

REEF CARE'S CORAL RESEARCH PROGRAMS FOR VOLUNTEERS ON CURAÇAO

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Reef Care Curaçao is a volunteer pool of sport divers who contribute to coral reef conservation by executing educational, conservation, public awareness and research programs. Two ongoing coral reef research projects are a study on annual coral spawning events and a continuous monitoring of the distribution and abundance of an encrusting and coral-killing ascidian. Coral spawning observations started in 1991 (Van Veghel, 1993) involving 75 volunteers and is continued annually. During a one-evening workshop, participants receive instructions on potential spawning times of different species and the kind of data that can be collected. This information is made available in a special flyer, and spawning observations can also be reported to the Reef Care Alarm Phone. To study the distribution and abundance of the encrusting ascidian *Trididemnum solidum*, a briefing was compiled and presented to participants at a 6-hour workshop. With the help of volunteers, a total of 42 localities, examined for abundance of the ascidian using a transect method in 1978 (Bak *et al.*, 1981), were re-examined using the same method in 1993. Future plans include placing permanent quadrats in several localities and monitoring them every 6 months. All 42 localities will be revisited in the year 2006. Presently, only local volunteers participate in Reef Care programs. The programs were chosen and adjusted for the type of volunteers for which social involvement and contact with local scientists is very important.

INTRODUCTION

Logistical limitations while studying pre-zygotic isolation mechanisms in the polymorphic Caribbean reef building coral *Montastrea annularis* (Van Veghel, 1994) gave reason to use local sport divers to monitor the reef. A total of 75 divers successfully participated in the project, '1991 Coral Spawning Event,' during which spawning data were collected on different reef organisms (Van Veghel, 1993b, 1994). The success of this project in terms of producing useful scientific information and in the enthusiasm of the local divers resulted in the formation of the organization 'Reef Care Curaçao' in December 1992. Reef Care carries out research projects, *e.g.*, studies of coral spawning (Van Veghel, 1993b), the distribution and abundance of the encrusting ascidian *Trididemnum solidum* (Bak *et al.*, 1994), reef damage surveys following tropical storm Bret (Van Veghel & Hoetjes, 1995), and the monitoring of sea turtle nesting. Other projects, which do not need the guidance of marine biologists, are also carried out by Reef Care. These include the organization of underwater clean-ups, snorkeling courses for children, Reef Alarm Phone, public lectures and seminars (Van Veghel, 1993c). In this paper the methods (training, experimental design, data collection, data validation) and experiences of

working with local volunteers are discussed for Reef Care's two major research projects, i.e., (1) the coral spawning study and (2) the *Trididemnum* monitoring.

REEF CARE'S SCIENTIFIC PROGRAMS

CORAL SPAWNING MONITORING

Project type: Volunteer divers monitor the reef during potential coral-spawning periods, both diurnal and nocturnal, and make observations of spawning behavior of coral species. Observations are recorded on special forms or reported to the Reef Care Alarm Phone. Volunteer divers are recruited through the media, local papers and newsletters, radio interviews, flyers and the Reef Care Network. The program was started in 1991 and will now enter its fifth year. The program expanded throughout the Dutch Caribbean: Bonaire (1992), Saba (1993) and Aruba (1994). It is our intention to publish the collected data every 5 years.

Training: Each year participants are briefed in a two hour lecture. The lecture covers: 1) general reproductive biology of corals, 2) results of previous monitoring, 3) species likely to spawn and their spawning behavior, 4) the kind of data to be collected and 5) how to record spawning data. Slides are shown of species likely to be observed. For details on potential spawning cues see Van Veghel (1994).

Experimental design: In 1991, local divers were asked to swim a 260 m long trail along 284 numbered *Montastrea annularis* colonies at depths between 5 and 15 m (Van Veghel, 1993b). The reef on the location 'Slangenbaai' was monitored between about 6:00 p.m. and 1:00 am, 3 consecutive days in August and September (Van Veghel, 1993b; 1994). In 1992 and 1993 divers were asked to visit different localities and report sightings on species they observed spawning. In 1994, with a setup similar to 1991, a total of about 125 local divers participated.

Data validation: Volunteers were cross examined about the spawning observations they recorded to confirm that the observations were correct. Slides or film of spawning observations are sometimes made by the volunteers.

Institutional involvement: The project is led by the senior author, affiliated with the University of Amsterdam (Department Tropical Marine Biology); the CARMABI Institute and local dive operators provided logistical support.

TRIDIDEMNUM SOLIDUM DYNAMICS

Project type: In the *Trididemnum* project diving volunteers monitor the spatial and temporal dynamics of the encrusting compound ascidian *Trididemnum solidum*. This organism contains symbiotic algae, and can overgrow and kill living corals. On Curaçao reefs the potential threat from *Trididemnum* was recognized in 1978 when its distribution and abundance was studied at 42 localities on the leeward reefs (Bak *et al.*, 1981; Sybesma *et al.*, 1981; Van Duyl *et al.*, 1981). A comparative study was formulated on Curaçao (Van Veghel, 1993a) and Bonaire (Van Veghel & De Meyer, 1993) for the use of local volunteers, and carried out in 1992. In the second phase of the project permanent quadrats will be established at several representative localities and depths. These will be monitored every 6 months. Every 15 years all 42 localities will be revisited.

Training: Volunteers were trained during a half day workshop, which included a test dive. A manual was prepared (Van Veghel, 1993a; Van Veghel & De Meyer, 1993) and handed out with all the necessary information, and materials (100 m transect line; underwater slates, underwater key to the substrate, 2.5 m line and measurement tape) were provided.

Experimental design: Volunteers were asked to swim two 2.5-m width transects between 1.5 and 35 m deep (tidal range about 20 cm; see Van Veghel, 1994) and when a colony of *T. solidum* was observed to record depth, maximum colony length, number of clusters, substrate type (20 categories were listed), and transect length. Volunteers were given the following options for collecting data: 1) at their convenience, and/or 2) at a pre-set time and location during a more social event.

Data validation: The data were checked during control transects by biology students of the University of Amsterdam.

Institutional involvement: Students from the University of Amsterdam (Department of Tropical Marine Biology) carried out control transects and collected data at localities where the species was

highly abundant. The Netherlands Institute for Sea Research (NIOZ), the University of Amsterdam and the CARMABI Institute provided logistical support.

EXPERIENCES AND DISCUSSION

The success of scientific projects in which data are collected by volunteers largely depends on the type of the project, the guidance of the scientists involved and the social involvement of the volunteers. The experience with the projects described above gave us a good idea of the potential and limitations of using volunteers and non-professionals in marine science.

TYPE OF DATA

Data collection should be simple: the simplest data are the presence or absence of *e.g.* a reef organism (*Trididemnum solidum*) or a phenomenon (spawning). This requires no special training and can provide essential information. More detailed data collection, *e.g.*, number or % of species spawned and size and composition of *T. solidum*, requires extra training and data validation. This is about the level of the present Reef Care projects. Most participating volunteers have no problems working at this level. As an experiment we also asked the volunteers to describe the substrate type on which *T. solidum* was growing, listing 20 potential substrates. However, most volunteers were unable to do this with sufficient accuracy despite training during a workshop, the project manual and an underwater identification card. This part of the project was therefore carried out by trained students or collaborating scientists.

FIELDWORK CONDITIONS

When working with groups of volunteers dive safety should come first. Since the work is new and exciting for most participating volunteers (*e.g.*, coral spawning) there is a tendency to become more oblivious to maximum depth and dive time. The maximum depth of 35 m in the *Trididemnum solidum*-project should be considered as the absolute maximum depth, although other projects with volunteers go to greater depths (Kobluk, 1991). Since the abundance of *T. solidum* is low between 25 and 35 m, this was not a problem in most transects. It is our experience that social aspects are an important key to success. During the spawning events of 1991 and 1994 all divers came to one locality, yielding more participants and useful information compared with other years when they were asked to spread to different localities. Also, the presence of the scientific coordinator is essential, so that last-minute questions can be answered and new people can get a last minute briefing. This was especially useful during the *T. solidum* monitoring, so that new volunteers could get on-the-job training. In comparison, only 2 out of 42 localities were surveyed on the individual initiative involving 16 divers. During social events 6 to 12 divers attended and up to 3 localities per gathering could be surveyed. An important difference between the two projects described above is that in the Coral Spawning Project no limitations were necessary in relation to completion of the task and dive time. However, in the *T. solidum* project the transect had to be completed according to the methods used in an earlier survey. Problems arose when, at certain localities, the task could not be completed in one dive (sometimes >10 dives were required), because of the increase in abundance of the target species (Bak *et al.*, 1994). It is recommended when using volunteers that tasks are chosen so that they can be completed within 1 dive. Continuous monitoring of *T. solidum* dynamics will therefore involve 'small' permanent quadrats of which more than one can be assessed in one dive.

LOCAL VERSUS OVERSEAS VOLUNTEERS

In contrast to many programs, Reef Care Curaçao makes use of volunteers that are locally based (Wells, in prep). In Table 1, an overview is given of advantages and disadvantages of local volunteers versus 'overseas'-volunteers (volunteers joining programs away from their home country). The potential role for each group is different, and so projects should be adjusted for the type of volunteers involved. The Reef Care programs were carefully selected, so they can be carried out in the evening (Coral Spawning) or weekends as part of a social gathering (*T. solidum* project); and they involve long-term monitoring or follow-up on unpredictable events (*e.g.*, storm damage). These projects make an important

contribution to local awareness as a result of press releases, interviews, background articles and television coverage.

Table 1. Advantages and disadvantages of the use of local versus 'overseas' volunteers in reef assessment studies.

Description	Local	Overseas
<u>In favor of local volunteers</u>		
Logistic costs (transportation, housing, equipment)	low	high
Preparation time of involved scientist(s)	limited	high
Time-span fieldwork	long	short (2 - 4 wks)
Response to unpredicted opportunities	fast	slow
Knowledge of local situation	good	poor
Contribution to local awareness	excellent	limited
<u>In favor of overseas volunteers</u>		
Training	continuously	once
Availability of volunteers	mostly weekends/evenings	continuously
Possibilities for socializing	limited	good

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