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Social carrying capacity assessment from questionnaire and counts survey: Insights for recreational settings management in coastal areas

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Abstract :

Because of demographic and tourism increase, coastal areas are facing higher numbers of recreational users. Together with other factors (environmental quality, protection status), the level of use affects the spatial distribution of users. This level also affects the quality of user experience, because beyond a certain level, the number of users results in decreased user satisfaction; this is the social carrying capacity (SCC), which depends on user and site characteristics. This study assessed the SCC in a popular coastal area and examined how it influences the spatial distribution of users. Boat and visitor counts as well as data from a questionnaire-based survey were analyzed to assess i) crowding perception, ii) factors affecting the disturbance associated with use level, and iii) user's coping strategies when managing high use levels. The results demonstrated that crowding perception and disturbances associated with use level depend on-site characteristics, use level, and user characteristics. Boat type was the main factor affecting user's coping strategy. SCC significantly differed between sites and according to the use level anticipated by users. The SCC was fulfilled at every site within the marine protected areas, except for the sites experiencing the lowest use level. This study provides novel and valuable information for the field of recreational use management, when attempting to achieve either sustainable use goals through SCC assessment or biodiversity conservation goals through the effect of SCC on the spatial distribution of pressures related to recreational uses.

Highlights

► Recreational users count and survey data were collected on same sites. ► Recreational users often under estimate the number of present visitors and boats. ► Number of boats and visitors is the main disturbance due to use level. ► Every MPA sites reached the social carrying capacity. ► Facing high use level, the coping strategy of users depends on boat type.

Keywords : Marine protected areas, Recreational users, Social carrying, capacity, Coping strategy, New Caledonia

1. Introduction

Demography and tourism are developing worldwide (Duedall and Maul, 2005), especially in coastal areas, where more users concentrate within recreational settings (Orams, 1999), leading to higher pressures on the natural environment. Marine protected areas (MPAs) aim at limiting these pressures and associated impacts (Wood et al., 2008, De Santo, 2013). Although MPAs have become more numerous and larger between 2006 and 2016, MPAs most often do not regulate the number of entrances, whether beach visitors or boaters (Shivlani and Suman, 2000; Smallwood et al., 2012a).

How recreational users are distributed in coastal areas depends on the experience sought for by users and the characteristics offered by existing recreational settings (Clark and Stankey, 1979). Among these, the anticipated or experienced number of boats or visitors was hypothesized to largely influence the selection by any user of the recreational setting (Bujosa et al., 2010). Under this assumption, changes in user numbers will alter their spatial distribution, practices (i.e. the manner in which they perform activities), and resulting pressures. A better understanding of these relationships, that is, between the number of users and their spatial distribution, is important for environmental managers to account for and anticipate subsequent anthropogenic pressures, particularly in MPAs.

Wagar (1964) defined the carrying capacity (CC) of a natural area for recreation as follows, “a quantitative limit beyond which undesirable consequences may occur.” He referred to two dimensions of CC linked to the impact of touristic and recreational activities in wild lands: i) impact on ecological state (i.e., resource degradation) and ii) impact on social conditions (i.e., a decrease in visit quality). Vourc’h (1999) clarified impact on social conditions as “the touristic level that a natural or cultural site can accept without that it decreases its quality, the visitation quality of visitors or lead to visitors’ rejection from local population.” Vourc’h (1999) definition raises the issue of the social acceptance of tourism. With these two dimensions, an assessment of CC (Saveriades, 2000) might be difficult because the use level associated with the decrease in user satisfaction might differ from that

associated with ecological degradation. The present study focused on the social dimension of CC.

Social carrying capacity (SCC) is the level of use (often, the number of visitors) for a given site, beyond which the users' quality of experience decreases or is no longer acceptable (Shelby and Heberlein, 1984). The quality of recreational experience might decrease in relation to the crowding effect and ecosystem degradation caused by high use level. SCC has been studied in terrestrial (Shelby and Heberlein, 1986; Shelby et al., 1989; Manning et al., 2002; Vaske and Shelby, 2008 ; Navarro-Jurado et al., 2013, Chen and Teng, 2016) and marine environments (Davis et al., 1995; Inglis et al., 1999; Needham and Szuster, 2011; Szuster et al., 2011). SCC has been deemed difficult to measure because it depends on individual preferences, attitudes, opinions, and experience (Lindberg et al., 1996; Navarro-Jurado et al., 2013; Mauerhofer, 2013).

Shelby and Heberlein (1984) described two components of SC: an absolute "level of use" and a level of use relative to the management goals of a given site (Lime and Stankey, 1971). Estimating the level of use is central in SCC assessment. The number of visitors is a relevant measure of the level of use, because in natural environments, crowding was negatively perceived by users (Shelby et al., 1989). In addition, users' well-being might decrease when disturbances occur, which is likely to be beyond an acceptable level of use. Users may then implement so-called coping strategies such as moving to another site (Manning, 1999) also termed displacement of users by Manning et al. (2001)]. Consequently, identifying SCC requires considering the density of users and their practices.

How to assess SCC depends on the management goal and/or scientific question addressed (Manning et Vallière, 1999; Vaske and Shelby, 2008). This study aimed to increase the understanding regarding the effects of SCC on users' spatial distribution. Based on the aforementioned considerations, characterizing the crowding perception of users was an important first step.

Several examples in the literature have demonstrated that this perception depends on the type of user and the recreational settings' characteristics (Kuentzel and Heberlein, 1992; Vaske and Donnelly, 2002; Vaske and Shelby, 2008; Mauerhofer, 2013). Heberlein and Vaske

(1977) developed an assessment method applied in greater than 180 studies (Vaske and Shelby, 2008). Their method relies on asking users to evaluate the use level they are experiencing during their trip. This estimate provides consistent information in relation to the user's experience satisfaction and SCC assessment (Shelby et Heberlein, 1986; Kuentzel et Heberlein, 1992; Navarro-Jurado et al., 2013; Brecard and De Luigi, 2016). According to our review of the literature, observed counts of visitors and boats have been compared with this perceived measure of use level perception (Diedrich and Tintoré, 2012; Diedrich et al., 2011), but this has not been the case for the estimation by users' of the numbers of visitors and boats. Characterizing the relationship between observed use level, crowding perception of users, and their effects on experience satisfaction increases the understanding and facilitates the identification of the use level beyond which a disturbance occurs and users' satisfaction is affected. Notably, the literature on this subject has not provided evidence of a significant relationship between use level and experience satisfaction (Shelby and Heberlein 1986; Manning 1999 for a review).

The effect of SCC on users' spatial distribution has been assessed by using two methods. The first requires directly asking users what they will do in the case of high use level. This method quantifies the "current risk population" (following Navarro-Jurado et al., 2013), that is, the population of users who perceive the use level as high and intend to avoid the area in such circumstances. Second is the encounter norm assessment, that is, the number of encounters users would like to see at the same time. This approach permits the consideration of several thresholds' values for use level, such as a preferred number, acceptable number, and intolerable number of encounters (Manning and Vallière, 1999, these thresholds were termed evaluative dimensions by these authors). This method also documents the probability of visiting a site as a function of its use level.

This study investigated the answers to two main questions: i) how to assess the SCC of coastal recreational settings; and ii) how SCC affects the spatial distribution of users. To answer these questions, data from visitors and boats counts surveys and questionnaire-based surveys documenting user's perceptions were collected and analyzed across sites. First, factors explaining and characterizing crowding perception were identified. Second,

factors affecting disturbance associated with use level and effectively perceived by users were assessed. Third, the relationship between these factors and the user's coping strategies in the case of high use level was studied. Lastly, SCC was assessed for each site by comparing use boats and visitors' counts with visitors' perception of use level obtained from questionnaire-based surveys.

2. Materials and Methods

2.1. Study case

New Caledonia is in tropical ecosystem approximately 1,500 km north-east of Australia. This French territory is surrounded by a large lagoon with many islets and reefs that are popular destinations for recreational users (Jollit, 2010; Gonson et al., 2016). In 2014, the population was approximately 180,000 and concentrated in the main city, Noumea, and surrounding cities (Dumbea, Paita, and Mont-Dore). The population has increased at an annual rate of 2.8% (ISEE, 2014).

MPAs with conservation goals have been created since 1981 on the closest islets and reefs to Noumea (Figure 1 – line 134). There are two MPA types, namely, natural reserves (NR) and sustainable management resource areas (SMRA), and both forbid extractive activities (fishing, shellfish collection, wood collection). NRs focuses on environmental conservation. SMRAs have economic development and environmental protection goals. For instance, the Maître islet hosts a hotel and kite surf school and is serviced by three shuttle transport companies. Amenities (e.g., permanent mooring, shelters, pontoon, and fireplaces) were installed on all the MPA islets to limit the impacts of recreational uses on the marine and terrestrial natural environments.

The six islets considered in this study differ in their geographical and managerial conditions. These differences offer a diversity of recreational conditions that can be formalized through the Recreational Opportunity Spectrum (ROS) (Clark and Stankey, 1979). According to the ROS semantic, a site is classified as modern when it is highly accessible, offers numerous amenities, and usually experiences a high use level; this is, for instance, the case of the SMRA islets like Maître. The NR islets are accessible by using the taxi-boat services operating

within these sites and near Noumea, resulting in a moderate-to-high use level. NR islets are classified as semi-modern sites according to the ROS. The other islets are considered primitive (Mbo and MbeKouen) or semi-primitive (Pandanus) sites because managerial intervention is very limited and little or no amenities are available; these sites are less accessible and, as a result, have a low-to-moderate use level. Compared with the primitive islets, the semi-primitive islets are a shorter distance to the main urban center and experience a higher use level (Gonson et al. 2017).

2.2. Data collection

2.2.1. Users' perception questionnaire-based survey

A survey was designed to collect data on users' characteristics: i) their perception of crowding, ii) factors related to crowding that disturb them, and iii) their coping strategies when managing crowding situations. The questionnaires were administrated between November 2014 and March 2015 in face-to-face interviews with recreational users during their trip to the islet. One person (aged over sixteen) was interviewed within each sampled group. A group is defined as a party of several persons who arrived on and then left the islet in the same boat or taxi-boat and spent time together while on site.

The perception of crowding is subjective and person-specific. To analyze perceptions as a function of users' characteristics, individual information was collected during the survey, such as their frequency of visits to the islets, their experiences in the area (number of years visiting the lagoon facing Noumea), socio-professional category, home city, and gender. The users were also asked about the following: i) boat type, ii) activities undertaken within the group, iii) group size, iv) trip duration and v) whether islet quietness was a motivation for site selection. Inquiring about quiet as a motivation documents which recreational experience users seek during their trip.

The perception of crowding is generally measured on a Likert scale (i.e., nine possible categories) adapted by Heberlein and Vaske (1977). To simplify the answer and avoid preferences for a central "refuge" value (i.e., a tendency to select the median neutral value), scoring was restricted to four categories and adapted from Vaske and Shelby (2008). This

adaptation was, for example, recommended by the French National Institute of Statistic and Economic Studies and has been used in the literature (see Bergere and Le Berre, 2011; Boncoeur et al. 2013; Brecard and De Luigi, 2016 for example).

Visitors were thus asked whether they felt the site was “not at all crowded,” “slightly crowded,” “moderately crowded,” or “extremely crowded.” They were also asked to estimate the number of visitors on the islet and number of boats around it at the time when the questionnaire was administered. Crowding perception is often assessed in relation to the perceived numbers of visitors or boats encountered by users during their trip. These numbers were likely to differ from the actual number of boats and visitors present at the site. Comparing the perceived number of boats and visitors estimated by users with the actual number observed is administrated and should provide relevant information on the dependence of crowding perception upon site, trip, and users’ characteristics.

As defined in the introduction, SCC refers to the use level beyond which users’ experience quality decreases. Often associated with the number of visitors or boats, quality decrease of user' experience might also depend on other events associated with crowding, like noise or disrespectful behavior (e.g., untidiness in the campground and trampling on coral reef). These criteria were termed disturbances in this study.

To increase the information regarding how users perceive crowding, the questionnaire included an open-ended question asking the user to identify disturbances related to other users. Among all possible disturbances, users were specifically asked whether the number of boats and/or visitors was one. When the answer was yes, visitors were asked the following: to evaluate the maximum number of visitors and boats they would prefer to see during their trip on the islet and the acceptable and intolerable numbers of visitors and boats. The acceptable threshold was the number above which there was a perceived disturbance associated with use level. The intolerable number was the threshold that induced the user to implement a coping strategy like displacement to another site. During the interview, the user was reminded of their estimated number of boats and visitors and of their crowding perception to increase the consistency of answers.

Finally, all interviewees were asked to select a coping strategy, in the case where they had to manage a crowded situation on the islet they had planned to visit. The following answers were proposed: i) I have no coping strategy; ii) I will stop visiting the islet during the most crowded days (e.g., weekend days and holidays) and then cope by displacing, either iii) within the same islet or iv) to another islet. The users were free to not respond to this question and declare they did not know how they would cope.

A total of 396 questionnaires were completed during five field trips operated between 9 a.m. and 5 p.m. The field trips were planned during weekend days because of the higher number of users compared with weekdays (Gonson et al., 2016), which is a concern for environmental managers. During the 2013 field work, it was observed that users did not perceive crowding during weekdays (Gonson 2017). Therefore, although the interviews conducted on weekdays would have provided additional information regarding crowding perceptions, they would also have added variability while contributing neither to identify factors affecting crowding perception nor to assess SCC. This point is further discussed in § 4.1.

The questionnaires were administrated on the islet and on boats for visitors who stayed on boats. When interviewing every group on the islet was not possible, groups were sampled to be representative of observed group sizes and locations on the islet. Location on the islet is termed on-site location factor in this study and has three categories: i) the leeward side of the islet, where users usually concentrate, ii) the windward side of the islet, and iii) staying on the boat.

2.2.2. Boats and visitors count surveys

Recreational boats were counted over a one year cycle: March 2013 to February 2014. In total, 50 field trips stratified per day type (i.e., weekday or weekend) and per quarter were undertaken. Day trips occurred between 8 a.m. and 4 p.m., and the duration was between 30 minutes and one hour. The departure times and weather conditions of trips were randomly selected within each stratum. At each islet, the overall number of boats observed (motor boat, sail boat, dinghy, and jet-ski) was recorded. Dinghies differ from so-called motor boats in that they are smaller than 5 m and the pilot sits at the rear of the boat

holding the helm of the motor. Dinghies were not counted when only used by visitors to shuttle between the main boat and the islet.

Additional counts of recreational boats and visitors on the islet were achieved by using the same method between November 2014 and March 2015, before conducting interviews. Counting visitors on the islet took between five and 30 minutes depending on islet size.

2.3. Data analysis

2.3.1. Data representativeness and consistency between 2013 and 2014

Crowding perception may depend on factors relative to individual users, islet settings, or current number of boats. The mean number of boats per trip observed during the questionnaire survey in 2014 was compared with the mean number of boats per trip observed at each islet in 2013, based on a Kruskal-Wallis test. The consistency of the boat number distributions in 2014 and 2013 was tested using a Mann-Whitney test. The mean duration of the users' trip was computed per islet, to inform the experience sought by users and their motivations for visiting a given islet.

The representativeness of the sample regarding the overall population of visitors was assessed from the mean sampling rate over trips at each islet. This rate was the ratio between the number of visitors interviewed and total number of visitors observed during the 2014 survey. In addition, the proportions of users' per boat type based on the boat counts in 2013 and in the questionnaire sample in 2014 were compared.

2.3.2. Factors affecting estimation of use level and perception of crowding by interviewees

To understand how factors related to user, trip, site and use level affect the estimation error of crowding perception and SCC, perceived and observed numbers of boats and visitors were analyzed.

The discrepancy between the numbers of visitors and boats perceived by users and their real observed values depends on the users' perception (Kuentzel and Heberlein, 1992) and real number of visitors and boats. The difference estimation error was computed and divided by

the observed number of boats or visitors. The ratio, hereafter called the estimation error, is written as follows: $$\alpha_i = \frac{N_i^{est} - N_{t_i}^{obs}}{N_{t_i}^{obs}} \quad (1)$$

With α_i, the estimation error N_i^{est} is the number of visitors (or boats) estimated by user *i*, and $N_{t_i}^{obs}$ is the number of visitors (or boats) observed during the survey on the day t_i when user *i* was interviewed. A positive (resp. negative) value of α_i indicates an overestimation (resp. underestimation) by user *i*.

A chi-squared test was used to test the effect of factors on crowding perception. A Kruskal-Wallis test was used to test the effects of the same factors on the estimation error α for the number of visitors and number of boats. The factors considered were either related to i) islet factors such as islet identity, ROS category, and protection status (Figure 1); ii) user's trip, that is, boat type, activity, on-site location, duration of the trip, and group size; iii) crowding, that is, relative crowding level, quietness as an islet selection criterion, number of visitors and/or boat perceived as a disturbance; and iv) user identity, that is, socio-professional category, age, home city, gender, trip frequency, experiences in the lagoon. The relative crowding level in iii) is a binary variable that is high (resp. low) if the number of users during the 2014 survey exceeded (resp. was lower than) the median number of users observed in 2013. This binary variable was computed for the number of boats and number of visitors.

2.3.3. Relationship between disturbances and coping strategies

The relationships between coping strategies and disturbances based on boat type and islet were explored through multiple correspondence analysis (MCA). Coping strategies and disturbances were the active variables of the MCA. Boat types and islets were used as illustrative variables and thus projected on the factorial axes to demonstrate their relationships with the active variables without contributing to factorial axes. The associations among the categories between the qualitative variables were tested by using a one-way analysis of variance for each factorial axis with respect to any category whether active or illustrative, also termed test-values (additional details in Lebart et al. (1984) and Pelletier and Ferraris (2000)).

2.3.4. Social carrying capacity assessment

SCC was assessed by gauging the observed numbers of boats and visitors estimated from the 2013 survey with respect to the preferred, acceptable, and intolerable threshold values for these numbers obtained from the interviews (see subsection 2.2.1).

Each of the three value (respectively corresponding to preferred, acceptable, and intolerable levels thresholds) was modified as follows to account for individual estimation error (see section 2.3.2) (see eq. 1).

$$E_i^c = E_i + \alpha_i E_i \quad (2)$$

with E^c_i as the modified estimation, E_i is the estimation given by user *i* for a given threshold, and α_i is the estimation error. This ensures that E^c_i relates to the actually observed numbers and that the estimations from all users are consistent.

The numbers of boats and visitors on weekend days were estimated from the 2013 survey, which was a year-round survey. However, visitors on the islets were only counted during the 2014 survey. An estimate of the number of visitors at each islet and for 2013 weekend days was obtained by multiplying the number of observed boats on weekend days during boat counts in 2013 with the average group size and average proportion of visitors disembarking on the islet observed during the 2014 survey. The latter averages were computed per boat type. Notably, this estimate is an overestimate as all visitors do not disembark on the islet at the same time.

These estimated numbers of boats and visitors were further divided by the surface area of the islet for the number of visitors and surface of the mooring area for the number of boats. Thus SCC was quantified in terms of density of visitors or boats. These estimates were then compared with their respective preferred, acceptable, and intolerable thresholds calculated from eq. (2); the comparison relied on a Wilcoxon test.

3. Results

3.1. Data representativeness and consistency between 2013 and 2014

The sampling rate ranged from 13.6% on the Signal islet to 32.5% on the Mbe Kouen islet. The overall sampling rate among field trips and islets was 16%. These rates are reasonably large to consider the samples as representative of the surveyed population during each field trip.

At each islet, the number of boats counted during the 2014 survey did not significantly differ from the boats counted during weekend days in 2013 (Kruskal-Wallis test, $p>0.05$) (Table 1 – line 315). Thus, the crowding conditions observed in 2014 can be hypothesized as being representative of those observed during the weekend days in 2013. By contrast, in 2013, the number of boats per trip during weekdays was almost ten times lower than during weekend days.

Likewise, the proportion of users per boat type and per islet did not differ between 2014 and 2013 (Mann-Whitney test, $p>0.05$), except for the Maître islet, where the proportions of sailboats and motor boats were higher in 2014 than in 2013 with, by contrast, a lower proportion of taxi-boat users.

Regarding trip duration, notably, on the islets most proximal to Noumea (Maître, Larégnère, and Signal, which are MPA), most visitors do not stay overnight; this result is in contrast with the unprotected islets where visitors usually spend at least one night. Thus, the experience sought by users is likely to differ between the MPAs and unprotected islets also because of the distance to the city.

3.2. Factors affecting crowding perception

Estimation error is highly variable among users, ranging from -0.88 to 7.11 for the number of visitors and from -0.86 to 2.57 for the number of boats. Estimation error of the number of visitors was found to significantly depend on the islet and its corresponding ROS category, on-site location of users, and home city (Table 2 – line 335). Specifically, for boat number, the estimation error significantly varied according to user's experience in the area; notably,

this was the case for the visitors and boats estimation error according to the observed use level compared with the usual one. Hence, at a modern islet, the number of visitors was overestimated by 13%; at semi-modern sites, it was underestimated (-23%). Users interviewed on the boat underestimated the number of visitors by 32% when on the leeward side of the islet; by contrast, where users concentrated, they slightly overestimated it (3%).

Users living outside New Caledonia, considered tourists, overestimated the number of visitors (31%), and Noumea residents underestimated it (-13%). Newcomers to the islet strongly underestimated (-48%) the number of boats, whereas users with more experience in the area only slightly underestimated this number, and their estimation error was then not significant: ranging from -21% to -12%. At relatively low use levels, the estimation error was lower than at higher use levels: a -20% versus -27% underestimate for the number of boats and a 0.1% overestimation versus 5% underestimation for the number of visitors. Among the factors considered, protection status, boat type, activity, trip duration, group size, quietness as islet selection criterion, number of boats or visitors considered a disturbance, age, socio-professional category, and gender did not significantly affect the estimation error for the number of boats or visitors.

Overall, 58% of the interviewed users felt not crowded at all, 26% slightly crowded, 14% moderately crowded, and 3% extremely crowded. These proportions significantly differed between islets, ROS categories, boat types, and user's location on the islet. These proportions also depended on the relative use level: i) whether the interviewees were looking for quietness or not, ii) whether they considered the number of visitors or boats as a disturbance or not, and iii) irrespective of user age (Table 3 – line 352).

For modern islets, the proportion of users feeling not crowded at all was higher than at other ROS categories' islets. For semi-modern islets, the proportion of users feeling slightly and moderately crowded was high. For semi-primitive islets, the proportion of users feeling moderately crowded was high.

Crowding perception by users did not significantly differ between protection status. Users who arrived in motor boats or dinghies felt more crowded than users using other boat types. Jet-skiers felt less crowded on average. Users located on the leeward side of the islet often

felt more crowded than users on boats or on the windward side of the islet. When use level was high, users logically felt more crowded.

The proportion of users feeling crowded (either moderately or extremely) was much higher for users choosing the islet for its quietness. When users looking for quietness were not satisfied with the actual use level, they tended to feel crowded more often. Crowding perception was higher for users potentially disturbed by the number of visitors and, to a lesser extent, for users disturbed by a large number of boats. By contrast, crowding perception was much lower for interviewees for which the number of boats or visitors was not considered a disturbance. Finally, younger users felt on average more crowded than older users. Among all factors tested, socio-professional category, place of residence, gender, experience in the area, and trip frequency did not affect crowding perception.

The most cited disturbances were the number of visitors (66%) and boats (53%). Crowding perception was observed to be highly correlated with use level. Other most cited disturbances were noise (26% cites), disrespectful behaviors (either with regarding the visitors or environment) (22%), and speed activities (e.g., jet-skiing, kite surfing, and windsurfing) (13%) (Figure 2 – line 379). Additional disturbances, namely, the presence of waste, pets, beached boats, and traffic along with insufficient space and extant infrastructure were cited by less than 8% of users. Perceptions related to these less cited disturbances contrasted among users, for example, extant infrastructure on the islet was considered a disturbance and a means of enhancing space and limiting islet saturation.

3.3. Relationship between disturbing criteria and coping strategies

The first axis of the factorial plan explained most of the data variance (89% versus 6% for the second axis) (Figure 3 – line 387). The first dominant axis distinguished users disturbed by a high number of visitors or boats and who would use displacement as a coping strategy, either within site or between sites, from users responding to other disturbances or not responding to any disturbance. Consequently, these users never displaced. Users potentially displacing generally arrived by motorized boat and located at less accessible islets. Sailboats did not implement any coping strategy.

For users disturbed by a large number of visitors, the displacement coping strategy was likely to occur within the islet. This was preferentially observed at the Mbo and Signal islets and, in particular, for taxi-boat users and dinghies. The within site displacement strategy was more frequently observed at larger islets. At the islets nearest to the coast (Maître, Pandanus and Larégnère), users did not implement any coping strategy (displacement or visiting on less crowded days).

3.4. Social carrying capacity assessment

Among users disturbed by a high number of visitors or boats, a large proportion could estimate either a number of boats or number of visitors for each evaluation dimension (Figures 4 and 5 – line 398). This answer rate was generally higher for low values, that is, less crowded islets, and for the preferred and acceptable threshold values.

Except for the Pandanus and Mbo sites, the observed use (i.e., boat or visitors) density was significantly higher than the users' preferred threshold values (Figures 4 and 5). At Signal Is., observed boat density was significantly lower than the intolerable threshold value and comparable to the acceptable threshold value (Figure 4), but boat and visitor densities did not significantly differ from the intolerable threshold value.

For the Maître, Larégnère, and Mbe Kouen islets, boat and visitor densities were similar in distribution to intolerable threshold values but could not be statistically distinguished from acceptable values. Thus, at these four islets, the SCC was reached. On the Maître, Larégnère and Mbe Kouen islets, this phenomenon might result in implementing coping strategies either for the boats' or visitors' density. By contrast, on Signal, no coping strategy was likely to be implemented based on the interview results.

For the Pandanus Islet, the observed user density for visitors and boats did not significantly differ from the threshold values. Thus, on this islet, SCC was reached only during the most crowded days (e.g., weekends during holidays). Mbo was the only islet where the observed visitors and boats densities were significantly lower than intolerable threshold values and did not significantly differ from preferred threshold values. Notably, on this islet, the

acceptable boat density was significantly higher than those observed. Thus, the Mbo islet was observed to be the only islet in this study where the SCC was not reached.

Notably, the estimation of threshold values from users strongly differed among sites for boat and visitor densities.

4. Discussion

4.1. Social carrying capacity and its link with spatial distribution of recreational users depend on settings and boat type

Based on quantitative and complementary data on the recreational users, the factors affecting the perception of crowding by boaters and visitors were investigated, and an assessment of SCC of recreational outdoor settings in an MPA network was proposed. The results showed that crowding perception was firstly and clearly explained by users' density. However, as demonstrated in the literature, crowding perception and sites' SCC are also affected by the expected users' density (Manning, 1985; Inglis et al., 1999), user experience (Arnberger and Brandenburg, 2007; Inglis et al., 1999), and setting characteristics (Cole and Hall, 2009). ROS setting classes, defined by social and managerial conditions, were helpful to assess SCC. The effect of SCC on recreational users' spatial distribution depended on boat type and their displacement capacity, for example, motorboat users were more willing to displace than sailboats users. In addition to use level, specific disturbances, such as noise and disrespectful behaviors, can also determine the implementation of a coping strategy.

Within the lagoon facing Nouméa, Gonson et al. (2017) demonstrated that site accessibility was the primary selection criterion for the choice of a recreational setting, but users can also consent to spend more sailing time to visit less accessible islets if they prefer low use levels. The results in this study indicate that in addition, the choice of an adequate setting is more determined by the expectations of individuals within a group looking for a specific experience than by the user and boat type category. In addition, the high proportion of users able to identify threshold values of use level (preferred, acceptable, and intolerable visitor and boat densities) further suggests that the quality of experience sought by most

recreational users strongly depends on use level. Consequently, and related to the concept of SCC, use level leads to a spatial distribution within and among recreational settings that is specific to use categories. Hence, Maître Islet is a modern (ROS category) site and characterized by a heavy use level with a higher proportion of tourists and of speed activity users than at other sites (Gonson et al., 2017). Thus, visitors of this islet perceived less crowding, either because they have less experience in the area or are not particularly seeking quietness. Moreover, they are less likely to go to other sites when they do perceive crowding, because tourists have less displacement capacity. Speed activities are practiced away from the crowded mooring areas and beaches and thus unlikely to displace. In addition, such islets being particularly accessible from Nouméa, a high use level is likely to be expected by users. Consequently, use level in this islet continues to increase at a high rate (Gonson et al., 2016), whereas the SSC has already been reached.

Similar evolutions are to be expected at two other islets in the same area categorized as modern sites (not investigated in this study, see Gonson 2017): Unlike Maître, which depends on speed and tourism, these islets host activities that specifically rely on environmental quality, for example, snorkeling on a submarine trail for Canard Islet and scuba diving at Amédée Islet. The environmental impact of these activities and of the high use level have been demonstrated in the literature (see reviews by Davenport and Davenport, 2006; Hardiman and Burgin, 2010; and Whitfield and Becker, 2014). Hence, at these two islets, reaching the SCC is a concern for private operators of these sites because a satisfactory ecological status is required to maintain the quality of the user's experience.

At semi-modern islets, the SCC was reached or nearly reached. These islets are NRs with conservation objectives. Their environmental quality attracts many visitors and boaters (Gonson et al., 2017). Therefore, the quality of their experience may be affected by ecological impacts (Priskin, 2003), which are often perceived by users as being associated with use level. Site attractiveness thus influences reaching the SCC. Notably, the semi-modern islets studied here differed in land area and plant cover. Hence, compared with the relatively large Signal islet, the SCC is more likely to be reached on a small islet like Larégnère Islet, where the number of visitors is actually considered the major disturbance associated

with crowding. The number of sailboats was found to be greater around this small islet than around Signal islet. Sail boat displacement capacity is limited by weather conditions and a slow pace, compared with motor boats, which may also explain why sailboats do not show displacement coping strategies. In addition, sailors are less affected by visitors' density. Indeed, when confronted to crowded islets, as they often stay overnight (Gonson, 2017), they can disembark when fewer visitors are on the islet.

For the semi-primitive Pandanus Islet, crowding perception was found to be similar to semi-modern islets, although user density was much lower. This result might be explained by the lower expected numbers of boats and visitors (Manning, 1985; Inglis et al., 1999). Surprisingly, at this islet, observed users' densities were rated as comparable to the "preferred" threshold but also sometimes considered as intolerable as a function of the day-to-day highly variable use levels. Variable weather conditions, seasons, and holidays have been demonstrated to influence the spatial distribution of users (Kuentzel and Heberlein, 1992; Smallwood et al., 2012a; Smallwood et al., 2012b; Smallwood, 2011; Gray et al., 2010; Dalton et al., 2010; Widmer and Underwood, 2004; Balaguer et al., 2011; Navarro-Jurado et al., 2013), especially in this area (Gonson et al., 2016). Such variability interferes with crowding perception and SCC assessment.

In this study, SCC was assessed based on a year-round survey, encompassing a wide range of conditions. It can be hypothesized that conditions fostering a high use level at most accessible sites result in higher numbers of users at semi-primitive islets through the displacement of users most disturbed by crowding. This increase in user number is also concurrent with a demographic increase in the proximate towns (Gonson et al 2016) where several marinas are installed. This situation entails more variable user numbers than at other islets, resulting in contrasted crowding perceptions among users.

At primitive islets, the proportion of users perceiving crowding is similar to semi-modern and semi-primitive islets; however, the distribution of use levels matches quite well with that of the preferred threshold value, indicating that the SCC is not reached on the primitive islets. The high proportion of sail boats, which are less affected by crowding and have fewer displacement coping strategies, could explain this result. That is, because these users are

most often overnighters, cognitive coping strategies (e.g., staying on the boat during the most crowded period of the day) are likely to occur and diminish the crowding perception (Shelby and Heberlein, 1986).

Our results may be related to the concept of limit acceptable change (LAC), which refers to the amount of change, in this case, the numbers of visitors deemed acceptable by users. LAC has been studied in recreational settings (McCool, 1994), protected areas (McCool, 1996), and coastal areas for recreational boating activity (Diedrich et al., 2011). In this study, the number of users increased much more at the most accessible islets than at the primitive and semi-primitive islets (Gonson et al. 2016). In parallel, our results showed that SCC was more often reached on these most accessible islets. These findings highlight the link between SCC and LAC.

4.2. Assessing Social Carrying Capacity by integrating interview and count data

In this study, the survey data (usually used for assessing SCC in recreational settings) were analyzed together with boat-count data obtained from a year-round survey. Navarro-Jurrado et al., (2012) identified a threshold value for visitors' density to study SCC on Spanish beaches. However, most studies have been based on the number of divers (Bentz et al., 2015; Szuster et al., 2011), snorkelers (Needham et al., 2011), visitors (Manning et al., 2002; Needham et al., 2008 ; Kim and Shelby, 2011), or boats (Needham et al., 2011; Bentz et al., 2015), beyond which, the perception of crowding either increases (Kim and Shelby, 2011) or is associated with an unacceptable use level (Manning et al., 2002 ; Needham et al., 2008; Bentz et al., 2015).

Other setting characteristics have been demonstrated to affect users' experience (Cole and Hall, 2009) and crowding perception (see Manning, 1999 for a review), such as the surface available to users, as demonstrated in the studies based on the photography of mooring areas (Needham et al., 2011) or trails (Manning and Valliere, 1999; Manning et al., 2002; Needham et al., 2004; Kim and Shelby, 2011). By considering density instead of number, the comparison among sites was easier and a better understanding of the influence of site

characteristics other than site surface area on crowding perception, and thus on SCC, was possible.

Monitoring recreational use in marine environments is difficult and data are often absent or scarce (Smallwood et al., 2011). Consequently, few studies have been able to quantitatively compare information on crowding perception and SCC with visitor- or boat-count data representative of intra-annual variability. Use level data considered in the literature has often corresponded to average or elevated numbers of users at year scale (Leujak and Ormond, 2007; Bentz et al., 2015; Salerno et al., 2013), rather than at the day level, where the individual perception of crowding occurs, thus making it the appropriate temporal scale for crowding perceptions.

We acknowledge that the 2014 interviews were conducted only on weekends. Based on 2013 observations (Gonson 2017), weekday users did not perceive any crowding. Interviews conducted on weekdays would provide additional information regarding crowding perceptions, mainly to identify which users are likely to prefer going out on the lagoon on weekdays as a coping strategy with respect to anticipated weekend crowding. But they would not provide information on crowding situations and factors affecting the perception of these situations. Notably, in 2013 and in previous years (Gonson et al. 2016), use level on weekdays was on average ten times lower than during weekends. Regarding SCC assessment, additional interviews on weekdays would primarily affect the distribution of preferred threshold values but should not affect that of intolerable threshold values.

Shelby and Heberlein (1986) developed a scale to assess the SCC of a site based on the proportion of users with a given crowding perception. Our approach relied on the joint use of count and interview data in addition; the purpose was to independently evaluate the users' estimation of the use level and correct their estimation as well as ii) assess the SCC of recreational outdoor settings and its potential effect on users' spatial distribution. SCC was assessed based on users' estimations of use level for several evaluative dimensions (preferred, acceptable, and intolerable) and annually representative use level data at the day scale. This quantitative approach, with its several evaluative dimensions, enabled this study to define a meaningful threshold for use level at a set of sites with distinct characteristics.

Furthermore, SCC assessment accounts for the use level varying between days depending on weather conditions, season, and day type (Gonson et al., 2016), by considering data from a year-round survey. Only weekend-related data were used because in this area, use level on weekdays is low compared with weekend days. The users interviewed on weekdays did not perceive any crowding (unpublished data, Gonson 2017). (Recall that one of the favorite coping strategies for users who arrived on a taxi-boat was to visit on less crowded days.)

4.3. Management implications

Islets located in the lagoon facing Noumea display diverse geographical, social, and managerial conditions. Such diversity provides a variety of user experiences, as demonstrated in the Great Barrier Reef Marine Park (Shafer and Inglis, 2000) and in the same study area (Gonson et al., 2017). Settings' management thus satisfies users' specific practices (Brown and Driver, 1978). However, for all these sites, at least 25% of users perceived crowding as bearing no link with user density, that is, in this case, site-specific regulation of practices can enhance the SCC.

Modern islets host a large population of tourists and specialized users and are subject to high use levels. Because these users are less affected by crowding, use level is likely to increase with demography and tourism development, with the critical issues being managing environmental and social impacts. Concerning the environmental impacts, signage describing the natural environment and existing regulations are posted at these islets. However, practical information about best practices aimed at reducing user impact on the environment should also be made visible. Moscardo et al. (2001) found that, at the Great Barrier Reef Marine Park, tourists were highly concerned for the well-being of the reef but did not have sufficient knowledge to adapt their practices to decrease their environmental impact.

For social impacts, activities undertaken by users in such multi-use managed areas can be conflicting (Widmer and Underwood, 2004). Hammit and Cole (1998) found that actual or potential conflicts among uses are an additional factor contributing to crowding perception. Thus, management measures for limiting interactions between conflicting practices should

be considered and could include spatial and/or temporal regulation of activities. For example, speed activities, which are most disturbing to visitors who value quietness, could be banned on the leeward side of the islet, where beach and snorkeling activities take place. Another measure could be to ban the most disturbing activities when use level is expected to be high. In the same area, such conditions were identified to occur during the warm season and on weekends (Gonson et al., 2016). For example, this ban might apply to jet-ski activity, the second most cited disturbance after user density.

At semi-modern islets, in this study, the NRs, the majority of islet users were New Caledonian residents. Eder and Arnberger (2012) found that resident users were more attached to nearby natural settings and more concerned regarding their utilization (Eder and Arnberger, 2012) and natural state (Cole and Hall, 2009). Management actions, such as information and education, should efficiently reduce the impacts of uses on the natural state.

Primitive and semi-primitive islets were characterized by lower use densities. Although they are not subject to regulations, the pressures related to recreational uses were lower at these sites than at NRs (Gonson et al., 2017). Users tended to visit these sites for quietness (Gonson et al., 2017). Unfortunately, the increasing number of inhabitants in nearby cities and propagation of users from more crowded islets are likely to increase user densities in the near future. Because practices are not regulated at these sites, the effects on the natural environment and crowding perception are hence expected to increase. Additionally, the relationship between use level and natural impacts is curvilinear, that is, a relatively small increase in pressure causes a marked impact where the pressure level has previously been low (Cole, 2004; Milazzo et al., 2002).

These unprotected islets, especially semi-primitive islets are quite accessible for proximal cities users and they have indeed experienced an increasing pressure level in recent years (Gonson et al., 2017). Limiting access to these islets could be desirable to preserve environmental quality and offer a quiet wilderness experience for users. Such management actions were recently undertaken at Mbe Kouen islet, where landing on the islet is forbidden

during the bird nesting period. Assessing the effectiveness of this measure would show the relevance of this measure and facilitate its application on other islets.

Several studies have shown that evidence of human-induced effects, such as the presence of litter and trampling (both underwater and inland), increased the perception of crowding by users (see Ormsby et al., 2004 for a review). Limiting these pressures should decrease impact and increase SCC. Amenities and built facilities (e.g., trash bins and toilets) are complementary management options but may decrease the enjoyment of users looking for a wilderness experience and increase their crowding perception (Shafer et al., 1998). A balance between use regulation and built facilities must be found in such MPAs to satisfy the wilderness experience aspect and limit the ecological impacts. Studying the impact of recreational uses on ecosystems through collection and joint analysis of appropriate ecological data should be undertaken concurrently with SCC assessment for practice regulation and to assess users' enjoyment of their trip—especially within MPAs.

This type of work was undertaken within the same AMBIO research project at the scale of the south-west lagoon of New Caledonia, an area encompassing the one in this study. The aim was to analyze data on sensitive species groups (fish and birds) and habitats (coral reefs and seagrass) to find evidence of the possible effects of recreational practices (fishing, anchorage) (Gonson 2017) and infrastructure.

5. Conclusion

With the increase in the number of recreational users in coastal areas and MPAs, crowding has become a major concern for management and raises the issues of SCC. However, crowding perception and its link with users' spatial distribution and SCC has been poorly documented. In this study, boat counts, visitor counts, and interviews were used to assess SCC at several sites corresponding to distinct outdoor recreational settings and explore its relationship with users' spatial distribution. User's crowding perception and several evaluative dimensions of crowding were assessed from the questionnaires. The ROS was found to be relevant to address and discuss SCC-related issues, together with major explanatory factors such as user's experience and expectations regarding use level.

Furthermore, in these recreational settings, SSC was found to also depend on the magnitude of change in use level. Boat type was identified as a determining factor for user's spatial distribution, because this factor is tightly linked to users' displacement capacity. Use level was the main criterion associated with crowding perception, either in number of boats or visitors. The outcomes of this study indicate critical factors for management measures aimed at increasing SCC, thereby enhancing recreational users' satisfaction and reducing the risk of conflicts between users.

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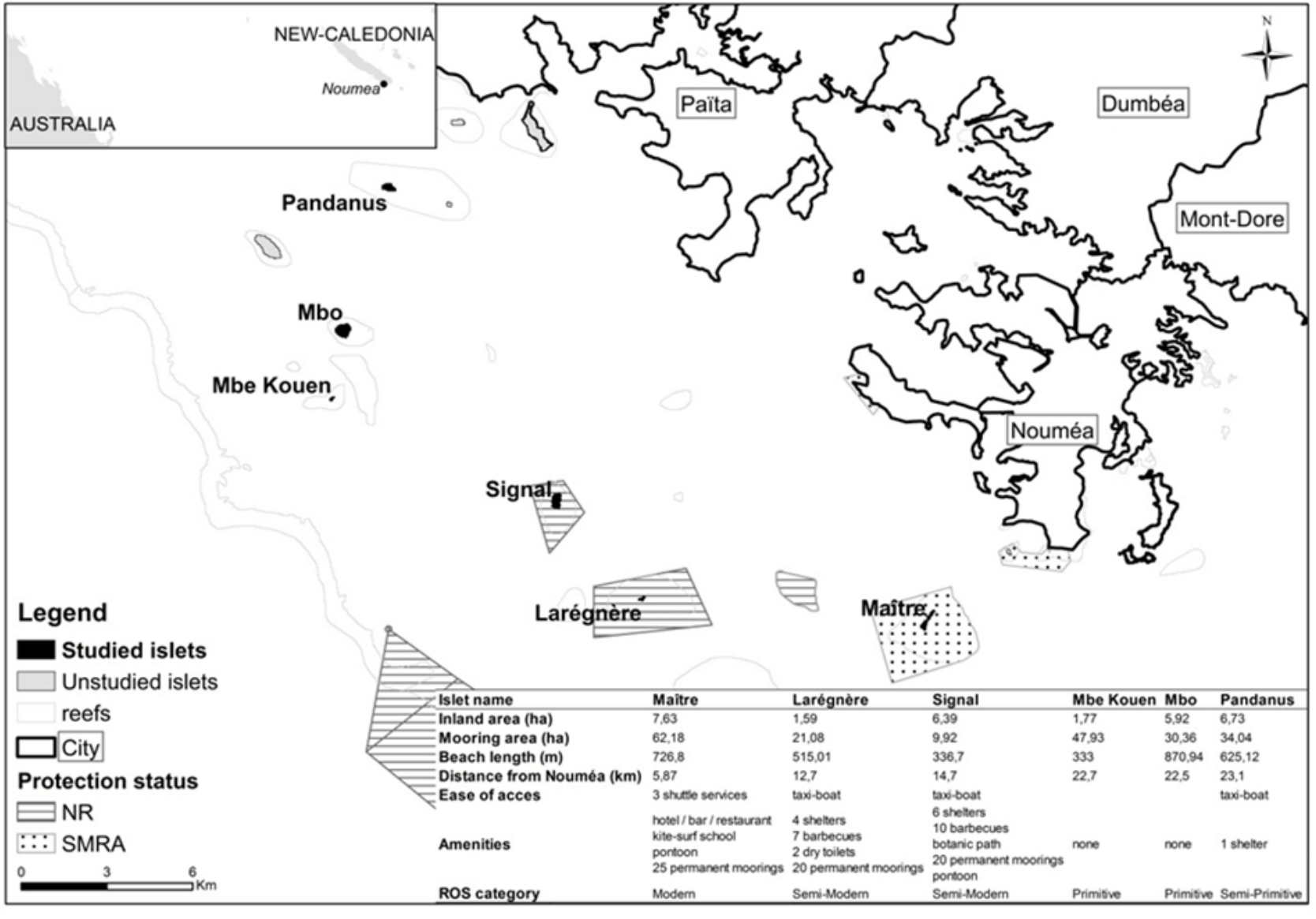
Fig. 1. Islets and MPAs considered in this study, with their geographical and managerial characteristics (line 134).

Fig. 2. Proportion of users citing disturbance criteria other than boat and visitor numbers (line 379).

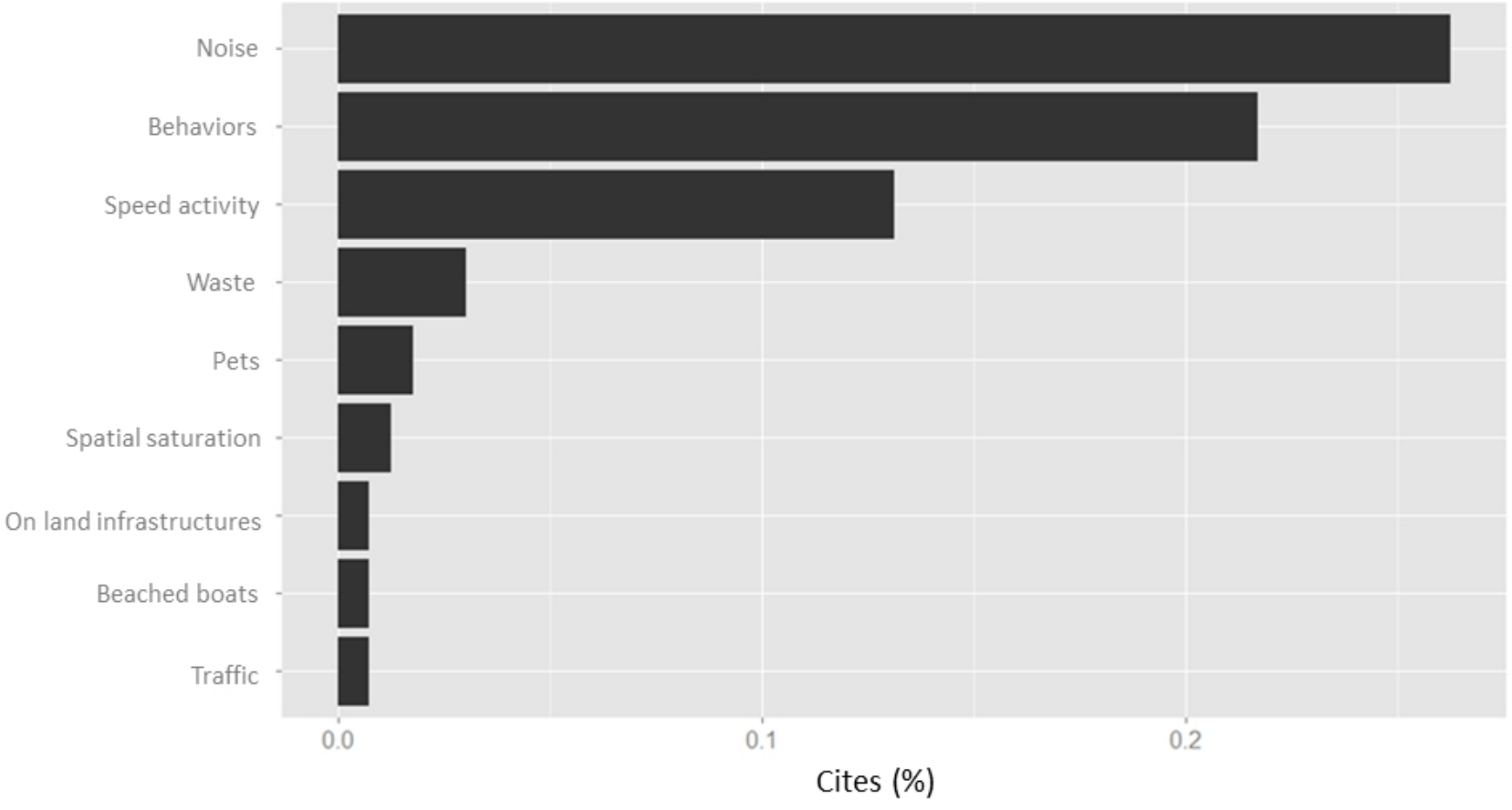
Fig. 3. Projection of disturbance criteria (large black italic font) and coping strategies (large grey font) on the first factorial plan of the MCA. Islets (small dark grey italic font) and boat types (small light grey font) were projected in addition (line 387).

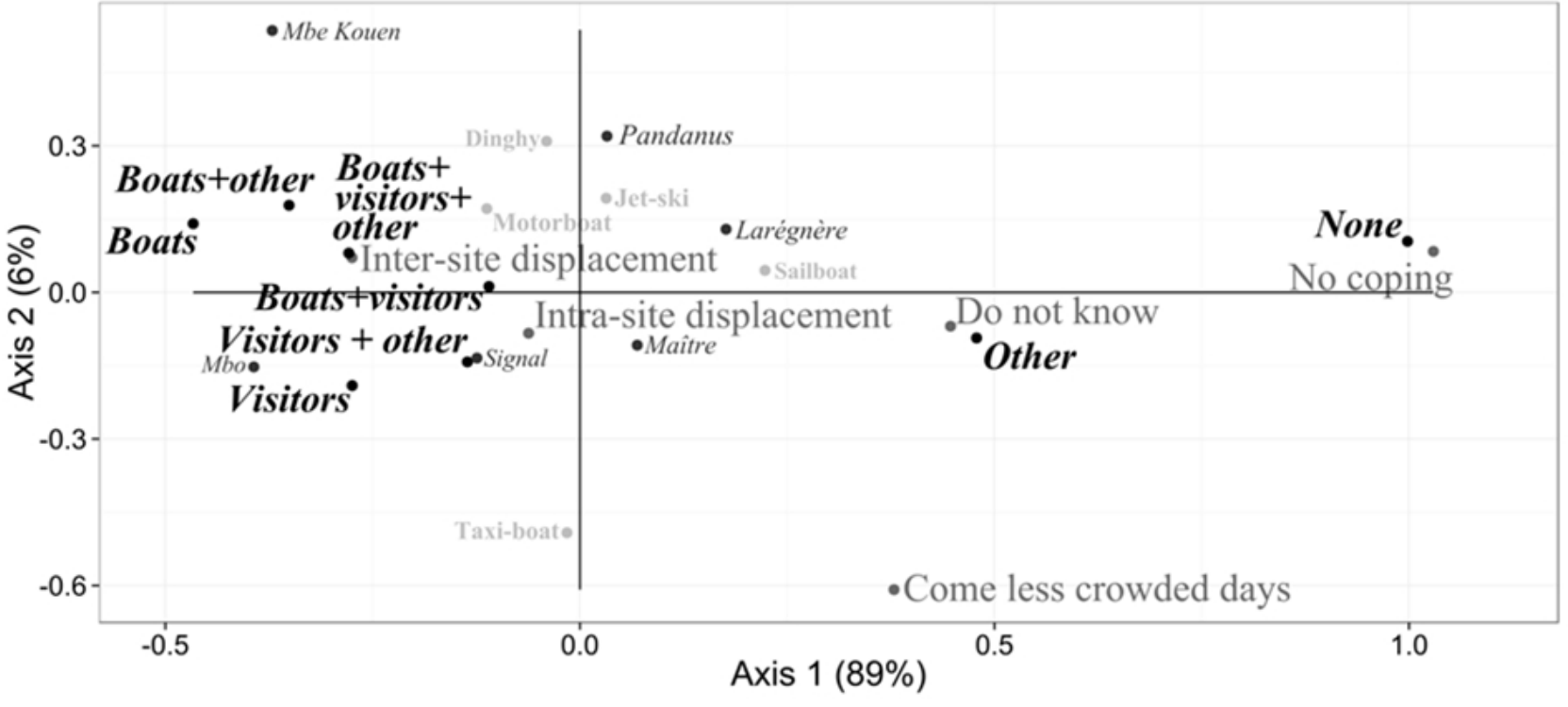
Fig. 4. Boxplots of boat density threshold values obtained from interviews (in white and grey). For each site, a boxplot was plotted per threshold value: (preferred (white), acceptable (light grey) and intolerable (dark grey). Boxplots in black correspond to boat densities per trip observed during weekend days in 2013. The percentages reported underneath boxplots are the proportion of users able to estimate a boat number threshold value. Note that only users considering a high number of boats as a disturbance were asked to estimate these values. The significance of the Wilcoxon test (see § 2.3.4) were reported above each boxplot with *: $p < 0.05$; **: $p < 0.01$; and ***: $p < 0.001$ (line 398).

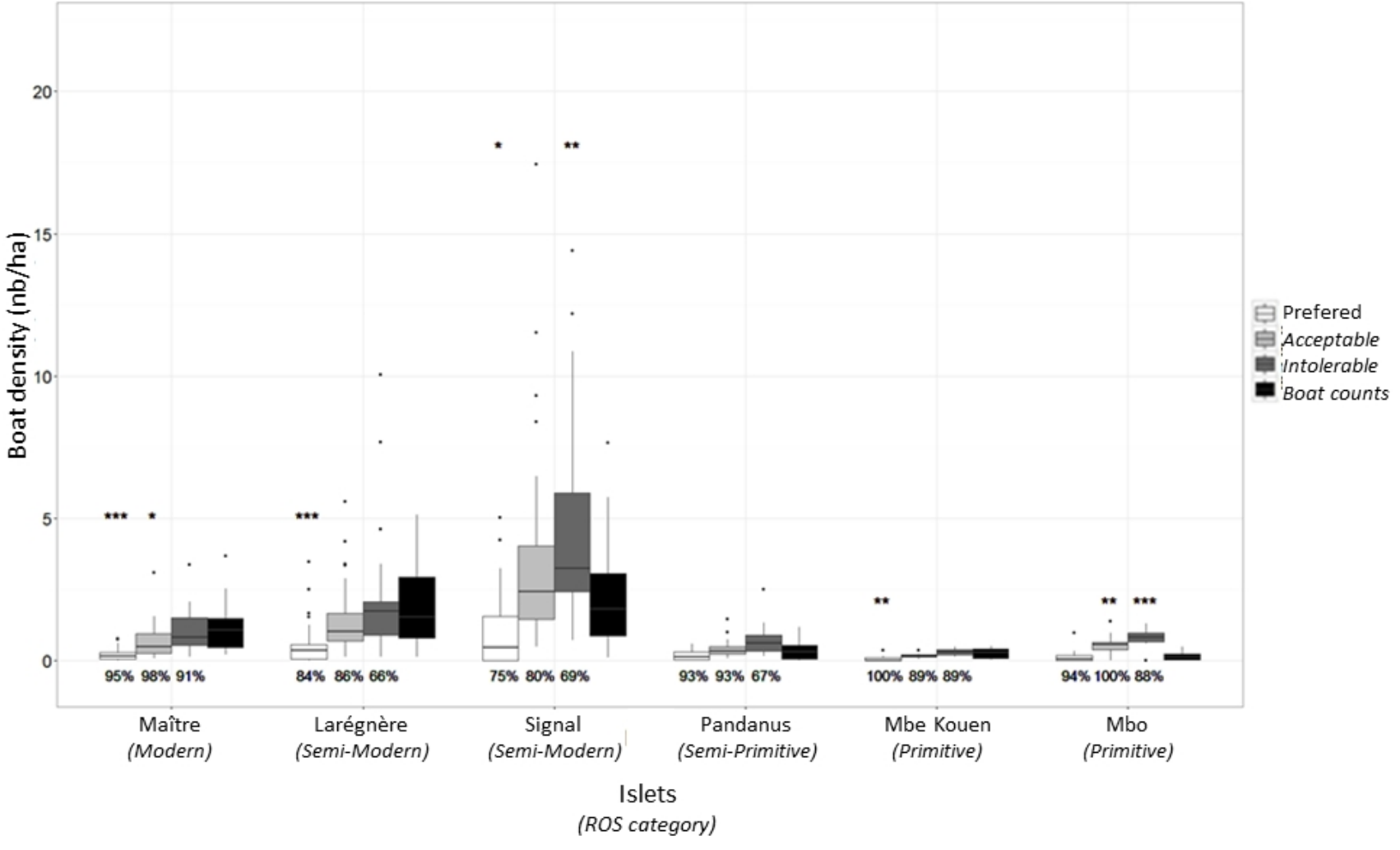
Fig. 5. Boxplots of visitor density threshold values obtained from interviews (in white and grey). For each site, a boxplot was plotted per threshold value: (preferred (white), acceptable (light grey) and intolerable (dark grey). Boxplots in black correspond to boat densities per trip observed during weekend days in 2013. The percentages reported underneath boxplots are the proportion of users able to estimate a boat number threshold value. Note that only users considering a high number of boats as a disturbance were asked to estimate these values. The significance of the Wilcoxon test (see § 2.3.4) were reported above each boxplot with *: $p < 0.05$; **: $p < 0.01$; and ***: $p < 0.001$ (line 398).



Islet name	Maître	Larégnère	Signal	Mbe Kouen	Mbo	Pandanus
Inland area (ha)	7,63	1,59	6,39	1,77	5,92	6,73
Mooring area (ha)	62,18	21,08	9,92	47,93	30,36	34,04
Beach length (m)	726,8	515,01	336,7	333	870,94	625,12
Distance from Nouméa (km)	5,87	12,7	14,7	22,7	22,5	23,1
Ease of acces	3 shuttle services	taxi-boat	taxi-boat			taxi-boat
Amenities	hotel / bar / restaurant kite-surf school pontoon 25 permanent moorings	4 shelters 7 barbecues 2 dry toilets 20 permanent moorings	6 shelters 10 barbecues botanic path 20 permanent moorings pontoon	none	none	1 shelter
ROS category	Modern	Semi-Modern	Semi-Modern	Primitive	Primitive	Semi-Primitive


Noise
Behaviors
Speed activity
Waste
Pets
Spatial saturation
On land infrastructures
Beached boats
Traffic
0.0
0.1
0.2
Cites (%)


Mbe Kouen
Dinghy
Pandanus
Jet-ski
Motorboat
Larégnère
Sailboat
Boats+other
Boats+ visitors+ other
Boats
Inter-site displacement
Boats+visitors
Intra-site displacement
Visitors + other
Signal
Maître
Mbo
Visitors
Taxi-boat
None
No coping
Do not know
Other
Come less crowded days
0.3
0.0
-0.3
-0.6
-0.5
0.0
0.5
1.0
Axis 2 (6%)
Axis 1 (89%)


Boat density (nb/ha)
20
15
10
5
0
***
*
***
*
**
**
**
***
95% 98% 91%
84% 86% 66%
75% 80% 69%
93% 93% 67%
100% 89% 89%
94% 100% 88%
Maître
(Modern)
Larégnère
(Semi-Modern)
Signal
(Semi-Modern)
Pandanus
(Semi-Primitive)
Mbe Kouen
(Primitive)
Mbo
(Primitive)
Islets
(ROS category)
Prefered
Acceptable
Intolerable
Boat counts

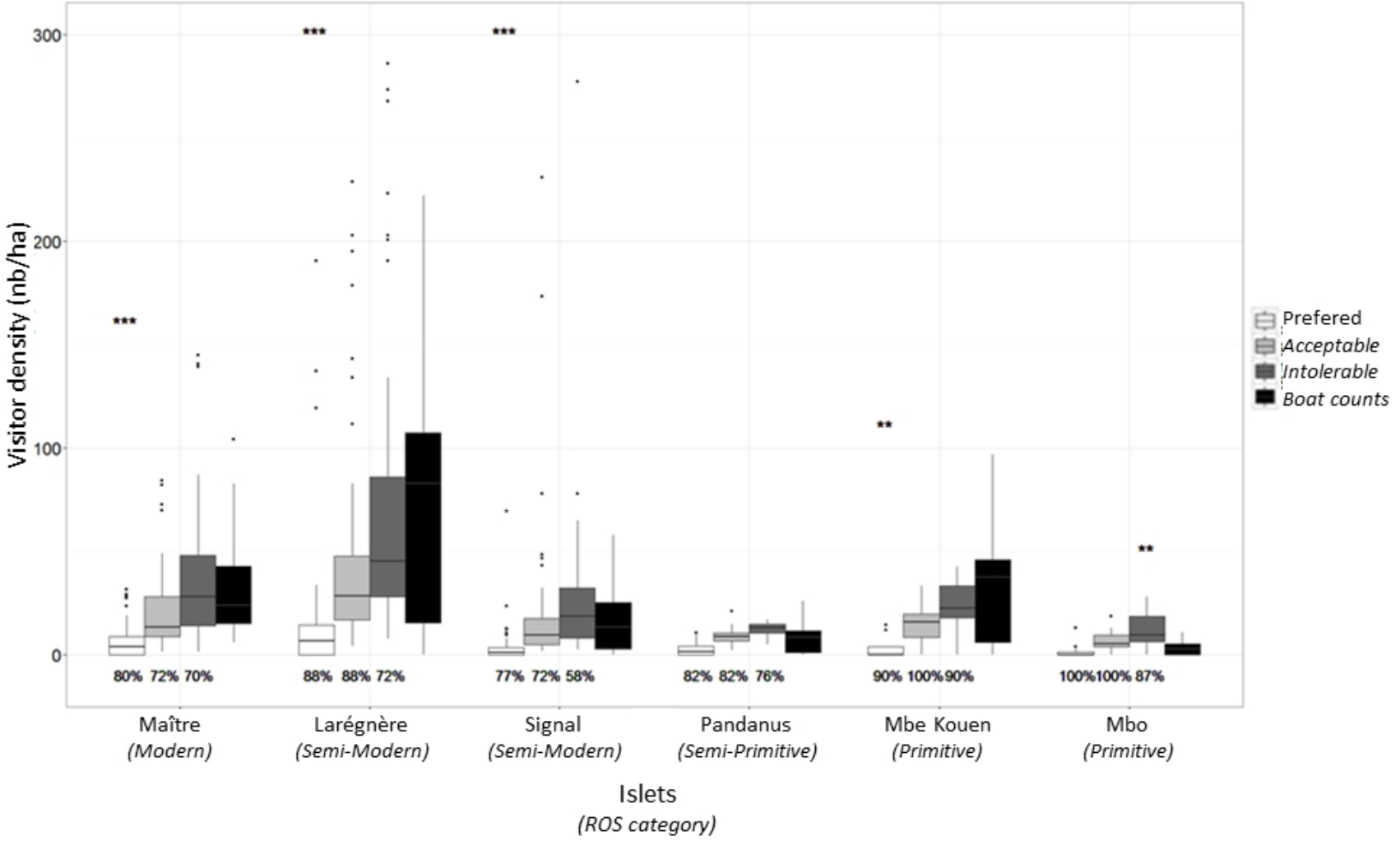

Visitor density (nb/ha)
300
200
100
0
***
***
***
**
**
80% 72% 70%
88% 88% 72%
77% 72% 58%
82% 82% 76%
90% 100% 90%
100% 100% 87%
Prefered
Acceptable
Intolerable
Boat counts
Maître
(Modern)
Larégnère
(Semi-Modern)
Signal
(Semi-Modern)
Pandanus
(Semi-Primitive)
Mbe Kouen
(Primitive)
Mbo
(Primitive)
Islets
(ROS category)

Table 1. Use level observed in 2013 and 2014 per islet. The number of interviews and the mean sampling rate are displayed for each islet in 2014. (line 315)

Islets		**Maître**		**Larégnère**		**Signal**		**Pandanus**		**Mbe Kouen**		**Mbo**	
Year		**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**	**2013**	**2014**
Mean number of boats per trip during weekend days		69.2	42	39.2	46.2	20.9	36	12.5	12.8	10	6.8	7.4	7.2
Mean number of boats per trip during week days		7.9	x	4.4	x	2.9	x	2.6	x	1.5	x	1.5	x
Mean number of visitors per trip		x	126.6	x	121.4	x	167.6	x	42.8	x	8	x	27.4
Proportion of users per boat type (%)	sailboat	11.4	21	24.5	27.8	18.6	19.3	6.6	12.5	48.3	66.7	12.1	15
	motorboat	16.8	38.5	51.8	47.6	67.7	56.1	88	84.4	51.5	33.3	85.6	80
	taxi boat	66.6	37	14.5	18.7	11.9	22.8	0.8	3.1	0	0	1.3	5
	jet ski	5.2	3.5	9.2	5.9	1.8	1.8	4.6	0	0.2	0	1	0
Mean trip duration (number of nights on the islet)		x	0.5	x	0.6	x	0.5	x	1.2	x	1.2	x	1.3
Number of interviews		x	154	x	110	x	128	x	38	x	13	x	20
Mean sampling rate (%)		x	15.6	x	15.4	x	13.6	x	17.6	x	32.5	x	18

Table 2: Mean estimation error for boat and visitor per level of the factors of interest. For each factor, significant differences between levels were displayed with same letter indices (Kruskal test at 5% significant level). ***: 0.1% significance level, **: 1% significance level, *: 5% significance level based on Kruskal test. (line 335)

Factors	Factor level	Mean error estimation for …	
		Number of boats	Number of pers.
Islet ***	Maitre	-0.16	0.13 [a b]
	Larégnère	-0.23	-0.16 [a]
	Signal	-0.07	-0,29 [b]
	Pandanus	-0.25	-0.13
	Mbe kouen	-0.15	0.16
	Mbo	-0.23	-0.23
ROS classes***	Modern	-0.16	0.13 [a]
	Semi-modern	-0.23	-0.23 [a]
	Semi-primitive	-0.13	-0.13
	Primitive	-0.20	-0.07
On-site location***	On the boat	-0.22	-0.32 [a]
	Leeward side	-0.12	0.03 [a]
	Windward side	-0.16	-0.12
Relative crowding level ***	Relatively high	-0.27 [a]	-0.05 [a]
	Relatively low	-0.20 [a]	0.001 [a]
City*	Noumea	-0.17	-0.13 [a]
	Neighbouring cities	-0.12	-0.08
	N. Caledonia	-0.09	-0.13
	Outside N. Caledonia	-0.28	0.31 [a]
Number of year, visiting the area *	None	-0.48 [a]	0.32
	Less than 1	-0.02 [a]	-0.09
	Between 1 and 5	-0.21	-0.21
	Between 6 and 10	-0.17	-0.20
	Between 11 and 20	-0.12	-0.10
	More than 20	-0.16	0.01

Table 3: Proportion of user's per crowding perception level as a function of the factors of interest (***: 0.1% significance level, **: 1% significance level, *: 5% significance level based on Chi-square test). (line 352)

Factors	Category	Crowding perception			
		Not	Slightly	Crowded	Highly
Islet *	Maître	73	17	9	1
	Larégnère	56	26	14	4
	Signal	42	36	18	4
	Pandanus	55	21	21	3
	Mbe kouen	62	30	8	0
	Mbo	65	20	15	0
ROS classes **	Modern	73	17	9	1
	Semi-modern	49	31	16	4
	Semi-primitive	55	21	21	3
	Primitive	64	24	12	0
Boat type *	Taxi-boat	58	30	9	2
	Sailboat	67	17	16	0
	Motorboat	52	28	15	5
	Jet-ski	92	8	0	0
	Dinghy	46	29	25	0
On-site location *	On the boat	65	19	16	0
	Leeward side	49	29	17	4
	Windward side	61	27	8	3
Relative crowding level ***	Relatively high	46	30	20	4
	Relatively low	70	21	8	1
Quietness as an islet selection criterion ***	No	60	23	14	3
	Yes and satisfied	57	40	3	0
	Yes but not satisfied	7	43	43	7
Disturbance related with crowding depends on ***	Only number of visitors	40	31	23	6
	Number of visitors + other	54	29	13	4
	Only number of boats	57	29	14	0
	Number of boats + other	75	17	8	0
	Number of visitors and boats	43	29	25	3
	Number of visitors, boats + other	46	33	15	5
	Not number but other criteria	78	17	5	0
	Never disturbed	93	7	0	0

Age **	>50	70	18	10	2
	40-50	63	24	13	1
	30-40	48	25	21	7
	<30	50	36	13	1