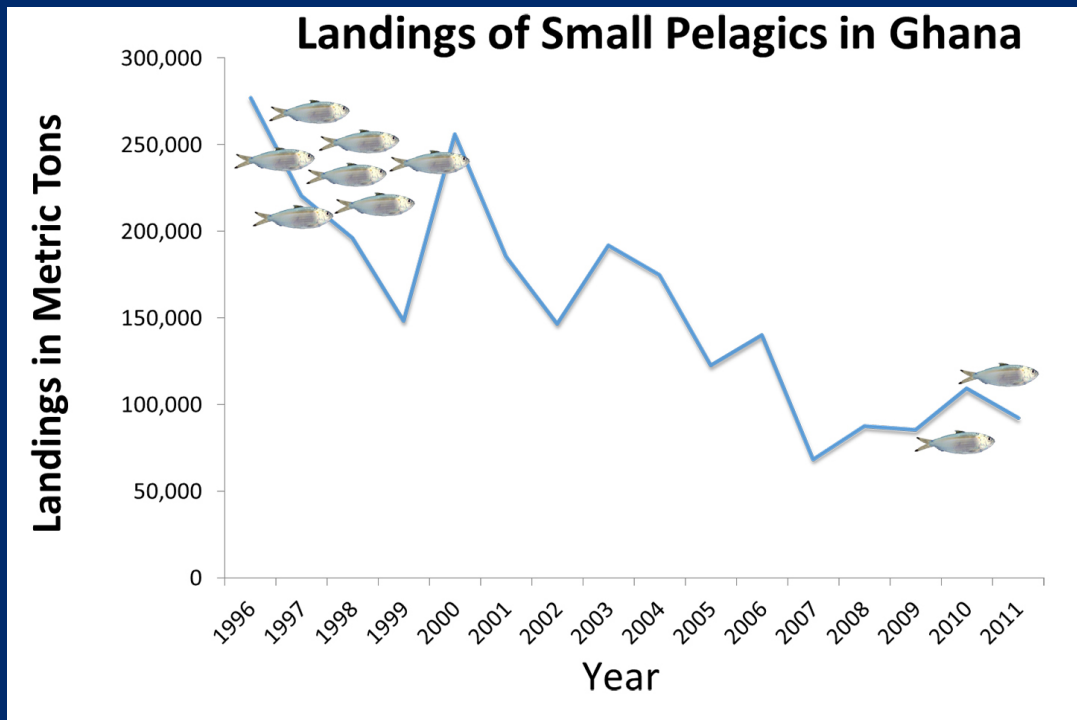




SUSTAINABLE FISHERIES MANAGEMENT PROJECT (SFMP)

Toward a Sustainable Fishery: Action Option: Business As Usual



2015



This publication is available electronically on the Coastal Resources Center's website at http://www.crc.uri.edu/projects_page/ghanasfmp/

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Cover photo: National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Credit: FAO Fish_statistics)

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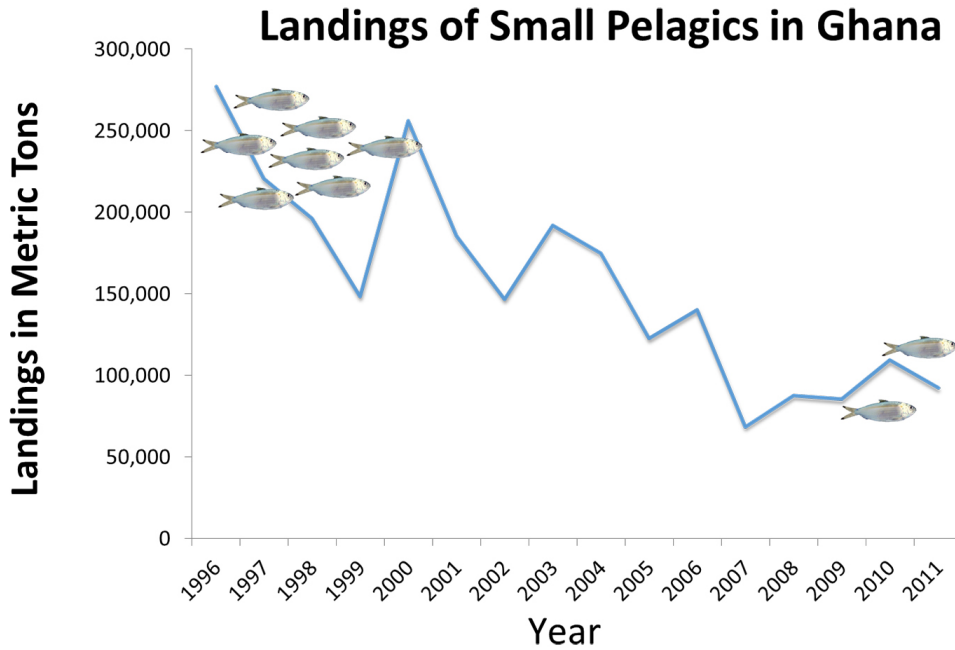
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SSG Advisors:	http://ssg-advisors.com/
Spatial Solutions:	http://www.spatialsolutions.co/id1.html



TOWARD A SUSTAINABLE FISHERY: *Action Option: Business As Usual*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. **BUSINESS AS USUAL**
2. Closed areas
2. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

Supporting the Ministry of Fisheries and Aquaculture Development, the USAID Ghana Sustainable Management Project (SFMP) is a five-year initiative that aims to rebuild targeted marine fisheries through the adoption of sustainable fishing practices. SFMP has identified a suite of Action Options toward achieving these goals and is describing each option to stakeholders in a series of briefs. The planning process now must move from discussion of problems toward developing a consensus of how to secure a rebuilt, healthy small pelagic fishery. Stakeholders must debate and decide on potential science-based options, listed above, and act. This brief details the **Business As Usual Action Option**. Call SFMP to learn more: 0302542497.

WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Business as usual is bad business for all Ghanaians.

WHAT IS BUSINESS AS USUAL?

Business as usual or status quo would mean implementing no new measures to restore the fishery. This would violate all provisions of the fisheries Act-625 (2002) and many international laws relative to the exploitation of marine resources.

This option would continue current management practices in which enforcement is weak and not sustained, where illegal and unsustainable fishing practices are widespread. With this

option, we would continue with open access to the fishery, pre-mix fuel subsidies, poor compliance with rules, use of small-mesh nets and lights and an increasing number of canoes and fishermen. Production would continue to plummet, as fishing effort would continue to increase—causing lower and lower earnings and income and fewer fish in the nets. In the end, the entire fishery resource and the artisanal fishing sector as a whole could collapse.

HOW DOES IT WORK?

- No changes to current situation.

ASSUMPTIONS

- Fishing effort and number of boats continue to increase at a rate of 800-1,000 canoes per year.
- No improvements in enforcement capabilities.
- Fish stocks continue to be overfished.

PROS AND CONS

- Ghana would lose money and jobs.
- No major changes or politically controversial decisions.
- No additional management costs.
- Open access would continue to prevail with growing poverty in coastal communities.

WHAT HAPPENS FIRST?

- No action.

*“Can we imagine life
in Ghana without smoked fish?”*

WHAT IS THE IMPACT?

With no change in management measures and enforcement, fish stocks would likely continue to decline along with catches, which could lead to potential loss of fishing as a main livelihood for coastal fishing communities. This could affect the ecosystem, where targeted species may be depleted to a level at which recovery could be impossible.

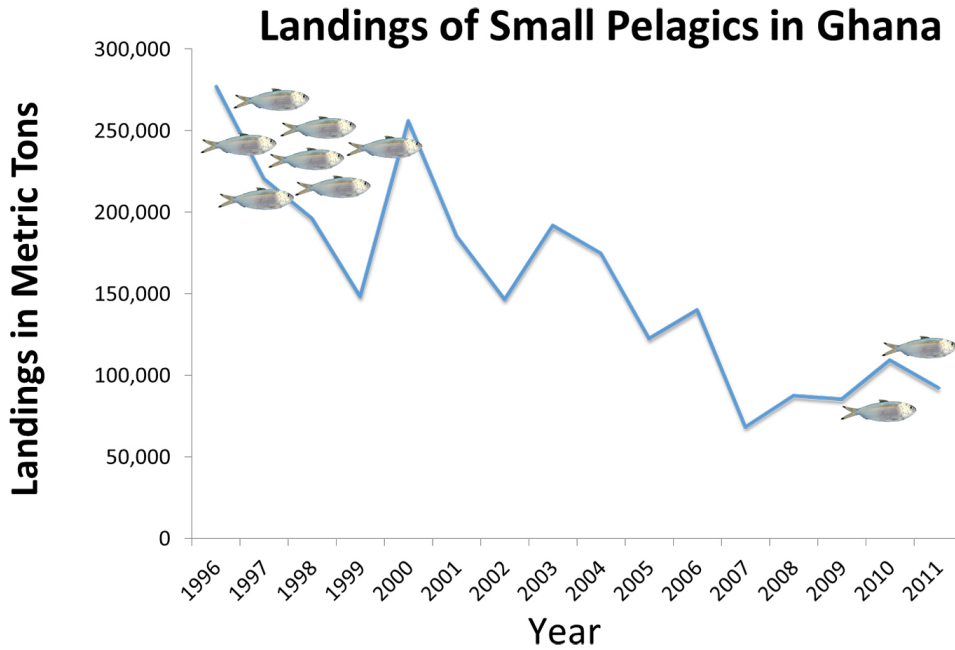
MEASURING OUTCOME

- Catch and effort monitoring (CPUE).
- Length-based assessment to monitor average size.
- Means of production (boats, gear, fuel, etc.).
- Socio-economic studies (revenues and well-being).



TOWARD A SUSTAINABLE FISHERY:

Action Option: *Closed Areas*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. **CLOSED AREAS**
2. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Closed areas provide fish a safe haven to spawn and grow.

WHAT IS A CLOSED AREA?

A permanent area closure defines a place as a no-take marine reserve. No fishing is allowed in a reserve, which is widely acknowledged as an effective conservation measure for fisheries management. Seasonal area closures are similar, but they are limited to a specific period of time. A permanent closure or reserve means the area is closed to fishing year round, year after year. This measure also is used to protect fish from harvesting in essential habitats where

they spawn or recruit to feed and grow. In the case of small pelagics, fish migrate and aggregate during spawning season in well-established areas with suitable environmental conditions. In known areas, a closure can protect fish from being caught and can provide benefits through increased production of eggs and larvae (recruitment effect) and the movement of adults after spawning into adjacent fishing grounds (spillover effect).

HOW DOES IT WORK?

- Area location and size are identified and defined. Preserve legal recognized as a protected area. A management plan is developed with stakeholders to ensure respect of the closed area, whose boundaries typically are marked with buoys. Effective public information and enforcement programs are necessary for success.

ASSUMPTIONS

- The selected areas have great conservation benefits (spawning grounds or nursery areas).
- The selected areas are static (do not shift year to year).
- Current and historical uses of the area, assessment of any incompatibility among uses, and the claims and conflicts between various user groups must be established and resolved.

PROS AND CONS

- Benefits should not be anticipated unless fishing in

open areas does not considerably exceed the acceptable level for maximum sustainable yield.

- Permanent closures work well for species that are long-lived, such as groupers, which do not migrate long distances and spend most of their life in the closed area.
- For fish that migrate and have known seasonal spawning areas, such as small pelagics, seasonal closures may be more appropriate.
- Closed areas reduce the size of fishing grounds, which may result in a loss of yield.
- Closed areas require at-sea enforcement of boundaries, which are difficult to define unless marked or vessels use GPS equipment.

WHAT HAPPENS FIRST?

- Effective enforcement must be available, and stakeholders must have buy-in.
- Resources for monitoring the

closed area at sea must be on hand.

- Legal endorsement of the closure area is required.

WHAT IS THE IMPACT?

- Provides protection for all species in the reserve.
- Fish have a chance to grow large and spawn multiple times.
- As fish grow larger and become more abundant inside the reserve, some spill over and leave the reserve and become available for capture in the outside adjacent areas.

MEASURING OUTCOME

- Monitor abundance (number of fish) in closed areas compared to outside areas.
- Fish should grow bigger inside the closed area compared to outside areas. Fish catch adjacent to the reserve should increase over time, but for long-lived species, it may take years to see the impact.



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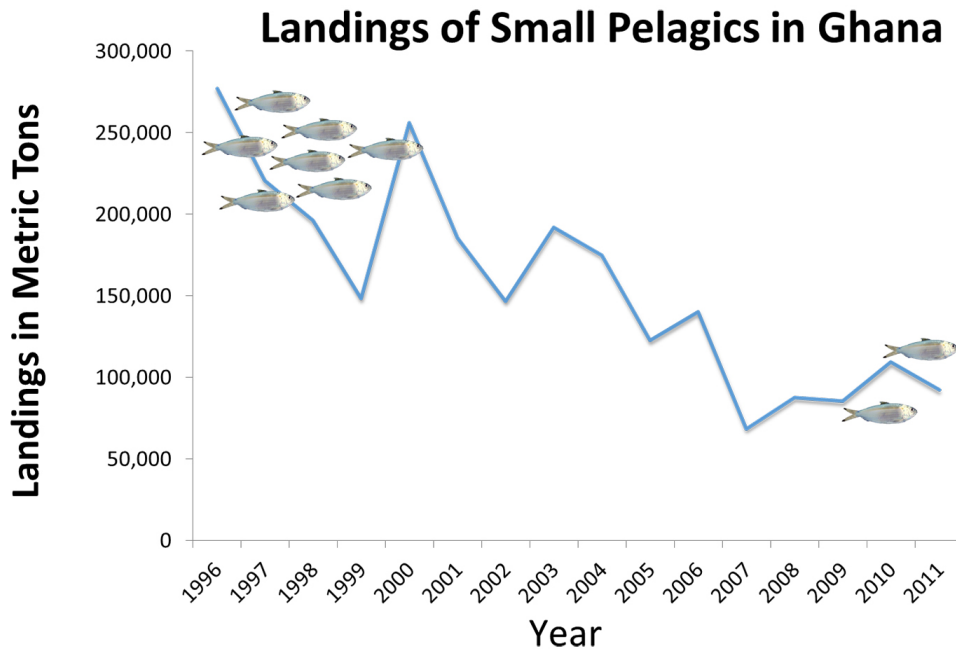
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SPATIAL SOLUTIONS



TOWARD A SUSTAINABLE FISHERY:

Action Option: *Closed Season*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
- 3. CLOSED SEASON**
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

A closed season allows exploited fish stocks to quickly recover, rebuild and emerge stronger—and so will we!

WHAT IS A CLOSED SEASON?

A seasonal closure means a period during which a ban is placed on fishing activities in respect to type of fish, area and zones, method of capture or any parameters specified in notice of closure as per the fisheries act (2002). A proposed seasonal closure for the small pelagics—anchovies, sardinellas, mackerels, and horse mackerel—would be nationwide and last for a period of months. The fishery could be closed for one season or more, and

decisions on subsequent closures and length are determined by scientific findings on the status of fish stocks in concert with stakeholders. During a closed season fishing of other species can continue, and some small pelagics may be part of the incidental catch. Experience shows that allowing such by-catch defeats the purpose of the closed season. Therefore, a total ban on landings, sale and possession of small pelagics would need to be enforced.

HOW DOES IT WORK?

- A closure typically occurs during and immediately after the peak spawning season. In Ghana scientists have determined that this season occurs from July to September. During this period, small pelagic fish aggregate and become easy to target. A closed season would provide fish protection to complete spawning. Each female can produce 20,000 to 50,000 eggs that mature at 15-16 cm (total length). This protection will allow significant production of abundant offspring for the next year's catch while also building up biomass. A ban on possession, including landings, sale, processing and imports from outside Ghana would be enforced to maximize benefits.

ASSUMPTIONS

- Peak spawning occurs during July through September.
- Production of small pelagics is highly dependent on the strength of upwelling.

- Compliance must be high.
- Initial benefits of the closure could be large, but over years may dissipate somewhat if more boats enter the fishery.

PROS AND CONS

- By-catch: Demersal trawlers or bottom gill nets might capture some small pelagics, and fishermen will not be allowed to land them. They must be discarded at sea (currently illegal). Allowing the landing of some by-catch makes it difficult to control what is by-catch and what is targeted once on shore.
- Closure is easier to enforce as gear is banned from boats going to sea. It also can be enforced by shore-based patrols to ensure the targeted stocks are not landed or sold in markets.
- Fishermen and processors may have reduced income during the closure but larger catches after.
- May encourage imports from other countries during closure.

- Risk of shift of effort to other already-overfished species.

WHAT HAPPENS FIRST?

- Buy-in by fishermen, Ministry of Fisheries and Aquaculture Development/Fisheries Commission.
- Fisheries Commission must declare a closed season by notice in the Gazette.
- Focused enforcement.

WHAT IS THE IMPACT?

- When fishery reopens, average fish caught should be bigger.
- In the following years, an increased number of fish should be landed.
- Spawning biomass and stock size should increase.

MEASURING OUTCOME

- Length-based assessment of average fish size.
- Fisheries dependent methods, catch per unit effort (CPUE).
- Change in total national landings per year.



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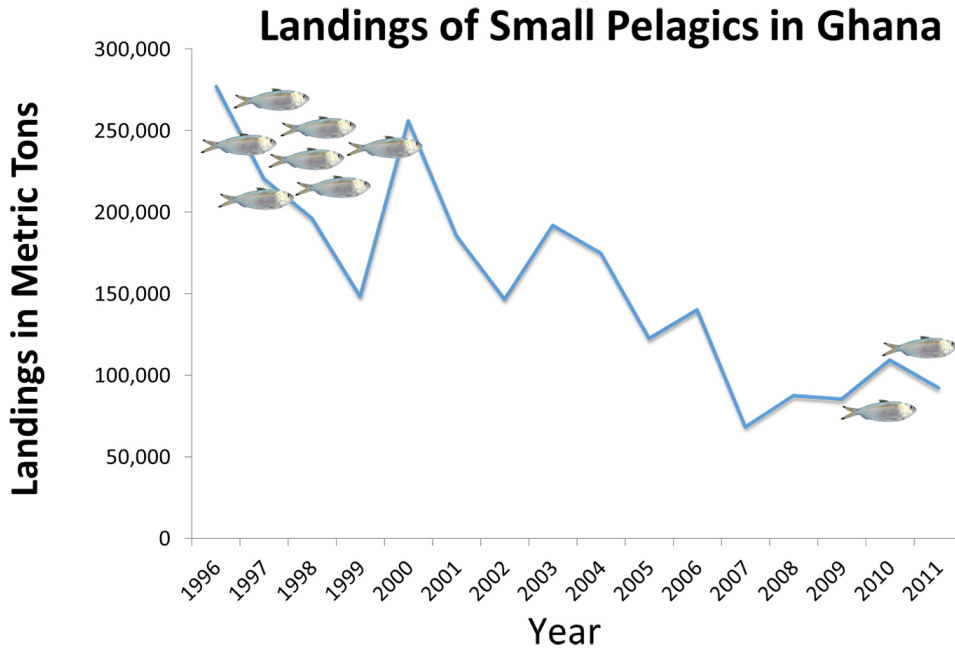


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SPATIAL SOLUTIONS



TOWARD A SUSTAINABLE FISHERY: *Action Option: Increased Mesh Size*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
2. Closed season
- 4. INCREASED MESH SIZE**
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

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WHAT WE CAN DO

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

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Larger net mesh can mean larger—and more—fish in our future.

WHAT IS MESH SIZE?

A mesh size is typically determined as the stretched mesh of the squares in the fish netting, from knot to knot, measured when wet. Minimum size is based on appropriate fish size by species to allow a large percentage of the population to escape the net and have a chance to grow to a size that allows fish to spawn at least once. Minimum mesh size allows small fish to escape

and get a chance to grow to a larger size bringing more monies for fishermen. Minimum mesh size, important for commercial fishers, was established in Ghana's 2010 fisheries regulations. The purse seine minimum is 2.5 cm, which may be too small for sardinella and mackerel, but too large for anchovies.

HOW DOES IT WORK?

- Mesh size determines the average size at which fish are first caught. Used correctly, small fish swim through and larger ones are caught. Mesh size works as a selective gear to avoid catching small fish, which then grow large enough to reproduce before capture.

ASSUMPTIONS

- The mesh is set properly and catches only fish of a size greater than the size at first maturity (e.g., mesh size of 2.5 cm for sardinella allows a fish of less than 16 cm to escape). The mesh must hang in a square for selectivity to work properly. If overstretched, the mesh becomes an entangling type of gear. Then, mesh size does not keep small fish from being caught. If the net does not have enough floats and lies on the bottom, it also becomes an entangling net with little degree of selectivity.
- Fish that pass through the mesh have a greater chance to survive and reproduce.

PROS AND CONS

- Hard to apply to a multispecies

fishery as one mesh size is not appropriate for all species.

- Can work for gears that target primarily one species, such as sardinella.
- Does not protect large breeders, which still get caught and which in some cases should remain at sea (e.g., larger groupers put out more eggs per weight than smaller ones).
- The legal mesh size for purse seine is 2.5 cm based on the 2010 regulations. However, fishermen use nets smaller than 2.5 cm because sardinella is gilled in the nets, which can cause safety hazards that can capsize canoes.
- It is easy for trawlers and encircling nets with bags to covertly place an undersized mesh liner inside the bag to catch smaller fish.
- Current minimum mesh size of 2.5 cm is too big to catch anchovies. If mesh size is then decreased, those smaller mesh nets may be used inappropriately for other species for which the size is too small.

WHAT HAPPENS FIRST?

- Train fishermen to use proper

mesh size and hanging ratios.

- Review laws' technical merits on minimum mesh size.
- Make appropriate-sized mesh available in local markets.
- Keep undersized netting out of market/fishery.

WHAT IS THE IMPACT?

- Prevents catch of small, juvenile fish.
- Fish have a chance to spawn at least once.
- Allows young fish to spawn and replenish the stock.
- Allows small individuals to grow to more valuable and larger market sizes, which prevents growth overfishing.

MEASURING OUTCOME

- Conduct selectivity studies to determine appropriate mesh size regarding size at first maturity by species.
- Measure stock abundance through fishermen's catch and effort data: Catch per unit effort (CPUE).
- Monitor average size of fish caught.



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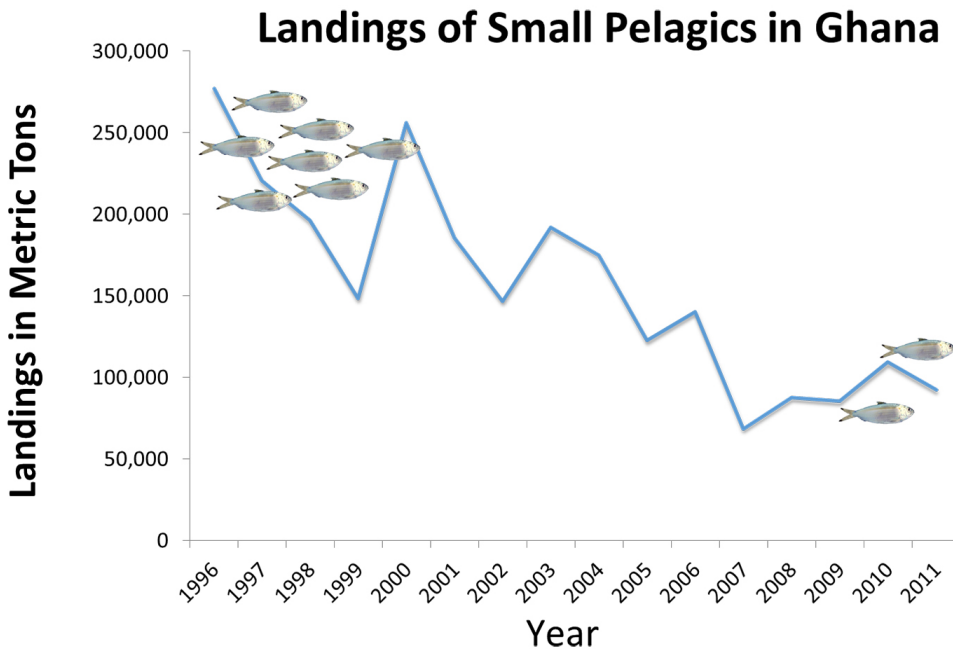
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SPATIAL SOLUTIONS



TOWARD A SUSTAINABLE FISHERY:

Action Option: *Increase Minimum Fish Size*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
3. Closed season
4. Increased mesh size
- 5. INCREASE MINIMUM FISH SIZE**
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Increased minimum fish size allows fish to grow to maturity and reproduce and help sustain the fishery's health.

WHAT IS INCREASED MINIMUM FISH SIZE?

Fisheries managers use size limits to protect juveniles and enhance growth of fish populations. Such regulations are designed to allow fish to grow and spawn to maximum natural weight. Typically, three types of size limits are considered: minimum, maximum, and slot. An

understanding of the biology of fish determines which method to use. Minimum size is the most common. Ghana's fisheries regulations (2010) set the minimum landing size for commercially important species: 18 cm for sardinella and mackerel, and 6 cm for anchovies.

HOW DOES IT WORK?

A minimum size limit allows small fish to grow and spawn at least once in their lifetime before they may be harvested legally. Scientists determine appropriate size based on growth rate, survival rate, and spawning potential. For a given minimum fish size, commercial trawl, gillnet, hooks, and seine fisheries must establish corresponding mesh sizes and hanging ratios to avoid catching fish that are under the minimum legal size.

ASSUMPTIONS

- The minimum fish size is based on proper biological information relative to growth, mortality, and spawning
- Broad acceptance throughout fishing communities of an increase in minimum fish size.

PROS AND CONS

- Minimum landing size is difficult to enforce in areas with high market demand for small fish.

- If the size measure is enforced, it reduces economic incentives to fish with a mesh smaller than regulated.
- It is difficult to apply to a multi-species fishery because minimum size varies by species, but the corresponding mesh size would need to be set for each specific species; one size does not fit all species.

WHAT HAPPENS FIRST?

- Review technical merit of existing laws.
- Once size is set, determine corresponding sizes for trawl, gillnet, seine, and hooks.
- Test selective-harvest gear with fishermen so they can buy into the results.
- Fisheries regulations are amended with the new fish sizes and net mesh sizes.
- Train fishermen to avoid catching sub-legal-sized fish and practice using selective harvesting nets.

- Keep undersized netting out of the market so it cannot be used.

WHAT IS THE IMPACT?

- The immediate effect of an increase in fish size is to lose some fish that would otherwise have been captured; therefore, a loss in catch and earnings for all fishermen can result in the short term. However, gains in landings and revenues are made in subsequent years.
- Prevents catch of small fish before they have a chance to spawn.
- Allows young fish to replace themselves and add more young into the stock.
- Allows small individuals to grow to more valuable market size.

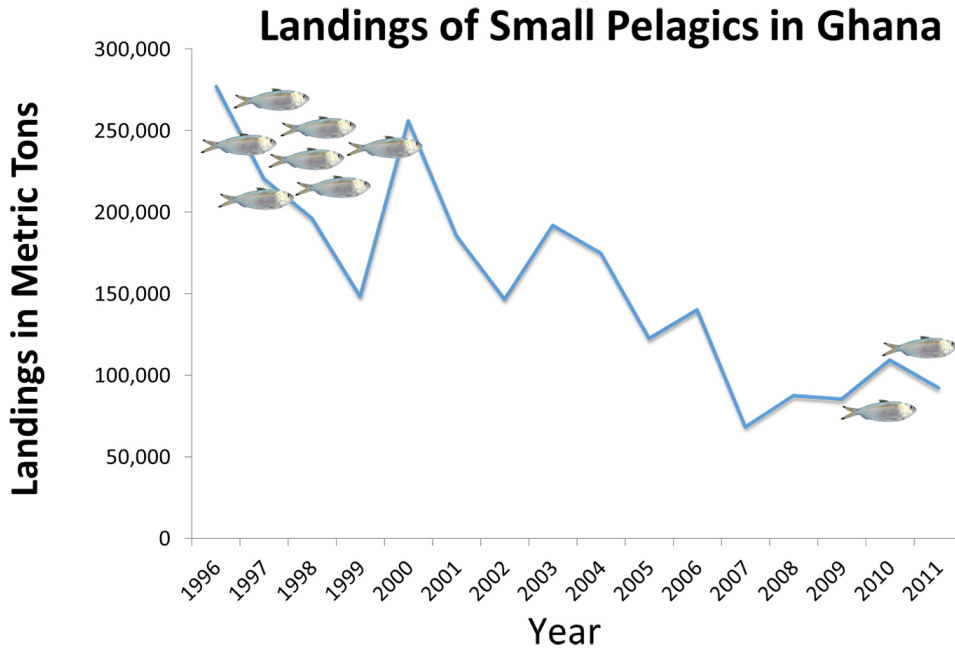
MEASURING OUTCOME

- Measure stock abundance through catch and effort data from fishermen: Catch per unit effort (CPUE).
- Monitor average size of fish caught and sold in markets.





TOWARD A SUSTAINABLE FISHERY: *Action Option: Add Fishing Holidays*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996 (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
3. Closed season
4. Increased mesh size
5. Increase min. fish size
- 6. ADD FISHING HOLIDAYS**
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

Supporting the Ministry of Fisheries and Aquaculture Development, the USAID Ghana Sustainable Management Project (SFMP) is a five-year initiative that aims to rebuild targeted marine fisheries through the adoption of sustainable fishing practices. SFMP has identified a suite of Action Options toward achieving these goals and is describing each option to stakeholders in a series of briefs. The planning process now must move from discussion of problems toward developing a consensus of how to secure a rebuilt, healthy small pelagic fishery. Stakeholders must debate and decide on potential science-based options, listed above, and act. This brief details the **Add Fishing Holidays Action Option**. Call SFMP to learn more: 0302542497.

WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

A traditional solution to a modern fisheries challenge.

WHAT IS ADDITION OF FISHING HOLIDAYS?

Fishing holidays are arguably one of the oldest traditional “fisheries management practices” in Ghana. Among almost all coastal communities, it is forbidden to go fishing on Tuesday (some observe Thursday or Sunday). Fishing holidays are based on traditional beliefs but are not recognized by Ghana’s current fisheries laws. From a scientific point, these non-fishing days mean there is less time available to fish, reducing to some extent overall fishing effort. In addition,

they allow fishermen time to mend their nets, repair their engines and tend to their family obligations. Most of the larger semi-industrial and industrial vessels (trawls and tuna vessels) do not follow this tradition. However, it could be legally adopted into modern fisheries laws, and with an additional weekly fishing holiday as an input control, it could effectively limit the amount of time fishermen are allowed to fish and could reduce overall fishing effort to more sustained levels.

HOW DOES IT WORK?

- Fishing holidays would be established according to customs of communities (i.e. Tuesdays and Thursdays to accommodate custom across all coastal communities in Ghana).
- No fishing or landing of catch is allowed during the holidays.
- Adding another day means less overall fishing effort throughout the year. This should translate into less fish caught initially and allow more fish to grow and reproduce and gradually build up a larger spawning stock in the sea. As fish stocks build up in the sea, potential catches should increase in subsequent years.

ASSUMPTIONS

- All communities respect fishing holidays.
- Fishing effort (number of active canoes/nets) does not increase on days when fishing is allowed.

PROS AND CONS

- Local artisanal fishermen have

been observing fishing holidays for many years and understand the approach.

- Integrates traditional practices and customs with modern ones and recognizes it as a good management practice.
- Promotes the principals of co-management in Ghana, where government and communities work together to establish good management practices.
- Addition of more fishing holidays will reduce catch and therefore revenues for fishermen in the short term.
- Chief fishermen and Kokohenes can play a role in promoting high compliance by ensuring vessels do not go to sea, and refusing to allow fish to be landed or sold during holidays.

WHAT HAPPENS FIRST?

- Define appropriate day(s) for all coastal communities and apply across the canoe and semi-industrial and trawler fleets.

- Establish a legal recognition of the fishing holidays.
- Establish effective information and enforcement programs.
- Prepare a monitoring plan to assess the impact fishing holidays.

WHAT IS THE IMPACT?

- Allows fish to rest, reproduce without disturbances for short periods of time.
- Preserves employment as no one is forced out of fishing.
- Social benefits as fishermen are with their families more often.

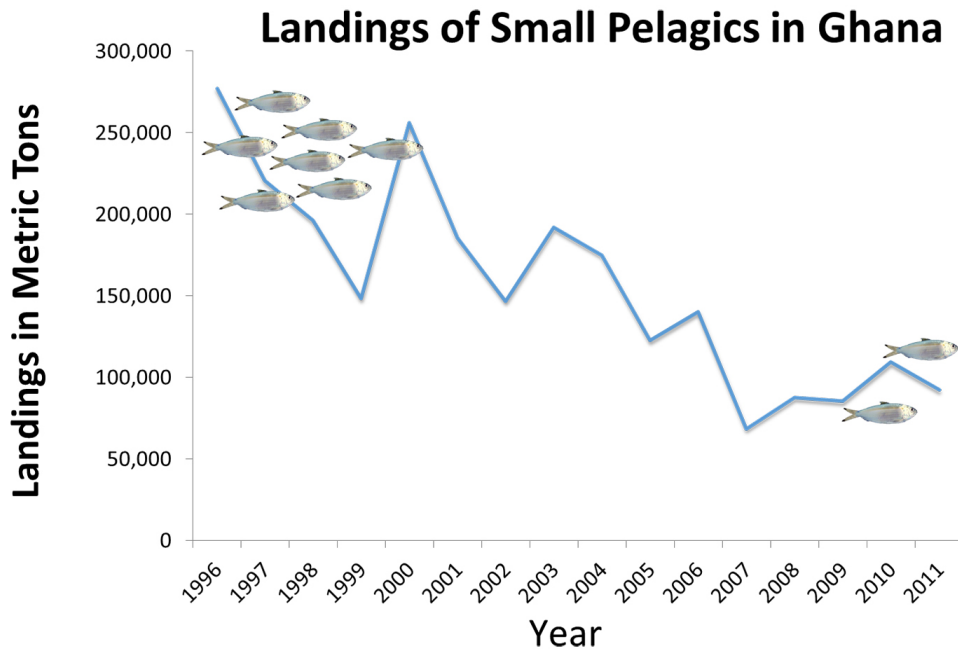
MEASURING OUTCOME

- Monitor the effects of fishing holidays by measuring stock abundance through catch and effort data from fishermen: Catch per unit effort (CPUE).
- Monitor the average size of fish caught over time.
- Monitor fish prices and fishermen’s revenues.





TOWARD A SUSTAINABLE FISHERY: *Action Option: Limit Number of Boats*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996 (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
3. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
- 7. LIMIT NUMBER OF BOATS**
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

It is time to solve the problem of too many fishermen chasing too few fish.

WHAT IS A LIMIT ON BOATS?

Limiting the number of boats in a fishery is a way to limit fishing capacity to match available fish stock size. Fishing effort (number of boats) and their activity combined, create the overall fishing capacity. It often is assumed that reducing the number of boats or number of fishing days will directly reduce the amount of fish caught by the

same amount, but this is not necessarily true. For example if we reduce the number of canoes and semi-industrial boats by 30%, we will not necessarily reduce the catch or effort by 30%. However, limiting the number of boats in all fleets is one way to help prevent the fishery from being over-exploited and improving its profitability.

HOW DOES IT WORK?

Identifying sustainable fishing effort levels and comparing these with current situation can guide fisheries managers to determine the appropriate number of canoes needed to match fish stock available. If actual capacity is more than the fishery can sustain, fleet reduction would be necessary. Current expert opinion suggests that Ghana's fishing fleets do need a reduction in capacity.

ASSUMPTIONS

- Stakeholders must agree to reduce fishing effort (number of canoes and nets) and/or activity (number of trips).
- Data on canoes and fishing-gear must be available over time (minimum 10 years).
- All vessels would be licensed, and an accurate, complete, and regularly updated registry would be needed.

PROS AND CONS

- Would make it easier to control

landings and effectively enforce management measures.

- Would offer great economic benefits to fishermen remaining in the fishery and reduce underutilization of fleet capacity.
- Would serve as economic incentive and motivation to engage in fisheries management and self-regulate.
- Fishery resources would be shared by a limited number of fishers, thereby providing better jobs for those that stay in the fishery.
- It is economically preferable to have a smaller number of efficient vessels than a larger number of inefficient ones.

WHAT HAPPENS FIRST?

- Political will is needed to close or limit access and reduce capacity.
- Adequate administrative capacity is necessary to manage access.
- Adequate legal provisions are needed to limit the number of licenses, which ideally confer

salable and transferable use rights.

- The fleet size initially is capped—no new entrants—and then a strategy for “rightsizing” is worked out.

WHAT IS THE IMPACT?

- In many countries, when limiting of licenses is linked to a use right, the measure has proven to be the best management method to maintain sustainability and rebuild fish stocks.
- Would likely increase proportion of part-time fishermen and reduce total number of fishermen.
- Loss of investment and income for some fishermen and boat owners.

MEASURING OUTCOME

- Routine fish stock assessments.
- Careful monitoring and limiting the number of fishing licenses.
- Monitor catch and effort data (CPUE).



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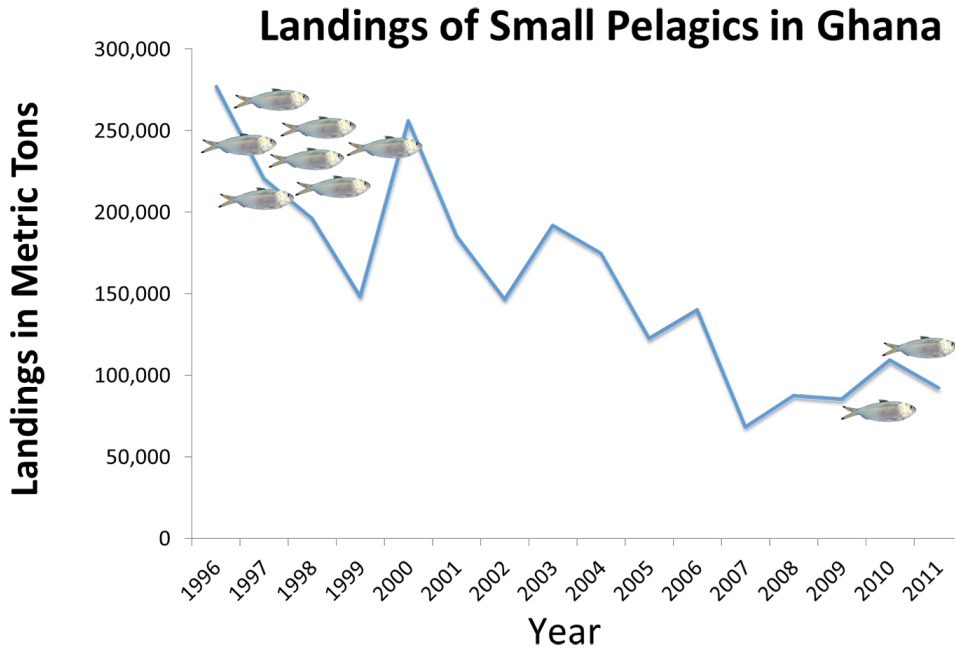


Sps

SPATIAL SOLUTIONS



TOWARD A SUSTAINABLE FISHERY: *Action Option: Total Annual Quotas*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
2. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
- 8. TOTAL ANNUAL QUOTAS**
9. Daily landing quotas
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Quotas are effective, but require a commitment to daily monitoring and ability to assess stock and sustained harvesting levels annually.

WHAT IS A QUOTA?

A quota sets a maximum total amount of fish that can be caught each year by all fishers. This is called total allowable catch (TAC). A technical group recommends annual quotas based on yearly stock assessments. When the quota is reached, the fishery is closed for the year regardless of how long it took to reach the quota. A TAC can be further subdivided into quotas for a sub-sector (artisanal vs. commercial) or per season or per

landing site. If catch monitoring is sufficient, the TAC even can be assigned to individuals or to a group of individuals. Such Individual Fishing Quotas (IFQ) or Individual Transferable Quotas (ITQ) or Sector Quotas (SQ) often are designated as a “property right that can be bought and sold.” Currently, Ghana does not have the capacity of information systems to implement a quota-based management system.

HOW DOES IT WORK?

- A quota is assigned annually before the fishing season begins. A quota allows a recommended weight of fish (yield) to be harvested while maintaining a sufficient portion of the fish stock (biomass) to replenish the harvest. Fishermen can decide when and how they catch fish, which is of less importance than how much is caught. Quotas often require some input controls, such as trip numbers or size limits. To succeed, landings must be recorded and tallied daily. The fishery closes as soon as the quota is reached. If individual quotas are used, landings must be recorded and summed per boat daily. The quota method requires a great deal of monitoring effort and ability. Data must be accurately reported quickly.

ASSUMPTIONS

- The estimate made for the TAC has a high degree of accuracy.
- Annual fluctuations in catch due

to variable environmental and upwelling conditions require a cautious approach.

- A quota for forage fish and ecosystem needs is required (whales, tuna, birds, etc., eat fish). General rule of thumb: 50% of allowable annual harvest stays in ocean as food for predators.

PROS AND CONS

- Quotas are often associated with allocation of property rights and are considered effective for managing fisheries sustainably and providing high profitability.
- Many people may get phased out of the fishery as quotas are bought and sold; there is a risk of a high proportion of quota rights getting in the hands of a few owners.
- With a total quota alone, there is a race to fish, with high levels of catch in a short period. Catch efficiency by fishermen grows, and the fishing period shortens. This affects pricing,

and processing capacity cannot keep up. Individual quotas are considered better practice, as they allow fishers some flexibility to catch fish over a long season to avoid market gluts.

- Fishing seasons may be shorter once the quota is reached, calling for diversified livelihood promotion in non-fishing seasons.

WHAT HAPPENS FIRST?

- Capacity needed to monitor landings accurately and quickly and to set an accurate, science-based TAC.
- Legal basis for TAC. If used, IFQs are recommended.

WHAT IS THE IMPACT?

- If not overfished, in the following year a higher number of fish are caught.

MEASURING OUTCOME

- Fisheries dependent methods: Catch per unit of effort (CPUE).
- Total landings per year: TAC can decrease if stocks are overfished.



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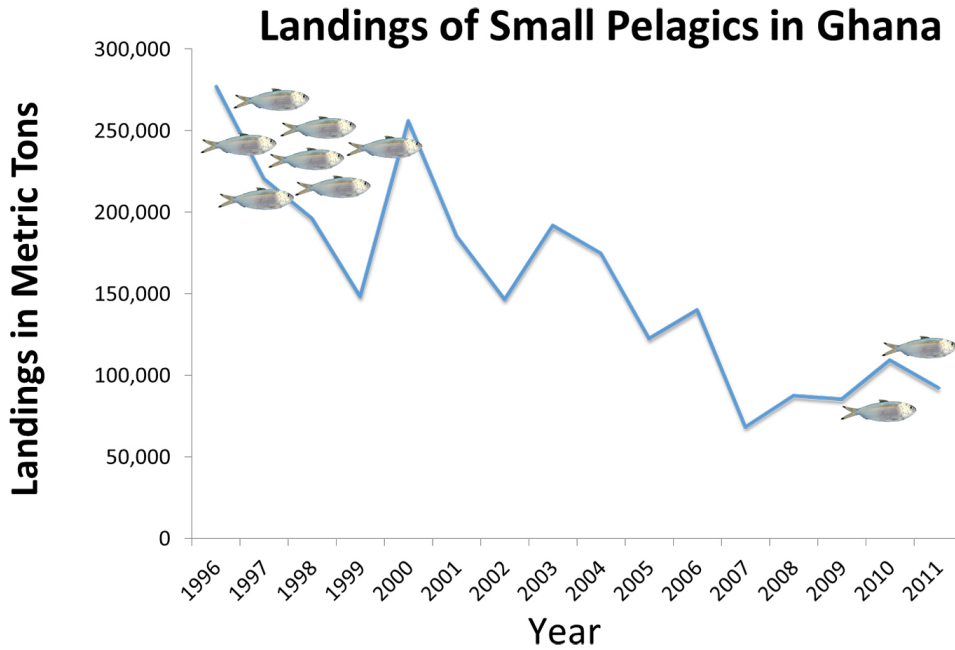


Sps

SPATIAL SOLUTIONS



TOWARD A SUSTAINABLE FISHERY: *Action Option: Daily Landing Quotas*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996 (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
3. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
- 9. DAILY LANDING QUOTAS**
10. Remove subsidies
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Daily landing quotas can ease the pressure on fish stocks and keep prices from collapsing due to oversupply.

WHAT ARE DAILY LANDING QUOTAS?

A daily landing quota is an amount of fish allocated for each boat to regulate fishing harvest and improve market pricing. It usually is assigned by species for each boat or a category of boats. If linked to an annual quota, stakeholders decide how to divide the daily quota among themselves by season and then by day. Each fisherman can get an equal allocation or an allocation proportional to catches from previous years. Fishermen must

have a logbook to report fishing and catch records to government. Once the total annual quota is reached, the fishery will close for the season. Currently, Ghana does not have the capacity to implement a daily landing and total quota-based management system. However, as in Cayar, Senegal, if landing sites were well organized, a community could establish a voluntary daily landing quota to stabilize prices.

HOW DOES IT WORK?

A daily landing quota is assigned before the fishing season begins for each boat and category (inshore, artisanal, industrial). It controls the amount of fish landed every day per boat, and if implemented with a total annual quota, maintains a sufficient portion of the fish stock in the sea to replenish the annual harvest. Market pricing would stabilize as supply becomes more constant. To succeed, the landings must be recorded and tallied daily, and fishermen must return logbooks to authorities monthly. How to allocate the amount of fish to each boat or category is a crucial element.

ASSUMPTIONS

- The total daily landing quota caught by all boats each year should not exceed an annual total allowable catch.
- The quota is provided to a limited and set number of boats.

- In a pelagic fishery, the daily quota usually is a conservative estimate because of the annual variability in potential yields, environmental conditions, and upwelling strength.

PROS AND CONS

- Daily landing quotas are often a property right allocation and are considered effective for managing fisheries sustainably.
- Many people may get phased out of the fishery if daily landing quotas become too small for large boats to be profitable.
- Daily landing quotas per boat can be effective to maximize harvests and profits only if the number of fishing permits also is limited.
- If the number of boats allowed to fish the daily quota is not limited, good pricing might be maintained but overfishing will not be prevented.

WHAT HAPPENS FIRST?

- The capacity to monitor landings accurately and quickly and to set an accurate, science-based daily landing quota must be available.
- A legal basis is needed for allocation of the daily landing quotas to fishermen or boats.

WHAT IS THE IMPACT?

- Initial recipients of a daily landing quota receive profits if the stock is healthy but may not otherwise until stocks recover.
- The quota can decrease if stocks are overfished and increase when stocks become healthy.

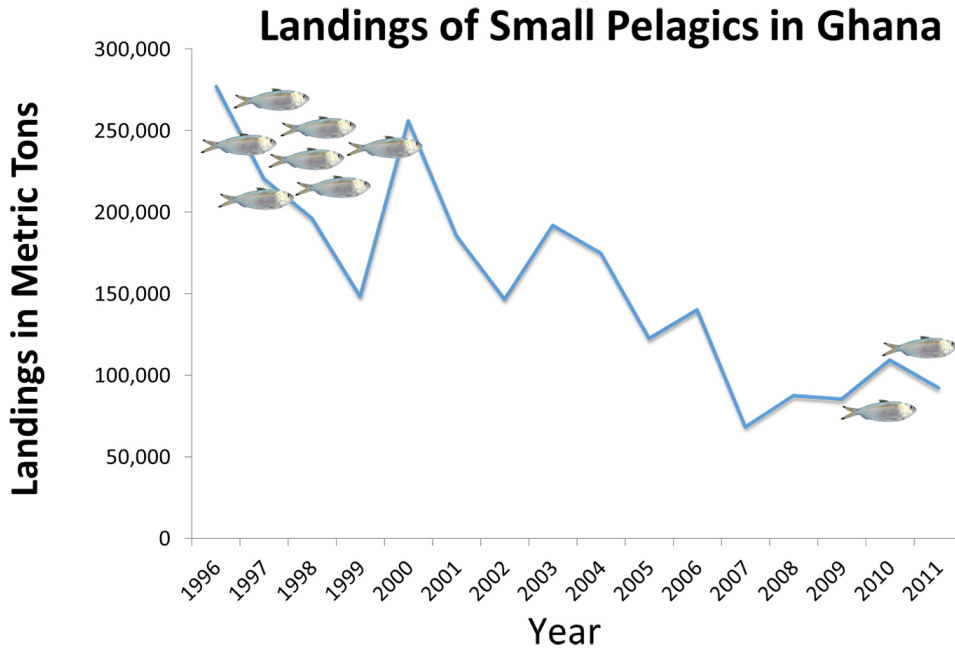
MEASURING OUTCOME

- Fisheries dependent methods: Catch per unit of effort (CPUE).
- Total landings per day, per boat, and per year.





TOWARD A SUSTAINABLE FISHERY: *Action Option: Remove Subsidies*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996. (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
3. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
- 10. REMOVE SUBSIDIES**
11. Territorial use rights

THE PROBLEM

Total landings of the small pelagics in Ghana have decreased from a high of 277,000 MT in 1996 to 92,000 MT in 2011. Weak governance, overcapacity and an open-access fishery that results in overfishing from an increasing number of boats and fishers contribute to the crisis. Entry into this fishery, which teeters on the edge of collapse, has been encouraged by government subsidies to the canoe sector. The number of active semi-industrial vessels has doubled since the 1990s, and the number of canoes has increased by 48 percent since 1997. As catches have started to decline, the frequency of illegal fishing practices has increased and law enforcement has been unable to control these activities. At risk are not only the livelihoods of more than 169,000 men and women engaged in the marine fishery sector, but also the food security of the nation and region.

WHAT WE CAN DO

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Removal of subsidies could reduce overcapacity, but by itself will be insufficient to return the fishery to full health.

WHAT ARE SUBSIDIES?

Subsidies are direct or indirect payments, economic concessions, or privileges granted by a government to fishing industries in order to make them more profitable. The most common subsidy provided to Ghana's fishing industry is the pre-mix fuel at a reduced price, a substantial component of the cost of fishing. The fuel subsidy plays a major role in keeping a large portion of the fishing fleet in business by increasing profitability. Other subsidies

sometimes provided include free gear and engines or reduced prices of these goods. The subsidies initially work to increase profitability of fishing, but if the fishery is open access, over time it encourages more people and vessels to enter the fishery, risking overcapacity. Then profitability is lost over time as long as the fishery remains open. Removing subsidies can reduce fishing effort, but as long as the fishery is still open access, economic profitability and healthy yields are unlikely to be sustained.

HOW DOES IT WORK?

- The government provides financial payments from public monies to fishers in the form of fuel, fishing engines, fishing gear, etc. Because these subsidies reduce the cost of the fishing operation, profitability increases for recipients. If subsidies were reduced or eliminated, the number of fishing vessels and fishers (capacity) would decline. Shrinking the overall fleet size would help to reduce overfishing and aid rebuilding of the stocks. Put simply, by making fishing a less profitable enterprise, some people would have to leave the sector to find other livelihoods.

ASSUMPTIONS

- Loss of economic incentive from subsidies will be enough to drive some people out of the fishery, reducing pressure on stocks.
- Subsidy elimination must be combined with measures to end open access to the fishery.

PROS AND CONS

- Elimination of subsidies might help control some destructive fishing methods that require large quantities of subsidized fuel to operate profitably.
- Would put the least efficient and profitable fishing operations out of business first.
- Could increase short-term unemployment in the fishing sector.
- Unlikely to be solely sufficient to end overfishing and rebuild fish stocks to more sustainable levels.
- As some less economically efficient fishermen would go out of business, social programs would be needed to help them find alternative livelihoods.

WHAT HAPPENS FIRST?

- Political will to end subsidies and public understanding of the long-term value of such a measure despite short-term sacrifice.

- Stakeholders must have buy-in.
- Government may propose a social impact program to assist fishers leaving sector to enter other occupations via skills training or low-interest alternative business loans.

WHAT IS THE IMPACT?

- Fishing capacity would be reduced as profitability decreases.
- Fishing mortality would be reduced (landings) initially.
- Increased profitability for those who stay in the fishery.
- Would likely create some unemployment among existing fishermen.

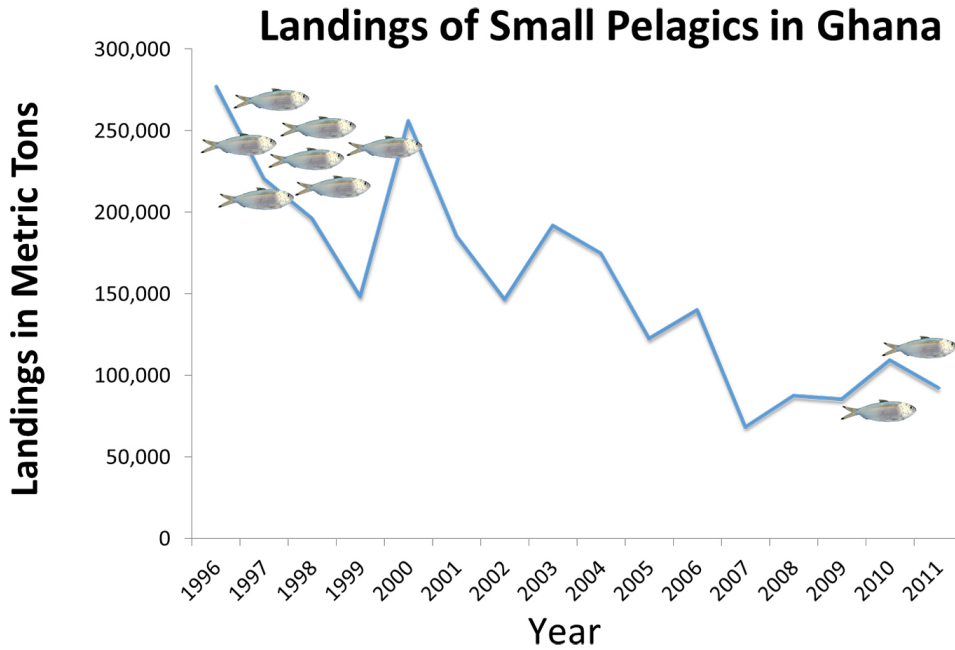
MEASURING OUTCOME

- Monitor catch and effort data (CPUE) and changes in number of fishing vessels fishing.
- Length-based assessment.
- Monitor number of fishermen employed in the fishery.





TOWARD A SUSTAINABLE FISHERY: Action Option: *Territorial Use Rights*



National data on landings of small pelagics (sardinella, mackerel, anchovies, etc.) since 1996 (Source credit: FAO Fish_statistics)

THE OPTIONS

1. Business as usual
2. Closed areas
3. Closed season
4. Increased mesh size
5. Increase min. fish size
6. Add fishing holidays
7. Limit number of boats
8. Total annual quotas
9. Daily landing quotas
10. Remove subsidies
- 11. TERRITORIAL USE RIGHTS**

THE PROBLEM

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WHAT OUR LEADERS CAN DO

To be effective, each option must be formally adopted and have legal weight. Methods of adoption and the pace of progress will vary depending on the option.

- Legislative amendment of the Fisheries Act.
- Regulatory amendment.
- Ministerial/administrative order.

Each brief describes a specific option in detail on the reverse.

Use rights would limit access to fishing areas to a fewer number of fishers and help control excessive fishing effort.

WHAT ARE TERRITORIAL USE RIGHTS?

Territorial Use Rights in Fisheries (TURFs) provides fishermen with exclusive rights to fish a certain area at the exclusion of others. TURFs have been applied for managing fish stocks that do not move much (demersal species) and for relatively small-scale community-based fisheries. The group of fishermen given exclusive access to a fishing area is often decided on the basis of historical participation. The group sets its own

rules on how and when to catch fish, and how many fish to catch yearly. The fishers do not own the space but they own the exclusive privilege to harvest fish within that space. TURFs can be flexible enough and scalable to effectively manage a broad range of fish stocks and can be an important opportunity for improving the welfare of small-scale fishing communities

HOW DOES IT WORK?

- Specific boundaries in the ocean are defined and allocated for exclusive use by selected groups of fishermen.
- Government delegates legal authority and management responsibilities to TURF users.
- TURF users establish rules for managing fish in their territory.
- TURF users invest monies in management because they have a stake in the outcome as “owners.”
- TURF users report to the government on landings and enforcement activities.

ASSUMPTIONS

- Appropriate legal framework is present to establish TURFs.
- Communities buy into the concept of fishery property rights.
- Natural resources attributes must be suitable for the creation and maintenance of TURFs.

- Fishing effort of TURF owners is effectively controlled to allow for sustained harvests.
- TURF owners have capacity for management and monitoring.

PROS AND CONS

- Works well for waters where boundaries can be well defined (estuary, lake, coral reef, bay).
- Promotes individual responsibility and local stewardship of the fisheries resources.
- Promotes co-management in which government and communities work together as partners.
- Excludes others from accessing fisheries resources in TURF areas.
- May not be appropriate where fish and fishermen traditionally migrate over long distances.

WHAT HAPPENS FIRST?

- Define the boundaries and management responsibilities for

the area to be designated as a TURF.

- Establish recognition of a use right to a group of fishers.
- Establish a fair and equitable process for selection for TURF users.

WHAT IS THE IMPACT?

- Fishermen would be rewarded with better and more profitable harvests if they properly care for and manage the fishery resource.
- The fishing fleet would become more efficient and would preserve employment.

MEASURING OUTCOME

- Monitor stock abundance through catch and effort data from fishermen.
- Monitor the average size of fish caught over time.
- Monitor fish prices and fishermen’s revenues.

