Available online at www.sciencedirect.com
SCIENCE DIRECT®
Ocean & Coastal Management
ELSEVIER
Ocean & Coastal Management 48 (2005) 31–50
www.elsevier.com/locate/ocecoaman

An analysis of critical areas for biodiversity conservation in the Gulf of California Region

Roberto Enríquez-Andrade[a,*], Gabriela Anaya-Reyna[b], Juan Carlos Barrera-Guevara[c], María de los Ángeles Carvajal-Moreno[d], Maria Elena Martínez-Delgado[e], Juan Vaca-Rodríguez[f], Carlos Valdés-Casillas[g]

[a]*Facultad de Ciencias Marinas, Universidad Autónoma de Baja California, Km 103 Carretera Tijuana-Ensenada, 22870 Ensenada, Baja California, México*
[b]*Área de Protección de Flora y Fauna—Islas del Golfo de California, Melchor Ocampo No. 1045 2do. Piso. Col. Centro, La Paz, B.C.S. C.P. 23000, México*
[c]*World Wildlife Fund—Gulf of California Program, Dr. Pesqueira 196 B, Colonia Prados del Centenario, Hermosillo, Sonora, México*
[d]*Conservation International Mexico, Obregón 64 Altos Miramar, Guaymas, Sonora, México*
[e]*Conservación del Territorio Insular Mexicano, Álvaro Obregón 735, La Paz, Baja California, México*
[f]*Universidad Autónoma de Baja California, Km 103 Carretera Tijuana Ensenada, Ensenada Baja California, México*
[g]*North American Commission for Environmental Cooperation, 393 Rue St. Jaques Ouest, Bureau 200, Montreal Quebec, Canada*

Abstract

This article summarizes the results of a broad regional consulting process aimed to identify critical areas for biodiversity conservation and to determine the relative level of anthropogenic pressure on natural resources throughout the Gulf of California Region. The methodology was designed to achieve broad consensus by means of a highly participative process that involved the following: (1) the independent, but coordinated, work of experts in task groups to integrate all available information on the key ecological and socioeconomic processes, as well as to generate updated inventories of species; (2) a workshop to identify (based mainly on the information gathered during the first stage) the biologically important areas, and to spatially

*Corresponding author. Fax: +52 646 174 4103.
E-mail address: enriquez@uabc.mx (R. Enríquez-Andrade).

0964-5691/$ - see front matter
doi:10.1016/j.ocecoaman.2004.11.002

analyze the anthropogenic pressure on biodiversity, as well as the potentiality for social conflicts; and (3) the integration and spatial analysis of the results by means of a geographical information system. Results show that the areas subject to high anthropogenic pressure coincide with the areas of biological importance. It is expected that the information ensuing from this exercise will help the stakeholders to develop a meaningful conservation portfolio.

1. Introduction

The Gulf of California or Sea of Cortez is among the five marine ecosystems with highest productivity and biodiversity in the world. It is bordered by the states of Sonora, Sinaloa and Nayarit in mainland northwest Mexico, as well as the Baja California Peninsula (Fig. 1). The presence of over 800 islands and the geographical features of the peninsula make the region a patchwork of isolated habitats ideal for a high incidence of endemic species. The Pacific coast along the state of Baja California Sur is also highly productive and diverse due to upwelling and other oceanographic processes that take place in the area. The region as a whole, for which we will refer to as the Gulf of California Region, is for the most part in a relatively good state of conservation. According to the Comisión Nacional para el Conocimiento y uso de la Biodiversidad (National Commission for the Study and use of Biodiversity) at the national level, the Gulf of California Region encompasses 23 priority sites for marine biodiversity [1], 42 priority sites for terrestrial biodiversity [2] and 62 priority sites for the conservation of birds [3]. In addition, the region encompasses 24 out of 110 of the country's priority hydrological basins [4].

Approximately 4800 intertidal invertebrate species have been identified in the Gulf of California [5], more than 740 of them endemic, as well as 875 fish species, out of which 77 are considered endemic [6]. Five of the seven species of sea turtles existing in the world are found in the region, some of which are very common around the islands. At least 17 species of seabirds use the islands in the Gulf of California for reproduction purposes, 11 of them are migratory, six resident and five are considered quasi-endemic [7,8].

The Gulf of California is also known worldwide for the diversity of cetaceans, for almost 40% of all known cetaceans are found in the region [9]. The Vaquita (Phocoena sinus), the only endemic cetacean in Mexico, inhabits the northern end of the Gulf of California, and has the most restricted habitat range of any marine cetacean in the world. Around 40 sea lion colonies are spread out throughout the region, with an estimated population of over 30,000 individuals [10].

The Gulf of California Region accounts for approximately 10% of Mexico's Gross Domestic Product, with a human population of about 8.6 millions, and a projection of 10.4 millions by the year 2010 [11]. More than 500 thousand tons of shrimp, sardine, tuna and squid, among others species, are caught annually, worth more than 300 million US dollars. Approximately 40% of Mexico's agricultural production comes from the region, mainly from the states of Sonora, Sinaloa and Nayarit.

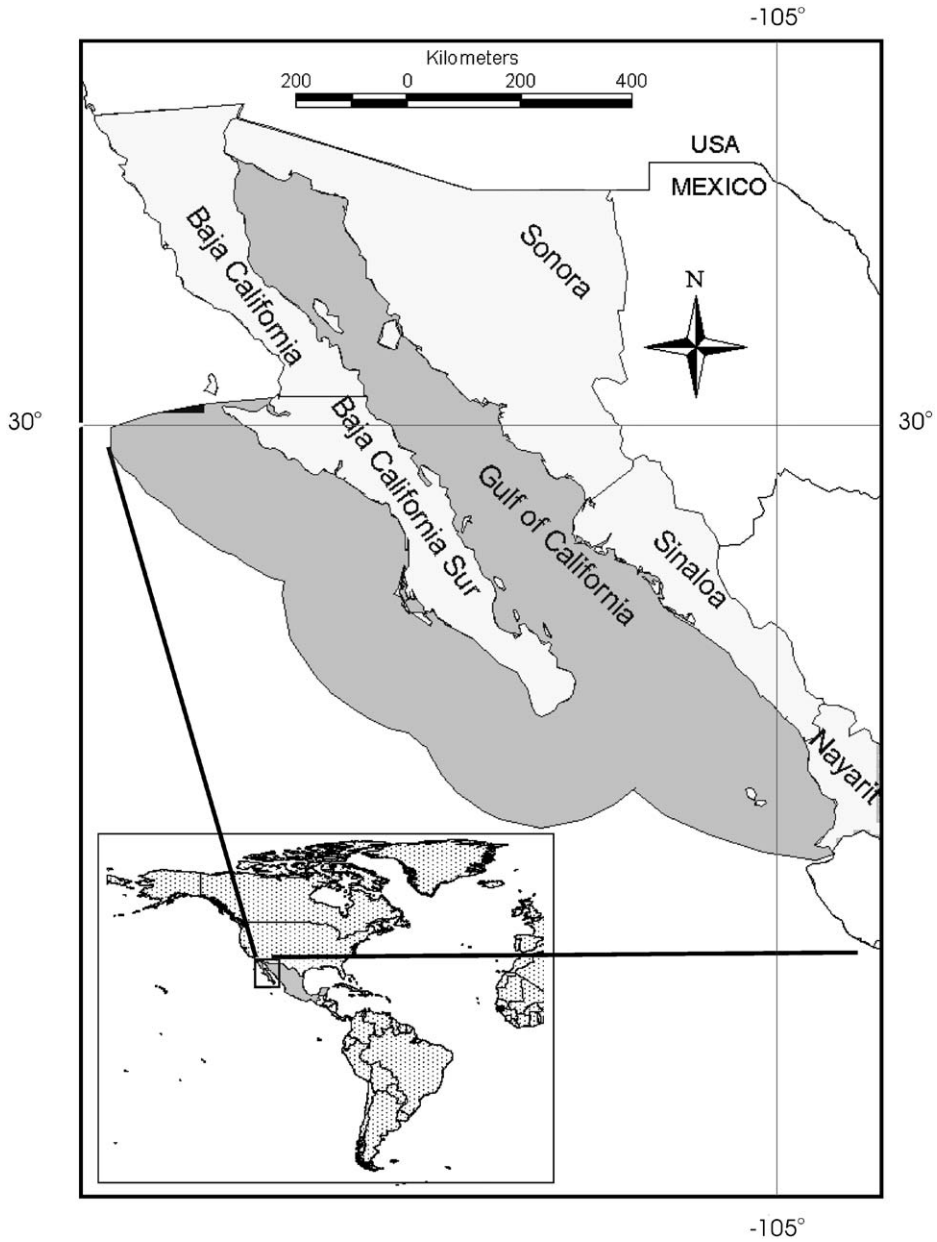

Fig. 1. The "Gulf of California Region": The study area includes the littoral fringe (shaded in blue), as well as the five bordering states of Nayarit, Sinaloa, Sonora, Baja California and Baja California Sur (shaded in yellow).

Tourism is also an important socioeconomic factor, with sport fishing as one of the main attractors, as well as the many still untouched scenic attributes remaining in the region [12]. Recognizing the relevance of tourism for the future development of the region, the Mexican government has launched an ambitious project, called Nautical Route, consisting of at least 22 yachting marina resorts placed strategically along the coast of the Gulf of California Region. The project also contemplates new and improved highways, airports, airstrips, and the development of hotels, golf courses, etc. Conservationists and scientists have expressed concern for this project since many of the proposed sites lie within or near ecologically critical areas.

Recognizing the landscape value of the region and its importance for biodiversity, different sectors of society have engaged in a conservation movement based on scientific research, environmental education, community outreach and activism. As a result, several natural protected areas have been established along the region, including five biosphere reserves, five marine parks, three wildlife reserves and three areas with other protection status. In addition, two new marine parks are being considered for decree (http://www.conanp.gob.mx/index).

Unfortunately, a large part of these valuable efforts have suffered from lack of coordination and lack of broadly agreed upon priorities. Scarce human and financial resources have been redundantly devoted to charismatic species or directed toward specific high-profile areas.

A coordinated conservation movement is becoming increasingly important in face of mounting demographic and economic pressure on natural resources. The coalition for the sustainability of the Gulf of California, for which we will refer to as The Coalition, was created in December 1997 as an attempt to integrate available information and generate broad consensus on conservation priorities for the Gulf of California Region. The Coalition has members representing 14 regional conservation organizations, three federal or state governments, three natural protected areas, and 12 public and private universities and research centers.

This paper describes a broad regional participative process coordinated by The Coalition to identify critical areas for biodiversity conservation and to determine the relative level of anthropogenic pressure on natural resources throughout the region. An additional goal of The Coalition is to assess and update conservation priorities; this effort however is still underway and is not reported in this paper. The project received technical, logistical and financial support from Conservation International, the Mexican Fund for Nature Conservancy, World Wildlife Fund and an independent anonymous member.

2. Methods

The Coalition structured a two-phase ad hoc methodology for determining important areas for biodiversity in the Gulf of California Region. The first phase involved gathering, organizing and preliminarily analyzing available information, as well as the basic organization and logistic activities. The second phase involved a workshop with a broad participation of experts and stakeholders.

The first phase was organized around seven thematic groups: (1) land flora, (2) land fauna, (3) marine biota, (4) wetlands, (5) marine physical processes, (6) marine ecological processes, and (7) socioeconomic processes. The first four groups were named the "biodiversity thematic groups", whilst groups five–seven were named the "processes thematic groups". In addition, two support groups were created: a technical–logistic group and a geographic information system (GIS) support group. The last group provided support to the remaining groups with collecting databases, integrating them in one common projection, sub-setting information, creating satellite images mosaics and training the experts with no former abilities in GIS in the usage of WWF-CECARENA DataMap2 software, specialized in collecting spatial information for conservation targets.

The members of the thematic groups were highly recognized persons, many of them scientists, with experience in the region, and were selected and invited by the organizers. Each thematic group had a coordinator and at least two other experts in the corresponding fields.

This phase was based, for the most part, on the independent work of each thematic group with cartographical support provided by the geographical information system group. ESRI compatible products in a uniform projection were used, according with national standards: Lambert Conformal Conic. The technical–logistic group facilitated constant communication among the thematic groups to promote information exchange, both via Internet and by means of two meetings. These meetings had also the goal of review preliminary results and agreed on standardized procedures.

The main objectives of each biodiversity thematic group were (a) to integrate all available information in a spatial context to be used in a geographic information system, (b) to generate an updated inventory of species of the region based on available information, (c) to select preliminary Conservation Targets from the inventories; and (d) to generate maps showing the areas where preliminary Conservation Objects are located and are, according with their expertise, the most suitable for the permanence of the target. Those maps were developed using the software ESRI ArcView 3.2 and WWF-CECARENA DataMap2.

The preliminary Conservation Objects represent species considered as key elements for biodiversity conservation. The criteria used to define them were: population and habitat condition, endemism, distribution ranges, threats and all the corresponding trends. All species in the inventories were evaluated according to each criterion using a grading scale from 1, representing the highest threat or worst condition, to 5, representing the most stable or desirable condition. Those species with the lowest median grades (1 and 2) were preliminarily considered as conservation objects. Peers external to the process reviewed the selected Conservation Targets before final approval.

The main objective of the marine physical processes thematic group was to gather all available information related to the oceanographic processes relevant for biodiversity. Meanwhile, the objective of the marine ecological processes thematic group was to identify the main interactions and connections among species from different taxonomic groups, and also between these and physical processes. This

group considered aspects such as reproduction, larvae dispersion, birthrates and recruitment, migration and so forth. During the first phase there were no groups working on land processes.

The objective of the socioeconomic processes thematic group was to collect all available information related to relevant human activities in the region, as well as the legal background regarding conservation. This information included also previous work done at ecoregional level to develop threats analysis, expressed spatially [13].

All collected information was peer reviewed to assure relevance and accuracy. Peers that participated reviewing in the information during the first phase were invited to take part in the workshop on the second phase.

The second phase used the information produced during the first as a baseline for a broad expert consultation in a workshop held at Mazatlan, Sinaloa, May 14–18, 2001. To facilitate the discussion, four working groups were created: (1) marine biodiversity; (2) land biodiversity; (3) physical and ecological processes; and (4) socioeconomic processes. The first two groups were sub-divided into taxonomic working sub-groups (marine fishes, marine mammals, marine invertebrates, macroalgae, wetlands, birds, land flora, and land vertebrates).

The workshop had an attendance of 180 persons, representing 67 institutions. One of the main characteristics of the workshop was the dynamic and participative motion among the local scientific, conservation and government communities in the area. A process characterized by consensus, where important agreements were reached among participants from different social sectors and diverse interests.

The first task for the participants in the workshop was the identification of biologically important areas, defined as the geographical location of habitats containing the conservation objects. With this in mind, each taxonomic sub-group revised the inventories of species and preliminary Conservation Targets from the first phase of the process, the evaluation criteria used, as well as any new inventories or information available. When necessary, the sub-groups re-evaluated the species from the inventories. Once the sub-groups selected the final Conservation Targets (lowest median grades, as explained before), the geographic location of these species/habitats/processes was displayed on maps by means of polygons. These polygons represent the areas containing the species classified as conservation objects.

The physical and ecological process groups also generated maps locating critical areas important for biodiversity conservation. These groups revised all available information as well as the biologically important areas generated by the taxonomic groups. The ecological interactions and connections among species, and physical processes such as marine currents, upwelling and front areas, etc., were used as criteria. All relevant information was recorded in appropriate databases.

The second task for the workshop participants was to put together the biologically important areas for the taxonomic groups and the areas where the important ecological and physical processes take place, to define the integrated important biological areas (AIBIs, after the name in Spanish). To achieve this, the participants revised all the individual biologically important areas, the criteria supporting their designation as such, their geographical limits, the relationship to other biologically important areas, and the ecological and physical context. Suggestions, comments

and critics on each biologically important area were considered and discussed in an open forum, and when appropriate, changes were made, such as exact geographical limits or interactions among areas. The purpose was to obtain as much feedback as possible.

Once a consensus was achieved, the geographical information system support group overlapped all the biologically important areas from all the taxonomic subgroups and the critical areas from the process groups in a single map (a map showing the AIBIs). The purpose was to identify regions where many of these areas overlapped, since these were considered more important for biodiversity conservation than those regions where only one or a few biologically important areas were present. For the marine and coastal regions, areas with three or more overlaps were arbitrarily considered important, while two or more overlaps were considered important for areas in land.

The third task for the workshop participants was the generation of maps displaying a spatial index of anthropogenic pressure on biodiversity and a spatial index of social conflict potentiality regarding the use of the natural resources in the region, as well as near future trends for both indexes. With this in mind, the socioeconomic processes group gathered relevant information from the first phase, as well as any new information available. Areas with high population density, as well as the main economic activities—including tourism, agriculture, aquaculture and all sorts of fisheries—were located on maps by means of polygons.

For each economic activity taking place in a given area, an index of anthropogenic pressure on biodiversity was evaluated using a set of criteria (Table 1). Scores for each activity were assigned for the present situation as well as for the most likely scenario in the next 5 years. Appropriate scores were given such that the higher its value, the higher the level of anthropogenic pressure. The resulting maps were overlapped by the geographical information system group to generate integrated indexes. This was done by placing all the polygons from the different activities in one map and adding up the scores of overlapping areas. Total scores were standardized to fit in a 1–10 scale. Trend maps were generated considering

Table 1
Criteria used during the workshop to evaluate the anthropogenic pressure by each relevant socioeconomic activity

Anthropogenic pressure	Description	Score
Very low	No significant impacts	1
Low	Significant impacts exist but are compensated or mitigated appropriately	2
Medium	Existing impacts can potentially be mitigated at low social or economic costs	3
Medium-high	Existing impacts can be potentially mitigated at high social or economic costs	4
Very high	Irreversible destruction of habitat and/or species extinction	5

Table 2
Criteria used during the workshop to evaluate social conflict potentiality produced by each socioeconomic activity

Anthropogenic pressure	Description	Score
Very low	Socioeconomic activities with no significant conflicts and acceptable levels of social organization	1
Low	Conflicts are notorious but can be solved at low social or economic costs. Acceptable levels of social organization	2
Medium	Significant social conflicts. There is an increasing pressure on the use of natural resources, and also a rising competition among different social sectors. Problems can be solved at high social or economic costs	3
Medium-high	Serious conflicts solved only at high social, economic, cultural or political costs	4
Very high	Unsolvable situation. The atmosphere is unmanageable. Irreversible impacts on natural resources. Where the cost-benefit relation is negative, the productive activity is abandoned and pressure on other resources is generated	5

the score difference between the present and the near-future scenario. The level of social conflict potentiality and its trend were evaluated using another set of criteria (Table 2), in a procedure that followed closely the one used for the anthropogenic pressure.

All inventories of species, relevant documents and the final geographical information system containing conservation objects, biologically important areas, and the anthropogenic and social conflict maps were integrated into two compact discs [14,15] and were widely distributed among the participants and others.

3. Results

3.1. Inventory of species and conservation objects

Table 3 shows the number of species registered in the updated inventories for each taxonomic grouped. The total number of species for all groups is 12,548, neither considering land invertebrates nor microplancton. Of these, around 650 were selected as conservation objects: 213 marine invertebrates, 27 fish species, all sea turtles, the Vaquita and other 7 marine mammal species, 63 algae species,2 marine grass species, 36 species of land mammals, 37 species of land reptiles and amphibians, 56 species of birds, and 214 species of land flora. However, all marine grass and mangrove species were given a "special" status due to their overall importance as ecosystems. As an example, Table 4 shows the species classified as Conservation Targets by the marine mammal taxonomic group.

Table 3
Number of species integrated into the updated inventories—marine and land flora and fauna

Group	Marine	Land	Total
Fauna			
Birds		530	530
Mammals	35	264	299
Reptiles and amphibians	35	564	599
Fish	739	85	824
Invertebrates	4848		4848
Flora			
Grasses	3	[a]	3
Algae	626		626
Other flora		4819	4819
Total	6286	6262	12,548

[a]Land grasses are included in "other flora".

Table 4
Species selected as conservation objects, and median grade assigned (lower grade indicates a higher threat to the species) by the marine mammal taxonomic task group

Median grade	Species
1	Vaquita (*Phocoena sinus*)
2	Common minke whale (*Balaenoptera acutorostrata*)
2	Blue whale (*Balaenoptera musculus*)
2	Fin whale (*Balaenoptera physalus*)
2	Gray whale (*Eschrichtius robustus*)
2	Orca (*Orcinus orca*)
2	Pigmy sperm whale (*Kogia brevipceps*)
2	Rough-toothed dolphin (*Steno bredanensis*)

3.2. Integrated biologically important areas

Each taxonomic sub-group determined the biologically important areas for a particular set of conservation objects. Fig. 2 shows, as an example, those determined by the marine mammal taxonomic sub-group.

The integrated biological important areas, resulted from overlapping, in one map, all biological important areas from all the taxonomic sub-groups, as well as those determined by the processes groups. The result of this exercise is shown in Table 5 and Figs. 3 and 4 for the coastal–marine and coastal–terrestrial regions, respectively. The intensity of the color reflects the number of overlaps, and therefore indicates the relative importance of the area for biodiversity.

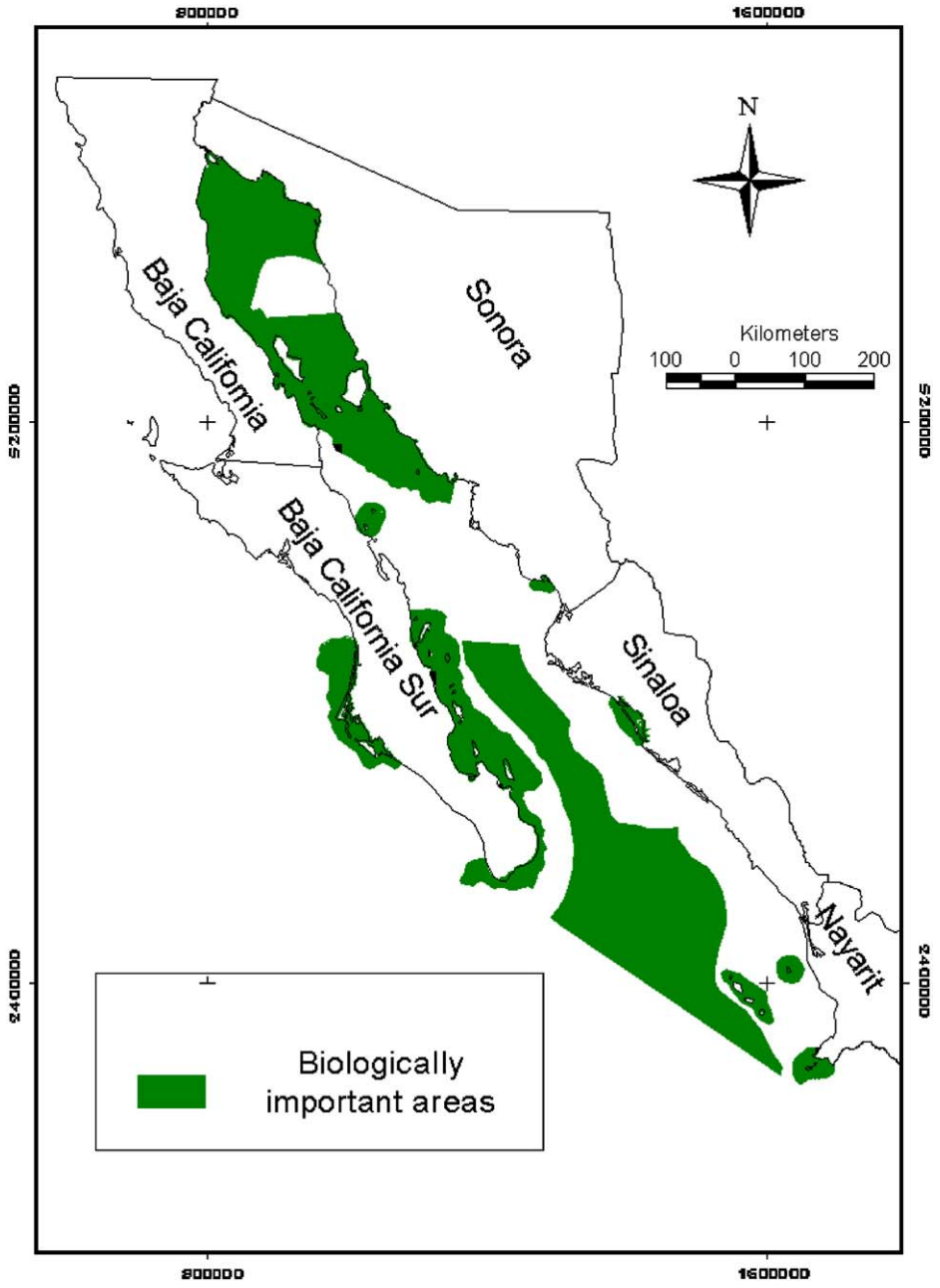

Fig. 2. Biologically important areas for the conservation of marine mammals (see Table 5 for the names of the sites).

Table 5
Some of the biologically important areas consistently mentioned by the working groups (see Figs. 3 and 4)

Site	Name
1	Upper Gulf
2	Midriff Region
3	Concepción Bay
4	San Ignacio Lagoon
5	Loreto
6	La Paz
7	Magdalena Bay
8	Coast of Sinaloa
9	San Pedro Mártir and Juárez Sierras
10	Colorado River Delta
11	Pinacate Region
12	San Pedro–Ajos–Bavispe Region
13	Valle de los Cirios
14	Punta Chueca and Kino Bay
15	Vizcaíno Region
16	San Francisco Sierra
17	Yecora Region
18	Giganta Sierra
19	Magdalena Bay
20	La Paz
21	Coast of Sinaloa
22	La Laguna Sierra
23	Tacuichomona Sierra
24	Marismas Nacionales
[a]	All islands

[a]Since the islands are scattered all trough the region they are not numbered in Figs. 3 and 4.

The upper Gulf of California including the Colorado River Delta, the Gulf of California midriff area, and all the islands—including its surrounding waters—were considered integrated biologically important areas (Figs. 3 and 4). Almost all coastal lagoons were also given this status, including the surrounding land and a marine buffer of 30 km from the coastline; particular mentions were given to the coastal lagoons in Sinaloa, Nayarit and Baja California Sur. The region around Loreto and the bays of La Paz and Concepción, in Baja California Sur, were also considered important for overall biodiversity conservation, as well as the terrestrial areas around Magdalena Bay and San Ignacio Lagoon on the Pacific coast of Baja California Sur. Other areas that deserve to be mentioned are the mountain ranges of San Pedro Martir and Sierra de Juarez in Baja California, Sierra de la Laguna and Sierra la Giganta in Baja California Sur, as well as some portions of the Sierra Madre Occidental (sites 12, 17 and 23 in Fig. 4) in the states of Sonora, Sinaloa and Nayarit.

It is important to mention that some integrated biologically important areas do not show in the maps displayed (in Figs. 3 and 4) due to the scale. Examples are some specific areas of San Ignacio and Ojo de Liere lagoons. This does not imply that

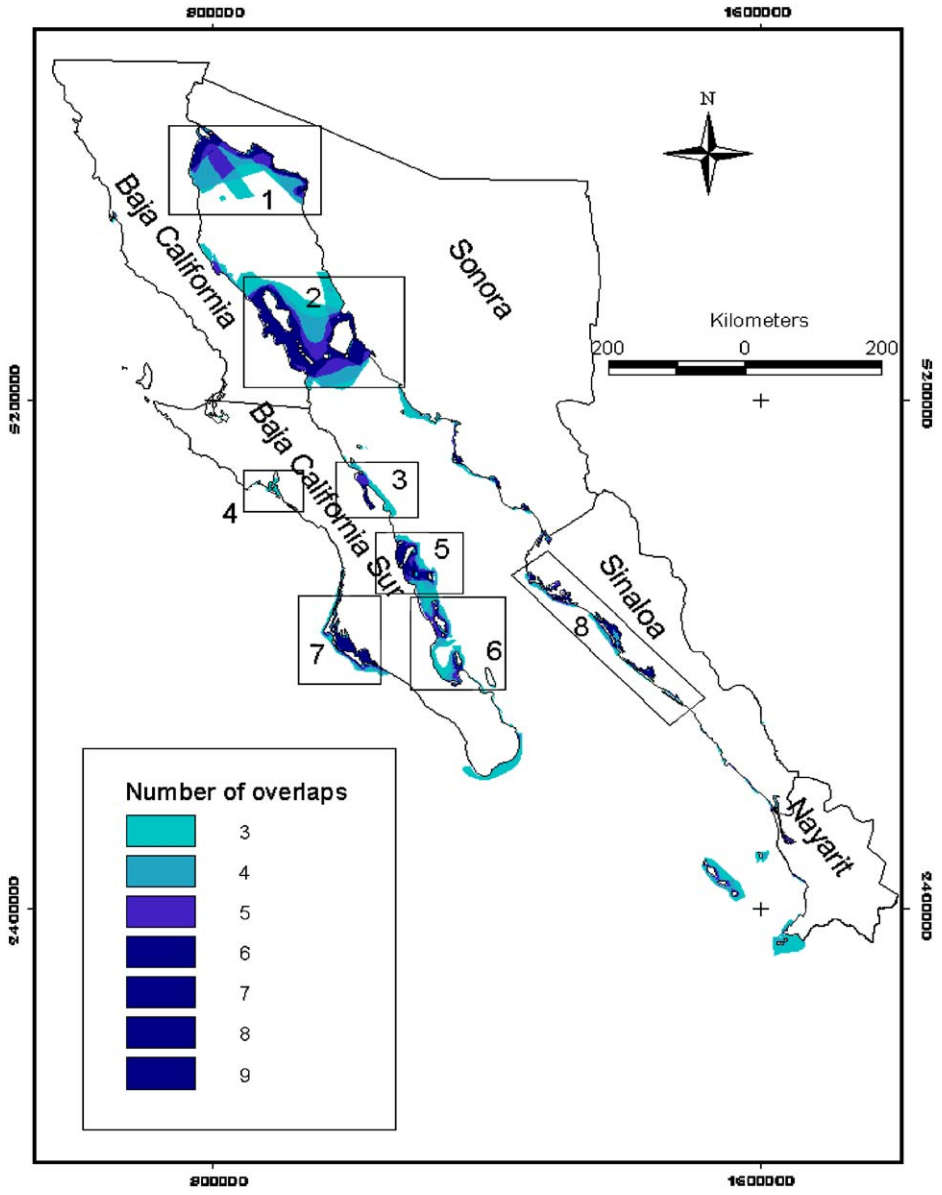

Fig. 3. Integrated biologically important areas for the conservation of coastal-marine biodiversity in the Gulf of California Region. The intensity of the color indicates the number of times a given area was designated as a biologically important area. The numbers in the map are used as reference for the names of each area (see Table 5).

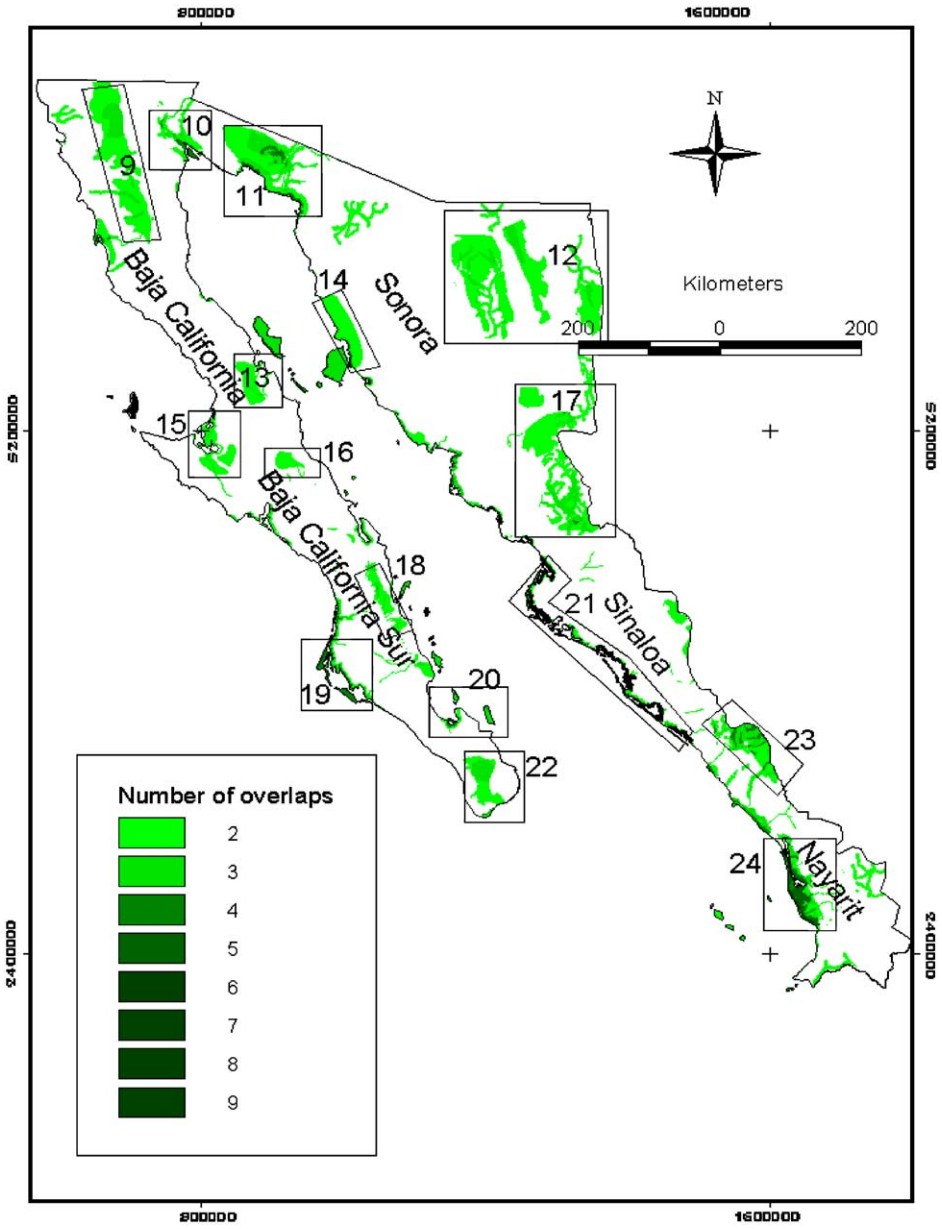

Fig. 4. Integrated biologically important areas for the conservation of the coastal-terrestrial biodiversity of the Gulf of California Region obtained during the workshop. The intensity of the color indicates the number of times a given area was designated as a biologically important area. The numbers in the map are used as reference for the names of each area (see Table 5).

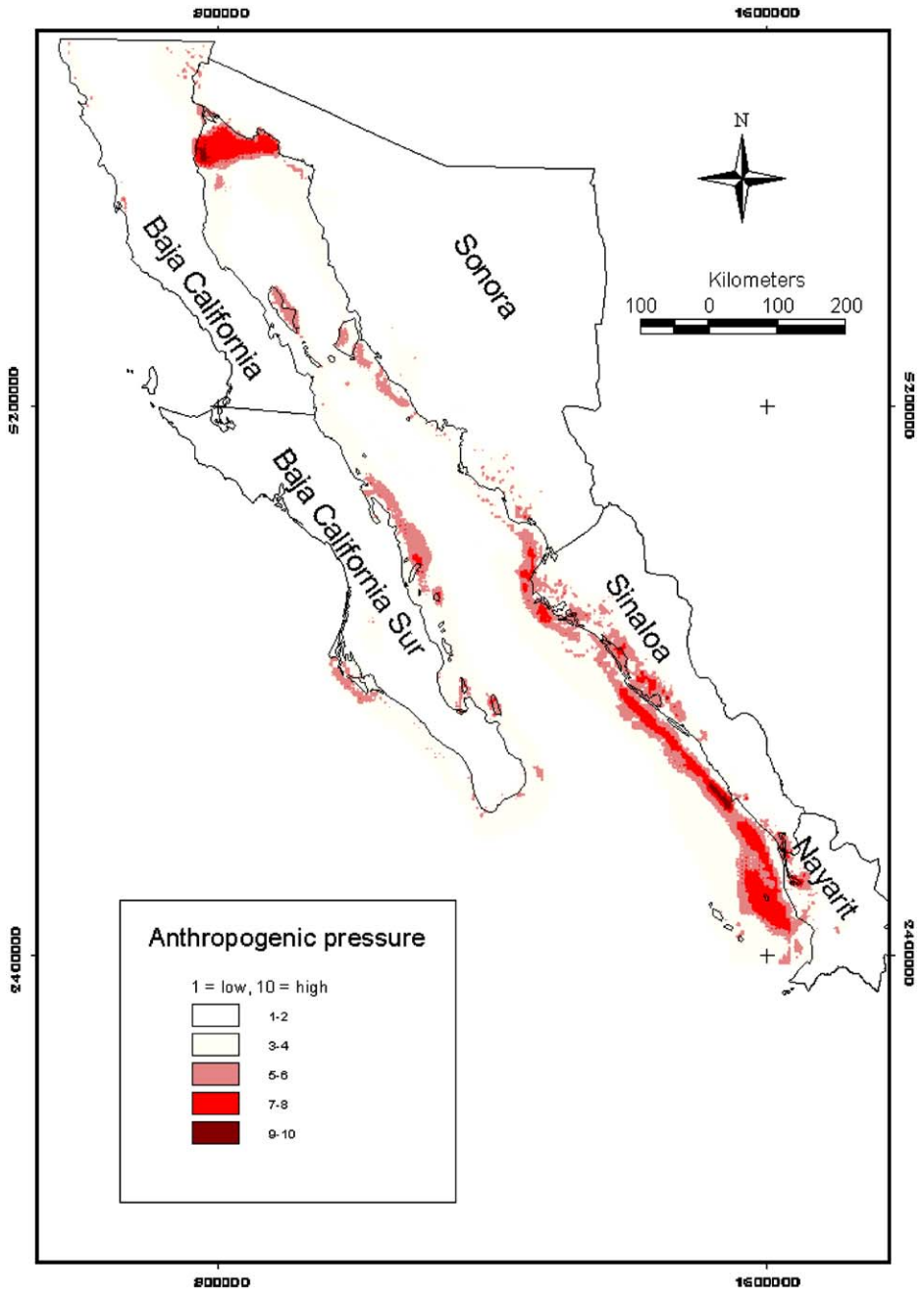

Fig. 5. Intensity of the anthropogenic pressure on biodiversity in the Gulf of California Region, estimated during the workshop. The intensity of the color indicates the level of pressure.

those areas were not considered important. A complete display of all important areas is available in the CD provided by The Coalition.

3.3. Anthropogenic pressure on biodiversity and social conflicts

Anthropogenic pressure on biodiversity was determined to be highest in the upper Gulf of California, the midriff region, along the coast of Sinaloa and Nayarit, as well as in some other areas of the Baja California Peninsula and Sonora (Fig. 5). The potentiality for social conflicts was also determined to be more prevalent in the upper Gulf of California, along the coast of Sinaloa and at Magdalena Bay on the Pacific coast of Baja California Sur (Fig. 6).

The anthropogenic pressure index showed an increasing trend in the upper Gulf of California, particularly outside the core zone of the biosphere reserve, also along the southern part of Sinaloa, as well as on some areas in the peninsula such as the bays of Magdalena and La Paz (Fig. 7). Potentiality for social conflicts, on the other hand, presented an increasing trend throughout the Gulf of California, with some exceptions (Fig. 8).

4. Discussions and conclusions

The analysis done by The Coalition provides a fresh look into the process of establishing meaningful conservation priorities, not only by treating the region as a unit, but also because it takes a different methodological approach. Instead of starting from an a priori established matrix of sites and criteria—as most existing studies do—The Coalition considered the spatial distribution of key species, as well as the distribution of important biophysical processes as the basis for determining critical sites.

The analysis is rooted in an impressive set of databases compiled by the participant experts; these databases represent the most updated inventories of species available. From the analysis of these inventories, the Conservation Targets and the integrated biologically important areas represent valuable results obtained through consensus in a highly participative process. These are the result of a serious and time-consuming effort to identify key species and their geographical location.

The inventories of species obtained during the two-phase process represent a significant output in themselves, since they are the most updated databases available in the region. Besides, the working groups committed themselves to continuously revise the inventories and keep them updated.

In spite of the different geographical scope and the different methodological approach taken by The Coalition, it is interesting to point out that the integrated biologically important areas resemble much the areas identified as important in previous studies. This is particularly true for the upper Gulf, the midriff region, the coast of Sinaloa, the Gulf coast of Baja California Sur and Magdalena Bay on the Pacific coast. Not all of these regions have protected area status, notorious examples are Magdalena Bay, as well as most of the marine area in the Midriff

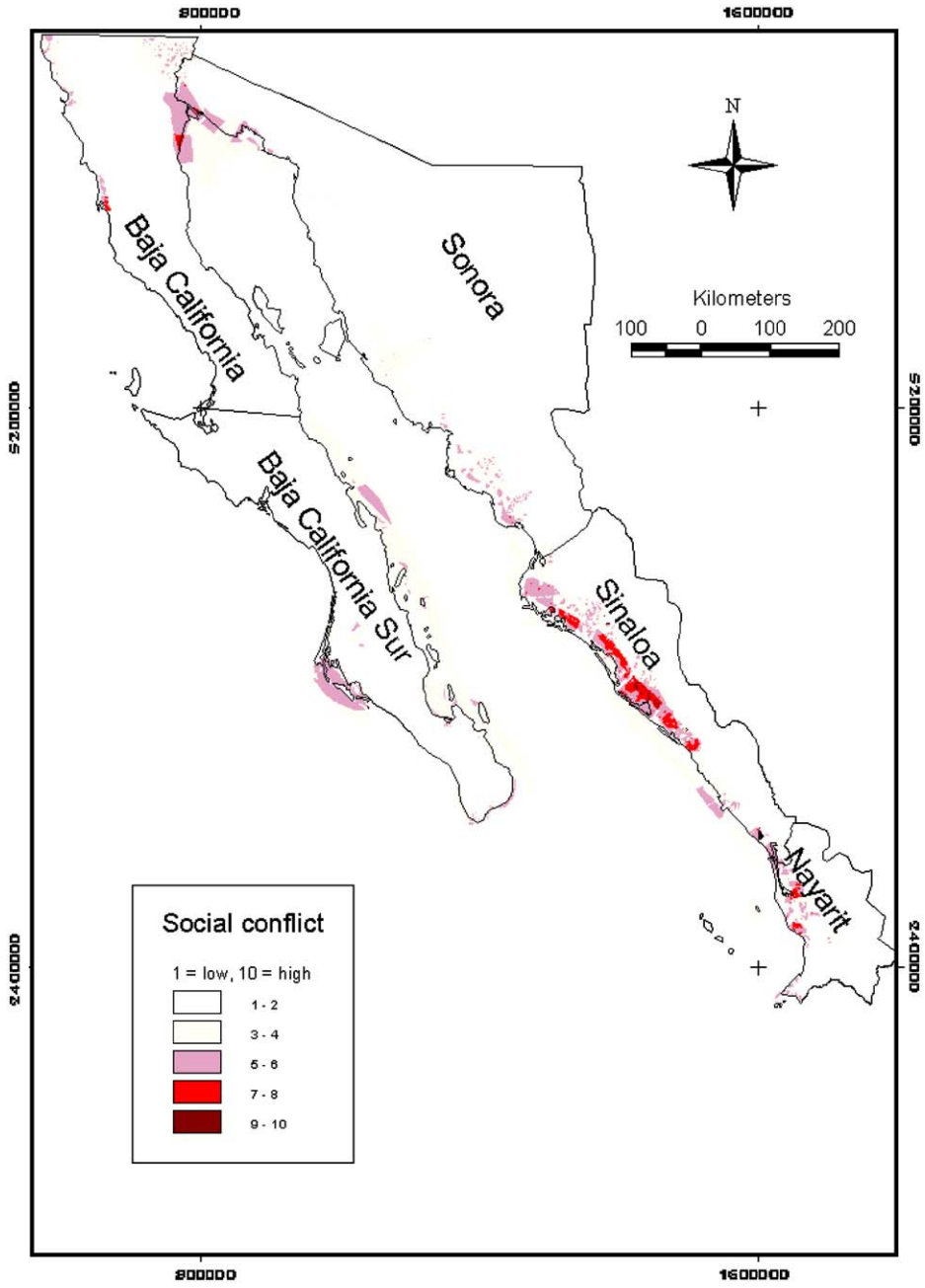

Fig. 6. Potentiality for social conflits in the Gulf of California Region, estimated during the workshop. The intensity of the color indicates the level of conflict potentiality.

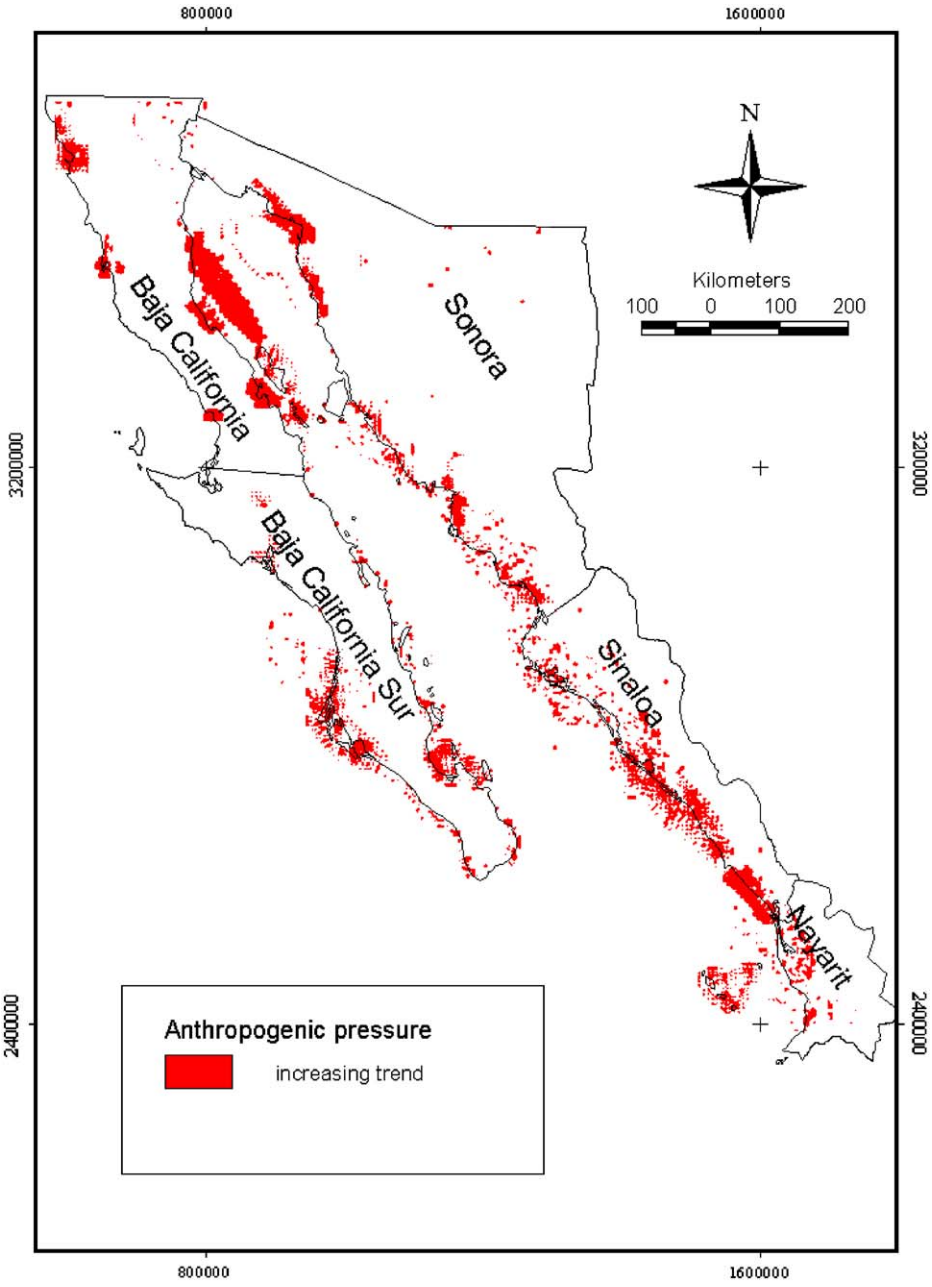

Fig. 7. Areas in Gulf of California Region with increasing trends in anthropogenic pressure, estimated during the workshop.

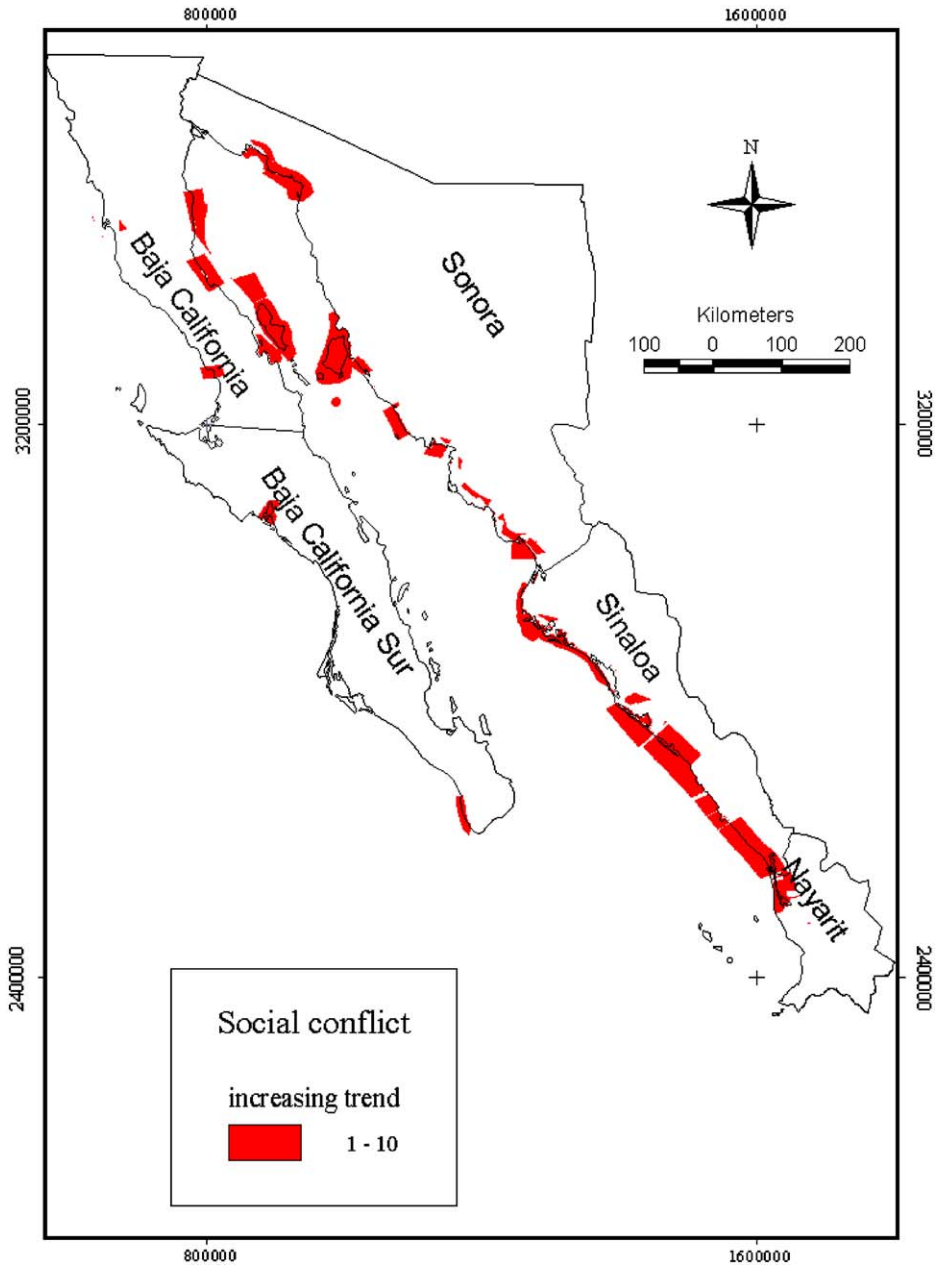

Fig. 8. Areas in the Gulf of California Region, with increasing potentially for social conflicts, estimated during the workshop organized by The Coalition.

Region. Therefore the results from this work ratify the conclusions drawn from previous studies.

The reader should be warned that the information and time devoted for the analysis of land ecosystems did not match the effort directed to marine and coastal systems. Therefore, the results of the terrestrial aspects of this analysis should be interpreted with caution.

The spatial distribution of anthropogenic pressure on natural systems that resulted from the workshop also has in general a pattern similar to other studies with a similar purpose [13]. It is interesting to note that those areas with the highest anthropogenic pressure, as well as those with the highest levels of social conflict potentiality, are the same as those mentioned as biologically important areas by most groups.

These results underscore at least two very important factors: (1) human activities in the region, particularly along the coasts, tend to develop in areas with high biological importance (high biodiversity) due to the high dependence of the economic activities on the biological resources; (2) areas with high biodiversity have high socioeconomic importance due to the flow of ecological services and goods provided to the economic system. Therefore, areas where biological importance and anthropogenic pressure coincide must be conserved not only to maintain biodiversity but also to assure a sustainable economy.

Particular attention on the part of conservationists and policy makers should be given to areas with AIBIs subject to increasing trends in anthropogenic pressure and (or) increasing potentiality of social conflicts. From the results of this exercise, it follows that AIBIs subject to increasing trends in at least one of the social indexes just described include the upper Gulf, the Midriff region (particularly the islands and Bahia de los Angeles), almost all off the coast of Sinaloa, isolated spots on the Gulf coast of Baja California Sur and Magdalena Bay on the Pacific coast.

These results are a key element for the environmental planning process of the region; they ratify the results from previous studies and give detailed information on species distribution and the location and nature of key biophysical processes, as well as the spatial distribution of human pressure on important biological areas. However, more important were the results obtained by means of a highly participative process where local and regional stakeholders generated important agreed upon results, generating an important conservation momentum.

References

[1] Arriaga-Cabrera L, Vázquez-Domínguez E, González-Cano J, Hernández S, Jiménez-Rosenberg R, Muñoz-López E, Aguilar-Sierra V, Coordinators. Regiones Marinas Prioritarias de México CONABIO, 1998 (document on line). Consulted July 31, 2002. http://www.conabio.gob.mx/conocimiento/regionalizacion/doctos/marinas.html.

[2] Arriaga L, Espinoza JM, Aguilar C, Martínez E, Gómez L, Loa E, Coordinators. Regiones Prioritarias Terrestres de México CONABIO 2000 (document on line). Consulted July 31, 2002. http://www.conabio.gob.mx/conocimiento/regionalizacion/doctos/terrestres.html.

[3] CONABIO. Áreas importantes para la conservación de las aves en México (AICAS), CONABIO 2002 (document on line). Consulted July 31, 2002. http://conabioweb.conabio.gob.mx/aicas/doctos/aicas.html.
[4] Arriaga L, Aguilar V, Alcocer J, Jiménez R, Muńoz E, Vázquez E, Coordinators. Regiones hidrológicas prioritarias (document on line). Consulted July 31, 2002. http://www.conabio.gob.mx/conocimiento/regionalizacion/doctos/hidrologicas.html.
[5] Brusca CR. Common intertidal invertebrates of the Gulf of California, 2nd (revised) ed. Tuscon, AZ: University of Arizona Press; 1980 520pp.
[6] Findley LT, Torre JM, Nava A, van der Heiden M, Hastings PA. Preliminary ictiofauna analysis from a macrofaunal database of the Gulf of California, Mexico. Abstracts of 76th the American society of lchtiologists and herpetologists, New Orleans, USA, 1996.
[7] DeWeese LR, Anderson DW. Distribution and breeding biology of Craveri's murrelet. Trans. San Diego Soc. Nat. Hist. 1976;18:155–68.
[8] Velarde E, Anderson DW. Conservation and management of seabird islands in the Gulf of California. Setbacks and successes. In: Nettleship DN, Burger J, Gachfeld M, editors. Seabirds on islands: threats, case studies and action plans. Bird Life Conservation Series, vol. 1, 1998. p. 229–43.
[9] Vidal O, Findley L, Leatherwood S. Annotated checklist of the marine mammals of the Gulf of California. In: Proceedings of the San Diego Society of Natural History. San Diego: UDA; 1993. p. 14.
[10] Aurioles-Gamboa D, Zavala-González A. Ecological factors that determine the distribution and abundance of the California Sea Lion Zalophus californianus, in the Gulf of California. Ciencias Marinas 1994;20(4):535–53.
[11] INEGI (Mexico's National Institute of Statistics, Geography and Informatics). XII censo general de población y vivienda del 2000. Aguascalientes. México: INEGI; 2000 375pp.
[12] INE (Mexico's Ecology Institute). Ordenamiento Ecológico Marino de la Región de Mar de Cortés. México: Instituto Nacional de Ecología (1 Compact Disc).
[13] Haro-Martínez A, Parra-Salazar I, Licón-González H. Metodología para el reconocimiento de Amenazas Potenciales en el Golfo de California. Technical Report PP22. World Wildlife Fund, México, 2000.
[14] Coalición para la Sustentabilidad del Golfo de California. Base de datos de biodiversidad, procesos ecológicos, físicos y socioeconómicos para el proceso de definición de prioridades de conservación del Golfo de California, México. Hermosillo México: World Wildlife Fund; 2001 (1 Compact Disc).
[15] Coalición para la Sustentabilidad del Golfo de California. Taller para el establecimiento de prioridades de conservación de la biodiversidad del Golfo de California. Hermosillo, México: World Wildlife Fund; 2001 (1 Compact Disc).