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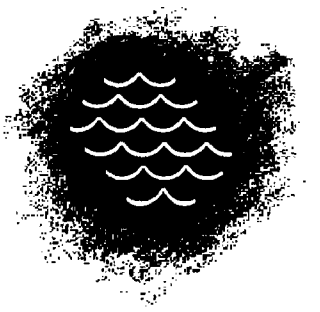

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Even though the international trade system was originally developed without considering environmental protection, efforts are being made to join environmental and political aims. In Mexico, Baja California Sur (BCS) is the most arid state and that with the longest coastline. Efforts to insert BCS into the international market have usually reflected the environmental topic. The purpose of this work was to identify environmental, economic and social impacts caused by the North American Free Trade Agreement (NAFTA) in BCS. We analysed, from 1994 to the present, the main fishery companies for growth in production, increases in the quantities and value of export products, the participation of personnel in environmental aspects, changes in pollution prevention and control, new technology, increase of investments and generation of employment. We find that in the short and medium term, NAFTA in the fishery sector has had no significant effects on the environmental, economic and social variables studied. Copyright © 2002 John Wiley & Sons, Ltd and ERP Environment.

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INTRODUCTION

Even though the international trade system was originally developed without cnsidering environmental protection, efforts are being made to join environmental and political aims (Orrego, 1995). Committed to this task there are global international organizations, such as the World Trade Organisation (WTO), the North American Free Trade Agreement (NAFTA) (SECOFI, 1993) and international conventions on the environment. Our purpose was to identify the possible environmental, economic and social impacts caused by NAFTA in BCS, a state in Northwest Mexico. The Mexican Northwest is next

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to and surrounding marine areas with the highest biological productivity in North America. Northwest Mexico is one of the four most important fishing regions of the planet (Casas and Ponce, 1996). With the commercial opening and the move to the globalization of the economic and social system, it is important to study the behaviour of the natural system inside these new integrated systems (Hauwermeiren, 1994).

MATERIALS AND METHODS

The study area was Baja California Sur (BCS), located between 28°00′ and 22°52′N and 109°25′ and 115°05′W (Figure 1 - shaded area).

In BCS, we identified the main fishing areas of shrimp, tuna, sardine and anchovy (Rodríguez-Sánchez *et al.*, 1996; Ortega-García *et al.*, 1996; García-Borbón *et al.*, 1996) and the location of the main processing plants (Figure 2).

Six periods of fieldwork, each of 5 days, were carried out to interview and question all the identified fish processing companies.

For each company we obtained the following data from 1994 to date: growth in production, increase of the value of their export products, commercialization changes, increase of the investments in their company, generation of employment, new technologies, clean technologies, export of their products to the members of NAFTA, production processes, possibilities of association with other companies the same field and quality of their products. The questionnaire used with fish processing companies contained 45 questions with four possible answers for each. The actual questions and most predominant answers are in Table 1.

RESULTS AND RECOMMENDATIONS

All the data gathered for the consulted companies indicates that most of the aspects studied were unchanged after NAFTA (Table 2). None of the companies had been consulted by the government about the effect of the commercial integration of their fishery. No company had been visited for an evaluation on the effects (so far), and they have

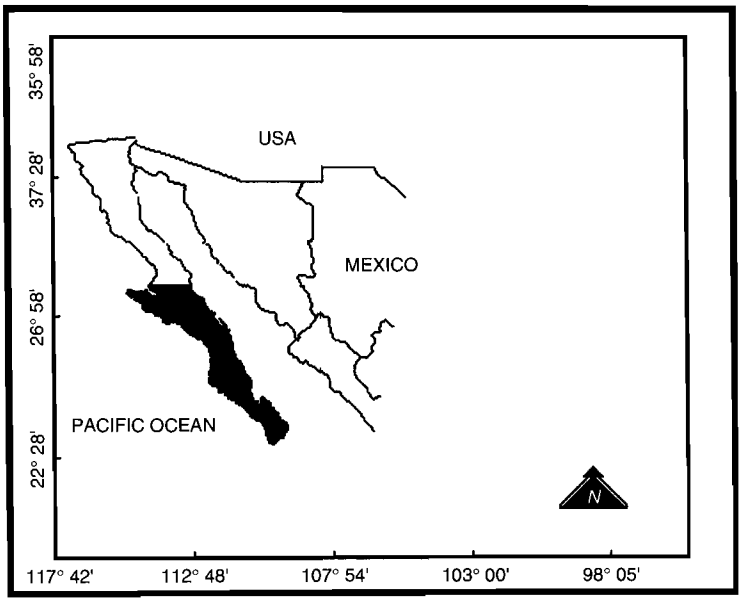


Figure 1. Location of Baja California Sur

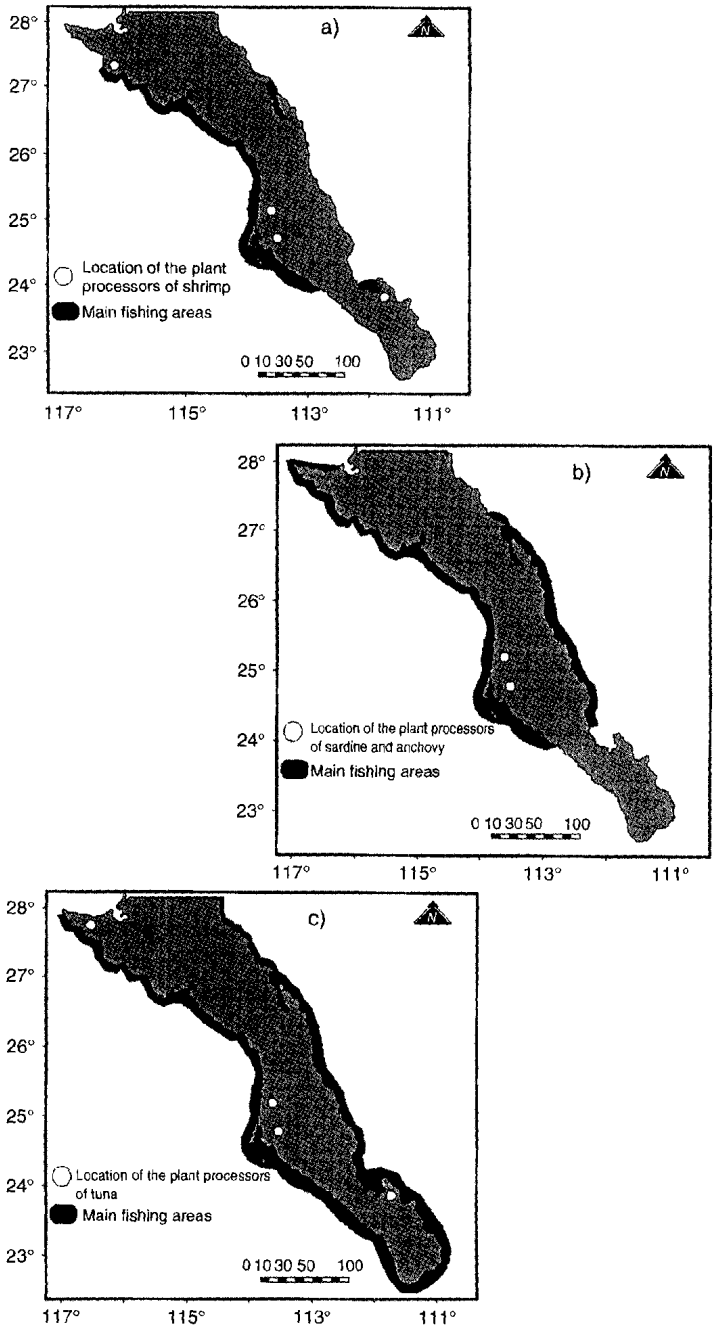


Figure 2. Location of the plant processing shrimp and the main fishing areas (a), location of the plant processing sardine and archovy and the main fishing areas (b) and location of the plant processing tuna and the main fishing areas (c)

not made a self-evaluation of the impacts of NAFTA.

In Table 2 are the positive, negative and neutral effects we noted in the selected environmental variables caused by NAFTA. Recycling of derivative materials of the processing, integration of environmental aspects to the production, increase or decrease of

Table 1. Questionnaire showing most predominant answers

Question	Most predominant answer
1. How is the production process selected?	Try to select nonpolluting processes.
2. Is the production process considered of high environmental risk?	Consider as risk that established by the environmental authority.
3. Has there been a formal investigation and were the risks documented ?	Consider the information of the workers on environmental risk.
4. How does the competition manage environmental matters?	Consulted the competition to determine their focus.
5. Are environmental indicators considered in the design of the product?	They do consider environmental indicators when it is possible.
6. How is the packing of the products decided?	Use packaging that conserves the product appropriately.
7. Does the life cycle of the product affect the atmosphere?	Don't know what is the focus 'at the end of the chain' in the company.
8. How is the concept of clean or green products used?	The concept of clean products is good in theory but not very applicable.
9. How is the economic cost of clean or green products analysed in the company?	The economic cost of clean products was not analysed.
10. Is there a certificate of Clean Industry?	Clean Industry is not certified.
11. How is the company informed on environmental regulation?	The environmental regulation is known when they receive the requirements.
12. How do you distribute the environmental norm information in your company?	The information is given directly to production personnel and directives.
13. Is the execution of the environmental obligations verified?	They claim they fulfill the environmental standards but do not claim records are kept.
14. How is monitoring of discharges, emissions and solid waste done?	They have a programme of monitoring of residues, discharges and emissions.
15. How are environmental matters integrated with the health politicians and the workers' social security?	They have a programme of risk prevention for the health of workers.
16. How does the company report environmental matters?	The environmental aspect is reported according to the obligations required by regulations.
17. What priority have environmental aspects in the policies of the company?	They are not high priority.
18. How are the environmental policies of the company settled?	The environmental policies of the company are determined by group decisions.
19. How is the environmental area structured in the company?	They do not have an environmental surface area in the structure of the company. Do not have a part of the company devoted solely to environmental policies.
20. What assignment of economic resources is for environmental aspects?	Assign resources as a problem occurs.
21. How is the participation of the workers promoted in the environmental improvement of the company?	They have committees to promote environmental matters.
22. How qualified are the employees in environmental aspects?	Environmental training is practised with the workers.

Table 1. (*Continued*)

23. How do they motivate the personnel in environmental programmes?	Incentives are given for good environmental practice.
24. How are the secondary products and the residuals generated in the process recorded?	They record the residuals that must be paid for their handling and disposition.
25. How does waste affect production?	They ignore changes in waste amount.
26. How are the environmental aspects integrated into production?	They seek to decrease environmental problems during production.
27. Do they have the flow diagrams of the process?	Have flow diagrams up to date.
28. Have they had changes in the last three years in the volume of matter, auxiliary materials and generated waste?	Variability is detected in the volume of the raw materials and it is attributed to changes in production.
29. How has the cost of treatment of residuals been managed?	Have not considered managing the resources ecologically.
30. How are opportunities identified to diminish the waste generation?	Monitoring the discharge emissions.
31. How is contamination controlled?	They have treatment plants.
32. How are the residuals managed?	By the gathering of residuals.
33. Which is the position of the company with relation to the handling of residuals, emissions and solid waste?	The authorities should install waste disposal sites.
34. How do they solve the problem of relative toxicity or toxic residuals that are generated during the process?	They try to substitute toxic raw materials and to modify the process.
35. Has the possibility of recycling materials of the process been explored?	No.
36. What is the main source of energy in the company?	Electric power and fuel oil are the main power sources.
37. How does the cost of electric power impact the operation of their company?	The cost of the energy is fairly important.
38. How do seasonal changes in the energy billing impact the company?	Do not know.
39. What relationship exists between energy consumption and the prices of our products?	The cost of energy affects prices.
40. Has some integral programme been considered for the energy saving?	They consider this only when needed.
41. What is their motivation to establish programmes of energy saving in the company?	The energy saving would decrease the cost of production.
42. How has the entrance of NAFTA affected the behaviour of the company?	No change.
43. Were they consulted by the authorities about the convenience of commercial integration of their fishery?	No.
44. Have they been visited by the authorities to carry out an evaluation on the caused effects (so far) for commercial integration in their fishery?	No.
45. Has their company carried out an evaluation of the impacts caused by commercial integration?	No.

Table 2. Environmental, economic and social effects caused by NAFTA in Baja California Sur, Mexico

Environmental	Changes from 1994 to 2000	Effect
Legislation, execution of the environmental obligations	They did not consider that the law demands high quality standards to export its products, like ISO 9000. Now NAFTA demands fulfillment of the environmental norms for Mexico to be able to export its products.	+
Prevention and control of contamination	They did not have control instruments and mechanisms to prevent contamination. Now they measure the emissions to the atmosphere.	+
Personnel participation in environmental aspects	They did not participate in environmental matters and continue without participating in environmental matters.	=
Recycling of materials of the process	No material was recycled into the production process, nor are they now.	=
Consumption of clean energy	The main energy source is diesel generators and thermoelectric electric power. They continue using the same energy sources.	=
Increase or decrease of waste	The waste has a positive correlation with the increase of production. There has been no change from 1994 to date.	=
Economic and social		
Growth of the fishing production	No changes.	=
Increase of the value of the export products	No changes.	=
Increase of the investments in the companies	No increase in investments in the fishing companies; they have not grown or modified their installation.	=
New technology	With NAFTA, they have acquired new technology, mainly teams for monitoring emissions to the atmosphere.	+
Export of their products toward the members of the treaty	They continue exporting their products to the same markets, mainly to Asian countries.	=
Quality of the product	To be able to compete in the open markets, they have improved the quality of their products.	+
Association possibilities with other companies of the same field	They have not received interest of any company of the member countries of NAFTA to associate their companies.	=
Generation of employment	There has been no change.	=

waste and changes in the fishing biomass have remained unchanged. Over the short and medium term negative or positive effects on the environment do not exist, though they may happen over the long term, an interesting situation to observe.

We find that the positive effects on the economic and social variables in the fishing sector identified in this work were happening before NAFTA, and not as a result of it. These variables were the increasing volume of exported products, increase in the public investment in the sector, acquisition of new technologies, improvement in the quality of the products and the integration of environmental aspects and benefits for the workers. Variables

such as the growth of fishing production, the value of production and generation of employment showed no significant changes.

After analysing the results, and as a function of the observations during the field work, we developed a series of recommendations to help the fishery sector in Baja California Sur respond to NAFTA to enhance the positive effects of this treaty. The recommendations to improve the environmental, economic and social aspects for the fish processing companies in Baja California Sur are productive processes, environmental regulation, participation of personnel in environmental matters, control of processing, prevention and control of contamination, use of energy, and globalization. Specifically, to improve or strengthen productive processes, we recommend the following.

(i) Develop processes at the beginning of production to agree with environmental standards.
(ii) Avoid processes with high environmental risk.
(iii) Design the containers and packaging of products for collection and later reuse.

Because environmental regulations are becoming stricter, it would be worthwhile to create an environmental working-group of the companies to interact with all stages of production. The following are suggested.

(i) Distribute all known information about environmental standards to all personnel to stimulate their participation.
(ii) Report the environmental situation periodically in the companies so the necessary measures are appropriately taken.
(iii) Assign the responsibility of meeting environmental legislation and knowledge of the standards to groups of capable individuals, supported by the whole company. This will help guarantee that the environmental aspects are supported with the necessary resources.

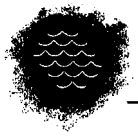
It is necessary that the personnel involved in the process understand it, to be able to respond to emergencies. Training in and documentation of the process is indispensable to assure quality. To improve or to strengthen the participation of personnel in environmental matters, a permanent programme of training should be developed for all the personnel of the company.

The control of processes of the companies needs recording of production, which is not yet systematized, so it is impossible to analyse environmental variables. It would be useful to find a consultant specializing in this. The control of residues is very important to reduce the waste and to improve productivity. To optimize the control of processes we suggest the following.

(i) Take maximum advantage of the raw materials, reducing waste.
(ii) Carefully record the production residues and analyse their causes. Use in other operations the residues generated in their productive processes, considering them subproducts with value.

The prevention and control of contamination represent non-productive expenses for the companies, but prevention of pollution is profitable because it optimizes the use of raw materials and biomass. The companies studied did not use recording of production to analyse the process, therefore we recommend they improve or strengthen these practices.

(i) The savings generated by reduction of waste are at least enough to cover the cost of treating the residues.
(ii) Control of contamination, using non-polluting materials and processes, and documenting and upgrading the productive processes of the companies with flow diagrams is recommended.
(iii) There should be identification of other economic activities that can take advantage of the residues of their productive



processes. Consider the residues, effluents or emissions as possibly usable subproducts in other productive processes, and promote alliances with other companies to take advantage of them.

For energy, we recommend the following measures.

(i) Have diagrams of the electrical system of the companies and operation manuals; update them regularly and assure they are available for the personnel responsible for production and the maintenance. To guarantee energy saving, there should be aid from external specialists.
(ii) Programme production preferably outside the period of highest demand and systematically analyse the data of the energy invoices to identify problems in hardware operation and opportunities of improvement in the operation.
(iii) Establish permanent recording of operation of the electrical devices, including maintenance, flaws and effective hours of operation to reduce the effect of energy consumption on cost.

CONCLUSIONS

(i) In BCS, Mexico there were no significant effects on the environment caused by NAFTA. The fishery sector was not an important part in the negotiation of the treaty.
(ii) Over the short and medium term, NAFTA had no apparent effect on the environmental, economic and social aspects of the fishery sector in Baja California Sur, Mexico.
(iii) It is important, though, to continue study of the effects of NAFTA over the long term.

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