ORIGINAL ARTICLES

KITTING UP: AN EQUIPMENT PROFILE OF QUEENSLAND DIVERS

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Abstract

Under new Queensland legislation divers are now required to have certain pieces of equipment before they are permitted to dive in commercial settings. To gain some idea of how this legislation might impact on current diving practices the present study asked certified divers to report on the equipment they currently owned and also equipment they would like to own. Results showed that a majority of divers own what could be described as the basics, mask, snorkel, fins. Less than 50% of the sample owned the main safety items specified under the new legislation. There were also considerable sex differences within the sample, with male divers owning significantly more equipment than females. Possible implications of these findings for continuing education, retail marketing and diver dropout are discussed.

Introduction

Recent government legislation in Queensland has attempted to formalise some aspects of diver safety by insisting that divers possess certain pieces of equipment.[1] On commercial charters dive supervisors now have a legal responsibility to ensure that divers have the following, mask, snorkel, fins, regulator fitted with an alternate air source, submersible pressure gauge (SPG), depth gauge and timer, buoyancy control device (BCD), power inflator, and tank (Regulation 262(c), p. 98).

While many commercial operators have quickly complied with these new regulations and purchased additional equipment (especially octopus regulators, contents gauges and timing devices), there is still no baseline information available to assess the implication of these safety measures for recreational divers.

To address this problem the present study asked certified divers to report on the equipment they currently owned, and the types of equipment they would like to own. Of particular interest was the ownership (or intended purchase) of equipment legally required under the new Queensland legislation.

Information on equipment ownership is also important to manufacturers for planning market strategies. One specific item of gear, the dive computer, is not legally required but was included in the present study to assess its popularity. Pilot studies had revealed that many certified divers are unable to use their dive tables correctly[2] so the possibility that significant numbers might be changing to computers was examined. Overseas studies have identified lack of equipment as a factor in diver dropout.[3] A similar situation appears to exist in Australia, with just over a third of certified divers who have dropped out of the sport citing lack of equipment as a contributing factor.

The intention of the present study was to obtain an accurate profile of the equipment owned by "active" divers so that relationships between safety, marketing and scuba promotion could be addressed. Active divers are defined as those who dive at least once a year. The definition follows those used in the most recent international studies. For example, "at least once a year" by McCarthy[3] and "have been diving in the preceding 12 months" by Diagnostic Research.[4]

Sampling

A random sample of 1,500 certified divers (900 males, 600 females) was drawn from the computer records of the National Association of Underwater Instructors (NAUI). After removing records where the address was incomplete, or care of a resort or dive shop, the first sample was reduced to 1,373 divers. As the research project had a particular interest in the Great Barrier Reef, a second sample of 192 PADI (Professional Association of Diving Instructors) divers certified in Central Queensland, was also included in the study.

A total of 1,565 questionnaires was mailed to certified divers throughout Queensland in September 1989. 287 were returned unopened as divers had left their previous address. From the 1,275 remaining, 380 completed questionnaires were returned. This represents a 29.7% return rate for the study. This return rate compares favourably with other recreational diving studies. For example, Somers[5] mailed 7,546 questionnaires to divers in the United States and received only a 16.5% return. Australian industry studies have also experienced low return rates, 40% by the Centre for Studies in Travel and Tourism[6] and 25% from the Diving Industry and Travel Association of Australia.[7] Without extensive, and expensive, mail and telephone follow-ups[8] the present rate of return appears robust, especially as the study was designed to investigate relationships between variables and not estimate population parameters.

Subjects

Of the 380 completed returns in the study, 285 were from active divers and 95 were from subjects who reported

TABLE 1.

DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE: PERCENTAGE OF RESPONDENTS BY SEX

Characteristic	Males	Females	All Respondents
Mean Age (in years)	28.7	27.8	28.4
Age Range (in years)	14-60	15-58	14-60
Occupation			
Professional	21	38	28
Managerial	9	3	7
White Collar	12	19	15
Skilled Manual	23	1	14
Semi-skilled Manual	10	4	7
Unskilled Manual	9	7	8
Tertiary Students	7	13	9
High School Students	8	6	7
Home Duties	0	9	4
Unemployed	1	1	1
Family Status			
Single (not married)	65	69	66
Parents	24	25	25
Time Since Certification (months)			
0-12	5	6	6
13-24	25	29	26
25-36	34	31	33
37-48	15	15	15
>49	20	19	20
Amount of diving done from commercial charter boats			
None	14	9	12
Less than half	29	23	26
More than 90%	54	63	60
Total number of divers	**177**	**108**	**285**

that they had not dived since gaining their open water certification. Details of the "diving dropouts" are to be presented in a separate report. Characteristics of the active divers in this study are presented in Table 1.

As can be seen from Table 1, subjects had an average age of 28 years, with a range from 14 to 60 years. Based on scales of occupational status developed at the Australian National University[9] the sample represents a full range of employment categories. Sixty-six percent of the sample were single and 25% were parents. Overall, the characteristics of this sample compare well with profiles of active divers in other studies. For example, a 1979 national profile in the United States showed divers to have a median age of 28 years and to be predominantly employed in management, technical and professional positions.[10]

Table 1 also presents details of time periods since subjects received their openwater certification. Most subjects (74%) had been certified for between one and four years. The proportions for males and females are very similar. Finally, Table 1 shows that the majority of divers surveyed do most of their diving from commercial charter boats and therefore would be subject to the equipment requirements set out under Queensland legislation.

Questionnaire

The questionnaire used in this study was developed from international literature[3,5], NAUI and PADI openwater training manuals[11,12], and through extensive consultation with local instructors. A draft schedule was pilot tested with

TABLE 2.

DIVING EQUIPMENT CURRENTLY OWNED: PERCENTAGE OF RESPONDENTS BY SEX

Equipment	Males	Females	All Respondents	
Mask	94	95	94	
Snorkel	93	95	94	
Log book	90	92	91	
Fins	92	87	90	
Dive tables	89	85	87	
Boots	79	67	74	+
Gloves	77	69	74	
Wet suit	82	59	73	**
Underwater watch	75	58	69	*
Weight belt	75	57	68	*
Gear bag	74	54	66	**
Dive knife	72	35	58	**
Buoyancy compensator	55	44	51	
Regulator	54	41	49	+
Depth guage	54	38	48	+
Underwater torch	53	39	48	+
Submersible pressure guage	50	41	46	
Tank	42	30	37	+
Power inflator	42	29	37	+
Octopus regulator	41	28	36	+
Compass	41	27	35	+
Slate and pencil	34	21	29	+
Hood	37	10	27	**
Diver's flag	27	19	24	
Underwater camera	17	14	16	
Dive computer	6	4	5	

** p< .001; * p< .01; + p< .05

four instructors, four divemasters, four advanced divers and four open water divers. Some questions were deleted and others rewritten for clarification following the pilot study.

The final nine page questionnaire examined diving activities under the headings of history, travel, training, equipment, dive tables and personal experiences. For the equipment questions subjects were presented with a 26 item check-list. They were asked to indicate the kind of diving equipment they currently owned by placing a tick in the box next to the piece of equipment. They were then asked to examine the list again and to circle any of the items they would like to own.

Results

Table 2 presents the results for diving equipment currently owned. Most divers reported that they had their own mask, snorkel, fins, log book and dive tables. Just under three quarters of the sample had boots, gloves and a wet suit. Two thirds of the sample owned an underwater watch, weight belt and gear bag; while 58% of respondents reported having a dive knife and 51% a buoyancy compensator. Slightly less than half the sample owned their own regulator, depth gauge, torch or SPG. Just over a third of the respondents owned a tank, power inflator, octopus regulator and compass. Toward the bottom of the list, around a quarter of the sample had a slate and pencil, hood and diver's flag; while 16% reported owning an underwater camera. Finally, only five percent of these certified divers owned a dive computer.

Examination of the equipment owned by males and females reveals some interesting sex differences. Males were significantly more likely than females to have their own boots, wet suit , watch, weight belt, gear bag, knife, regulator, depth gauge, torch, tank, power inflator, octopus regulator, compass, slate and pencil and hood.

Having reported on the equipment they currently owned, subjects then nominated the gear they would like to

TABLE 3.

DIVING EQUIPMENT DESIRED: PERCENTAGE OF RESPONDENTS BY SEX

Equipment	Males	Females	All Respondents	
Underwater camera	52	57	54	
Octopus regulator	33	46	38	+
Buoyancy compensator	34	42	37	
Depth guage	32	45	37	+
Tank	36	35	35	
Regulator	29	38	33	
Submersible pressure guage	25	35	29	
Compass	23	34	27	+
Underwater torch	19	26	21	
Wet suit	14	33	21	**
Dive computer	28	9	21	**
Weight belt	15	28	20	+
Underwater watch	10	30	18	**
Dive knife	14	23	17	+
Power inflator	17	17	17	
Diver's flag	19	12	16	
Slate and pencil	14	17	15	
Boots	7	18	11	*
Gloves	8	15	11	
Gear bag	5	20	11	**
Fins	8	11	9	
Hood	6	6	6	
Mask	6	4	5	
Dive tables	5	6	5	
Snorkel	5	4	5	
Log book	1	1	1	

** $p < .001$; * $p < .01$; + $p < .05$

own. As can be seen in Table 3, the most popular item for intended purchase was an underwater camera. Over half the sample indicated that they would like to own one. Over one third of the divers expressed an interest in having an octopus regulator, a BCD, depth gauge and tank. One third also indicated that they would like a primary regulator. Just over one quarter of the sample showed interest in owning a submersible pressure gauge and compass. Some respondents even wrote on the questionnaire that they intended to buy a combination gauge which included a compass and bottom timer.

Less than one quarter of the respondents indicated a desire to purchase a torch, wet suit, computer, weight belt, watch or dive knife. Of course these figures, and the proportions toward the bottom of the list, are smaller because the majority of divers already own the equipment discussed. However, some of the sex differences that emerged are interesting. Female divers reported owning less equipment than males (see Table 2) and therefore are likely to require gear. Females were significantly more likely than males to express interest in owning a wet suit, watch, gear bag, boots, compass, knife, weight belt, depth gauge and octopus regulator. Males, on the other hand, were more likely to express interest in owning a dive computer.

Discussion

Similar to the findings of overseas studies[3] most Queensland divers surveyed owned basic snorkeling gear (mask, snorkel and fins). Around three quarters of the sample also owned boots, gloves and a wet suit. Even in tropical waters the possibility of hypothermia must be recognised, so it reassuring to note that 94% of the sample either own or are interested to own a wet suit.

Ownership of equipment required by divers under the new Queensland legislation[1] varied considerably. Only half the sample owned a buoyancy compensator (51%) and only slightly more than a third (37%) owned the mandatory power inflator. Similar low rates of ownership were reported for regulators (49%) and octopus regulators (36%). The latter is the most common alternate air source available and meets the new legislative requirements. Interestingly, it became clear from the question on equipment subjects would like to own (and later discussions with divers) that many divers believe an "octopus" to be all the hoses running from the first stage. This is why some divers who do not own a regulator did not express any interest in owning one, but instead indicated that they would like an octopus. A similar misunderstanding seems to exist with the power inflator. Subjects either did not realise it was important (they may have had a vest which did not require one) or they believed it was part of the BCD. Alternatively, some divers may not be familiar with this piece of equipment. While both NAUI and PADI open water manuals discuss equipment in depth, it is clear from these results that some divers are still a little confused.

A majority of the divers in this study reported owning dive tables (87%). In a separate exercise they were asked to use their tables to complete two basic dive profiles. Preliminary analyses showed that most could not correctly complete the profiles.[2] These findings, together with the fact that less than half the sample own a depth gauge (48%) or submersible pressure gauge (46%), raise serious concerns about the possibility of risk for decompression sickness[13] or at least out-of-air emergencies.[14] Admittedly, 69% of the sample do have a timing device (underwater watch) and most dive on charters where a supervisor is available. Even so, analyses of accident reports consistently point to the importance of regular maintenance and familiarity with all equipment as central components of diving safety.[15,16] One way to achieve this is for divers to have their own gear and not rely on rented or borrowed equipment.

One positive finding which relates to the new Queensland legislation[1] is that most divers (91%) owned a log book. Admittedly, most receive a log book automatically with their certification. Regulation 264 (3)(c) requires that each diver keep a record of their dives in a prescribed form (a dive profile) and that these records are signed by the dive supervisor. This provision appear useful in alerting the dive supervisor to potential problems with"pushing the limits" during repetitive dives. As a final point on safety however, it is disappointing to note that only slightly more than one third of the sample owned a compass (35%) and less than one quarter (24%) owned a diver's flag. Again these results may reflect the fact that the sample predominantly dive on commercial vessels where supervision and gear hire are readily available.

Significant sex differences were identified on 15 of the 26 items of equipment owned by divers. In all cases, males owned more equipment than did females. The implication of this finding is that manufacturers and retailers might consider specific marketing strategies directed at the female market. In the United States, for example, the Diving Equipment Manufacturers Association (DEMA) currently run national media campaigns aimed at encouraging women to learn to dive.[17] These campaigns appear to be very successful. The industry as a whole should also be aware of the need to encourage the purchase of gear by both men and women since overseas[3] and unpublished Australian studies have found lack of equipment to be a significant factor in diver dropout. What is not clear , however is whether divers drop out because they cannot afford to purchase or hire equipment, or whether they drop out for other reasons and in retrospect rationalise that they did not have the gear to keep diving anyway. If we wish to retain divers, then this should be one of the priority areas for further research.

When given the option of nominating the type of gear they would like to own, over half the sample chose an underwater camera. This particular interest in underwater photography also emerged in other parts of the research project. Divers were asked to nominate any training courses they would be interested in taking. Underwater photography was a popular choice, in front of the more safety-oriented training programs. In terms of equipment desired, however, safety items such as an octopus regulator, BCD and depth gauge were high on the shopping list of divers in this study (see Table 2). Interestingly, only 21% of the sample expressed interest in owning a dive computer (5% already owned one). Despite the amount of advertising by manufacturers, divers appear hesitant to try this new technology.

When figures from Tables 1 and 2 are combined it becomes clear that divers either own or would like to own most of the equipment discussed. There are, however, pieces of equipment that some divers do not consider are important to own. These include: power inflator (46% of the sample did not own one or express interest in owning one), compass (38%), octopus regulator (26%), SPG (25%), regulator (18%), depth gauge (15%), underwater watch (13%), BCD (12%), dive tables and log book (8% each). Divers were not asked specifically why they did not consider these items important to own. Based on other questions in the study the issue of cost must be given serious consideration. At the same time, divers may not believe that their safety will suffer by not owning this equipment. Another study will address this issue in greater depth.

As previously mentioned, many divers are probably not aware of the new Queensland legislation and the requirements set down for diving in a commercial environment. Hire gear is usually available for divers, but as stressed earlier, there is no substitute for owning and being familiar with one's own equipment. The results of this study point to a need for the industry to emphasise safety aspects of equipment use and maintenance. Preliminary research shows that many certified divers would willingly take a general

refresher course if one was offered by their local instructor.[2] While certifying agencies will quickly point out that these refresher courses are currently available, the real need is to market them actively.

Acknowledgements

This study was initiated through a grant from the University College of Central Queensland and supported by Downunder Research. I would like to thank NAUI Australia for access to their confidential records from which the major sample was drawn. Special thanks go to Robert Freitag and his staff at Capricorn Reef Diving, Rockhampton, for their professional assistance throughout the project.

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THE DCIEM SPORT DIVING TABLES

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Historical background

Canadian decompression research began in 1962 in what is now named the Defence and Civil Institute of Environmental Medicine (DCIEM). Kidd and Stubbs set out to develop an instrument which would monitor the diver's depth-time profile, and provide instantaneous decompression information when complicated dive profiles were undertaken, or where wide variations of gas mixtures were used. In these situations, the traditional tabular approach to determine decompression was inadequate.

Initially, their decompression computer was based on the traditional Haldane model in order to duplicate the U.S. Navy 1958 Standard Air Tables. However, parameters were changed and the model was modified until a low incidence of decompression sickness was achieved.

A variety of dives were tested, ranging from fixed depth dives, random depth dives and repetitive dives. Within five years they had developed a fairly successful computer based on 5,000 man-dives.