

Appendixes

Appendix 1: Conventional Management Tools and the LRFF Trade

Management Tool	Merit	Impediments
Output Controls		
<p>Minimum/maximum sizes</p>	<ul style="list-style-type: none"> ➤ Limiting the size at which fish can be caught can <ul style="list-style-type: none"> – increase/ maintain spawning biomass (i.e., ensure sufficient fish reach spawning size before capture); – address management considerations resulting from sex change in fish; and – address the problem of growth overfishing. ➤ Size limits can be based on known patterns of sexual maturity in other geographic locations. 	<ul style="list-style-type: none"> ➤ Effective management of coral reef fisheries on the basis of minimum and maximum size limits for target and nontarget species is hindered by <ul style="list-style-type: none"> – limited availability of biological data; – physical remoteness of landing sites; – discord between minimum sizes based on biological data, and preferred market size; – need for collaboration between industry and government agencies.
<p>Catch quotas</p>	<ul style="list-style-type: none"> ➤ Catch quotas help to maintain catches within sustainable levels and allow catches to be allocated among different fishery sectors. ➤ Catch quotas can specify catch volumes for certain species. 	<ul style="list-style-type: none"> ➤ Setting quotas in tropical inshore multispecies fisheries is resource intensive and hindered by <ul style="list-style-type: none"> – limited knowledge of the biology and stock size of targeted species; – the need to monitor local and export catches of artisanal and LRFF fisheries concurrently; – multiple landing points; – poor information, with data aggregated into species groups rather than by individual species; – localized overfishing due to effort concentration in inshore areas and areas close to trading hubs; – decentralized and subnational implementation; - – high management and enforcement costs; and – highly variable seasonal stock abundance.
<p>Export controls</p>	<ul style="list-style-type: none"> ➤ National export bans can be strengthened through international trade regulations (i.e., CITES) that prohibit or regulate the harvest and sale of threatened or endangered species. 	<ul style="list-style-type: none"> ➤ The large number of geographically remote fishing sites and a lack of centralized landing sites in many live reef fisheries hinder monitoring of exports and make enforcement difficult.

Appendix 1: Conventional Management Tools and the LRFF Trade (cont'd.)

Management Tool	Merit	Impediments
Area closures (marine protected areas and no-take zones)	<ul style="list-style-type: none"> ➤ There is potential for positive spillover effects from areas closed to fishing to those remaining open. ➤ Zones/reefs can be closed for extended periods to act as harvest refugia and replenishment areas for recovery of fish stocks. 	<ul style="list-style-type: none"> ➤ Capacity constraints limit the effective enforcement of spatial closures at remote sites. ➤ High management and enforcement and compliance costs may be involved.
Seasonal closures (spawning aggregations)	<ul style="list-style-type: none"> ➤ Protection of spawning aggregation sites and migration routes to and from these sites during the spawning season protects spawning fish and reproductive output. ➤ Protection of species vulnerable to overfishing because of their spawning times; reduces high mortality often associated with catching of ripe males and females. 	<ul style="list-style-type: none"> ➤ Targeting of spawning aggregations is driven by the need to collect sufficient fish for sea transport in a short time period.
Input Controls		
Licensing	<ul style="list-style-type: none"> ➤ Licensing can compel operators to submit regular data that are useful for evaluating the state of the fishery, or other information considered necessary. Licenses can <ul style="list-style-type: none"> - limit the time period over which the license is active; - nominate the species able to be retained for live export or excluded from being exported; 	<ul style="list-style-type: none"> ➤ The prospect of implementing and maintaining a license program for many hundreds of artisanal fishers is limited.

(continue next page)

Appendix 1: Conventional Management Tools and the LRFF Trade (cont'd.)

Management Tool	Merit	Impediments
Licensing (cont'd.)	<ul style="list-style-type: none"> - limit the amount of effort being applied to certain reefs (e.g., vessel numbers, area closures); - impose moratoriums; - designate permitted mode of transport; - set out ownership and local crewing requirements of live fish operations; and - control transshipments of live fish and designate live fish collection areas. 	
	<ul style="list-style-type: none"> ➤ Licensing can recognize traditional reef ownership (e.g., customary marine tenure); ➤ While enforcement capacity will dictate a licensing program's effectiveness, institutional capacity requirements are less than for output controls. 	
Gear controls	<ul style="list-style-type: none"> ➤ Specifying permissible gear, such as minimum hook sizes, can increase the size/age at which fish are recruited to the fishery and protect juveniles. ➤ Prohibiting certain gears and fishing practices will reduce mortality of target species, reduce bycatch, and protect habitat and standing biomass. 	<ul style="list-style-type: none"> ➤ Effective and widespread adoption of nondestructive capture techniques will be hindered by <ul style="list-style-type: none"> - overexploited target stocks and declining catch per effort, which lead to unsustainable fishing practices; - limited enforcement capacity because of physical remoteness of landing sites; - accuracy and timing of procedures to detect poisons (e.g., cyanide); and - the efficiency of destructive practices relative to less destructive alternatives, which makes the former more attractive.

Appendix 1: Conventional Management Tools and the LRFF Trade (cont'd.)

Management Tool	Merit	Impediments
Trial fishing/moratoriums	<ul style="list-style-type: none"> ➤ Trial fishing periods can be used to collect biological and catch and effort information and evaluate the effects of LRFF fisheries on other fisheries, particularly subsistence fishing. ➤ Moratoriums or periodic closures can limit fishing effort or close a fishery based on "trigger points," such as number of days fished or the volume caught. ➤ Limit LRFF fisheries to designated areas during the trial period to improve effectiveness of and minimize resource requirements for monitoring. 	<ul style="list-style-type: none"> ➤ An effective observer monitoring program is needed, which will be limited by: <ul style="list-style-type: none"> – capacity and resource constraints; – observer knowledge; – corruption; and – enforcement capability.
Mode of transport (air/sea)	<ul style="list-style-type: none"> ➤ Restrictions on sea transport can <ul style="list-style-type: none"> – decrease rates of mortality, thereby increasing shipment values; and – enhance monitoring and enforcement efforts. 	<ul style="list-style-type: none"> ➤ Adoption of air transport may be hindered or excluded by <ul style="list-style-type: none"> – lack of air transport options at geographically remote landing sites; and – distance of remote fishing sites from market.