Recreational Survey in Selected Marine Managed Areas in the Main Hawaiian Islands

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Colophon

This study is part of a larger report with the title “Assessment of Economic Benefits and Costs of Marine Managed Areas in Hawaii" by Herman Cesar, Pieter van Beukering and Alan Friedlander. This publication is a result of research carried out by Cesar Environmental Economics Consulting (CEEC) and funded by the National Oceanic and Atmospheric Administration, Coastal Ocean Program, under awards NA 160A2412 to the University of Hawaii for the Hawaii Coral Reef Initiative Research Program. Co-funding was obtained from the Division of Aquatic Resources (DAR) and the Department of Business, Economic Development & Tourism (DBEDT). The field data were compiled by Linda Flanders (Waiopae), Sara Peck (Kahaluu), Liz Foote (Honolua), Hannah Barnard (Molokini and rest Maui) and Jan Dierking (Oahu sites). Scott Atkinson (then at TNC) managed the collection of other surveys on Big Island.

1. Introduction

Marine Managed Areas (MMAs) provide several direct and indirect benefits to the tourism industry, including: (a) Enhanced attractiveness of reefs – maintaining and enhancing coral cover, fish stock and coral and fish diversity will increase satisfaction from diving, snorkeling and glass bottom boat rides; (b) Shoreline maintenance – a healthy reef will protect the shoreline from erosion and maintain sand levels on beaches; (c) Support for reef fisheries in adjacent areas as well as pelagic fisheries in coastal areas through improved reef health and fish biomass.

In this study we focus particularly on the first aspect. Little is known about perceptions of divers and snorkelers in Hawaii and how important good quality reefs are for these reef users. A study in the early 1990s reported on the diving industry in 1990 only from a macro-economic perspective. The main motivations of divers and snorkelers in Hawaii to involve in marine activities were studied by Cesar et al. 2002[1]. Still, it remains unknown how recreational users perceive MMAs, whether they are willing to contribute financially to the management of MMAs and whether better reefs also lead to higher satisfaction and therefore higher welfare levels. To fill this lacuna, a survey was conducted in close collaboration with The Nature Conservancy (TNC) during the period of April till October 2003.

2. Methodology

The target audience was the group of active users of coral reefs in Hawaii. In total 532 divers and 771 snorkelers have been interviewed. In addition, 77 non-users filled the questionnaire to investigate differences in perception between users and non-users. In conjunction with The Nature Conservancy (TNC), Cesar Environmental Economics Consulting (CEEC) developed a survey that focused on individual divers' activities and contingent valuation of visits to the reefs. The questionnaire was pre-tested at several locations to ensure the accuracy of the completed forms. In conjunction with the overall study, six sites were specifically targeted: Hanauma (283 respondents) and Diamond Head (95) on Oahu, Molokini (237) and Honolua (243) on Maui, and Waiopae (98) and Kahalu'u (188) on Big Island. The remaining 250 respondents were interviewed at various other dive and snorkel sites in Hawaii. All interviews were self-administered, i.e., the respondents are handed surveys and fill them out themselves, and then return them to the interviewer.

Returned forms were logged, then reviewed for completeness and condition. Blank forms, incomplete, and damaged forms were discarded. Data were then entered by a data entry specialist and verified by the project director. The database was checked for internal consistency, missing or duplicate records, and improperly observed contingency items. Response options were checked for multiple answers, blank fields, and out-of-range codes. If any errors were found to have slipped by quality control procedures applied to this point, response values were checked against the survey form to assure the proper information had been recorded.

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[1] Cesar, H.S.J., P.J.H. van Beukering, W. Pintz and J. Dierking (2002) "Economic valuation of the coral reefs of Hawaii", HCRI, University of Hawaii, Hawaii.

3. Socio-economic characteristics

First, we tested whether the sample was representative in terms of socio-economic and demographic background of the respondents. The most obvious variable to test is the country of origin. The sample has been subdivided into regions, of which each consist of a cluster of states in the US or specific countries and continents (see Figure 1).

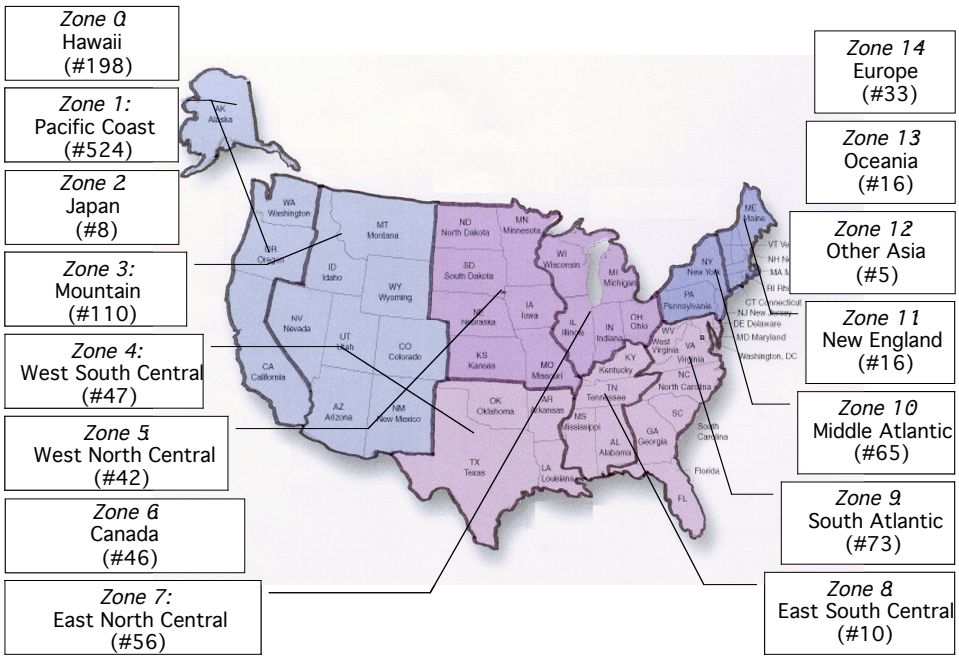

Figure 1: Country of origin

Table 1 shows the proportion of each region defined in the sample (column 1) and compares this with the actual visitor numbers to Hawaii in 2002 (column 2). With only 1% of the total sample, Japan is highly underrepresented. This is probably due to language constraints since the questionnaire has only been distributed in English. When adjusted for this, the survey sample is fairly representative of marine visitors to Hawaii.

Table 1: Adjustment of sample distribution of country of origin

Zone	Region	Survey (*unadjusted*)	Actual (*unadjusted*)	Survey (*adjusted*)	Actual (*adjusted*)
1	Pacific Coast (US)	50%	32%	50%	44%
2	Japan	1%	26%	-	-
3	Mountain (US)	10%	7%	11%	9%
4	West South Central (US)	4%	4%	5%	5%
5	West North Central (US)	4%	6%	4%	9%
6	Canada	4%	4%	4%	5%
7	East North Central (US)	5%	3%	5%	4%
8	South Atlantic (US)	7%	5%	7%	7%
9	East South Central (US)	1%	1%	1%	2%
10	Middle Atlantic (US)	6%	4%	6%	6%
11	New England (US)	2%	2%	2%	2%
12	Other Asia	0%	2%	0%	2%
13	Oceania	2%	1%	2%	2%
14	Europe	3%	2%	3%	3%

The other demographic characteristics are summarized in Table 2. Throughout the analysis, a distinction has been made between divers, snorkelers and non-users. Compared to snorkelers, divers are generally older, wealthier, more often male, and better educated. The few non-users interviewed are at the other end of the spectrum. With an average age of 39, Hawaii visitors are generally older than those at many other popular holiday destinations. This may be due to the high costs involved in visiting Hawaii.

Table 2: Summary of demographic variables

Variable	Divers	Snorkelers	Non-users
Sample	532	771	77
Male	60%	46%	43%
Age	40	38	35
Education	3.90	3.71	3.37
Income	US$ 99,694	US$ 89,773	US$ 84,052

Looking into more detail at education and income structure of the sample, it is clear that the respondents are generally highly educated and relatively wealthy (Figure 2).

Figure 2: Educational and income-related background

4. Marine-related activities

To determine the experience level of the respondents and spatial distribution of their activities, respondents were asked how many diving and snorkeling experiences they had had at a number of locations in Hawaii in the previous 12 months. After eliminating the outliers[2], the number of activities was summed for each site in order to determine the popularity of each potential marine site.

Figure 1 shows the distribution of dives and snorkel trips in Hawaii over the previous 12 months by the respondents. Accounting for 45% of the activities, Big Island is by far the most popular diving/snorkeling destination of the main islands of Hawaii. Figure 1 also shows that some sites are typical diving sites (e.g. Molokini) while others are particularly popular with snorkelers (e.g. Hanauma and Honolua). The average annual number of

[2] A number of respondents claimed to dive more than 250 times annually. Since these respondents are most likely either dive instructors or boasters, these individuals have been eliminated from the sample as they are not representative of the average marine user.

diver and snorkel trips in Hawaii per "active" person is 3.2 and 7.8, respectively. In summary, the majority of users is relatively inexperienced regarding water activities.

Figure 3: Distribution of diving and snorkeling destinations in Hawaii

To test their experience level, the respondents were asked to estimate the total number of dives and snorkel trips they took in their lifetime. Figure 4 shows the outcome of this question. Most respondents snorkeled around 7 to 15 times in their lifetime. Women are generally less experienced than men. Diving is much less common among the respondents. 54% of the man and 68% of the women had never taken a dive trip in their lifetime. Most divers have taken 1 to 10 dives so far. Only very few respondents are highly experienced and belong to the category 500 plus.

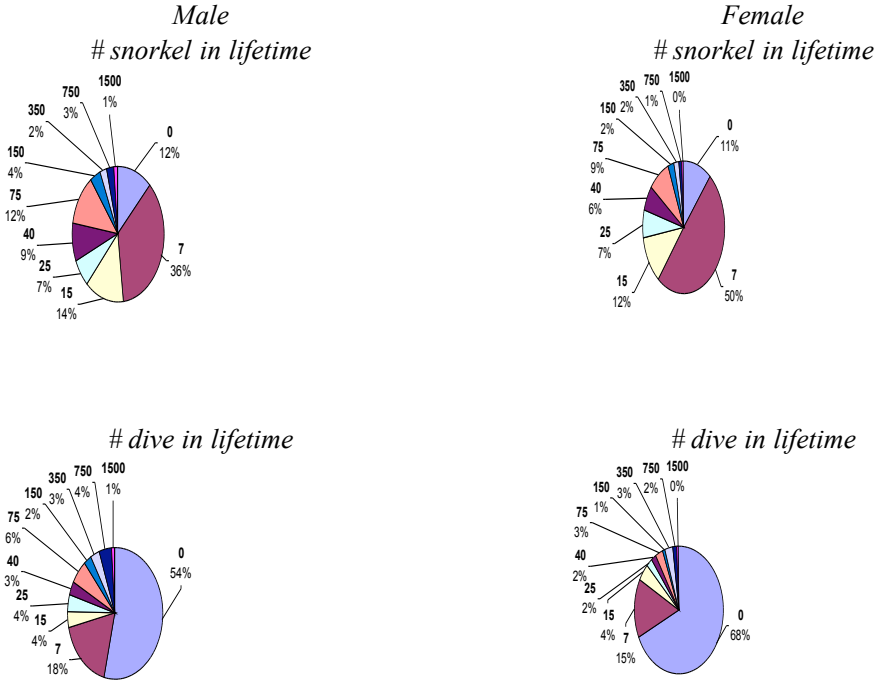

Figure 4: Gender distribution of number of snorkel and dives experiences

Next, respondents were asked about their perception of the state of the reef that they visited on "today's" dive/snorkel experience. Figure 5 shows how respondents perceive the health of the reef they visited last. The majority of the respondents consider the

Hawaiian reefs to be in a healthy state (i.e. between 40 and 50%). Compared to snorkelers, divers generally are more pessimistic about the health of Hawaiian reefs.

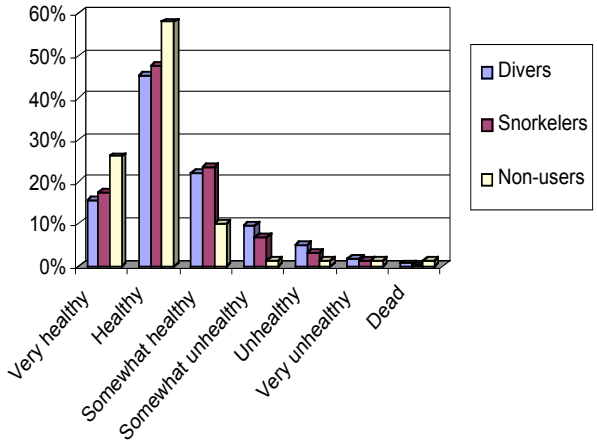

Figure 5: Respondent's perception of reef quality

Table 3 shows the composition of different nationalities recorded at the 6 study sites. Waiopae clearly has the largest proportion of local users (i.e. 65%) since it is not located in a region that is particularly popular among foreign tourists. Waikiki Diamond Head is divided as local users tend to use the Diamond Head location while tourists reef users exclusively frequent the Waikiki location. The majority of the tourists in the remaining sites consist of US mainlanders.

Table 3: Country composition by site

Sites	Hawaii	Mainland US	Canada	Other
Waiopae	63%	32%	4%	1%
Diamond Head	24%	60%	4%	12%
Kahalu'u	19%	72%	2%	7%
Hanauma	12%	78%	3%	7%
Honolua	7%	86%	2%	5%
Molokini	5%	89%	5%	1%
Other	9%	82%	4%	5%

5. Willingness to Pay for conservation

An important aspect of the survey is what people are willing to pay (WTP) for the conservation of coral reefs on top of what they are already paying in terms of standard expenditures (e.g. dive equipment, boat fee, tanks, instructor). First, an introductory text was presented which was phrased as follows: "Let's say, divers and snorkelers are asked to help fund activities that protect corals, reef fish, sea turtles and other reef animals in Hawaii." Next, the question was posed whether the respondent would be willing to pay a certain amount per dive/snorkel experience, in addition to the usual expenses, to fund a program for a healthier marine environment. The possible answers were "yes" or "no". Those who answered "yes" where asked "What would be the maximum you would be

willing to pay per dive/snorkel experience, in addition to the usual expenses, to fund this program for a healthier marine environment?"

Figure 6 shows the distribution of the WTP of the respondents to pay extra for conservation. Less than 25% answered that they would not pay anything extra for conservation of the reef. The most frequently answered amount to pay extra for conservation is $5 per experience. Excluding non-payers, the average payment of the respondents is $3.77 per experience. Including non-payers, this average amounts to $2.81. Divers have a slightly (i.e. 8%) higher WTP than snorkelers. When asked about how they feel about paying extra, the large majority of the respondents feels really good about contributing to conservation. Only between 8 to 9% of the users would actually refrain from taking the activity. For non-users this lost market share is less than 1%.

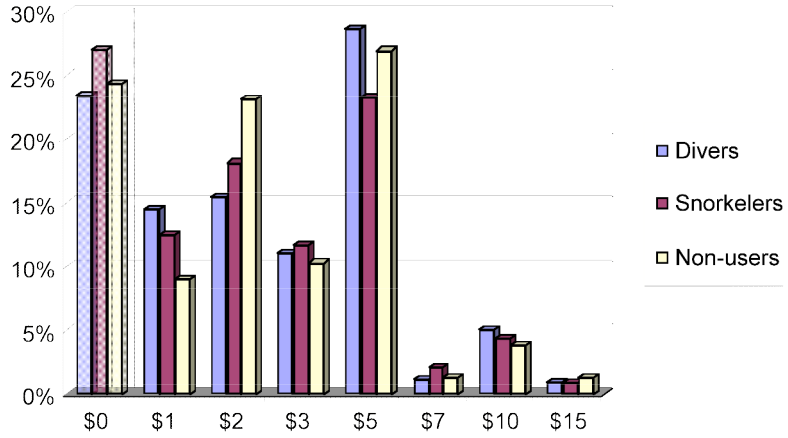

Figure 6: Distribution of WTP per activity for conservation program

Typically, the WTP is dependent on the characteristics of the site where the interview was held. Table 4 shows the average WTP for each site and reports the level of zero-bidders in the site-specific sample. The uniqueness of the site, the service level and the health of the reef have a positive impact on the WTP for conservation. Therefore, Molokini and Hanauma score high. Remoteness and the absence of facilities depress the level of the WTP. This explains the low WTP levels in Honolua and Waiopae.

Table 4: Site specificity of WTP estimates

Interviewed at following site:	Average WTP* (US$/trip)	Share zero WTP (%)
Molokini	4.54	18.6%
Hanauma	3.81	29.0%
Diamond Head	3.47	26.3%
Honolua	3.32	31.3%
Waiopae	3.15	50.0%
Kahaluu	3.01	22.9%
Others	3.98	24.3%

* The average willingness to pay of the positive bidders. Zero-bidders are excluded.

Another way of looking at the WTP estimate is the difference between nationalities. Table 5 shows the significant variation in the degree of zero-bidders across nationalities. It is the Hawaiian respondent that is most clearly opposed a conservation contribution. Most likely Hawaiian born respondents consider it a birthright to have free access to the ocean and its reefs. Typically, the most agreeable group is the Mainland US citizen of

which almost 80% is willing to pay extra for conservation. Being temporary users of the reef, they consider it normal to contribute to conservation.

Table 5: Conservation willingness breakdown by nationality

Country	No	Yes
Hawaii	45%	55%
Mainland US	21%	79%
Canada	26%	74%
Australia/New Zealand	44%	56%
Japan	38%	63%
Other Asian country	20%	80%
United Kingdom	23%	77%
Europe (excl. UK)	30%	70%
Elsewhere	33%	67%

Figure 7 shows the motivations of the zero-bidders for not being willing to pay for conservation. Again, a distinction has been made between divers, snorkelers and non-users. Only a minority feels that management is unnecessary. The majority of users feels that it is not their responsibility but the government's to manage the marine environment. Another important reason for not being willing to pay is the fact that most respondents do not want the additional financial burden. Regression analysis shows that the level of WTP is indeed positively related with the level of annual household income.

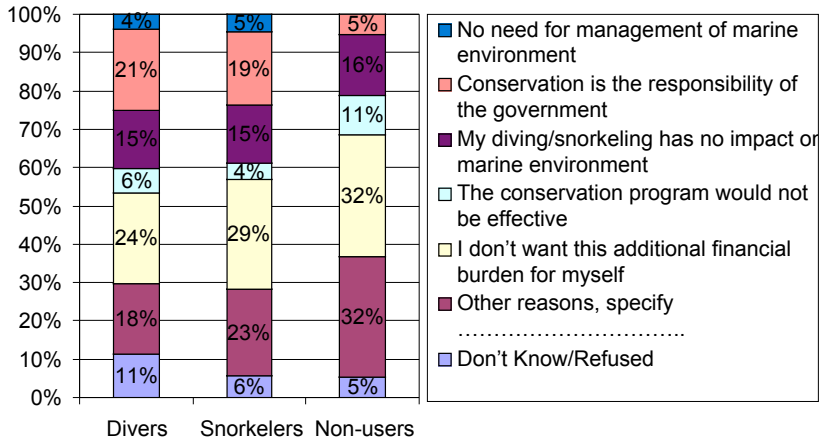

Figure 7: Motivation for zero WTP for conservation

6. Funding mechanism

Next, several follow-up questions focusing on the funding mechanism that respondents see as the most convenient and trustworthy way in which collection of the conservation contributions can be dealt with were raised. For example, one follow-up issue to the WTP question looked at the form in which respondent would like to pay. Respondents were asked the following question: "*Do you prefer to be charged a small conservation amount for each dive /snorkel day you take (for example $2) or would you prefer a larger conservation amount to be charged on an annual basis (for example $10)?*" The respondent could chose between (a) payment per dive/snorkel day; (b) an annual contribution, or could indicate to have (c) no preference. Table 6 shows the outcome of

the preferred payment vehicle as expressed by divers, snorkelers and non-users. For most respondents, payment per activity is the most popular payment vehicle. Still a significant share, especially within the subgroup of intensive users, feels that annual payments are preferable.

Table 6: Preferred payment vehicle

Payment vehicle	Divers	Snorkelers	Non-users
Per dive/snorkel day	50%	58%	72%
Annual contribution	33%	27%	10%
No preference	14%	14%	14%
Don't know	3%	1%	3%

This relationship between level of activity and payment vehicle choice has been visualized in Figure 8. As expected, the popularity of the "pay per activity" is negatively correlated with the number of activities, while the option "annual basis" is positively related. Clearly, the respondents calculate which option is most financially beneficial to them. Another typical observation from Figure 8 is the fact that the breakpoint of the "pay per activity" and the "pay per year" curves coincides with the highest number of hesitant respondents. Respondents that snorkel about 25 times in a year in Hawaii seem to be indifferent to the type of payment vehicle.

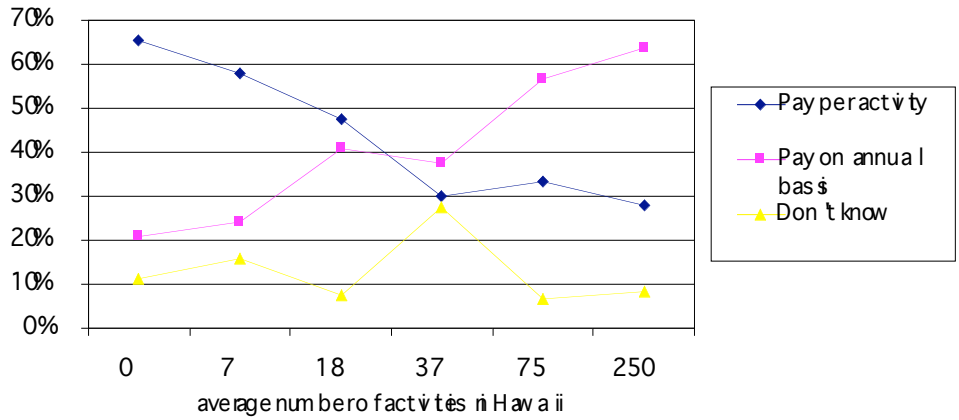

Figure 8: Relation between activity level and payment vehicle preference

Next, the respondents were asked whether they believe the contribution should be voluntary or mandatory. Figure 9 summarizes the responses. The majority prefers the scheme to be mandatory. They may fear the free-rider effect. The more activities the respondent is involved in, the more he prefers a voluntary scheme. This also reflected in the slightly higher proportion of divers that favor a voluntary scheme over a mandatory scheme.

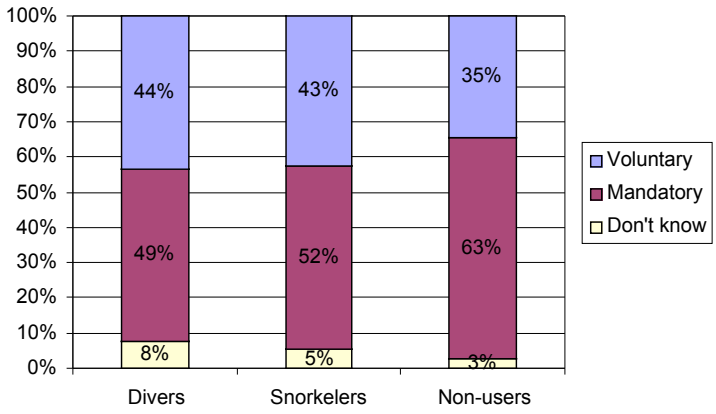

Figure 9: Preference of scheme type

Respondents were also asked who they trust most in collecting and allocating the funds for marine management in Hawaii. The first column of Table 7 shows the options that respondents could chose from. Despite the often-heard complaint that the government is not doing its job properly, the public sector (chosen by 30% of respondents) is still the most trusted organization to collect and allocate the funds. Snorkelers and divers do not think very different in this respect. NGOs (19%) like The Nature Conservancy and the Sierra Club are also trusted in playing a role in the collection and allocation of the funds. Local communities (12%) and the private sector (10%) are not particularly popular as intermediaries between donors and beneficiaries. Nevertheless, from this overview it is clear that some sort of collaboration between NGO's, the public sector and private entrepreneurs is desirable.

Table 7: Most suitable organization to collect and allocate the funds

Organization	Divers	Snorkelers	Non-users
Public sector (State, Federal, etc.)	30%	31%	28%
Non Governmental Organizations (TNC, etc.)	19%	18%	23%
Public/private partnerships	14%	15%	6%
Local communities	10%	13%	9%
Private sector (Operators, rentals, etc.)	13%	7%	13%
Don't know	14%	16%	21%

Finally, respondents were given various options of possible actions to be financed by the collected funds and were asked: "If we ask you to allocate the collected funds to different actions that are aimed at improving the marine environment in Hawaii, how would you distribute these funds, percentage-wise, over the different actions (note that it adds up to 100%)?". Table 8 shows the results of this inquiry. Comparing the opinions of divers, snorkelers and non-users indicates that there is no major difference between the different groups opinions on how the funds should be allocated among the various management options. Typically, water pollution is considered to be a crucial threat. People also want the authorities to be stricter about poaching and other harmful practices. Education and research are also popular items for spending conservation funds. Non-use zones are particularly popular among non-users, but less among divers and snorkelers.

Table 8: Allocation of the funds for various management options suggested in the survey

Management options	Divers	Snorkelers	Non-users
Reducing water pollution	17%	19%	20%
Enforcing regulations (stop poaching and feeding etc.)	17%	14%	14%
Supporting research and monitoring of the coral reef	13%	14%	10%
Educating users/public about marine environment	14%	13%	12%
Supporting wardens to help to protect marine life	9%	9%	11%
Preventing spread of algae which kills corals	8%	9%	7%
Creating conservation only areas (e.g. no fishing/diving)	8%	8%	10%
Improving facilities (restroom, garbage bins, etc.)	7%	8%	6%
Lobbying for more funds from State or Government	5%	5%	6%
Other action	2%	2%	4%

Appendix I. Questionnaire

To be filled by surveyor		**Weather**: sunny, mixed, cloudy (*circle one*)
Date (m/d/y):	**Type**: diver / snorkeler (*circle one*)	**Site(s):**

DIVERS/SNORKELLERS SURVEY ON MARINE MANAGEMENT & PROTECTION

We hope you enjoyed your diving/snorkeling. We need your help to learn more about how people appreciate the marine environment. We're not selling anything; we're only interested in your opinions. Everything you tell us will be 100% anonymous. We hope you are willing to participate in this survey.

Q1. Roughly how many dives and snorkel experiences have you had in your life until now?

☐ Dives: please fill in # ➔ ☐ Snorkel: please fill in # ➔

☐99 Don't know/refused ☐99 Don't know/refused

Q2. How many dive/snorkeling experiences have you had at the following locations in Hawaii in the last 12 months, including today's? (*Please fill # cells below***)**

	# dives	# snorkel
☐1 Molokini		
☐2 Honolua Bay		
☐3 Other Maui sites		
☐4 Hanauma Bay		
☐5 Other Oahu sites		

	# dive	# snorkel
☐6 Kona Coast Hawaii		
☐7 Hilo coast Hawaii		
☐8 Other Hawaii sites		
☐9 Other sites		
☐99 Don't know/refused		

Q3. On today's dive/snorkel experience, what was the state of the reef you visited? (*Tick one*)

☐1 Very healthy
☐2 Healthy
☐3 Somewhat healthy
☐4 Somewhat unhealthy
☐5 Unhealthy
☐6 Very unhealthy
☐7 Dead
☐99 Don't know/refused

Let's say, divers and snorkeler are asked to help fund activities that protect corals, reef fish, sea turtles and other reef animals in Hawaii.

Q4. Would you be willing to pay a certain amount per dive/snorkel experience, in addition to the usual expenses, to fund this program for a healthier marine environment? (*Tick one*)

☐1 Yes ➔ *go to Question* ***5.***
☐2 No ➔ *go to Question* ***6.***

Q5. [*If your answer was "YES" in Question 4*] What would be the maximum you would be willing to pay per dive/snorkel experience, in addition to the usual expenses, to fund this program for a healthier marine environment. (*Tick only one*)

☐1 $1 per dive/snorkel
☐2 $2 per dive/snorkel
☐3 $3 per dive/snorkel
☐4 $5 per dive/snorkel
☐5 $7 per dive/snorkel
☐6 $10 per dive/snorkel
☐7 More than $10 per dive/snorkel
☐99 Don't know/refused

Continue to Question 7.

Q6. [*If your answer was "YES" in Question 4*] Do you prefer to be charged a small conservation amount for each dive /snorkel day you take (for example $2) or would you prefer a larger conservation amount to be charged on an annual basis (for example $10)? (*Tick only one*)

☐1 I prefer the conservation contribution per dive/snorkel day
☐2 I prefer to pay an annual contribution for marine conservation
☐3 I have no specific preference
☐99 Don't Know/Refused

Q7. [*If your answer was "NO" in Question 4*] What is the main reason you are not willing to contribute to this program for the marine environment? (*Tick only one*)

☐1 No need for management of marine environment
☐2 Conservation is the responsibility of the government
☐3 My diving/snorkeling has no impact on marine environment
☐4 The conservation program would not be effective
☐5 I don't want this additional financial burden for myself
☐6 Other reasons, specify ……
☐99 Don't Know/Refused

Q8. How do you feel about a site that charges a small amount (i.e. $2 per dive/snorkel) that will be used for marine conservation (i.e. protecting corals and reef fish, sea turtles, whales and dolphins and other marine life)? (*Tick only one*)

☐1 Great, I am really happy to support it
☐2 Fine, it is O.K. but I am neutral
☐3 Unacceptable, I would not go to the site
☐99 Don't know/refused

Q9. Do you believe the contribution should be voluntary or mandatory? (*Tick only one*)

☐1 Voluntary ☐2 Mandatory ☐99 Don't Know/Refused

Q10. Who do you trust most in collecting and allocating the funds for marine management in Hawaii? (*Tick only one*)

☐1 Public sector (State, Federal, etc.)
☐2 Private sector (Operators, rentals, etc.)
☐3 Non Governmental Organizations (TNC, etc.)
☐4 Local communities
☐5 Public/private partnerships
☐99 Don't know/refused

Q11. If we ask you to allocate the collected funds to different actions that are aimed at improving the marine environment in Hawaii, how would you distribute these funds, percentage-wise, over the different actions (*note that it adds up to 100%*)?

☐1	Enforcing regulations (stop poaching and fish feeding etc.)	
☐2	Reducing water pollution	
☐3	Educating divers/snorkellers/public about marine environment	
☐4	Supporting research and monitoring of the coral reef	
☐5	Improving facilities (restroom, garbage bins, etc.)	
☐6	Preventing the spread of alien algae which grows over and kills corals	
☐7	Supporting local marine wardens to help to protect marine life in the area	
☐8	Lobbying for more funds from the State or Federal Government	
☐9	Creating conservation only areas (e.g. no fishing, no diving)	
☐10	Other action, ……	
	TOTAL	***100%***
☐99	Don't Know/Refused	

The remaining questions are for statistical purposes.

Q12. Where do you live (If from mainland US, specify acronym of State)? (*Tick only one*)

☐1Hawaii
If Hawaii, where you born here ➔ Y / N
☐2Mainland US
If US, fill State code (i.e. NY)! ➔
☐3 Canada
☐4 Australia/New Zealand
☐5 Japan
☐6 Other Asian country
☐7 United Kingdom
☐8 Europe (excl. UK)
☐9 Elsewhere
☐99 Don't know/refused

Q13. Sex?

☐1 Female
☐2 Male

Q14. Age?

☐ Years old
☐99 DON'T KNOW/REFUSED

Q15. What is your highest level of education completed?

☐1 Did not finish high school
☐2 High school
☐3 Some college or university
☐4 Finished college (bachelor's degree)
☐5 Advanced degree
☐99 DON'T KNOW/REFUSED

Q16. Please tell me about your household income last year.

☐1 $25,000 or less
☐2 $25,000 to $50,000
☐3 $50,000 to $75,000
☐4 $75,000 to $100,000
☐5 $100,000 to $125,000
☐6 $125,000 to $150,000
☐7 Over $150,000
☐99 Prefer not to answer

THANK YOU VERY MUCH FOR PARTICIPATING IN OUR SURVEY!