

COMMISSION GÉNÉRALE DES PÊCHES POUR LA MÉDITERRANÉE

COMITÉ SCIENTIFIQUE CONSULTATIF

Sous Comité des Sciences Economiques et Sociales

Barcelone, 6-9 mai 2002

1. OUVERTURE DE LA SESSION

1. La Troisième Session du Sous-Comité des Sciences Économiques et Sociales (SCSES) du Comité Scientifique Consultatif (SAC) de la Commission Générale des Pêches pour la Méditerranée (CGPM) s'est tenue à Barcelone du 6 au 9 mai 2002. M. Malouli Idrissi, Coordinateur du Sous-Comité, a souhaité la bienvenue aux nouveaux participants (Voir la liste des participants à l'Annexe 2) et a remercié le *Centre Mediterrani di Investigaciones Marines i Ambientals* (CMIMA) pour l'organisation de cette réunion.

2. A cette occasion, le SCSES a félicité M. Alain Bonzon, qui a largement contribué dans la réussite des travaux du Sous-Comité, pour sa nouvelle nomination comme Secrétaire de la CGPM. Le SCSES invite la FAO/FIP à identifier un nouveau secrétaire technique, afin d'assurer l'efficacité des travaux du Sous-Comité.

2. ADOPTION DE L'ORDRE DU JOUR ET ARRANGEMENTS POUR LA RÉUNION

3. Le Sous-Comité a revu l'ordre du jour provisoire de la réunion. Celui-ci a été adopté à l'unanimité par les participants avec des modifications mineures. Un point sur les derniers développements du STECF de la Commission Européenne, a été ajouté (L'ordre du jour définitif est reproduit en annexe 1).

3. RAPPEL DES RECOMMANDATIONS DES DERNIÈRES SESSIONS DE LA CGPM ET DU SAC

4. M. Alain Bonzon a présenté une synthèse des objectifs fondamentaux et priorités à court- moyen termes du travail actuel du SCSES. Le Sous-Comité a souligné l'importance de l'approche socio-économique pour l'aménagement des pêches, notamment pour la gestion des capacités et de l'effort de pêche en Méditerranée. Ceci nécessite notamment de progresser de manière coordonnée sur les sujets suivants avec les autres Sous-Comités :

- ◆ Définition des segmentations de la flotte Méditerranéenne ;
- ◆ Définition des sub-divisions géographiques des Unités Opérationnelles (UO) à un niveau inférieur des zones géographiques de la CGPM ;
- ◆ Confirmer la liste des données de base pour les indicateurs socio-économiques à collecter par les Etats membres et en spécifier la séquence temporaire.

5. Le SCSES a estimé que la banque de données statistiques du SAC devra assurer la compatibilité avec les besoins d'analyse économique et sociale, et en conséquence, il faudra s'assurer que l'approche économique est bien prise en compte par le Sous-Comité s'occupant des statistiques.

6. Il a été en particulier rappelé le paragraphe 53 du rapport de la Vingt-sixième session de la CGPM (Ischia, Italie, 2001), qui demande expressément au SCSES d'identifier les paramètres de base relative à la structure économique des unités opérationnelles.

7. D'autre part, la nécessité, à terme, d'envisager un lien en référence avec les indications des paragraphes 60-64 du rapport de la Vingt-sixième session de la CGPM concernant la prise en compte du secteur privé dans les travaux de la CGPM avec les travaux du SAC a été soulignée. Le SCSES a estimé qu'il pourrait contribuer activement à l'étude des questions permettant d'identifier la nature d'un tel lien. Des thèmes tels que les activités de commerce, la co-gestion et les marchés de l'emploi, la participation institutionnelle à l'aménagement, le suivi, contrôle et surveillance, la sélectivité des engins de pêche, pourraient par exemple offrir des possibilités de collaboration plus étroite entre la recherche et l'industrie.

4. ANALYSES ET RÉSULTATS MÉTHODOLOGIQUES CONCERNANT LES ÉTUDES SUR LES INDICATEURS SOCIO-ÉCONOMIQUES

8. Les conclusions de la réunion du Groupe de travail *ad hoc* sur les indicateurs socio-économiques (Salerne, 11-13 mars 2002) ont été examinées (Annexe 3). En plus de l'étude pilote sur la mer d'Alboran, l'avancement dans la réalisation des travaux suivants a été noté :

- ◆ Golfe de Gabès (Tunisie)
- ◆ Mer Tyrrhénienne (Italie)
- ◆ Avancement sur la Méditerranée française
- ◆ Avancement sur la mer Adriatique
- ◆ Contribution des travaux d'EUROSTAT

9. Les principales conclusions et recommandations du Groupe de travail ont été jugées très utiles pour la suite des travaux du Sous-Comité et constituent un progrès notable. Le SCSES a fait sienne ces recommandations.

10. Le SCSES a rappelé le besoin de la mise en place d'un système routinier de collecte de données socio-économiques de base par chaque Etat Membre de la CGPM. Il a reconnu que la couverture de l'ensemble de la Méditerranée doit être considérée comme un processus de moyen terme. Il a rappelé également, le besoin de connaître plus en détail les caractéristiques socio-économiques de chaque Unité Opérationnelles ainsi que le besoin de considérer une dimension spatiale désagrégée au niveau d'unités locales opérationnelles (voir point 6 ci-dessous).

11. Il a donc été recommandé :

- a) d'étendre les études de cas sur les indicateurs à toutes les *zones géographiques de la CGPM* de la Méditerranée pour aider à l'établissement de banques de données nationales sur les indicateurs socio-économiques compte tenu des segments envisagés (tableau 1);

- b) de maintenir la routine annuelle de collecte de données de base pour l'élaboration des indicateurs dans les pays déjà couverts, afin d'assurer le suivi temporel, améliorer le système d'enquête et développer l'analyse de simulation.
- c) de mettre en place un Groupe de travail conjoint SCSES/SCIS pour l'établissement de la base donnée du SAC sur les unités opérationnelles.

12. Le SCSES recommande par ailleurs de tenir compte de la liste (Annexe 4) qui spécifie le type de travail à développer dans le futur sur la base des développements méthodologiques identifiés par le deuxième Groupe de travail des indicateurs socio-économiques (Salerne, 2002).

13. Le SCESS a rappelé que l'établissement d'une segmentation homogène de la flotte Méditerranéenne est une condition fondamentale pour assurer l'information de base et l'analyse nécessaire à la gestion des pêches en Méditerranée. Si l'on veut établir un système de gestion de pêche basé sur le contrôle de l'effort et des capacités, il faut obtenir les informations sur une base de segments précis pour l'ensemble de la flotte en Méditerranée.

14. Après une longue discussion sur la documentation et les conclusions contenues dans le rapport de la Deuxième session du Groupe de travail sur les indicateurs, un accord unanime sur la segmentation à appliquer a été trouvé. Le Sous-Comité recommande au SAC d'adopter cette segmentation, telle que spécifiée ci-dessous.

Tableau 1 : Proposition des segments de flotte de pêche

Groups	< 6 meters	6-12 meters	12-24 meters	More than 24 meters
1. Minor Gear without engine	A	⇐		
2. Minor Gear with engine	B	C		
3. Trawl	⇒	D	E	F
4. Purse Seine		G	H	⇐
5. Long line			I	
6. Pelagic Trawl		⇒	J	⇐
7. Tuna Seine			K	⇐
8. Dredge		⇒	L	
9. Polyvalent			M	

15. Le SCSES a défini 13 segments de flotte en fonction du métier et de la longueur des navires, comme autant d'Unités Opérationnelles comme spécifié à l'annexe 5.

16. Le SCSES considère que c'est une base minimale s'il s'avère nécessaire de désagréger davantage, chaque pays est invité à le faire, en tenant compte de la base minimale d'agrégation proposée par le sous-comité.

17. En voyant les résultats obtenus, en considérant la difficulté pour l'obtention des données et en prenant en compte la perspective de la gestion basée sur l'effort de pêche, le besoin de renforcer la coordination entre les approches biologiques et économiques de la gestion et le besoin d'harmonisation méthodologique avec les autres Sous-Comités ont été soulignés. L'insuffisance de communication en temps utile avec les autres Sous-Comités a été également remarquée. A cet effet, le SCSES invite le coordinateur à attirer l'attention des autres Sous-Comités sur les sujets d'intérêt commun qui étaient proposés.

5. INFORMATION SUR LES DERNIERS AVANCEMENTS DES TRAVAUX DU STECF DE LA COMMISSION EUROPÉENNE.

18. Le SCSES a pris connaissance des conclusions de la Quatorzième Session du STECF qui s'est tenue début mai 2002. Il a été souligné que les indicateurs économiques développés ces dernières années par le SCSES/SAC, ont été adoptés dans les grandes lignes comme base de travail pour toutes les pêcheries européennes.

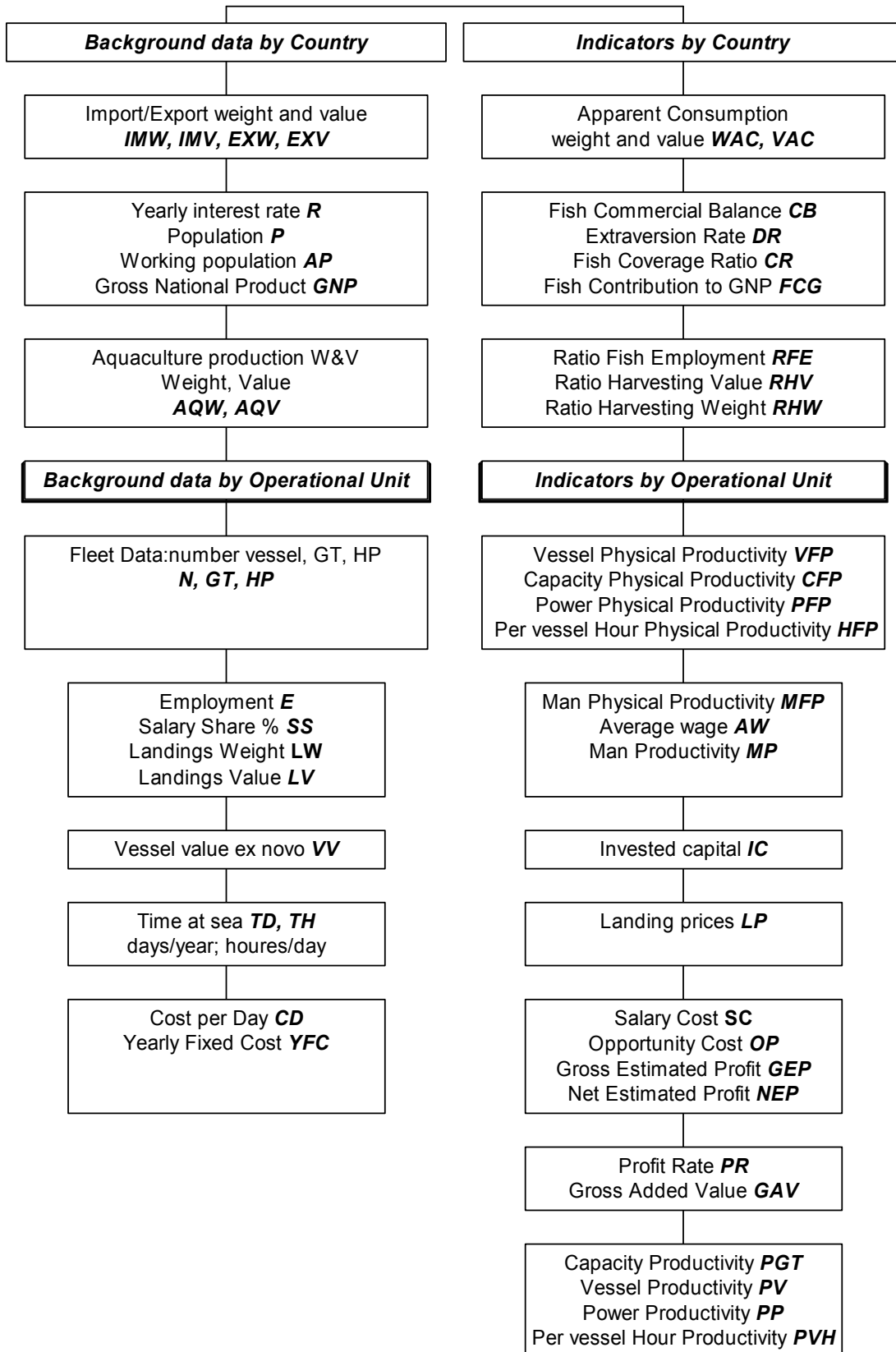
19. D'autre part, le SCSES a été informé que le STECF dans sa contribution à la révision de la Politique Commune des Pêches dans la Méditerranée Européenne, a prévu de développer trois réunions de travail, qui seront ouvertes aux experts communautaires. La première réunion est prévue entre le 4 et 6 septembre 2002 à Bruxelles, dans l'objectif d'identifier les pêcheries de la Méditerranée Européenne les plus importantes d'un point de vue bio-économique. Le Sous-Comité s'est félicité de cette initiative qui favorise la cohérence entre les activités de l'Union Européenne et de la CGPM dans ce domaine. Les deux autres réunions se tiendront au cours de cette année. Elles porteront sur les flottilles européennes (segments, techniques, impact, etc.) et sur leur poids économique et social (profits, emploi, etc.). La participation des experts européens du SCSES dans ces réunions, a été encouragée.

6. DISCUSSION ET ADOPTION DES PARAMÈTRES SOCIO-ÉCONOMIQUES POUR LA BASE DE DONNÉES DES UNITÉS OPERATIONNELLES

6.1 Paramètres socio-économiques

20. Le développement des études pilotes sur les indicateurs socio-économiques a permis au SCSES de définir les indicateurs socio-économiques minimum, qui doivent être collectés d'une manière régulière. Les données de base nécessaires pour l'élaboration de ces indicateurs pour chaque segment, sont présentées dans le tableau suivant :

Tableau 2 : Données et indicateurs socio-économiques



21. Deux types d'indicateurs étaient identifiés par le SCSES. Les indicateurs nationaux, il s'agit des indicateurs macro-économiques nécessaires pour décrire le poids de l'activité économique de pêche au niveau des pays et/ou aux niveaux des grandes régions du pays (certaines informations sont disponibles); et un deuxième groupe d'indicateurs micro-économiques, qui ont pour but d'assurer le suivi et l'analyse des caractéristiques des flottes de pêche. Ce sont les indicateurs collectés par unités opérationnelles.

22. Les indicateurs nationaux sont décrits dans le tableau 3 :

Tableau 3 : Indicateurs Nationaux

<ul style="list-style-type: none"> • Apparent Consumption, shows the gross consumption of fishing products per inhabitant of each country. It can be expressed either as weight of consumed fish per inhabitant (WAC) or as expense per inhabitant (VAC). • Fish Commercial Balance (CB), shows whether exports or imports of fishing products are higher in a given country. • Ratio Fish Employment (RFE), indicates the ratio of employment created directly by the fishing industry in a country. • Fish Coverage Rate (CR), shows the rate of apparent consumption covered by the national production. • Extraversion Rate (DR), shows to what extent the fishing sector of a country depends upon foreign trade, both for imports and exports. • Fish Contribution to the GNP (FCG), shows the importance of fishing production in the Gross National Product. • Ratio Harvesting Value (RHV), shows the importance of fishing in comparison to aquaculture in terms of income. • Ratio Harvesting Weight (RHW), shows the importance of fishing in comparison to aquaculture in terms of production weight.

23. Il est important de noter que les indicateurs des unités opérationnelles ont trois dimensions: les segments de flottes, la dimension temporaire (annuelle) et la dimension spatiale.

24. La dimension spatiale demande une attention particulière. Le SCSES a constaté l'existence d'une importante différence des aspects économiques entre les différentes localités des zones géographiques de la CGPM étudiées et en parallèle, il a constaté que le nombre de sites de débarquement est très large pour établir une analyse spatiale au niveau de chaque port. Par conséquent, le SCSES a suggéré un niveau spatial, agrégeant plusieurs sites de débarquement autour des principaux ports. Le SCSES a considéré comme Unité Opérationnelle Locale (LOU) l'ensemble des bateaux appartenant à chaque segment de flotte de cet espace géographique: il s'agit néanmoins d'un compromis entre l'hétérogénéité observée et les ressources budgétaires. Pour l'analyse de chaque zone géographique de la CGPM, il sera nécessaire de définir la dimension spatiale des LOUs. Des études pilotes de cette analyse doivent être développées.

25. La description des indicateurs socio-économiques des unités opérationnelles, est présentée dans le tableau 4 :

Tableau 4 : Indicateurs socio-économiques par Unité Opérationnelle

- **Vessel Physical Productivity (VFP)**, shows the average production of each vessel in terms of weight of landings.
- **Capacity Physical Productivity (CFP)**, indicates average production in terms of weight of landings for each capacity unit (GT) of the vessels.
- **Power Physical Productivity (PFP)**, shows the average production in terms of weight of landings for each power unit (HP) of the vessels.
- **Per vessel Hour Physical Productivity (HFP)**, indicates the average production in terms of weight of landings for each full fishing hour. The total fishing time (T) results from multiplying the number of fishing hours by working days and then by the number of working days in one year (TD).
- **Capacity Productivity (PGT)**, shows average production in terms of market value in the first sale for each capacity unit installed (GT) in the vessels.
- **Vessel Productivity (PV)**, shows average production in terms of market value in the first sale for each vessel.
- **Power Productivity (PP)**, shows the average production in terms of market value in the first sale for each power unit (HP) of the vessels.
- **Per Vessel Hour Productivity (PVH)**, shows the average production in terms of market value in the first sale for each fishing hour.
- **Man Physical Productivity (MFP)**, shows the average production in terms of weight of landings for each man employed.
- **Man Productivity (MP)** shows average production in terms of value in the first sale for each man used.
- **Average Wage (AW)** indicates the average salary obtained by each man employed.
- **Landing Prices (LP)** represents the average market price of landings.
- **Invested Capital (IC)** shows the current value of the whole of the vessels. Invested capital is very difficult to measure in the Mediterranean Sea. A recommended method will be explained below.
- **Salary Cost (SC)** indicates the fishermen's income. To measure the salary cost, we must bear in mind the parts in which landings of each kind of fleet are divided. This indicator tends to underestimate the actual figures, since fishermen usually keep a small part of landings as salary in kind. Often, in artisanal fisheries, each fisherman's earnings depend on his condition, i.e., whether he is a sailor (salary) or the owner (salary plus profits). For the purposes of making an economic analysis, we should make a distinction between the natures of each distinctive part of the income.
- **Opportunity Cost (OP)** shows the yields that the owner could obtain should he invest his money in National Debt instead of investing in his business. This means that the owner is relinquishing that potential income. There is a profit in its economic sense when the yields of the invested capital surpass the opportunity cost.

- **Gross Estimated Profit (GEP)**, which indicates the total profits obtained by the whole of the vessel owners, once the operating costs have been deducted. Such costs include: Salary Cost (SC), Opportunity Cost (OP), Costs related to Fishing (CDxTD) and Yearly Fixed Costs (YFC). How to calculate CD and YFC is explained below.
- **Net Estimated Profit (NEP)**, which shows the total earnings obtained by the whole of the owners, once the depreciation cost has been deducted from the GEP. This cost is calculated following the criterion that the shelf life of a vessel is 10 years. In fact, the shelf life of vessels is normally longer, but in that subsequent period repair costs equal the value of a new vessel.
- **Profit Rate (PR)**, which indicates the percent ratio of yearly net profits plus the opportunity cost in relation with the investment. It should be borne in mind that this figure does not include the additional earnings obtained by the owner as an employee in artisanal fisheries.
- **Gross Added Value (GAV)**, which expresses the Added Value that the segment in question contributes to the National Economy. This includes: salaries, profits, opportunity cost and depreciations.

6.2 Paramètres sociaux

26. Le SCSES a pris connaissance des conclusions du Groupe de Travail sur les indicateurs de Salerne, sur les aspects sociaux. Il a recommandé qu'il faut fournir des efforts supplémentaires pour identifier des indicateurs sociaux minimum pour les zones géographiques de la CGPM.

27. En particulier, le SCESS a recommandé d'élargir la liste des indicateurs socio-économiques, en considérant les indicateurs sociaux, tels que ceux en cours de développement à l'étude pilote sur la mer Thyrrénienne (âge moyen pondéré ; période d'activité ; quota de participation dans la structure du capital) et ceux développés dans l'étude socioéconomique de la lagune de Nador au Maroc (scolarisation, foyer, origine sociale et expérience).

28. Le Coordinateur du projet AdriaMed a rappelé aux participants, qu'en ce qui concerne les aspects sociaux, un programme en vue de prendre en compte d'autres paramètres socio-économiques a été lancé en Albanie. Le type d'information qui seront collectées à travers cette enquête a été présenté au SCESS. Le questionnaire couvre en particulier : "la définition et les caractéristiques des profils socio-économiques des districts maritimes", y compris en incluant des informations sur : les personnes, les conditions de travail des équipages et les stratégies de pêche, les caractéristiques et relations entre districts et internes aux districts. Le Sous-comité s'est félicité du travail enterpris par le projet AdriaMed. Il a aussi considéré que les résultats obtenus jusqu'ici ainsi que les autres activités en cours dans ce domaine, constituaient des contributions positives aux thèmes de travail du SCESS.

6.3 Manuel d'échantillonnage

29. Suite aux propositions de la Deuxième Session du Groupe de travail sur les indicateurs, le SCESS a recommandé que soit élaboré un manuel sur les techniques d'échantillonnage et distribution des enquêtes auprès d'une population donnée, afin d'optimiser l'exploitation des résultats d'enquête.

30. Le SCSES a pris connaissance et a remercié IREPA du travail préparé et distribué, sur les méthodologies d'échantillonnage pour la collecte de données sur les indicateurs socio-économiques (Annexe 6). Cette présentation était accompagnée par la distribution d'un CD-Rom.

31. Le manuel devra être élaboré sur la base de l'ébauche de manuel proposé par la GFCM au Groupe de travail et du Manuel utilisé par l'IREPA pour ce type d'activité (Annexe 6). A cet égard, le Sous-Comité remercie et fait sienne l'offre du GEM et de l'IREPA de produire conjointement un manuel pour le SCESS. Celui-ci devra notamment couvrir trois aspects:

- a) une introduction aux techniques d'échantillonnage;
- b) la méthode de Neyman;
- c) la méthode de Bethel.

32. De surcroît, chacune des ces parties devra considérer les éléments suivants:

- ◆ L'explication de la méthodologie pour tous les utilisateurs potentiels ;
- ◆ Une présentation claire, étapes par étapes, et pédagogique des concepts et de leur application ;
- ◆ L'inclusion d'exemples clairs, facilitant l'application sur des cas réels pour être appliqué par les experts nationaux de façon autonome dans tous les pays de la CGPM .

33. De surcroît, il faudra s'assurer :

- ◆ de mettre à disposition les logiciels nécessaires aux techniques proposées ;
- ◆ de présenter les références bibliographiques afférentes aux méthodes utilisées.

34. Les experts nationaux ont été invités à fournir aux auteurs des commentaires utiles pour la rédaction finale afin de s'assurer que le texte serait le plus pédagogique et clair possible. Le Sous-Comité a invité les auteurs à déployer tous les efforts pour qu'une version préliminaire du manuel soit disponible avant la prochaine session du SAC (juillet 2002).

7. REVUE ET ADOPTION DE LA DERNIÈRE VERSION DU GLOSSAIRE

35. Le Sous-Comité a noté que la première phase de distribution d'une première ébauche et la deuxième phase pour compléter le glossaire avec de nouvelles définitions, prévues dans le plan de travail de l'année passée, a été bien complété.

36. Tout en notant que le travail déjà effectué était important, il a été suggéré de compléter cette année par email le travail prévu comme troisième phase. Il s'agit d'ouvrir une discussion sur les définitions qui figurent maintenant sur le Glossaire. Des commentaires critiques de la part de tous les participants du Sous-Comité sur les actuelles définitions ont été demandés. Les définitions ne soulevant aucune critique ou commentaire seront considérées comme étant acceptées et seront incorporées au Glossaire.

37. Pour résoudre les controverses sur les définitions soulevant une discussion, une quatrième phase a été proposée sous la forme d'un Atelier. Cet Atelier devra harmoniser les définitions et pourra se tenir entre les Sous-Comités ou pendant ceux-ci.

38. Même si la quatrième phase concernant la convocation d'un atelier n'était pas acceptée, il a été proposé de maintenir de toute façon la troisième phase. Pour s'assurer du succès de cette phase, il faut avoir de bons moyens permettant la discussion sous forme électronique. Il faudra également trouver un coordinateur (Pilar Pereda a été suggérée), établir une méthode de communication qui facilite la participation et les échanges d'idées (liste de discussion, web, etc.), établir des formulaires pour les commentaires sur les définitions, etc. Le Coordinateur a été invité à informer les autres Sous-Comités de cette proposition.

8. PRÉSENTATION DES RAPPORTS NATIONAUX ET ETUDES ET PROJETS EN SCIENCES ECONOMIQUES ET SOCIALES

8.1 Rapport Nationaux

39. M. Malouli a présenté les travaux socio-économiques en cours en Méditerranée marocaine. Il s'agit essentiellement d'approfondir les études sur les indicateurs socioéconomiques du SCSES, de développer des études de cas sur les pêcheries artisanales et de tester les possibilités d'appliquer le logiciel bio économique « MEFISTO », au niveau des pêcheries les plus importantes. (Annexe 7). Dans ce sens, le SCSES a recommandé à tous les experts de fournir des informations identiques, sur les programmes nationaux et régionaux, développés dans leurs régions.

40. Le SCSES a pris connaissance de l'étude socio-économique sur la lagune de Nador (Maroc), réalisée par l'INRH (Annexe 8). Cette étude, présentée par M. Idrissi Malouli, a pour objectif d'évaluer des caractéristiques socio-économiques, d'identifier et d'évaluer les circuits de commercialisation des produits de pêche du secteur, et enfin d'estimer l'effort de pêche et la capture. L'outil SIG a été utilisé pour cartographier l'effort de pêche, la capture totale et les caractéristiques socio-économiques.

41. Le SCSES a rappelé que les Membres du réseau du Sous-Comité sont invités à envoyer au Coordinateur des résumés sur les études et les projets en sciences sociales auxquels ils participent.

42. M. Roland Kristo, a exposé les derniers développements liés à la mise en place d'un système de co-gestion pour les pêcheries de l'Albanie. Cette initiative est supportée par la Banque Mondiale.

43. A cet égard, le SCSES s'est félicité de la publication intitulée « Sociétés maritimes, droits et institutions des pêches en Méditerranée occidentale » préparé par M. F. Féral, qui a été distribuée. Il a pris note des efforts poursuivis dans plusieurs pays de la Méditerranée pour mettre en oeuvre des mécanismes de co-gestion. Le représentant de l'UE a également rappelé que le co-management est un thème important du « Green Paper ». Le SCSES a invité les experts du réseau à suivre les développements en cours dans ce domaine.

8.2 Etudes et projets régionaux

44. M. Rafael Robles, Directeur du projet COPEMED, a présenté les résultats du travail développé en Méditerranée occidentale concernant la collecte d'informations juridiques sur la régulation des pêcheries. Ce travail a pour but de permettre la comparabilité des régulations entre les pays Méditerranéens. Les résultats seront mis sur la page www.ua.es/copemed, d'accès public.

45. M. Fabio Massa, Coordinateur du projet ADRIAMED, a informé le SCSES de la préparation d'un document technique sur les aspects législatifs et les mesures de gestion des pêcheries au niveau des quatre pays de l'Adriatique (Albanie, Croatie, Italie et Slovénie).

46. Le SCSES s'est félicité de l'initiative des projets régionaux et des travaux réalisés et a recommandé d'étendre ce type de travaux au niveau des autres zones géographiques de la CGPM.

47. M. Ramon Franquesa a informé le SCSES du démarrage du projet BEEMFISH, financé par la Commission Européenne. Ce projet développera des modèles bioéconomiques pour la Méditerranée. On peut se disposer de plus d'information sur le projet à www.Beemfish.net. Le SCSES invite les projets régionaux (COPEMED, ADRIAMED, etc.) à faciliter la participation d'experts de pays non-membres de la communauté à ces travaux.

9. ÉTAT D'AVANCEMENT DES BASES DE DONNÉES DU SCSES

48. Le Directeur du projet ADRIAMED a présenté les premiers résultats sur les sources et l'accessibilité des données socio-économiques en Adriatique obtenus avec la collaboration des experts de l'adriatique. Le document est basé sur un questionnaire distribué lors de la dernière réunion du SCSES et qui intègre les aspects sociaux.

49. Concernant la page WEB du SCSES, actuellement abritée sur le site WEB de COPEMED, le SCSES a recommandé de continuer à collecter les informations sur les listes bibliographiques, selon les formats standardisés et de fournir un effort supplémentaire pour l'identification des experts en sciences sociales et économiques, dans les pays de la CGPM. Il est de plus suggéré que le SCSIS assiste le sous-comité pour améliorer la page existante.

10. RECOMMANDATIONS EN MATIÈRE DE RECHERCHES ET AMÉNAGEMENT

50. Les principales recommandations suggérées par le SCSES, dans le domaine des sciences sociales et économiques, afin d'assurer une meilleure gestion des zones géographiques de la Méditerranée, sont :

- Etendre les études de cas sur les indicateurs socio-économiques à toutes les *zones géographiques de la CGPM* ;
- Maintenir la collecte des données de base pour l'élaboration d'indicateurs socio-économique dans les pays déjà couverts, avec un rythme annuel.
- Organiser un Groupe de travail conjoint SCSES/SCIS pour l'établissement de la base des données du SAC sur les unités opérationnelles.
- Adopter la segmentation proposée par le Sous Comité, lors de l'identification des Unités Opérationnelles ;
- Organisation d'une troisième réunion du groupe de travail sur les indicateurs socio-économiques ;

- Solliciter le projet COPEMED pour réaliser un travail sur les capacités de pêche ;
- Solliciter le projet COPEMED pour réaliser un travail sur le développement d'une base de données bibliographiques, dans le domaine des sciences sociales et économiques ;
- Entreprendre des études de base sur les aspects législatifs, au niveau de l'ensemble des zones géographiques de la CGPM, comme ceux réalisés dans le cadre des projets régionaux COPEMED et ADRIAMED ;

11. PROGRAMME DE TRAVAIL ET ACTIVITÉS POUR L'ANNÉE PROCHAINE

51. Les travaux qui seront développés par le SCSES, afin d'assurer la bonne réussite de ses mandats sont :

- Elargir la liste des indicateurs socio-économiques, en considérant les indicateurs sociaux ;
- Finaliser un manuel pratique sur les techniques d'échantillonnage et la distribution des enquêtes, pour la collecte des données socio-économiques. Cette tâche sera assurée par IREPA et GEM- Université de Barcelone
- Collecter des informations sur les programmes de recherche nationaux et régionaux, développés dans les pays de la CGPM ;
- Continuer à collecter les données sur les listes bibliographiques, selon les formats standardisés ;
- Fournir un effort supplémentaire pour l'identification des experts en sciences sociales et économiques, dans les pays de la CGPM.
- Poursuivre l'analyse des définitions qui présentent des controverses, afin d'actualiser le glossaire proposé par le SCSES ;
- Entreprendre des études de base au marché de travail, au flux migratoire de la main d'œuvre, et au rôle de la femme.

12. AUTRES QUESTIONS

52. Aucune autre question n'a été soulevée.

13. ADOPTION DU RAPPORT

53. Le rapport du Sous Comité a été adopté à l'unanimité le 9 mai 2002.

ORDRE DU JOUR

Coordinateur: Mohammed Idrissi Malouli
Email: malouli@inrhador.gov.ma / malouliidrissi@hotmail.com

1. Ouverture de la session
2. Adoption de l'ordre du jour et arrangement pour la réunion
3. Rappel des recommandations des dernières sessions de la CGPM et du SAC pour le SCSES ;
4. Analyse et résultats méthodologiques concernant les études sur les indicateurs socio-économiques ; (Conclusions et recommandations du GT_ Indicators, 9-11 mars, Salerne) ;
5. Information sur les derniers avancements des travaux du STECF de la Commission Européenne ;
6. Discussion et adoption des paramètres socio-économiques pour la base de données des unités opérationnelles ;
 - 6.1 Paramètres socio-économiques
 - 6.2 Paramètres sociaux
 - 6.3 Manuel d'échantillonnage
7. Revue et adoption de la dernière version du « Glossaire »
8. Présentation des rapports nationaux et études et projets en sciences sociales et économiques.
 - 8.1 Rapport Nationaux
 - 8.2 Etudes et projets régionaux
9. Etat d'avancement des bases de données du SCSES.
10. Recommandations en matière de recherches et d'aménagement
11. Programme de travail et activités pour l'année prochaine
12. Autres questions
13. Adoption du rapport.

LISTE DES PARTICIPANTS

Camiñas, J.A	jacaminas@ma.ieo.es
Fores Sanjuan, Rafael	rfores@gi.ieo.es
Franquesa, Ramon	ramon@gemub.com
Guillen Garcia, Jordi	jordi@gemub.com
Malouli, Idrissi Mohammed	malouli.idrissi@inrhnador.net.ma
Placenti, Vincenzo	placenti@irepa.org
Rasines Pérez, Inmaculada	inma.rasines@gi.ieo.es
Robledo Fraga, Guillermo	gillermo.robledofraga@cec.eu.int
Robles, Rafael	rafael.robles@ua.es
Massa, Fabio	fabio.massa@fao.org
Kristo, Roland	
Bonzon, Alain	alain.bonzon@fao.org
Coppola, Rino	rino.coppola@fao.org

GROUPE DE TRAVAIL SUR LES INDICATEURS SOCIO-ECONOMIQUES
Salerne, 11-13 mars 2002

The Working Group on socio-economic indicators (WGSEI) reviewed four studies which have been launched during the intersession. They cover respectively: the Gulf of Gabès (Tunisia); the Adriatic Sea; the Tyrrhenian Sea; and the Gulf of Lion (France). In this respect, the WGSEI reiterated the importance of defining Local Operational Units (LOUs: fleet segments/ports) and recommended the formal adoption of this concept. The WGSEI adopted 3 basic social indicators (average age of fishers; length of activity; share in capital structure) and recommended to pursue works toward identifying other basic social indicators at the level of each GFCM geographical area. The WGSEI also confirmed that the collection of data to build the basic economic indicators adopted by SCESS should be done on a yearly basis.

The WGSEI reviewed in detail various possible fleet segmentation frames (i.e., from : IREPA; AER; U.E (Regulation No 1639/2001)/EUROSTAT/STEFCE), and from the SCESS pilot study on the Alboran Sea). It concluded that these segmentations could be harmonized taking as reference the E.U segmentation. On this basis, the Group elaborated and agreed upon a segmentation to be submitted to SCESS for adoption. This entails 9 segments crossing 3 vessel/LOA groups. It further recognized that more detailed segmentation would need to be identified with regard to the small-scale fleet (< 12 m.).

The WGSEI also confirmed the list of basic socio-economic data to be taken into consideration by SCIS while building a data base on operational units. It reviewed and commented a draft guideline on sampling methodologies for building socio-economic indicators, in particular the use of the Neyman and Bethel criterion in this respect. The Working group recommended that the draft guidelines be consolidated and finalised, taking into consideration the guideline used by IREPA. It also recommended that additional studies for setting up socio-economic indicators be initiated, following SCESS methodology, in other GFCM geographical areas, particularly in Eastern Mediterranean. The WGSEI further recommended that a workshop on potential application of socio-economic indicators in simulation tools be organized.

The Group commended the results of the Copemed study on artisanal fisheries and invited the Project to ensure a large distribution of the ArtFish data base and related CD Rom.

**INDICATEURS SOCIO-ECONOMIQUES : TRAVAIL A DEVELOPPER POUR
CHAQUE ZONE GEOGRAPHIQUE DE LA CGPM**

FAO SUBAREA	FAO STATISTICS DIVISIONS	GFCM GEOGRAPHICAL SUB-AREAS	Economic Indicators Work	
WESTERN	1.1. BALEARIC	5. Balearic Island	Starting a Pilot Study	
		6. Northern Spain	Starting a Pilot Study	
		4. Algeria	Starting a Pilot Study	
	1.2. GULF OF LIONS	1. Northern Alboran Sea 2. Alboran Island 3. Southern Alboran Sea	1. Northern Alboran Sea	To be continued
			2. Alboran Island	To be continued
	1.3. SARDINIA	7. Gulf of Lions 7. Gulf of Lions 8. Corsica Island 11. Sardinia 10. South and Central Tirrenian Sea 9. Ligurian and North Tirrenian Sea 10. South Tirrenian Sean 12. Northern Tunisia	7. Gulf of Lions	To be continued
			7. Gulf of Lions	To be continued
			8. Corsica Island	Starting a Pilot Study
			11. Sardinia	Starting a Pilot Study
			10. South and Central Tirrenian Sea	To be continued
			9. Ligurian and North Tirrenian Sea	To be continued
	CENTRAL	2.1. ADRIATIC	17. Northern Adriatic	To be continued
18. Southern Adriatic Sea			To be continued	
2.2. IONIAN		19. Western Ionian Sea 20. Eastern Ionian Sea 15. Malta Island 16. South of Sicily 13. Gulf of Hammamet 14. Gulf of Gabes 21. Libya	19. Western Ionian Sea	Starting a Pilot Study
			20. Eastern Ionian Sea	Starting a Pilot Study
			15. Malta Island	Starting a Pilot Study
			16. South of Sicily	Starting a Pilot Study
			13. Gulf of Hammamet	Starting a Pilot Study
			14. Gulf of Gabes	To be continued
EASTERN	3.1. AEGEAN	22. Aegean Sea	Starting a Pilot Study	
		23. Crete Island	Starting a Pilot Study	
	3.2. LEVANT	25. Cyprus Island	Starting a Pilot Study	
		24. South of Turtkey	Starting a Pilot Study	
		27. Levant	Starting a Pilot Study	
BLACK SEA	4.1. MARMARA 4.2. BLACK SEA 4.3. AZOV SEA	26. Egypt	Starting a Pilot Study	
		28. Marmara Sea	Starting a Pilot Study	
		29. Black Sea	Starting a Pilot Study	
		30. Azov Sea	Starting a Pilot Study	

ANNEXE 5

DEFINITION DES SEGMENTS DEVELOPPES PAR LE SCSES

A- Minor Gear without engine	All vessels non provided of engine (wind or oar propulsion). Exceptionally, vessels without engine with length of more then 6 meters. can be included.
B- Minor Gear with engine less 6 m. length	All vessels under 6 meters length provided of engine, excluded trawl
C- Minor Gear with engine between 6 to 12 m	All vessels between 6 to 12 meters length provided of engine, excluded specific gears as demersal trawl, purse seine, pelagic trawl and dredge.
D- Trawls less 12 m. length	All demersal trawl less than 12 meters. Exceptionally, trawl vessels under 6 meters can be included.
E- Trawls between 12 to 24 m	Demersal trawl between 12 to 24 meters
F- Trawls of more then 24 m	Demersal trawl with length of more than 24 meters
G- Purse Seines between 6 to 12 m	
H- Purse Seines between 12 to 24 m	Excluded Tuna Seine. Exceptionally, Purse Seines vessels of more than 24 meters, can be included
I- Long line of more than 12 m	Long line as exclusive gear more than 12 m. Exceptionally, vessels more than 24 meters, can be included
J- Pelagic Trawl	All Pelagic Trawl vessels, but normally this group is between 12 to 24m.
K- Tuna Seine	All Tuna Seine vessels
L- Dredge	All Dredge vessels. Normally this group is between 12 to 24 meters, but exceptionally dredges under 12 meters can be included.
M- Polyvalent more 12 m	All vessels with more then 12 meters, that use different gears along the year or use a gear not listed in this classification (Trawl, Pelagic Trawl, Seine, Tuna Seine, Long line and Dredge)

**DATA COLLECTION FOR THE ELABORATION OF THE ECONOMIC
INDICATORS. SAMPLING MANUAL
PROVISIONAL VERSION 1.5.2002**

**Second Workshop about Socio-economic Indicators
SCSES - SAC – CGPM
Salerno, 6 to 9th May 2002**

Ramón Franquesa

1. Introduction to the problem

The pilot studies that are being realized in order to elaborate a series of economic indicators for the Mediterranean fishing fleets are obtaining an important part of the data from inquiries.

Until now it has been employed a quite simple criteria that consisted in doing at least a sample at every port and segment, tending to look for the 10 % of the sample on the total population, but reducing this percentage in the cases of more than 50 units, so that from 5 samples it can be reduced the exigency of the 10% so the ports where exist a large number of artisanal vessels it is not necessary to obtain the 10% sample, but at least 5 cases. By the contrary, in the more important economic segments, the rate of sampling can be higher and it should tend to sample whole population.

Although this valid procedure for some first weighting-up studies, it would appear insufficient to fundament a scientifically elaboration, so, in order to pretend comparing the results from diverse regions seems necessary to establish a clear sampling methodology to avoid errors derived from a bias in the sampling process. The aim of this paper is to give simple criteria in order to solve this problem, in such a way that this is no longer a problem when developing these studies in the CGPM member countries.

2. Some statistical concepts

The sample technique allows producing information from a population, from the observation of a part of the same population. In general we suppose that we know the whole of the objective “population” of our study, as the vessels are a limited population and known through the fleet census of each country.

Any of these vessels are a **statistical unit**, an element of the studied population. We understand as the **sample** the part of the statistical units extracted from the population that we want to known some determined characteristics.

We name as **sampling rate**, to the part of the enquired universe of the population. That is the vessels enquired in relation to the total census. So it will be equal to:

$$f = \frac{n}{N}, \text{ being } n \text{ the samples and } N \text{ the population}$$

From here the observed results in the sample we pretend to extrapolate the estimations about the characteristics of the population. In our case are numerical characteristics, of the values that can took determined variables that we are going to sample.

The sampling process will bring us to obtain an estimator of those characteristics. The **estimator** is a variable that can achieve a certain number of values with a probability associated to each value. The **estimator** is then a *random variable*, with a likelihood distribution that will come from the whole of the results obtained in the sampling, which is supposed to be random.

Assure the random character (each vessel has the same probability to be interviewed) is very important. For example, if we do the interviews at some fix time, is possible that some vessels will not be interviewed if at that time they are not on port. If these vessels have a characteristic in common (employs a determined gear that ports at some other time) and not sampling them creates a **bias** in our enquiries. The results then are not going to be close to the reality that we pretend to know.

A variable will have a mean and a variance. And the **mean** is defined as:

$$\bar{Y} = \frac{1}{N} \sum_{\alpha=1}^N Y_{\alpha} \quad (1)$$

The **variance** expresses the dispersion of a variable in respects of its mean. We are defining the variance of Y as:

$$V(Y) = \frac{1}{N} \sum_{\alpha=1}^N (Y_{\alpha} - \bar{Y})^2 \quad (2)$$

The square of the variance, is the **standard deviation**, that we define as:

$$\sigma_y = \sqrt{V(Y)} \quad (3)$$

Finally we define the **coefficient of variation** as:

$$c.v. = \frac{\sigma_y}{\bar{Y}} \quad (4)$$

The interest of this magnitude is in that the numerator and in the denominator are expressed on the same units; so, the **coefficient of variation** is *adimensional* and gives an idea of the importance of the **standard deviation** respect to the **mean** (or the hope) and so the dispersal level of the distribution.

3. Criteria for evaluating a sample

From the enquiries we pretend to obtain a sample, with it we try to obtain an estimation that is in average the closest possible to the value (unknown) that we want to estimate.

During the development of the enquiry we can do two kinds of errors:

- a) Sampling errors, due to a bad design in the enquiries distribution and we have observed a non-representative part of the population.
- b) Observation errors, due to that that the enquiries have been bad developed. Maybe due to a lack of diligence of the one in charge of doing the enquiry, but maybe due to a lack of interest for the one who is answering it (or even trying to lie to the enquirer). This second type of errors can generate even bigger distortions in the results. For above this we have to control as much as we can the way in which observations are taken.

Through de sample we can know the sample mean \bar{y} of the value of a variable \bar{Y} . Obviously, we do not know the value of that variable, but if we assume that this differences have a Normal Distribution, then we can know that it is going to exist a likelihood of the 95% that the value of \bar{Y} , it is going to be delimited in the range between $\bar{y} - 2\sigma(\bar{y})$; $\bar{y} + 2\sigma(\bar{y})$.

The variance of \bar{y} when there is no reposition, that means when there is no possibility of interviewing the same vessel twice (so we are going to note in our list that a vessel is already interviewed) equals to

$$V(\bar{y}) = \left[\frac{N-n}{N-1} \right] \frac{V(Y)}{n} \quad (5)$$

By this, we want to say that the estimator variance is going to be small when the variance of the population observed is going to be small are the sample is going to be big. If $n=N$ then the variance of the sample (not the one of the population) logically it turns into cero

In terms of \bar{y} variance, precision depends essentially of the amount of units observed n , and relatively small on the sampling rate n/N .

Variance is proportional to $1/n$; the standard deviation, which permits to calculate the confidence interval, which is proportional to $1/\sqrt{n}$. This means that in order to reduce the confidence interval to a half there is the need four times more observations.

Which one is going to be the adequate number of samples? It depends on equation 5. Depending on the confidence level that we pretend to achieve we will define n . The problem is that we do not know the confidence interval until the enquiry is finished.

Doing a pilot enquiry that will allow us to determine a first approximation to the sample variance can only solve this problem. What is possible to know at the end of the enquiry is which one is the confidence level and use that information in the development of new enquiries, so we can increase the number of enquiries in those samples that showed a lower confidence interval in the past.

Even though the problem than upsets more the researchers is not achieving a determined level of confidence, but to achieve in a limited number of enquiries (due to budget reasons) the higher degree of precision in every sampling stratum. In fact, in this moment, the researchers are limited by the budget, which allows them to realize a determined number of enquiries n . So we are going to examine now how we distribute our total of n possible enquiries between the diverse stratum in which the fleet is segmented (our population universe).

With this we are introduced to another of the problems that we should face: the stratification.

4. The stratification in the data collection in a population

The population **stratification** consists in dividing it before the extraction of the sample; in homogeneous subgroups in respect to some establish a priori attributions. To these subgroups we are calling them stratum. The extraction is done in an independent way inside every stratum.

In our case, the stratification has as an objective obtaining the sufficient precision inside every stratum. The stratum are going to be every group of vessels that are in the same segment or port (LOU)¹.

The definition of stratum is based initially on a series of previous criteria. On one side the geographic (LOU) are deduced on the direct observation of which is the area and so forth, the market. This does not give big problems. On another side, fleet segmentation answers to a decision that tends to simplify notably the reality. Probable instead of the approximately 15 segments that we have been defining, we could divide these segments in more subgroups. In a while we are going to discuss about how we can look the fleet segmentation criteria from a *posteriori* statistical perspective, so that is our second criteria of stratification.

The main problem for us is to determine which is the volume of the samples that we are going to take at every stratum.

A statistical criteria is to use a constant sampling rate f for all the stratum. Even this is a little bit inadequate when the stratum have a very different universe: some vessels or even only one in some of the segments (tuna ships) and hundreds in others (artisanals).

In this case is evident that we need another criteria. One statistical solution is to use the criteria of the **Neyman's representative distribution**. This consists on respect the equality:

$$\frac{n_h}{N_h S_h} = \text{const} \tan t = \frac{n}{\sum_{h=1}^k N_h S_h} \quad (6)$$

Where we have h stratum (1,2,...k); for each h stratum the effective total is N_h ; the number of enquiries is for that stratum n_h ; and S_h is the variance estimator for the stratum h :

$$S_h^2 = \frac{1}{N_h - 1} \sum_{\alpha_h=1}^{N_h} (Y_{\alpha_h} - \bar{Y}_h)^2 \quad (7)$$

Applying the Neyman's criteria has the problem that we need to know previously to the enquiry the value of each S_h .

We have two options in order to solve this problem. On one side, we can realize a previous enquiry. Another way is to advance in a successive adjustment coming from a priori determined distribution, employing the results from the precedent enquiries to correct the next year's ones. Taking into account the budget restrictions is evident that in our case we are going to employ the second way.

¹ Local Operative Unit

5. Criteria for the stratification in the indicators studies

We cannot forget that in every enquiry (sample) due to economic reasons, we will want to take at the same time information for several variables (fishing days, costs, etc.). This will plot us more difficulties, because some kinds of samples can obtain good results for obtaining several variables, but be worst for some others. And evidently, when realizing the sampling, the estimated variances are going to be different for every variable.

From a strict point of view, we should do this valuation for every of the parameters we are trying to measure and that appear listed in table 1. Nevertheless, it is not viable and we should accept to realise our estimations about one of the variables that we considered particularly representative.

Table 1: Estimated values in each enquiry

Description of boat	Description activity	Description of Cost	Description of Catch
Gears (9 options)	Distance of port	Variable Cost (before share)	Landings in Kg.
Crew	Work time per exit	Tank Cost	Kg per moth (12)
HP	Number of exits	Daily Cost	Yearly Income
GRT	Exits per moth (12)	Yearly Cost	
Length	Exits per tank		
Value	Share		

When we design the enquiry not all the parameters should receive the same importance.

- There are some parameters that have a descriptive character and that they are not going to have a great importance when elaborating the indicators: tank dimension, number of tank way outs, price for filling the tank, fishing gears on board, monthly captures, monthly departures, monthly captures, working time, distance to the port, share.
- There are some that have a not very exact value, both in the census as said by the interviewed, like the engines horse power (HP).
- There are some more that are very relevant and that we can know previously to the enquiry thank you to the census: GRT, length
- Finally, there are other variables with great importance when elaborating the indicators and that we can do not know them alter doing the enquiries: Vessel's value, total annual sales value, costs, and crew members.

A possible way to solve this problem is to apply an analysis that considers simultaneously the behaviour of all the parameters in the enquiry when optimizing its distribution. In this kind of analysis, IREPA employs the Bethel method for the study of the Italian fishing fleet. With this method is possible to determine the size of the taken samples for each stratum considering multiple variables. The optimal distribution of the enquiries between stratum is solved by the Bethel method that uses the Kuhn-Tucker theorem and deduces the expressions for the optimal assignation in terms of Lagrange multipliers. Nevertheless, the Bethel method implies the need of employing an specific procedure in base to employ statistical programs like the SAS (from which IREPA has developed and application), but it can not be accessible to the administrations and researchers of other countries².

In my opinion the most adequate methodology for designing a simple should be that which:

- 1) Previously design an enquiry distribution between every stratum h , by fulfilling the Neyman's criteria in relation to a variable known by the census, as GRT or length.
- 2) Then the next years' enquiries distribution should be affined fulfilling the Neyman's in relation to an economical relevant variable, as the vessel value or the annual revenues.

Evidently, next can be analysed the dispersion degree in relation to other variables, which can give way to a large range of statistical studies. But in the future, the enquiries distribution criteria should be homogeneous and standardised for the CGPM country members, despite the existence of really good arguments for exceptional

² The Bethel method has been using also by the USA Agriculture Department and especially by the NOAS agency (National Agricultural Statistics Service). In annex 2 is informed of its last developments.

situations (for example, a country does not have that data on the census). We should not forget that the objective in the data collection when building the indicators is to gain the availability of some indicators that will allow us to compare the situation of several fleets and LOU. If there is not used a common method, then the benefits from comparisons are questionable.

But as long as there is access to an accessible enlargement of this manual, when applying multivariate methods and in particular the Bethel one, then would be suitable that in next periods this method would be applied in order to redistribute the next years enquiries for optimizing the sampling outcomes.

In any case there should be maintained the same criteria that adopted at the beginning of the indicator studies:

- a. Do at least one sample for every port and segment.
- b. Tend to look in the simple for the 10% of the total population.
- c. Reducing this percentage in the cases of more than 50 units, so that from 5 samples it can be reduced the exigency of the 10% so the ports where exist a large number of artisanal vessels it is not necessary to obtain the 10% sample, but at least 5 case.
- d. By the contrary, in the more important economic segments, the rate of sampling can be higher and it should tend to sample whole population.

These criteria must adjust to a distribution process of previous design in order to fulfil the Neyman's criteria in relation to a variable known through the census.

Then, for the next years, can be used the results in order to correct the distributions in function to fulfil the Neyman's criteria in relation to an economic relevant variable obtained in the samples.

Once that in every study zone we have establish an enquiries distribution between the segments, it is still remaining to assure another aspect.

The data collection on every stratum must be as random as possible. From a theoretical "of manual" point of view", it must be raffled from the fleet census the vessels we should inquire at every place. So, technically, it can be assigned a number to each vessel and do a raffle o take a list of the census and select one for each ten, etc.

Nevertheless, the practical process of sampling in the coast is, as well known, quite complex. The vessels are not always in the port, and if they are maybe the fishermen are not there, and even if both, vessels and fishermen, are, fishermen will not always have the time to answer. On the other hand, the enquirer has an important expense on travelling and normally will have little time at every port in order to do the enquiries. It is not possible to be fixed to an enquiring program that implies waiting for days until the coming back of a vessel in order to enquirer it then. So forth, it is unavoidable a certain degree of freedom. Those who direct the sampling must establish a distribution of the samples between the stratums from "the office" and then control that in the field, are avoid any kind of bias during the development of the enquiries thanks to its common sense. Probably from the application of the collective work of those enquiries, we can obtain some experiences that may do our job a little bit easier.

Let me summarise some of the things we have learnt from the enquiry's realization process:

- Is easier to obtain answers at the return to the activity while selling or when it is already sold, than before going to fish, as in that moment fishermen are upset in preparing the vessel and leave fast.
- In Spain we have realised that the best time is on Friday, as on that day fishermen go to the cofradia in order to get paid for the weekly activity and there is some spare time at the bar when waiting for the liquidations, etc.
- The bad weather days are very good ones for having some time at the bar, so, those days are "good" days for the economists to go to the port to get some information.
- We also know that it is not good to start asking for the revenues, but be very detailed on the expenses and the description of the activity and only asking for the revenues in an indirect way asking them for the success that they have achieved in the market with its product.
- It is much easy to obtain right answers from the skipowners than the employees, from the younger than the older people (even though these are the ones that normally will have more spare time).

- It may also be useful to make the enquiries more precise the presence of several people from the same vessel or interview simultaneously several skipowners from the same port around a bar table.
- We know that we must appear as a fishery researcher and nothing similar to an administration fiscal institution, etc.

We hope than with the help of all of us we are going to be able to improve with our experience a series of criteria in order to do this work more effective.

There is one last criterion that we must hold. Unless that exists very good reasons (know that data are nearly all false due to any reason), we must hold on the data systematically compiled by the administration rather than the ones given by the memory of the fishermen. This tries to say that in those countries where the data from the census are right, like GRT; length, etc. can be directly taken from the census. On the same way, the European Union countries that enforce the selling notes laws, the information about revenues and catches must be taken from these notes and not from the enquiries.

In the process of using the data we must assure the statistical secret. Naturally in the analysis process we must individualise the data, for example in order to adjust the answers to the census data of each vessel or to the selling bills. But when we arrive to the publication of the results we should never present them in a way that it can be individualised to a vessel. Due to legal reasons, but also because it can mean depleting the data source. Special attention must be put in those cases where a stratum is composed of a small number of vessels. On an extreme case, when a segment is composed by only one vessel, then we can publish the indicators, but not the data used to build them. In its place we must aggregate the cases or present the results in graphs, etc.

6. An example of samples distribution analysis

We are next presenting a practical application of how can we apply the Neyman's Coefficient in order to examine the samples distribution *a posteriori* effect between stratum, taking the Gabes Gulf the case study as an example ³.

In the Tunis case, a total of 149 enquiries to vessels were performed, from a universe of 2739 vessels. These enquiries were distributed among a total of 33 segments. The sampling rate was the 0.054. The sampling rates for each stratum are given at attached the table 2.

Let's take a look on how can we adjust the enquiries distribution in every stratum taking into account the vessel's value and the landings value. From the results obtained in the enquiries we pass to calculate the value of the coefficient (equation 6), for this we need to know each stratum: N (population dimension), n (number of enquiries), summation of the quadratic difference of the sample with the mean, S (estimated variance). On the next table we collect these values for the variables **vessel's value** and the **landings value**. With them we can find the value of the Neyman's Coefficient for each variable and stratum.

The stratum are named by a number that represents the fleet segment and a letter that represents the port: G (Gabès), J (Djerba), K (Kerkennah), M (El Mahres), S (Sfax), H (Skhira), R (Zarrat) y Z (Zarzis).

In table 3 we present the results obtained from this estimation, employing equation 7 in order to obtain the estimated variable, and equation 6 to obtain the Neyman's Coefficient for every stratum and variable: Vessel Value (VV) and Landings Value (LV).

On the next page we can observe graph 1, where we represent the results obtained for every stratum and variable. In the graph is traced the line of the coefficient mean of each variable, with the colour of its column. As we already commented before, the sampling distribution is going to be optimal when in every stratum the coefficient is similar. Increasing the number of samples on a stratum we increase the coefficient value and diminishing the number of samples we diminish the coefficient value.

We can see as in some cases the value of the coefficient is quite close to the variable Vessel Value (VV) and Landings Value (LV), in others differs notably. This implies that if, for example in the case R9, we diminish the number of samples, because the VV coefficient is higher than the mean, we find that when diminishing the samples the coefficient for the LV variable, which is already in case R9 under the mean, will also diminish.

³ Scander Ben Salem, Dr. Ramon Franquesa, Pr. Amor El Abed, Indicadores socioeconómicos para la pesca en el Golfo de Gabès (Túnez). Estudio de caso, INSTM, FAO-COPEMED 15 de Marzo 2002

For other cases we can clearly observe how there are some cases insufficiently sampled, as are J9, S3, Z8, etc. And in comparison, exist other cases that are excessively sampled as G2, K2, S2, etc. It is in these cases is shown that we must make a redistribution of the samples between them.

Table 2: Population, Enquiries and Sampling Rates. Gabes Golf Study

<i>Number of samples by segment and area</i>								
Port	2. Multipurpose minor	3. Bottom Trawler	4. Little Trawler	5. Middle Purse Seine	6. Little Purse Seine	8. Multipurpose OnS, medium	9. Multipurpose OnS, largest	TOTAL
Sfax	3	29	11			6	8	57
El Mahres					3	2	2	7
Skhira					3	4	1	8
Kerkennah	3					12	3	18
Gabès	2			2	5	3	3	15
Zarrat					6	1	4	11
Djerba	3				1	7	3	14
Zarzis	2	1	1	2	5	3	5	19
TOTAL	13	30	12	4	23	38	29	149
<i>Number of boats by segment and area</i>								
Port	2. Multipurpose minor	3. Bottom Trawler	4. Little Trawler	5. Middle Purse Seine	6. Little Purse Seine	8. Multipurpose OnS, medium	9. Multipurpose OnS, largest	Total
Sfax	17	207	52			439	114	829
El Mahres					12	62	23	97
Skhira					16	54	23	93
Kerkennah	40					328	32	400
Gabès	14			7	37	77	41	176
Zarrat					17	4	40	61
Djerba	124				3	231	73	431
Zarzis	92	2	3	8	23	309	215	652
TOTAL	287	209	55	15	108	1504	561	2739
<i>Sample Rate</i>								
Port	2. Multipurpose minor	3. Bottom Trawler	4. Little Trawler	5. Middle Purse Seine	6. Little Purse Seine	8. Multipurpose OnS, medium	9. Multipurpose OnS, largest	Total
Sfax	0.176	0.140	0.212			0.014	0.070	0.069
El Mahres					0.250	0.032	0.087	0.072
Skhira					0.188	0.074	0.043	0.086
Kerkennah	0.075					0.037	0.094	0.045
Gabès	0.143			0.286	0.135	0.039	0.073	0.085
Zarrat					0.353	0.250	0.100	0.180
Djerba	0.024				0.333	0.030	0.041	0.032
Zarzis	0.022	0.500	0.333	0.250	0.217	0.010	0.023	0.029
TOTAL	0.045	0.144	0.218	0.267	0.213	0.025	0.052	0.054

Let's observe that when on a stratum there is only one simple, obviously the coefficient is zero. Like an example J6, H9, R8. In order to compare these strata we must go to the aggregated comparison of the fleet segments in order to know if they are enough homogeneous between them.

Table 3: Calculation of Neyman Coefficient by Stratum

Stratum	N	N	Vessel value			Landings value			
			sumqdr	S	Neyman	sumqdr	S	Neyman	
G2	14	2	12,500,000		981	0.000146	15,125,000	1,079	0.000132
G5	7	2	1,250,000,000	14,434	0.000020		50,000,000	2,887	0.000099
G6	37	5	2,720,000,000	8,692	0.000016		12,770,000,000	18,834	0.000007
G8	77	3	20,666,667	521	0.000075		1,378,291,667	4,259	0.000009
G9	41	3	134,000,000	1,830	0.000040		64,500,000	1,270	0.000058
J2	124	3	126,000,000	1,012	0.000024		25,626,667	456	0.000053
J6	3	1	0	0	0.000000		0	0	0.000000
J8	231	7	283,248,571	1,110	0.000027		597,812,143	1,612	0.000019
J9	73	3	614,000,000	2,920	0.000014		1,006,506,667	3,739	0.000011
K2	40	3	6,500,000	408	0.000184		4,186,667	328	0.000229
K8	328	12	908,250,000	1,667	0.000022		1,164,416,667	1,887	0.000019
K9	32	3	216,666,667	2,644	0.000035		13,740,000	666	0.000141
M6	12	3	3,532,666,667	17,921	0.000014		84,666,667	2,774	0.000090
M8	62	2	0	0	0.000000		32,000,000	724	0.000045
M9	23	2	32,000,000	1,206	0.000072		91,125,000	2,035	0.000043
S2	17	3	86,000,000	2,318	0.000076		74,853,600	2,163	0.000082
S3	207	29	215,584,166,667	32,350	0.000004		331,699,820,030	40,127	0.000003
S4	52	11	11,090,000,000	14,746	0.000014		28,507,180,000	23,642	0.000009
S8	439	6	70,833,333	402	0.000034		47,230,083	328	0.000042
S9	114	8	1,600,000,000	3,763	0.000019		317,602,400	1,676	0.000042
H6	16	3	2,646,000,000	13,282	0.000014		2,660,666,667	13,318	0.000014
H8	54	4	206,187,500	1,972	0.000038		951,240,000	4,236	0.000017
H9	23	1	0	0	0.000000		0	0	0.000000
R6	17	6	21,330,833,333	36,513	0.000010		9,455,298,441	24,310	0.000015
R8	4	1	0	0	0.000000		0	0	0.000000
R9	40	4	41,000,000	1,025	0.000098		224,010,000	2,397	0.000042
Z2	92	2	12,500,000	371	0.000059		36,808,200	636	0.000034
Z3	2	1	0	0	0.000000		0	0	0.000000
Z4	3	1	0	0	0.000000		0	0	0.000000
Z5	8	2	12,800,000,000	42,762	0.000006		266,805,000	6,174	0.000040
Z6	23	5	4,790,800,000	14,757	0.000015		5,211,457,920	15,391	0.000014
Z8	309	3	248,000,000	897	0.000011		358,166,667	1,078	0.000009
Z9	215	5	156,528,000	855	0.000027		5,137,782,080	4,900	0.000005
SUM	2739	149	2.80519E+11	221,359	0.001112		4.02247E+11	182,927	0.001323
Average					0.000038				0.000046

In table 4 we present the analysis of the Neyman's Coefficient on an aggregated level, and in on the graphic 2 we represent these results. From this results we can deduce that the fleet segments 8 and 9 are relative well represented don a global level, even that on an individual level we cannot know its coefficient as being sampled only once in the Skhira and Zarrat ports respectively.

Neyman Coeficent by Stractus

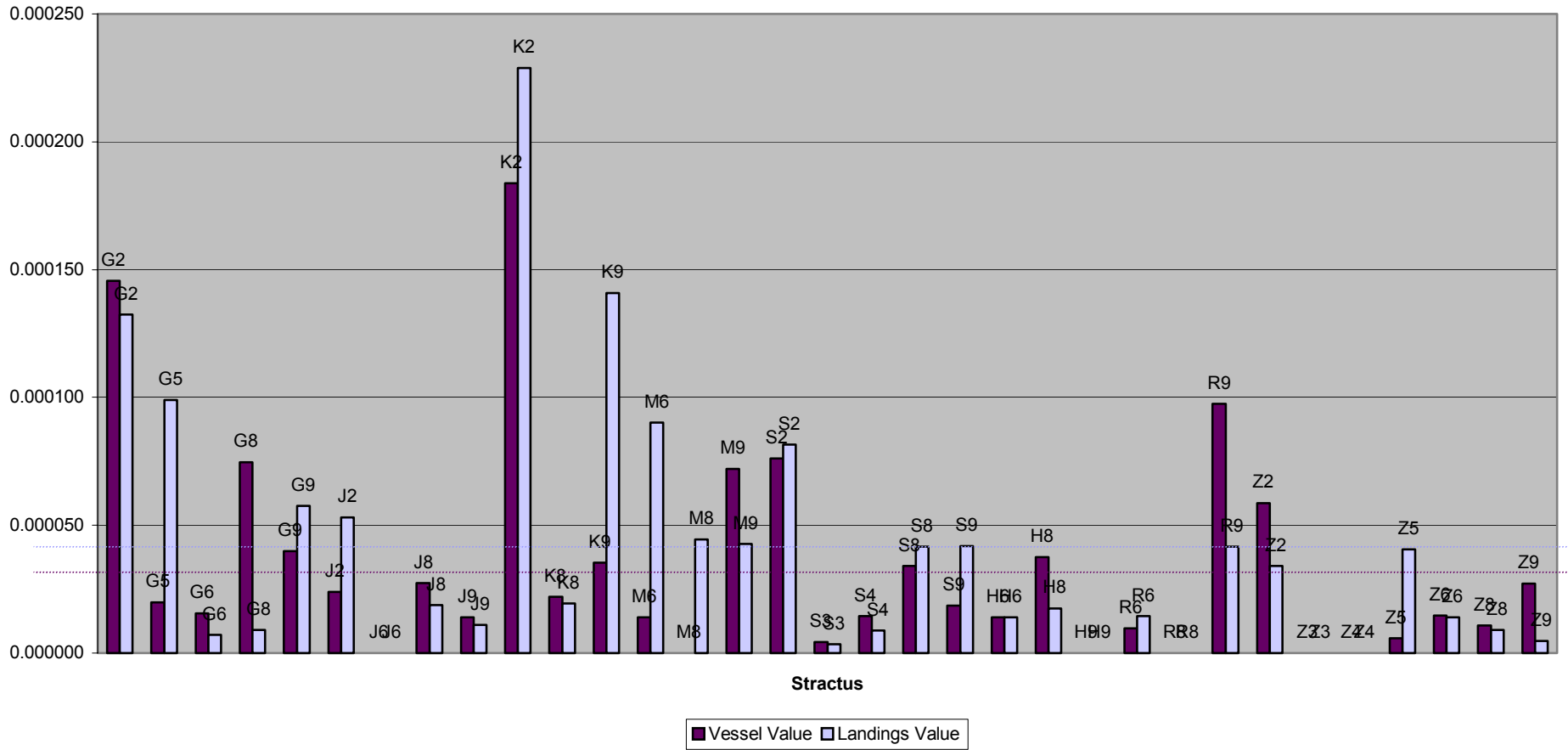
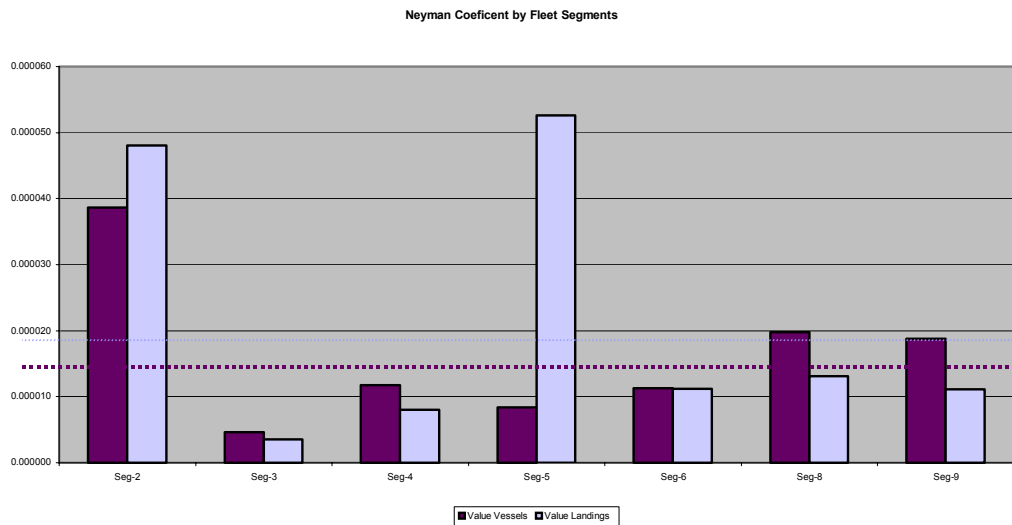


Table 4: Calculation of Neyman's Coefficient by Aggregated Segments

Segment	N	n	Vessel value			Landings value		
			sumqdr	S	Neyman	sumqdr	S	Neyman
Seg-2	287	13	393,230,769	1,173	0.000039	253,853,908	942	0.000048
Seg-3	209	30	197,684,166,667	30,829	0.000005	334,249,844,030	40,087	0.000004
Seg-4	55	12	18,625,000,000	18,572	0.000012	40,030,096,667	27,227	0.000008
Seg-5	15	4	14,075,000,000	31,707	0.000008	359,707,500	5,069	0.000053
Seg-6	108	23	37,955,826,087	18,834	0.000011	38,403,178,476	18,945	0.000011
Seg-8	1504	38	2,447,913,947	1,276	0.000020	5,530,407,834	1,918	0.000013
Seg-9	561	29	4,255,249,655	2,757	0.000019	12,028,484,855	4,635	0.000011
SUM	2739	149	2.75436E+11	105,147	0.000113	4.30856E+11	98,823	0.000148
Average					0.000014			0.000018



As it can be expected, we can also observe how in an aggregated degree, except for segment number 3 that is low sampled, and for the number 2 that is “oversampled”, there is a greater closeness the medium value of the Neyman's coefficient.

7. An example of sampling reliability analysis

Once the enquiry is done, we can also know with a certain degree of likelihood, which is the possible dispersion margin of the population.

As we already explained in point 2, the normal law tell us that exists a likelihood of the 95% that the \bar{Y} value is going to be on the range determined between $\bar{y} - 2\sigma(\bar{y}); \bar{y} + 2\sigma(\bar{y})$. So, if we calculate the estimated variance through the equations 2 and 3, we can know the dispersion margin of the simple observed mean and at the same time establish which one is the dispersion percentage presented.

Once more, taking again the Tunis study case, we can do an example of exercise. On the next tables we are presenting the results of the estimations.

Stratum	N	Vessel value						Landings value					
		Sum	sumqdr	average	min.	max.	%	sum	sumqdr	average	min.	max.	%
G2	2	15,000	12,500,000	7,500	5,732	9,268	24%	9,500	15,125,000	4,750	2,805	6,695	41%
G5	2	550,000	1,250,000,000	275,000	257,322	292,678	6%	310,000	50,000,000	155,000	151,464	158,536	2%
G6	5	520,000	2,720,000,000	104,000	93,569	114,431	10%	570,000	12,770,000,000	114,000	91,399	136,601	20%
G8	3	94,000	20,666,667	31,333	29,818	32,849	5%	78,250	1,378,291,667	26,083	13,708	38,458	47%
G9	3	99,000	134,000,000	33,000	29,141	36,859	12%	52,500	64,500,000	17,500	14,823	20,177	15%
J2	3	45,000	126,000,000	15,000	11,258	18,742	25%	32,800	25,626,667	10,933	9,246	12,621	15%
J6	1	130,000	0	130,000	130,000	130,000	0%	107,000	0	107,000	107,000	107,000	0%
J8	7	146,200	283,248,571	20,886	18,481	23,290	12%	158,850	597,812,143	22,693	19,200	26,186	15%
J9	3	99,000	614,000,000	33,000	24,740	41,260	25%	72,400	1,006,506,667	24,133	13,558	34,708	44%
K2	3	28,500	6,500,000	9,500	8,650	10,350	9%	15,800	4,186,667	5,267	4,585	5,949	13%
K8	12	315,000	908,250,000	26,250	23,739	28,761	10%	207,400	1,164,416,667	17,283	14,440	20,127	16%
K9	3	130,000	216,666,667	43,333	38,427	48,240	11%	48,900	13,740,000	16,300	15,064	17,536	8%
M6	3	337,000	3,532,666,667	112,333	92,521	132,145	18%	211,000	84,666,667	70,333	67,266	73,400	4%
M8	2	50,000	0	25,000	25,000	25,000	0%	32,000	32,000,000	16,000	13,172	18,828	18%
M9	2	72,000	32,000,000	36,000	33,172	38,828	8%	47,500	91,125,000	23,750	18,977	28,523	20%
S2	3	33,000	86,000,000	11,000	7,909	14,091	28%	22,920	74,853,600	7,640	4,756	10,524	38%
S3	29	11,465,000	215,584,166,667	395,345	379,334	411,356	4%	6,809,490	331,699,820,030	234,810	214,950	254,670	8%
S4	11	2,610,000	11,090,000,000	237,273	227,699	246,846	4%	1,400,000	28,507,180,000	127,273	111,924	142,622	12%
S8	6	205,000	70,833,333	34,167	32,764	35,569	4%	65,810	47,230,083	10,968	9,823	12,114	10%
S9	8	360,000	1,600,000,000	45,000	40,000	50,000	11%	145,440	317,602,400	18,180	15,952	20,408	12%
H6	3	252,000	2,646,000,000	84,000	66,854	101,146	20%	167,000	2,660,666,667	55,667	38,473	72,861	31%
H8	4	92,500	206,187,500	23,125	19,535	26,715	16%	94,800	951,240,000	23,700	15,989	31,411	33%
H9	1	20,000	0	20,000	20,000	20,000	0%	30,000	0	30,000	30,000	30,000	0%
R6	6	653,000	21,330,833,333	108,833	84,492	133,175	22%	492,193	9,455,298,441	82,032	65,826	98,239	20%
R8	1	30,000	0	30,000	30,000	30,000	0%	13,600	0	13,600	13,600	13,600	0%
R9	4	106,000	41,000,000	26,500	24,899	28,101	6%	63,800	224,010,000	15,950	12,208	19,692	23%
Z2	2	35,000	12,500,000	17,500	15,732	19,268	10%	23,420	36,808,200	11,710	8,677	14,743	26%
Z3	1	400,000	0	400,000	400,000	400,000	0%	281,000	0	281,000	281,000	281,000	0%
Z4	1	170,000	0	170,000	170,000	170,000	0%	190,000	0	190,000	190,000	190,000	0%
Z5	2	560,000	12,800,000,000	280,000	223,431	336,569	20%	323,100	266,805,000	161,550	153,383	169,717	5%
Z6	5	594,000	4,790,800,000	118,800	104,957	132,643	12%	388,320	5,211,457,920	77,664	63,226	92,102	19%
Z8	3	84,000	248,000,000	28,000	22,751	33,249	19%	81,500	358,166,667	27,167	20,858	33,475	23%
Z9	5	186,900	156,528,000	37,380	34,878	39,882	7%	267,260	5,137,782,080	53,452	39,116	67,788	27%
Total	149	20,487,100	280,519,347,405	137,497	133,943	141,052	3%	12,813,553	402,246,918,230	85,997	81,740	90,254	5%

Table 5: Calculation of % of dispersion of average estimated for 95% of reliability by Stratums (Previous page)

Stratum	n	Vessel value						Landings value					
		sum	sumqdr	average	min.	max.	%	sumqdr	average	min.	max	%	
Seg-2	13	156,500	393,230,769	12,038	10,513	13,564	13%	104,440	253,853,908	8,034	6,808	9,259	15%
Seg-3	30	11,615,000	197,684,166,667	387,167	372,346	401,987	4%	6,845,490	334,249,844,030	228,183	208,912	247,454	8%
Seg-4	12	3,030,000	18,625,000,000	252,500	241,127	263,873	5%	1,835,000	40,030,096,667	152,917	136,244	169,590	11%
Seg-5	4	1,110,000	14,075,000,000	277,500	247,840	307,160	11%	633,100	359,707,500	158,275	153,534	163,016	3%
Seg-6	23	2,486,000	37,955,826,087	108,087	99,616	116,558	8%	1,935,513	38,403,178,476	84,153	75,632	92,673	10%
Seg-8	38	1,016,700	2,447,913,947	26,755	25,453	28,057	5%	732,210	5,530,407,834	19,269	17,312	21,226	10%
Seg-9	29	1,072,900	4,255,249,655	36,997	34,747	39,246	6%	727,800	12,028,484,855	25,097	21,315	28,878	15%
Total	149	20,487,100	275,436,387,125	137,497	133,975	141,020	3%	12,813,553	430,855,573,270	85,997	81,592	90,402	5%

Table 6: Calculation of % of dispersion of average estimated for 95% of reliability. Segmentation by Fleets

From the previous tables it can be observed, that as we were expecting exists a higher trust grade in the case of fleet segmentation than in stratum segmentation. And even more in the dispersion for the VV variable than in the LV variable, which evidently is affected by the irregularity of the captures, while the value of the investments tends to lower degree of dispersion between the different examined units.

In fact, this exam, apart from telling us the level of closeness to the reality with a likelihood of the 95 %, it is also useful for examining the consistency of the established segmentations.

Effectively, a high variability degree about the mean, will indicate us that in this case the reality is diverse and so a segment with a high level of variability, even we increase the level of sampling is a segment very little homogeneous. That will indicate us the convenience of making subdivisions.

In the examined case, we can observe that for big samples, the degree of variability is under the 15%, which is very acceptable. Even though, when we go under to the stratum level (for each port) that variability increases (as the sample is more reduced) in some cases to the 40%. Even this, the majority is under the 20%, which indicates a high degree of acceptability in the established segments.

References:

R.. Clairin, P. Brion, *Manuel de Sondages*, CEPED, Paris, 1997.

Bethel, J. (1989) *Sample allocation in Multivariate Surveys*, Survey Methodology, June 1989, vol. 15 n. 1, pp 47-57

Scander Ben Salem, Dr. Ramon Franquesa, Pr. Amor El Abed, Indicadores socioeconómicos para la pesca en el Golfo de Gabès (Túnez). Estudio de caso, INSTM, FAO-COPEMED 15 de Marzo 2002

J.J. Sánchez Carrion, manual d análisis estadístico de los datos, Alianza Editorial, Madrid, 1999.

James Stevens. Mahwah, N.J *Applied multivariate statistics for the social sciences*. 4th ed. -. Lawrence Erlbaum Associates, 2002, 699 p. + 1 CD-ROM. ISBN 0-8058-3776-0

Appendix 1: Sample enquiry



FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS
Rome, Italy

DEPARTEMENT
FIPP

Etude de faisabilité pour l'établissement d'une banque de données sur les indicateurs socio-économiques de la pêche dans la mer d'Alboran
Questionner pour Maroc

A) données techniques des bateaux

- Nom et matricule du bateau
- nombre de marins à bord (en général)
- longueur du bateau (mètre)
- Quels sont les engins à bord
- Chalut (C), Senne Tournante (ST), Filet Maillant Dérivant (FMD), Trémail (T), Palangre de Surface (PS), Palangre de fond (PF), Autres (AU),
- Puissance en CV
- TJB
- Quelle est la distance maximale habituellement atteinte à partir de la côte (milles)
- Nombre d'heures de travail par sortie (en comptant les heures de travail dans le port, dans le marché et au
- Nombre de sortie (de fois) à la mer par mois
- Si ce nombre est différent pour chaque mois, quel est le nombre de sortie approximatif par mois durant toute l'année

Jan	Fe	Ma	Av	Mai	Jun	Jul	Ao	Se	Oct	No	Dec
	v	r	r				û	p		v	
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

B) Données sur les coûts

- Après la vente, quelles sont les choses déduites avant la distribution des parts: Essence (E), aliments (A), Glace (GL), Appât(C), Lubrifiants (L)
- Quel est le pourcentage de la part de l'équipage, en incluant le propriétaire s heure
- Quel est le coût d'un plein de gasoil
- Combien de sorties peut assurer un plein de
- Quel son les depesse par jour (par sortie) de pêche, dehors de l'essence, en choses com:
Appât

Aliments Lubrifiant

- Quelle est la valeur de votre bateau en leur état actuelle, en comptant les équipements (engins, radar, électronique, etc.), quelle est la valeur approximative ans.
- Quel est le coût annuel pour maintenir le bateau opérative (assurance, poste au port, licences, papiers, changement des anciens a

De ça, quel est le coût annuel de l'assurance.

- Quel est le coût de la glace pour une tonne de poisson débarquée

C) données sur les débarquements

- approximativement, combien de kilos est débarqué chaque mois, si ces débarquements connaissent une grande variation dans l'année, indiquer l'évolution approximative dans le tableau ci-dessous

Jan	Fe v	Ma r	Av r	Ma i	Jun	Jul	Ao û	Se p	Oct	No v	Dec

- Valeur de la totalité des ventes pour l'année précédente

Nom de l'enquêteur: Port Date de l'enquête:

Appendix 2**Complete and Document the Sample Allocation Program Developed for and Used
by the Sample Design Section****National Agricultural Statistics Service (NOAS) of Agriculture Dept of USA**

Based essentially on the methods used in the PASCAL program that James Bethel wrote for the Sample Design Section in 1985, section staff recently wrote an optimum sample allocation program in SAS that is currently being used operationally. This SAS program contains several additional features which the PASCAL program did not have. It is capable of finding the optimum allocation for a sample for which population totals, population means, and ratios estimators are used.

Research is being conducted in cooperation with the Sample Design Section to improve the allocation program. Research is also being conducted to assess the importance of a simplifying assumption with the integrated surveys to overcome a technical difficulty arising from the multivariate nature of the allocation problem. The results of this assessment will constitute the second chapter of the documentation of the allocation program. The results of research in deriving an optimum sample allocation for the linear models used in objective yield surveys will form the basis of the third chapter in the documentation. The fourth chapter will be a user's guide for the allocation program.

Important progress was made during 1998 in solving the problem of finding the optimum sample size for an objective yield survey, given the spatial partitioning of the objective yield region. The next step will be to derive an algorithm, like Chromy's or Bethel's, to generate a numerical solution. Once the algorithm is found and implemented into the SAS program, the documentation of the optimum sample allocation program will resume.

<http://www.nass.usda.gov/research/>

MANUAL OF FISHERIES SAMPLING SURVEYS

**METHODOLOGIES FOR ESTIMATIONS OF SOCIO-
ECONOMIC INDICATORS IN THE MEDITERRANEAN SEA**



Irepa Onlus

Istituto Ricerche Economiche Pesca e Acquacoltura

I DRAFT

May 2002

Working Group on socio-economic indicators (WGSEI)

CONTENTS

1. Introduction

- 1.1 Socio-economic indicators
- 1.2 Study of the existing situation
- 1.3 Geographical and technical fleet segmentation
- 1.3 The scope of this manual

2. Population and sampling

- 2.1 Potential methods for data collection
- 2.2 Advantages of sampling methods
- 2.3 Some statistical terms
 - 2.3.1 Mean
 - 2.3.2 Variance and standard deviation
 - 2.3.3 Normal distribution and confidence limits
- 2.4 The role of sampling theory
- 2.5 Probability sampling
- 2.6 Alternatives to probability sampling
- 2.7 Bias and its effects

3. The principal steps in a sample survey

- 3.1 Objectives of the survey
- 3.2 Population to be sampled
- 3.3 Data to be collected
- 3.4 Degree of precision desired
- 3.5 The questionnaire and the choice of the data collectors
- 3.6 The frame
- 3.7 Selection of the sample
- 3.7 The pre-test
- 3.8 Organisation of the field work
- 3.9 Summary and analysis of the data
- 3.10 Information gained for future surveys

4. Survey methods and questionnaire design

4.1 Simple random sampling

4.2 Stratified random sampling

4.3 The estimation of sample size and allocation across strata

4.3.1 Sample size with more than one item

4.4 Estimation of parameters

4.5 Sources of error in surveys

4.5.1 Sampling errors

4.5.2 Effects of non-response

5. References consulted**APPENDIX A – Survey questionnaire on socio-economic data****APPENDIX B – Implementation of the Bethel method (SAS ® HML)****APPENDIX C – Optimal sample size and the differences between Neyman
and Bethel methods – an example**

1. Introduction

1.1 *Socio-economic indicators*

Indicators are data or combination of data collected and processed for a clearly defined analytical or policy purpose. That purpose should be explicitly specified and taken into account when interpreting the value of an indicator. Fisheries indicators should provide practical and cost-effective means for the evaluation of the state and the development of fisheries systems and the effects that policy changes have on those systems.

The importance attached to socio-economic information on the fisheries sector has greatly increased for several years. Most bodies ask themselves what information they should be collecting in order to establish indicators which are representative of the sector.

Most effort to date has been on developing indicators related to the ecological sustainability of fishery systems. There is a large and established literature on the use of a wide range of indicators to assess the relative abundance and health of individual fish stocks. This is done through such concepts as target and limit reference points, biomass indexes, fishing mortality and effort measures, and so on. In the meantime, relatively little attention has been paid to the set of potential indicators that could be used to assess the economic and social aspects of fisheries and the interaction with the pursuit of sustainable development objectives. The growing demand for social and economic indicators from policy makers is a result of this perceived imbalance.

Indicators are not an end in themselves. They are a tool to help make clear assessments of and comparisons between fisheries, through time. They describe in simple terms the extent to which the objectives set for sustainable development are being achieved. The main purpose in developing a set of sustainability indicators is to assist in assessing the performance of fisheries policy and management and to stimulate action to better pursue sustainability objectives.

1.2 *Study of the existing situation*

At its 83rd session on 7-9 April 1999 the **OECD** Committee for fisheries decided, as a part of its Programme of Work 2000-2002, to conduct a study on Fisheries Sustainability Indicators. The study “will seek to develop fisheries social and economic indicators to be used as tools in policy analysis” [AGR/FI/M(99)1].

At its 85th session on 20-22 March 2000 the Committee agreed that: “the overall goal for this Study should be to contribute to improvement in the measurement of economic and social dimensions of sustainable development of fisheries, and where possible, relate these to the resource and environmental dimensions”.

The Spanish and Italian representatives (among others) have given progress reports on their work on this subject. The document presented by Spain is a sub-set of another document presented in the context of the GFCM, mentioned below. This paper includes a general discussion of the use of indicators, the relationship between economic and environmental indicators and the requirements to be fulfilled for indicators to be useful management instruments. Several methodological and data difficulties have arisen during this project.

Italy's document, entitled “Italian Fisheries: Implementation of a Monitoring System for Techno-Economic Data and the Evaluation of Socio-economic Parameters. Part I – Methodology” [AGR/FI(2001)xx] describes the new survey methodology to be used in fisheries data collection in Italy. A second paper is envisaged to present and discuss empirical findings.

The **European Commission (Fisheries DG and Eurostat)** has been pursuing work and studies to improve knowledge of the sector for several years.

The Scientific, Technical and Economic Committee for Fisheries (STECF) issues useful proposals for managing the Common Fisheries Policy. Annex IV to Council Regulation (EC) No 1543/2000 of 29 June 2000 establishing a Community framework for the collection and management of the data needed to conduct the common fisheries policy, the detailed rules for the application of which are laid down in

Commission Regulation N° 1639/2001 of 25 July 2001, also sets out a list of (socio-)economic indicators drawn up by this Committee.

The document entitled "STECF needs for socio-economic indicators" presents a general set of economic and social fisheries stability indicators. The underlying notion is that to be economically and socially sustainable a fishery must be capable of being exploited profitably at some biologically sustainable level. The purpose of indicators must therefore be to show whether a fishery is currently sustainable, economically, socially, and biologically, and if not whether it is capable of being exploited sustainably at all and if so at what levels of capital, and labour employed and of fish stock.

To support the implementation of the Code of Conduct for Responsible Fisheries, the **FAO** has published a document addressed to all parties concerned by the sustainable development of fisheries. Entitled "Indicators for sustainable development of marine capture fisheries" this document, is part of the "FAO Technical Guidelines for Responsible Fisheries No 8, Rome, FAO, 1999, 68p". These guidelines provide general information on the issue of sustainable development focusing on a system of indicators, called the Sustainable Development Reference System (SDRS).

The definition of sustainable development adopted by FAO can be considered a very general framework for fisheries sustainable development. This definition establishes five main components: the multiple resource in its environment; social and economic human needs; the technology; and the institutions. While the first two must be conserved, the others need to be respectively satisfied, controlled and established through the general management process. The guidelines also provide information on the type of indicators and related reference points needed. However, it is recognized that it is difficult to generalize, and that there is a need to agree on common conventions for the purpose of joint reporting at national, regional and global level, particularly in relation to international fisheries, or transboundary resources.

Taking into consideration the conclusions reached at the meeting of the former Working Party on Fishery Statistics and Economics of the General Fisheries Commission for the Mediterranean (**GFCM**), the newly established Scientific Advisory Committee (SAC) of the GFCM invited its Subcommittee on Social Science to initiate work to set up a database on socio-economic indicators. It recommended to start with a pilot assessment study for a management unit. The Alboran Sea was chosen for the pilot study as it encompasses stocks shared between a developing (Morocco) and a developed (Spain) country, as well as a wide range of fishing operations typical of what can be found elsewhere in the Mediterranean. This would allow elaboration of a socio-economic indicator methodology that would be applicable across each of the GFCM management units and the Mediterranean as a whole.

In 2001, the GFCM published a "Feasibility assessment for a database on socio-economic indicators for Mediterranean fisheries" (Studies and Reviews N° 71). This represents the outcome of the above pilot study on compiling socio-economic indicators initiated by the GFCM's Subcommittee on Social Sciences (Scientific Advisory Committee).

Based on the same methodology this pilot study is being followed by a study on the Gulf of Gabès (Tunisia) fisheries. It is also likely that similar work is going to be organised for the Adriatic Sea fisheries (through the ADRIAMED project).

The Working Group on socio-economic indicators (WGSEI, Salerno 11-13 March 2002) reviewed four studies which have been launched during the intersession. They cover respectively: the Gulf of Gabès (Tunisia); the Adriatic Sea; the Tyrrhenian Sea; and the Gulf of Lion (France). In this respect, the WGSEI reiterated the importance of defining Local Operational Units (LOUs: fleet segments/ports) and recommended the formal adoption of this concept. The WGSEI adopted 3 basic social indicators (average age of fishers; length of activity; share in capital structure) and recommended to pursue works toward identifying other basic social indicators at the level of each GFCM geographical area.

1.3 Geographical and technical fleet segmentation

One important consideration in the development of indicators is selection of the geographical "units" for which indicators will be reported. These units should reflect the geographic scale of ecological processes that reasonably define ecosystem boundaries (recognising that boundaries are always open for aquatic ecosystems), fishery resources and fishing activity, and political jurisdictions. While commitments have been made for national reporting, units at a regional scale (either within a nation or for shared resources of several nations) will be more appropriate in some cases. It may be useful to have indicators at finer scales (e.g. individual fisheries or sub-national regions).

Moreover, the economic indicators should complement the tools used in biological assessment of resources, to clarify the consequences for society of resource degradation. The decision-maker's regulations (on fishing schedules, licenses, taxes, etc.) are usually aimed at specific fleet groups. Therefore, a proper fleet segmentation is essential in the construction of indicators.

Management authority regulations (on fishing schedules, licenses, taxes, etc.) are normally binding upon specific fleet groups. That is why a correct fleet segmentation is essential in the construction of the indicators; otherwise they would prove useless. The vessel categories should be flexible enough to cover the whole of the fishing fleet operating in the Mediterranean Sea. At the same time, however, they should be precise enough to yield operative (meaningful) answers to the management units. For this reason the concept of "Operating Unit" has been developed.

In the Mediterranean Sea context, an important issue was to reach agreement on the number of segments that should be established. The Working Group on socio-economic indicators (WGSEI, Salerno 11-13 March 2002) reviewed in detail various possible fleet segmentation frames (i.e., from : IREPA; AER; U.E (Regulation No 1639/2001)/EUROSTAT/STEFEC), and from the SCESS pilot study on the Alboran Sea). It concluded that these segmentations could be harmonized taking as reference the E.U segmentation. On this basis, the Group elaborated and agreed upon a segmentation to be submitted to SCESS for adoption. This entails 9 segments crossing 3 vessel/LOA groups. It further recognized that more detailed segmentation would need to be identified with regard to the small-scale fleet (< 12 m.).

1.4 *The scope of this manual*

Indicators need to be underpinned by data. Data availability and costs are major issues in the selection of indicators and their adoption. Data availability and their quality and quantity vary greatly between fisheries and countries.

Much of the data needed for socio-economic indicators are often already being collected by different agencies or ministries. However, the availability of data is uneven across disciplines and countries. More data is available on biological and environmental aspects than on socio-economic ones. Data availability is also uneven between developed and developing countries and it may be necessary to agree on a common minimum set of information to be collected if the objective is to assess progress towards sustainable development at regional or global levels.

The Working Group on socio-economic indicators (WGSEI, Salerno 11-13 March 2002) reviewed and commented a draft guideline on sampling methodologies for building socio-economic indicators. The Working group also recommended that the draft guidelines be consolidated and finalised, taking into consideration the guideline used by IREPA. The present manual is the final outcome of this process.

This manual is aimed at all decision-makers who may need correct data to build socio-economic indicators. At an international level, the manual can be used to facilitate and simplify reporting under international conventions and agreements on matters relating to the sustainable development of the world's fisheries. Regional fisheries bodies and stakeholders involved in fisheries decision making, such as the fishing industry, other user groups, certification bodies, local communities and non-governmental organisations (NGOs) may also draw upon this manual to assist in meeting societal goals for fisheries.

This manual can be applied to fisheries at many different levels, from individual fisheries and coastal management units to a global level. It aims to encourage consistent usage of statistical methods in data collection. Governments may also wish to adapt the manual to the specific requirements of their national fisheries

Finally, although much care has been taken to integrate in this manual existing knowledge and experience in other sectors in statistical data collection, the experience available from the fishery sector is limited to few Mediterranean countries. As a consequence, these guidelines are intended to be flexible and capable of evolving as experience is gained and constructive suggestions accumulate. The present document is the first version of the manual and will be revised and completed (additional methodological annexes will be included) as required in the future.

2. Population and sampling

2.1 Potential methods for data collection

Data collection can be classified into two general forms: census and sample.

A census is not a survey per se, as it involves collecting data from all individuals in the target population. Several European logbook programmes could be considered a census as they (theoretically) require all vessels that meet certain characteristics to provide the required data. The key advantage of a census is that (assuming perfect compliance) the results are known with certainty.

The principle disadvantage of a census is the considerable cost involved in collection and the subsequent compilation of all the data collected. In the case of fisheries, the cost of interviewing every fisher to collect the data would be prohibitive. Logbook programmes require fishers to complete the data themselves and provide the completed forms to the appropriate authority. Provision of such data is mandatory for the target population of vessels, and is enforced through legislation that enables prosecution and penalisation of individuals who do not comply or deliberately provide incorrect or misleading information.

While such an approach has considerable appeal, regular provision of such data would place an increased burden on both fishers and administrators. The benefits of more precision in the resulting values of the key indicators would need to outweigh the additional costs for such an exercise to be worthwhile.

Sample surveys involve the collection of data from a sample of the target population rather than all individuals in the target population. The key advantage of the sample survey is that less data need to be collected and analysed.

A key assumption of the sample survey is that the sample is representative of the target population as a whole. A range of sampling methods can be employed to improve the likelihood that the sample is representative (see next paragraphs), although a risk always remains that the sample estimates are biased due to the sample being different in some way to the target population as a whole. However, as the standard error decreases with sample size, the optimal sample sizes can be determined based on the desired level of precision of the data (see paragraph xx).

2.2 Advantages of sampling methods

Reduced cost

If data are secured from only a small fraction of the aggregate, expenditures are smaller than if a complete census is attempted. With large populations, results accurate enough to be useful can be obtained from samples that represent only a small fraction of the population.

Greeter speed

For the same reason, the data can be collected and summarized more quickly with a sample than with a complete count. This is a vital consideration when the information is urgently needed.

Greater scope

In certain types of inquiry trained personnel or specialised equipment, limited in availability must be used to obtain the data. A complete census is impracticable: the choice lies between obtaining the information by sampling or not at all. Thus surveys that rely on sampling have more scope and flexibility regarding the types of information that can be obtained. On the other hand, if accurate information is wanted for many subdivisions of the population, the size of sample needed to do the job is sometimes so large that a complete enumeration offers the best solution.

Greater accuracy

Because personnel of higher quality can be employed and given intensive training and because more careful supervision of the field work and processing of results becomes feasible when the volume of work is reduced, a sample may produce more accurate results than the kind of complete enumeration that can be taken.

2.3 *Some statistical terms*

This document is not a text book of statistics many of which describe the statistical concepts related to sampling. However, knowledge of some basic statistical terms is required to a better understanding of the next sections.

2.3.1 *Mean*

The arithmetic mean or the *mean* of a set of N numbers $X_1, X_2, X_3, \dots, X_N$ is denoted by \bar{X} (read “X bar”) and is defined as:

$$\bar{X} = \frac{X_1 + X_2 + X_3 + \dots + X_N}{N} = \frac{\sum_{j=1}^N X_j}{N}$$

2.3.2 *Variance and standard deviation*

The standard deviation of a set of N numbers $X_1, X_2, X_3, \dots, X_N$ is denoted by s and is defined as:

$$s = \sqrt{\frac{\sum_{j=1}^N (X_j - \bar{X})^2}{N}} = \sqrt{\frac{\sum x^2}{N}}$$

where x represents the deviation of each of the numbers X_j from the mean \bar{X} .

Sometimes the standard deviation for the data of a sample is defined with (N-1) replacing N in the denominators of the previous expression because the resulting value represents a better estimate of the standard deviation of a population from which the sample is taken. For large value of N (certainly $N > 30$) there is practically no difference between the two definitions. Also, when the better estimate is needed we can always obtain it by multiplying the standard deviation computed according to the first definition by $\sqrt{N/(N-1)}$.

The variance of a set of data is defined as the square of the standard deviation and is thus given by s^2 .

When it is necessary to distinguish the standard deviation of a population from the standard deviation of a sample drawn from this population, we often use the symbol s for the latter and σ for the former. Thus s^2 and σ^2 would represent the *sample variance* and the *population variance* respectively.

2.3.3 *Normal distribution and confidence limits*

The normal distribution is a bell-shaped distribution which is used most extensively in statistical applications in a wide variety of fields. Its probability density function is given by:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{1}{2\sigma^2}(x-\mu)^2\right] \quad -\infty < x < +\infty$$

Its mean is μ and its variance is σ^2 . When x has the normal distribution with mean μ and variance σ^2 , we write this compactly as $x \approx N(\mu, \sigma)$.

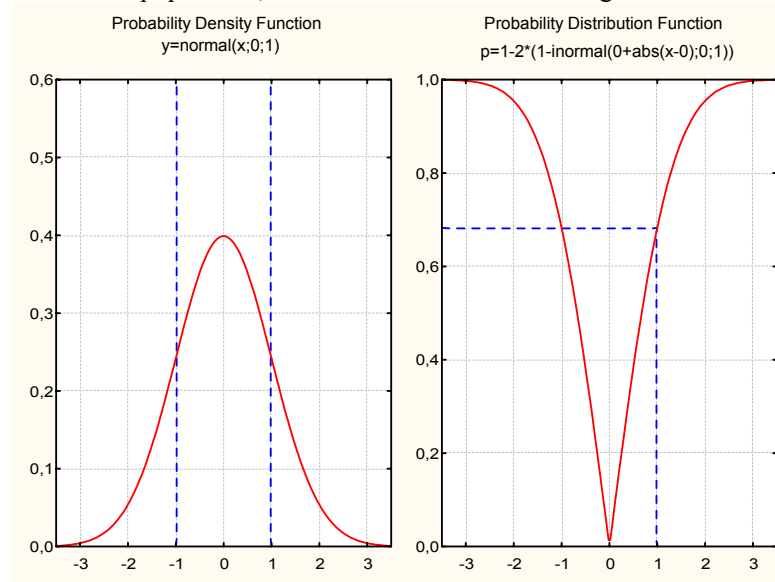
When the variable x is expressed in terms of standard units, $z=(x-\mu)/\sigma$, the previous equation is replaced by the so called standard form:

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}$$

In such case we say that z is normally distributed with mean zero and variance one.

A graph of this standardised normal curve is shown in fig. 1. In this graph we have indicated the area included between $z=-1$ and $+1$ as equal to 68.27% of the total area which is one. The areas included between $z=-2$ and $+2$ and $z=-3$ and $+3$ are equal respectively to 95.45% and 99.73%.

For example the “99% confidence” figure implies that if the same sampling plane were used many times in a population, a confidence statement being made from each sample, about 99% of these



statement would be correct and 1% wrong.

2.4 The role of sampling theory

Sampling theory is a study of relationships existing between a population and samples drawn from the population. It is of great value in many connections. For example it is useful in estimation of unknown population quantities (such as population mean, variance, etc.), often called population parameters or briefly parameters, from a knowledge of corresponding sample quantities (such as sample mean, variance, etc.), often called sample statistics or briefly statistics.

The purpose of sampling theory is to make sampling more efficient. It attempts to develop methods of sample selection and estimation that provide, at the lowest possible cost, estimates that are precise enough for our purpose. In order to apply this principle, we must be able to predict, for any sampling procedure that is under consideration, the precision and the cost to be expected.

Sampling theory is also useful in determining whether observed differences between two samples are actually due to change variation or whether they are really significant. The so called tests of significance and hypothesis are important in the theory of decisions.

In general, a study of inferences made concerning a population by use of samples drawn from it, together with indications of the accuracy of such inferences using probability theory, is called *statistical inference*.

2.5 Probability sampling

The sampling procedures have the following mathematical properties in common.

1. We are able to define the set of distinct samples S_1, S_2, \dots, S_v , which the procedure is capable of selecting if applied to a specific population. This means that we can say precisely what sampling units belong to S_1, S_2 , and so on.
2. Each possible sample S_i has assigned to it a known probability of selection π_i .
3. We select one of the S_i by a random process in which each S_i receives its appropriate probability π_i of being selected.
4. The method for computing the estimate from the sample must be stated and must lead to a unique estimate for any specific sample.

For any sampling procedure that satisfies these properties, we are in a position to calculate the frequency distribution of the estimates it generates if repeatedly applied to the same population. The term probability sampling refers to this situation.

In practice we seldom draw a probability sample by writing down the S_i and π_i outlined above. This is too laborious with a large population, where a sampling procedure may produce billions of possible sample. The drawn is most commonly made by specifying probabilities of inclusion for the individual units and drawing units, one by one in groups until the sample of desired size and type is constructed.

2.6 Alternatives to probability sampling

The following are some common types of non-probability sampling.

1. The sample is restricted to a part of the population that is readily accessible.
2. The sample is selected without conscious planning.
3. With a small but heterogeneous population, the sampler inspects the whole of it and selects a small sample of “typical “ units – that is units that are close to his impression of the average of the population.
4. The sample consists essentially of volunteers, in studies in which the measuring process is unpleasant or troublesome to the person being measured.

In some cases and under the right conditions, any of these methods can give useful results. They are not, however, open to the development of a sampling theory, since no element of random selection is involved. These methods, moreover, are unable to predict from the sample the accuracy to be expected in the estimates.

2.7 Bias and its effects

Sample bias largely arises as a result of inappropriate sample selection (i.e. the average of the selected group differs in characteristics from the true average of target population). As most sample surveys are completed on a voluntary basis, bias may also be introduced through non-response. In such cases, bias may arise if the individuals who do not participate have different characteristics to the target population as a whole. As information is not subsequently derived from these individuals, it is impossible to determine the extent of any bias that may be introduced.

Moreover, in sample survey theory it is necessary to consider biased estimators for two reasons.

1. In some of the most common problems, estimators that are convenient and suitable are found to be biased.

2. Even with estimators that are unbiased in probability sampling, errors of measurement and non response may produce biases in the numbers that we are able to compute from the data.

The use of a stratified random sample approach (see paragraph xx) reduces the potential for sample bias, but required additional information on the target population prior to the sample selection. Where the complete sample for particular fleet segments cannot be achieved due to non-response, bias can be reduced through assigning weights to the individual sample responses to re-balance the data. The potential bias arising directly from non-response can be reduced through replacement of boats with similar characteristics, on the assumption that the similar boat is as representative of the boat that failed to respond.

The principal steps in a sample survey

As a preliminary to a discussion of the role that theory plays in a sample survey, it is useful to describe briefly the steps involved in the planning and execution of a survey.

The principal steps in a survey are grouped somewhat arbitrarily under 11 headings.

3.1 Objectives of the survey

The first step when assessing a sample survey is to well identify the general objectives of the survey. Without a lucid statement of the objectives, it is easy in a complex survey to forget the objectives when engrossed in the details of planning, and to make decisions that are at variance with the objectives.

One of the principal choice is between average values (mean of the population) or total values. In fact, depending on this choice, techniques for the optimal sample size and estimators factors are different.

A number of measures exist that have been used by various agencies to measure the economic significance of fisheries to the regional economy. In addition, a number of performance indicators also exist that can be used to assess the performance of fisheries management in achieving its economic objectives (see chapter 1 and related annexes).

3.2 Population to be sampled

The word population is used to denote the aggregate from which the sample is chosen. The definition of the population may present some problems in the fishing sector, as it should consider the complete list of vessels and their physical and technical characteristics.

The population to be sampled (the sampled population) should coincide with the population about which information is wanted (the target population). Some-times, for reasons of practicability or convenience, the sampled population is more restricted than the target population. If so, it should be remembered that conclusions drawn from the sample apply to the sampled population. Judgement about the extent to which these conclusions will also apply to the target population must depend on other sources of information. Any supplementary information that can be gathered about the nature of the differences between sampled and target population may be helpful.

For example, let us consider the Italian statistical sampling design for the estimation of "quantity and average price of fishery products landed each calendar month in Italy by Community and EFTA vessels" (Reg. CE n. 1382/91 modified by Reg. CE n. 2104/93). Aim of the survey is to estimate total catches and average prices for individual species. Therefore, the sampling basis consists of the more than 800 landing points spread over the 8.000 Km of Italian coasts. It is not however feasible to consider the list of the landing points as the list of elementary units.

To overcome these difficulties, a sampled population, distinct from the target population but including units in which the considered phenomenon takes place, has been considered. In synthesis, the elementary units considered are the landings of the vessels belonging to the

sampled fleet. Thus, the list from which the sampling units are extracted is constituted by all the vessels belonging to the Italian fishery fleet.

3.3 *Data to be collected*

It is well to verify that all the data are relevant to the purposes of the survey and that no essential data are omitted. There is frequently a tendency to ask too many questions, some of which are never subsequently analysed. An overlong questionnaire lowers the quality of the answers to important as well as unimportant questions.

3.4 *Degree of precision desired*

The results of sample surveys are always subject to some uncertainty because only part of the population has been measured and because of errors of measurement. This uncertainty can be reduced by taking larger samples and by using superior instruments of measurement. But this usually costs time and money. Consequently, the specification of the degree of precision wanted in the results is an important step. This step is the responsibility of the person who is going to use the data. It may present difficulties, since many administrators are unaccustomed to thinking in terms of the amount of error that can be tolerated in estimates, consistent with making good decisions. The statistician can often help at this stage.

3.5 *The questionnaire and the choice of the data collectors*

There may be a choice of measuring instrument and of method of approach to the population. The survey may employ a self-administered questionnaire, an interviewer who reads a standard set of questions with no discretion, or an interviewing process that allows much latitude in the form and ordering of the questions. The approach may be by mail, by telephone, by personal visit, or by a combination of the three. Much study has been made of interviewing methods and problems.

A major part of the preliminary work is the construction of record forms on which the questions and answers are to be entered. With simple questionnaires, the answers can sometimes be pre-coded, that is, entered in a manner in which they can be routinely transferred to mechanical equipment. In fact, for the construction of good record forms, it is necessary to visualise the structure of the final summary tables that will be used for drawing conclusions.

Information may be collected using a number of different survey methods. These include personal interview, telephone interview or postal survey. The questionnaire design needs to vary based on the approach taken.

Personal interviews involves visiting the individual from which data are to be collected. The interviewer controls the questionnaire, and fills in the required data. The questionnaire can be less detailed in terms of explanatory information as the interviewer can be trained on its completion before starting the interview process. This type of survey is best for long, complex surveys and it allows the interviewer and fisher to agree a time convenient for both parties. It is particularly useful when the respondent may have to go and find information such as accounts, log book records etc. The personal interview approach also allows the interviewer to probe more fully if he/she feels that the fisher has misunderstood a question, or information provided conflicts with other earlier statements.

Data collectors are usually external to the phenomenon that is being examined and, moreover, they are often part of some public structure, in order to avoid possible influences due to personal interests. However, on the basis of the experience acquired in this field by Irepa, it has been demonstrated that it is essential to have data collectors belonging to the fishery productive chain in order to obtain correct and timely data. Therefore, data collectors should

belong to the productive or management fishery sectors.

3.6 *The frame*

Before selecting the sample, the population must be divided into parts that are called sampling units, or units. These units must cover the whole of the population and they must not overlap, in the sense that every element in the population belongs to one and only one unit.

The construction of this list of sampling units, called frame, is often one of the major practical problems.

3.7 *Selection of the sample*

There is a variety of plans by which the sample may be selected. For each plan that is considered, rough estimates of the size of sample can be made from a knowledge of the degree of precision desired. The relative costs and time involved for each plan are also compared before making a decision.

3.8 *The pre-test*

It has been found useful to try out the questionnaire and the field methods on a small scale. This nearly always results in improvements in the questionnaire and may reveal other troubles that will be serious on a large scale, for example, that the cost will be much greater than expected.

3.8 *Organisation of the field work*

In a surveys many problems of business administration are met. The personnel must receive training in the purpose of the survey and in the methods of measurement to be employed and must be adequately supervised in their work.

A procedure for early checking of the quality of the returns is invaluable.

Plans must be made for handling non-response, that is, the failure of the enumerator to obtain information from certain of the units in the sample.

3.9 *Summary and analysis of the data*

The first step is to edit the completed questionnaires, in the hope of amending recording errors, or at least of deleting data that are obviously erroneous. The check on the elementary data to eliminate non-sampling errors can be achieved by means of computer programmes implemented to correct the erroneous values and to permit statistical data analysis. These programmes are mainly based on graphical analysis of elementary data.

Thereafter, the computations that lead to the estimates are performed. Different methods of estimation may be available for the same data.

In the presentation of results it is good practice to report the amount of error to be expected in the most important estimates. One of the advantages of probability sampling is that such statements can be made, although they have to be severely qualified if the amount of non-response is substantial.

3.10 *Information gained for future surveys*

The more information we have initially about a population, the easier it is to devise a sample that will give accurate estimates. Any completed sample is potentially a guide to improved future sampling, in the data that it supplies about the means, standard deviations, and nature of the variability of the principal measurements and about the costs involved in getting the data. Sampling practice advances more rapidly when provisions are made to assemble and record information of this type.

Survey methods and questionnaire design

4.1 Simple random sampling

A number of methods exist that can be used to select a sample.

Simple random sampling is a method of selecting n units out of the N such that everyone of the ${}_N C_n$ distinct sample has an equal chance of being drawn. In practice a simple random sample is drawn unit by unit. The units in the population are numbered from 1 to N . A series of random numbers between 1 and N is then drawn, either by means of a computer programme that produces such table. Random samples are particularly useful when little is known about the target population.

When a number that has been drawn is removed from the population for all subsequent draws, the method is also called random sampling *without replacement*. Random sampling with replacement is entirely feasible: at any draw, all N members of the population are given an equal chance of being drawn, no matter how often they have already been drawn.

4.2 Stratified random sampling

in stratified sampling the population of N units is first divided into subpopulations of N_1, N_2, \dots, N_L units, respectively. These subpopulations are non-overlapping, and together they comprise the whole of the population, so that:

$$N_1 + N_2 + \dots + N_L = N$$

The subpopulations are called strata. To obtain the full benefit from stratification, the values of the N_h must be known. When the strata have been determined, a sample is drawn from each, the drawings being made independently in different strata. The sample sizes within the strata are denoted by n_1, n_2, \dots, n_L , respectively. If a simple random sample is taken in each stratum, the whole procedure is described as stratified random sampling.

Given the above definition, we can state that stratified random samples take advantage of additional information of the fishery. For example, if boat length information was available, the survey could be stratified on the basis of this variable. The idea is to group boats into (what are considered to be) relatively homogeneous groups. For example, the boats could be grouped into several size classes. These size classes could be sub-setted further into, say, engine size classes.

Stratification is a common technique. There are many reasons for this; the principal ones are the following.

1. If data of known precision are wanted for certain subdivisions of the population, it is advisable to treat each subdivision as "population" in its own right.
2. Administrative convenience may dictate the use of stratification; for example for socio-economic indicators in the Mediterranean stratification per management units could be advisable.
3. Sampling problems may differ markedly in different parts of the population.
4. Stratification may produce a gain in precision in the estimates of characteristics of the whole population. It may possible to divide a heterogeneous population into subpopulations, each of which is internally homogenous. This is suggested by the name strata, with its implication of a division into layers. If each stratum is homogeneous, in that the measurement vary little from one until another, a precise estimate of any stratum mean can be obtained from a small sample in that stratum. These estimates can then be combined into a precise estimate for the whole population.
5. The potential for sample bias is reduced through using a stratified random sample. Since the population has been stratified, a balanced sample can be chosen that is more likely to be representative of the population than a purely random sample. Consequently, smaller samples can be selected than using a purely random sample

The theory of stratified sampling deals with the properties of the estimates from a stratified sample and with the best choice of the sample size n_h to obtain maximum precision. The problems of how to construct strata and of how many strata there should be are presented in the next paragraph.

4.3 *The estimation of sample size and allocation across strata*

In the planning of a sample survey, a stage is always reached at which a decision must be made about the size of the sample. The decision is important. Too large a sample implies a waste of resources, and too small a sample diminishes the utility of the results. The decision cannot always be made satisfactorily; often we do not possess enough information to be sure that our choice of sample size is the best one. Sampling theory provides a framework to solve these problems.

The principal steps involved in the choice of a sample size are as follows.

1. There must be some statement concerning what is expected of the sample. This statement usually is in terms of desired limits of error.
2. Some equation that connects n with the desired precision of the sample must be found. The equation will vary with the content of the statement of precision and with the kind of sampling that is contemplated. One of the advantages of probability sampling is that it enables this equation to be constructed.
3. This equation will contain, as parameters, certain unknown properties of the population (for instance the variability of the investigated phenomenon). These must be estimated in order to give specific results.
4. Finally, the chosen value of n must be appraised to see whether it is consistent with the resources available to take the sample. This demands an estimation of the cost, labour, time and material required to obtain the proposed size of sample.

In the case of simple random sampling, the formula for the definition of the sample size, n , is the following:

$$n \geq \frac{N^2 S^2}{\varepsilon^2 Y^2 + NS^2}$$

where

N is the number of units in the population,

ε is equal to $\theta/2$, where θ is the maximum error that is accepted for the final estimates,

S^2 is an estimate of $V(Y)$, total variance of the phenomenon in the population and is given by:

$$S^2 = \frac{1}{N-1} \sum_{i=1}^N (Y_i - \bar{Y})^2$$

with

$$\bar{Y} = \frac{1}{N} \sum_{i=1}^N Y_i$$

In the case of single stage stratified sampling, and in the hypothesis of extracting the sampling units with equal probability and without re-pooling⁴, the formula to calculate the sample size, for a maximum error of 2θ , and with a probability equal to $P=95\%$, is the following:

⁴ To draw sample units from the population, several methods can be used, depending on the type of the chosen sample strategy:

- sample with equal probabilities

$$n \geq \frac{\left(\sum_{h=1}^H N_h S_h \right)^2}{\theta^2 + \sum_{h=1}^H N_h S_h^2}$$

where, H is the total number of strata, N_h is the population size in the stratum h, S_h^2 is the estimate of the variance in the stratum h.

Once the sample size has been obtained, the allocation among strata has to be defined. The allocation across strata can be assessed on the basis of two different methods:

the proportional criterion, in each stratum we have the same number of units: $n_h = n/H$

the Neyman criterion, by which a variable percentage of elements is drawn from each stratum in order to minimise the value of the variance. In this case, the formula is:

$$n_h = n \frac{N_h S_h}{\sum_{h=1}^H N_h S_h}$$

In order to apply the previous formulas a pre-estimate of the S_h^2 variances is required; in other words, the variances of the target variables of the survey must be known. For this purpose, the results of previous sampling survey can be used. In the case this information is not available, a pilot study can be developed to have an indication of the variability of the investigated phenomenon.

4.3.1 Sample size with more than one item

In most surveys information is collected on more than one item. Sometimes the number of items is large. In particular, fisheries surveys are generally multivariate, that is, the variables investigated are more than one (revenues, costs, employment, etc.).

If a desired degree of precision is prescribed for each item, the calculations lead to a series of conflicting values of n, one for each item. It may happen that the n's required are all reasonably close. If the largest of the n's falls within the limits of the budget, this n is selected. More commonly, there is a sufficient variation among the n's so that we are reluctant to choose the largest, either from budgetary considerations or because this will give an over-all standard of precision substantially higher than originally contemplated. In this event the desired standard of precision may be relaxed for certain of the items, in order to permit the use of a smaller value of n.

However, nowadays with progress in sampling theory and software technology some methods are available to manage the problem of the sample size with more than one item.

In particular, we give a brief description of the Bethel method that is the application of Neyman's method to the multivariate case. The approach used by this method is to transform the analysis into a linear programming model that allows the identification of the sample size and the allocation across strata, minimising the variances of all variables simultaneously (see also Bethel, 1989).

The optimal allocation across strata for multi-scope studies has been solved by Bethel using the Kuhn-Tucker theorem and then deriving the expressions for the optimal allocation in terms of the LaGrange

– sample with probabilities proportional to the size (PPS).

In the first case, each unit of the population has the same probability to take part of the sample, while in the case of a PPS sample each unit has a different probability to be sampled and this probability is proportional to the following measure: $P_i = X_i/X_h$, where, i = a generic vessel, h = stratum, X = a size parameter, for example the overall length.

multipliers. The Bethel method has been implemented on SAS basis (the implementation algorithm is reported in annex C).

4.4 Estimation of parameters

In the previous chapters we saw how sampling theory can be employed to obtain information about samples drawn at random from a known population. From a practical viewpoint, however, it is also very important to be able to infer information about a population by use of samples drawn from it. Such problems are dealt with in statistical inference, which uses principles of sampling theory.

One important problem of statistical inference is the estimation of values referred to the population (such as population totals, means, variances, etc.) from the corresponding sample data.

In this manual, the Horvitz-Thompson estimator is reported, but a lot of other estimators exist that have been studied by the sampling theory.

The Horvitz-Thompson estimator is used to estimate the total values (for examples total catches, total revenues, and so on).

In the case of simple random sampling, and in the hypothesis of extracting the sampling units with equal probability and without re-pooling the formula is:

$$\hat{Y}_{HT} = \sum_i^n w_i y_i$$

where $w_i = N/n$, and y_i are the observed values from the sample units.

In the case of a stratified random sampling, and in the hypothesis of extracting the sampling units with equal probability and without re-pooling, the formula is:

$$\hat{Y}_{HT,h} = \sum_{i=1}^{n_h} w_{hi} y_{hi}$$

with:

n_h sample size in the stratum h;

$w_{hi} = N/n_h$;

y_{hi} , sample data of the unit i in the stratum h.

4.5 Sources of error in surveys

The sample theory assumes that some kind of probability sampling is used and that the observations y_i on the i th unit is the correct value for that unit. The error of estimate arises solely from the random sampling variation that is present when n of the units are measured instead of the complete population of N units.

These assumptions hold reasonably well in the simpler types of surveys in which the measuring devices are accurate and the quality of work is high. In complex survey, particularly when difficult problems of measurement are involved, the assumptions may be far from true. Three additional sources of error that may be present are as follows.

1. Failure to measure some of the units in the chosen sample. This may occur because of their refusal to answer the questions.
2. Errors of measurement on a unit. The measuring device may be biased or imprecise. The respondents may not possess accurate information or they may give biased answers
3. Errors introduced in editing, coding and tabulating the results.

These sources of error necessitate to develop methods for computing standard errors and confidence limits that remain valid when the other errors are present.

4.5.1 Sampling errors

The standard deviation is used to provide information about the relative distribution around the estimates. The level of confidence is related to the amount of variation around the estimates, so is related to the standard deviation. Also, from the Central limit Theory, the larger the sample size, the greater the confidence in the estimate. Therefore the level of confidence is related also to the size of the sample.

The standard error is an indicator of the level of confidence in the estimate. In the case of stratified random sampling, the standard error is given by

$$\hat{SE}(\hat{Y}_{h,HT}) = \sqrt{\frac{1-f_h}{n_h} N_h S_h}$$

where s is the standard deviation of the sample.

Standard errors are often expressed as relative standard errors in survey reports. These are the standard error expressed as a percentage of the mean. The relative standard error is given by

$$RE(\hat{Y}_{h,HT}) = \sqrt{\frac{1-f_h}{n_h} C_h}$$

where C_h is the estimate of the variation coefficient.

Standard errors provide information about the confidence interval around the estimates. Assuming that the distribution is normally distributed around the estimate value, there is a 95 per cent probability that the true population value is within 2 standard errors of the sample value. That is, there is a 95 per cent probability that

$$\hat{Y}_{h,HT} - 2SE(\hat{Y}_{h,HT}) < Y_h < \hat{Y}_{h,HT} + 2SE(\hat{Y}_{h,HT})$$

For small samples, the confidence interval is defined by the t distribution, such that

$$\hat{Y}_{h,HT} - t_{0.0025, n-1} SE(\hat{Y}_{h,HT}) < Y_h < \hat{Y}_{h,HT} + t_{0.0025, n-1} SE(\hat{Y}_{h,HT})$$

where $t_{0.025, n-1}$ is the critical value of the t-statistic at the 5 per cent level of significance and $n-1$ degrees of freedom. This value can be read off any t-statistic table. For the number of observations in the sample, the critical values of the t-statistic ranged from roughly 2.1 to 2.6 depending on the number of observations in each size class. For the sample as a whole, the critical value is approximately 2. As the standard error is dependent upon the number of observations in the sample, the larger the sample, the smaller the standard error and the tighter the confidence interval around the mean. Consequently, the larger the sample, the more confidence that can be placed on the sample estimate.

4.5.2 Effects of non-response

Information can only be collected from those individuals selected willing to participate in the survey. However, a rejection may occur for a number of reasons, such as bad timing of the survey. A problem with rejection is that there is no guarantee that the individual who does not want to participate is the same as those who do participate. In some cases, there may be a correlation between rejection and the characteristics of the individual being surveyed. In such cases, exclusion of these individuals may result in a biased sample.

An advantage of the stratified approach is that another individual in the group can be selected to replace the reject. While this still may lead to some bias in the sample, the bias is not likely to be as great as in a purely random sample. This is because the reject is being replaced by another individual with similar characteristics, and the assumption is made that any individuals within the group are representative of the group. The greater the degree of stratification, the more likely this assumption is to hold.

Another way to treat the non-response is to adjust the initial weights w_{hi} on the basis of data referring to the responses (r_h) and the non-responses (s_h) of the sample (nh). The method consists in multiplying the initial weights (w_{hi}) by a factor (d_h) equivalent to:

$$d_h = \frac{r_h + s_h}{r_h}$$

5. References consulted

- Bethel, J. (1989) Sample allocation in Multivariate Surveys. *Survey Methodology*, 15(1): 47-57.
- Cassel C.M., Sarndal, C.E., Wretman, J.H.- (1977) - Foundation of inference in survey sampling - Wiley
- Cicchitelli, G., Herzel, A., Montanari, G.H. (1992) Il campionamento statistico. Il Mulino, Bologna, 571 pp.
- Cochran G.W. (1977) Sampling techniques. Wiley, 430 pp
- Concerted Action N.2. (2000) "Promotion of Common Methods for Economic Assessment of EU Fisheries", Annual Report 2000. Concerted Action N.2. Contract FAIR CT97-3541. ISBN: 90-5242-624-4, Report to the EC DG XIV, Brussels, November 2000.
- COMMISSION OF THE EUROPEAN COMMUNITIES (2002) STECF's needs for socio-economic indicators. 14th Report Brussels, 22-26 April 2002
- EU Project no. 00/32 (2001) Data on economic performance of the fisheries sector. Final report. October 2001
- EUROSTAT (2002) Socio-economic Indicators for fisheries. Meeting of the working group "fishery statistics" 18-19 February 2002
- EUROSTAT (2002) National programmes of fishery statistics – Italy, proposal for a statistical sampling survey for the estimation of "quantity and average price of fishery products landed each calendar month in Italy by Community and EFTA vessels" (Reg. CE n. 1382/91 modified by Reg. CE n. 2104/93). Doc. ASA/FISH/218en
- FAO (1999) Indicators for sustainable development of marine capture fisheries. Technical Guidelines for Responsible Fisheries No.8
- FAO ADRIAMED (2001) Report of the AdriaMed Meeting on Socio-Economic Aspects of the Adriatic Sea Fishery Sector Campobasso, Italy, 28th – 29th May 2001
- Fox, D.R. (1989) Computer selection of Size-Biased Samples, *The American Statistician*, 43(3): 168-194.
- General Fisheries Commission For The Mediterranean. (2001) feasibility assessment for a database on socio-economic indicators for Mediterranean Fisheries. Studies and reviews No. 7
- GFCM / SAC / SCESS (2002) Deuxième Groupe de travail ad hoc sur les indicateurs socio-économiques (Salerno, Italie, 11-13 mars 2002)
- IREPA, ISTAT (2000). Proposta di una indagine campionaria per la stima delle qualità e del prezzo medio dei prodotti della pesca sbarcati sul territorio italiano da navi da pesca comunitarie e dell'EFTA, nel corso di ogni mese di calendario". Report Istat-Irepa.
- IREPA. (2001) Osservatorio economico sulle strutture produttive della pesca marittima in Italia. ^{Franco} _{Angeli} Eds. Milano, July 2001, Italy, 312 p.
- ISTAT. (1989) Manuale di tecniche di indagine, Note e Relazioni, n.1, 271 pp.
- OECD (1999) Programme of Work 2000-2002, [AGR/FI/M(99)1]

- OECD (2001) Economic and social sustainability indicators for fisheries survey and issues paper AGR/FI(2001)12
- OECD (2001) Espagne -- indicateurs socio-economiques pour la gestion des peches : methodologie et application -- contribution a l'etude sur les indicateurs socio-economiques de la durabilite des peches AGR/FI(2001)12/PART1
- OECD (2001) Italy - implementation of a national observatory for monitoring techno-economic data of the fishing fleet and the evaluation of socio-economic parameters. Part I - methodology - contribution to the study on economic and social sustainability indicators for fisheries. AGR/FI(2001)12/PART3
- OECD (2001) Italy - evaluation of socio-economic indicators for sustainable fishery in Sicily. Part 2 - case study - contribution to the study on economic and social sustainability indicators for fisheries. AGR/FI(2001)12/PART3
- Placenti, V. (1997) Scientific and Technical Observatory in the Mediterranean. Contract MED 93/022. Report to the General Directorate for Fisheries (DG XIV), EC, Brussels, 210 p. + annexes, in collaboration with Cofrepeche (FR), Centre d'Etudes et de projects (FR), Cetemar, (SP), IEO (SP) and ACC (GR), April 1997.**
- SAS. (2000). SAS/IML User's Guide, version 8, 841 pp.
- Scander Ben Salem, Dr Ramon Franquesa, Pr. Amor El Abed (2002) - Indicateurs socioéconomiques pour la pêche au Golfe de Gabès (Tunisie). Étude de cas
- Spagnolo, M., Placenti, V. (1998) I Sistemi di Informazione Statistica della Pesca in Italia. Franco Angeli Eds. Milano, Italy, September 1998, IREPA Working Papers 2, 149 pp.
- StatSoft. (1994) Statistica, User's Guide, vol. I, II, III, StatSoft Inc.

APPENDIX A

Survey Questionnaire
Socio – economic data

I DRAFT

Year _____
Quarter _____

Name of vessel _____
GRT _____
Length _____
kW _____
Vessel age _____
Company type _____

MU FAO _____
Port _____
Principal gear _____

Revenues		
<i>Description</i>	<i>Value</i>	<i>Notes</i>
from the sale of fish		
other sources of revenue such as insurance claims, compensation and government assistance		

Fixed costs		
<i>Description</i>	<i>Value</i>	<i>Notes</i>
Social security contributions and charges		
Routine maintenance, hull and engine		
Non-routine maintenance, hull		
Non-routine maintenance, engine		
Non-routine maintenance (other)		
Vessel insurance		
Miscellaneous taxes and dues		
Interest charges (loans, etc.)		

Production costs			
<i>Description</i>	<i>Unit cost</i>	<i>Value</i>	<i>Notes</i>
Fuel			
Lubricants			
Purchase of nets			
Purchase of bait			
Ropes and warps			

Selling costs			
<i>Description</i>	<i>Unit cost</i>	<i>Value</i>	<i>Notes</i>
Boxes			
Ice			
Fish market or wholesaler			
Transport of catches			

Labour costs			
<i>Number employed</i>	<i>Grade of member</i>	<i>of crew</i>	<i>Average net monthly pay</i>
.....			

How many **crew** (*excluding* the skipper) are normally employed on the vessel during a typical trip?

.....

Number of owners:

ownership shares:

Are you (the vessel's owner) also the **skipper** of the vessel?

Yes, full-time [] Yes, part-time [] No []

What is the **market value** of your vessel (including equipment and license value)?

.....

APPENDIX B

IMPLEMENTATION OF THE BETHEL METHOD (SAS ® HML)

```

/* SOFTWARE TO CALCULATE THE SAMPLE SIZE WITH THE BETHEL
METHOD*/
/* THE ESTIMATES PER STRATUM - SUM - THE VARIANCES PER
STRATUM - VAR AND THE POPULATION SIZE - N - ARE REPORTED IN
THE FILE NAMED DATIN */

%MACRO BETHEL(DATIN,DATOUT,STR,SUM,VAR,N,ERR,NITER,CONV);

/* RICHIEDE LA SPECIFICA DEL NOME DEL FILE DI INPUT, NOME DEL
FILE */
/* DI OUTPUT, NOME DELLA VAR CHE INDICA LO STRATO, NOME DELLE
VARS */
/* DI CUI SI CONOSCE LA STIMA, NOME DELLE VARIANZE,
NUMEROSITA' */
/* DELLA POP. PER STRATO, ERRORI ATTESI PER CIASCUNA VAR,
NUMERO */
/* MAX DI ITERAZ, CRITERIO DI CONVERGENZA
*/

PROC IML;
USE &DATIN;
READ ALL VAR { &SUM } INTO SOMME; READ ALL VAR { &VAR } INTO
VARIA;
READ ALL VAR { &N } INTO N; READ ALL VAR { &STR } INTO
STR;
ERR={ &ERR };
STATS=ERR;
AIJ=(N##2)#VARIA#(1/(((SOMME[+,]##2)#(ERR##2))+(N#VARIA)[+,])))
;
ALFA=J(NCOL(AIJ),1,1/(NCOL(AIJ)));
DO I=1 TO &NITER UNTIL(DIF< &CONV);
X=1/(SQRT(AIJ*ALFA)*((SQRT(AIJ*ALFA))[+,,])+1E-20);
NALFA=(ALFA#(T(AIJ)*X)##2)#(1/(ALFA#(T(AIJ)*X)##2)[+,,]);
DIF=MAX(ABS(NALFA-ALFA));
ALFA=NALFA;
END;
NH=CEIL(1/X);
VARI2=(N/NH)#(N-NH)#VARIA;
ERR=(SQRT(VARI2[+,,])/SOMME[+,,]); * può dare errore se
NH>N;
STATS=STATS//ERR;
NH=(NH<>J(NROW(AIJ),1,2))><N;
NHS=(N-NH)><NH; * trova il minore
elemento per elemento;
VARIA=(N/NH)#(N-NH)#VARIA;
ERR=(SQRT(VARIA[+,,])/SOMME[+,,]); * [+,] somma per riga
prendi tutte le colonne;
STATS=STATS//ERR;
STATS=STATS//T(ALFA);
NH=STR||NH||NHS||N; * affianca tutti gli
elementi elencati;
CREATE STATS VAR { &SUM };APPEND FROM STATS;
CREATE &DATOUT VAR { &STR NH NHS &N };

```

```

APPEND FROM NH;
QUIT;
PROC TRANSPOSE DATA=STATS OUT=STATS;
DATA STATS;SET STATS;
ATTRIB COL1 LABEL='ERRORI RICHIESTI'
      COL2 LABEL='ERRORI OTTENUTI SENZA CORREZIONI'
      COL3 LABEL='ERRORI OTTENUTI CON CORREZIONI'
      COL4 LABEL='IMPORTANZA DELLA VAR. SULLA DIM. CAMP.'
      _NAME_ LABEL='NOME VARIABILE';
PROC PRINT DATA=STATS NOOBS LABEL;
VAR _NAME_ COL1 COL2 COL3 COL4;
DATA &DATOUT;SET &DATOUT;
ATTRIB &STR LABEL='CODICE DI STRATO'
      NH LABEL='NUMEROSITA CAMPIONE'
      NHS LABEL='NUMEROSITA EVENTUALE SUPPLETIVO'
      &N LABEL='NUMEROSITA POPOLAZIONE'
      _NAME_ LABEL='NOME VARIABILE';
PROC PRINT DATA=&DATOUT NOOBS LABEL;
VAR &STR &N NH NHS ;
SUM &N NH NHS;
%MEND;

OPTIONS MPRINT MTRACE SYMBOLGEN;
%BETHEL(IREPA.VARIANZ1,IREPA.NBETH31,STR,S1 S2 S3 S4 S5 S6 S7
S8 S9 S10,V1 V2 V3 V4 V5 V6 V7 V8 V9 V10,
_N,0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
0.03,300,0.000001);
RUN;

/*      %MACRO
BETHEL(DATIN,DATOUT,STR,SUM,VAR,N,ERR,NITER,CONV); */
/* elenco elementi necessari a far girare la macro

```

APPENDIX C

OPTIMAL SAMPLE SIZE AND THE DIFFERENCES BETWEEN NEYMAN AND BETHEL METHODS – AN EXAMPLE

Suppose to define a sample survey in order to estimate the total revenues of the fleet per group of species. Our target variables are:

- revenues of crustaceans
- revenues of molluscs
- revenues of other fishes
- revenues of anchovies.

We stratify our target population per fleet segment (because we know that there is, at some extends, a correlation between segments and target groups of species). The stratification is as follow:

segment	N_h^5
purse seines	235
dredges	835
small scale fishery	12425
multipurpose	3564
vessels	
trawls	2364
tuna fleet	212
midwater pair trawls	145
Total	19780

What must be the sample size in order to have a maximum error of our estimates not higher than, for instance, 5% with a confidence level of 95%? To answer this question we can apply the Neyman formula (see paragraph 3.6), but, as our target variables are four, we have to apply this method four times:

crustaceans - revenues

segment	N_h	S_h^2	$N_h * S_h^2$	S_h	$N_h * S_h$	$n_h-5\%$
purse seines	235	2660,5	220824,2	51,6	4281,2	8
dredges	835	0,0	0,0	0,0	0,0	0
small scale fishery	12425	686,4	608782,8	59,0	58073,2	105
multipurpose	3564	27023,6	10254979,9	405,9	145590,8	180
vessels						
trawls	2364	80634,5	29624128,9	706,1	194462,0	221
tuna fleet	212	0,0	0,0	0,0	0,0	0
midwater pair trawls	145	5,5	298,0	2,3	126,8	25
Total	19780	111029,9	40711713,7	1229,2	403148,8	539

⁵ all figures reported in this annex are part of an exercise developed by Irepa in 2000

**other fishes -
revenues**

segment	N_h	Sh^2	$N_h * S_h^2$	S_h	$N_h * S_h$	$n_h - 5\%$
purse seines	235	40499,6	1601939,5	390,4	15117,6	8
dredges	835	0,0	0,0	0,0	0,0	0
small scale fishery	12425	11640,5	15201704,2	300,2	352201,6	165
multipurpose	3564	73240,6	26638037,8	678,3	243427,1	124
vessels						
trawls	2364	110333,0	35197945,5	870,8	222044,1	113
tuna fleet	212	83411,7	5320063,7	529,3	32960,4	17
midwater pair trawls	145	800,8	37013,6	50,0	2062,9	9
Total	19780	319982,2	84004549,0	2826,5	868861,8	436

molluscs - revenues

segment	N_h	Sh^2	$N_h * S_h^2$	S_h	$N_h * S_h$	$n_h - 5\%$
purse seines	235	78,3	6481,0	9,6	749,6	25
dredges	835	3237,0	829282,9	70,6	15548,6	28
small scale fishery	12425	3036,6	2571116,7	139,8	134984,7	194
multipurpose	3564	7780,5	2792485,3	260,4	87990,1	159
vessels						
trawls	2364	14379,0	2566988,5	334,0	64506,0	117
tuna fleet	212	0,0	0,0	0,0	0,0	0
midwater pair trawls	145	0,0	0,0	0,0	0,0	0
Total	19780	28523,8	8766668,2	818,6	303902,5	523

**anchovies -
revenues**

segment	N_h	Sh^2	$N_h * S_h^2$	S_h	$N_h * S_h$	$n_h - 5\%$
purse seines	235	130797,7	5607901,6	905,2	34180,8	132
dredges	835	0,0	0,0	0,0	0,0	0
small scale fishery	12425	1436,6	2040314,0	69,7	105012,1	145
multipurpose	3564	85,8	62171,7	16,6	10176,4	39
vessels						
trawls	2364	277,1	23508,8	21,6	2196,6	8
tuna fleet	212	0,0	0,0	0,0	0,0	0
midwater pair trawls	145	30253,6	1237186,5	303,4	11978,6	46
Total	19780	162850,9	8971082,6	1316,5	163544,5	371

In this way, for each variable we obtain a different sample size. In order to respect our assumption (maximum error 5% of the total values) we must consider the maximum value for each segment:

segment	Neyman	Bethel
purse seines	132	95
dredges	28	19
small scale fishery	194	125
multipurpose	180	99

vessels		
trawls	221	165
tuna fleet	17	12
midwater pair trawls	46	32
<u>Total</u>	<u>818</u>	<u>547</u>

The Bethel method has been applied on the same data using the SAS implementation (see Appendix B) and the results are reported in the previous table. Applying the Bethel method, we will obtain a lower sample size (547 units instead of 818 units). In fact, the Bethel method considers the four variables all together and therefore it minimises the variances taking into account the constraints all together.

The Bethel method requires the same basic data as Neyman, and it can be implemented on the basis of any software (see appendix B for an example).

RAPPORT NATIONAL DU MAROC

(*Malouli Idrissi Mohammed, INRH- Nador*)

Introduction

La pêche en Méditerranée marocaine participe vivement dans le développement du tissu économique national et particulièrement, la région du Nord. Elle se déploie sur l'ensemble du littoral et se compose de la pêche artisanale et la pêche côtière effectuées par les chalutiers, les sardiniers et les palangriers. D'autres activités sont présentes, telles que les madragues et la pêche sous marine.

L'institut National de Recherches Halieutiques, par le biais de son Centre Régional de Nador, s'occupe du suivi des aspects socio-économiques des différentes pêcheries et essentiellement les pêcheries artisanales. Ce suivi a bénéficié pleinement de l'appui technique et financier du projet FAO- COPEMED.

Les principales activités socio-économiques sont focalisées sur les points suivants :

- Etude des indicateurs socio-économiques
Une première étude sur les principaux indicateurs socio-économiques de la pêche dans la mer d'Alboran (Espagne et Maroc), était réalisée en 2000, dans le cadre des travaux du SCSES. Les résultats tirés de cette étude pilote étaient très satisfaisants. Une publication de cette étude est disponible, elle est intitulée « Feasibility assessment for a database on socio-economic indicators for Mediterranean fisheries », Studies and Reviews. General Fisheries Commission for the Mediterranean. No. 71. Rome, FAO. 2001. 55p.

Les analyses ont compris aussi bien les indicateurs nationaux que les indicateurs par Unité Opérationnelle Locale. Elles ont permis :

- d'avoir une idée sur la distribution et la dimension de l'investissement dans le secteur de la pêche et son impact économique ;
- d'évaluer la situation des segments et des Unités Opérationnelles Locales, définies par l'étude et d'analyser le modèle de pêche ;
- d'évaluer les structures des coûts et d'investissement ;
- de fournir le détail sur les différences sociales ;
- d'élaborer des cartes des ressources, des conflits et des potentialités relatives à la perspective économique ;
- de donner une image claire des similarités et des disparités entre les différents segments, ports et pays ;

Toutefois, l'importance des indicateurs socio-économiques, ne peut être concluante, que si la collecte des données serait réalisée, selon un système régulier et continu (chaque année ou deux années). Pour le moment, nous essayerons de mettre en place ce système.

- Etudes des aspects socio-économiques des pêcheries artisanales

La pêche artisanale en Méditerranée marocaine, est une activité qui assure une main d'œuvre importante et des apports considérables en devises, par l'exportation de la majorité de ces produits.

Vu la dispersion de cette activité le long du littoral, un programme de recherche est établi pour réaliser des études ponctuelles au niveau des zones et des pêcheries les plus importantes et les plus sensibles. Dans ce cadre, une première étude vient d'être achevée au niveau de la lagune de Nador, considérée comme une zone très fragile.

Les résultats de cette étude ont permis de ressortir :

- les principales caractéristiques socio-économiques ;
- les principales caractéristiques de la commercialisation ;
- l'estimation de l'effort de pêche et de la captures ;

Afin de faciliter la lecture et l'analyse des données collectées lors de cette étude, les principaux résultats étaient cartographiés.

- Application de logiciels bio-économiques dans les problèmes d'aménagement

Le grand manque de données économiques, handicape l'utilisation de logiciels bio-économiques. Malgré cette situation, une tentative est en cours d'étude pour l'application du logiciel « MEFISTO » sur la flottille sardinière et la flottille chalutière au niveau des régions de Nador et Al Hoceima. Cette tentative sera réalisée en collaboration avec certaines universités.

NOTE D'INFORMATION SUR L'ETUDE INTEGREE DE LA PECHE ARTISANALE DANS LA LAGUNE DE NADOR

Par

Malouli Idrissi M., Zahri Y., Houssa R., Abdelaoui B., El Ouamari N.

Institut National de Recherche Halieutique
Centre Régional de Nador
BP 493 Nador, Maroc

Contexte

La lagune de Nador est parmi les zones les plus productives de la Méditerranée marocaine. Elle présente un intérêt particulier dans la région, aussi bien sur le plan écologique, que sur le plan économique et d'exploitation. Cette lagune présente des opportunités importantes pour le développement économique et touristique de la région, grâce à sa structure géomorphologique caractérisée par son accès facile, sa proximité aux sites balnéaires et sa proximité au milieu urbain.

La lagune de Nador connaît une activité de pêche importante, avec environ 300 barques abritées au niveau de 12 sites. Mais, cette activité reste peu connue, car la majorité des études réalisées sur ce milieu ont concerné principalement les aspects sédimentologiques, écologiques, microbiologiques, etc. Les aspects relatifs à l'activité de la pêche artisanale et les aspects socio-économiques, ont été très peu appréhendés.

De ce fait, et après une première étude sur la situation de la pêche artisanale dans l'ensemble du littoral méditerranéen, le *Centre Régional de Recherche Halieutique de Nador* a inscrit dans son programme de travail une étude de la pêche artisanale dans la lagune de Nador. Cette étude s'inscrit dans le cadre des études pilotes du programme régional « Pêche Artisanale », co-financées par le projet FAO-COPEMED.

Objectifs

Les principaux objectifs assignés à cette étude sont :

- l'évaluation des caractéristiques socio-économiques du sous secteur de la pêche ;
- l'estimation de l'effort de pêche et de la capture ;
- l'étude de quelques aspects biologiques des principales espèces ;
- l'identification et l'évaluation économique des circuits de commercialisation ;
- l'utilisation de l'outil SIG pour la cartographie des résultats obtenus.

Méthodologie de travail

Trois missions d'enquêtes sont réalisées durant la période juin-novembre, pour collecter les données sur les aspects techniques, socio-économiques et biologiques. Cette collecte est réalisée moyennant des entretiens auprès des pêcheurs et des mareyeurs. Le taux de sondage réalisé est de l'ordre de 23,7 %.

Les principaux indicateurs retenus pour l'analyse socio-économiques sont : l'âge des acteurs, la taille du foyer, le niveau de scolarisation, le salaire des marins pêcheurs, le capital investi, le produit brut, les charges de production, les revenus, les productivités économiques des facteurs de production et la valeur ajoutée.

L'analyse biologique a concerné l'étude de la structure démographique et la répartition des principales espèces. Un échantillonnage biologique est élaboré, selon une stratégie aléatoire et simple, pour la détermination des fréquences de taille.

L'effort de pêche est évalué par estimation du nombre de sorties réalisées par les barques, alors que les niveaux des captures sont établis par espèce de poisson et pour l'ensemble de la production de la pêche.

Les données socio-économiques et biologiques définies sous forme de tables en Access sont Géoréférenciées et transférées au SIG « Arcview » par un lien dynamique permettant de cartographier les données. Les unités de référence spatiale optées pour ce lien sont les sites de pêche artisanale de la lagune, déterminés au cours de l'enquête par le système de postions globale GPS.

Résultats de l'étude

Les sites de pêche implantés autour de la lagune de Nador sont au nombre de 12. La pêche dans ces sites est totalement artisanale, nécessitant une petite embarcation en bois propulsée généralement par un moteur hors bord.

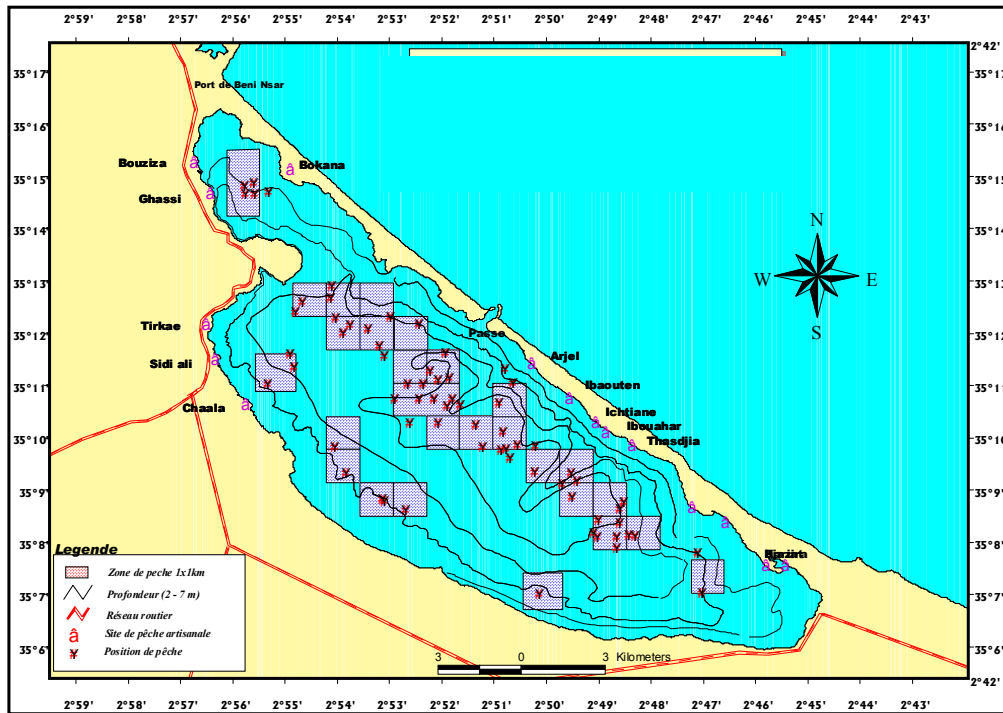
Les ressources halieutiques de la lagune de Nador sont caractérisées par une composition spécifique très diversifiée dans l'espace et dans le temps. Elles sont capturées essentiellement par deux engins, la palanza et le trémail.

La caramote (*Panaeus kherathurus*) est la principale espèce ciblée par la palanza, principalement pendant deux périodes de l'année, septembre- décembre et avril- juin. D'autres espèces accompagnent la caramote, comme l'anguille (*Anguilla anguilla*), le rouget (*Mullus barbatus*) et la Seiche (*Sepia officinalis*).

Une multitude d'espèce est capturée par le trémail, car c'est un engin non sélectif. Cependant, les pêcheurs peuvent cibler certaines espèces pendant des périodes bien définies de l'année, par exemple : la seiche, la dorade royale, le loup- bar et le mérrou. Les autres espèces pêchées d'une manière importante sont : le marbré (*Lithognathus mormyrus*), le poulpe (*Octopus vulgaris*), la dorade royale (*Sparus aurata*), la sole (*Solea vulgaris*), la bogue (*Boops boops*), le pageot commun (*Pagellus erythrinus*), le sar (*Diplodus sp.*) et saupe (*Boops salpa*).

L'aire de déploiement de l'effort de pêche s'étend sur l'ensemble de la lagune, avec une concentration plus importante au niveau de la passe et de Bokana pour les trémailleurs, Ichtiane et Iboughar pour les pêcheurs qui utilisent la palanza.

En fonction de l'espèce et de sa taille, des zones de répartition ont été déterminées par l'analyse des fréquences de tailles échantillonnées au niveau des sites de la lagune.



Carte 1 : Zones de concentration des principales espèces

L'effort total estimé durant la période d'étude (juin – novembre) est important, environ 18000 sorties, avec certaines différences entre les sites. La durée de la marée est très courte, en moyenne 6 heures par sortie, alors que le nombre d'heure moyen de dépôt des engins de pêche est très variable, selon le type d'engin, 24 heures pour le trémail et 15 heures pour la palanza.

La capture totale estimée est de l'ordre de 240 tonnes, constituée essentiellement de la seiche, avec 40 tonnes, la bogue (32 tonnes), le rouget (23 tonnes) et la caramote (18 tonnes). Il faut signaler l'apparition de l'anchois d'une manière très intense entre les mois de novembre et de janvier, avec une capture totale de 48 tonnes. (Tableau 1)

Tableau 1 : Estimation de la capture totale des principaux sites de la lagune, durant la période juin – novembre (en kg)

Site	Sèche	Caramote	Poulpe	Dorade	Bogue	Sar	Rouget	Anchois	Autres espèces	Total
Arjel	3446	853	4218	5947	13186	5783	4277	0	3109	40 820
Iboughar	3543	3003	1438	429	156	3203	1221	0	6685	19 678
Ibaouten	2929	3054	1436	1482	6490	509	2141	0	2456	20 498
Ichtiane	7785	5694	1886	2346	3570	2040	3786	0	655	27 712
Tirkæ	3574	282	757	3359	579	1466	2722	9000	5246	26986
sidi ali	7354	527	969	576	1925	307	2678	33000	4960	52459
Ghassi	1810	278	581	252	426	356	794	11 406	748	16 651
Lagune	38877	17719	13636	17016	31792	17087	22739	48000	34265	241000

La communauté des pêcheurs vit près des sites d'attache, dans des petites agglomérations appelées « Douars ». Cette communauté est entièrement masculine, composée d'environ 800 marins. L'expérience des pêcheurs dans ce métier est très importante, elle est en moyenne de l'ordre de 26 ans. Le métier de pêche est l'activité principale des pêcheurs. Dans de très rares cas, il peut être accompagné par une agriculture vivrière de faible revenu ou un petit commerce.

Pour la scolarisation, les résultats sont satisfaisants, surtout pour les plus jeunes qui sont pratiquement à 100 % scolarisés. Pour les moins jeunes et les femmes, la situation montre une certaine inquiétude avec des taux d'analphabétisation très élevés.

L'analyse des indicateurs socio-économique a permis d'illustrer la distribution et la dimension de l'investissement, de l'emploi et des revenus. Elle a montré que le secteur de la pêche artisanale dans la lagune de Nador, est un secteur rentable qui apporte beaucoup à la région.

Le capital investi total dans l'ensemble de la lagune est d'environ 20 millions de dhs, il est distribué d'une manière équitable entre les différents sites (figure). Ce capital montre que les pêcheurs de la lagune fournissent un effort d'investissement considérable, surtout que Le financement des moyens de production est assuré dans la majorité des cas par l'épargne propre des armateurs.

La barque constitue la part du lion dans l'investissement du pêcheur artisan, avec 50 % du capital investi, suivi des engins de pêche avec 40 % et du moteur avec seulement 10 % du capital.

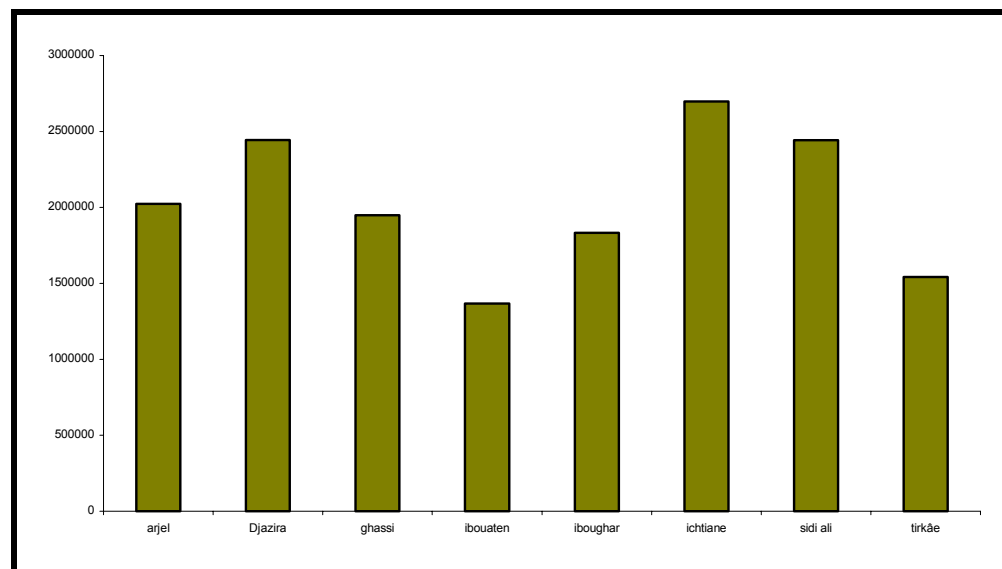


Figure 1 : Capital Investi total

Les charges totales par unité de production sont estimées à 6300 dhs par mois dont 65 % sont dus aux charges variables et 35 % aux charges fixes. Les charges fixes sont liées à l'amortissement et l'entretien des moyens de production, alors que les charges variables incluent principalement les frais de la main d'œuvre et ceux du carburant.

Les engins de pêche constituent les moyens de production qui pèsent le plus dans les charges fixes avec 84 % de l'ensemble des charges. Leur niveau annuel moyen est de l'ordre de 17500 dh comme charge d'amortissement et de 5100 dh comme charge d'entretien. Ces charges sont élevées en raison de la disposition des pêcheurs d'un nombre élevé d'engins de pêche, du prix élevé des engins de pêche et de la durée de vie courte de ces engins à cause de leur détérioration, soit par l'inexistence d'abris de protection, contre les aléas climatiques, soit par les dommages causés par d'autres embarcations.

Les charges fixes liées au moteur de propulsion et à la barque représentent respectivement 10 % et 5% du total des charges fixes.

Les résultats et les profits enregistrés par les barques de la lagune de Nador sont très positifs comparativement aux résultats des autres sites de la Méditerranée, qui enregistrent dans la majorité des cas des résultats négatifs. Le profit net moyen par barque est de l'ordre de 20 000 dhs, soit environ 3300 dhs par mois. Il existe des différences remarquables entre les différents sites, ces différences sont dues à la difficulté d'écouler la capture avec des prix élevés, à l'état de la flottille et des engins de pêche et à la productivité physique (figure).

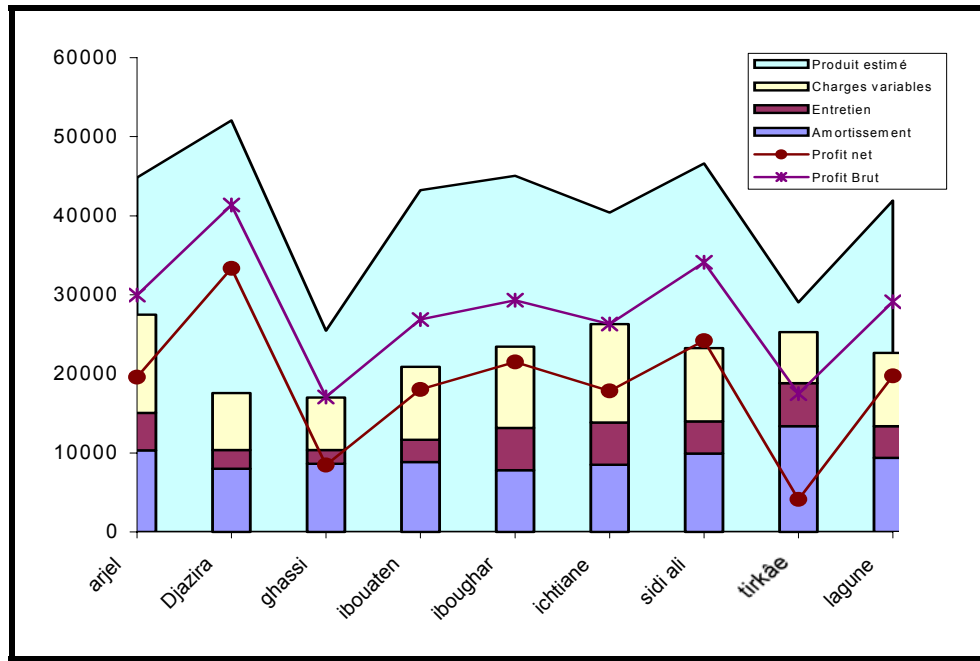


Figure 2 : Coûts et résultats des principaux sites de la lagune

La pêche artisanale dans la lagune de Nador, de la production à la commercialisation participe d'une manière positive dans le Produit Intérieur Brut du pays, avec une valeur ajoutée additionnelle qui dépasse les 11 millions de dhs.

La commercialisation des produits de pêche de la lagune fait intervenir une multitude d'intermédiaires, qui travaillent dans des conditions d'hygiène très médiocres. Les produits de la lagune connaissent, généralement trois principales destinations, qui diffèrent selon la nature et la qualité des espèces. (Figure)

Le poulpe a pour destination les usines de transformation, la caramote est rassemblée par certains des collecteurs qui se chargent de son exportation, alors que les autres espèces sont destinées principalement aux marchés et souks avoisinant les sites de pêche.

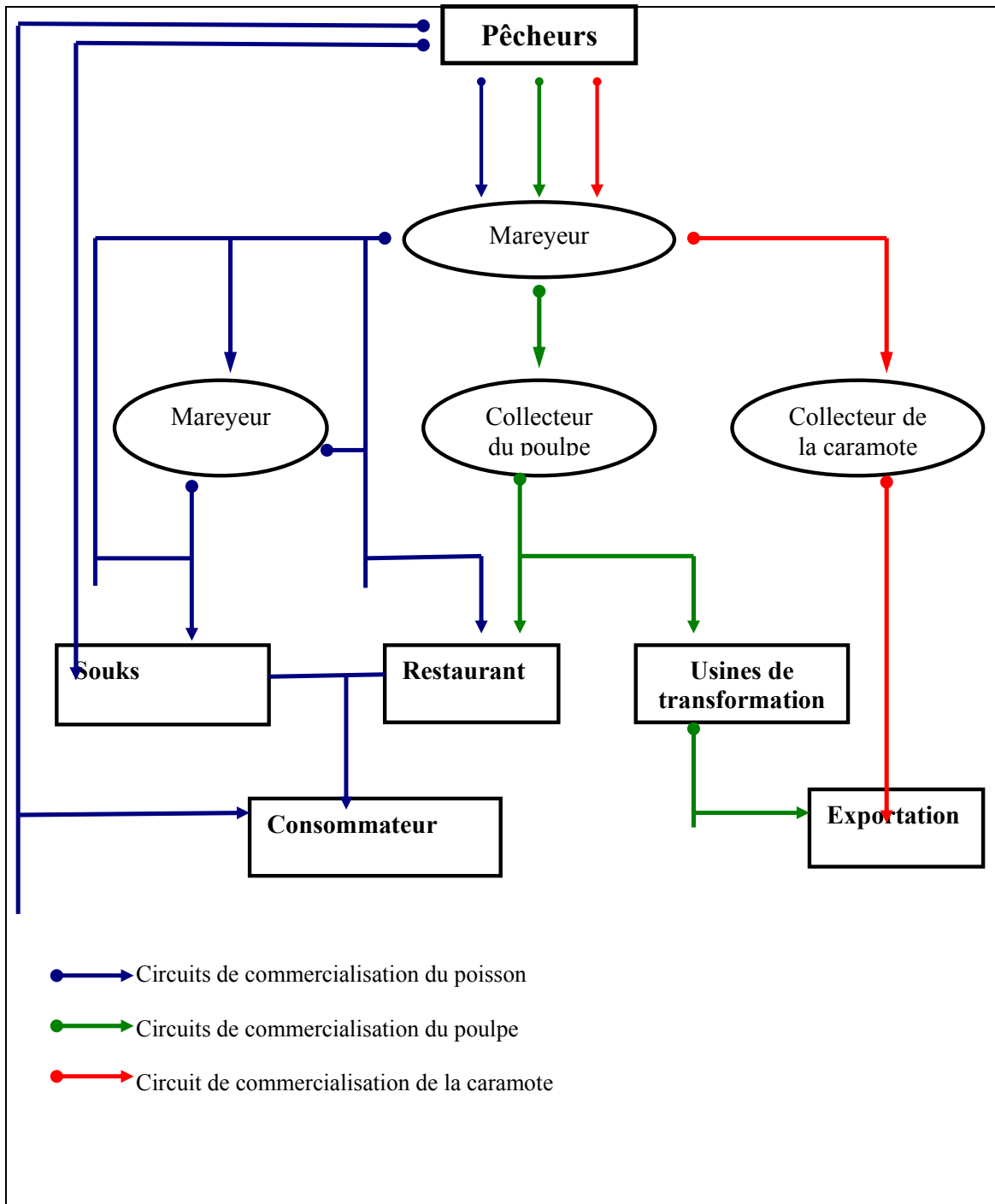


Figure 3 : Circuits de commercialisation des produits de la pêche de la lagune de Nador

Conclusions et recommandations

La pêche artisanale dans la lagune de Nador, est une activité pratiquée dans des conditions très traditionnelles, avec des moyens de productions très rudimentaires, des barques et des moteurs anciens et des engins en mauvais état et dans un environnement vierge d'infrastructures de base et de pêche. Mais cette situation n'a pas empêché ce sous-secteur de réaliser des résultats économiques positifs, d'assurer l'emploi pour un grand nombre de jeunes et par conséquent assurer un certain équilibre socio-économique de la région et lutter contre l'immigration.

La durée qui était réservée à l'étude était insatisfaisante pour répondre à tous les objectifs, surtout en relation avec les aspects biologiques et l'estimation de l'effort de pêche et de la capture. Les résultats de l'étude auraient pu être meilleurs, si le cycle de collecte des données était élargi à une année. Cependant, les résultats obtenus avec cette limitation de temps étaient très significatifs.

L'analyse des différentes données collectées a permis de déduire les zones de répartition des principales espèces capturées, les niveaux et les caractéristiques de l'effort de pêche et de la capture, au niveau de la lagune de Nador.

L'analyse sociométrique a révélé que la communauté des pêcheurs de la lagune est une communauté relativement jeune et purement masculine, mais avec une éventualité de vieillissement rapide dans les prochaines années, en raison du danger de l'immigration et de l'exode vers les grandes villes.

L'analyse des indicateurs économique a permis d'illustrer la distribution et la dimension de l'investissement, de l'emploi et des revenus.

Les résultats économiques satisfaisants réalisés par les pêcheurs de la lagune, ne reflètent pas la réalité des conditions difficiles de l'environnement des pêcheurs. Les problèmes vécus par les pêcheurs de la lagune sont sans limites et dépassent leur capacité d'intervention, car leur solution nécessite une vision globale de développement du monde rural dans l'ensemble du territoire marocain. Dans ce sens, on peut les diviser en deux grandes catégories : les problèmes d'ordre général, liés à l'absence de l'infrastructure de base (route, électricité, eau, institut de scolarisation, hôpitaux, etc.) et les problèmes en relation avec l'activité de pêche, principalement l'absence d'infrastructures de pêche, la détérioration des engins calés et la difficulté d'approvisionnement en intrants. Certains pêcheurs réclament également d'autres problèmes techniques, comme le problème de la passe et le manque du contrôle.

Afin de ressortir les pêcheurs de leur situation sociale délicate, certaines actions peuvent être recommandées, dont l'objectif d'intégrer la pêche artisanale dans le secteur formel.

Trois actions peuvent assurer un développement durable de l'activité de pêche au niveau de la lagune de Nador, le développement de l'infrastructure de base, l'amélioration des conditions de commercialisation et la mise en place d'une forme d'organisation des pêcheurs (association ou coopérative) qui facilite toute intervention et mesures d'aménagement prévues par les pouvoirs publics.

Pour réussir l'organisation des pêcheurs dans un cadre associatif, il faut obligatoirement améliorer leur capital humain, par la mise en place de programmes d'alphabétisation et de programmes de vulgarisation et d'encadrement des pêcheurs.

Ces deux programmes, joueront un rôle important dans l'amélioration des compétences humaines et professionnelles des pêcheurs, qui seront de plus en plus proches à la compréhension du système lagunaire et de sa fragilité. Ces actions peuvent assurer l'auto préservation des ressources et du milieu lagunaire, par une auto gestion efficace avec la collaboration de l'administration.

L'autogestion peut être assurée par une association, qui jouera le rôle d'interlocuteur avec l'administration. Elle aidera le ministère des pêches, à assurer la gestion des ressources de la lagune et de faire respecter les mesures d'aménagement prises.

Le développement de l'infrastructure de base au niveau de la lagune de Nador, peut se réaliser dans le cadre du programme de la mise en place de points de débarquement et de villages de pêcheurs, tracé par le Ministère des Pêches Maritimes. Ce programme suit un rythme très lent, qui doit être accéléré.

Les besoins prioritaires déclarés et attendus par les pêcheurs, portent sur la mise en place de stations de carburant proches des sites d'attache, l'approvisionnement en eau et en électricité, la construction d'une route et d'un hôpital, etc.

La valorisation et l'amélioration des produits de la pêche, ne peut se faire que par l'amélioration des conditions de la commercialisation, basée sur un transport conditionné par le biais de petits camions frigorifiques, une utilisation massive de la glace et des conditions d'hygiène contrôlées.

Références bibliographiques

Boutaib, R. et El Madani, F. (2000) : La Mar Chica ou Lagune de Nador : « Etat de connaissances sur les problèmes de pollution », INRH- Nador, 44p

Franquesa, R. ; Malouli, M.I. et Alarcon, J. A. (2001) : Feasibility assessment for a database on socio-economic indicators for Mediterranean fisheries, *General Fisheries Commission for the Mediterranean, Studies and Reviews, N°71, FAO, Rome, 51 p.*

MARSHALL, E. et BROSSIER, J. (1981): Le raisonnement économique des décisions de l'agriculteur, INRAP.

Zine, N.E. et Menioui, M. (1998) : Aperçu sur les conditions de surface d'une lagune méditerranéenne (Lagune de Nador, Maroc), *Rapp. Comm. Inter. Mer medi. ; n°35*

Meaden, G. J. et Kapetsky, J. M. (1991) : Geographical information systems and remote sensing inland fisheries and aquaculture. *FAO Fisheries Technical Papers, N° 318, FAO, Rome, 262 p.*

