Understanding wreck divers: Case studies from Australia and Chuuk Lagoon

Joanne Edney

Abstract

A fundamental challenge for managers is how to allow divers access to shipwrecks whilst ensuring these sites are not harmed. A better understanding of the motivations and attitudes of divers who visit shipwrecks may allow better informed and more targeted management strategies to protect these fragile sites. This study sought to gain an insight into the socio-demographic characteristics, motivations and attitudes of wreck divers. It did this by conducting surveys of two groups of wreck divers: a group of divers at Chuuk Lagoon (Federated States of Micronesia) and a group of Australian wreck divers.

This study found that wreck divers primarily visit shipwrecks to see historically significant sites, artefacts and marine life. Fines, permits, special certification and dive guides were the most acceptable ways to control diver behaviour. There were significant differences in the motivations and attitudes of divers with different socio-demographic profiles: notably between genders and between divers from North America and Australia.

The data suggests management strategies should be tailored to the socio-demographic profile of the divers visiting a shipwreck. Sites which attract divers from different parts of the world may require a range of approaches to achieve widespread compliance and acceptance of the need for minimum impact.

Introduction

Recreational scuba diving has become increasingly popular and it is estimated that there may be as many as 28 million active divers throughout the world today (Edney 2006:205; Garrod and Gössling 2008:7-8). As divers become more experienced they seek new experiences and challenges, such as wreck diving (Cater 2008:59-61). As well as adding challenge, shipwrecks also offer unique and diverse diving experiences and have become important recreational resources for divers (Delgado 1988a:8; Edney 2006:205).

Shipwrecks have important cultural heritage values (Delgado 1988a:5-8) and scuba diving can have adverse impacts on these values. Potential diver impacts on shipwrecks have been described by Joanne Edney (2006:214-219) and include boat anchor damage, disturbance to and removal of artefacts and accidental and deliberate diver contacts with wrecks. Therefore, a fundamental challenge is allowing divers access to shipwrecks whilst ensuring these fragile sites are not harmed.

A better understanding of the motivations and attitudes of divers who visit shipwrecks may allow better informed and more targeted management strategies to protect these sites (Barker and Roberts 2008:172; Holecek and Lothrop 1980:1). Unfortunately, very little research has been conducted into divers, and Donald Holecek and Susan Lothrop's (1980) study of the demographics, behaviour and expenditure patterns of wreck and non-wreck divers in the Great

Lakes region of the United States (US) is the only example in the literature of a study specific to wreck divers (Edney *in press*).

This study aimed to determine the socio-demographic characteristics, motivations and attitudes of wreck divers to provide data which could be used to inform the management of shipwrecks in the Asia-Pacific region. Two groups of wreck divers were surveyed: 1) a group of divers in Chuuk, in the Federated States of Micronesia; and 2) a group of divers in Australia.

There are around 50-60 shipwrecks in Chuuk Lagoon, the result of Allied air attacks during World War II. The wrecks are a tangible reminder of Chuuk's recent history, an important part of military history and the graves of many Japanese servicemen. As world renowned dive sites, they are also Chuuk's main tourist attraction and a major source of revenue (Jeffery 2006:137, 2004a:51-52, 55, 62-63, 2004b:107). Due to Chuuk's popularity with wreck divers, and as only wreck diving opportunities are offered, Chuuk provided a unique opportunity to survey wreck divers.

In Australian coastal waters more than 900 of the 7,000 recorded shipwrecks have been located, and provide popular recreational opportunities for wreck divers (Kenderdine 1997:8-11). However, whilst diving is popular in Australia, it is difficult to estimate the size of the industry (Tschapka 2006:7) and little is known about Australian divers. There is a paucity of accurate data about the industry, including certification numbers, participation (Cummins 1995:113) and diver characteristics.

This research addresses four questions:

- What are the characteristics, motivations and attitudes of wreck divers?
- Are there any differences in the socio-demographic characteristics of the two wreck diver sample groups?
- Are there any differences in the motivations for wreck diving between the two wreck diver sample groups?
- Are there any differences in the attitudes to management controls that may be put in place to protect shipwrecks between the two wreck diver sample groups?

Methods

The data from divers at Chuuk was obtained using a self-completed questionnaire, in hard copy format, which was distributed to passengers who stayed on a live aboard dive vessel in Chuuk Lagoon between August 2009 and January 2010. The first batch of surveys were distributed by the researcher with the permission of the vessel's captain, and subsequent surveys were distributed by the crew. The results of this survey are reported in detail in Edney (*in press*).

Between July and October 2010 a sample of Australian wreck divers were surveyed using a self-completed questionnaire available in an electronic web-based format, using SurveyMonkey™, and hard copy. Participants were recruited by emailing information about the study to dive operators and clubs across Australia, who were requested to forward the information to divers on their mailing lists. Information about the survey was also posted on the Dive-Oz scuba diving website forum, publicised in the *Dive Log Australasia* free monthly newspaper and promoted by word of mouth communication amongst divers. These methods were chosen because it was not possible to obtain mailing lists of divers due to privacy laws and proprietary issues. The use of a web-based survey also enabled cost effective data collection and a large number of respondents across Australia to be reached in a relatively short period of time.

The survey was divided into three main sections, socio-demographic characteristics (five items) and dive experience (three items); wreck diving motivations (fourteen items); and, attitudes to management controls to protect wrecks (nine items). Closed questions with checklists were used for the socio-demographic and dive experience questions and five point scales were used to rate the relative importance of motivations for wreck diving and diver attitudes. The questions concerning diver characteristics and motivations for wreck diving were derived and adapted from other surveys of divers (Davis 1997:121-136; Ditton *et al.* 2002:S187-S189; Holecek and Lothrop 1980:2-11; Jewell 2004:47-50; Meisel and Cottrell 2004:394-399; Musa *et al.* 2006:95-97; Stolk *et al.* 2005:159-163; Thapa *et al.* 2005:57-58; Todd *et al.* 2002:108-109).

The Statistical Package for the Social Sciences (SPSS) software was used to analyse the survey data. Data analysis included descriptive statistics of diver socio-demographic and dive experience data, Pearson Chi-Square[1] test for the comparison of the two wreck diver groups and the influence of socio-demographic variables on diver motivation and attitudes.

Results

Socio-demographic and dive experience profiles

Socio-demographics

The socio-demographic results are presented in Table 1. The majority (88 percent) of survey respondents were wreck divers in Australia (923 respondents) and the remainder were from Chuuk (123 respondents). Seventy four percent of wreck divers were male and 26 percent female. The majority (55 percent) of divers were aged 35-54 years. There was a significant difference between the

[1] A statistical test for significance of the relationship between two variables.

ages of the two groups of divers (χ^2=40.7, df=6, p=0.00), with the divers to Chuuk being older than those in Australia.

Seventy two percent of the divers had completed tertiary education (i.e. diploma, degree or higher degree) and 58 percent had completed bachelor degrees or higher degrees. The majority (53 percent) of wreck divers had an annual income higher than the equivalent of Australian Dollars (AUD) $75,000, well above the average annual Australian income of $68,000 (ABS 2011). There were significant differences in levels of income between the two groups (χ^2=87.9, df=5, p=0.00), with wreck divers to Chuuk earning more than those in Australia. Notably, 42 percent of wreck divers to Chuuk earned more than the equivalent of AUD $150,000 a year, compared to 11 percent of wreck divers in Australia, while almost half (47 percent) of wreck divers in Australia earned between AUD $51,000-$100,000 annually, compared to 28 percent of those in Chuuk.

Table 1. Socio-demographic profile (*Reported in Edney *in press*)

Socio-demographic variable	All wreck divers Frequency %	Australian wreck divers Frequency %	Chuuk* wreck divers Frequency %
Gender			
Male	74	74	73
Female	26	26	27
Age			
<25 years	8	9	1
25-34 years	22	24	10
35-44 years	27	28	22
45-54 years	28	25	43
55-64 years	12	11	20
>64 years	3	3	4
Level of education			
High school	14	13	17
Trade qualification	14	15	3
Diploma	14	16	5
Degree/higher degree	58	56	75
Annual income $AUD equivalent			
0-25,000	11	13	5
26,000-50,000	13	14	8
51,000-75,000	23	24	14
76,000-100,000	22	23	14
101,000-150,000	17	17	17
>150,000	14	11	42
Region of residence			
Asia	-		2
Australia	88	100	-
Australia/New Zealand	2		14
Europe	-		2
Other	1		7
United Kingdom	1		8
USA/Canada	8		67

The majority of divers to Chuuk originated from US/Canada (67 percent), followed by Australia/New Zealand (14 percent), the United Kingdom (8 percent), around 2 percent each from Asia and Europe, and the remainder were from other regions.

Dive experience

Dive experience results are presented in Table 2. The majority (60 percent) of divers had completed more than 250 dives and 40 percent had completed more than 500 dives. The highest level of certification attained by a large proportion (41 percent) of the divers were leadership certifications (i.e. Divemaster or above), and only 9 percent of held basic (open water diver) certification.

Table 2. Dive experience (*Reported in Edney *in press*)

Experience variable	All wreck divers Frequency %	Australian wreck divers Frequency %	Chuuk* wreck divers Frequency %
Number of dives			
0-20	3	3	0
21-50	8	9	3
51-100	12	12	7
101-250	17	16	25
251-500	20	20	21
>500	40	40	44
Years diving			
0-5	29	30	24
6-10	20	20	21
11-15	14	15	12
16-20	10	10	12
21-25	9	8	10
26-30	7	7	7
31-35	5	4	7
36-40	3	3	3
>40	3	3	4
Highest level of certification			
Open water	9	10	4
Advanced open water	12	10	26
Specialty	28	30	13
Master scuba diver	10	10	7
Divemaster	19	20	19
Instructor	13	12	16
Master instructor	9	8	15

Almost half of the divers (49 percent) had been diving for 10 or less years and the majority (63 percent) had been diving for 15 or less years.

Motivations for wreck diving

When the means of all responses were compared (Table 3), 'seeing marine life' (mean 4.19), 'seeing historically significant shipwrecks' (4.05), the 'peace and tranquillity of the underwater environment' (3.96), 'seeing artefacts' (3.90) and 'the clear water' (3.81) were found to be the top motivations for wreck diving. Notably, 'collecting artefacts and fittings' (2.06) and 'fossicking for artefacts and fittings' (2.59) were the least important motivations.

Table 3. Motivations for wreck diving: Australia and Chuuk survey results combined

Motivation	N	Mean	Std Deviation
Seeing marine life	992	4.19	.790
Seeing historically significant shipwrecks	993	4.05	.843
Peace & tranquillity of the underwater environment	994	3.96	.862
Seeing artefacts	992	3.90	.878
The clear water	995	3.81	.868
Penetrating a wreck	994	3.60	1.044
Researching or learning more about a wreck	993	3.57	.972
Photography	992	3.53	1.167
Observing the effects of time (decay) on a wreck	989	3.47	.962
Complexity & size of the wreck	989	3.46	.998
Other	235	3.43	1.113
Exploring & discovering machinery & fittings	990	3.30	1.087
Fossicking for artefacts	983	2.59	1.127
Collecting artefacts & fittings	978	2.06	1.067

Significant differences were found between genders and the location of survey (i.e. Chuuk or Australia). 'Penetrating a wreck' (χ^2=23.8, df=5, p=0.00), 'fossicking for artefacts' (χ^2=25.0, df=5, p=0.00), 'exploring and discovering machinery and fittings' (χ^2=90.5, df=5, p=0.00) and the 'complexity and size of the wreck' (χ^2=35.1, df=5, p=0.00) were important to male divers (χ^2=20.3, df=5, p=0.00), while 'seeing marine life' was more important to females (χ^2=23.8, df=5, p=0.00). 'Fossicking for artefacts' was also important to divers to Chuuk (χ^2=14.2, df=5, p=0.01).

Diver attitudes to management controls over shipwrecks

When the means of all responses were compared (Table 4) the statement that received the highest level of agreement was that 'harsh penalties should be

imposed on divers who take things from wrecks' (mean 4.13), followed by 'divers should be required to have special permits to dive some wrecks' (3.32), 'only divers who have special certification should be allowed to dive on a wreck' (2.79), 'an underwater guide should control what people do' (2.66) and 'some accessible wrecks should be off-limits to divers' (2.58). There was least agreement with the statements 'wrecks should be protected from all visitation' (1.44) and 'there should be no controls over what divers do on wrecks' (1.78).

Table 4. Attitudes to management controls over shipwrecks: Australia and Chuuk survey results combined

Management control	N	Mean	Std Deviation
Harsh penalties should be imposed on some divers who take things from wrecks	978	4.13	1.053
Divers should be required to have permits to dive some wrecks	981	3.32	1.296
Only divers who have special certification should be allowed to dive on a wreck	981	2.79	1.286
An underwater guide should control what people do	976	2.66	1.172
Some accessible wrecks should be off-limits to divers	960	2.58	1.221
A dive briefing is enough to control diver behaviour	972	2.47	1.048
Moving artefacts around on a wreck is okay so long as the artefacts remain at the wreck site	981	1.87	.974
There should be no controls over what divers do on wrecks	982	1.78	1.081
Wrecks should be protected from all visitation	978	1.44	.763

Significant differences were found between genders, location of survey and the origin of the divers. There was more agreement from females that 'an underwater guide should control what people do' than from males (χ^2=47.4, df=15, p=0.00). Australian divers agreed that 'only divers with special certification should be allowed to dive on a wreck' (χ^2=51.8, df=20, p=0.00) and 'divers should be required to have permits to dive some wrecks' (χ^2=67.4, df=35, p=0.00), while wreck divers from US/Canada disagreed with these statements. Wreck divers in Chuuk agreed that 'moving artefacts around on a wreck site is okay so long as the artefacts remain at the wreck site' (χ^2=160.0, df=35, p=0.00), while wreck divers in Australia disagreed with this statement.

Discussion

The socio-demographic findings from this study are broadly consistent with a number of other studies of scuba divers. This includes the predominance of

males, high levels of education (Davis 1997:133-135; Ditton *et al.* 2002:S188; Musa 2002:200; Musa *et al.* 2010:6; Stolk *et al.* 2005:161-163; Thapa *et al.* 2005:58; Todd *et al.* 2001:135; Tschapka 2006:99-102) and above average incomes (Davis 1997:136; Stolk *et al.* 2005:161-163; Thapa *et al.* 2005:58). However, divers from this study were older than those from other studies, including more recent studies (Musa *et al*. 2010:6; Thapa *et al.* 2005:58; Tschapka 2006:100-101).

The income and age differences between the two groups of wreck divers may have been influenced by the sampling strategy. The divers in Chuuk had travelled from their home location to participate in wreck diving, and in comparison to other shore-based alternatives in Chuuk and other wreck diving destinations, the live aboard the survey was conducted on is relatively costly. Therefore it may be expected that divers on this live aboard would be more affluent and older, with higher income generally linked to age (Musa *et al.* 2006:99; Edney *in press*).

Wreck diving is more demanding and challenging, requiring higher levels of skill, training and experience for safe participation than regular scuba diving (Edney *in press*). Therefore, the finding that wreck divers had higher levels of dive experience and certification than divers from other more recent studies was expected (Ditton *et al.* 2002:S188; Musa *et al.* 2010:7; Stolk *et al.* 2005:163; Tschapka 2006:107-110).

Most divers visit shipwrecks to see historically significant sites, artefacts and marine life, and to enjoy the peace and tranquillity of the underwater environment. Few divers visit wrecks to collect artefacts and fittings. These findings are in contrast to Holecek and Lothrop's (1980:17-19) study which found treasure and trophy hunting important to wreck divers. This may reflect changes in diver and community attitudes towards shipwrecks over the past 30 years. In the past, the collection of artefacts was often the focus of wreck diving and considered an acceptable activity by many divers (Todd *et al.* 2001:139), whereas today shipwreck protection laws generally prohibit these types of activities. Diver and the general community attitudes to shipwrecks now better recognise the cultural heritage values of wrecks and their protection is better supported (Edney 2006:221; Edney *in press*).

Differences were found in motivations based on gender and location of the survey. The more challenging aspects of wreck diving and the technical aspects of wrecks, such as penetrating wrecks, exploring and discovering machinery and fittings and the complexity and size of wrecks were more important to males than they were to females. Fossicking for artefacts was more important to males and divers in Chuuk than it was to females and divers in Australia. These latter findings are concerning because the disturbance caused by fossicking can

diminish the integrity of cultural heritage values of wreck sites (Delgado 1988b:18; Edney 2006:213-214, 217), and shipwreck protection laws have been in place in Chuuk and Australia for more than three decades (Green 1995:335-338; Hezel and Graham 1997:34-35; Jeffery 2004a:58-59, 2004b:110; Kenderdine 1997:15).

Most wreck divers agreed that there should be management controls to protect shipwrecks and accepted the use of penalties, special certifications, permits and underwater guides as management controls. These findings differ from a study of divers from the Great Lakes region of the US (Todd *et al.* 2001: 139), which found that experienced divers preferred less invasive management controls. This difference may indicate differences in attitudes between divers from Australia and the US, as the majority of divers in this study were from Australia. Another difference this study found was that divers from North America considered moving artefacts around on a wreck site acceptable, whereas Australian wreck divers did not. This may reflect differences in legislation and levels of knowledge as well as cultural and or ethical differences between divers from North America and Australia. More study is required to determine the reasons for these differences.

It is notable that few divers agreed that all wrecks should be protected from visitation. This suggests that while wreck divers generally support the protection of shipwrecks they also want access to wrecks. For heritage managers, greater access to wrecks can present challenges in achieving the protection of these sites (Edney *in press*).

Conclusion

This study found that wreck divers are predominantly male, middle aged, well educated, higher than average income earners, and experienced divers with high levels of diver certification. Wreck divers visit shipwrecks to see historically significant sites, artefacts and marine life, and to enjoy the peace and tranquillity of the underwater environment. Divers can have adverse impacts on shipwrecks and this study shows that certain management controls, including penalties, permits, special certification and dive guides can be acceptable to divers. It also found that some divers participate in activities which disturb sites and they may not be aware of the consequences of disturbing and moving artefacts around. Management strategies may therefore need to be tailored to the demographic profile and origin of the divers visiting these sites because people from different countries have different attitudes about management. Sites with diverse demographics may need a range of controls, while sites with one demographic might have more focused efforts. This also highlights the importance of

implementing these controls in conjunction with more effectively communicating to divers the importance of wreck sites and appropriate behaviour when visiting these sites.

Abbreviations

ABS	Australian Bureau of Statistics
ANOVA	Analysis of variance
AUD	Australian dollars
df	Degrees of freedom, and is the number of values of the variable
p	P-value, the probability of obtaining a test statistic
SPSS	Statistical Package for the Social Sciences
US	United States
χ^2	Chi square

Acknowledgements

Special thanks to Lenny Kolczynski, Captain of the *Odyssey* and the crew of *Odyssey*, Chuuk Lagoon, Federated States of Micronesia, for distributing and returning the majority of the Chuuk surveys to me. Thanks to all the divers in Chuuk and Australia who gave their time to participate in the survey. I would also like to thank Dr Jonathon Howard for supervising this research, his support and guidance, and for reviewing and commenting on this manuscript.

Bibliography

Australian Bureau of Statistics, 2011	*Incomes*, Australian Bureau of Statistics, viewed 24 March, 2011, <http:www.abs.gov.au/AUSSTATS/abs@nsf/mf/1345.0?opendocument#Untitled%20Section_7>.
Barker, N., and Roberts, C., 2008	"Attitudes to and preferences of divers toward regulation", in (eds.) Brian Garrod and Stefan Gössling, *New frontiers in marine tourism: Diving experiences, sustainability, management,* pp. 171-187, Elsevier Ltd., Amsterdam.
Cater, C., 2008	"Perceptions of and interactions with marine environments: Diving attractions from Great Whites to pygmy seahorses", in (eds.) Brian Garrod and Stefan Gössling, *New frontiers in marine tourism: Diving experiences, sustainability, management,* pp. 49-64, Elsevier Ltd., Amsterdam.
Cummins, T., 1995	"Diving in Australia", in *The Journal of the South Pacific Underwater Medicine Society, 25*, 2, pp. 113-117.

Davis, D., 1997	*The development and nature of recreational scuba diving in Australia: A study in economics, environmental management and tourism,* Doctor of Philosophy, University of Queensland, St Lucia, Queensland.
Delgado, J.P., 1988a	"The value of shipwrecks", in (ed.) Joy Waldron Murphy, *Historic shipwrecks: Issues in management,* pp. 1-10, Partners for Liveable Places and National Trust, Washington, DC.
Delgado, J.P., 1988b	"Historical overview", in (ed.) Joy Waldron Murphy, *Historic shipwrecks: Issues in management,* pp. 11-20, Partners for Liveable Places and National Trust, Washington, DC.
Ditton, R.B., Osburn, H.R., Baker, T.L., and Thailing, C.E., 2002	"Demographics, attitudes, and reef management preferences of sport divers in offshore Texas waters", in *Journal of Marine Science, 59*, pp. S186-S191.
Edney, J., in press	"Diver characteristics, motivations and attitudes: Chuuk Lagoon", in *Tourism in Marine Environments*, Cognizant Communication Corporation, Putnam Valley, NY.
Edney, J., 2006	"Impacts of recreational scuba diving on shipwrecks in Australia and the Pacific: A review", in *Micronesian Journal of the Humanities and Social Sciences, 5*, 1/2, pp. 201-233, viewed 2 July, 2011, <http://marshall.csu.edu.au/MJHSS/>.
Garrod, B., and Gössling, S., 2008	Introduction, in Brian Garrod and Stefan Gössling (eds.), *New frontiers in marine tourism: Diving experiences, sustainability, management,* pp. 3-28, Elsevier Ltd., Amsterdam.
Green, J., 1995	"Management of maritime archaeology under Australian legislation", in *Bulletin of the Australian Institute for Maritime Archaeology,* 19, 2, pp. 33-44.
Hezel, F.X., and Graham, C., 1997	"Truk's underwater museum: A report on the sunken Japanese ships, Federated States of Micronesia", in (eds.) Margaret Pepin-Donat and David W. Look, *Micronesian Resources Study*, Micronesian Endowment for Historic Preservation, Federated States of Micronesia and San Francisco, CA.
Holecek, D.F., and Lothrop, S.J., 1980	*Shipwreck vs. nonshipwreck scuba divers: Characteristics, behaviour, and expenditure patterns*, Michigan Sea Grant Publications Office, Ann Arbor, MI.
Jeffery, W., 2006	"A CRM approach in investigating the submerged World War II sites in Chuuk Lagoon", in *Micronesian Journal of the Humanities and Social Sciences, 5*(1-2), pp. 137-155, viewed 2 July, 2011, <http://marshall.csu.edu.au/MJHSS/>.
Jeffery, B., 2004a	"World War II shipwrecks in Truk Lagoon: The role of interest groups", in *CRM: The Journal of Heritage Stewardship, 1*, 2, pp. 51-67.

Jeffery, B., 2004b	"World War II underwater cultural heritage sites in Truk Lagoon: Considering a case for World Heritage listing", in *The International Journal of Nautical Archaeology, 33*, 1, pp.106-121.
Jewell, B., 2004	"The effectiveness of interpretation on diver attitudes and awareness of underwater shipwreck values – *SS Yongala,* a case study", in *Bulletin of the Australasian Institute for Maritime Archaeology, 28*, pp. 43-62.
Kenderdine, S., 1997	"Culture and heritage: Shipwrecks and associated objects, Australia" in *State of the Environment Technical Paper Series (Natural and Cultural Heritage)*, Department of the Environment, Canberra, ACT.
Meisel, C., and Cottrell, S., 2004	"Differences in motivations and expectations of divers in the Florida Keys", in (comp. ed.) James Murdy, *Proceedings of the 2003 Northeastern Recreation Research Symposium*, April 6-8 Bolton Landing, New York, Gen. Tech. Rep. NE-317, pp. 393-401, Department of Agriculture Forest Service, Northeastern Research Station, Newtown Square, PA.
Musa, G., 2002	"Sipadan: a SCUBA-diving paradise: an analysis of tourism impact, diver satisfaction and tourism Management", in *Tourism Geographies, 4*, 2, pp.195-209.
Musa, G., Seng, W.T., Thirumoorthi, T., and Abessi, M., 2010	The influence of scuba divers' personality, experience, and demographic profile on their underwater behaviour, in *Tourism in Marine Environments, 7*, 1, pp. 1-14.
Musa, G., Sharifah , L.S.A., Kadir., and Lee, L., 2006	"Layang Layang: An empirical study on scuba diver's satisfaction", in *Tourism in Marine Environments, 2*, 2, pp. 89-102.
Stolk, P., Markwell, K., and Jenkins, J., 2005	Perceptions of artificial reefs as scuba diving resources: A study of Australian recreational scuba divers, in *Annals of Leisure Research, 8*, 2-3, pp. 153-173.
Thapa, B., Graefe, A.R., and Meyer, L.A., 2005	"Moderator and mediator effects of scuba diving specialization on marine-based environmental knowledge-behaviour contingency", in *The Journal of Environmental Education, 37*,1, pp. 53-66.

Todd, S.L., Cooper, T., and Graefe, A.R., 2001	*"*Scuba diving and underwater cultural resources: Differences in environmental beliefs, ascriptions of responsibility, and management preferences based on level of development*",* in (comp. ed.) Gerard Kyle, *Proceedings of the 2000 Northeastern Recreation Research Symposium*, April 2-4 Bolton Landing, New York, Gen. Tech. Rep. NE-276, pp. 131-140, U.S. Department of Agriculture Forest Service, Northeastern Research Station, Newtown Square, PA.
Todd, S.L., Graefe, A.R., and Mann, W., 2002	"Differences in scuba diver motivations based on level of Development"*,* in (comp. ed.) Sharon Todd, *Proceedings of the 2001 Northeastern Recreation Research Symposium*, April 1-3 Bolton Landing, New York, Gen. Tech. Rep. NE-289, pp. 107-114, U.S. Department of Agriculture Forest Service, Northeastern Research Station Newtown Square, PA.
Tschapka, M.K., 2006	*Involvement, motivations and setting preferences of participants in the adventure tourism activity of SCUBA Diving,* Master of Arts in Tourism (Research), University of Canberra, Canberra.