



National Marine
Science Centre



A Review of Underwater Volunteer Groups in NSW

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*Report prepared for the Hunter-Central Rivers
Catchment Management Authority, August 2009*

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Cover photos: (all by Steve Dalton) left to right - marine debris collected on a GLUG training dive; shallow reef being surveyed by GLUG at Forster; GLUG members during a training dive, Forster.

Introduction	3
Methods	5
Results	7
Marine Volunteer Groups in NSW.....	7
Byron Underwater Research Group (BURG).....	7
Solitary Islands Underwater Research Group (SURG)	8
Port Macquarie Underwater Research Group (PURG).....	8
Great Lakes Underwater Research Group (GLUG).....	9
Charlestown Dive Social Club (CDSC)	9
Terrigal Underwater Group (TUG)	10
Underwater Research Group (URG) of NSW	10
Eco Divers.....	11
Nature Coast Marine Group (NCMG).....	11
Sapphire Coast Marine Discovery Centre (SCMDC).....	12
Sapphire Coast Marine Society (SCMS).....	13
Australian National University SCUBA Club (ANUSC).....	13
Harbourkeepers/Coastkeepers.....	13
Volunteer group capacity.....	15
Diving experience and member participation	15
Research interest and diver training priorities.....	18
Training programs and trainers utilised by voluntary groups.....	19
Voluntary research projects capable of answering management questions.....	20
Evaluating voluntary groups with different levels of research capacity (SURG and GLUG)	21
Discussion and recommendations	23
Spatial coverage of volunteer groups.....	23
Standardisation of methods and training	23
Quality Assurance and Quality Control (QA/QC).....	25
Suggested steps in future development of capacity.....	27
Acknowledgements	28
References	29
Appendices	30

Introduction

Voluntary organisations are an integral part of Australian life and, collectively, these groups make an extraordinary contribution to Australian society. It has been estimated that 34% of the Australian adult population is associated with voluntary organisations, contributing an average of 1.1 hours per person, per week (713 million hours per year) to a range of activities (Australian Bureau of Statistics 2006). Overall, people in the 34-44 years age group have the highest capacity for voluntary activity, with women's participation rates slightly higher than men's (Australian Bureau of Statistics 2006). The main types of voluntary organisations within Australia include: sport and recreational support; education and training; and community welfare and religious groups.

Community awareness, education and conservation of the marine environment have been a high priority for a number of organisations, including many volunteer groups, over the past 20-30 years. This has led to the establishment of several marine voluntary organisations along the New South Wales (NSW) coast. The main objectives of these groups include enhancing understanding of the local marine environment and increasing awareness and stewardship of this environment within the wider community. In 1953, the Underwater Research Group (URG) of NSW was established in Sydney and became incorporated during 1958. During the early years, this group was involved in research projects such as surveys of benthic assemblages, restocking and transplanting abalone, and a year-long biodiversity study of Port Hacking.

During the early to mid 1980s, awareness of marine conservation gained momentum and other volunteer groups began actively contributing to the knowledge of marine communities along the NSW coast. In the mid to late 1980s, the Solitary Islands Underwater Research Group (SURG) began documenting fish life and benthic assemblages on reefs adjacent to islands located within the Solitary Islands Marine Reserve. This organisation produced a number of technical reports and their research provided important information which assisted with the development of the zoning plans for Solitary Islands Marine Reserve (1991) and the Solitary Islands Marine Park (SIMP) (2002). Since then, additional volunteer groups have been established in various locations along the length of the NSW coastline. With the financial support from state and federal government agencies, these groups are undertaking a range of marine research and conservation activities.

In the past, there has been some reluctance to use data generated by voluntary groups for planning and management strategies as data quality has been questioned. Indeed, where studies of

accuracy of volunteer data have been conducted, a number of issues have been identified that necessitated careful data review (e.g. Smith and Edgar, 1999). Nevertheless, with the vast coastline of Australia and the relative lack of research investment, or projects with wide spatial coverage, the potential for volunteers to add to the collective body of information on marine systems is immense. By itself, engagement in marine knowledge and conservation activities can be individually rewarding, fulfilling personal and group desires for more constructive diving activities. However, with some standardisation of activities, methods and outputs, there is also strong potential for collection of valuable data, over large scales, to fill existing knowledge gaps and assist with sustainable management of coastal resources. The first step in this process is the need to address current activities, determine the existing capacity of volunteer groups and the utility of current data to address key management objectives, and recommend simple steps that can be taken to standardise data collection across groups.

The Hunter-Central Rivers Catchment Management Authority (HCRCMA), through recent engagement with volunteer groups, has realised that they may have the capacity to conduct research that complements the NSW marine habitat mapping program currently being undertaken by the NSW Department of Environment and Climate Change (DECC). This project represents the first stage in an attempt to facilitate collection of sound and relevant data that will augment the more formal research program. The aims of this project were to:

- Identify all NSW underwater volunteer groups currently undertaking, or with the capacity to undertake, marine research programs;
- Develop a database on marine volunteer groups, which details each group's experience levels and marine research activities to date;
- Catalogue the experience and capacity level of the volunteers;
- Identify training programs and trainers that have provided support for volunteer groups;
- Liaise with managing authorities to determine activities considered suitable for volunteer groups that would help to address specific management questions;
- Provide support and training to two volunteer dive groups with different capacity and experience and make recommendations regarding survey methods and survey design;
- Evaluate quality assurance and quality control measures used within the groups to standardise data collection; and
- Make recommendations for ongoing engagement with volunteer groups that will promote standardisation of data collection and their ability to provide robust and accurate data to inform specific management issues.

Methods

In order to quantify the capacity of marine volunteer groups and to determine the skill and participation levels of the membership, two questionnaires were developed. Careful consideration was given to the questions in order to maximise their relevance to the objectives of the project and to provide data that were, at least, semi-quantitative. The latter was of particular importance as such an approach facilitates numerical summaries of capacity and experience. These initial data can also, potentially, be used as a baseline measure against which activities to improve capacity can be evaluated (i.e. training programs, field experience).

The group questionnaire (Questionnaire 1 - Appendix 1) was either: i) handed to the committee of an established volunteer group; ii) given to the co-ordinator of any non-incorporated group; or iii) sent via email to targeted members who had the required knowledge to comment on past and present research activities of the group. A member questionnaire (Questionnaire 2 - Appendix 2) was also developed, which was either handed-out to participants during scheduled meetings or social events, or sent electronically to members via the group's contact person. Specific questions regarding the members' diving experience, group activity and level of research experience were included. Additionally, individuals were questioned regarding their interest in marine research and what type of training would improve their ability to successfully meet their aspirations.

Maximising participation rates in questionnaire-based studies is notoriously difficult and so, in this case, questionnaires were developed that minimised effort by the participants. Thus, the electronic version enabled group members to simply check appropriate boxes or type a limited amount of text into text boxes within the document. Submission of the completed form was then simply a matter of a return email. The electronic version of the questionnaire was developed with data storage in mind, and completed questionnaires were uploaded into a specifically designed database (see Appendix 3 for database example). This not only streamlined data acquisition but reduced the scope for transcription errors (i.e. from hard copies to the database).

Profiles of each group's capacity to develop and implement marine research were summarised from the information provided in Questionnaire 1. Data gathered from group members using Questionnaire 2 were summarised to determine the overall capacity of the groups and to identify areas where further training and development may be required to successfully implement sound and robust research programs.

During the initial contact process of this program, two groups, SURG and the newly established Great Lakes Underwater Group (GLUG), were identified as having different levels of research capacity, and a training program was developed for both groups. A key factor in selecting these groups was their recent, successful application for research funding to conduct targeted research programs in their respective regions. There was a clear need for training to service these programs to ensure that the objectives could be optimally addressed and that data collected could be more widely applied outside the nominated sampling sites (e.g. through standardisation of sampling methods). The programs consisted of two theory presentations, and two field trials focusing on assessment of fish communities and marine debris on reefs. Each group was presented with background information on the design and methods of standardised debris surveys being used extensively along the northern NSW coast (Smith *et al.* 2008). Additionally, groups participated in an introductory training program in fish identification.

SURG undertook the Coastkeepers (National Parks Association [NPA]), PADI Project Aware fish identification course, which consisted of a two-hour presentation on identifying 50 targeted fish species, followed by two training dives. *In situ* debris training was also provided to SURG by Associate Professor Steve Smith, and follow up training dives were evaluated by Steve Dalton. GLUG organised Associate Professor Bill Gladstone from the University of Newcastle to provide training in: i) fish survey techniques; and ii) identification of common fish and mobile macro-invertebrates found throughout the Forster regions. Steve Dalton also provided an overview of the method for assessing marine debris. A survey design was developed that enabled fish, macro-invertebrates and debris surveys to be completed simultaneously. This design was trialled at two locations adjacent to Forster Main Beach. Follow-up evaluation dives, which incorporated quality assurance and quality control, were conducted with both volunteer groups enabling the methods and techniques to be reviewed.

Results

Marine Volunteer Groups in NSW

Fourteen marine volunteer groups, with varying capacity to undertake marine research, were identified. These groups have a range of skills and capacity to undertake specifically-designed marine research and, with further training and support could provide the foundation for a state-wide monitoring program that would complement the NSW DECC marine habitat mapping program. Below is a summary of the group profiles, provided through direct communication with members, completion of the group questionnaire and additional information accessed via the respective group's internet site.

Byron Underwater Research Group (BURG)

Byron Underwater Research Group was established in 2006 with support from Coastcare, Cape Byron Marine Park and local dive operators. The main objectives of BURG are to enable the wider community to become involved in marine research projects that have a conservation focus and foster greater awareness of the marine environment through practical and educational projects. BURG provides the framework to enable the wider community to participate in marine focused research under the guidance of specialized marine researchers. BURG members, which include researchers and academic staff from Southern Cross University (SCU), provide guidance and support in survey techniques and design, which enables the collection of quality research data that answers conservation questions.

BURG has been successful in securing funding for three research/education-based projects (Table 1). Additionally, funding has been provided to enable the purchase of underwater equipment and member training, and to develop educational material. BURG's current project aims to improve reef health and resilience in the Cape Byron Marine Park (CBMP) by removing marine debris and promoting low impact diving techniques. Additionally, the project aims to increase community skills, knowledge and engagement in marine conservation by involving group members and the community in clean-up days and marine surveys, which will foster stewardship of the marine environment.

Julian Rocks, located three kilometres from Byron Bay, is a popular dive site and attracts over 35,000 recreational divers annually (NSW Marine Parks Authority 2003). As a result of this high visitation, marine communities associated with the iconic dive site are potentially threatened by diver-related activities. Improving the skill level of divers will minimise the number of threatening

interactions at this location. BURG members have developed a series of swimming techniques that aid in maintaining adequate buoyancy and control to minimise diver disturbance. Currently, members and dive leaders are being trained in these techniques, and further development of educational material will be made available to local dive shops and visiting divers.

Solitary Islands Underwater Research Group (SURG)

Solitary Islands Underwater Research Group was established in 1985 by a group of enthusiastic underwater naturalists, videographers, photographers and SCUBA divers who had a unified interest in understanding and protecting the marine environment found along the mid-north coast of NSW. Since its inception, the membership of SURG has included trained marine scientists, especially staff and students from the University of New England (UNE), who have helped develop training and monitoring methods, facilitating successful outcomes of grant applications.

Over the past 20 years, SURG members have been involved in many research projects that have provided management authorities with important information regarding the ecological significance of reef habitat types found adjacent to the Solitary Islands (Table 1). With financial support from NSW Fisheries, Coastcare and Envirofund, SURG have been involved in eight projects that have had direct management outcomes, including: providing quantitative data on habitat types found within the SIMP; monitoring threatening processes such as coral bleaching and coral disease; production of educational material such as small identification booklets, subsequent SIMP photographic inventory CD and online database; and, currently they are involved in marine debris, fish and threatened species surveys throughout the SIMP.

SURG has been successful in gaining funding for seven projects totalling \$116,800, resulting in several technical reports (Smith and Edgar 1999; Edgar *et al.* 2003 and Edgar and Malcolm in prep). Data collected during these studies were also instrumental in the development of zoning plans for the SIMP. Current projects include: i) quantitative assessments of benthic marine debris and the role of boating moorings in patterns of debris distribution; and ii) surveys of fish assemblages on island-associated reefs, with special focus on documenting threatened species.

Port Macquarie Underwater Research Group (PURG)

Port Macquarie Underwater Research Group, comprising 30 members, was established in February 2007. Following a successful Envirofund grant application, PURG have been compiling a photographic inventory of marine organisms and mapping marine habitats in the Port Macquarie area. The group has collected over 100 photographs of marine fauna and flora and

produced a marine education CD, and are currently in the process of linking this database to their web site. PURG are involved in local education programs and have been actively promoting marine conservation issues via a series of marine discovery seminars. They hope to establish links with local schools and marine educators to further increase awareness of the significance of Port Macquarie's marine biodiversity. PURG members have also participated in Clean-Up Australia Day dives where they have collected marine debris from estuaries and nearshore reefs.

Recently, several members travelled to Port Stephens to take part in Reef Life Survey (RLS) training facilitated by researchers from the University of Tasmania. The successful completion of this course, which includes five days of intensive theoretical and practical training, will enable the group to quantify the distribution and abundance of fish assemblages on nearshore and offshore reefs adjacent to Port Macquarie using standardised methods.

Great Lakes Underwater Research Group (GLUG)

Great Lakes Underwater Research Group includes up to 65 community members with varying levels of marine research experience, from graduate students with research qualifications to novice divers with limited diving experience. Successful funding applications through the HCRCMA in late 2007, and a recent Caring For Our Country grant, has increased the group's capacity to engage in marine research and education programs. The Caring For Our Country grant will enable the group, in consultation with NSW Marine Park managers and university researchers, to monitor marine habitats in the Port Stephens-Great Lakes Marine Park. Research strategies have been discussed with leading authorities in marine fish and debris surveys and GLUG members are presently trialling these procedures as well as improving their scientific research knowledge and diving skills. Additionally, outcomes from organised dive trips will provide education material such as species inventories. These will complement the current educational program, delivered by guest speakers, through the Great Lakes Marine Discovery Series.

Charlestown Dive Social Club (CDSC)

Charlestown Dive Social Club is based in Newcastle and members of this club promote safe and responsible diving and marine environmental awareness. CDSC members have participated in Clean-Up Australia Day dives, particularly concentrating on areas within the Port Stephens-Great Lakes Marine Park. Following the completion of the Coastkeepers fish survey course conducted through the Charlestown Dive Academy in October 2007, members of CDSC have been actively contributing to the collection of data from reefs within the Port Stephens-Great Lakes Marine Park and from locations along the Newcastle coast. During an information night organised by

Margo Smith (Lake Macquarie City Council), further interest was demonstrated in actively participating in marine conservation programs such as debris surveys. Members of CDSC are currently investigating the potential to establish greater capacity in marine research by determining the level of interest in the wider community, including from other local dive shops, universities and government agencies such as Port Stephens-Great Lakes Marine Park.

Terrigal Underwater Group (TUG)

Terrigal Underwater Group Inc. is a social, non-profit organisation whose 60 members foster goodwill of all SCUBA-diving interests. Recently, TUG was successful in gaining an Envirofund grant to monitor changes in marine communities following the scuttling of the ex-HMAS Adelaide near Terrigal. As part of this program, TUG members recently completed training in fish identification and survey methods with Associate Professor Bill Gladstone from the University of Newcastle. Several members have also successfully completed the PADI Aware Fish Identification Course co-ordinated by Coastkeepers NSW.

Underwater Research Group (URG) of NSW

The Underwater Research Group of NSW was established in 1953, became incorporated in 1959, and was the first marine volunteer group to conduct marine research in NSW. The membership has previously consisted of marine educators, researchers and wildlife photographers, including the extensively published marine author Neville Coleman, photographer/artist Steve Parish and Dr. Carl Edmonds, an underwater medical practitioner and author on subaquatic medicine. URG has been involved in many marine activities including: monitoring of the marine benthos; biodiversity studies; abalone and seahorse research; and studies on introduced marine pests (Table 1).

As part of the North Harbour Aquatic Reserve Biodiversity Study, URG applied for funding through the Commonwealth government's Envirofund program to determine the distribution and abundance of the introduced marine pest *Caulerpa taxifolia* within the North Harbour Aquatic Reserve and adjacent areas. Between January 2003 and February 2004, 20 URG members completed dives at 21 sites within North and Middle Harbour, Sydney. These surveys resulted in the identification of eight sites where *C. taxifolia* was present. Recent surveys conducted between December 2007 and March 2008 indicated that *C. taxifolia* distribution and abundance had increased from the 2003-2004 surveys. Presently, with support provided by Coastkeepers NSW, marine pest surveys are ongoing throughout Sydney Harbour.

URG members have also assisted in many university marine studies and made a significant contribution to determining the presence of Aboriginal archaeological sites that were submerged more than 8,000 years ago. With the assistance of researchers from the Australasian Institute of Maritime Archaeology and Archaeological and Heritage Management Solutions Pty. Ltd., the group located and mapped two submerged rock overhangs or caves that may have accommodated people in the past. Surveys along the south-west arm of Port Hacking have identified additional sites that may have accommodated Aboriginal communities when seawater levels were lower.

URG regularly participates in Clean-Up Australia Day dives and has been working with the Australian Marine Conservation Society, Sydney Aquatic Cleaners Klub (SACK) and NSW Maritime to remove rubbish from Sydney beaches, rocky reefs and wharves.

Eco Divers

Eco Divers is based in Warringah, Sydney, is a marine conservation organisation that was incorporated in June 2007. Currently, up to 40 community members contribute to a suite of marine monitoring and educational projects around the northern beaches and reefs of Sydney Harbour. Eco Divers previously assisted the NSW DECC and Manly Council in mapping marine habitats within the recently declared Cabbage Tree Bay Nature Reserve. This reserve contains many fragile marine habitats, including seagrass meadows, which provide refuge for many syngnathid species including seahorses and pipefish.

Members of Eco Divers regularly participate in Clean-Up Australia Day and have been actively removing debris from the northern beaches of Sydney for more than five years. During 2009-2010, Eco Divers will participate in a Coastcare-funded project entitled "Save our Bottoms" which will map and monitor marine habitats along the northern beaches. The program will also provide educational tools to raise awareness of threats to the marine environment.

Nature Coast Marine Group (NCMG)

Following a series of public presentations on the conservation value of grey nurse sharks (organised by Coastcare officers), members of Eurobodalla Shire were stimulated to establish a marine conservation group. As a result, NCMG was incorporated in December 2005. Since then, NCMG has rapidly grown and currently has a membership that exceeds 200 volunteers. The main objectives of the group are to promote the protection and understanding of coastal, estuarine and marine environments in the Eurobodalla Shire by promoting and undertaking research within the recently established Batemans Bay Marine Park (BBMP). Many members are

active snorkelers and divers; this small sub-group has been working with Marine Park Research Officers in the development of survey methods to monitor the spatial and temporal patterns of marine assemblages and determine the optimum zoning plan for BBMP.

NCMG recently received funding through Caring For Our Country, which will enable the group to collect data on fish, macro-invertebrate and algal assemblage within the BBMP. Dr. Melinda Coleman, the BBMP Research Officer, has designed a monitoring program which will build the capacity of participants to collect reliable data from shallow subtidal environments. The aim of the project is to monitor changes in marine assemblages through time in order to understand the relationship between Marine Park zones and the dynamics of subtidal assemblage.

Members are also involved in Coastkeepers fish surveys and threatened species surveys and have been opportunistically collecting data on the distribution of many rare and threatened marine species including the weedy sea-dragon, black cod and the grey nurse shark. Additionally, NCMG actively participate in the removal of pest species, such as the pacific oyster, from estuarine habitats. Data collected from these projects will provide resources for educational material that will demonstrate the conservation significance of the Eurabodalla marine environment to the wider community.

Sapphire Coast Marine Discovery Centre (SCMDC)

Sapphire Coast Marine Discovery Centre is a not-for-profit community group that was established in 2000. The aim of the group is to facilitate and encourage the local community to learn more about the local marine environment. In so doing, SCMDC has been successful in attracting funding through many private and government agencies, to encourage the local community to participate in research and education programs (Table 1). Funding through Envirofund and Coastcare has enabled the establishment of a long-term monitoring and management program for the introduced European crab (*Carcinus maenus*) in the Eden Twofold Bay region. Additionally, volunteers have participated in surveys of marine species at a number of important sites along the Sapphire Coast. These include the Blue Pools at Bermagui, Edrom Lodge, Eden (a well known weedy sea-dragon breeding site) and Wallagoot Lake, which lies within Bournda National Park.

The recently established marine discovery centre at Snug Cove, Eden, provides the opportunity to enhance marine research, education and entertainment activities in the region. The SCMDC vision is to use the facility to foster volunteer involvement in marine research through both government-funded programs, and in university research. Current voluntary projects include

increasing public awareness of marine macroalgae, and the potential threats to marine communities associated with climate change. This program, funded through Caring For Our Country, includes a series of seminars and field trips conducted by Dr. Allan Millar (Royal Botanical Gardens Sydney). Other activities currently underway include the development of educational material for primary and secondary school groups as well as the general public.

Sapphire Coast Marine Society (SCMS)

The Sapphire Coast Marine Society comprises a group of dedicated marine conservationists who collectively aim to promote awareness and conservation of marine communities through education and research. The group actively participates in field excursions that target rocky shores and shallow marine environments, including estuaries, where they conduct educational activities such as instruction in marine species identification. SCMS has links with SCMD; the groups hold joint field activities with marine educators to assist in the identification of marine organisms found during field excursions. SCMS activities are generally limited to intertidal areas but they do support other research activities that are conducted along the Sapphire Coast.

Australian National University SCUBA Club (ANUSC)

Several members of the Australian National University SCUBA Club are actively involved in surveys of marine fish, regularly completing research dives at Jervis Bay. Their membership has an interest in Coastkeepers and Reef Life Surveys as well as in developing other voluntary projects in Jervis Bay. This interest can be further developed by consultation with the Jervis Bay Marine Park Research Officer, Dr. Nathan Knott, who indicated that specific management questions could be addressed utilising well-planned and co-ordinated volunteer research projects.

Harbourkeepers/Coastkeepers

Harbourkeepers and Coastkeepers were created by the Marine sector of the National Parks Association (NPA). NPA-Marine aims to improve community understanding and encourage active participation in a range of marine conservation issues. Additionally, NPA-Marine liaises with local communities, industries, scientists and government agencies to campaign for the establishment of marine sanctuaries. Previously, NPA-Marine developed a number of educational and volunteer programs to enable members to become involved in marine conservation activities. Many volunteers from groups identified above have undertaken the Coastkeepers fish survey training and are actively participating in subsequent surveys throughout NSW. Volunteers from Coffs Harbour to Narooma are currently providing NPA-Marine with quantitative data on 50 nominated fish species from sites across the five NSW marine bioregions. Data from these groups are sent to the Department of Primary Industries (DPI) and downloaded onto the NSW

government BioNet website, where it is accessible to the public. Harbourkeepers/Coastkeepers are involved in a range of other activities including: monitoring invasive marine pests (*Caulerpa taxifolia*); assisting in cleanup events; and contributing to the protection of threatened marine species such as the grey nurse shark.

Table 1: Summary of voluntary organisation funded programs which meet specific management objectives or have had an educational focus.

Voluntary group	Project title	Funding body	Project dates	Amount	Management objectives *
BURG	Reef clean & fish ID education Cape Byron Marine	Envirofund	2007-08	\$22,488	E, BIO, TP, TS
	Small equipment grant Video + U/W housing	Dept. of fam./comm.	2006	\$3,206	
	Restoration, education and protection Cape Byron Marine Park sub-tidal reefs	Coastcare	2009-10	\$32,863	E, BIO, TP, TS
SURG	Assessment of the benthos with the SIMP	Australian Nature Conservancy Agency	1996-99	\$12,000	HM, BIO, NP
	Photographic inventory	Coastcare	1999		BIO, E
	Coral bleaching in the SIMP	Coastcare	2000-02	\$23,200	TP
	Threatening process to SIMP biodiversity	Envirofund	2003-06	\$14,800	TP
	Assessment of processes affecting SIMP reef habitats	Envirofund	2006-08	\$24,800	TP, NP
	Fish surveys in the SIMP Marine debris and threatened spp.	Coastcare Coastcare	2009 2009	\$18,140 \$16,200	BIO TS, TS, SI
PURG	Marine biodiversity monitoring and community education project	Coastcare	2007-09	\$19,360	BIO, E
GLUG	Marine species inventory and data collation	HCR-CMA	2008-09	\$15,000	E
	Marine monitoring and community education in the Great Lakes area	Coastcare	2009-10	\$38,050	BIO, TS, TP, E
TUG	Fish identification and habitat surveys on the NSW central coast	Envirofund	2008-10	\$16,400	BIO, TS, E, SI
Eco Divers	Save your bottom	Coastcare (corporate)	2009	\$9,500	HM, BIO, NP, SI, E
URG	Biodiversity baseline survey in the North Harbour Aquatic Reserve	Envirofund	2003-04	\$11,214	BIO, TS, TP, HU, TP, E
NCMC	Trans-generational and educational approach to ensure long-term marine biodiversity conservation	Coastcare	2009-10	\$8,150	BIO, TS, SI, E
SCMDC	Review of the state of knowledge of the Sapphire Coast marine environment	Envirofund	2005	2006	\$27,000
	Construction of an education trailer and part-time marine educator	Envirofund	2007	2008	\$70,350
	Volunteer green shore crab eradication program	SR-CMA	2007	2008	
	Snorkel leaders course	SR-CMA	2007		
	Marine habitat banners for discovery centre	NSW-NPWS	2008		\$5,000
	Develop high school education material	Coastcare	2008	2009	\$48,500
	Seaweed Identification workshop	Coastcare	2008		\$7,700
	Purchase of aquarium equipment	Mumbulla Foundation	2008		\$3,700
Continuation and extension of the volunteer green shore crab project	George Alexander Foundation	2008	2009	\$19,100	

* Management objectives: (BIO) Biodiversity; (E) Educational; (HM) Habitat Mapping; (HU) Human Usage; (NP) Natural Processes; (ME) Marine Park Compliance; (SI) Specific Impacts; (TP) Threatening Processes; and (TS) Threatened Species

Volunteer group capacity

Diving experience and member participation

A total of 162 members from 11 voluntary groups completed and submitted member questionnaires, with a participation rate $\geq 50\%$ from eight voluntary groups. Data extracted from the volunteer database were quantitatively evaluated by applying a weighted scoring system to the diver-related, categorical variables (Questions 2-6 in the member questionnaire; Appendix 2). For example, diver qualification levels were given a number from 1 for an open water diver to 8 for a diver with commercial accreditation. The categories for “number of dives completed” and “years of diving” were weighted similarly. Each group member’s diving experience was then determined as the sum of all values from the diving experience questions. Data from each voluntary group are summarised in Figure 1. Similarly, each member’s capacity as a volunteer was determined quantitatively by applying similar weighted values to relevant questions in the member questionnaire (i.e. related to member participation in volunteer group activities - Questions 8-13 in the member questionnaire). Results from this evaluation are displayed in Figure 2, below.

Up to 50% of members in most voluntary groups have extensive diving experience, generally with qualifications of divemaster or higher. Many of these individuals have been diving for more than 10 years and have completed over 300 dives. Overall, experience levels in CDSC and PURG tended to be lower than for the other groups, with diving experience limited to < 5 years and approximately 100 dives for many group members. Diving experience within SURG ranged from limited to extensive, which may be explained by the recent (early 2009) recruitment drive for new members (Fig. 1). This pattern is also evident for the level of member participation within SURG (Fig. 2). Thus, membership participation is skewed to the left of Fig. 2 because 25 members have been with the group for less than one year.

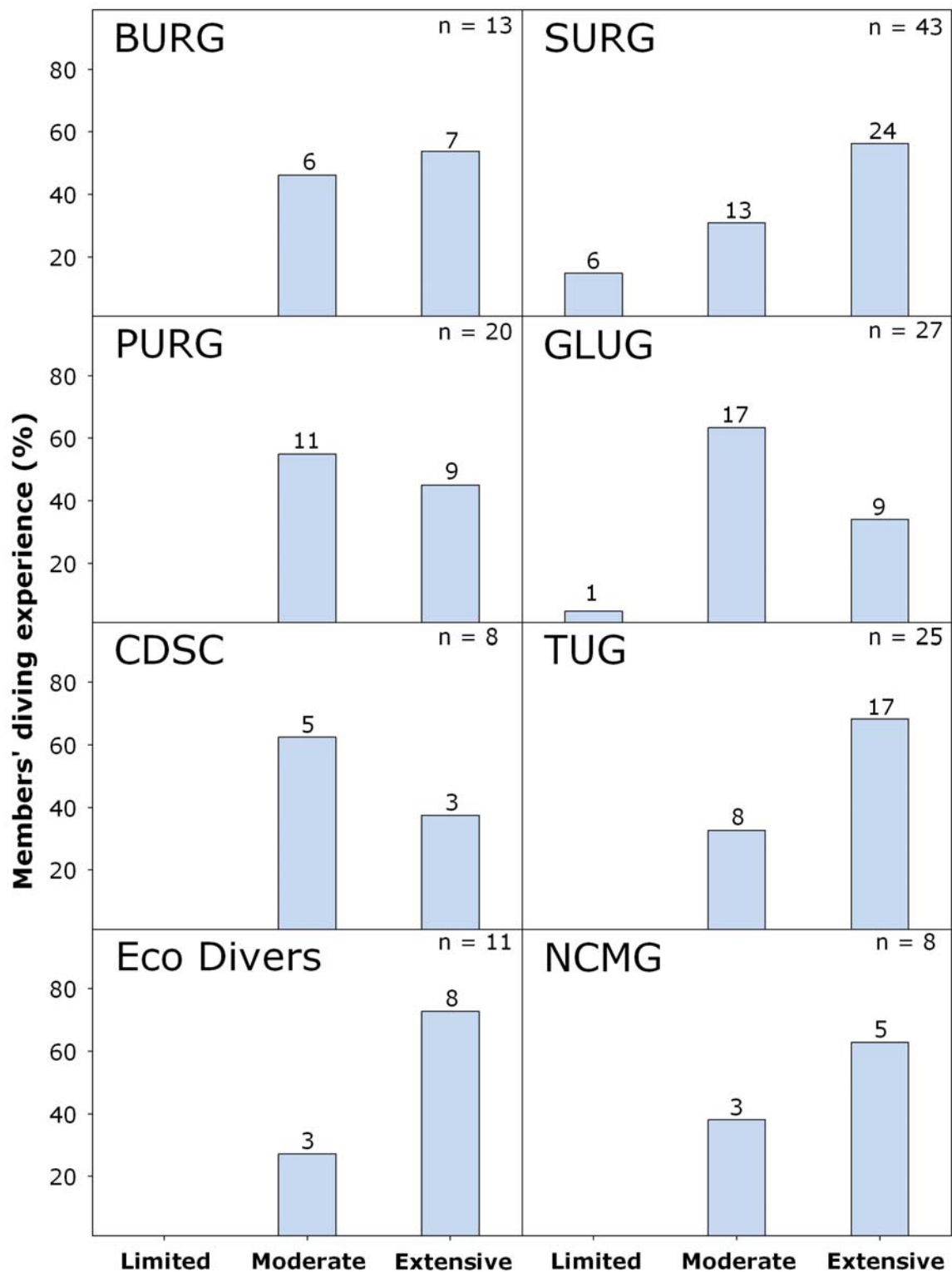


Figure 1: Summary of diving experience for each volunteer group. Values were determined by weighting categorical variables answered within each completed member questionnaire (Appendix 2). Example of diving experience: Limited – an open water diver with < 10 dives; Moderate – advanced/rescue diver with > 50 dives; and Extensive – an active diver with (generally) a minimum of divemaster certification and > 100 dives.

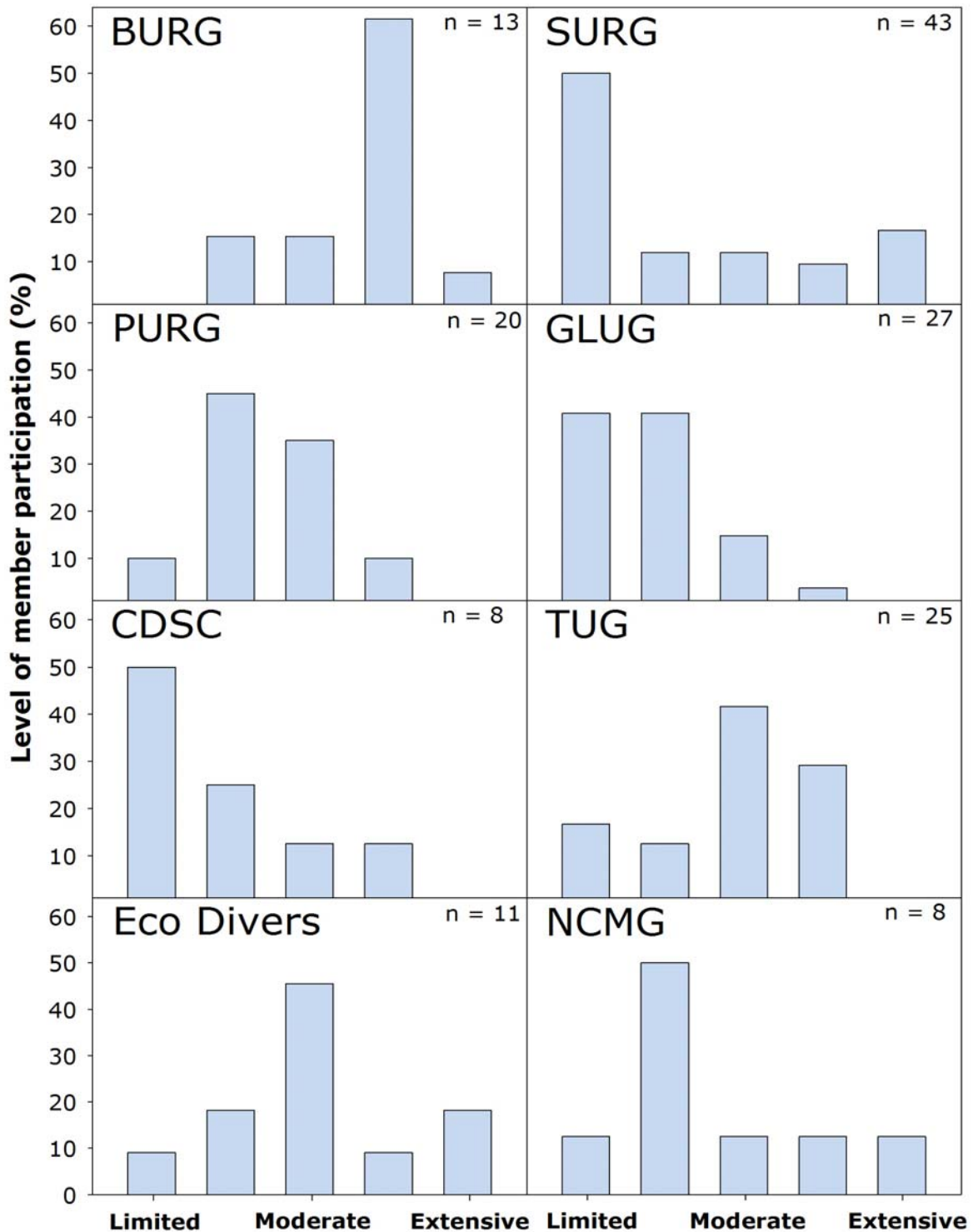


Figure 2: Summary of group participation by members. Values were determined by weighting categorical variables answered within each member questionnaire (Appendix 2). Example of participation: Limited - a new member with minimal participation in group activities; Moderate – membership > 2 years and regular participation in field and group activities; and, Extensive - membership > 3 years, participation in > 20 field activities and/or participation in numerous non-diving-related group activities.

Member participation rates for BURG ranged between moderate to extensive (Fig. 2) whereas levels were not as high within the newly established groups such as PURG, GLUG and CDSC. Group activities within CDSC were limited to those completed as part of the Coastkeepers surveys and Reef Life Surveys as this group has not, as yet, been successful in attracting funding to enable the establishment of their own research programs. Members of Eco Divers have been actively participating in habitat surveys and regularly complete clean-up dives around Mosman and Manly beaches; this is reflected by the moderate to extensive participation level (Fig. 2). Members of TUG have extensive diving experience (Fig. 1) and have a moderate to high group participation rate (Fig. 2), which is generally attributable to social activities rather than research-associated events.

Research interest and diver training priorities

From the returned member questionnaires, 87% and 78% of respondents indicated that fish and threatened species surveys were a high priority, respectively (Table 2a); however, this was not consistent across all groups surveyed. For example, members of BURG and GLUG were more interested in human impacts (85% and 89%, respectively) than threatened species (77% and 81%, respectively).

Table 2: Summary of research interests and training priorities to increase the research capacity of marine voluntary groups. The 2 highest priorities are shown in bold font.

a) Percentage research interest									
	Overall	BURG	SURG	PURG	GLUG	CDSC	TUG	Eco Divers	NCMG
Habitat mapping	67	69	77	60	78	38	40	55	75
Human impacts	70	85	74	60	89	63	40	73	38
Fish surveys	87	92	84	70	93	88	76	91	88
Benthic surveys	65	69	70	40	70	63	36	64	75
Threatened spp.	78	77	84	85	81	50	40	91	75
b) Percentage of training priorities									
	Overall	BURG	SURG	PURG	GLUG	CDSC	TUG	Eco Divers	NCMG
Diving training	40	77	37	50	37	13	24	36	36
Benthic Id	66	77	60	65	81	63	40	64	64
Fish Id	72	77	72	75	93	75	48	55	55
Research methods	74	69	77	75	70	50	60	73	73
Data entry	28	46	30	20	41	25	8	18	18

Training in research methods and fish identification was identified as the highest priority for improving the overall capacity of volunteer groups (Table 2b). Again, this was not consistent within all groups and members from BURG indicated an interest in training in dive skills (diver training) and benthic identification. The latter was also identified as high priority by members of Eco Divers and GLUG.

Training programs and trainers utilised by voluntary groups

Most of the voluntary groups indicated that they have actively participated in some form of training to improve the overall research capacity of the membership. The main topics covered, utilising both internal and external trainers, included fish identification, photography and, to a limited extent, research methodologies. In their first funded project mapping and quantifying benthic communities within the (then) Solitary Islands Marine Reserve (Table 1), SURG developed a robust training program that involved a slide library of each of the benthic categories to be documented. Interactive training occurred both in the class room and *in situ*. To maximise data quality, *in situ* training involved volunteers completing line transects that were also recorded using video. This provided feedback and remedied identification errors. Nevertheless, errors still occurred in subsequent field work; this was assessed in the report that resulted from the project (Smith and Edgar, 1999).

Many group members have participated in the Coastkeepers training program with some also completing training for Reef Life Surveys. The PADI, two-day fish identification course, which covers 50 specific (mostly temperate) species, has been used by some other groups to provide members with skills for surveys of fish assemblages (including threatened species). SURG also provides additional internal training in the identification of threatened and protected species as this topic is the focus one of their current, externally funded projects. Zan Hammerton, a PADI instructor, delivers instruction on a different suite of fish species to members of BURG. This modified list includes tropical and subtropical species that are found throughout northern NSW. Coastkeeper trainers, including David Roe from Coastkeepers and Mike Davey from Jetty Dive Coffs Harbour, have provided training to members of SURG, CDSC, TUG, NCMG, ANUSC and URG. Members from CDSC, GLUG and TUG have previously undertaken fish survey training with Professor Bill Gladstone from the University of Newcastle. The learning objectives of this training are to: provide participants with the knowledge to identify approximately 20 fish species; introduce and practise survey methodologies for collecting quantitative fish data; and provide additional information on other methods including macro-invertebrates and debris survey techniques.

The Reef Life Surveys project is funded by the Australian Government's Commonwealth Environment Research Facilities (CERF) program. The project aims to provide marine managers with biodiversity data that is collected by highly skilled and enthusiastic volunteer members throughout Australia. The use of volunteers enables data to be collected at larger spatial and temporal scales than is possible by using research professionals. The Reef Life Survey program provides the technical, financial and logistic support to a growing network of skilled volunteer

divers, who complete standardised survey methods to generate quantitative data on marine communities. During a five-day period, volunteers are trained in fish, macro-invertebrate and benthic monitoring methods which includes at least eight *in situ* training dives to produce data that are consistent and comparable to data collected by research scientists. Many enthusiastic NSW volunteer group members have undertaken the Reef Life Survey course and are actively monitoring local reefs along with reefs throughout Australia and overseas. However, this program appears to be limited to members with a high capacity to conduct marine research and may not be appropriate for the majority of volunteers.

Nature Coast Marine Group members are actively involved in a research project that will determine the effectiveness of management strategies used in the implementation of the BBMP. They are monitoring the spatial and temporal changes in marine biodiversity via snorkelling surveys. Dr. Melinda Coleman, a research officer from BBMPA, has been working closely with members of NCMG to ensure a high level of knowledge and experience, which will enable the collection of useful data from snorkelling surveys conducted along shallow reefs within the park. Batemans Bay Marine Park officers believe that, with appropriate training and support, NCMG members will provide sound, robust data that will meet the requirements of the strategic plan for the marine park (NSW Marine Parks Authority 2008). This model may provide a template for other collaborative programs between marine voluntary groups and marine parks throughout NSW.

Voluntary research projects capable of answering management questions

Managers and Research Officers from the MPA, DECC and DPI were interviewed to determine whether data collected by voluntary organisations could answer specific management questions. Initially some officers were concerned with the accuracy and robustness of data collected by voluntary groups. However, most research officers indicated that volunteer groups could provide important information to marine managers if specific projects were designed in consultation with managers and professional scientists. A list of potential projects was compiled from these discussions (Table 3). However, it was also emphasised that adequate training, quality assurance and quality control procedures are necessary if volunteer marine groups are to provide managers with reliable data to inform management decisions. All MPA research officers that were contacted strongly endorsed volunteer-based regarding debris surveys as part of the evaluation of the effectiveness of marine park zoning plans.

Table 3. Overview of voluntary marine projects that have been proposed to meet management outcomes. BURG-Bryon Bay Underwater Research Group, SURG-Solitary Islands Underwater Research Group, PURG-Port Macquarie Underwater Research Group, GLUG-Great Lakes Underwater Group, CDSC-Charlestown Dive Social Group, NCMG-Nature Coast Marine Group, URG-Underwater Research Group Dive Club. Refer to Table 1 for management outcome descriptions.

Proposed research project	Current group participation	Proposed by	Management outcomes
Marine species inventory	BURG, SURG, PURG, GLUG, SCMDC	Dave Harasti & Nathan Knott (DECC)	BIO, E, NP
Fish inventory and abundance surveys	BURG, SURG, PURG, GLUG, CDSC	Bill Gladstone (UNC) and group members	BIO, SI
Marine debris surveys	GLUG, SURG, CDSC, PURG, BURG	Steve Smith (UNE), Dave Harasti	HU, SI, MC
Threatened species surveys	SURG, PURG, GLUG	Alan Jordan & Dave Harasti (DECC)	TS
Benthic community composition	BURG, Previously SURG		HM, BIO, TS, NP, SI
Macro-invertebrate surveys	GLUG, NCMG, SURG, CDSC	Dave Harasti	BIO, TS, NP
Video tape transects of remote habitats identified by the habitat monitoring program	GLUG	Alan Jordan	HM, BIO,
Monitoring shallow subtidal marine assemblages (snorkel based surveys)	NCMG	Melinda Coleman & Alan Jordan (DECC)	BIO, SI,
Assisting in the collection and deployment of Acoustic listening station	Acoustic loggers are located all the way along the east coast.	Alan Jordon	NP, SI
Monitoring pest species	URG, Eco Divers, Coastkeepers, SCMDC	Nathan Knott	TP, SI
Monitoring introduced algal species (<i>Caulepra taxifolia</i>)	URG 2003-04, 2007-08	Bob Creese (DPI)	TP, SI

Evaluating voluntary groups with different levels of research capacity (SURG and GLUG)

The debris and fish survey studies being conducted by SURG use research designs and methods developed in conjunction with professional researchers from the National Marine Science Centre (NSMC; Associate Professor Steve Smith and Steve Dalton). Similarly, research methods being used by GLUG for fish surveys were developed in conjunction with Associate Professor Bill Gladstone; debris surveys follow the design being used by SURG that is currently widely applied throughout northern NSW for long-term monitoring of reef health (Smith *et al.* 2006, 2008). Theory sessions and two practical training days were conducted with both groups, with additional evaluation dives completed to determine the accuracy of data collection and any problems with the logistics of field work (1 with GLUG, 2 with SURG).

For SURG, the survey design and sampling methods were initially developed in conjunction with appropriate office bearers (Bob Edgar and Ian Shaw). A theory session was then conducted at the NMSC where over 40 SURG members were in attendance. The members were introduced to the aims of the fish and debris survey, survey design and methods, and specific details were presented and discussed. Debris categories were described to the group and refined during subsequent discussion to make them relevant to offshore, reefal sites rather than nearshore sites from which the list was compiled (e.g. “shopping trolley” was removed). This training session was repeated at a subsequent SURG meeting. As part of the funded project to evaluate fish assemblages in the SIMP, 25 SURG members also undertook the Coastkeepers training, which was presented by David Roe.

Over the next four weeks, SURG members conducted fish and debris training dives, which were evaluated by Mike Davey and SURG dive co-ordinator Bob Edgar (fish surveys), and Steve Smith and Steve Dalton (fish and debris surveys). Survey teams consisted of one experienced and one relatively inexperienced diver and, following each training dive, a debriefing was conducted to further improve the performance of the participants. Evaluating SURG’s capacity to accurately conduct fish and debris surveys over the past several months indicated that, with adequate supervision and training, members are able to consistently capture reliable data when inexperienced divers are paired with experienced divers. However, observations during training dives indicated that many divers failed to maintain adequate buoyancy control and body position and regularly came into contact with the benthos. This was probably due to the additional activities being undertaken during fish survey dives necessitating concentration on aspects other than diving skills (counting fish and writing on slates). This is of considerable importance when divers are making contact with fragile sessile organisms such as corals. Further development of divers’ buoyancy control is required to address this issue.

Evaluation of the ability of GLUG members to participate in marine research was conducted over two weekends. During the first weekend members were introduced to fish, macro-invertebrate and debris survey techniques during theoretical sessions conducted by Bill Gladstone and Steve Dalton. On the following morning, the group trialled the survey techniques on land prior to completing two surveys on nearshore reefs adjacent to Forster. Following each dive, fish species were identified to species level where possible, and recommendations on improving survey techniques were discussed. During the first survey dive, observers collecting fish data completed the nominated area too quickly, and it was decided that a 10-15 minute period was required to accurately evaluate the fish community within each transect. The maintenance of independence of replicate transects (i.e. not placing them too close together) and diver swimming

techniques were also discussed. During subsequent fish surveys conducted over the following weekend, it became apparent that the skill levels of most members were insufficient to accurately survey fish communities. It was therefore decided that further training was needed. Currently, debris surveys are ongoing within the Port Stephens-Great Lakes Marine Park with complementary Reef Life Surveys being conducted by divers trained in these methods. Further development of fish survey techniques was recommended and is currently being addressed within the group.

Discussion and recommendations

There is little doubt that the volunteer research groups evaluated in this study have strong potential to contribute to the realisation of management objectives for the marine habitats of NSW. However, in order for this to occur, there are some clear steps that need to be taken to standardise methods and training, assure quality of data, and provide continuing support for tasks with which groups generally struggle (data handling, analysis and report preparation). Each of these will be dealt with below.

Spatial coverage of volunteer groups

This evaluation of voluntary marine research groups has identified considerable research activity in different regions along the NSW coast. However, it has also identified a number of key areas where diving occurs, that presently lack voluntary marine groups or in which such groups perform little coordinated research. From the north, these areas include the Tweed Coast (although BURG conducts some activities in this region), the Ballina - Evans Head region, South West Rocks (but note that PURG has shown interest in this area), Port Stephens and Newcastle (but note that CDSC and GLUG conduct some research activity in this region), Wollongong and Illawarra. In conjunction with the development of standardised training programs and methods (see below), priority should be given to establishing active groups within these regions.

Standardisation of methods and training

While different groups conduct, and have conducted, a range of different research activities, inventory of species (photographic identification), assessment of fish communities and reef clean-up activities are predominantly practised amongst groups. All of these have the potential to provide valuable data on, for example, the distribution of threatened and protected species, the ranges of other species (esp. with respect to potential range extensions under the influence of climate change), spatial and temporal patterns of community structure, and impacts/risks

associated with human activities. In order for these activities to realise their potential to provide broadscale, reliable data, however, methods, training and subsequent quality assurance measures need to be standardised. In many cases this is a very simple process to establish, but standardising different methods utilised by groups should be a priority. For example, fish surveys are conducted over varying sizes of transects ranging from 50 m (Reef Life Survey) to 25 m. *Post hoc* standardisation is fraught with difficulties and it is always better to standardise prior to data collection. The relative merits of different designs and sampling sizes need to be objectively reviewed taking into consideration: ease of application (more difficult methods are less likely to attract volunteers); methods used in the past (to allow for addition to existing data sets); the practicality of methods given the wide geographic scale over which they are to be applied (e.g. 50-m transects intersect too many different habitat types in subtropical reefs and are too long for assessment of most patch reefs).

A number of different training programs, using a range of trainers, were evident across the groups. While this is an inevitable consequence of geographic extent of groups, there is clear scope to provide more standardised training. The best example of variation across programs, although each is likely to achieve the nominated objectives, is provided by fish training programs. BURG has developed a computer-based program that allows members to conduct self-paced evaluation and training in the identification of fish common to the local region. This allows members to continue to learn outside of nominated training days or courses. In contrast, SURG has opted to use in-house lectures and PADI-approved fish ID courses to train members. Similarly, GLUG has opted for lecture- and practical-based training provided by Bill Gladstone. A useful process would be to distil the best elements out of each of these programs in consultation with existing trainers and develop a program that can be easily replicated in different locations.

A clear recommendation is therefore that a list of training programs should be compiled and funding sought to develop these for implementation across the different groups. Priority should be given to programs for which group members have expressed a strong interest and which marine managers see as highly beneficial for long-term sustainable management of marine habitats. Training programs can range from simple instruction on, for example, the use of underwater cameras to optimise images, through to more complex training in survey methods and identification of diverse biota. The resultant programs should attempt to use the best aspects of the current range of training approaches and be developed in collaboration with existing trainers.

An example of a possible program, at a state-wide level, is a monitoring program which incorporates Coastkeepers and BURG's fish species list, and other currently developed programs (i.e. Prof. David Booth's tropical fish recruitment study). Such a program would enable the determination of transitional zones along the east coast as evidenced by a change in species presence and dominance (e.g. a gradual decline in the girdled Parma (*Parma unifasciata*) and an increase in white-ear Parma (*Parma microlepis*) with increasing latitude). Long-term monitoring of temporal changes in these patterns may also contribute to broader assessment of the effects of climate change.

Quality Assurance and Quality Control (QA/QC)

As indicated by Engel and Voshell (2002), volunteer biological monitoring programs can provide reliable information on ecological conditions if research procedures are validated and standardised methodologies are utilised. From the group feedback questionnaire, it is apparent that while most groups are aware of the need for QA/QC measures to be implemented, there is no consistent way in which this is being achieved. Without such control measures, it is highly unlikely that data collected by volunteers can be reliably used for management. Most groups relied upon leaders within the groups to determine the ability of members to accurately collect data. Only 50% of the groups indicated that procedures had been established to: ensure member standardisation and ground-truthing; regularly review and update resource material. Most groups indicated that data entry was not checked by another member - this can lead to errors during data transfer.

Several groups have established QA/QC procedures that ensure consistency in data collection between group members. A good example of this is BURG, which has developed several training programs for members. For example, following the initial training in fish identification, members are required to participate in a fish evaluation quiz (Appendix 4) which requires members to successfully identify 37 fish species. Yearly refresher testing and training updates can occur prior to the beginning of any research survey period using these evaluation tools.

The NCMG monitoring program for shallow subtidal marine communities is also an excellent example of ensuring accurate data collection by providing sound research strategy and training at the beginning of the program. With the assistance of research professionals from the BBMP, standardised research procedures, in combination with adequate training of participants, provides confidence that the long-term program has the ability to detect changes in community composition associated with the establishment of marine park zones. Collaborative ventures such as this represent a useful template for future research projects involving volunteers. A similar

model has been used by SURG (with staff and research students from UNE) for many of their projects (Smith and Edgar, 1999).

While most volunteers enjoy the hands-on experience of gathering data, few happily engage in activities such as data handling, processing, analysis and report production. This is reflected in the responses to the question on training priorities; data entry had the lowest interest levels ranging from 8-46%. Recent experiences with SURG highlight the lack of knowledge in aspects of data management and lead to a strong recommendation that training in these essential skills is offered to all groups. This is especially important for those that have gained external funding and thus need to generate summary reports. Indeed, it is apparent that the process of report production itself is a key area where substantial support is required. This final process is generally a major bottleneck in the successful completion of projects and consequently an impediment to wider participation in externally funded research activities. For example, SURG consistently struggles to meet reporting deadlines because of the volume of work required and the lack of suitably trained members who can assist with the process. Suggestions to address this include:

- conducting a specific review of group capabilities with respect to data handling, analysis and summarisation;
- providing external support for these activities (e.g. linkage with researchers already involved with training or similar research programs - costs for such support could be incorporated into funding applications);
- establishing a mechanism by which designs can be evaluated to ensure they can deliver the objectives of the study (links with researchers, vetting of research applications) – this is fundamental to the ability of volunteer programs to deliver usable data; and
- developing training in relevant aspects of data entry, data management, data analysis and preparation of scientific reports.

Suggested steps in future development of capacity

1. Facilitate the establishment of new voluntary groups in key areas (i.e. where there are current gaps);
2. In collaboration with the volunteer groups, refine the list of key activities and develop appropriate training protocols, wherever possible from existing activities (e.g. BURG low-impact diving);
3. Gauge willingness for a more formal accreditation process and develop this if there is general support;
4. Improve QA/QC procedures and build capacity in data handling, analysis and report preparation;
5. Facilitate regular exchange of information between groups, managers and researchers through, for example, conferences/workshops, chat rooms or online forums; and
6. In consultation with managers, identify key state-wide programs suitable for volunteer groups for which funding could be sought. This could be used as a vehicle for specific training and collaborative research of National significance.

Acknowledgements

This project was funded through the Hunter-Central Rivers Catchment Management Authority (Project Code HCR07_634) and we are grateful to Brian Hughes for close consultation and collaboration over the duration of the work. We would also like to acknowledge all the members of the voluntary groups who participated in the member questionnaire and/or provided insight into marine projects being conducted by volunteers throughout NSW. In particular, we would like to thank the contact people who provided information on the historical and current details of all groups and liaised with other members on our behalf: Zan Hammerton and Simon Hartley (BURG); Bob Edgar, Ian Shaw, Lindy Powells and Neil Vaughan (SURG); Jai Cooper (PURG); Isabelle Strachan, Suzanne Fiebig and John Duggan (GLUG); Margo Smith (CDSC); Paula and Grant Bradly (TUG); Dave Thomas (Eco Divers); Dave Roe and Nicky Hammond (Harbourkeepers/Coastkeepers); Andrew Green and Bill Baker (NCMG); Jennifer Hine (ANUDC); and Jenny Rob (SCMDC). We also like to thank the following staff from the NSW MPA and DPI for taking time to discuss potential research programs that suitable for volunteers and relevant to marine management: Dr Alan Jordan, Dr Bob Creese, Hamish Malcolm, David Harasti, Dr Nathan Knott and Dr Melinda Coleman.

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Appendices

1. Group questionnaire
2. Member questionnaire
3. Example of Volunteer Database established to determine marine volunteer groups capacity to undertake marine research.
4. Example of BURG's fish identification quiz

Appendix 1

Questionnaire 1 (Group)

Date:

Organisation name:

Commencement date: Current membership N^o:

Official positions:

Tick appropriate boxes

President	<input type="checkbox"/>	Social Secretary	<input type="checkbox"/>
Vice President	<input type="checkbox"/>	Dive Officer / Coordinator	<input type="checkbox"/>
Treasurer	<input type="checkbox"/>	Committee Members	<input type="checkbox"/>
Secretary	<input type="checkbox"/>		

1. Has the group received external funding? (tick one)

YES NO

If YES: Please complete attached **PROJECT EVALUATION FORM (page 5)**

2. Have reports been submitted to funding agencies? (tick one)

YES NO

TRAINING

3. Has the group conducted informal and/or formal training? (tick one)

YES NO

If YES: Please complete relevant training sections below

a) **Research methods:** (tick) YES Internal trainer
NO External trainer

Trainer's name: Organisation:

Email address:

The training included: (tick appropriate boxes)

Theoretical session/s . Practical session/s Field activities

What resource material was utilised during the training? (tick appropriate boxes)

ID cards: Fish	<input type="checkbox"/>	Video presentations	<input type="checkbox"/>
Biota	<input type="checkbox"/>	Powerpoint presentations	<input type="checkbox"/>
Other	<input type="checkbox"/>	Research equipment (tapes, slates etc.)...	<input type="checkbox"/>

Questionnaire 1 (Group cont')

e) **Passive diving** (peak buoyancy): **YES** **Internal trainer**
NO **External trainer**

Trainer's name: **Organisation:**.....

Email address:

The training included: (tick appropriate boxes)

Theoretical session/s . Practical session/s ... Field activities ...

What resource material was utilised during the training? (tick appropriate boxes)

ID cards: Fish Video presentations
Biota Powerpoint presentations
Other Research equipment (tapes, slates etc.).....

f) Other training:

Topic:

Trainer's name: **Organisation:**.....

Email address:

The training included: (tick appropriate boxes)

Theoretical session/s . Practical session/s ... Field activities

What resource material was utilised during the training? (tick appropriate boxes)

ID cards: Fish Video presentations
Biota Powerpoint presentations
Other Research equipment (tapes, slates etc.).....

Topic:

Trainer's name: **Organisation:**.....

Email address:

The training included: (tick appropriate boxes)

Theoretical session/s . Practical session/s Field activities

What resource material was utilised during the training? (tick appropriate boxes)

ID cards: Fish Video presentations
Biota Powerpoint presentation
Other Research equipment (tapes, slates etc.).....

Questionnaire 1 (Group cont')

4. What other training and/or resources would assist the members to meet the goals of the group? (tick appropriate boxes)

Funding application writing.....	<input type="checkbox"/>	Report writing.....	<input type="checkbox"/>
Reference material	<input type="checkbox"/>	Waterproof ID cards	<input type="checkbox"/>
Research equipment (tapes, slates, etc.) ...	<input type="checkbox"/>	Underwater camera/video	<input type="checkbox"/>
Specialised dive equipment (specify).....	<input type="checkbox"/>	Other (specify)	<input type="checkbox"/>

QUALITY CONTROL

5. What type of mechanisms for data quality control does the group utilise?

Tick appropriate boxes

None.....	<input type="checkbox"/>
Member standardisation (regular training updates)	<input type="checkbox"/>
Ground truthing of observers (data comparison)	<input type="checkbox"/>
Regular review and upgrade of training material	<input type="checkbox"/>
Data entered by observer and verified by others	<input type="checkbox"/>

6. Any other information that you may think is relevant to the organisations mission and voluntary research goals:

.....

.....

.....

.....

.....

.....

.....

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.....

.....

We appreciate the time you have taken to complete this questionnaire

Appendix 2

Questionnaire 2 (Members)

Date:

Name:

Mail or email address:

Age: (tick one) 10-20 21-30 31-40 41-50 > 51

Gender: (tick one) M F

1. Please indicate your highest level of education: (tick one)

Secondary School TAFE (e.g. certificate or diploma) Bachelor Degree
 Honours Degree Masters or Doctorate

2. Approximately how long has it been since your last dive? (tick one)

< 2 weeks 1 month 2 months 6 months 1 year 2 years 5 years

3. How many years have you been diving? (tick one)

< 1 1-5 6-10 11-15 16-20 > 20

4. How many dives have you completed? (tick one)

< 10 11-20 21-50 51-100 101-300 > 300

5. Tick all SCUBA qualifications:

None (go to question 7)	<input type="checkbox"/>	Assistant Instructor	<input type="checkbox"/>
Open Water	<input type="checkbox"/>	Instructor	<input type="checkbox"/>
Advanced Diver	<input type="checkbox"/>	Scientific Diver	<input type="checkbox"/>
Rescue Diver	<input type="checkbox"/>	Commercial	<input type="checkbox"/>
Divemaster	<input type="checkbox"/>	Other (please list)	<input type="checkbox"/>

6. Tick your diving experience:

Shore.....	<input type="checkbox"/>	Photography.....	<input type="checkbox"/>
Boat.....	<input type="checkbox"/>	Wreck.....	<input type="checkbox"/>
Tropical reefs (QLD).....	<input type="checkbox"/>	Research.....	<input type="checkbox"/>
Subtropical reefs (northern NSW).....	<input type="checkbox"/>	Commercial.....	<input type="checkbox"/>
Temperate reefs (Sydney & south).....	<input type="checkbox"/>	Other (please list)	<input type="checkbox"/>

Questionnaire 2 (Members cont')

7. Which voluntary diving group are you a member of? (tick appropriate box)

BURG SURG PURG GLUG TUG Other (list)

8. How many years have you been associated with this group? (tick one)

< 1 2 3 4 5 6-10 > 10

9. Previously, what types of group activities have you participated in? (tick one or more)

Social events Research dives Committee Member Other (please list)

10. How many volunteer group research dives have you completed? (tick one)

None 1-5 6-10 11-20 21-50 50-100 > 100

Field activity:

11. If you have participated in group dives, what type of data have you collected? (tick one or more)

1. None (observation only).....
 2. Basic (taking photographs)
 3. Some judgement (biota classifications using ID cards)
 4. Intensive judgement (gained through personal experience)

12. What type of non-diving group activities have you undertaken? (tick one or more)

None Data entry Social event coordinator
 Fundraising Website design Social presentations
 Promotional events.. Other (specify).....

13. What research programs you are interested in: (tick one or more)

Habitat mapping..... Fish surveys..... Threatened species
 Human impacts..... Benthic* surveys..... Others (specify)

14. What type of training would improve your personal skills?

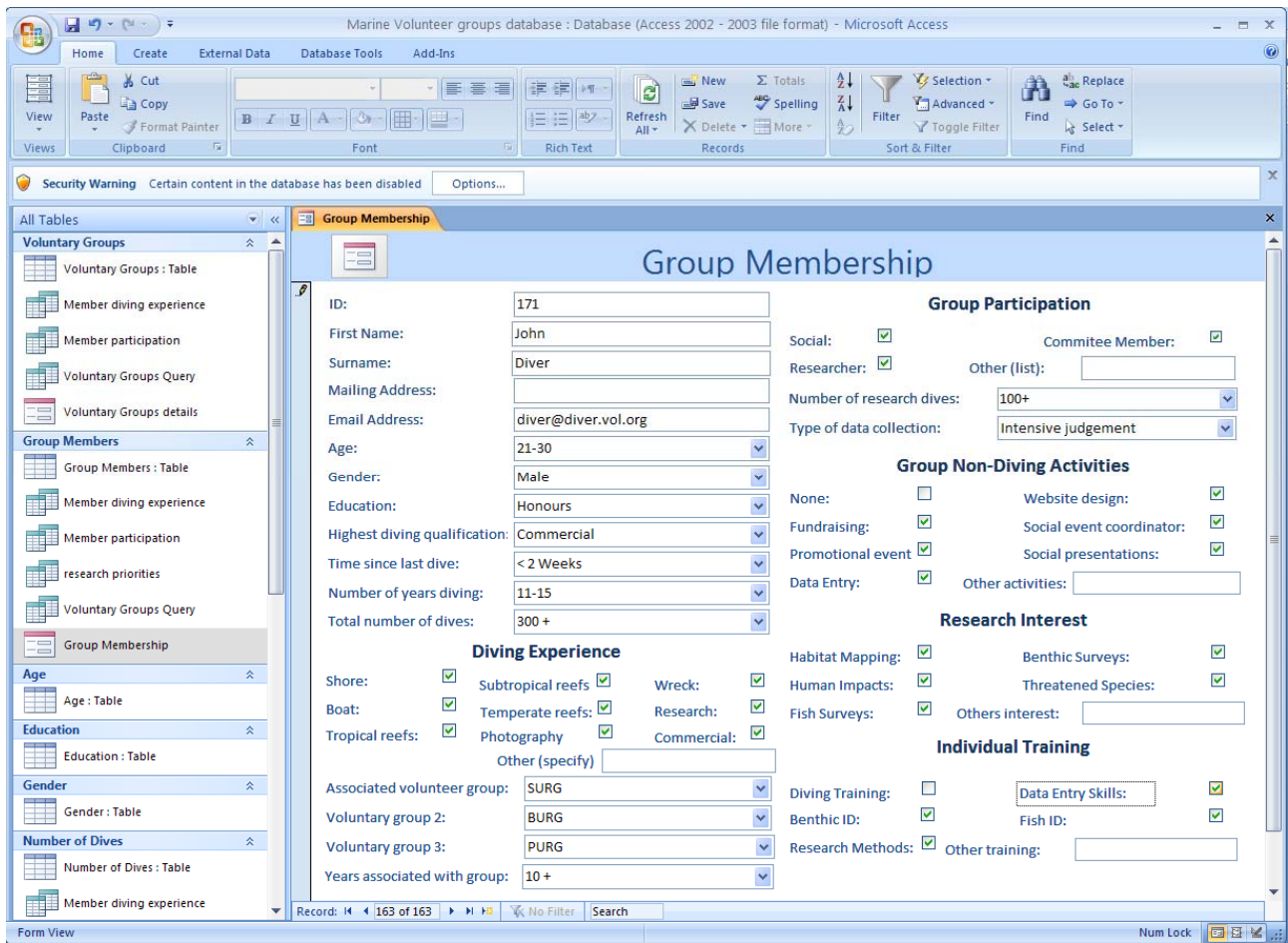
Diving training Research methods Fish identification (ID)
 Benthic* ID Data entry Other (specify)

*Organisms living on the sea or lake bottom

We appreciate the time you have taken to complete this questionnaire

Appendix 3

Example of Volunteer Database established to determine the capacity of marine volunteer groups to undertake marine research.



Appendix 4

Example of fish identification quiz, developed by Christian Colli and Zan Hammerton of Byron Underwater Research Group, which is used to evaluate group members' ability to adequately identify targeted fish species.

BURG FISH QUIZ

Your Score: 37
Out of: 37

Click in the answer box and type in the correct corresponding letter.
Use 'control' and Scroll on your mouse to zoom in or out if needed.

BURG
BYRON UNDERWATER RESEARCH GROUP

Question	Image	Options	Answer	Species
1		A - Girdled Parma B - Big Scaled Parma C - Blue Eye Parma D - Long finned Parma	b	<i>Parma oligolepis</i>
2		A - Western Blue Groper B - Big Scaled Parma C - Eastern Blue Groper (Male) D - Eastern Blue Groper (Female)	c	<i>Achoerodus viridis</i>
3		A - Square spot Goatfish B - Pink Stripe Goatfish C - Black spot Goatfish D - Round spot goatfish	c	<i>Parupeneus signatus</i>
4		A - Western Blue Groper B - White Spotted Wrasse C - Eastern Blue Groper (Male) D - Eastern Blue Groper (Female)	d	<i>Achoerodus viridis</i>
5		A - Crimson Banded Wrasse B - Striped hogfish C - Gunther's Wrasse D - Inscribed Wrasse	a	<i>Notolabrus gymnogenis</i>
6		A - White Ear Parma B - Girdled Parma C - Banded Parma D - Scaly Fin Parma	b	<i>Parma unifasciata</i>
7		A - Tiger B - Bronze Whaler C - Mako D - Grey Nurse	d	<i>Carcharias taurus</i>
8		A - White Stripe Morwong B - Red Morwong C - Dusky Morwong D - Jackass Morwong	b	<i>Cheilodactylus fuscus</i>
9		A - Tarwhine B - Yellow Fin Bream C - Black Bream D - Southern bream	a	<i>Rhabdosargus sarba</i>
10		A - Sawtail Surgeon (adult) B - Spotted Sawtail C - Sawtail Surgeon (juvenile) D - Pencilled Surgeon	c	<i>Prionurus microlepidotus</i>



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