

Designing a Conservation Program

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Whether one defines conservation as "preservation" or as "management for sustained utilization," there can be little doubt that sea turtles are in need of stringent conservation measures. While short- and long-term objectives, as well as specific methodologies, will necessarily differ among conservation programs, none can hope to realize its full potential without prior planning. Information gathering, the involvement of stakeholders (which, in the case of sea turtles, may include multilateral constituencies), and the recruitment of sufficient human and financial resources are fundamental to program success. Prior planning benefits all levels of program application, from single nesting beaches or foraging grounds (serving one or more nesting or foraging assemblages) to international initiatives encompassing multiple range states, recognizing that cooperative mechanisms are requisite in the management of shared migratory populations.

The overall goal of any conservation plan for sea turtles is to promote the long term survival of sea turtle populations, including the sustained recovery of depleted stocks and the safeguarding of critical habitat, integrated with the well being and needs of human communities with which they interact. Specific objectives will differ, but should include: (i) identification of populations; (ii) assessment of the conservation status of the population throughout its range and identification of key recruitment areas (*e.g.*, breeding and nesting sites); (iii) regular monitoring of populations (to assess trends); (iv) calculation or estimation of annual mortality; (v) effective protection of important nesting beaches, feeding areas, and known or suspected migratory corridors; (vi) implementation of a sufficient regulatory framework; (vii) regulation of domestic and international commerce in parts and products; and (viii) achieving and perpetuating public support for program goals and objectives.

Guidelines and Criteria

Population Size and Trends

The foundation upon which all management decisions are based must include an accurate assessment of population size, including a determination of whether populations are stable, increasing, or declining. Index habitats (intensive study areas designated to include major nesting and foraging grounds) should be monitored at intervals consistent with the determination of population dynamics over the period of at least one generation, a period of time which may range from little more than a decade for *Lepidochelys* to three decades or more for the slower-growing herbivorous *Chelonia*. Data collection should include the number of females reproductively active, the number of nests laid, the number of eggs/nest, and the number of young hatched on an annual basis; annual and inter-annual nesting periodicity; estimates of growth, maturity, and longevity; and an evaluation of survivorship among life stages.

Critical Habitat

An assessment of the distribution and status of critical habitat (*i.e.*, habitat critical to the survival of sea turtle populations), and the protection of such habitat from both existing and anticipated threats is fundamental to the conservation of sea turtles. Major threats to nesting beaches include shoreline development (*e.g.*, the direct effects of roads and built structures, as well as the indirect effects of increased traffic and inadequate waste disposal), artificial lighting, coastal sand mining, and beachfront stabilization structures. Major threats to foraging grounds and migratory corridors include industrial and agricultural discharges (point and non-point sources), destructive fishing practices, petroleum industry activities (*e.g.*,

exploration, production, refining, transport), seabed destruction (*e.g.*, dredging, anchoring), and other forms of marine pollution, including persistent marine debris. Index habitats should be protected to the highest degree practicable. Strategies for the protection of habitats important to sea turtles should be fully incorporated into local, national, and regional (international) integrated coastal zone management initiatives.

Sources of Mortality

A conservation plan must identify and quantify important sources of mortality, both direct and indirect (*e.g.*, capture which is incidental to other commercial fishing operations), in all life stages. Mitigating solutions must be designed and implemented. These should encompass, where appropriate, strengthening existing national legislation and international agreements (including making fines and other penalties commensurate with product value), promoting multi-sectoral public awareness (*e.g.*, urban consumers, rural stakeholders, coastal landowners, government), adopting fisheries-related management actions (*e.g.*, gear modifications, time and area closures, alternative livelihoods), closing market loopholes, and fielding efficient and motivated law enforcement units. Identifying illegal and clandestine threats to sea turtle populations, including addressing sensitive socio-political issues, is an important consideration in any national or regional conservation plan. Identifying ways to convert users and other stakeholders to stewards, as a means to reduce mortality, should be a priority.

Research and Data Management

Research and inquiry should be encouraged; notwithstanding, the mere accumulation of information is insufficient to meet the needs of a competent conservation program. Standard record-keeping procedures, trained field and analytical personnel, and centralized and appropriately accessible databases are crucial to program success. Research is needed both to define the extent of the conservation challenge, and to evaluate the effectiveness of a potential intervention or management response. Recommendations for intervention should be based on appropriate research, and designed to respond to a defined threat. Popular forms of intervention, including egg hatcheries, head-starting (the rearing and subsequent release of yearlings), and predator control, may not address in any meaningful way the underlying threat(s) facing

the target population. The significance of research, including routine population and habitat monitoring, is lost without conscientious data management.

Public Awareness and Education

Including environmental concern in the consciousness of the average citizen is crucial to the sustained survival of both human residents and wildlife, especially endangered wildlife. Sea turtles are particularly good candidates for public education campaigns. They are easily cast as symbols of the health of the coastal zone, both marine (coral reefs, seagrass) and terrestrial (sandy beaches, littoral forest). Coastal peoples in particular have observed sea turtles in one setting or another, and the connection between protecting sea turtles and protecting large segments of the economic base (*e.g.*, fisheries, tourism) can often be clearly articulated to both rural and urban audiences. Finally, sea turtles are integral to the folklore and cultural history of many peoples around the world and as such have an added potential for capturing the imagination and emotion of a citizenry. Public awareness campaigns should accompany conservation action, target relevant stakeholders (specifically or collectively), and embrace all available avenues of communication, including print and electronic media, school curricula, extension programs, public displays, and local gatherings (*e.g.*, festivals, political events, town meetings).

Other Considerations

To validate proposals of sustainable use, PBR (potential biological removal) or other appropriate models should be presented, based on current abundance estimates and determinations of maximum intrinsic rates of increase, together with sources of mortality and their predicted trends. Because all sea turtle populations have extended geographical ranges (*i.e.*, distributions comprising multiple range states), proposed domestic use should not compromise the status of the population elsewhere in its range. Prior to the initiation of any harvest, long distance tracking (*e.g.*, using satellite telemetry) and genetic studies should be undertaken to determine both the full range of the target population and the genetic composition of the locally occurring assemblage from which the harvested animals will be drawn. Predetermined threshold values of population trends and changes in status, mortality, or habitat should be articulated such that the passing of these thresholds would automati-

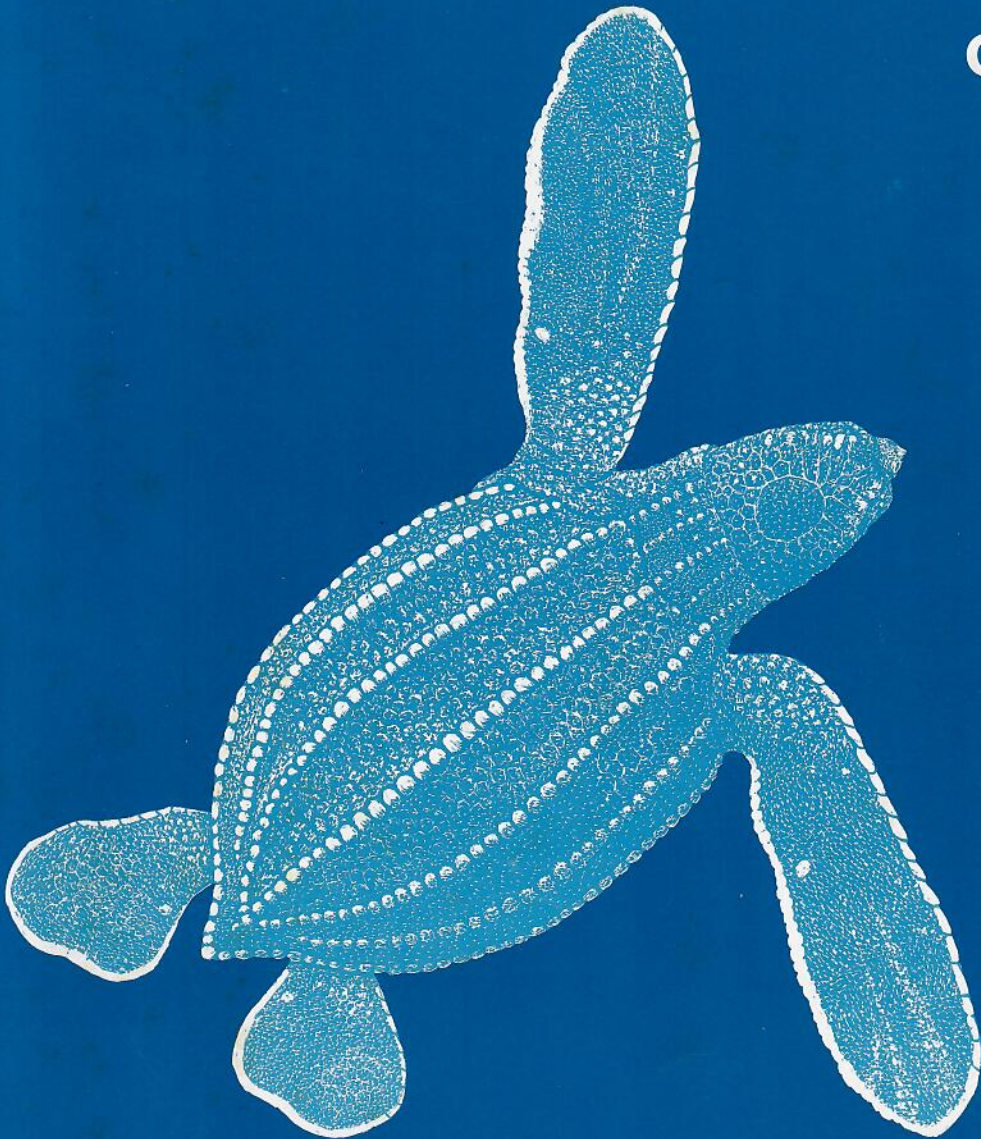
cally trigger the suspension of harvest(s) and the initiation of appropriate conservation measures.

For a variety of reasons (including relatively slow growth, delayed maturity, high juvenile mortality, wide-ranging movements and migrations, the importance of long-lived adult age classes, and a dependence on vulnerable coastal ecosystems), the biology of sea turtles confounds attempts at defining sustainable take. To maximize accuracy in the underlying estimations of population size and population dynamics, and the consequent interpretation of what might constitute sustainable take, assembling the necessary data would require decades of careful field work in multiple range states. Notwithstanding, advances in remote sensing, genetic technologies, and computer simulations can assist managers to make informed decisions based on databases that span several years, rather than several decades. In any case, the outcome will depend on the quality of the data assembled. All data collection should be done by trained personnel, rely on standard methodologies, and be subjected to rigorous peer-review.

Concluding Remarks

Few sea turtle populations currently occupy their full historical range or approach their historical abundance. Some of the largest breeding assemblages of sea turtles that the world has ever known have gone extinct (or nearly so) over the course of little more than a century. The specific attention of government and nongovernmental entities to the design and implementation of scientifically sound conservation plans is, therefore, urgently needed. Moreover, the notion that species- or population-level sea turtle conservation, management, or recovery can be defined based on the unilateral actions of governments hosting specific nesting assemblages or foraging aggregations of sea turtles is obsolete. In recent years, managers and government officials have come to recognize that sea turtles are shared resources, and that shared resources require shared responsibility. For a conservation program to succeed, every effort must be made to involve all relevant sectors and stakeholders in planning and, ultimately, in implementation.

Research and Management Techniques for the Conservation of Sea Turtles



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