Chapter 2
PARTICIPATORY COASTAL RESOURCE ASSESSMENT METHODS

PCRA methods provide various forms of information that are useful in CRM planning and implementation. The process of taking results from PCRA methods and producing a coastal area profile for such use is discussed in Chapter 3. The PCRA methods are presented in the approximate order in which they are best accomplished. Some of these methods can be implemented simultaneously or over several iterations, or not implemented at all depending on time requirements and other constraints (Fig. 2.1). Generally, a PCRA exercise in one community or barangay will take 2 to 3 days and should be conducted in succeeding days without break. These methods are most effective when the CW works together with at least one partner or counterpart from an LGU or NGO, where the counterpart has knowledge

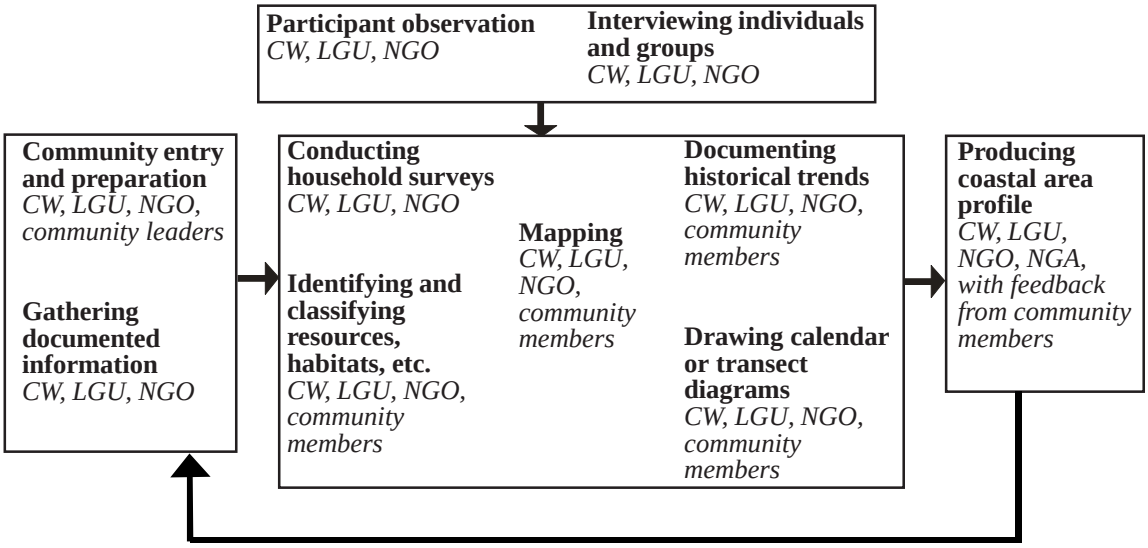

Fig. 2.1 The interrelated methods of PCRA (potential actors are shown in italics).

and skills that complement those of the CW. CWs should be as objective and non-partial as possible.

Gathering existing information

Collecting all information produced previously in a "hard" form — reports, planning documents, legal documents, maps, satellite images, aerial photographs, and old photographs — is almost always the best way to start the PCRA process. Such materials, sometimes referred to as secondary information, are valuable. Often, a great deal of good quality information already exists, allowing the researcher to substantially reduce the number of, or to

redirect, assessment activities. Plans for PCRA efforts in the field should therefore be kept open until after an appraisal of existing documented information has been completed. It is also critical to evaluate the existing information and to use relevant and current but not obsolete reports or data.

Documented information for CRM planning typically falls under two basic categories: government/ institutional documents and scientific documents.

Government documents such as ordinances, regulations, plans, and other documents related to the legal CRM regime are important indicators of past and present government involvement or non-involvement in CRM. The information they provide is useful in identifying government management strategies and evaluating the success of previous and current government CRM activities.

Scientific studies in ecology and/or socio-economics are also prevalent and useful. These studies provide information on the status of coastal ecosystems and the living and working conditions in coastal communities. For PCRA purposes, this information is considered as “baseline”, i.e., a starting point in determining the long-term impact of CRM efforts.

Plans for PCRA efforts in the field should be kept open until after an appraisal of existing documented information has been completed.

Leave no stone unturned in looking for useful information.

If a profile or similar document has not been produced previously, collecting existing documented information is usually not easy. Potential information sources within the general profile headings where each type of information falls are listed in the far right column of Table 1.1. In general, the sources are local and national government agencies, NGOs and research institutions such as universities, museums, and technical schools. In some cases, however, barangay councils and/or fisher associations will also provide useful information from studies they have conducted or participated in. The best strategy is to use Table 1.1 as a guide, "leave no stone unturned," and always be vigilant for information from an unexpected source. Often, aid organizations sponsor planning, development, and conservation projects and may be good sources of previous, ongoing, or planned studies.

There is no detailed methodology for gathering information, which is mostly a matter of writing letters, making telephone calls, visiting offices and libraries, and interviewing officials, teachers, scientists, and researchers. Using the right contact persons and/or letters of introduction is always helpful. When collecting information, always:

a) respect and credit the rights and wishes of the source;

b) promptly return any borrowed material; and,

c) respect the wishes of a source to be or not be credited when the information is presented to others.

Although the CW might find it difficult to track down all the existing information available (from barangay halls in the barrios to museums, libraries and government offices in Manila), the mere effort is good for all concerned. In addition to gathering data, it allows the CW to establish contact with other informants and experts who have something to offer the CRM process. This in turn helps the CW understand better the many perspectives from which one can view CRM. It also allows involved outsiders, such as scientists and technicians, to interact directly with the CW, who can then serve as their intermediary with local fishers and other resource users (Fig. 2.2). The CW might view this activity as contributing to the development of a broader definition of community, or what some call institutional strengthening. In accomplishing this task, therefore, the CW should have a twofold objective:

1. gather extensive, good quality information (as practical); and,

2. develop relationships with and between

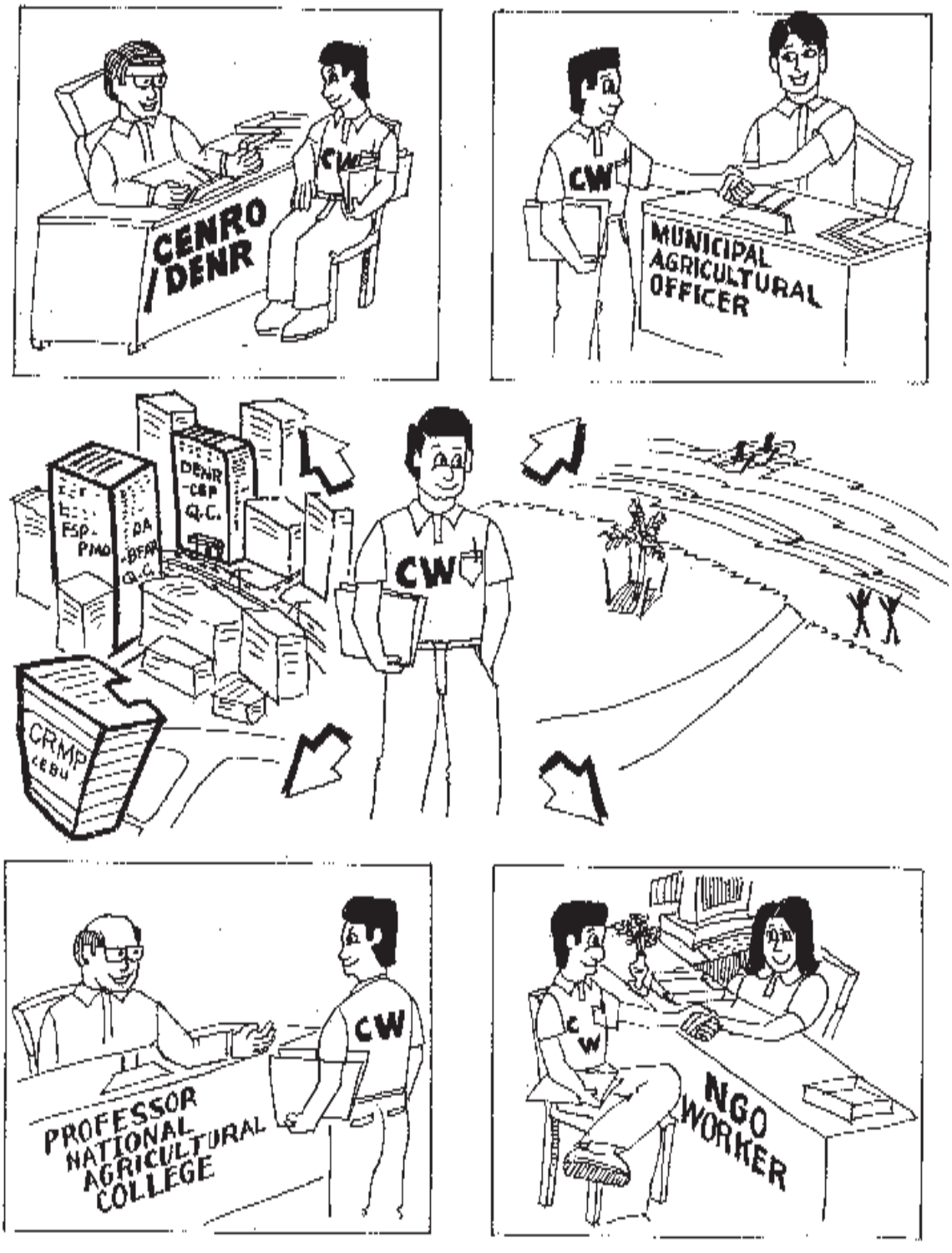

Fig. 2.2 While gathering assessment information from a variety of sources, the CW can simultaneously build professional relationships and facilitate institutional strengthening.

scientists, government workers, and other stakeholders that can be used beneficially in the CRM process.

Community entry and preparation

This handbook assumes preexisting proficiency in community entry and other aspects of effective community organization and development in Philippine coastal communities. Because of this, only a few recommendations specific to successful application of PCRA are made. These are:

1. Attempt PCRA exercises only in communities where a significant amount of community development has already been accomplished and where there is strong interest or where community organizers are available and willing to serve as interfaces. There should at least be a solid organization such as a fisherfolk association with which to work.

2. Consider fishers and other resource users who participate in PCRA as local consultants and collaborators, and not just beneficiaries. Treat them with appropriate respect as essential contributors to the CRM process. CWs usually get a great deal more information when they

Consider fishers and other resource users who participate in PCRA as local consultants and collaborators, and not just beneficiaries.

cast themselves as researchers interested in helping fishers to document their local knowledge and expertise as well as CWs trying to get the local people involved in CRM.

Good participant observation requires effective note-taking.

Participant observation

The approach CWs take with local consultants just described for community entry also fits well with the method of participant observation. As in community entry, this handbook assumes that through previous training and experiences, CWs already have skills in participant observation. By actively living daily life in fishing communities, CWs can glean a great deal of information relevant to resource assessment. Many of the constraints and opportunities that are considered in CRM planning are more apparent, and their subtleties better appreciated, when the CW experiences them as a participant in the coastal resource system.

Good participant observation requires effective note-taking. CWs should always have a note pad and pen or pencil handy. An effective tactic is to jot abbreviated notes throughout the day as observations are made, and then use these notes to produce more detailed accounts at the end of each day. These notes should be periodically reviewed and systematically filed for use in the production of a coastal area profile.

Like the interviewing approach discussed in the following section, participant observation should be seen as a "meta-method," one that can be applied in concert with any of the specific PCRA methods discussed below.

A stranger or a group of visitors (CWs, scientists) taking notes on a community resident or residents is sometimes viewed with reservation, suspicion, and resentment. This is especially true if the reasons for the note-taking are not well understood or if permission is not first granted after an explanation. To avoid suspicion or resentment, a "warming up" period should always precede participant observations involving notebooks, videos, and audio recorder. The idea of "civilized" scientists interviewing the "natives" is no longer acceptable in this age of telecommunications and rising community spirit and values. Appropriate precautions must be taken that community residents do not get the wrong impression from the participant observation methods used.

Interviewing individuals and groups

The methods described in the remaining sections of this chapter are all accomplished to some extent through interviews with individuals or workshops conducted with groups (primarily characterized as

group interviews). Interviews can be used to effectively accomplish two goals simultaneously:

1. to gather reliable information for resource assessment, and

2. to facilitate improved communication for community development and institutional strengthening.

Good communication allows all those involved in CRM to reach a common understanding, or at least see the situation from different points of view, thus greatly facilitating management planning decisions. The challenge for the CW is to communicate well with all those he or she comes in contact with. It is also the CW's job to help facilitate communication between all the people involved in CRM, from local resource users to national government officials. Good communication makes for accurate information and facilitates community development.

Good communication allows all those involved in CRM to see the situation from different points of view.

When interviews with individuals and groups are conducted while the other PCRA methods are being carried out, the specific objectives and information areas of concern vary from method to method. The overall improvement in communication and accuracy of information should however be a universal goal in all interview situations. In the initial stages, the communication is typically one-way, as the CW will be

the first to directly elicit information. As the process progresses, those being interviewed will themselves begin to learn about and from the interviewer, if not by asking questions directly, by inferring from the questions they are asked.

Furthermore, multi-channeled communication results in follow-up interviews where the CW asks for feedback on information gathered from other sources. The later PCRA activities, in which the CW refines the profile data by cycling through a group of stakeholders, often facilitate communication between all those involved in the process, with the CW serving as an intermediary and/or interpreter.

Although group interviews are less intimidating to communities and offer peer pressure to keep the story straight, it is sometimes best for CWs to first conduct interview work with individuals in the community, such as “key informants” or people who have been identified by local leaders as knowledgable about coastal resources. A number of resource users having a wide range of specialties, such as spear fishing or fish farming, or having important knowledge over a long time span (elders) should be interviewed. This way, all local expertise can be drawn out. To help avoid the omission of small details, resource users from all over the management area should also be included.

When CWs gain a basic understanding of the coastal resource system from the individual interviews, they can then initiate group activities. Group activities help improve the CWs' understanding and also raise the understanding of the workshop participants — and eventually the general public — of coastal resource management issues.

Respect for the interviewee is essential. Respect your interviewee's time, personal opinions and intellectual property rights.

As all those that use this handbook are assumed to have had some training in conducting interviews, only a few more points need to be mentioned:

1. Respect for the interviewee is essential: Respect your interviewee's time, personal opinions and intellectual property rights. Request permission to record interview data, even in notebooks, and especially when using video or audio recording equipment.

2. Always make a conscious effort to avoid judgment and bias. During the interview, record information exactly as the interviewee expresses it; there will be time for interpretation and analysis later.

3. Participatory action research is not the focus of this handbook, but it is every CW's concern to be aware of the importance of promoting a two-way flow of information between CWs and local

participants, and among participants themselves in group or workshop settings. Once local knowledge has been collected in an unbiased manner, CWs can begin sharing their understanding of various features of the coastal resource system with local fishers and eliciting local feedback. In a group setting, getting the group to arrive at a consensus on a particular piece of information usually requires that individual members share contrasting ideas and perceptions. Almost always, this entails changing and increasing local understanding and thus calls for considerable time and patience. To the extent possible, CWs should see themselves as learning together *with* the community, and not merely learning from or merely teaching local fishers.

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Conducting household surveys

To be useful, surveys require more skills and knowledge than can be covered in this handbook. In many places, however, a good amount of survey work has already been accomplished by at least one NGO, or by a local or national government agency, and it may not be necessary to conduct a full survey. Even if the survey data are old, a quick sampling of a minimum of 10% of the households involved can help

illuminate significant changes in the community that have occurred since the survey was conducted. If no survey has been accomplished previously, some sort of survey may be required for PCRA to be really useful. In any case, all those involved in CRM should have a common understanding of the approximate values of important variables such as population, average cash and non-cash income, and especially the measures of coastal resource use, such as fish and seaweed harvests.

Surveys are most useful when applied in different ways at different times.

Surveys are most useful when applied in different ways at different times. At the start of a project, it is usually best to do a general survey, one that gives a broad overview of demography, livelihood, and community organizations, as well as general coastal resource information such as the types of resources harvested or cultured and their production amounts, the gears used in production, and the numbers of people involved in production. Later in the life of the project, more focused and specific surveys can be useful. By revealing the participants' exact preferences, attitudes and abilities, surveys at this point can help planners decide which projects and other interventions will work best in the community.

A guide to determining what exact information is important to glean from communities is presented in

the Appendix. Here, a Socio-Demographic Profile questionnaire and a Fishing Practices Survey form contain a comprehensive list of potential questions.

Identifying and classifying resources, habitats and other environmental factors

The identification and classification of coastal resources and other aspects of coastal communities is an absolute requirement for successfully completing the other methods of PCRA. If local resource users and professionals are to work effectively together, there must be a common understanding of what a certain local name or term corresponds to in the scientific world and vice-versa. For instance, confusion, and thus undesirable PCRA results, can occur when it has not been made clear what kinds of fish the general term *isdang bato* includes, or what exactly *bahura* means (see Definitions). In addition to common terms that have meanings that vary from place to place, there are often unique names used only in one locality. It is important therefore that the CW learns to properly present the information to outsiders.

In identifying the important elements of the coastal resource system, one is usually able to classify these elements to a certain extent and determine what structure links the various names and terms (Fig. 2.3).

This way, the CW gains insights into how local fishers perceive the coastal resource system and thus understands better the fishers' behavior — that is, their actions and decisions. For example, fishers in some communities might not consider *bakaw* (mangrove) to be a *yamang dagat* (literally: wealth or riches of the sea); if the CW is not aware of this, he or she may not be able to communicate his or her exact meaning when he or she uses the term *yamang dagat*. Or take one community where a *suno* is a kind of *lapu-lapu* (grouper), which is a kind of *isda* (finfish), which is a kind of *yamang dagat* (Fig. 2.3). If it is not clear to the CW that a *suno* is a kind of *lapu-lapu*, errors in estimating fish catches might occur, as the catch of *suno* reported by fishers might be counted as both a separate species and a part of the *lapu-lapu* catch.

The use of photographs or field visits to habitats are useful techniques to ensure that English and local terminologies refer to the same habitats. Habitat classification need not be hierarchical; initially, a listing will do. Later, with the use of diagrams and photos, features can be labeled and a better approximation of the habitat classification can be realized. Aside from the involvement of interpreters to ensure accurate communication, the assistance of natural scientists is also essential in gaining the necessary understanding

of the habitat regimes in each local area.

When classifying resources, uses, gear types, and conflicts or issues, it is best to approach each category sequentially at the start of the mapping exercise. The use of identification guides (especially on fish and shellfish) can help the CW to focus on the correct names for various resources. Uses and gear types need to be identified and described by the users; a field visit may be required to clarify the meaning of these terms.

Finally, a listing of issues should also be identified through mapping and interviews.

In summary, identification and classification should use the following sequence, from basic to more specific elements:

1. habitats
2. resources
3. uses (including gears), livelihood, opportunities
4. conflicts, issues or problems

These categories are also the key elements of the diagramming and mapping exercises to be described later.

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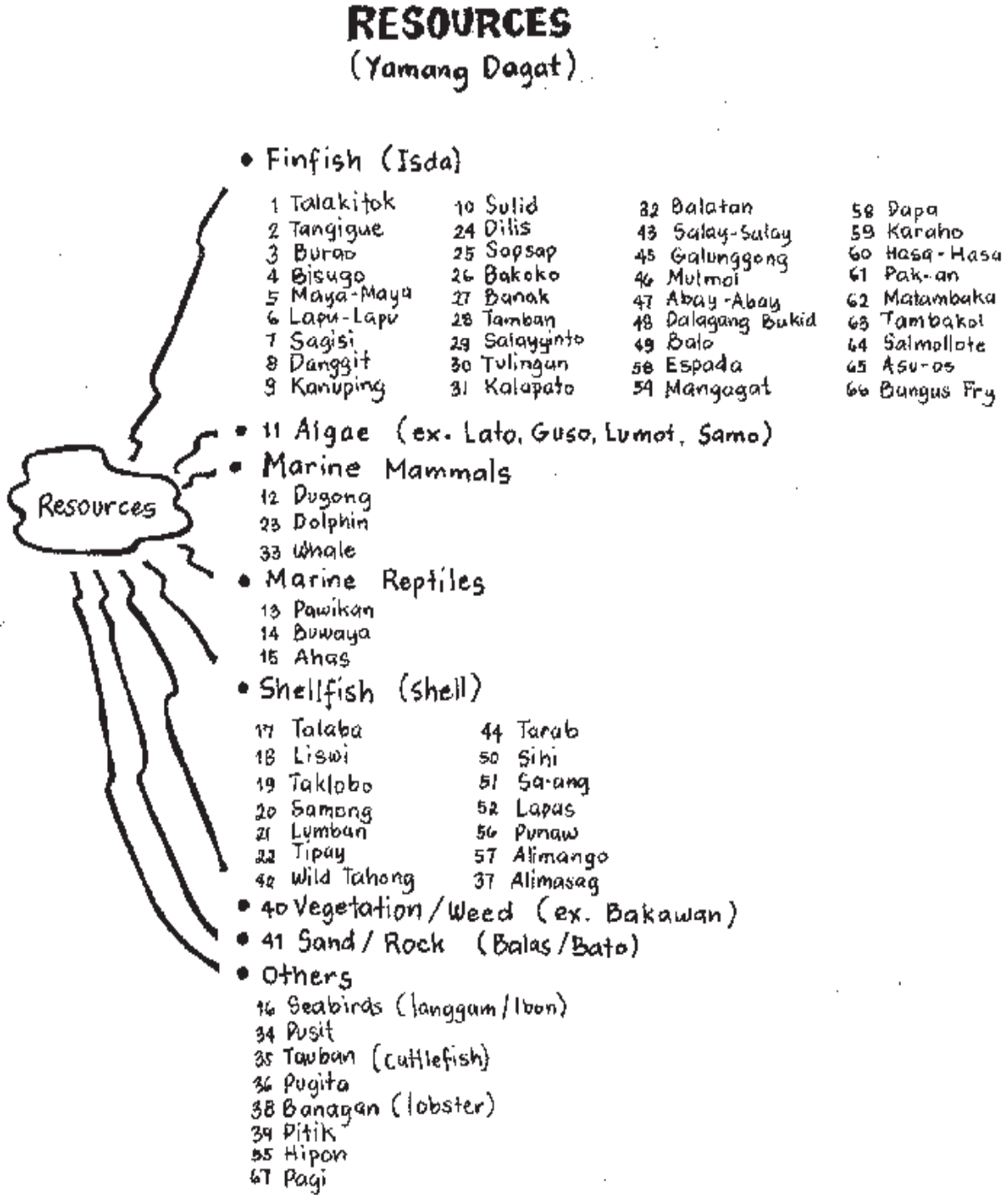

Fig. 2.3 Coastal resources of San Vicente, Palawan as identified by community participants.

The procedure for identifying and classifying environmental factors is relatively simple. It involves asking questions that progress from the most general to the most specific. This progression from general to specific is done to minimize any bias that may be introduced by the interviewer. Always remember that the initial focus of the interviewer should be on recording the knowledge of local stakeholders; there will be time later for interpretation and analysis of the data collected.

Before going into the interview proper, spend time simply listening to the local stakeholders discuss the coastal area and their livelihood. Visit the coastal area to further clarify terminology and concepts. Eventually, you should be able identify a set of terms that come up repeatedly and appear to be significant to the local knowledge system. Once you have collected several key terms from open-ended discussions, ask a series of successively more specific questions about these terms. This will help you learn more about the terms' local usage and the way they relate to one another.

If you are interested in identifying all the kinds of X that are important in a coastal community, this would be your first question:

1. *What kinds of X can one find in your area/ community?*

Spend time simply listening to the local stakeholders discuss the coastal area and their livelihood.

The tree diagram that results from carefully documenting local systems serves as the key to translating local folk knowledge into science.

If A, B and C are identified as being kinds of X, then ask:

2. What kinds of A are there? then: What kinds of B? and so on.

To help in identifying and correlating local terms to scientific terms, one can ask:

3. How does A differ from B, and C? and so on.

After asking a number of these kinds of questions, you would be able to see a structure in the way the terms are related. You can draw a tree or cascade diagram that shows that A, B, and C are kinds of X, and that there are several kinds of As, Bs and Cs which appear to correspond to various scientific terms. The tree diagram that results from carefully documenting local systems serves as the key to translating local folk knowledge into science. In the example given above, *yamang dagat* is called the domain; it is the most general class to which the scientific equivalent of “coastal resource” belongs. *Isda* is a kind of *yamang dagat*. *Isda* is also a domain to which *lapu-lapu* belongs, which in turn serves as a domain for several specific kinds of *suno* (Fig. 2.3).

Once the local system is understood, it is important to find as many scientific equivalents as possible. This requires a discussion of the unique features of each

domain. Refer to photographs, pictures and actual samples or specimens to find out what local names correspond to in English and scientific naming systems. Browse through a book of photographs or drawings — this is useful in the identification and classification process, especially for living resources such as fish. Study samples of fish and other resources if these are available. Although photos and pictures are usually quite effective, samples are even better for identification purposes.

The general process of identification and classification can be applied to numerous elements of the coastal community beyond the coastal resources themselves. For example, for mapping exercises described in the next section to be effective, the local system of naming directions, habitats, land cover, and sea floor substrate must be elucidated. The procedure can also produce some interesting results when socioeconomic aspects, such as types of livelihood or production methods, are discussed.

Once a domain, such as *mga uri ng pinamamahayan o pinaninirahan ng mga yamang dagat* (types of coastal resource habitat), has been classified, it may be useful to discuss what makes each member of that domain unique, or what

Habitat Management parameter	Bakawan (mangrove)	Aplaya (beach)	Hibasan (tidal flat)	Damuhan (seagrass bed)	Bahura (reef / shoal)	Ilalim (deep water)
Mga likas na kayamanan (natural resources)	alimango, tamilok, shells, manla	resort, shells, alimango (mangrove crab), pandan (*Pandanus*), niyog (coconut), nipa (*Nypa fruticans*)	hermit crab, tayong (sea urchin), balatan (sea cucumbers), shells, alimango (crabs)	seaweeds, fish - danggit, gono, banak, pusit banyaw-banyaw, bantol	isda (finfish), pugita (octopus), shells, banagan (lobsters), balatan (sea cucumbers	isda (finfish)
Mga uri ng hanapbuhay, mga pagkakataon (types of livelihoods, opportunities)	pangisdaan (fishery), bahayan (place for houses), pantalan (pier location), gatong (firewood)	harvest and sell above, gawa ng banig, etc. (making mats, etc.) coco products, pawid (roof shingles), wine	sell balatan (sea cucmbers, dried)	harvest and sell above	harvest and sell above	harvest and sell above, fish deep reefs with compressor (not recommended)
Mga suliranin (problems, issues)	bawal magputol (cutting is illegal), nik-nik (biting flies/midges)	losing nyog (losing coconut trees)	none	more human disturbances of panti (gill net), bantol (stonefish)	sodium cyanide fishing, blast fishing, tubli (poisonous root used to catch fish), lagtang (poisonous plant)	trawlers, blast fishing, sodium cyanide fishing, tubli (poisonous root used to catch fish), lagtang (poisonous plant)

Fig. 2.4 Sample transect diagram from PCRA in San Vicente, Palawan.

distinguishes the different classes. One way of representing these distinguishing features is through a transect diagram (Fig. 2.4). Transect diagrams are representations of geographical cross-sections of coastal ecosystems or habitats ranging from deep water to beaches and mangrove areas. Along the horizontal axis of the transect are the habitats. Along the vertical axis are places to list resources, economic opportunities, and problems associated with each habitat.

When producing a transect diagram with fishers, prepare the diagram beforehand by drawing a grid and writing in the habitats already identified along the top and headings for resources and other factors down the left side. Then, before actually asking the fishers to fill in the diagram, explain to them how the diagram works. To illustrate, for *mga uri ng pinamamahayan o pinaninirahan ng mga yamang dagat*, for example, several classes have been identified in one community (Fig. 2.3). Using these classes in constructing a transect diagram helps produce information that is important to consider in CRM planning.

Transect diagrams also provide another spatial dimension to the mapping exercises described below. In the vernacular, transect diagrams may be likened to "fish eye" views of the habitats within a region.

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Participatory mapping helps to point out spatial details and new information on features whose conditions vary over space or whose locations vary over time.

Mapping

Maps are some of the most important tools used in planning and implementing CRM projects. Without maps, it would be difficult to understand the many variables essential in planning. With maps, the extent and condition of resources and habitats can be represented and analyzed, zones for various uses can be plotted out, and infrastructure and other interventions can be spatially optimized and the localities for possible problems, issues, and conflicts identified. Moreover, spatial patterns of settlement, income levels, and other social variables can reveal opportunities and obstacles for CRM.

As with other PCRA activities, participatory mapping helps to point out spatial details and new information on features whose conditions vary over space or whose locations vary over time. Maps are also important visual media, allowing more effective communication between the stakeholders involved in CRM. They often help when verbal communication is constrained by differences in language, background, education and worldview. Indeed, mapping is one of the most appreciated and successful strategies for eliciting information from local resource users. The old saying “A picture is worth a thousand words” is, without question, true for the use of maps in CRM. All active coastal resource users must therefore understand maps and their spatial value.

Maps are most useful when they can be compared to maps of other areas and to maps of different scales. When the format of maps made through PCRA is consistent, such comparisons can show important similarities and differences between different management areas. Another advantage of a consistent or standardized mapping format is that maps of small areas, e.g. *sitios* (villages), can be combined or joined together to produce maps of a larger management area, such as an entire bay.

One format that has been used successfully divides the elements to be mapped (on one map) into five basic categories: habitats, resources, uses, issues, and other features. Habitats are shown as shaded areas. The next three categories are depicted on maps where they are known to occur as arabic numerals, letters, and letters with arabic numerals, respectively (in preparing the map for presentation and distribution, letters and numerals can be replaced with icons or symbols). The last category can be depicted as shapes or lines depending on the nature of the feature to be mapped. Table 2.1 lists examples of features that fall under these categories. Example maps are shown in Figures 2.5 and 2.7.

PCRA mapping can be divided into three basic types: sketch mapping, drawing over base maps, and field mapping. The standardized mapping format

PCRA mapping can be divided into three basic types: sketch mapping, drawing over base maps, and field mapping.

Table 2.1 Standardized format for PCRA mapping and sample elements.

ELEMENTS	FORMAT
Habitats (e.g. estuaries and lagoons, coral reefs, mangroves, seagrass beds, beaches)	Various colors used to shade areas on maps where habitats are reported to exist (Table 2.2)
Resources (e.g. mammals, reptiles, finfish, invertebrates [shellfish, crustaceans, etc.], seaweeds)	Arabic numerals (1, 2, 3...) placed over the location/s where the individual resources are reported to be found (Table 2.3)
Uses (e.g. gill net, spear fishing, reef gleaning, tourism, aquaculture)	Capital letter codes (T for traditional fishing etc.) placed over the location/s where individual uses are reported to take place (Table 2.4)
Issues (e.g. blast fishing, commercial fishing, pollution, mangrove clearing)	IS plus an Arabic numeral (1, 2, 3...) placed over the location/s where issues are reported to exist (Table 2.5)
Other Features (boundaries of sanctuaries, use zones, municipal/barangay jurisdictional boundaries, roads, freshwater sources, artificial reefs, islands, river mouths, deep channels)	Various colors and line styles (dashed, dotted, solid and others) used to depict the location of other important features of the management area

shown in Table 2.1 can be used in all three types. CWs can conduct mapping activities either with an individual or a group. The basic procedures are the same with individuals as with groups, except that group activities have the added consideration of group dynamics that can work either for or against — or both for *and* against — the success of the activities. At this stage, the local ways of referring to resources, places and habitats should already be known to CWs. The classification system in Table 2.1 can be used in all mapping

exercises to minimize confusion and maximize local input.

Sketch mapping. Sketch maps are freehand drawings that can reveal much about both the coastal areas represented in the maps and the people who draw them (Fig. 2.5, Fig. 2.6). They can be particularly useful in the early stages of PCRA. Since these maps start as a blank piece of paper, they provide the least biased view of how fishers perceive their surroundings; they provide, in other words, a glimpse of the fishers' "mental maps" of the coastal environment.

Sketch maps provide the least biased view of how fishers perceive their surroundings.

Sketch maps are easy to make. Provide a large, blank piece of tabloid (28 cm x 43 cm) or larger size paper, marking pens, and a comfortable place to draw. Many people tend to start drawing at a scale that is too large for the size of the paper provided, so they run out of room to draw all the area they intend to. To compensate for this, use a light-colored pencil to draw a box on the paper, leaving wide margins on all sides. Tell the mapper to try to keep his drawing inside the box and use the margins only if necessary.

Fishers often find it easiest to draw first those features of the coastal area that are most familiar to them, e.g. the way from their home to the market or to their fishing grounds. Distinct geographical features,

such as bays, river mouths and islands, are also good starting points. When prompted to draw these features, fishers typically draw the coastline first and then add other features such as reefs, mangroves, rivers, roads, and settlements voluntarily or with prompting from the CW. To avoid confusion, use the local ways of referring to resources, places and habitats. Coastlines are best drawn in black ink with other colors (e.g. red, green, brown) being most easily recognized as reefs, mangroves, roads and other features (Fig. 2.5).

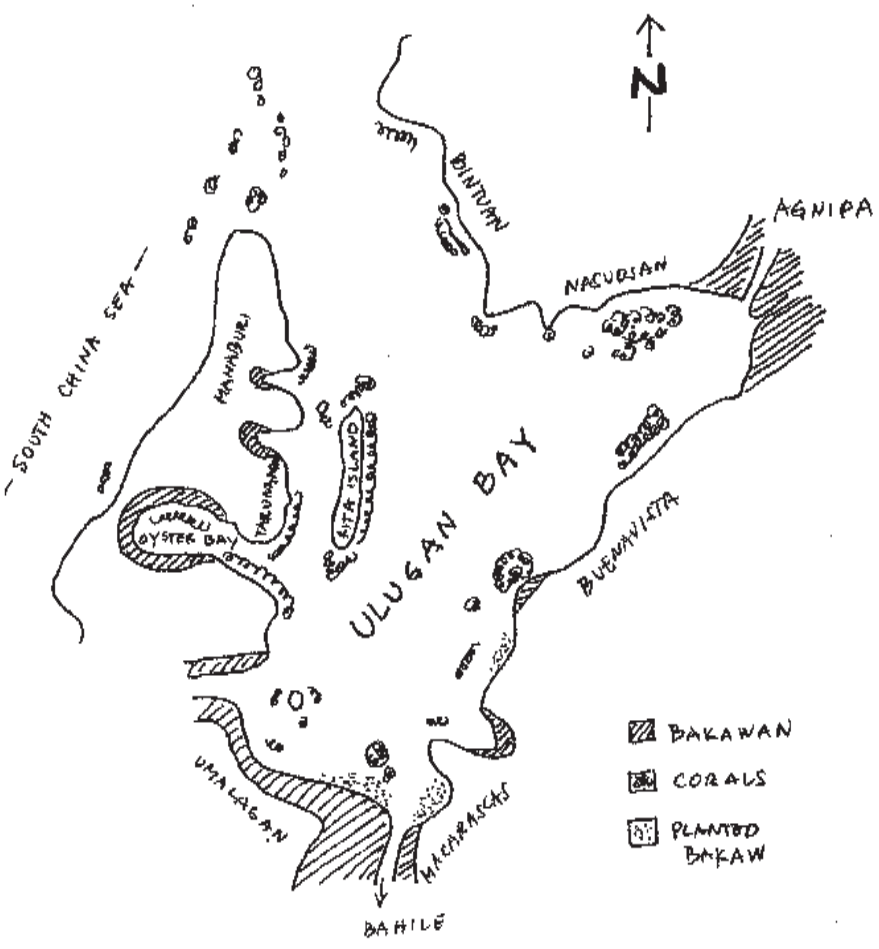


Fig. 2.5 Sample sketch map from PCRA in Ulugan Bay, Palawan.

Fig. 2.5 Sample sketch map from PCRA in Ulugan Bay, Palawan.

Sketch maps are most useful in locations or cases where base maps and aerial photos are not available and where there is a lack of knowledge or understanding of local resource users' perception on habitats and resource uses. Sketch maps also offers perspective on those elements that are most important to the local communities participating in the sketch mapping exercises.

Drawing on base maps. A base map is a map of selected features such as coastlines, roads, and villages. It serves to orient the mapper to the area and provides a consistent scale for the mapper to draw in additional features such as reefs, mangroves, fishponds, fishing grounds, and locations of stationary fishing gears such as *baklad* (fish corrals). Base maps are often produced by government geological or navigation agencies. If the precision and the scale used are adequate, these maps serve as the best vehicle for accurately representing a variety of environmental elements such as habitats, uses, resources, issues and conflicts.

Using a map produced by NAMRIA or other professional mapping agency as a guide, prepare the base map in advance of the mapping activity, ideally on a tabloid-size tracing paper. The basic goal is to

Base maps serve as the best vehicle for accurately representing a variety of environmental elements.

produce a spatial guide to the area, leaving out those features that the fishers can fill in. A base map with predrawn black lines representing coastlines, rivers and roads and general bathymetry is generally sufficient to orient the mapper, allow useful comparison between maps, and ensure largely unbiased mapping of important features such as those listed in Table 2.1.

It is usually best to discuss the base map with the fishers before mapping starts.

The best map scales to use depend on the size of the area to be mapped. For mapping barangay coastal waters, the best maps to trace have scales that range from 1:5,000 to 1:50,000; for mapping at the municipal level, 1:30,000 to 1:100,000 scales are probably the best. NAMRIA produces a series of topographic maps at a scale of 1:50,000 – these are the best available for creating base maps. The agency's nautical charts, available at a various scales, are also useful.

It is best to choose a scale that allows each distinct coastal area unit to be mapped to fit a tabloid-size sheet of paper. At a scale of 1:50,000, a coastal area measuring 15 km by 25 km fits well on this paper size. Smaller areas can use a scale of 1:5,000 to 1:20,000, while larger areas will require a scale of 1:100,000.

Many maps from which base maps are traced, e.g. NAMRIA topographic sheets, show more details than those required in the PCRA base map. Details such as

locations of reefs and mangroves (except for bathymetric contours), for example, should not be traced onto the base map, or it will defeat the purpose of the mapping activity, which is to learn what local fishers know about the coastal environment and not what is reported by professional mapping agencies. The maps drawn by the fishers can be compared later with those done by professional cartographers.

After completing the base map, make several photocopies (also tabloid size) that can be drawn over by participating fishers. Orient participants before the mapping begins. Most fishers quickly understand the exercise, but mapping the coastline, especially mangroves, can sometimes be confusing. It is therefore usually best to discuss the base map with the fishers before drawing starts (Fig. 2.6).

Tape the map to a table, then cover with mylar tracing paper in preparation for mapping the elements. Begin with the mapping of habitats (including mangroves); this eliminates confusion regarding the location of the shoreline. Because habitats take up distinct areas, it is best to shade each type using color pencils. Most maps from which base maps are traced have coastlines that define the area above water at low tide — this should be explained to the fishers before they start. Explain that mangrove swamps, sand

For mapping barangay coastal waters, the best maps to trace have scales that range from 1:5,000 to 1:50,000.

For mapping at the municipal level, 1:30,000 to 1:100,000 scales are probably the best.

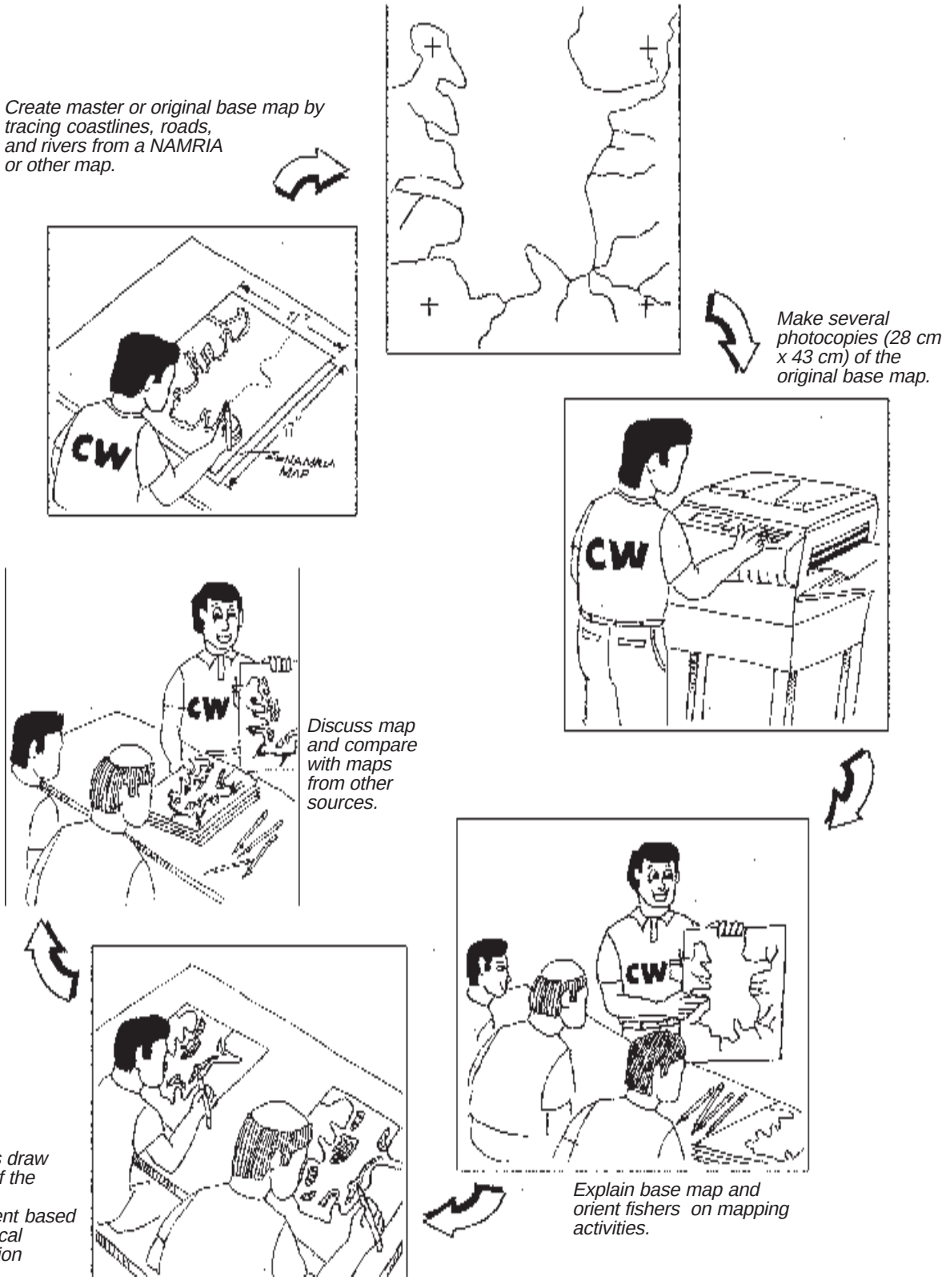


Fig. 2.6 Procedure for drawing on base maps.

bars, and other features exposed at low tide are all on the "inside" or inland side of the coastline and should be drawn accordingly.

It is useful to arrive at a set color scheme and codes that all participants will use for all the features mapped. Recall the necessity of choosing features to be mapped that arise from previously determined local classification systems for coastal resources, habitats, and other factors. In drawing the maps, it is especially important to use colors to differentiate all the various local classes. Using colors can help differentiate the location of reefs, rocks and other resources, and the relative condition of resources and habitats. For example, reefs with relatively higher live coral cover can be differentiated from those without live coral cover, or mangroves with significant remaining old growth can be distinguished from those having mostly secondary growth. Following the standardized mapping format previously discussed, numbers, letters and symbols can be used to indicate locations associated with various resources, uses, and issues.

Five types of mapping elements that are generally accepted and understood in CRMP project areas include:

It is useful to arrive at a set color scheme and codes that all participants will use for all the features mapped.

1. ***General information.*** This may include coastline, islands, bathymetry, topography, roads usually found on most maps published by the government. To help orient the local map producers on the scale and precise location of additional map elements, include general information and label key features on the maps.

2. ***Habitats.*** These are usually mapped next using color pencils to color-code the different habitats (e.g. light green for seagrass, yellow for beach, brown for rocky shoreline). (Table 2.2)

Table 2.2 Color codes used in PCRA maps of CRMP Learning Areas.

Habitats - *color codes (12)*		
Mangrove	-	dark green
Seagrass	-	light green
Beach	-	yellow
Rocky shoreline	-	brown
Mudflats	-	black
Inshore flats	-	orange
Coral reef	-	red
Estuary	-	blue
Marine waters	-	light blue
Passes/channels/deep ocean	-	dark blue
Offshore sandbar	-	yellow green
Terrestrial area	-	light yellow

3. ***Resources.*** These are usually mapped after the habitats. Resources are elements (e.g. fish, shellfish, rock, wood) that provide food and other materials of tangible value to local

communities. An arabic numeral code is used for mapping resources, with each type assigned a number. For large resource areas, arrows can extend the range of resources beyond the location on the map where a number is placed. A large variety of resources may require knowledge of names and reference to guide books (Table 2.3).

4. ***Uses, livelihood, opportunities.*** These include sites (e.g. fishing gear areas, gleaning sites, mining areas, mangrove cutting, sacred sites, shore protection, parks) where activities are accomplished or where opportunities or functions provide potential benefits to communities. It is best to use a letter coding system, assigning a letter to each type of "use". Keep in mind, however, that some letters can be confused with some numbers and should not be used (for example, the letter "O" can be mistaken for the number "0", and the letter "I" for the number "1"). (Table 2.4)

5. ***Problems, issues and conflicts.*** These are last to be mapped because they logically follow the mapping of resources and uses, and because they are the most abstract of the mapping elements. The capital letters "IS" followed by a number may be used to represent

Mapping is best handled as a group exercise.

Table 2.3 Common coastal and marine resources and suggested numerical codes.*

Resources		
Birds, Mammals and Reptiles (1-100)		
ENGLISH	LOCAL	FAMILY
Crocodiles	buaya	Crocodylidae
Dolphins	lumod, balakiki, lumba-lumba, mayahon, kabang	Delphinidae
Dugong	dugong	Dugongidae
Seabirds	kanaway, tirik, tabon, yuho, talingting, manaol, lapay, ok-ok, du-ong	
Sea snakes	tangkig	Hydrophidae
Sea turtles	pawikan	Cheloniidae
Whales	balyena, bongkaras	Balaenopteridae
Fish (101-300)		
Anchovies	bolinao, boris, dilis, libud, tuakang	Engraulidae
Angelfish	alibangbang, baro-baro, boray-boray, paruparo	Pomacanthidae
Anglerfish and frogfish	noog-noog	Antennariidae
Anthiases, basslets	minyat-minyat	Serranidae
Archerfish	ananabing, anunuput, ataba, bang-ga, kataba	Toxotidae
Bandfish	upos-upos	Cepolidae
Barracudas, seapikes	lusod, rompe kandado (large-sized), tursilyo	Sphyraenidae
Batfish, leaffish	bayang, dahong-gabi, dalipugan, muray-muray	Ephippidae
Bigeyes, bullseyes	baga-baga, bocao, buan-buan, matahari	Priacanthidae
Billfish (swordfish, spearfish, marlins, sailfish)	malasugi, dogso, liplipan, lumod, mayaspas, pahabela	Xiphiidae, Istiophoridae
Blennies	pawog, tiki-tiki, tanghaw, tingo-tingo	Blenniidae
Bonefish	bidbid, tigi	Albulidae
Butterflyfish	paruparo, alibangbang, saguranding	Chaetodontidae
Cardinalfish	bungka, dangat, mo-ong, parangan, suga	Apogonidae
Clownfish, anemone fish	bantay-butbut, mangkot, palata	Pomacentridae
Conger eels	banusak, obod, ogdok, palos, pindanga	Congridae
Cornetfish	dahog-tubo, droal, sunugan, tihul-tihul, tubo-tubo	Fistulariidae
Croakers	abo, alakaak, dulama, ibot, kabang, lagis, silay	Sciaenidae
Damselfish	baro-baro,ulan-ulan, puyong dagat, pata, bika-bika	Pomacentridae
Dolphinfish	dorado, lumbag, marang, pandawan	Coryphaenidae
Dottybacks	hingasan, tingasan	Pseudochromidae
Dragonets	bugo, banto, noog-noog, talimusak	Callionymidae
Eagle rays and cow-nosed rays	pagi-manok, palimanok, paol, bulik, banugan	Myliobatididae, Rhinopteridae
Eel blennies	batad, tamayo	Congrogadidae
Eel-tailed catfish	alimusang, balibot, hito, patuna, sumbilang	Plotosidae
Emperor breams	bagangan (young), bitilya, katambak, kirawan, madas, dugso, bakuktut, sapingan	Lethrinidae
False trevallies	algodon, pagapa, papaga, pelyan, rigudon	Lactariidae
False whitings, blanquillos	banghutin, matang dagat	Malacanthidae
Flagtails	aligaman, buan-buan, bulan-bulan, ramagan	Kuhliidae
Flatfish (soles, halibuts, flounders)	tambiki, palad, dalidali, tampal, dapa, kalangkao, malapalad, papang sinilas, hagudila, dapang bilog dapang kawayan, tatampal	Soleidae, Psettodidae, Cynoglossidae, Bothidae, Paralichthyidae
Flatheads	isdang buwaya, sunog, sunogan, lubalab	Platycephalidae
Flying fish	aliponghok (fingerling), antulihaw, bangsi, barongoy, bolador, eliu, laniu	Exocoetidae

*Arabic number ranges are suggested for each group of resources, specific numbers can be assigned to a particular resource at the time of mapping.

Fork-tailed catfish	bongoan, kanduli, tabangongo, tabanko	Ariidae
Fusiliers, bananafish	bilason, butlogan, dalagang bukid, sinao-an, sulid	Caesionidae
Garfish, needlefish	balo, dugso, doal, mangansing, batalay, sinao-an	Belonidae
Goatfish	saramulyete, senok (young), tiao, timbungan	Mullidae
Gobies, sleepers	biya, tambo-tambo, tiao, senok (young)	Gobidae, Eleotrididae
Groupers, seabasses, perchlets	lapulapu, kugtong (large sized), suno, señorita, tingag, tirang, dolit, lilig, taleti-on, kobe, turnutulin, garopa	Serranidae
Guitarfish, shovelnose rays	bariwan, pating-sudsud	Rhinobatidae
Hairtails, cutlass fish	balila, liwit, lahing, espada, langkoy	Trichiuridae
Halfbeaks	bamban, buging, kasusuwit, sasa, sausid	Hemiramphidae
Hammerhead sharks	bingkungan, kodosan, kurosan	Sphyrnidae
Hardtails	atulay, adlo, kalapeon, pakan, oriles	Carangidae
Hawkfish	katambak-buak, ngisi-ngisi, ungo-ungo	Cirrhitidae
Jacks, cavallas, crevalles, trevallies, darts	damis, tawa-ay, baho-olo, salay-salay, barilason, pampano, talakitok, lagidlid (young), pagapa, makaagum, trakito, bitilya, badlon, mamsa	Carangidae
Jawfish	tabangka	Opistognathidae
Leatherjackets	salindato, yapis, lari	Carangidae
Lizardfish	kalaso, salantiki, talho, tiki-tiki, bubule	Synodontidae
Manta rays, devil rays	sanga, mantihan, piantaihan, salanga	Mobulidae
Milkfish	banglis, banglus, bangus, awa, sabalo	Chanidae
Mojarras, silver biddies	batuhan, batuhanan, batuhanon, malakapas	Gerreidae
Monos, silverbat fish	muray-buray, duhay, kambing-kambing	Monodactylidae
Moonfish	bilong-bilong, chabita, habas, sapatero, tabas	Menidae
Moorish idols	alibangbang, sagurading, kalmin-kalmin	Zanclidae
Moray eels	hagmag, hangit, hawig, ogdok, pananglitan	Muraenidae
Mudskippers	talimusak, tamasak, tambasakan	*Periophthalmus, Boleophthalmus*
Mullets	balanak, banak, gagapan, gapang, pili, gisao	Mugilidae
Parrotfish	aliyakyak, bon-ak, bungalog, loro, mulmul	Scaridae
Pomfrets, butterfish	pampano, kambing-kambing, sandatan	Formionidae, Stromateidae/Carangidae
Porcupine fish	butete, duto, karatungan, tagutuman, utik	Diodontidae
Pufferfish	boriring, butete, langigidon, tikong, tinga-tinga	Tetraodontidae
Rabbitfish, spinefeet	danggit, kitung, layap, samaral, tagbago	Siganidae
Remoras	parikitugit, parakitugit, parakit, banka, kini	Echeneididae
Rudderfish, drummers	hak, lupak, ilak	Kyphosidae
Runners	salmon, lapi, bansikol, solinaw	Carangidae
Sardines, herrings, sprats gizzard shads	tamban, tunsoy, toy, haol-haol, helos, kabasi mararapad, lupoy (fry), siliniasi (fry)	Clupeidae
Sawfish	taghan, tagan, gabsan, ihong gabsan	Pristidae
Scads	galunggong, borot, matangbaka, hagumaa, gutlob	Carangidae
Scorpionfish, lionfish, turkeyfish, stonefish	bantol, gatasan, lalong, lawag, lawong, lolong, ngisi-ngisi, noog-noog, tunok	Scorpaenidae
Seabasses, sandbasses sea perches, barramundi	bulgan, katuyot, matang pusa, apahap	Centropomidae
Sea breams, porgies	bisong tabo, gapas-gapas, mahuwana, kuwa	Sparidae
Seahorses, pipefish	kabayo-kabayo, hingiki sa buaya, hingiki, dagum-dagum, kulbog	Syngnathidae
Sea-haarders, bonnetmouths	inlis, lubintador, uan-uan	Emmelichthyidae
Sergeant majors	kapal, puong dagat, preso-preso	Pomacentridae
Sergeantfish, cobias	dalag dagat, kume, pandawan, tase, gile	
Sharks	bagis, iho, lahos, lahoy, pating, tanguiguihon	Lamnidae
Shrimpfish, razorfish	isdang laring-laring, sipul-sipul	Centriscidae

Sicklefish	bayang, kalmin-kalmin, kilyong, mayang, pasyon	Drepanidae
Silversides	langaray pako, guno	Atherinidae
Slipmouths, ponyfish	laway-laway, lumu-an (large sized), palangan (large sized), parutpot	Leiognathidae
Snake eels	igat, ogbok, ukdok	Ophichthyidae
Snake mackerels	aswang, langpoy	Gempylidae
Snappers, sea perches	aha-an, auman, lagan, mangagat, maya-maya	Lutjanidae
Soapfish	lumoan	Grammistidae
Spadefish, scats	kitang, kikiro, langkia, ngisi-ngisi	Scatophagidae
Squirrelfish and soldierfish	siga, baga-baga, ganting, suga-suga	Holocentridae
Stingrays, skates, electric rays	pagi, dahonan, pantikan, kiampao	Dasyatidae, Rajidae, Torpedinidae
Surgeonfish, tangs, unicornfish	alibangbang, bagis, bakwak, bongkokan, indangan, kadlitan, kalmin-kalmin, labahita, mungit, pelason, saguranding, songhan, tudlo-an	Acanthuridae
Sweepers	tabas, sundang-sundang	Pempheridídae
Sweetlips and grunts	bakoko, kanwo, olay-balay, pasinko, lipte, agoot, alatan	Haemulidae
Tarpons	awa-awa, buan-buan, bulan (small-sized)	Megalopidae
Tenpounders	alho, bidbid, bidbir	Elopidae
Therapons, tigerfish	bugaong, gonggong, langbu, bungao, dukuson	Theraponidae
Threadfins	kumehan, mamale, mamaleng bato, midbid	Polynemidae
Threadfin breams, spinecheeks	bisugo, lambado, lagao, sagisi-on, bakay, silay	Nemipteridae
Tilefish	bisugong kabayo, tangaron, matang dagat	Branchiostegidae
Triggerfish and filefish	pakol, pugot, saguk-suk, sulaybagyo, ampapagot	Balistidae, Monacanthidae
Tripletails	kapkap bato, ligad	Lobotidae
Tripodfish	sungay-sungayan, sulay-bagyo, musi	Triacanthidae
Trumpetfish, flutemouths	droal, dahug-tubo, tubo tubo, sunugan, tihul-tihul	Aulostomidae
Trunkfish, boxfish	tabaong, tabayong, obuluk	Ostracionidae
Tunas and mackerels	tulingan, bariles, bankulis, alumaan, tangigue, hasa-hasa, burao, kabalyas, tambakol, pirit, karao	Scombridae
Whale sharks	balilan, iho-tiki, tuki-tuki, tawiki	Rhincodontidae
Whitings, sillagos	asohos, oso-os	Sillaginidae
Wolf herrings	balila, balira, parang-parang	Chirocentridae
Wrasses	bagondon, bugok, bungat, ipos-ipos, labayan, lakhoy, lamon-lamon, lupit, maming	Labridae

Shells (301-400)

Abalones	kapinan, lapas	Haliotidae
Ark shells	batotoy, suod-suod, tipay	Arcidae
Auger shells	sungkod-sungkod, honsoy-honsoy	Terebridae
Bubble shells	poki, buan-buan, litub, lumo, wasay-wasay	Bullidae
Carditas	tikud-tikud	Carditidae
Cockles	bisong-bisong, bug-atan, imbao, kasing-kasing, litub, pagapan	Cardiidae
Comb oysters, oysters	basa, sali-ot (small), sisi	Ostreidae
Conches	balo-balo, bao-bao (small), sa-ang, habasan	Strombidae
Cone shells	habasan, liswi	Conidae
Coral snails	tanghuwa	Magilidae
Cowries	katipan, lumban, poki, buwao	Cypraeidae
Dolphin shells	taktakon	Angariidae
Egg shells	poki	Ovulidae

Fig shells, pear shells	tanghuwa	Ficidae
Frog shells	guba-guba	Bursidae
Giant clams	basa (small), hagdanan, sali-ot (small), taklobo, tilang	Tridacnidae
Harp shells	sinaw	Harpidae
Helmet shells	budyong	Cassidae
Horn shells	pao-pao	Potamididae
Jewel boxes	tikud-tikud	Chamidae
Melon shells, volute shells	kibol	Volutidae
Miter shells	amo-amo, anikad, aninikad, guyod, paitan	Mitridae
Moon shells	buan-buan	Naticidae
Mussels	bahong, tahong, tahong-tahong	Mytilidae
Olive shells	dalinasan	Olividae
Pearl oysters, wing oysters	amahong, talaba, tipay	Pterridae
Pen shells	tarab	Pinnidae
Periwinkles	saka-saka, guba-guba, torong-torong	Littorinidae
Rock shells	guba-guba	Thaididae
Scallops	paypay, tipay	Pectinidae
Slit shells, turret shells	sungkod-sungkod	Turridae
Spindle shells	sungkod-sungkod	Fasciolariidae
Staircases, sundials	lagang	Architectonidae
Thorny oysters	tikud-tikud	Spondylidae
Top shells	amongpong (small), samong, tandok	Trochidae
Tritons	tambuli	Cymatiidae
Tun shells	tanghuwa	Tonnidae
Turban shells	lumban, pidjong-pidjong, piyong-piyong, nasa	Turbinidae
Venus shells	bugatan, halaan, imbao, punaw	Veneridae
Whelks	nasa	Buccinidae

Other invertebrates (401-500)

Coconut crabs	alikway, tatus	Coenobitoidae
Cuttlefish	baghak, kobotan, kolambutan, tauban	Sepiidae
Large shrimps and prawns	hipong puti, lukon, pasayan, sugpo	Penaeidae
Mantis shrimps	kamuntaha	Squillidae
Mud/mangrove crabs	alimango	Portunidae
blue crabs	alimasag, kasag, lambay, masag	
Nautilus	lagang	Nautilidae
Octopuses	kugita, pugita, tabugok	Octopodidae
Sea cucumbers	balat, balatan, bat, trepang	Holothuridae
Sea urchins	tuyom	Diadematidae
	suwaki	Toxopneustidae
Shovel-nosed/slipper lobsters	banagan	Theninae
Small shrimps	alamang, balao, hipon	Sergestidae
Spiny rock lobsters	banagan	Palinuridae
Squids	nokus, noos, pusit	
giant red squids	alopapa, dalopapa	Loliginidae
Starfish	koros-koros, padpad, dap-ag	Oreasteridae

Plants (501-600)		
Seagrasses	lusay	Potamogetonaceae, Hydrocharitaceae
Green algae	dayong-dayong, payong-payong	Polyphysaceae
	bitukang-manok, lumot, lablab, habol-habol	Ulvaceae
	arurusep, aruting, lato	Caulerpaceae
	pupuklo, pokpokio, sam-ang	Codiceae
Brown algae	tabtaba, balbalolang, lukot-lukot, poko-poko	Scytosiphonaceae
	aragan, layog-layog, samo	Sargassaceae
Red algae	bulaklak-bato	Bonnemaisoniaceae
	kulot, dipdipig, tartariptip, lagot-laki	Rhodomelaceae
	gayong-gayong, gulaman-bato, kulkulbot	Gelidiaceae
	kulot, sumon-sumon	Hypneaceae
	kawkawayan, gulaman, lagot	Gracilariaceae
	guso, kanot-kanot, ruprupuuk	Solieriaceae
Nypa	nipa	Palmae
Mangroves	bungalon, api-api, piapi	Avicenniaceae
	pedada, pagatpat	Sonneratiaceae
	bakawan-lalake, bakhawan-tigrihon, bakawan-babae, pototan-lalake, busain, langaral, malatangal, tangal, pototan	Rhizophoraceae
	taualis	Myrtaceae
	saging-saging, tinduk-tindukan	Myrsinaceae
	sagasa, kulasi, mayoro, talisay	Combretaceae
	nilad	Rubiaceae
	bantigi	Lythraceae
	buta-buta, alipata	Euphorbiaceae
	baraibai	Apocynaceae
	malubago	Maluaceae
	bitobitoon, botong	Lecythidaceae
	dungon, dungon-late	Sterculiaceae
	tabigi, piagau	Meliaceae
	balok-balok, tui	Bignoniaceae
	bani, tubli	Fabaceae

Table 2.4 Common traditional fishing methods, illegal activities and other uses with suggested codes.

Traditional and Subsistence Fishing Methods (T1-T100)			
T1	Bag nets	T15	Encircling gill nets
T2	Barricades	T16	Filter nets
T3	Beach seines	T17	Fish corrals
T4	Blanket nets	T18	Fish pots and crab pots
T5	Bottom set gill nets	T19	Fish shelters
T6	Cast nets	T20	Hand instruments with curved blades, forks, hooks, etc.
T7	Cover nets		
T8	Cover pots	T21	Harpoons
T9	Crab lift nets	T22	Hook and lines/handlines/droplines
T10	Dip nets	T23	Hoop nets
T11	Dredge nets	T24	Jiggers
T12	Drift gill nets	T25	Lever nets
T13	Drift longlines	T26	Lights
T14	Drive-in nets	T27	Multiple hook and line

T28 Pole and lines
T29 Pull nets
T30 Purse seines
T31 Push nets
T32 Rakes and dredges
T33 Reef seines
T34 Ring nets
T35 Round haul seines
T36 Scoop seines
T37 Scoops
T38 Set longlines
T39 Skimming nets
T40 Snares
T41 Spears
T42 Stop seines
T43 Trammel nets
T44 Trap nets
T45 Troll lines

Illegal Fishing/Uses (IF1-IF50)

IF1 Drive-in net with bamboo/tree trunk scare devices (kayakas)
IF2 Drive-in net with weighted scarelines (muro-ami)
IF3 Electrofishing
IF4 Explosives
IF5 Fine mesh nets (less than 3 cm) for unexempted species
IF6 Fishing in closed areas (e.g. fish sanctuaries, limitation on baby trawls, etc.)
IF7 Fishing without license
IF8 Harvest of dolphins
IF9 Harvest of giant clams (taklobo)
IF10 Harvest of helmet shells (budyong) IF11 Harvest of kapis (*Placuna placenta*) <80mm using mechanical rakes, dredges and motorized boats
IF12 Harvest of manta rays
IF13 Harvest of marine turtles and eggs
IF14 Harvest of milkfish (60cm and over)
IF15 Harvest of triton shells (tambuli)
IF16 Harvest of whale sharks
IF17 Not honoring closed seasons
IF18 Other gears (banned by local legislation, like baby trawls, modified Danish seines, beach seines, compressors, etc.)
IF19 Pantukos (tuckseine) with torch and/or flammable substance
IF20 Poisons/obnoxious substances
IF21 Superlights within municipal waters
IF22 Unauthorized commercial fishing within municipal waters

Legal but controversial fishing methods (perceived as destructive/depletive) (C1-C10)

C1 Beach seines
C2 Compressors
C3 Drive-in nets with various scaring devices
C4 Modified Danish seines
C5 Other drag nets
C6 Trawls

Other Uses and Activities (A1-A50)

A1 Airports
A2 Anchorage
A3 Banana plantations
A4 Breakwaters
A5 Coconut farms
A6 Drainage canals
A7 Educational reservations
A8 Fish cages
A9 Fish landings
A10 Fish pens
A11 Fishponds/shrimp ponds
A12 Historical sites
A13 Human settlements/built-up areas
A14 Industrial estates
A15 Lighthouses/beacons
A16 Limestone quarries
A17 Mangrove plantations

A18	Mangrove timber cutting
A19	Military stations/bases
A20	Mineral extraction
A21	Navigation channels
A22	Nipa harvesting
A23	Nipa plantations
A24	Oil refinery/depots
A25	Orchards
A26	Port/pier/wharf/marina
A27	Power stations
A28	Protected areas (formal and informal) A29 Public laundry areas
A30	Public parks/plazas
A31	Research stations
A32	Resorts
A33	Rice paddies
A34	Roads, bridges
A35	Salt beds
A36	Sand and gravel extraction
A37	Seawalls
A38	Seaweed culture
A39	Shellfish culture
A40	Waste dumps/outfalls/effluent discharges
A41	Watchtowers/observation platforms

Table 2.5 Common CRM issues and suggested codes (IS1-IS100).

IS1	Abandoned/unproductive fishponds IS2 Beach/shoreline erosion	IS30	Lack of legislation
IS3	Breakage of corals	IS31	Lack of organization
IS4	Closed access to sea	IS32	Lack of security of tenure of land and/or home lot
IS5	Coliform pollution	IS33	Lack of social services
IS6	Coral bleaching	IS34	Landslide
IS7	Coral extraction	IS35	Loss of rare/endangered species
IS8	Crown-of-thorns epidemic	IS36	Low awareness
IS9	Declining fish catch	IS37	Low prices of fishery products
IS10	Decreased estuary circulation	IS38	Mangrove conversion
IS11	Defoliation/loss of vegetation	IS39	Mangrove overharvesting
IS12	Destructive fishing	IS40	Nipa overharvesting
IS13	Deterioration of aesthetic quality	IS41	Oil spills
IS14	Diversion of fresh water	IS42	Overfishing
IS15	Dredging	IS43	Pesticide pollution
IS16	Encroachment on the fishing ground by outsiders	IS44	Piracy
		IS45	Reclamation
IS17	Eutrophication	IS46	Red tide
IS18	Fish diseases	IS47	Salt water intrusion
IS19	Fish kills	IS48	Shellfish contamination
IS20	Fishing gear conflicts	IS49	Siltation
IS21	Flooding	IS50	Smuggling
IS22	Heavy metal pollution	IS51	Theft of fishing gears and accessories
IS23	High cost of fishing inputs	IS52	Upland erosion
IS24	Hunting	IS53	Use conflicts
IS25	Illegal fishing	IS54	Use rights conflicts
IS26	Illegal fishponds	IS55	Waste dumping
IS27	Increased estuary salinity	IS56	Water turbidity
IS28	Lack of alternative livelihood activities	IS57	Weak organization
IS29	Lack of law enforcement	IS58	Wildlife trade

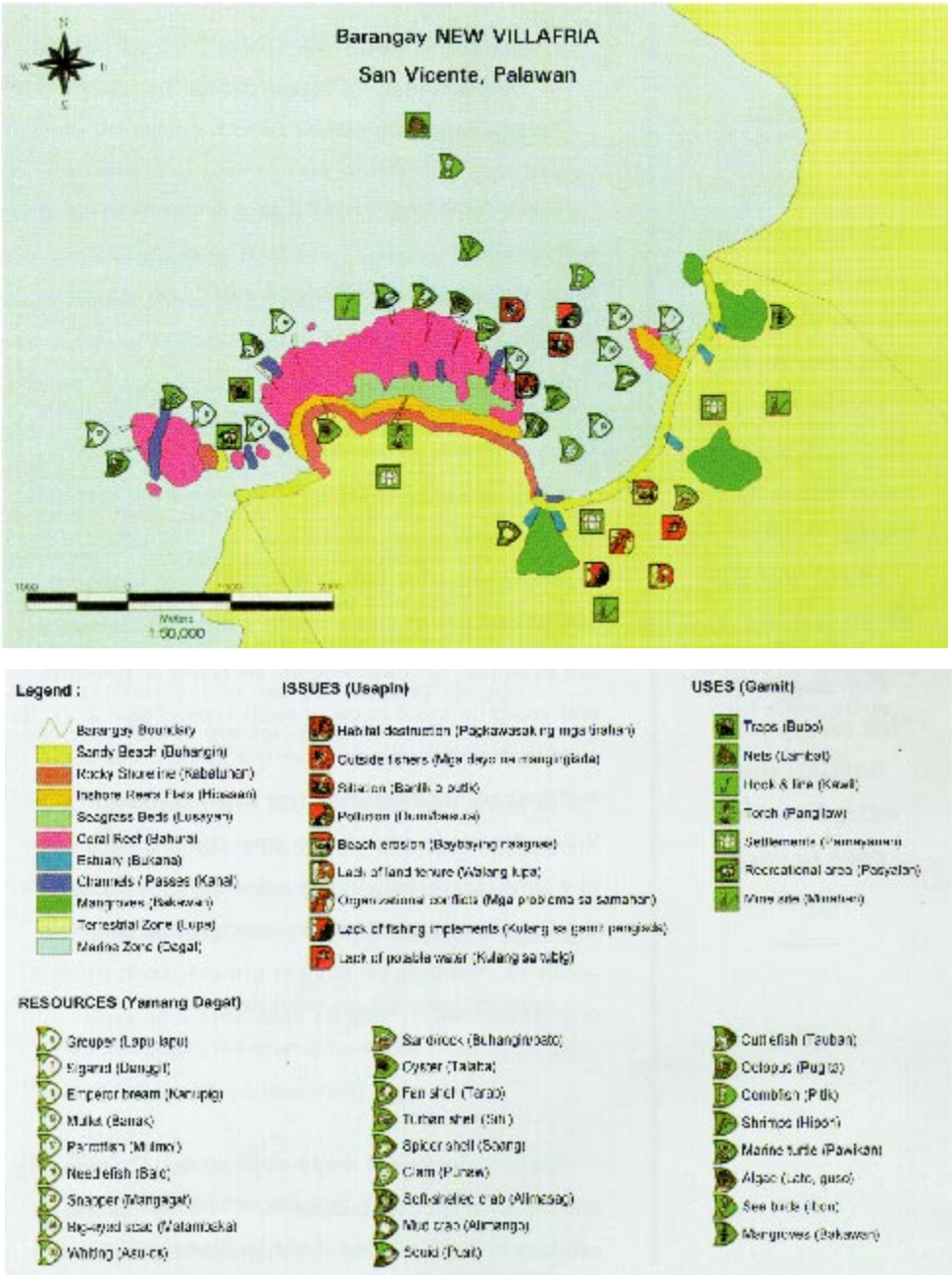


Fig. 2.7 Completed map for one barangay from PCRA in San Vicente, Palawan which has been digitized in a computer program using symbols for resources, uses and issues.

the issues. (Table 2.5). A finished map is shown in Figure 2.7 which uses symbols.

Mapping is best handled as a group exercise. Peer pressure and group consultation lead to better understanding of terminology and more accurate location of map elevents.

Place the base map on a table (Fig. 2.6). Take away all chairs to provide as much open space as possible around the table. This allows the mappers to move freely around the map as they perform the mapping exercise. Before mapping each category, review the list of all elements within the category. For example, for habitats, list all types of habitats and assign a color code to each type (Table 2.2). Be sure that no two types have the same color code and that colors are distinct to avoid confusion later. When the list is completed, map the elements, one at a time, preferably in the order that they appear in the list. In cases where few resource users are involved, mapping by smaller groups, such as on a one-on-one basis, may be appropriate or even essential.

For habitats, list all types of habitats and assign a color code to each type.

Making signboard maps or posters. For planning, education and other purposes, it is often useful to produce a large map of the management area on a signboard or poster. Signboard maps are

usually produced in a group setting after fishers have finished drawing over the tabloid-size base maps. The exercise is similar to that of drawing over base maps, except that the base map used is much larger and usually prepared in a different way. Signboard maps should be at least 120 cm x 120 cm and are best made of marine plywood with a 2.54 cm (1 inch) or larger trim or frame around the edges to give it strength and durability. It is best to hire a professional signboard artist to prepare the signboard base map, but a resourceful CW or community member can also handle the job (Fig. 2.8). Since it is impossible to trace through a signboard, the lines of the map must be transferred from a reference map using a "scaling" or grid technique. Follow the steps below:

1. On a tabloid-size (28 cm x 43 cm) sheet of paper, prepare a base map showing coastlines and a few other features, such as rivers and roads, to help orient the participant mappers.

2. Draw a grid of squares on the map so that each square measures no more than 2.54 cm x 2.54 cm (1 square inch).

3. Calculate a multiplication factor by dividing the length of the longest side of the base map into the length of the longest side of the area in

Signboard maps should be at least 120 cm x 120 cm and are best made of marine plywood with a 2.54 cm (1 inch) or larger trim or frame around the edges to give it strength and durability.

Locally drawn maps can add critical details and locally significant and relevant features that make them useful for CRM planning purposes.

which the map is to be drawn on the signboard (leave space on all the edges of the signboard for a border).

4. Multiply the size of the squares on the paper base map by the multiplication factor to calculate the corresponding size of the squares to be drawn on the signboard. For transferring a tabloid-size base map onto a 120 cm x 120 cm signboard, one can draw a grid of 2.54 cm x 2.54 cm squares on the base map and a corresponding grid of 6.4 cm x 6.4 cm squares on the signboard. (120 cm divided by 43 cm is 2.8, which can be rounded down to 2.5 to leave room for a border; 2.5 multiplied by 2.54 cm equals 6.4 cm).

5. Draw the square grid on the signboard using the size of the squares just calculated (e.g. 6.4 cm x 6.4 cm).

6. Going square by square, copy the lines on the base map into the squares on the signboard using the lines of the squares as guides to the placement of the map features.

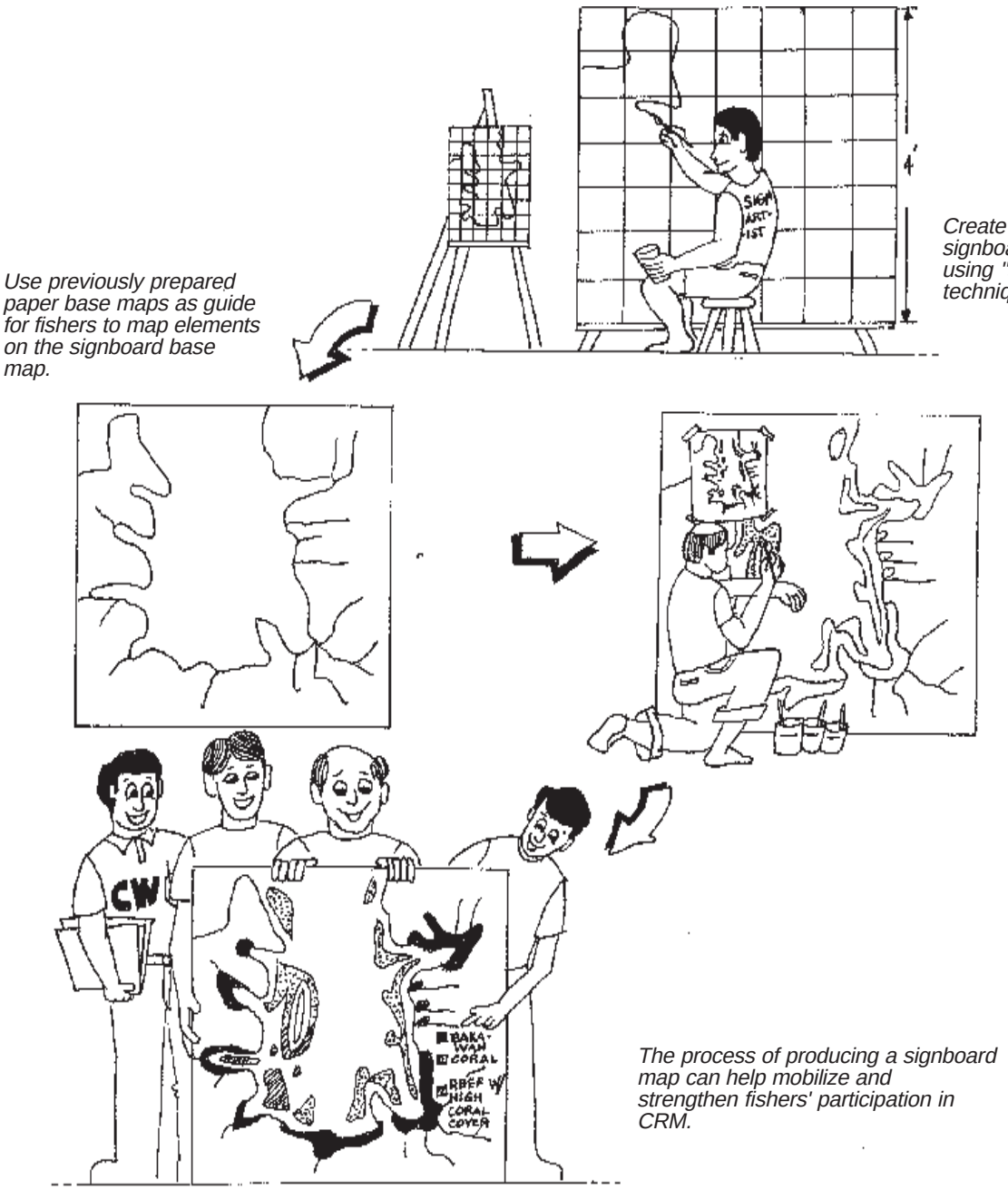
7. Once the basic lines have been drawn on the signboard, paint of various colors can be used

to fill in the map, for example, light green for seagrass and green for mangroves.

Once the signboard base map has been prepared in the manner described above, fishers can begin painting the features they have mapped on their paper base maps. The job is made easier if the fishers tape their paper base maps on to a corner of the signboard base map, so that they can easily glance from one map to the other as they paint (Figure 2.8). Fishers typically are good painters and usually have little trouble transferring the features of one map to another. Enamel paints, available from most hardware stores, are best for the job.

Refining maps drawn by fishers. Once local fishers and other coastal resource users have completely drawn all the various features on the base maps, all of the details from existing printed information sources such as the NAMRIA maps can be shown to participants and compared to the maps the fishers have just drawn. Since most fishers are quite good mappers, comparing their maps to the NAMRIA maps is usually a positive experience as they see the strong similarity between their maps and the maps produced by experts.

While the similarity is often striking, much can be gained from examining the differences between the



Use previously prepared paper base maps as guide for fishers to map elements on the signboard base map.

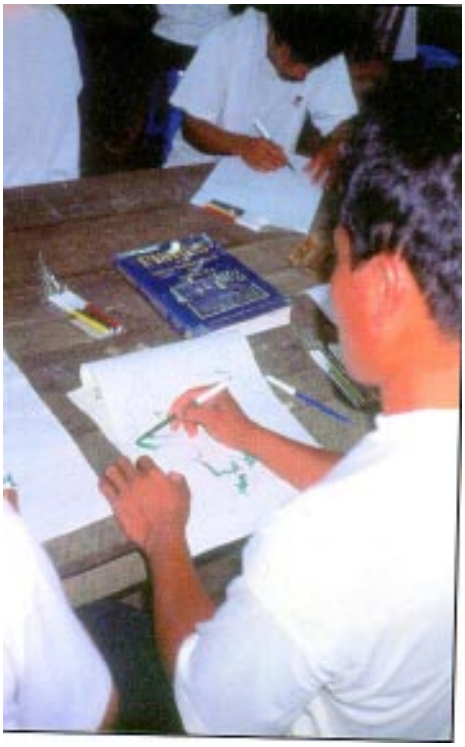
Create base signboard map using "scaling technique".

The process of producing a signboard map can help mobilize and strengthen fishers' participation in CRM.

Fig. 2.8 Procedure for making a signboard map.

The mapping process in pictures...

Fishers individually shade mangrove areas on photocopied base maps with color felt-tipped pens. (Palawan 1995)



Fishers identify and classify reef fish, while others (background) collectively map mangrove areas. (Palawan 1995)

After base maps have been drawn over, fishers compare the maps they created with existing maps, such as this nautical chart. (Palawan 1995)

An example of the group mapping technique where several fishers draw while others discuss and offer guidance and suggestions. (Palawan 1997)

PCRA facilitators discuss habitat color code with participants. (Palawan 1997)

Many hands make light work. (Palawan 1997)

Painting a poster map. (Ulugan Bay, Palawan 1995)

An attractive and durable poster map on plywood (Palawan 1995)

Group and individual interviewing techniques are also part of a PCRA.

A great deal of useful information can be generated by field checking or ground truthing maps prepared by fishers and professional cartographers.

local and expert maps. As with all PCRA results, look for new or different information on spatial details (such as small patches of mangrove), details on features that vary over space (such as old growth vs. previously logged mangrove), and features that vary over time (such as locations of seasonal fish aggregations).

Once fishers see expert maps in comparison to their own, they will often wish to amend the maps they have drawn based on features of the expert maps that they think are more accurate. This should be encouraged as long as the original maps drawn by the fishers are retained for reference, and as long as the fishers truly believe, based on their own knowledge and experience, that the expert map is more accurate in terms of the features they wish to correct. What usually results from the verification and correction process are maps that are composites of expert and local perceptions and often more accurate and useful than either map considered separately. Expert maps can help with producing exact scales, overall distributions and consistent locations, while the locally drawn maps can add critical details and locally significant and relevant features that make them useful for CRM planning purposes.

Field map verification and ground truthing. This method is useful with individuals or small groups after at least some drawing over base maps has been accomplished. The basic idea is to move around in the management area, either on foot or in vehicles (boats, jeeps, etc.), to verify and further refine various maps that have resulted from earlier exercises (Figure 2.9). For example, the areal distribution and quality of coastal habitats, e.g. mangroves and coral reefs, can be verified and/or modified by comparing maps to field survey results. Useful mapping can be accomplished with the use of the global positioning system (GPS) technology, which allows one to know, relatively accurately, one's geographical location or coordinates. The use of relatively simple and cheap hand-held GPS units is encouraged.

Even without the benefit of GPS technology, a great deal of useful information can be generated by field checking or ground truthing maps prepared by fishers and professional cartographers (Fig. 2.9). In many situations, it can be assumed that the positions on the maps of roads and other landmarks are relatively accurate. If this is the case, using these landmarks, one can navigate around the area knowing one's approximate location on the ground relative to one's position on the map, and thereby place other features on the map as these are found and examined.

Useful mapping can be accomplished with the use of the global positioning system (GPS) technology, which allows one to know, relatively accurately, one's geographical location or coordinates.

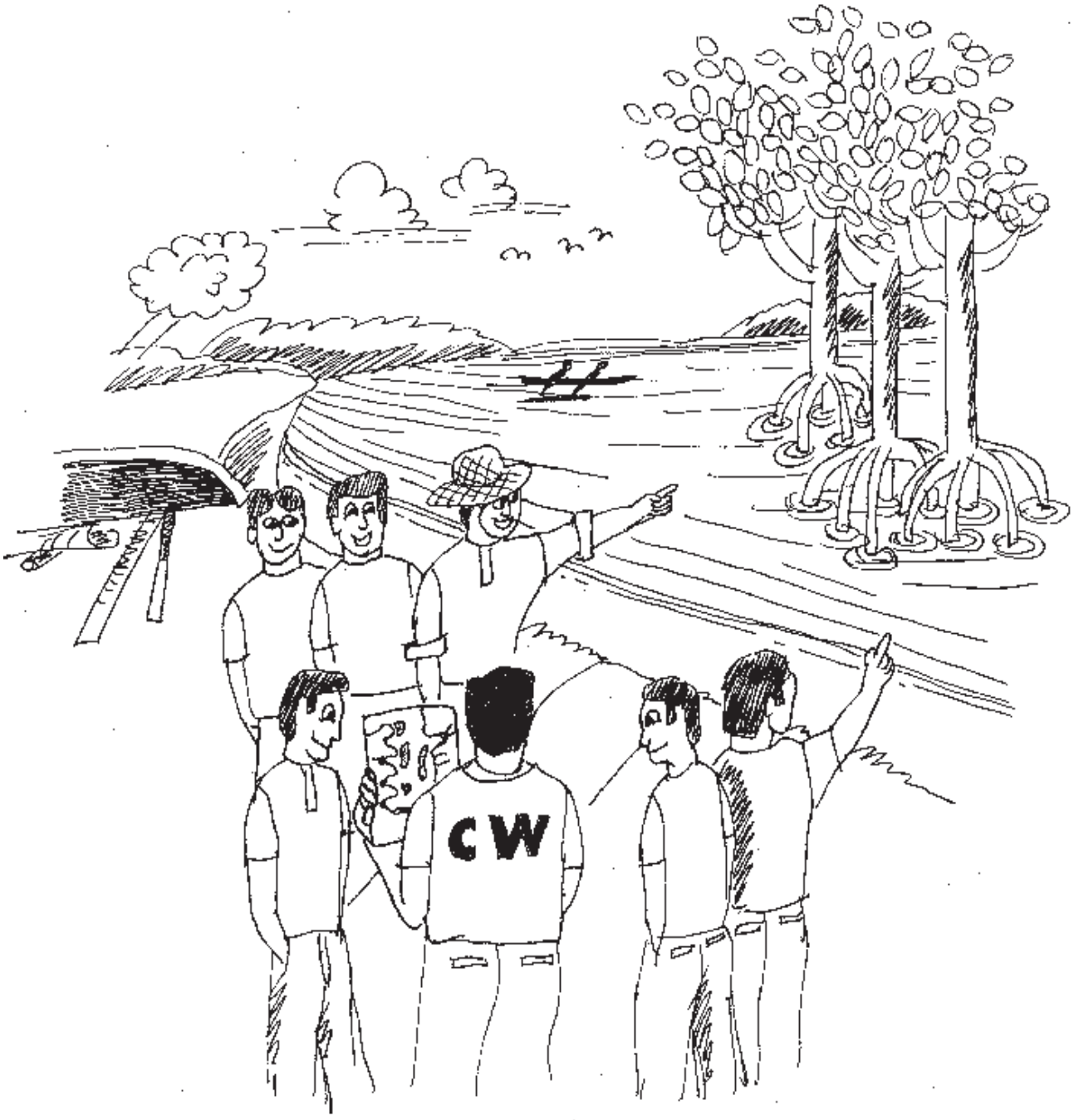


Fig. 2.9 Participatory field mapping allows fishers to further refine and ground-truth their maps.

Triangulation is one technique which uses landmarks to get a rough estimate of one's location; it involves taking compass readings from the location of interest on various surrounding landmarks in the field and then drawing lines through the landmarks on the map that correspond to the compass readings. The place where these lines converge or come closest to converging on the map is the approximate location. Seek assistance from NGO and government partners and counterparts for a more detailed description of — or assistance with — this activity.

Diagrams are another way of representing spatial information using a different set of dimensions from that used in maps.

Diagramming

Diagrams are another way of representing spatial information using a different set of dimensions from that used in maps. Seasonal and trend diagrams rely on sketching resources in the dimension of time. Transect diagrams allow sketching in two dimensions — vertical and horizontal — and provide an additional dimension to mapping which includes information on the two "horizontal" dimensions (length and width) or, more specifically, in a geographical context. The same process is followed as for mapping. First, list the elements to be diagrammed to ensure there is agreement and then draw each element on the diagram.

Drawing calendar diagrams

Calendar diagrams depict changes in certain variables over an annual cycle. They are useful in visualizing weather patterns (e.g. temperature, wind intensity and direction, rainfall levels) and understanding how resource use activities change through their yearly cycles. Seasonal production peaks and labor requirements are effectively represented in calendar diagrams (Fig. 2.10).

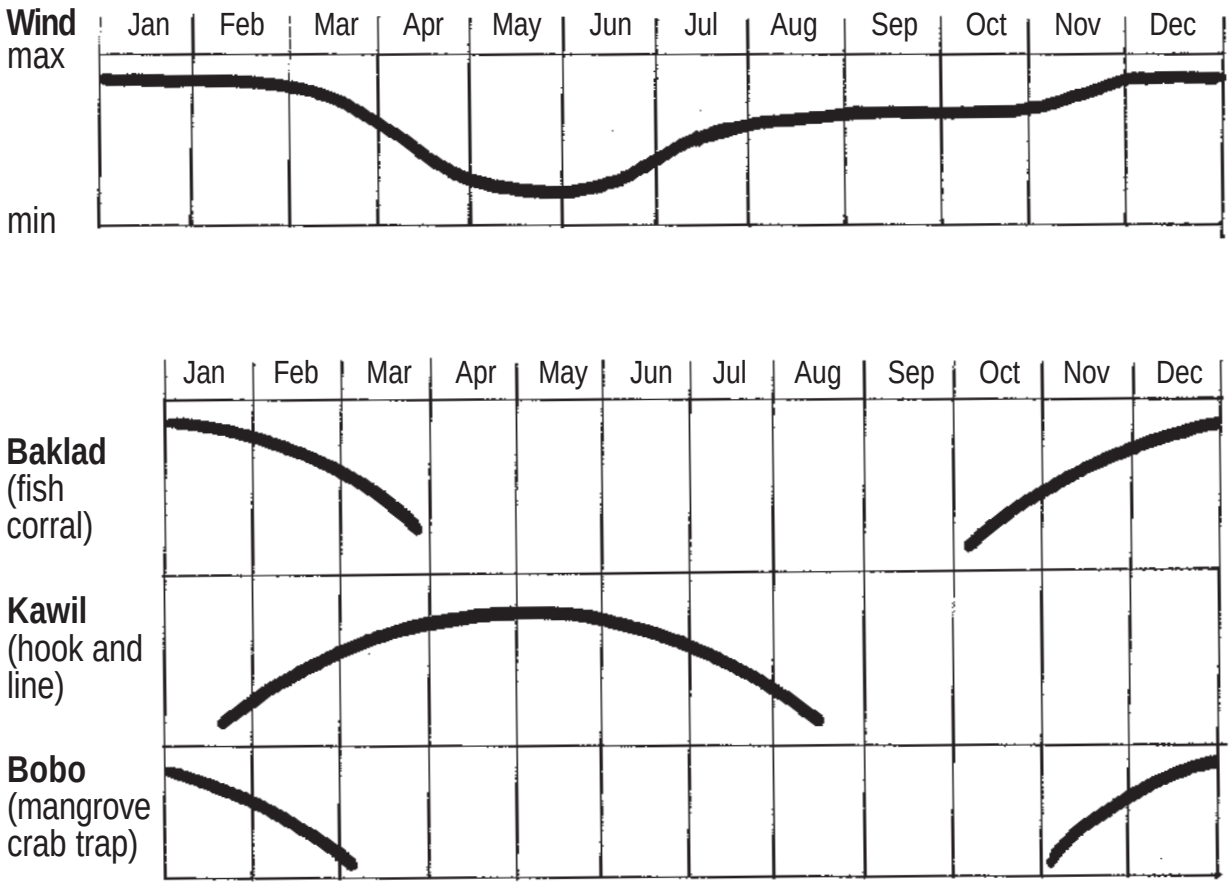


Fig. 2.10 Sample calendar diagrams: peak seasons for important gears used in Ulugan Bay as affected by wind patterns.

Before working with fishers, prepare blank calendars. Separate the months by drawing vertical lines on the calendar. Draw the dividing lines so that they are dark enough to be seen but not so dark that they could block out the horizontal lines and curves that the fishers will later draw on the diagram. As with all PCRA diagrams, take time to introduce to the fishers the format first, explaining how the position of the line or curve represents the intensity of the variable being measured over the course of a year.

Documenting historical trends

By understanding the past, one can glimpse the future. In PCRA work, possibilities for potential productive uses are usually revealed in discussions of past practices and productivity (Fig. 2.11). Since many areas already suffer from overfishing and, consequently, depressed total catch levels, the only real indication of maximum possible economic yield comes from past experience when overfishing was not yet a problem. By understanding the ways habitats have changed over time, such as the years and extent in which mangroves have been cleared or reefs have been blasted, one can better understand the present condition of coastal habitats.

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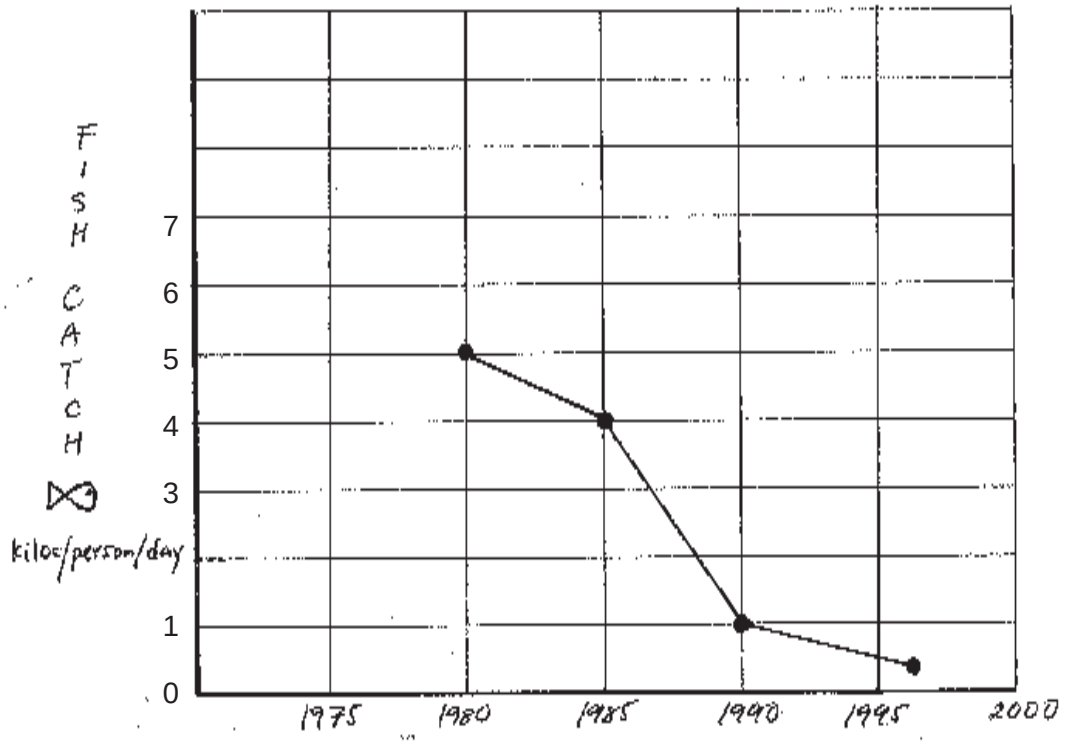

Fig. 2. 11 Sample trend diagram from the Sarangani PCRA training workshop (1997).

The methods used to document the past center around storytelling or *pakikipagkwentuhan*. All that is required is a knowledgable local person who feels free to reminisce about the way things were in years gone by as well as discuss more recent conditions and events. Ask the local stakeholder not only about what happened in the past, but also about why he or she thinks it happened the way it did. This often generates insights into what the current constraints are, e.g. an increase in population led to overfishing, or rapid land clearing for agriculture resulted in siltation.

It is important to draw out qualitative and quantitative information regarding historical trends and their causes. Whenever possible, ask the local consultant to be specific about years and numbers. Fish harvest information is most useful when presented in units of kg per fisher per day. Relatively good indications of decline in fishery productivity can be attained by asking consultants to report the average catch per day in the past and the present, compare the situation then and now, and then comment on reasons why the apparent decline has occurred.

It is useful to conduct this exercise repeatedly over the course of the assessment as the opinions of local consultants can evolve and/or become more detailed as the other methods are applied. The results of documenting historical trends usually serve as key starting points for the identification and discussion of problems and opportunities for CRM during the production of the coastal area profile (Chapter 3).

Whenever possible, ask the local stakeholder to be specific about years and numbers.

The role of women in PCRA

Although most fishers who go to sea are men, women play a valuable role in gathering useful information for community-based CRM. Women typically make up half of the local population and are often highly involved in

Often, women are the best sources of information regarding the economic feasibility of various fishing methods, market conditions for various coastal resources.

coastal resource use as reef gleaners and fry gatherers, and in other shore-based harvesting practices. For social and economic assessment, women are usually excellent sources of knowledge, since they typically play prominent roles as fish buyers and vendors, and as financiers of fishing businesses. Often, women are the best sources of information regarding the economic feasibility of various fishing methods, market conditions for various coastal resources, and other aspects of the local economy. Encourage women to participate in PCRA activities to the maximum extent possible, taking care, however, not to force local consultants into socially uncomfortable situations. In many communities, there will be little problem with women and men participating simultaneously in group exercises, but there are places or situations where it might be more appropriate to have separate sessions for men and women. If segregation must be done, take measures to ensure that it does not diminish equality and the usefulness of the information produced by the female participants.

Ethical and political considerations

When gathering information, pay special attention to the individuals' "intellectual property rights." Know when not to persist with a line of questioning that

begins to infringe on what a local consultant considers to be “private matters”. Locations of especially productive fishing spots, for example, may be regarded by fishers as “trade secrets” on which their livelihood depends.

Sensitivity to different cultures is an important asset to have in PCRA. Watch out for verbal and non-verbal cues which indicate the persons’ discomfort with the questions asked. Ensure that local stakeholders understand clearly what they can expect from the PCRA process. Do not create expectations that may not be realized. If it is not absolutely certain that future funding is available, for example, make sure that the fact is effectively communicated to the community. Be realistic about the potential of PCRA to lead to further management efforts. Strive to avoid misunderstandings regarding the future that can lead to disappointment. Disappointment can make communities skeptical, if not outright critical, of future management efforts. Finally, beware of being “used” by certain community members to achieve selfish political and economic objectives. Careful research and the use of neutral informants are necessary to minimize the presence and influence of individuals, e.g. local politicians, commercial fishers and land developers, who have vested interests that might not be compatible with the collective good of the community.

Disappointment can make communities skeptical, if not outright critical, of future management efforts.