectively, implying that the same rate of reduction in tuna catch by Japan and the rest of the world has a similar impact on the Japanese domestic price.

1．研究の目的

マグロは日本をはじめとして海外でも需要が伸びつつある（CAMPBELL 1996）。一方、マグロ資源は乱獲の傾向にあり（FAO 1997）、各種国際機関によって漁獲制限がなされている。そこで、漁獲制限がマグロ価格をどの程度高めるのか、あるいは所与の漁獲量の下で所得の伸びがどの程度の価格上昇につながるのかを評価するため、マグロの価格モデルを作成し、シミュレーションを行なう。

2．日本におけるマグロ需給のトレンド

1）マグロの供給

国産漁獲量は30万トンから40万トンの間で安定的に推移している。輸入は円高が急速に進行した1980年代後半から急増し、現在は国産と同レベルの約30万トンであり、マグロ世界貿易の約1/3を占める。

国産のマグロのうち、クロマグロ（ミナミマグロを含む）の割合は低下傾向にあり、現在は約1

万7000トンの漁獲量である。残りの大部分を、ビンナガ、メバチ、キハダで3分している。

輸入のマグロは、キハダとメバチの割合が高く、キハダは台湾、インドネシア、韓国から、メバチは台湾、韓国からの輸入が多い。この他に、クロマグロはスペイン、ビンナガは韓国、ミナミマグロはオーストラリアからの輸入が多い。

2）マグロの需要

わが国のマグロの消費量は原魚換算重量で約60万トンであり、世界全体の約4割を占める。需要関数の計測によると、支出弾力性は1997年時点で0.56であり（Tada 2000）、依然として所得の増加が需要の拡大につながることを示している。一方、家庭内で「生鮮マグロ」として購入されているマグロの支出弾力性は-0.26である。このことから、外食や「刺身盛り合わせ」として消費されているマグロが増加しているものと判断される。

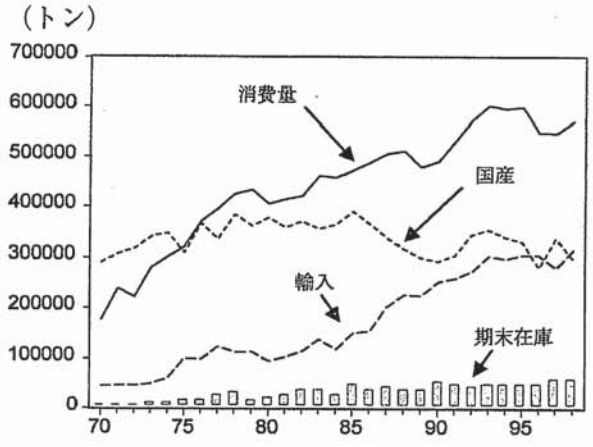


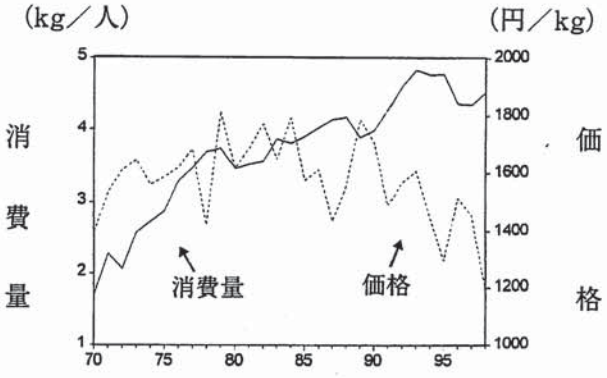
図1　マグロの需給動向

3．マグロ価格モデルで用いる方程式の計測

以下の各方程式は通常最小2乗法によって計測されている。2段階最小2乗法によっても同様の結果が得られたが、モデル構築上の柔軟性の高い通常最小2乗法を採用した。

1）価格関数

マグロの1人当たりの消費量は趨勢的に増加傾向にある。バブル経済が崩壊する1990年までは卸売価格は1600円／kg前後の水準であったので、当時の消費量の増加は所得要因であったと推定される。また、バブル崩壊後は価格が下落傾向に転じたため、所得の伸びの鈍化にもかかわらず消費量が増加を続けている。



（注）価格は6大中央卸売市場における生鮮・冷凍の平均であり、消費者物価指数によって1998年水準に補正されている。

図2　マグロの消費量と価格の動き

このような事情を背景に、基本的には需要関数から導かれる逆需要関数を用い、卸売価格を1人当たり家計消費支出と供給量によって説明する。さらに、供給量を国産漁獲量、輸入量、在庫の純放出に分解する（輸出はマイナスの供給量とする）。

得られた価格関数は

$$JP = -16905300\,(1/JHC) - 289.3\,(JQ/JN) - 517.9\,(JIM/JN) + 107.6\,(JEX/JN) + 234.8\,(JESTK - JESTK(-1))/JN + 219.0\,D79 + 258.2\,D93 + 5038$$

(-5.7)　(-3.7)　(-6.3)　(0.7)　(1.0)　(2.5)　(2.9)　(9.4)

自由度調整済決定係数：0.77　　DW：1.99

計測期間：1968～1997年

（　）内はt値

である。ここで、

JP＝日本の6大卸売市場生鮮・冷凍平均価格
（円／kg：1997年物価水準に換算）
JHC＝1人当たり家計消費支出
（消費者物価指数でデフレート）
JN＝人口　（1000人）
JQ＝日本のマグロ漁獲量　（トン）
JIM＝日本のマグロ輸入量　（トン）
JEX＝日本のマグロ輸出量　（トン）
JESTK＝マグロの期末在庫　（トン）
D79＝1979年ダミー
D93＝1993年ダミー

である。

マグロ卸売価格の家計消費支出に対する弾力性は需要の支出弾力性がプラスであることを反映して0.13である。また、価格関数全体としては供給量を日本のマグロ漁獲量と輸入量に分解した方が統計的適合度は高まり、価格の国産漁獲量と輸入量に対する弾力性はそれぞれ-0.54と-0.43である。しかし、両者の価格形成に対する影響度に大差は見られない。輸出は缶詰原料用のものが多く、国内の価格形成には有意な影響を及ぼしていない。また在庫積み増しの影響もデータが年次データであることから限定的である。

2）外国から日本に向けての輸出関数

価格関数では、日本の輸入量と国産漁獲量は独立であると想定している。しかし、実際には国産漁獲量が減少した場合には国内価格が上昇し、輸入が増加する。そこで、輸入量、すなわち外国から日本への輸出量を外国の漁獲量と内外価格差によって説明する。

得られた計測式は

$$JIM = 0.0472\ (WQ - JQ) \quad (2.7)$$
$$+ 10.97\ (JP\$ - WP) \quad (2.2)$$
$$- 39739 \quad (-1.7)$$

自由度調整済決定係数：0.94　　DW：1.3
計測期間：1976～1996年

である。ここで

WQ＝世界の漁獲量
JP$＝ドル建ての日本のマグロ価格
（$／トン）
WP＝世界平均のマグロ輸出価格（$／トン）
(JP$ - WP)＝内外価格差　（$）

である。

この結果は、日本の輸入量が海外の輸出余力と輸出インセンティブを示す内外価格差によって決まることを示す。

3）国際価格の決定関数

マグロは国際貿易が多いため、国際価格も国内価格と同様に需給動向を反映して決定される。ただ、日本がプライス・リーダーであり、日本市場における価格変化が海外市場に先行しているため、国際価格には日本の国内価格がタイム・ラグをともなって反映される。同時に、マグロ国際価格を決定する需要・供給サイドの要因として世界の漁獲量と米国の国内総生産を用いる。

得られた計測式は

$$WP = 82.58\ (JP\$) \quad (1.3)$$
$$+ 163.23\ (JP\$(-1)) \quad (3.0)$$
$$- 0.00171\ WQ \quad (-4.2)$$
$$- 6129000\ (1/USGDP) \quad (-1.0)$$
$$+ 1667 \quad (4.1)$$

自由度調整済決定係数：0.86　DW：1.6
計測期間：1976～96年

である。ここで、

USGDP＝米国の実質GDP　（1992年価格：10億ドル）

である。

4）在庫関数

通常、在庫には取引需要と投機需要が存在するため、それぞれの要因を価格と消費量として在庫関数

を計測した。計測結果から、消費量の12%程度が取引需要として在庫されていること、価格が下落すると在庫が増加するとの関係が得られた。ただし、価格関数の結果から、在庫の積み増しが卸売価格の上昇につながらないため、在庫の価格に対するマイナスの反応は、積極的な投機というよりも、事後的な結果（売れ残り）であると判断する方が妥当である。

$$JESTK = -1632\,JP + 0.1201\,JCONS + 3206$$
$$(-1.8) \qquad (12.3) \qquad (0.3)$$

ここで、

JESTK＝マグロの期末在庫 （トン）

JCONS＝マグロ消費量 （トン）

である。

以上の関係をフローチャートにしたのが図３であり、モデルの外生変数は日本の漁獲量、外国の漁獲量、為替レート、輸出量、日本の消費支出と人口、米国のGDPである。

4．シミュレーションの結果

以上のモデルに基づき、主要な外生変数である日本の漁獲量、外国の漁獲量、為替レート、日本の家計消費支出増加率、米国の実質GDP増加率に代替的な仮想値を用いてシミュレーションを行ない、その影響を分析した。その結果は以下のとおりである。

１）日本の漁獲量の変化

日本の漁獲量の３万トン（約１割）の減少は、輸入を2.3%増加、卸売価格を2.6%（41円/kg)、国際価格を3.5%（97$/ｔ）上昇させる。

２）外国の漁獲量の変化

外国の漁獲量の15万トン（約１割）の減少は、輸入を3.0%減少、卸売価格を2.2%（35円/kg）上昇、国際価格を12.1%（339$/ｔ）上昇させる。

３）為替レートの変化

為替レートの１割の円安は、輸入を4.2%減少、卸売価格を3.1%上昇、国際価格を7.7%下落させる。

４）日本の経済成長

日本の１人当たり家計消費支出の10%上昇（１人当たり実質GDPでは約20%に相当）は、輸入を4.0%増加、卸売価格を6.4%上昇、国際価格を9.3%上昇させる。

５）米国の経済成長

米国の実質GDPの10%の上昇は、輸入を0.4%減少、卸売価格を0.3%上昇、国際価格を4.0%上昇させる。

5．結論と今後の課題

シミュレーション分析によって、日本の漁獲量と外国の漁獲量のそれぞれの１割削減は国内の卸売価格をそれぞれ2.6%（41円／kg)、2.2%（35円／kg)上昇させることが示された。このことから、

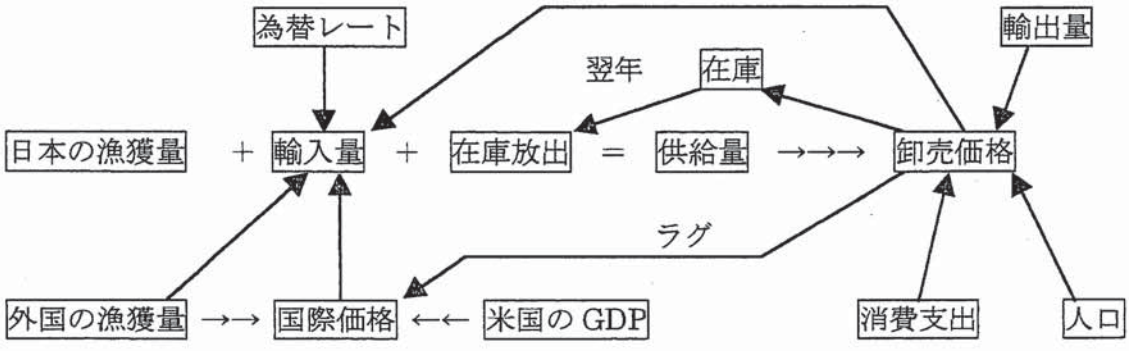


図３ まぐろ計量経済モデルのフローチャート

国内価格に対する影響度は国産の漁獲削減の方が若干強いものの、外国における同程度の漁獲削減もほぼ同等の効果を持つと推定される。

一方、漁獲量削減の外国価格に対する影響は国産よりも外国の漁獲量削減の方が明らかに強い。このことから、外国におけるマグロ需要の価格弾力性が低いと直ちに判断することはできず、むしろ外国における冷凍設備容量と関連がある可能性もある。

今回のマグロ計量経済モデルにおける漁獲量に海域区分を導入することによって、国際マグロ管理機関による漁獲規制の効果を計測することが可能になり、また、地球環境モデルとも接続可能なモデルへと発展させることも今後の課題である。

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Problems of Export-Oriented Yellowfin Tuna Industry: Indonesia and the Philippines

輸出特化型マグロ関連産業の諸問題
—フィリピンとインドネシアを事例として—

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【Abstract】 In this paper, we examine the problems inherent in the export-oriented tuna industry taking the Philippines and Indonesia as examples. Although problems are reduced to the depletion of or possible depletion of tuna resources, we intend to clarify the industry structure that may have led to such local depletion. Though Yellowfin tuna is the main species for investigation, we also refer to tuna as a whole and to skipjack specifically. In Chapter 1, we survey the overall tuna market. The characteristics are the concentration of production and consumption sites. In Chapter 2, we discuss the tuna industry in the Philippines. Small tuna and skipjack are caught by purse seines with the combination of FADs. Tuna canning industry is also developed. In Chapter 3, we discuss the tuna industry in Indonesia, which is well endowed with tuna and skipjack resources. Since the canning industry is not fully developed, Indonesia takes the role of supplying the raw material to other countries. In Chapter 4, we point out that the structure of the industry, particularly, in the Philippines, does not inherently build in sustainable resource use mechanism. We consider who is responsible for the local depletion of resource, whether it is the producer, government, or the consumer.

【Keywords】 export-oriented, yellowfin tuna, Indonesia, Philippines, *sashimi*-grade, canned tuna

【要約】 本稿ではフィリピンとインドネシアを事例として、輸出特化型マグロ関連産業が抱える諸問題を明らかにする。諸問題とは、究極的には資源の枯渇ないし枯渇の可能性であるが、これを導く国内産業構造とは何かを明らかにしようと言うのが本稿の目的である。第1章では世界のマグロ市場についてキハダまぐろを中心として概観する。マグロ市場は漁場、漁獲国、消費国ともに集中しているのが特徴である。第2章ではフィリピンのマグロ関連産業について述べる。パヤオを使った旋網操業で小型マグロ・カツオの漁獲があり、輸出用缶詰生産も盛んである。第3章ではインドネシアのマグロ関連産業について述べる。豊富なマグロ資源に恵まれているものの、加工産業の発達が遅れ、原料輸出が主に行われている。最後に第4章では両国の比較を通じ、とりわけフィリピンの輸出特化型産業構造が資源の持続的利用メカニズムを内包していないことについて述べる。生産者、政府の政策、および消費者のうち誰が資源の枯渇に責任をもつのかについて考える。

1. OVERVIEW OF WORLD TUNA AND CANNED TUNA MARKET

1.1 Tuna Producing Countries

Tuna, in the broadest concept, includes tuna, swordfish and skipjack: Each spicy has further divisions. In this paper, we focus our discussion mainly on yellowfin tuna. We refer to other tuna species such as bigeye tuna and bluefin tuna as well as skipjack. Figure 1 shows the long-term trend of the production of yellowfin, bigeye and bluefin tuna. We observe that the production of yellowfin and bigeye are increasing. Particularly, the production of yellowfin increased dramatically after the late 1970's and late 1980's[i]. Table 1 shows the production of yellowfin tuna by regions.

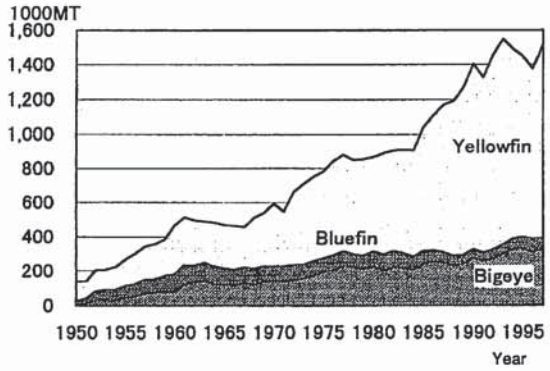

Figure 1 World tuna production
Source: FAO, FAO Yearbook, Fishery Statistics, various years

Table 1 Production of yellowfin tuna by area in 1996

Area	Production (mt)	World total
Atlantic, Eastern Central	95,430	9.6%
Indian Ocean, Western	243,651	24.5%
Pacific, Eastern Central	194,044	19.5%
Pacific, Southeast	77,899	7.8%
Pacific, Western Central	301,226	30.3%
World total	993,646	100.0%

Source: FAO, FAO Yearbook, Fishery Statistics, 1996.

Table 2 Production and trade of yellowfin in 1996

Country/ Region	Production (mt)	Export Ratio	Import Ratio	Self Sufficiency
Mexico	127,815	0.095	0.002	1.103
Indonesia	115,549	0.179	0.002	1.215
Spain	102,980	0.455	0.519	0.884
Taiwan	82,891	0.819	0.001	5.519
Japan	80,135	0.059	0.643	0.380
France	72,650	0.769	0.437	2.434
Venezuela	71,248	0.044	0.030	1.014
Philippine	61,280	0.189	0.003	1.230
USA	47,187	0.117	0.388	0.693
Others	231,911	0.341	0.525	0.721
Total	993,646	0.310	0.372	0.909

Source: FAO, FAO Yearbook, Fishery Statistics, 1996.
Export Ratio: ratio of export volume in total catch
Import Ratio: ratio of import volume in net domestic consumption Self Sufficiency: ratio of net domestic consumption in total catch

Most of the catch occurs within five regions; about a half of it does in the Pacific and a half of production in Pacific region does in the Western Central. Table 2 shows yellowfin production by country. From this table, we confirm that Indonesia (rank 2 nd) and the Philippines (8 th) that are located in the Western Central Pacific are major producers of yellowfin. Some production by Taiwan (4 th) and Japan (5 th) is also occured in this region.

1.2 Tuna Consuming Countries

Now we turn to the observation of how the produced tuna is processed, distributed and consumed. Tuna including yellowfin is mainly consumed in the form of canned tuna or *sashimi* (raw fish).

1. 2. 1 Japanese *Sashimi* Market

In Japan, yellowfin is mainly consumed as *sashimi*: 84. 6 % of imported yellowfin were *sashimi* grade in 1998. The volume of total supply of *sashimi* grade tuna (including yellowfin, bigeye and bluefin) was 461,683 mt in 1998: 58.2% of total supply was imported. 34.0% of the world catch of tuna, yellowfin, bigeye and bluefin, was consumed in Japan as *sashimi* in 1996. Major exporting countries/ regions of yellowfin to Japan are Taiwan, Guam, Malaysia, Micronesia and Singapore in addition to Indonesia and the Philippines (Figure 2).

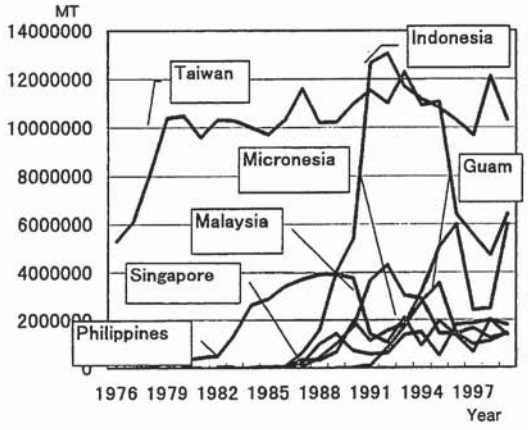

Figure 2 Major yellowfin exporter to Japan
Source: Ministry of Finance, Japan Trade Statistics, various years

There are two forms of distribution: Fresh chilled and frozen. In the case of frozen tuna distribution, tuna is frozen immediately after the catch as cold as -60 centigrade, and the temperature is kept until it reaches retailer's storage for sale. The speed of delivery is not important. Instead, modernized super-cold storage should be furnished in the catch vessel, carrier vessel, and port area if it is transshipped. Wholesale price of frozen yellowfin is US$6.19/kg or ¥857/kg in 1997 (average price of ten central wholesale markets in Japan), which is lower than that of fresh yellowfin. However the price dispersion by individual tuna as well as seasonal fluctuation is smaller than that of fresh yellowfin because of the lower diversification of quality. 74% of *sashimi*-grade tuna is distributed as frozen product for both domestic and imported product.

On the other hand, fresh chilled tuna is stored in icebox or dampened in chilled water in the vessel until it is unloaded. Then, the unloaded tuna is delivered to Japan by airplane. The speed is required from the catch to the final consumption. The fishing ground should not be too far from the unloading port. Although neither modernized vessel equipments nor landing facilities is necessary, periodical and frequent flight is necessary from the nearest airport since the utilization of cargo space on passenger plane is the most economical way of air transportation. In Figure 2, we show that Guam and Singapore are major exporters of yellowfin to Japan. It is not because tuna is caught by vessels of these country and region. Rather, the landing area of these country and region are used for the convenience of flight availability. The price of fresh yellowfin is US$9.14/kg or ¥1,106/kg in 1997 (average price of ten central wholesale markets in Japan), which is higher than that of frozen tuna. There is a large price range, however, by individual species of tuna[ii]. In order for an exporter to successfully export fresh tuna to Japan, one must be knowledgeable about the quality of the fish and handling operation.

It should be noted that there is one problem in the Japanese distribution system. Tuna is essentially distributed in the form of GG, i.e. a round tuna where the gut and gills are eliminated. It is more efficient to process tuna to fillet or steak before it is exported since an exporter otherwise cannot tell the quality of the meat and only 55% of the original weight (YAMASHITA 2000, p. 33) is finally consumed as *sashimi*[iii]. It is, however, not conventional[iv].

Table 3 Production and trade of canned tuna in 1996

Country/ Region	Production (mt)	Export (mt)	Import (mt)	Consumption (mt)	Share of production	Share of consomption
USA	306,551	4,475	87,937	390,013	24%	31%
Thailand	189,000	188,434	0	566	15%	0%
Spain	153,179	39,656	15,671	129,194	12%	10%
Italy	78,000	5,200	47,050	119,850	6%	10%
Japan	71,385	1,912	32,966	102,439	6%	8%
Philippines	69,114	69,114	137	137	6%	0%
Ivory Coast	61,012	61,012	0	0	5%	0%
France	39,243	29,047	92,689	102,885	3%	8%
Ecuador	26,453	26,453	0	0	2%	0%
Indonesia	23,500	31,074	325	-7,249	2%	-1%
EU*	291,235	93,016	332,474	530,693	23%	42%
Others	217,975	139,606	157,131	235,500	17%	19%
Total	1,256,225	615,096	610,970	1,252,099	100%	100%

*EU includes Spain, Italy and France
Soruce: *SUISAN SHINCHO SHA*, Yearbook of Tuna & Skipjack 1999, pp.230-232. Original data from FAO

Sashimi market is attractive for producers and exporters in terms of the price. However, it calls for various quality requirements. In addition, the fishing gear acceptable to *sashimi* grade is limited. Tuna is commonly caught by means of longline purse seine or hook-and-line methods. Tuna caught by purse-seine, the most productive gear among the three, is not suitable for *sashimi* in the case of imported tuna, as the meat is crushed by the weight of other fish when the net is pulled up.

1. 2. 2 Canned Tuna Market in the US and EU

Tuna for canneries does not question the way it is caught. Neither does the size or variety of tuna a matter for concern. Canneries in the developing countries are designed to operate using labor-intensive methods whereas those of developed countries are capital intensive (SUEHIRO 2000, p.18). Both fresh and frozen tuna caught by purse-seiner, hook-and-line and longliners are delivered to canneries.

Canned tuna is not only made from yellowfin but also from albacore, bigeye tuna and skipjack. In terms of volume, skipjack is the dominant species. Since separate data is not available, the following discussion of canned tuna includes all kind of tuna as well as skipjack. Major producers of canned tuna are the U.S. and EU (including Spain, Italy and France). These country and region account for 48% of the world production (Table 3). In

Table 4 Production and trade of canned tuna in 1996

Country/ Region	Production (mt)	Export ratio	Import ratio
USA	306,551	0.015	0.225
Thailand	189,000	0.997	0.000
Spain	153,179	0.259	0.121
Italy	78,000	0.067	0.393
Japan	71,385	0.027	0.322
Philippines	69,114	1.000	1.000
Ivory Coast	61,012	1.000	0.000
France	39,243	0.740	0.901
Equador	26,453	1.000	0.000
Indonesia	23,500	1.322	-0.045
EU*	291,235	0.319	0.626

*EU includes Spain, Italy and France
Soruce: *SUISAN SHINCHO SHA*, Yearbook of Tuna & Skipjack 1999, pp. 230-232. Original data from FAO

terms of consumption, the share of these country and region is as high as 74% of the total consumed. The U.S. and EU are not only major producers but also major importers. Table 4 illustrates canned tuna producing countries that are dedicated to the export of the product to these country and region: They are Thailand, Philippines, Ivory Coast, Ecuador, and Indonesia (statistics of Indonesia is incomplete). We find that export-oriented canneries are located in the Philippines and Indonesia.

Among the three Asian suppliers of canned tuna, Thailand is unique. For the government decided to establish tuna canning industry in 1984 despite the fact that the country did not have any historical background of tuna fishery: Canneries were well established and even overtook the production of the Philippines in the end of 1980's. 90% of the materials are imported from neighborhood countries, namely, Indonesia and the Philippines (APRIETO 1995, p. 168, SUEHIRO 2000, p. 18). On the other hand, production of the Philippines, which used to occupy 70% of the share of the total U.S. import, stagnated because of the limited supply of tuna while the material import was prohibited until 1986. Since the late 1990's, canned tuna producers of the Philippines has been revitalized due to the fact that the fishing ground has been expanded by means of joint ventures and illegal fishing in other countries in addition to the fact that infrastructure such as fish ports and electricity has been developed in Davao and General Santos City.

Tuna resources in the Philippines and Indonesia are fully utilized for export irrespective of the products: fresh or frozen, Sashimi or canned tuna. On the other hand, the national preference of marine products is not competing with such export: They prefer palm-sized small fish. Cultured milkfish is also favored by both nations.

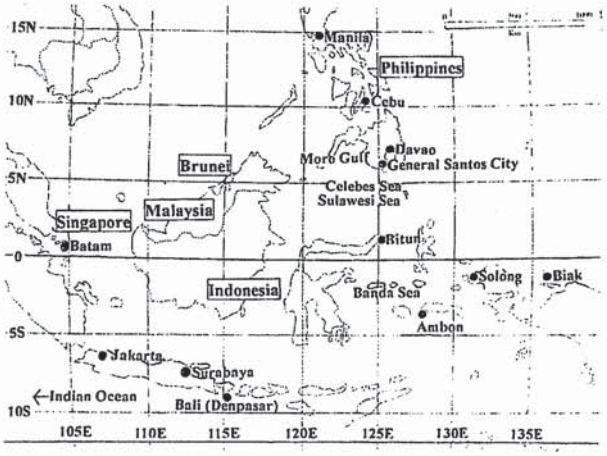

Figure 3 Fishing grounds landing/ Processing areas

Tuna and skipjack, being abundant in the water of both countries, were thus identified as valued products by foreigners and were induced to develop as export-oriented materials[v].

2. CHARACTERISTICS OF THE PHILIPPINES TUNA INDUSTRY

Characteristics of the tuna industry in the Philippines are summarized as follows: first, fishing grounds and landing and processing areas are concentrated, and secondly, the leadership of private entrepreneurs formulates the industry in the absence of governmental policy.

2.1 Concentration of Fishing Ground and Processing Sites

General Santos City, located in southern limb of Mindanao Island of the Philippines, is named as the "Tuna Capital of the Philippines" (Figure 3). In Manila and Cebu, the capital and industrial/ tourism city respectively, significant volumes of tuna are unloaded and several canneries are located there. This is not because of the location of fishing ground but the attractiveness of the

landing location. There, fishing ports can accept large vessels, infrastructure such as electricity and water necessary for canneries are well prepared, and periodical passenger flights to Japan that carry *sashimi* grade fresh Yellowfin tuna depart from airports of these cities[vi]. On the other hand, in General Santos City and the nearby large city of Davao together, the eatch accounts for about a half of the tuna produced in the Philippines. Seven canneries produce 65% of the country's canned tuna for export[vii]. General Santos City became the tuna capital because of the resources in the area. Moro Gulf and Celebes Sea (Sulawesi Sea) is said to be spawning grounds for yellowfin (APRIETO 1995, p.53).

In the late 1960's, American purse-seiners came to look for supplies of tuna for their canneries, and developed the fishing ground. Gradually, local entrepreneurs took over the production and slowly started canning factories. Tuna and skipjack are mainly caught by purse-seiners or "Pumpboats", a hook-and-line vessel. Both gears are combined with "*Payaos*", i.e., FADs or fish aggregating devices[viii]. *Payao* fishing used to be a traditional way of fishing. When the productivity of *Payao* fishing was investigated and admitted by FAO in 1979 (APRIETO 1995, p.66), local purse-seiners also started to adopt the technology[ix]. Nowadays, 50 *Payaos* are set per unit of purse-seiner[x]. *Payao* technology was subsequently disseminated to Indonesia and Okinawa (Japan).

In General Santos City, there are 165 units of purse-seiners operated by 43 fishing companies. About 3,000 traditional hook-and-line vessels (*Pumpboats*) are also in operation. The total number of Payao is estimated to be 8,000[xi]. Fishery regulation in the Philippines requires a license to a vessel over 3 gross tons. Such vessel is regarded as "Commercial Fishery" and allowed to operate in the sea further than 15km from the coastal line, while the sea within 15km is reserved for "Municipal Fishers". *Pumpboat*, a traditional wooden made canoe with outriggers, being enlarged and empowered as large as 15 gross tons, however, is regarded as "Municipal Fishery". It can operate without license and allowed to fish anywhere within the Filipino EEZ. Payao can be set as first-come, first-set basis without any permission. There is an unofficial agreement among fishers that one *Payao* has to set 7 nautical miles away from other company's *Payao*, while it can be set only 3 nautical miles away from the *Payao* of the same company.

Seven out of 12 tuna canneries for export are located in General Santos City and produced 69,000 mt in 1996. Canning materials are mainly caught by purse-seiners. On the other hand, yellowfin caught by hook-and-line vessels are forwarded to Japan as fresh *sashimi* grade tuna. In addition, longliners from Taiwan catch Yellowfin in the same fishing ground, unload the product at Davao port, and export to Japan as fresh *sashimi* grade tuna.

Lucrative tuna resources in the area attracted entrepreneurs who established convenient and efficient industry complexes. Depletion of local resources, however, occurred within a decade from late 1970's. *Payao* was initially set in Salangani Bay, until the resources were depleted within several years. Fishing ground then expanded to the Philippines EEZ water, but it was also depleted by the beginning of 1990's[xii]. As of September 1999, *Payaos* of various Filipino fishing companies are placed on the EEZ boundaries between the Philippines and Indonesia[xiii]. At the beginning of 1990's, Filipino fishing companies established joint ventures with Indonesia, Papua New Guinea, and the Solomon Islands (APRIETO 1995, P.141). These are formal arrangements to fish in other countries' water. Several hundreds of

fishermen are said to be put in prison in Bitun City of Indonesia and in Palau as a result of informal (illegal) fishing[xiv].

2. 2 Initiatives of Private Entrepreneurs

In general, development of an industry by private initiatives without any governmental support is desirable. Moreover, it is noteworthy that local capitalists took over the businesses of American firms. Within the same island, Mindanao, agricultural products such as Bananas and Pineapples are still firmed and processed by the US-Filipino firms such as Dole and Del Monte. Fresh products are exported to Japan and canned products are forwarded to the U.S., EU and Japan. This example in agricultural plantation would give us a good contrast against fishery.

Furthermore, several private fishing ports coexisted in General Santos City until the end of 1998. Six local fishing companies built their own fishing port facilities equipped with auctioning places (GLADYSHINGCO-EVANS, 1995, p. 32). Ice plants and cold storages were also provided privately. Such entrepreneurs then vertically integrated tuna industry, from catch, processing to export, and financially assisted local small-scale tuna fishers. Absence of the government or a management institution, however, essentially leads to the "tragedy of the commons". Free access to *Payao* technology accelerated the depletion of local resources within the Filipino EEZ.

As many as 16,000 workers are employed in seven canneries. These workers, however, are part-time workers: Every five months, they resign and apply to other canneries. For example, one cannery in the area produces tuna cans whenever the order from overseas meets the local condition of material supply. Factory workers go to the factory whenever the production starts, and get their salary according to the number of days they worked. Such flexibility in canneries production contributed to the depletion of resource since neither the stable supply of tuna nor sustainable use of resource is a premise of the operation of the cannery.

3. CHARACTERISTICS OF INDONESIAN TUNA INDUSTRY

The characteristics of the tuna industry in Indonesia are summarized as follows. First, fishing grounds and landing areas are dispersed. Second, the government takes initiative in the management of the industry. Such characteristics show a good contrast with that of the Philippines.

3. 1 Dispersed Fishing Grounds and Landing Areas

Although a significant volume of tuna is unloaded in Jakarta and Bali (Denpasar City), other fishing ports also carry tuna and skipjack (Table 5). It is because tuna resources are abundant and scattered around the Indonesian water. In fact, yellowfin production of Indonesia is the second largest after Mexico (Table 2). When the production by Taiwanese vessels is taken into account, yellowfin catch in Indonesian water

Table 5 Tuna and skipjack production by landing Area in 1997

Port	Tuna (mt)	Share	Skipjack (mt)	Share
Jakarta	3,331	22.1%		
Bali	5,211	34.6%		
Bitun	2,698	17.9%	16,272	51.5%
Ambon	1,217	8.1%	6,675	21.1%
Solong	1,476	9.8%	5,814	18.4%
Others	1,117	7.4%	2,886	9.1%
Total	15,050	100.0%	31,617	100.0%

*Source: BPS, Perusahaan Perikanan 1997, p. 13.

would be the largest in the world. Dispersed unloading ports, however, would be a part of the reason why the canning industry has not been fully developed. Indonesia is essentially a country of material supply: It has not reached a stage of value-added production.

Fishing gears for the tuna fishery in Indonesia are longline, traditional hook & line, and purse-seine combined with *Lumpala* (FAD). There are 40 longliners with available super-cold storage facilities in 1993 that operated in Banda Sea and the Indian Ocean: Ambon is the mother port of seven of them, and Bitun is that of one. The fish caught is unloaded in Jakarta, Ambon and Bitun, or trans-shipped to carrier vessels without unloading, and then exported to Japan as frozen *sashimi* grade yellowfin. Longliners with icebox unload mainly in Bali (Denpasar city) or Jakarta, and then the product is exported by air to Japan as fresh *sashimi* grade yellowfin. Purse-seiner with *Lumpala* was introduced from the beginning of 1990's after its success in the Philippines; it catches small tuna and skipjack for canning material. Unlike the case of the Philippines, the government permission is required to set a *Lumpala*. Major fishing companies are state-owned, joint venture of the state and private company or operated by fishermen' cooperatives. There are 12 tuna canneries in Indonesia as of 1994: 5 in Bali, 2 in Bitun, 1 in Surabaya, Biak and Batam. Some of then are not fully in operation, others are not operated at all (OFCF 1993, p. 81, pp. 167-173, OFCF 1994, pp. 43-51, p. 137).

Foreign ownership of fishery and cannery is conditioned as follows; it should obtain license as Foreign Capital Investment, and it should operate under the joint venture with national company, state-owned company or cooperative (MA 1995, p. 17). Import of foreign vessels has been prohibited since 1990; leasing is allowed under certain condition.

3. 2 Governmental Initiative

Dispersed fishing ground is not a unique reason for dispersed unloading ports and stagnant canning industry. It is a reflection of the Government policy: An equality in the development of all regions. When one establishes a canning factory, a fish-canning license has to be approved. Ministry of Industry, Agriculture and the local government coordinate to decide the capacity and location of the canning factory taking into account the condition of local resources (MA, 1995, p. 57).

The Government makes an estimate of the resource and produces a production plan. Table 6 reveals that the estimated production in 1995 was optimistic. It estimated that the potential production in Indonesian water was 6.9 mil. mt/year, whereas actual production was 3.1 mil. mt/year in 1993. Therefore, it considered that only 45% of the potential production was realized.

Table 6 TAC and expected production of Indonesia Marine fishery

	Total (mt)	IEEE (mt)	Zone (mt)
Potential Production Capacity (MSY)	6,864,119	2,323,780	4,540,339
TAC		1,860,000	
Realized Production (1993)	2,529,000	627,386	1,901,614
Expected Production (1998)	3,090,600	766,209	2,324,391
Quota for Foreign Vessels (TAC-EP)		1,093,791	

source: MA, Promotion on Business Opportunity in Fisheries Srctor, 1995, p. 3, pp. 50-51.

According to the Indonesian regulation, marine fishery is divided by two: IEEE and Zone. Zone

fishery is operated by domestic fishers with the fishing vessels less than 30 gross tons and fish within the 12 nautical miles' territorial water. IEEE fishery is operated by domestic fishers of vessels over 30 GT or all capacity of foreign fishers, outside the 12 nautical miles and within EEZ water. License is required for both types of fisheries.

According to MA(1995, pp. 50-51), expected production of IEEE fishery in 1998 is 766,209 mt, and it estimates that 660 units of new vessels should be built in order to achieve the production level. The difference between total allowable catch (TAC) and expected production, 1.1 mil. mt/year, is allocated to foreign vessels. The policy seems to have dual purposes: to promote the local fishery and the local economy through the utilization of lucrative fisheries resources and to obtain foreign currency by selling excess resources to foreign vessels.

Under the Wahid Administration, such policy goal has ever been stressed. It was decided to establish the Ministry of Maritime Investigation. The mission of the ministry is to administer fishers who try to rob Indonesian marine resources, eliminate destructive fishing methods and recover from devastated fishing grounds. A Bogor Agricultural University scholar, Rokhim Dahuri, estimates that the loss incurred by the illegal fishery of foreign vessels is as much as US$40 bil. per year (INOUE 1999, p.94).

In terms of the tuna fishery, it estimates the potential production of (yellowfin) tuna as 178,368 mt including 87,123 mt of IEEE fishery, and that of skipjack as 294,975 mt including 110,225 mt of IEEE fishery. Since actual production was 122,750 mt for yellowfin and 209,100 mt for skipjack in 1997[xv], which was lower than the potential production, there was enough volume to be allocated to foreign vessels when illegal fishing is fully excluded.

The Government tries to control Indonesian tuna industry. The lack of private initiative slows down the canning and processing sector and the whole industry stays as a material exporter.

4. PROBLEMS OF THE INDUSTRY

Depletion or the possibility of depletion of resources is a common issue that fishery sector always faces. In this paper, the problem exists in this point, too. The reason for the industry being in such a situation is because sustainable production mechanism is not built into the industry. The problems would stem either from the producers, government policy or the consumers. We will compare the situation of two countries and examine which player is a main generator of the problem.

4.1 Producers

In the Philippines, the main reason for the depletion of resource apparently stems from the producers. Unlimited entry and competition put excessive pressure on the resources. Although owners of large fishing companies understand that a vicious circle is occurring, "More catch ahead of others is unavoidable because If I do not take it, others will take it anyway"[xvi]. A resource management institution cannot be established automatically in the free entry condition. Autonomous resource management initiative could be initiated only if the entry is limited and the entrants share the experience of the serious resource depletion (YAMASHITA 1998, p.66).

We illustrated in 2-1 that the Filipino marine fisheries are classified as Commercial fishery and

Municipal fishery. In the case of tuna fishery in General Santos City, fishing companies in the former category own and operate purse-seine vessels Most of the Municipal fishers are financially supported by Commercial fishers as well as other players of the industry for their Pumpboat building costs and operating costs. In exchange, the financier have a right to direct the auctioning place of the tuna caught by the financed Pumpboats: the Financier receive commission and/or a part of the profit generated by the *Pumpboat's* operation (GRADYSHINGCO-EVANS 1995, p.40). Each Municipal fisher thus depends on certain Commercial fishing company for product handling and operates mere livelihood fishing. Therefore, they do not have power nor incentive to organize an autonomous resource management institution under the long-term perspectives.

Moreover, Commercial fishing companies do not necessary care for a stable fishery business. They are rather intentionally shortsighted in a high-risk high-return fishery business[xvii]. Many of them operate fishing companies as one of several branches of their conglomerates including banking, pawnshop, department store or auto shop. They do not starve even if tuna industry is not sustainable.

On the other hand, the operator of tuna industry in Indonesia is well controlled by the government. Inefficiency of public enterprise is a common phenomenon all around the world, and Indonesian tuna canneries are not an exception. It is, however, appreciated that the government sets TAC for tuna production. Under the United Nations Convention of the Law of the Sea, establishment of a regional resource management institution and its execution of TAC control is required for highly migratory species such as tuna. Tuna resources in the Pacific Western Central area ought to be managed by such an institution form the first place. In the absence of such regional management board, however, a TAC set by a single country, Indonesia, can be said as the second best solution. We are not certain, however, the appropriateness of neither the country's estimation of potential production nor the volume of unreported catch. The latter include both the catch from illegal fishery and unreported catch from legal fishery. When such uncertainty is eliminated, tuna production sector in Indonesia is sustainable.

4. 2 Government Policy

It seems that the Government puts low priority on marine fishery despite the fact that the both archipelagic countries possess long coastlines and large EEZ waters. Primary attention seems to have been paid to aquaculture[xviii]. It is natural in the sense that the nation's favorite fish is cultured milkfish, and cultured seaweed is one of the major exporting product in the Philippines. Cultured prawn is the main source of foreign currency and milkfish is also a favorite fish in Indonesia. Moreover, in both countries, the average protein intake has not reached governmental goal yet. Aquaculture production is the only reliable and controllable source or the supply of protein within the fishery sector.

On the other hand, Municipal fishers in the Philippines and Zone fishers in Indonesia inhabit along the long coastal lines[xix]. The governments of the both countries face difficulties in collecting adequate data of catch by species or the number of operating vessels. An effective fishery policy may not be established without such basic information.

Whereas, Commercial fishery in the Philippines and IEEE fishery in Indonesia exists to feed

foreigners. Declining trend of tuna resources is not the first class interest for the government.

In Indonesia, however, as we argved in 3 - 2, the new administration is aiming to protect marine resources. Even if the primary purpose of the policy stems from locking out of illegal fishery, collection of license fee from foreign vessels, or national security, it is commendable that it has started to protect marine resources including tuna.

4. 3 Distributors and Consumers

Lastly, we will examine how foreign consumers are connected to the depletion of tuna resources. There are two reasons for consumer to be unaware of the local depletion. One is that the price does not give any indication to the problem of local depletion. The other is that the retail price does not significantly reflect the increase in producer's price even if the local depletion gives an alert signal through the increase in producer's prices.

Tuna is already a world commodity. Even such limited product as *sashimi* grade tuna is exported from 71 countries to Japan. If a local depletion of tuna in one country raises its production cost, the country will not be able to export at all but other 70 countries will compensate the fall in volume of exports. The effect on the retail price would be minimal: "A small country assumption" of International Economics would be applicable. Canned tuna market is more worldwide so that the effect on the retail price would be much smaller than that of *sashimi* product. Consumers have no way to be informed through the pricing that there is local depletion occurring in one country.

Let us assume that the average imported price have risen in Japanese *sashimi* market as a result of local depletion. Nevertheless, the effect on the retail price would be negligible because the margin between producer's price and retail price is very large. According to the field research conducted by Yamashita (2000, p.29), producer's price of fresh yellowfin was US$2.76/kg or ¥360/kg while the retail price in Japan was US$54.61/kg or ¥5,800/kg in 1999. Since 45% of the original weight is discarded, we count the price of a yellowfin assuming its original weight being 40kg. Then, the producer's price of a whole tuna was $110.4 or ¥14,400 and retail price was $1201.5 or ¥127,600. It is nearly 11 times higher by dollar or 9 times by yen than the original price. The margin includes the costs of transportation, trade documentation, auction, cutting and profits of middlemen[xx]. The cost of tuna is a mere 9.1% by dollar or 12% by yen of the retail price. Therefore, even if the producer's price was risen, the retail price would not be risen proportionally.

The market reacts against the resource in such a way that when the price goes up, consumers purchase less, then the volume of production decreases, giving less pressure to the resources for the time being until the stock of the resource recovers a sound level. If the retail price does not rise, an alert from the resource would not reach the consumers. A rise in retail price has a side effect, for consumers would have tried to know why the price had risen. If consumers feel a sense of responsibility over the depletion of local resources, as recent "green consumers" would do, they could have taken an action to preserve the resources. We expect neither of these channels to work effectively, for producer's price alert does not reach the cinsomers.

At present, however there is no reason or means to inform the consumers of the crisis. As long as it is within the range of local depletion[xxi], producers

and the government would have to take the responsibility over the loss of a valuable resource in their country.

Notes

[i] Within the Asian region, the volume of Japanese production has been stable at the level of 300,000 mt after 1975. Ten years continuous increase ever after was a contribution of Taiwan and Korean vessels that started to build longliners with super-cold storages. After the middle of 1980's, Indonesia and the Philippines started to contribute the production. See Table 2.

[ii] For example, the price of 101 fresh yellowfin tuna auctioned in Osaka City Central Wholesale Market on Sep. 11, 1998 varied from US$2.29/kg or ¥300/kg to US$20.62/kg or ¥2,700/kg. Average price of US$ 9.14/kg or ¥1,106/kg (in 1997) is an average of all these varieties. As we discuss later, producer's price of yellowfin is far below the wholesale price. It is US$2.02/kg or ¥243/kg in Indonesia in 1997 (calculated from BPS (1997)), and US$2.76 or ¥293/kg in the Philippines (interview in September 1999) in 1999. Still, it is much higher than that of skipjack, US$0.50/kg or ¥61/kg in Indonesia in 1997.

[iii] According to OGAWA (1998, pp. 224-225), net weight of yellowfin fillet is 65.6% of original weight. A steak, a pen-case like cut of fillet, is made from fillet, and a piece of *sashimi* is made from steak. In the cutting process, the surface of meat is further cut and discarded.

[iv] YAMASHITA (2000, p. 33) discusses the possible reasons. Recently, *sashimi* market is expanding in the U.S. yellowfin fillet processed in the Philippines is exported.

[v] APRIETO (1995, p. 6) states that tuna is consumed in high-income countries. It is exported from low-income countries to high-income countries. We confirmed the fact. It does not imply, however, that the price of tuna is prohibitively high for citizens in the exporting countries. For example, retail prices of food products in the Philippines in September 1999 were as follows: US$2.75/kg for frozen yellowfin fillet, $2.07/kg for frozen chicken breast, $0.18/155g for canned mackerel and sardine, $0.25/155g for canned tuna. Low volume of domestic consumption in the Philippines is rather the result of preference.

[vi] In the Osaka City Central Wholesale Market (in September 1998) and Tokyo Central Wholesale Market (Tsukiji) (in November 1999), fresh yellowfin tuna of the product of the Philippines was tagged as "Cebu" and that of Indonesia was as "Bali".

[vii] Interviews from producers and DOA, September, 1999.

[viii] *Payao* is a local word: it is a raft-shaped float with an anchor. Fishes are aggregated in such a way that small fish come underneath of the float and larger fishes stay in deeper sea to catch small fishes.

[ix] THOMAS (1999, p.29) stresses that it is not solely the sake of *Payaos* but the combination of *Payaos* and lights that attract fish.

[x] According to GLADYSHINGCO-EVANS (1995, pp. 14-25), 10 *Payaos* were set per unit of purse-seiner in 1980's. In 1995, it increased to 20-25. Information about recent numbers, 50, is obtained from an interview with a manager of a fishing company in September. 1999. The company itself produces steel made *Payaos*.

[xi] Interview, September. 1999 at the First Tuna Conference, GSC, Philippines.

[xii] Interview from a fishing company (Sep. 1999).

[xiii] An interview from a manager of purse-seine fishing company.

[xiv] At the First Tuna Conference a delegate of Palau was invited. When he declared the release of 150 Filipino fisher prisoners, participants of the conference applauded.

[xv] The data of potential production is taken from MA (1995, 32-33) and that of actual production is

from FAO Yearbook 1997 Fisheries Statistics. Although tuna in MA (1995) is denoted as "bluefin", we consider it as yellowfin tuna taking into account the resource distribution of the area. The data of FAO statistics is not consistent with the data issued by BPS, which is shown in Table 5, we use FAO statistics in this section.

[xvi] Cited by an owner of purse-seine fishing company at the First Tuna Conference

[xvii] They do not only obtain profits from vertically integrated fisheries business but also does from financing medium-to-small scale fishers through the provision of capital goods such as vessels and/or operating expenses such as ice, foods, crew's advance salary and fuel.

[xviii] Such judgment is made by subjective observation. For example, in the Philippines' annual fisheries data book "1998 Philippine Fisheries Profile" issued by BFAR, data of aquaculture comes first followed by municipal and commercial fishery. In fact, the volume of production of aquaculture products is larger than others. In a handbook for investors of Indonesian fisheries sector issued by Ministry of Agriculture (1995), an equivalent volume of pages are devoted to both aquaculture and marine fishery. In fact, it expects further development of aquaculture production because it assumes that the actual production is merely 12.4% of potential production for shrimp and 28.9% for milkfish.

[xix] Various types of municipal fishers are coexisting: Some are livelihood fishers who can only feed themselves. But others can catch fish for sale. Further, some people work in other sector but catch fish for their food. Some fishers do not own any fishing gear and catch shellfish. Others own manual or motorized boats.

[xx] One reason for such differential stems from the form of import, i.e. tuna is imported in the form of GG as we noted in 1 - 2 - 1 (YAMASHITA 2000 pp. 33-34). The large price differential between producer's price and retail price is also applied to Japanese tuna products. Japanese fishers submitted a petition for the reform of distribution system (YAMASHITA 2000 p. 33 note 30).

[xxi] APRIETO (1995, p.45) states that it is considered that yellowfin tuna caught in the Philippines stay in the Philippines Sea for its lifetime. In this sense, resource depletion in the Philippines is a local phenomenon.

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