

2017 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR
AMERICAN EEL
(Anguilla rostrata)

2016 FISHING YEAR



Prepared by the American Eel Plan Review Team
January 2018

Approved by the American Eel Management Board
February 2018

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AMERICAN EEL
(*Anguilla rostrata*)**

I. Status of the Fishery Management Plan

<u>Date of FMP approval:</u>	November 1999
<u>Addenda:</u>	Addendum I (February 2006) Addendum II (October 2008) Addendum III (August 2013) Addendum IV (October 2014)
<u>Management unit:</u>	Migratory stocks of American Eel from Maine through Florida
<u>States with a declared interest:</u>	Maine through Florida, including the District of Columbia and the Potomac River Fisheries Commission
<u>Active committees:</u>	American Eel Management Board, Plan Review Team, Technical Committee, Stock Assessment Subcommittee, and Advisory Panel

The ASMFC American Eel Management Board first convened in November 1995 and finalized the Fishery Management Plan (FMP) for American Eel in November 1999 (ASMFC 2000). The goal of the FMP is to conserve and protect the American eel resource to ensure ecological stability while providing for sustainable fisheries. In support of this goal, the following objectives are included:

The FMP requires all states and jurisdictions to implement an annual young-of-year (YOY) abundance survey to monitor annual recruitment of each year's cohort. In addition, the FMP requires a minimum recreational size, a possession limit and a state license for recreational fishermen to sell eels. The FMP requires that states and jurisdictions maintain existing or more conservative American eel commercial fishery regulations for all life stages, including minimum size limits. Each state is responsible for implementing management measures within its jurisdiction to ensure the sustainability of its American eel population.

In August 2005, the American Eel Management Board directed the American Eel Plan Development Team (PDT) to initiate an addendum to establish a mandatory catch and effort monitoring program for American eel. The Board approved Addendum I at the February 2006 Board meeting.

In January 2007, the Management Board initiated a draft addendum with the goal of increasing escapement of silver eels to spawning grounds. In October 2008, the Management Board approved Addendum II, which placed increased emphasis on improving the upstream and downstream passage of American eel. The Management Board chose to delay action on management measures in order to incorporate the results of the 2012 stock assessment.

In August 2012, the Management Board initiated Draft Addendum III with the goal of reducing mortality on all life stages of American eel. The Addendum was initiated in response to the findings of the 2012 Benchmark Stock Assessment, which declared American eel stock along the US East Coast depleted. The Management Board approved Addendum III in August 2013.

Addendum III requires states to reduce the yellow eel recreational possession limit to 25 eel/person/day, with the option to allow an exception of 50 eel/person/day for party/charter employees for bait purposes. The recreational and commercial size limit increased to a minimum of 9". Eel pots are required to be ½" by ½" minimum mesh size or have at least a 4" by 4" escape panel of ½" by ½" mesh escape panel. The glass eel fishery is required to implement a maximum tolerance of 25 pigmented eels per pound of glass eel catch. The silver eel fishery is prohibited to take eels from September 1st to December 31st from any gear type other than baited traps/pots or spears. The Addendum also set minimum monitoring standards for states and required dealer and harvester reporting in the commercial fishery.

In October 2014, the Board approved Addendum IV. This addendum was also initiated in response to the 2012 American Eel Benchmark Stock Assessment and the need to reduce mortality on all life stages. The Addendum established a coastwide cap of 907,671 pounds of yellow eel, reduced Maine's glass eel quota to 9,688 pounds (2014 landings), and allowed for the continuation of New York's silver eel weir fishery in the Delaware River. For yellow eel fisheries, the coastwide cap was implemented for the 2015 fishing year and established two management triggers: (1) if the cap is exceeded by more than 10% in a given year, or (2) the cap is exceeded for two consecutive years regardless of the percent overage. If either one of the triggers are met, then states would implement state-specific allocation based on average landings from 2011-2013. The addendum also requires any state or jurisdiction with a commercial glass eel fishery to implement a fishery independent life cycle survey covering glass, yellow, and silver eels within at least one river system.

In October 2017, the Board initiated draft Addendum V. The draft Addendum will explore new management options for provisions included in Addendum IV, specifically the coastwide cap, the management triggers, and state by state allocations for the yellow eel fishery as well as Maine's glass eel quota. The Board will take final action on the document in 2018.

II. Status of the Stock

In 2009, the Management Board initiated a benchmark stock assessment. After reviewing over 100 surveys and studies, the American Eel Stock Assessment Subcommittee (SAS) selected 19 YOY surveys and 15 yellow eel surveys along the East Coast for use as indices of abundance in the assessment. Despite the large number of surveys and studies available for use, the American eel stock is still considered data-poor because very few surveys target eels and collect information on length, age, and sex of the animals caught. Additionally, eels have an extremely complex life history that is difficult to describe using traditional stock assessment models. Therefore, several data-poor methods were used to assess the American eel resource.

The first set of analyses (trend analyses) aimed to determine if there was a statistically significant trend in the fishery-independent survey data and whether or not there was evidence for significant trends on the regional and coastwide scales. The second approach involved a Depletion-Based Stock Reduction Analysis (DB-SRA) model, which uses trends in historical catch to estimate biomass trends and maximum sustainable yield. Both the trend analyses and DB-SRA results indicated that the American eel stock declined in recent decades, and the prevalence of significant downward trends in multiple surveys across the coast is cause for concern. Therefore, the stock status for American eels is depleted, although overfishing and overfished status in relation to the reference points could not be determined with confidence. The benchmark stock assessment was peer reviewed in March 2012 and was approved for management use in May 2012 (ASMFC 2012).

In 2003, declarations from the International Eel Symposium (AFS 2003, Quebec City, Quebec, Canada) and the Great Lakes Fisheries Commission (GLFC) highlighted concerns regarding the health of eel stocks worldwide. In 2010, the Canada Department of Fisheries and Oceans (DFO) conducted a stock assessment on American eels in Canadian waters and found that region-specific status indices show that abundance is very low in comparison to levels in the 1980s for the Lake Ontario and upper St. Lawrence River stock, and is either unchanged or increasing in the Atlantic Provinces.

The 2017 American Eel Stock Assessment Update updates the 2012 American Eel Benchmark Stock Assessment with data from 2010-2016. The trend analysis results in this stock assessment update are consistent with the 2012 results, with few exceptions. Despite downward trends in the indices, commercial yellow American eel landings have been stable in recent decades along the Atlantic coast (U.S. and Canada), although landings still remain much lower than historical landings. The trend analysis and stable low landings support the Assessment Update's conclusion that the American eel population in the assessment range is similar to five years ago and remains depleted. Therefore, the resource is considered depleted and no stock status specific to overfishing determination can be made based on the trend analyses performed (ASMFC 2017).

III. Status of the Fishery

American eel currently support commercial fisheries throughout their range in North America, with significant fisheries occurring in the US Mid-Atlantic region and Canada. These fisheries are executed in riverine, estuarine, and ocean waters. In the US, commercial fisheries for glass eel/elvers exist in Maine and South Carolina and a silver eel weir fishery exists in New York's Delaware River, whereas yellow eel fisheries exist in all states and jurisdictions with the exception of Pennsylvania and the District of Columbia.

Although eel have been continuously harvested, consistent data on harvest are often not available. Harvest data from the Atlantic coastal states (Maine to Florida) indicate that the harvest fluctuated widely between 1970 and 1980, but showed an increasing trend that peaked

in 1979 at 3,951,936 pounds. Harvest has declined since then, with the lowest harvest of 641,225 pounds occurring in 2002. Because fishing effort data are unavailable for the entire time series, finding a correlation between population numbers and landings data is difficult.

Commercial

Please Note: Landings information for the following section are from state compliance reports. The states are working with ACCSP to provide updated and correct landings information; as such, some of the information below may not reflect updated landings information.

Commercial landings have decreased from a high of 3.95 million pounds in 1979 to a low of 641,000 pounds in 2002, and have only recently begun to exceed one million pounds. State reported landings of yellow/silver eels in 2016 totaled 937,346 pounds¹ (Table 1), which represents an 8.4% increase in landings from 2015 (865,070 pounds). Yellow eel landings increased in seven states and jurisdictions, while decreasing in six others. In 2016, state reported landings from Maryland and Virginia together accounted for 72% of the coastwide commercial total landings. Landings of glass eels were reported from Maine and South Carolina, totaling 9,399.61 pounds.

Table 1. 2016 Commercial Landings by State and Life Stage¹

	State Reported	
	Glass	Yellow
Maine	9,399.61	4166
New Hampshire	No Fishery	0
Massachusetts	No Fishery	1,705
Rhode Island	No Fishery	2,651
Connecticut	No Fishery	266
New York	No Fishery	36,371
New Jersey	No Fishery	67,422
Pennsylvania	No Fishery	No Fishery
Delaware	No Fishery	44,398
Maryland	No Fishery	583,578
D.C.	No Fishery	No Fishery
PRFC	No Fishery	58,223
Virginia	No Fishery	96,336
North Carolina	No Fishery	39,911
South Carolina	Confidential (<750 pounds)	0
Georgia	No Fishery	Confidential
Florida	Glass: 0 Elver: 0	6,034
Total	Glass: 9,399.61 Elver: 0	937,346

¹ Harvest data for 2016 comes from the 2017 State Compliance Reports.

Table 2. State commercial regulations for the 2016 fishing year.*

State	Min Size Limit	License/Permit	Other
ME	Glass No minimum size	Daily dealer reports/swipe card program; monthly harvester report of daily landings. Tribal permit system in place for some Native American groups.	The harvester license lottery was previously suspended by the Legislature for improvements, but will be reinstated for 2018 fishing season.
	Yellow 9"	Harvester/dealer license and monthly reporting. Tribal permit system in place for some Native American groups.	Seasonal closures. Gear restrictions. Weekly closures.
NH	9"	Commercial saltwater license and wholesaler license. No dealer reports. Monthly harvester reporting includes dealer information.	Gear restrictions in freshwater.
MA	9"	Commercial permit with annual catch report requirement. Registration for dealers with purchase record requirement. Dealer/harvester reporting.	Traps, pots, spears, and angling only. Mesh restrictions.
RI	9"	Commercial fishing license. Dealer/harvester reporting.	Seasonal gear restrictions.
CT	9"	Commercial license (not required for personal use). Dealer/harvester reporting.	Gear restrictions.
NY	9"	Harvester/dealer license and monthly reporting.	Gear restrictions. Maximum limit of 14" in some rivers.
NJ	9"	License required. No dealer reports. Monthly harvester reporting includes dealer information.	Gear restrictions.
PA	NO COMMERCIAL FISHERY		
DE	9"	Harvester reporting, no dealer reporting. License required.	Commercial fishing in tidal waters only. Gear restrictions.
MD	9"	Dealer/harvester license and monthly reporting.	Prohibited in non-tidal waters. Gear restrictions. Commercial crabbers may fish 50 pots per day, must submit catch reports.
DC	NO COMMERCIAL FISHERY		

State	Min Size Limit	License/Permit	Other
PRFC	9"	Harvester license and reporting. No dealer reporting.	Seasonal gear restrictions. Mesh size restrictions on eel pots.
VA	9"	Harvester license required. Dealer/harvester monthly reporting.	Mesh size restrictions on eel pots. Seasonal closures.
NC	9"	Standard Commercial Fishing License for all commercial fishing. Dealer/harvester monthly combined reports on trip ticket.	Mesh size restrictions on eel pots. Seasonal closures.
SC	Glass No minimum size	Fyke and dip net only permitted. Dealer/harvester monthly combined reports on trip ticket. License required.	Max 10 individuals. Gear and area restrictions.
	Yellow 9"	Pots and traps permitted only. Dealer/harvester monthly combined reports on trip ticket. License required.	Gear restrictions.
GA	9"	Personal commercial fishing license and commercial fishing boat license. Dealer/harvester monthly combined reports on trip ticket.	Gear restrictions on traps and pots. Area restrictions.
FL	9"	Permits and licenses. Harvester reporting. No dealer reporting.	Gear restrictions.

* For specifics on licenses, gear restrictions, and area restrictions, please contact the individual state.

Recreational

Available information indicates that few recreational anglers directly target American eel. For the most part, hook-and-line fishermen catch eel incidentally when fishing for other species. American eel are often purchased by recreational fishermen for use as bait for larger gamefish such as striped bass, and some recreational fishermen may catch their own to use as bait.

The National Marine Fisheries Service (NMFS) Marine Recreational Information Program (MRIP, formerly the Marine Recreational Fisheries Statistics Survey) shows a declining trend in the catch of eel during the latter part of the 1990s. As of 2009, recreational data are no longer provided for American eel, due to the unreliable design of MRIP that focuses on active fishing sites along coastal and estuarine areas.

Table 3. State recreational regulations for the 2016 fishing year.*

State	Size Limit	Possession Limit	Other
ME	9"	25 eels/person/day	Gear restrictions. License requirement and seasonal closures (inland waters only). Bait limit of 50 eels/day for party/charter boat captain and crew.
NH	9"	25 eels/person/day	Coastal harvest permit needed if taking eels other than by angling. Gear restrictions in freshwater.
MA	9"	25 eels/person/day	Nets, pots, traps, spears, and angling only; seasonal gear restrictions and mesh requirements. Bait limit of 50 eels/day for party/charter boat captain and crew.
RI	9"	25 eels/person/day	Bait limit of 50 eels/day for party/charter boat captain and crew.
CT	9"	25 eels/person/day	
NY	9"	25 eels/person/day	Maximum limit of 14" in some rivers. Bait limit of 50 eels/day for party/charter boat captain and crew.
NJ	9"	25 eels/person/day	Bait limit of 50 eels/day for party/charter boat captain and crew. Mesh size restriction on pots.
PA	9"	25 eels/person/day	Gear restrictions.
DE	9"	25 eels/person/day	Two pot limit/person.
MD	9"	25 eels/person/day	Gear restrictions.
DC	9"	10 eels/person/day	
PRFC	9"	25 eels/person/day	
VA	9"	25 eels/person/day	Recreational license. Two pot limit. Mandatory monthly catch report. Gear restrictions. Bait limit of 50 eels/day for party/charter boat captain and crew.
NC	9"	25 eels/person/day	Gear restrictions. Non-commercial special device license. Two eel pots allowed under Recreational Commercial Gear license. Bait limit of 50 eels/day for party/charter boat captain and crew.
SC	9"	25 eels/person/day	Gear restrictions. Permits and licenses. Two pot limit.
GA	9"	25 eels/person/day	
FL	9"	25 eels/person/day	Gear restrictions. Wholesale/retail purchase exemption applies to possession limit for bait.

* For specifics on licenses, gear restrictions, and area restrictions, please contact the individual state.

IV. Status of Research and Monitoring

The FMP requires states and jurisdictions with a declared interest in the species to conduct an annual YOY survey to monitor annual recruitment of each year's cohort. In 2015, the states of Maine (West Harbor Pond), New Hampshire (Lamprey River), New Jersey (Patcong Creek), Delaware (Millsboro Pond), and Maryland (Turville Creek) had above average YOY counts. The 2016 catch at Maine's West Harbor Pond site was the third largest catch on record. The 2016 catch at New Hampshire's Lamprey River site was similarly the third highest in the time series. The 2016 catch at New Jersey's Patcong Creek site was the sixth highest in the 15 year time series. The 2016 catch at Delaware's Millsboro Pond was the sixth highest in the 17 year time series. The 2016 CPUE at Maryland's Irish elver ramp on Turville Creek was above average. All other states with YOY surveys (Massachusetts-New York, PRFC, South Carolina, and Florida) had below average survey counts. Pennsylvania, D.C., North Carolina, and Georgia do not have YOY surveys, but instead have yellow eel surveys. The results from Virginia's YOY surveys are forthcoming. North Carolina is relying solely on NOAA's Beaufort Bridgenet Ichthyoplankton Sampling Program (BBISP) to develop a YOY abundance index for American eel. The program is currently backlogged, but sampling is continuing and funds have been secured to process the newly generated backlog, as well as samples through 2019. New Jersey additionally developed and implemented a fishery-independent eel pot survey to collect abundance data of yellow American eels within nursery grounds. This survey, which began in 2015, supplements the current glass eel survey by sampling more life stages and will allow biologists to collect additional biological samples (age-length-weight data).

As required by Addendum IV, Maine initiated a fishery independent life cycle survey covering glass, yellow, and silver eels within at least one river system in 2016.

North Carolina's aquaculture plan for an American Eel Farm was approved for 2016, and they were given a quota of 200 pounds of glass eel, though they caught 0 pounds in the 2016 fishery.

The FMP does not require any other research initiatives in participating states and jurisdictions. Nonetheless, the American Eel TC has identified several research topics to further understanding of the species' life history, behavior, and biology. Research needs for American eel include:

High Priority

- Accurately document the commercial eel fishery to understand participation in the fishery and the amount of directed effort.
- Investigate, develop, and improve technologies for American eel passage upstream and downstream at various barriers for each life stage. In particular, investigate low-cost alternatives to traditional fishway designs for passage of eel.
- Formulate a coastwide sampling program for yellow and silver American eels using standardized and statistically robust methodologies.
- Conduct regular periodic stock assessments and establish sustainable reference points

for eel to develop a sustainable harvest rate and to determine whether the population is stable, decreasing, or increasing.

- Research the effects of the swim bladder parasite *Anguillacolla crassus* on the American eel's growth and maturation, migration to the Sargasso Sea, and spawning potential.
- Evaluate the impact, both upstream and downstream, of barriers to eel movement with respect to population and distribution effects. Determine relative contribution of historic loss of habitat to potential eel population and reproductive capacity.

Medium Priority

- Investigate survival and mortality rates of different life stages (leptocephalus, glass eel, yellow eel, and silver eel) to assist in the assessment of annual recruitment. Continuing and initiating new tagging programs with individual states could aid such research.
- Tagging Programs: A number of issues could be addressed with a properly designed tagging program. These include:
 - Natural, fishing, and/or discard mortality; survival
 - Growth
 - Validation of aging method(s)
 - Reporting rates
 - Tag shedding or tag attrition rate
- Research contaminant effects on eel and the effects of bioaccumulation with respect to impacts on survival and growth (by age) and effect on maturation and reproductive success.
- Investigate fecundity, length, and weight relationships for females throughout their range; growth rates for males and females throughout their range; predator-prey relationships; behavior and movement of eel during their freshwater residency; oceanic behavior, movement, and spawning location of adult mature eel; and all information on the leptocephalus stage of eel.
- Assess characteristics and distribution of eel habitat and the value of habitat with respect to growth and sex determination.
- Identify triggering mechanism for metamorphosis to mature adult, the silver eel life stage, with specific emphasis on the size and age of the onset of maturity, by sex. A maturity schedule (proportion mature by size or age) would be extremely useful in combination with migration rates.

Low Priority

- Perform economics studies to determine the value of the fishery and the impact of regulatory management.
- Review the historic participation level of subsistence fishers in wildlife management planning and relevant issues brought forth with respect to those subsistence fishers involved with American eel.
- Examine the mechanisms for exit from the Sargasso Sea and transport across the continental shelf.
- Research mechanisms of recognition of the spawning area by silver eel, mate location in

the Sargasso Sea, spawning behavior, and gonadal development in maturation.

- Examine age at entry of glass eel into estuaries and fresh waters.
- Examine migratory routes and guidance mechanisms for silver eel in the ocean.
- Investigate the degree of dependence on the American eel resource by subsistence harvesters (e.g., Native American Tribes, Asian and European ethnic groups).
- Examine the mode of nutrition for leptocephalus in the ocean.
- Provide analysis of food habits of glass eel while at sea.

V. Status of Management Measures and Issues

The FMP required that all states and jurisdictions implement an annual YOY abundance survey by 2001 in order to monitor annual recruitment of each year's cohort. Addendum III requires a 9 inch minimum size restriction in the commercial and recreational yellow eel fisheries, as well as the use of ½ by ½ mesh in the commercial yellow eel pot fishery. The recreational bag limit is 25 fish/angler/day, and the silver eel fishery is restricted, as is the development of pigmented eel fisheries.

Proposed Endangered Species Act Listing of American Eel

The US Fish and Wildlife Service (USFWS) reviewed the status of American eel in 2007 and found that, at that time, protection under the Endangered Species Act was not warranted. American eel was later petitioned for listing as threatened under the Endangered Species Act (ESA) in April 2010 by the Center for Environmental Science, Accuracy, and Reliability (CESAR, formally the Council for Endangered Species Act Reliability). The USFWS published a positive 90 day finding on the petition in September 2011, acknowledging that the petition may be warranted and that a status review would be conducted. CESAR filed a lawsuit in August 2012 against the USFWS for failure to comply with the statutes of the ESA, which specifies a proposed rule based on the status review be published within one year of the receipt of the petition. A Settlement Agreement was approved by the court in April 2013, which required the USFWS to publish a 12-month finding by September 30, 2015. In the published finding, the USFWS determined that a listing under the ESA was not warranted.

VI. Current State-by-State Implementation of FMP Compliance Requirements

The PRT reviewed the state compliance reports for 2016. The PRT notes the following changes with states implementing the required provisions of the American Eel Fishery Management Plan:

Silver Eel Fishery Measures:

- Florida does not have a regulation preventing harvest of eels from pound nets from September 1 through December 31, but the state is unaware of any active pound net fishery in the past 10-15 years.

Reporting Measures:

- New Hampshire and New Jersey do not have dealer reporting, but harvesters report some information on dealers. Delaware, the Potomac River Fisheries Commission, and Florida do not have dealer reporting.

In addition to the monitoring program changes implemented with Addendum III and Addendum IV, the following changes were made to the YOY survey in 2016:

- Maine – The state initiated the required eel life cycle study in 2016.
- New Hampshire – An Irish elver trap was installed on the Lamprey River and a box trap was installed on the Oyster river in order to expand the YOY monitoring program. Sampling occurred on the Oysters River in 2014, 2015, and 2016, and on the Lamprey River since 2001.
- Maryland – Trap functionality and efficiency has been affected at Maryland’s Bishopville prong by the removal of the Bishopville dam in 2014. Maryland made several modifications to traps at the site in 2016, including the addition of both an attraction sprayer and a second intake hose, but observed limited success.
- South Carolina – The state transitioned to using eel ramps for the 2016 survey, as opposed to the stake fyke-net gear used in previous years.

Section 4.4.2 of the FMP stipulates that states may apply for *de minimis* status for each life stage if (given the availability of data), for the preceding two years, their average commercial landings (by weight) of that life stage constitute less than 1% of the coastwide commercial landings for that life stage for the same two-year period. States meeting this criterion are exempted from having to adopt commercial and recreational fishery regulations for a particular life stage listed in Section 4 and any fishery-dependent monitoring elements for that life stage listed in Section 3.4.1.

Qualification for *de minimis* is determined from state-reported landings found in compliance reports. In 2016, New Hampshire, Massachusetts, Pennsylvania, District of Columbia, South Carolina, Georgia, and Florida requested *de minimis* status for their yellow eel fisheries. All states that applied for *de minimis* of the yellow eel fishery meet the *de minimis* criteria. The state of South Carolina additionally requested *de minimis* status for its glass eel fishery, but does not meet the 1% landings criteria for this life stage.

VII. Recommendations/Findings of the Plan Review Team

1. The PRT recommends the Board consider state compliance issues as detailed in Section VI.
2. The PRT recommends *de minimis* be granted to New Hampshire, Massachusetts, Pennsylvania, District of Columbia, South Carolina, Georgia, and Florida for their yellow eel fisheries.
3. The PRT requests that the Board reevaluate the requirement that states provide estimates

of the percent of harvest going to food versus bait, as there is a high level of uncertainty and subjectivity inherent in the data.

4. The PRT requests that states work with the law enforcement agencies to include information on any confiscated poundage from illegal or undocumented fisheries, and that the Board continue to encourage interstate enforcement actions with regards to poaching, due to the broad geographic scale at which the issue occurs.
5. The PRT requests that New York separate its yellow and silver eel landings, if possible, when reporting harvest.
6. The PRT recommends the Board investigate whether North Carolina's American Eel Farm source its glass eels solely from North Carolina waters, as a recent article in the Outer Banks Times indicated the Farm was importing eel from nearby states.
7. The PRT requests that states quantify upstream and downstream passage at blockages, if possible, and provide the information to the Technical Committee for evaluation.

VIII. Works Cited

Atlantic States Marine Fisheries Commission (ASMFC). 1998. Interstate Fishery Management Plan for American Eel (*Anguilla rostrata*). Washington D.C. NOAA Oceanic and Atmospheric Administration Award No. NA97 FGO 0034 and NA07 FGO 024.

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