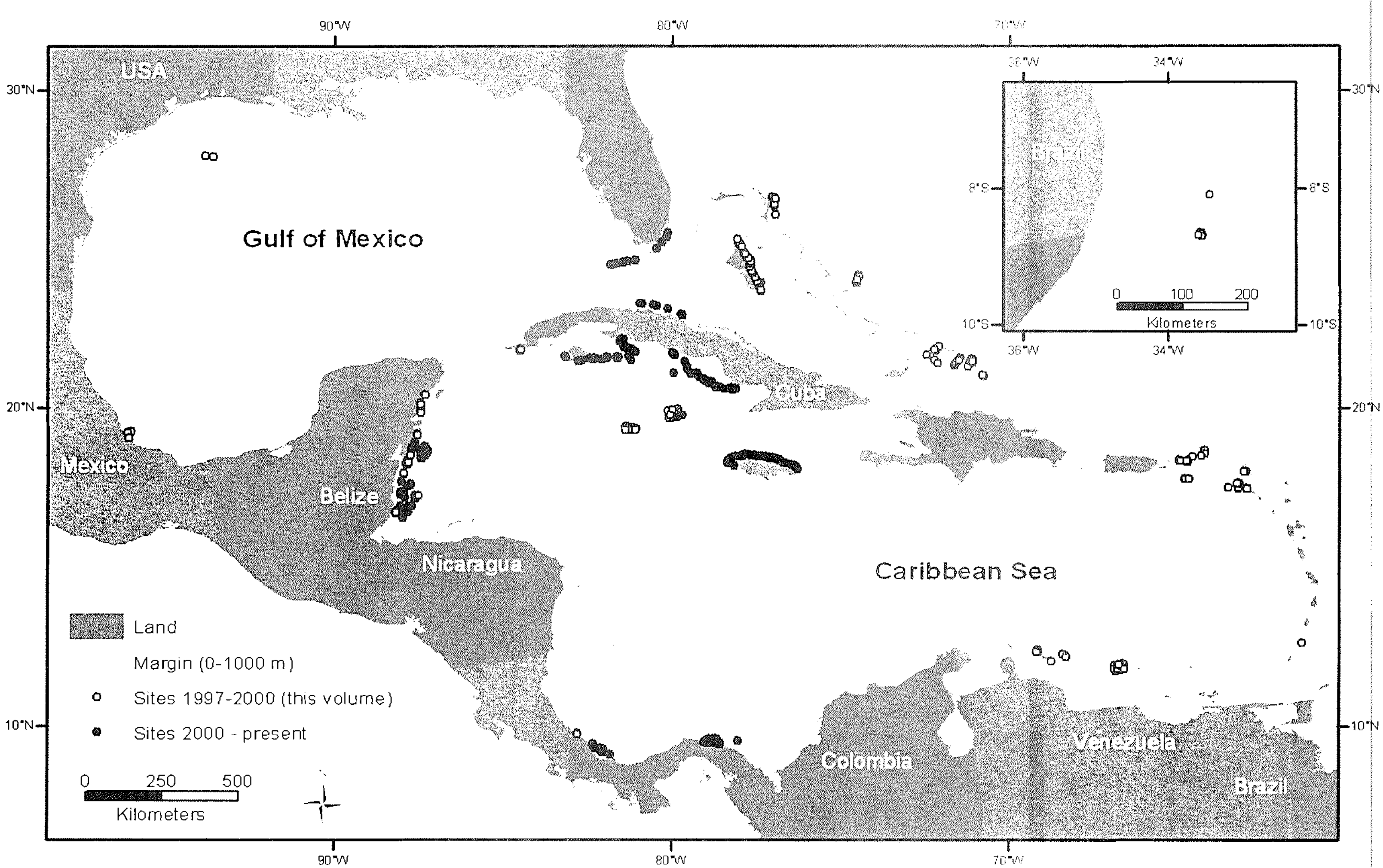

Plate 1. Location of all AGRRA sites assessed as of mid 2003.

CAVEATS FOR THE AGRRA "INITIAL RESULTS" VOLUME

BY

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INTRODUCTION

The Atlantic and Gulf Rapid Reef Assessment (AGRRA) collaboration is designed for small teams of trained observers to quickly collect relatively simple quantitative indicators of the condition and/or abundance of stony corals, benthic algal groups, and reef-associated fishes at specific depth intervals in certain zones of maximum reef development. Results of the early (August 1997 to mid-2000) AGRRA assessments provide the focus of this volume. Coral reef ecosystems are so diverse, and their inhabitants engage in such intricate ecological relationships, that no rapid visual assessment technique can possibly provide in an unbiased manner all the information desired by scientists and resource managers for any given location. Comparisons among reefs are inherently constrained by numerous differences in physical environment, geomorphology, species composition, and proximity to direct human influences. Nevertheless, standardized application of the AGRRA methodology is facilitating multiscale spatial and temporal comparisons of key species, functional groups or guilds in the wider Caribbean (e.g., Ginsburg et al., 2000; Kramer, this volume). The purpose of this section is to alert readers to some of the special attributes of the AGRRA approach and some limitations in its initial application.

QUALIFICATIONS

General Considerations

Versions. The AGRRA protocols have undergone several changes since their original posting in 1997 (see http://coral.aoml.noaa.gov/agra/method/methodhome.htm for the current version). Version 2, which is the basis for most of the research reported herein, is summarized in Appendix One (this volume). Given in the Methods section of each assessment paper are the particular version of the protocol that was used and any changes made in response to field conditions (or for any other reason).

Sites. Site selection criteria, and the rationale employed when any sites were chosen for "strategic" purposes, are specified in the Methods.

Nomenclature. The generic and specific names in the Methodology that were posted on the Internet and found in most of the papers in this volume are based on Foster (1987) for *Stephanocoenia,* Weil and Knowlton (1994) for the *Montastraea annularis*

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species complex, and two publications of the American Fisheries Society (AFS): Cairns et al. (1991) for the remaining stony corals and Robbins et al. (1991) for fishes. The nomenclature and/or spelling of certain species differ from those given in the several editions of Paul Humann's exemplary field guides that are widely used in the field by the AGRRA observers and/or from Eschmeyer's (1998) revised *Catalog of Fishes*.

Consistency. A degree of subjectivity is inherent in many of the decisions made when executing these protocols and subtle distinctions will occur as a function of the observer's knowledge and level of experience. Consistency training to standardize the visual assessments followed by periodic reviews are two important components of the AGRRA methodology. Specific efforts to reduce observer bias among team members are described in the individual assessment papers. It must be admitted, however, that when divers and/or time become limited, in-water reviews are likely to be sacrificed. Inter-observer variability undoubtedly contributes to some of the larger variance values, especially in the means for individual assessment sites.

Spatial coverage. During the time interval covered by the papers in this volume, several of the AGRRA geographic subregions were either poorly represented (e.g., Cuba, Lesser Antilles) or missing (e.g., Panamá, Hispaniola) as was the entire Florida region. Due to various circumstances (e.g., funding, geography), some papers are limited in spatial coverage and/or in the number of assessed sites. Furthermore, the two high-relief habitats of particular interest (*Acropora palmata* in ~1-5 m, and fore reef or equivalent in ~8-15 m) are not present in all coral reef areas or, if present, sometimes could not be assessed for other reasons such as remoteness or weather.

Temporal Coverage. Some of the individual assessments predate the 1998 ENSO while others either overlap with or postdate this extreme event, the effects of which were not experienced uniformly across the western Atlantic. Hurricanes (Georges, Mitch, Lenny) and outbreaks of disease also had nonrandom spatial and temporal distribution patterns profoundly affecting some of the assessed reef areas without influencing others. Particularly when recent partial mortality estimates of stony corals from different areas are compared, it is important to note the dates of the various assessments.

Synthesis. In order to include all the data in the initial Synthesis, Kramer (this volume) has provisionally classified each site as either shallow (≤5 m) or deep (>5 m) on the basis of its mean depth under the benthic transect lines with some resulting mixing of habitats and reef types. Each assessment has been treated as a separate unit and given equal weight in his analysis (Kramer, this volume). Hence its contribution is independent of the areal extent of the local reef system and of the numbers of assessed sites (or habitat types). In other words, the small (Costa Rica, Flower Garden Banks) and large (Cuba) areas, each with few assessed sites as of mid 2000, have been treated the same as the small (windward Netherlands Antilles) and large (Andros) areas for which a larger number of sites had been assessed (The corresponding numbers of habitats are three, one, two, numerous, and two, respectively.)

As explained by Kramer (this volume), the specific datasets and methodology used for calculating site means in the Synthesis chapter differ from those employed in most of the individual assessment papers.

Stony Corals

Condition. The prevalence of bleaching, disease, predation, overgrowth, etc. are each expressed as a percentage of the surveyed population, i.e., all colonies of ≥10 cm (or ≥25 cm) maximum diameter that underlie the haphazardly placed 10-m transect lines. Observers vary in how much information they record as a function of time available and/or by their familiarity with these disturbances. Photographs and descriptions of the perturbations that commonly affect the wider Caribbean's stony corals are now available at several web sites, in sets of laminated field cards, and in Bruckner (2002), yet there is no substitute for good, in-situ training. Given the variability of signs displayed by disturbed corals, however, even the most experienced observers are presently unable to reliably distinguish between the effects of certain diseases and certain predators, particularly during rapid "snapshots" like the AGRRA assessments. Therefore "absence of evidence" in some locations cannot be taken as necessarily indicating "evidence of absence." For example, the AGRRA geologists have a tendency to report a higher proportion of stony corals that are "standing dead" (= completely dead with the colony still in growth position and recognizable at least to genus) than have the AGRRA biologists (P. Kramer, personal communication).

Mortality. "Recent" and "old" mortality of stony corals is estimated as the percentages of their outward-facing surfaces that are dead when seen from above the colonies. Hence, average "partial-colony mortality" (or partial mortality) refers to the mean percent of tissue loss/colony and not to the percent of colonies with any (necessarily unspecified amount of) tissue loss. "Recent partial mortality" (after Diáz et al., 1995) in the AGRRA benthos protocol encompasses that percentage of the colony surface in which the skeleton is white and covered by a (necessarily thin) layer of algae or fine mud. "Old partial mortality" is used to describe the corresponding percentage in which the skeletal structures are no longer white and have either been lost or are covered by epibenthic organisms that are not easily removed. Standing dead corals are included in the calculations of mean values for old and total (= recent + old) partial mortality in all but one of the individual assessment papers; in the Synthesis they are excluded from the mean values of old partial mortality (Kramer, this volume).

Attempts to "flesh out" these definitions and, in the absence of published data, to add putative temporal ranges to the definition of recent mortality, are given in the Methodology section of the AGRRA web site and by Bruckner and Bruckner (this volume), Kramer (this volume), and Steneck and Lang (this volume). Recently occurring mortality will be underestimated when: (a) exposed skeletal surfaces are quickly covered with sediment and/or algae (Fonseca, this volume); (b) turf algal-sediment mats expand at the expense of stony corals without creating any noticeable "recently dead" areas at their interfaces (Roy, personal communication); and (c) in the presence of superior spatial competitors (Deschamp et al., this volume) like the rapidly growing *Trididemnun solidum* (Bak et al., 1981) since the skeleton that is being overgrown is never exposed to view.

Algae

Functional algal groups are characterized by their abundance in 25 cm x 25 cm (= 0.0625 m^2) quadrats with at least 80% coverage by any kind of benthic algae. The location of the quadrats is spatially limited to a 1-m radius of the 2-m marks on the transect lines. Although not a measure of algal cover, the abundance of each group on exposed substrata that are available to herbivores is provided by these data. As the identity of the functional groups that are assessed was changed between Versions 2 and 3 of the protocol, the usage of "relative abundance" has been restricted in this volume to the groups that were estimated in Versions 1 and 2 (i.e., macroalgae, turf algae and crustose coralline algae).

Fishes

The AGRRA benthos protocol is a novel collaborative creation (see the Forward and Appendix One, this volume) that is still being fine-tuned as we gain experience with its application in diverse geographical areas. In contrast, only minor adjustments have been implemented thus far with the fish belt transects (here restricted to ecologically important herbivores and commercially significant carnivores) and Roving Diver Technique (Schmitt and Sullivan, 1996). Both had been thoroughly tested for some years prior to their adoption for the AGRRA fish protocol. Hence their relative strengths and limitations are better understood (e.g., Brock, 1954; Sale, 1980; Thresher and Gunn, 1986; Fowler, 1987; Schmitt et al., 2002). For example, serranids (e.g., Pattengill-Semmens and Semmens, this volume) are generally underreported in the belt transects, especially on reefs with high structural complexity (Kramer, Marks and Turnbull, this volume). Also underestimated in belt transects are roving schools of scarids or acanthurids (Nemeth et al., this volume). While the Roving Diver Technique provides a relatively rapid quantification of reef fish assemblage, longer search times or a larger number of searches than are appropriate for rapid assessments would be needed to fully estimate species richness (Nemeth et al., this volume; Marks, personal communication; Semmens, personal communication).

AFFIRMATION

Caveats notwithstanding, our understanding of reef condition in the western Atlantic is enhanced as a result of the early (August 1997 to mid 2000) AGRRA efforts reported in this volume. Some important geographical gaps have been filled during subsequent assessments: northern and western Jamaica; southwestern and south-central Cuba; Bocas del Toro and western Kuna Yala, Panamá; and Upper and Lower Keys, Florida. The data added from these (and remaining as-yet unvisited) areas is certain to modify some of the initial conclusions presented in this volume. Pending the outcome of their analysis we anticipate being able to provide a more complete accounting of the overall status of the coral reefs in the Intra-Americas Seas and Brazil.

ACKNOWLEDGMENTS

Robert Ginsburg is thanked for the probing discussions that precipitated this cautionary preamble. Comprehensive reviews by Robert Ginsburg and Patricia Richards Kramer have clarified its execution. The specific comments of Ana Fonseca Escalante, Kristi D. Klomp, Kenneth Marks, Richard Nemeth, Paulette Peckol, Juan Posado, Roshan Roy, Miguel Ruiz, Brice Semmens, and Robert Steneck are also greatly appreciated.

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