SALMON SUPP. STUDIES IN ID RIVERS - SHO-BANN TRIBES 8909803

SHORT DESCRIPTION:
Determine the best method to maintain and rehabilitate Idaho's chinook salmon. Compare adult returns, productivity, and genetic composition between treatment and control streams, over time, throughout the Salmon and Clearwater basins. Broodstock management and lifestage at release will vary between treatment streams.

SPONSOR/CONTRACTOR: SBT
Shoshone-Bannock Tribes
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SUB-CONTRACTORS:
Joint Sponsors: Idaho Department of Fish and Game, US Fish and Wildlife Service, Nez Perce Tribe

GOALS

GENERAL:
Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Adaptive management (research or M&E)

ANADROMOUS FISH:
Research, M&E

NPPC PROGRAM MEASURE:
7.0; 7.1C; 7.1F; 7.2; 7.3B.2; 7.4A; 7.4D

RELATION TO MEASURE:
-ISS is designed to assess the impacts and success of chinook supplementation projects in the Salmon and Clearwater drainages.-ISS monitors and evaluates high priority supplementation projects. Annual progress reports have been completed from 1992 to 1995. Supplementation project implementation, monitoring, and evaluation have been ongoing since 1991.- Improve existing hatchery production.-An outcome from ISS should result in suggestions for improvement to existing hatchery supplementation programs.-Another outcome of ISS meets this measure. ISS collects information on various wild/natural chinook life histories and population status'.-ISS coordinates and participates in captive brood stock/rearing collection activities and locations.-Coordinated implementation of habitat and production actions.-ISS implements, monitors and evaluates steelhead hatc

BIOLOGICAL OPINION ID:
NMFS file number P501A, permit #824; Hatchery Section 7 (LSRCP); BIA Section 7 consultations; Hatchery Section 10 (IDFG and IPC).

OTHER PLANNING DOCUMENTS:
Shoshone-Bannock Tribes Fish and Wildlife Management Plan (Draft)NMFS Proposed Recovery Plan for Snake River Salmon - 4.1, 4.1.b, 4.2, 4.2b, 4.5.c.- Biological Objective: Conserve remaining Snake River salmon gene pools through implementation of captive broodstocks/supplementation/gene bank programs.Wy Kan Ush Me Wa Kush Wit - Appendix A Tables 1 and 2

TARGET STOCK	LIFE STAGE	MGMT CODE (see below)
Headwaters Salmon R. and tribs/Summer steelhead	All	S N P W
Headwaters Salmon R. and tribs/Spring-summer chinook salmon	All	S N L W
Upper mainstem Salmon R. and tribs/Summer steelhead	All	S N P W
Upper mainstem Salmon R. and tribs/Spring-summer chinook salmon	All	S N L W
South Fork Salmon R. and tribs/Summer steelhead	All	S N P W

South Fork Salmon R. and tribs/Spring-summer chinook salmon	All	S N L W
Middle mainstem Salmon R. and tribs/Summer steelhead	All	S N P W
Middle mainstem Salmon R. and tribs/Spring-summer chinook salmon	All	S N L W
Bear Valley Cr./Spring-summer chinook salmon	All	L N
Valley Cr./Spring-summer chinook salmon	All	L N
Herd Cr./Spring-summer chinook salmon	All	L,N
EF Salmon R./Spring-summer chinook salmon	All	L S W N
WF Yankee FK Salmon R./Spring-summer chinook salmon	All	L S W N
SF Salmon R./Spring-summer chinook salmon	All	L S W N

AFFECTED STOCK	**BENEFIT OR DETRIMENT**
Other resident fish and trout/Salmon R.	Beneficial
Westslope Cutthroat Trout/Salmon R.	Beneficial
Bull Trout/Salmon R.	Beneficial
Summer Steelhead/SF Salmon R.	Beneficial
Summer Steelhead/Salmon R.	Beneficial

BACKGROUND

Stream name:
Bear Valley Cr., EF Salmon R., Herd Cr., SF Salmon R., Valley Cr., and WF Yankee Fork Salmon R (ISS); Middle mainstem (French Cr. To Middle Fk.), South Fork, Upper mainstem (Middle Fk. to Sawtooth weir), Headwaters, and tributaries of the Salmon River (SRPP).

Subbasin:
Salmon River

Stream miles affected:
200 (ISS)

HISTORY:
ISS began in 1989 with the development of the experimental design, published by BPA in 1991. Full implementation of ISS was to begin over a period of years beginning in 1991 as large capital outlay items (e.g., traps, weirs, PIT tagging equipment) were purchased.

Although full implementation was never achieved, estimates of juvenile chinook outmigration and survival to lower Snake River projects have been made for one stream, rearing parr population estimates have been made for six streams, redd counts have been conducted in five streams, and rearing parr have been tagged in two streams. In 1995, assistance was provided to IDFG in the collection of juvenile salmon as part of their captive brood stock/rearing program.

Low chinook salmon adult returns and subsequent decreased hatchery production have prohibited scheduled hatchery releases (treatments for the study).

A cumulative report summarizing data collected by all cooperators since 1991 is in the process of being completed. Outcomes of the report will include a review of the impacts of low adult returns on the study design and our ability to determine the results of supplementation.

BIOLOGICAL RESULTS ACHIEVED:
Much of the work to date has been collection of baseline data. Estimates of juvenile chinook outmigration and survival to lower S

nake river projects have been made for one stream; rearing parr population estimates have been made for six streams; redd counts have been conducted in five streams; and summer rearing parr have been tagged in two streams.

PROJECT REPORTS AND PAPERS:

Nemeth, D., et al. In progress. Idaho Supplementation Studies, Cumulative Report 1991-1996.

Reighn, C. A., R. M. Keith, M. Rowe, E. Honena, and T. Trahant. 1996. Salmon Supplementation Studies in Idaho Rivers. Shoshone-Bannock Tribes Progress Report 1995, Bonneville Power Administration, Project 89-98-03, Portland, Oregon.

Keith, R. M., M. Rowe, E. Honena, and T. Trahant. 1995. Salmon Supplementation Studies in Idaho Rivers. Shoshone-Bannock Tribes Progress Report 1992-1994, Bonneville Power Administration, Project 89-98-03, Portland, Oregon.

Bowles, E. and E. Leitzinger. 1991. Salmon Supplementation Studies in Idaho Rivers, Experimental Design. Bonneville Power Administration, Project 89-098, Portland, Oregon.

ADAPTIVE MANAGEMENT IMPLICATIONS:

The results of this research will help guide the current and future use of hatchery fish and broodstock management of spring/summer chinook salmon, steelhead, and potentially coho salmon for the Shoshone-Bannock Tribes and the State of Idaho. ISS will help direct management of hatchery chinook in the primary production areas of Idaho with implications for hatchery management and use of the hatchery production throughout the Northwest.
The SBT ISS project has become involved and will become more involved in the Salmon River Production Program. The project has aided in the planning, implementation, and monitoring and evaluation of the SRRP.

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:

Objective 1. Determine the utility of hatchery-produced chinook salmon to increase natural populations of chinook in the Salmon River and Clearwater River basins.
Objective 2. Determine which supplementation strategies (broodstock composition and release stage) produce rapid and effective responses in natural production without adverse effects on productivity.
Objective 3. Determine any changes in genetic composition and natural productivity of target and adjacent chinook populations following supplementation.
Objective 4. Recommend specific implementable recommendations for the management of hatchery broodstocks and their progeny to prevent extinction of Idaho's primary chinook salmon populations.

CRITICAL UNCERTAINTIES:

The associated risks and uncertainties of ISS were evaluated under the RASP 1991 draft criteria.
Genetic- ISS treatment streams already have on-going hatchery programs. Consequently, ISS hatchery protocols should pose a minimal ecological risk, if any, to the chinook salmon populations in these streams. Risks are primarily associated with not conducting ISS, and failing to identify and implement the best hatchery-based recovery measures. Failing to identify and implement the best hatchery-based recovery measures could result in the continued decline or extinction of populations and adversely impacting wild/natural populations through the use of inappropriate supplementation due to a lack of information.
Physical- The use of outmigration traps and adult weirs impose a limited risk to individual fish in terms of direct mortality and alteration of migration timing. The use and acceptability of each research activity is evaluated and monitored under the NMFS section 10 permit process.
The availability of naturally returning chinook to provide for supplementation treatments in the project design is another underlying critical uncertainty.

BIOLOGICAL NEED:

The first recorded supplementation of chinook in Idaho was in 1920 on the Lemhi River. The operation was abandoned in 1933 due to declining runs. The Lower Snake River Compensation Plan was authorized in 1976 and 11 hatchery facilities were constructed as a result. Between 1977 and 1989, 33.5 million hatchery-produced chinook have been released into Idaho yet adult returns continue to decline with 1995 returns being the lowest on record. Throughout the northwest the utility of

supplementation as a recovery tool has been much debated. Fueling the debate has been the absence of studies designed with treatment and control streams under different ecological parameters, evaluating not only adult returns but the productivity of those adults, their ability to produce offspring that will return, and genetic and ecological factors as well.
Existing knowledge on the long term effectiveness of supplementation, based on experimentation and experience, indicates that supplementation using traditional hatchery practices is rarely successful and can impose significant risk to the genetic integrity and long-term survivability of natural stocks (Miller et al. 1990; Steward and Bjornn 1990). The risk of failure is particularly high for upriver stocks experiencing extreme survival bottlenecks from mainstem passage constraints (Miller et al. 1990). Conversely, the need for supplementation as an interim recovery tool may be most pertinent for these same upriver stocks which are rapidly declining to the point where recovery may be impossible. The biological need involves developing strategies to maximize the benefits of supplementation and minimize the risk to target and neighboring natural populations. These strategies must be evaluated prior to large scale management implementation.
ISS represents the largest and most comprehensive effort in the Columbia Basin, and perhaps the northwest, to rigorously address these questions.

HYPOTHESIS TO BE TESTED:

H01a: Supplementation-augmentation of existing chinook salmon populations in Idaho does not affect natural production.
Corollary: Rejecting H01a indicates that supplementation can enhance or deter natural production.
H02a: Supplementation-augmentation of existing chinook salmon populations in Idaho does not reduce productivity of target or adjacent populations below acceptable levels (e.g., replacement).
Corollary: Rejecting H02a indicates that supplementation can adversely affect survival and performance of existing natural populations.
H02b: Supplementation does not lead to self-sustaining populations at some enhanced level (e.g., 50% increase in abundance maintained over time).
Corollary: Rejection of H02b indicates that certain supplementation strategies are successful in establishing self-sustaining populations or enhancing the level at which populations maintain themselves.
H03a: Utilization of existing hatchery broodstocks in Idaho in not an effective strategy to supplement existing populations of chinook salmon within local or adjacent subbasins.
Corollary: Rejection of H03a indicates that established hatchery broodstocks within Idaho can be used successfully to supplement existing natural populations of chinook salmon in local or adjacent subbasins.
H03b: Development of new, local broodstocks with known natural component for supplementation does not provide an advantage over utilization of existing hatchery broodstocks for supplementation within the local or adjacent subbasin.
Corollary: Rejection of H03b indicates that development of new supplementation broodstocks from the target populations can be more successful for supplementation than utilization of existing hatchery broodstocks.
H03c: The effects of supplementation on natural production and productivity does not differ among life stages (parr, presmolt, smolt) of hatchery fish released.
Corollary: Rejecting H03c indicates which supplementation release strategies (life stage) are most effective (or least deleterious) in rebuilding natural populations.

ALTERNATIVE APPROACHES:

The ISS Study Design was developed through Regional Assessment of Supplementation Project (RASP), Supplementation Technical Work Group (STWG), and other scoping groups to achieve consensus on the program objectives and needs.

JUSTIFICATION FOR PLANNING:

N/A ISS does not focus on pre-implementation efforts.

METHODS:

The entire ISS experimental design is about 180 pages and was published by BPA in 1991.
The ISS experimental design is split into three main approaches. The primary level of evaluation involves large scale population production and productivity studies designed to provide statewide inferences. The second level utilizes study streams as individual "case histories" to evaluate specific supplementation programs. The third level represents small-scale studies designed to evaluate specific hypotheses. Levels one and two focus on measuring population responses to supplementation and hence are long-term in nature. The third level will determine specific impacts of supplementation such as competition, dispersal, and behavior. These studies are relatively short-term and will be conducted in laboratory streams or "controlled" field environments.
There are two categories of case histories; supplementation of existing natural populations (predominantly in the Salmon River

basin) and supplementation of extinct populations (predominantly in the Clearwater basin). Supplementation effects will be evaluated by comparing the following population parameters in supplemented and unsupplemented streams of similar ecological parameters (productivity, geology, habitat quality, etc.): weir returns, redd counts, juvenile production, juvenile survival, fecundity, age structure, emigration timing, and genetic structure and variability.
Primary data collection includes:
Mid-summer parr - Parr abundance is estimated in all treatment and control streams. Number of parr is estimated with standardized snorkeling techniques utilizing stratified systematic sampling (Scheaffer et al. 1979) designed to provide a coefficient of variation of approximately 15%. Parr densities are expanded by strata to estimate total parr abundance within the experimental unit. (treatment or control reach).
Fall and spring emigrants (presmolt and smolt) - Juvenile emigration numbers and timing are estimated with outmigrant (screw traps) traps. Traps are operated during the fall and spring emigration period unless icing or water velocity is prohibitive. Capture efficiency is estimated by recapture of marked emigrants from the study streams and hatcheries. Hatchery fish (500 - 1000) are PIT tagged prior to release into treatment streams. Naturally produced parr and emigrants will be PIT tagged following collection by seining, minnow traps, or emigration traps.
Adult escapement - Escapement to study streams is determined for all treatment and control streams. An adult weir is located on the East Fork Salmon River and South Fork Salmon River. Multiple redd counts are used in streams with and without adult weirs. Entire potential spawning area is surveyed. Potential egg deposition will be estimated from fecundity schedules derived from appropriate hatchery racks. These schedules will be applied directly to natural fish in study streams with weirs and applied as a function of the measured female:redd ratio for streams without weirs.
Supplementation effects will be evaluated using repeated measures profile analysis (split plot through time) to test the response of populations to treatments over time as compared to untreated streams. To help partition variability, some hypotheses utilize a block design. Depending upon the specific hypothesis, blocks may include status of existing population, brood source, life stage out-planted, and stream productivity.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase **Start** 1990 **End** 2007 **Subcontractor**

Task Planning was done during project development resulting in the ISS Experimental Design in 1991. More planning on a much smaller scale will be done throughout the life of the project as project conditions and needs change.

Implementation Phase **Start** 1992 **End** 2007 **Subcontractor**

Task Production monitoring will continue as outlined in the experimental design. Refinements in methods will be an ongoing process. Annual field activities are as follows: Nov- Jan, data analysis; Jan - Mar, report writing; Mar - Nov, trapping and tagging emigrants, checking data, compiling data; Jun - Aug, snorkeling; Aug - Oct, redd counts and carcass surveys.

PROJECT COMPLETION DATE:

2007

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:

Continued decline of spring/summer chinook salmon returning to Idaho, especially the naturally produced component, could impede indefinitely the development of supplementation broodstocks.
The screw trap was not installed in the East Fork Salmon River in Fall 1996 because there were no redds observed in 1995. Furthermore, the screw trap will not be installed in the East Fork Salmon River in Spring 1997 for the same reason. Based on chinook adult return estimates for 1997, ISS should have sufficient numbers of fish to work with beginning in Summer 1997. FY 98 will be full field year encompassing all SBT primary project parameters.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

Expected performance of target population or quality change in land area affected:

This research will define the best method for supplementing existing naturally reproducing populations of chinook salmon and the

best method for re-establishing naturally producing populations in streams where chinook have become extinct. Because study streams have different ecological characteristics, supplementation effects and recommendations will likely be different for different streams.
ISS will also attempt to determine survival rates between juvenile life stages.

Present utilization and convservation potential of target population or area:
With one exception, all project spring/summer chinook salmon populations are currently at levels too low to support a sport fishery.

In 1997, a surplus of hatchery marked chinook returning to the South Fork Salmon River (SFSR) may be targeted for a sport fishery.

The Shoshone-Bannock Tribes have and will likely continue to conduct Treaty Right chinook salmon utilization activities in portions of the project area, including the SFSR.

The potential for conservation of chinook salmon in the Salmon River drainage still exists. In other words, there are still fish/populations/genetic qualities left to preserve/conserve.

Assumed historic status of utilization and conservation potential:
Historically, the Salmon River produced 40% of the Columbia River spring/summer chinook salmon run.

Long term expected utilization and conservation potential for target population or habitat:
The minimum goal is to prevent the extinction of spring/summer chinook salmon and maintain a naturally producing chinook fishery at levels to sustain Tribal utilization. The long term desired utilization goal is to restore chinook populations in Idaho to levels supporting sport harvest.

Contribution toward long-term goal:
This research will provide insights into the best hatchery methodology to maintain Idaho's chinook salmon to the extent possible with current mainstem migration and mortality problems. If solutions to Columbia and Snake River survival problems are implemented, the ISS should provide information to help guide the rehabilitation of Idaho's chinook salmon populations.

Indirect biological or environmental changes:
ISS will provide insight into possible supplementation strategies for other anadromous fish. In addition, ISS collects information on steelhead and resident fish which is valuable to the Tribes and other fishery and land management agencies.

Physical products:
Estimates of juvenile chinook outmigration and survival to lower Snake River projects have been made for one stream; rearing parr population estimates have been made for six streams; redd counts have been conducted in five streams; and rearing parr have been tagged in two streams.
Products and milestones to date include PIT tagging the three brood year (BY) 1991 juvenile life stages identified in the experimental design. These include summer parr, fall emigrants, and spring emigrants. All life stages were tagged in streams where emigrant traps are operated. In other streams, only summer parr were tagged. Detection rate information has been collected from four Snake and Columbia dams with detection facilities for these groups. All treatment and control streams were snorkeled during the summers of 1992, 1993, 1994, 1995, and 1996. The first outplants of juvenile Chinook salmon for supplementation occurred during the summer of 1992. The first fall releases were in the fall of 1992, and the first smolt releases were in the spring of 1993. All these fish were differentially marked from general hatchery production fish.

Environmental attributes affected by the project:
N/A ISS does not affect habitat parameters.

Changes assumed or expected for affected environmental attributes:
N/A ISS does not affect habitat parameters.

Measure of attribute changes:
N/A ISS does not affect habitat parameters.

Assessment of effects on project outcomes of critical uncertainty:
Risks:
We are in the process of gaining knowledge in identification of the best hatchery-based recovery methods to minimize the likelihood of adversely impacting wild/natural populations and maximize the likelihood of beneficially impacting those populations.
Effects on individuals resulting from trapping, handling, and observing are minimized by using methods that minimize impacts and by consistent and timely monitoring of potential impacts.

Uncertainties:
Regardless of the overall goal and long term strategies for supplementation, efforts will be negated without improvements in mainstem mortality problems.

Information products:
ISS provides critical monitoring information (adult returns, juvenile production, survival rates) for the critical chinook production areas in Idaho. Information gained from this project will aid in determining the most beneficial method for future chinook supplementation.

Coordination outcomes:
Through coordination with Idaho Department of Fish and Game, Nez Perce Tribe, and US Fish and Wildlife Service, adult return information, juvenile production, and juvenile survival rate information is available for more than ten streams. In addition, information regarding hatchery chinook salmon behavior has been obtained.

MONITORING APPROACH
ISS outcomes could be measured through its success at evaluating supplementation as an effective method in improving adult returns and productivity of supplementation fish in the wild. A positive outcome would be increased survival of released supplementation fish and increased productivity of those fish returning to spawn in the wild relative to general hatchery production fish.

Provisions to monitor population status or habitat quality:
The ISS Experimental Design (1991) was set up to monitor changes in chinook salmon populations through emigrant trapping, snorkeling, redd counts, carcass surveys, and adult trapping.

Data analysis and evaluation:
The Experimental Design outlines statistical procedures to be used. If substantive changes are made to the Experimental Design in the future, new statistical methods will be prescribed.

In brief, supplementation effects will be evaluated using repeated measures profile analysis (split plot through time) to test the response of populations to treatments over time as compared to untreated streams. To help partition variability, some hypotheses utilize a block design. Depending upon the specific hypothesis, blocks may include status of existing population, brood source, life stage out-planted, and stream productivity.

Information feed back to management decisions:
Management is a part of ISS. In addition, at least three meetings a year are held with researchers and management personnel.

Critical uncertainties affecting project's outcomes:
Improved mainstem survival would reduce the uncertainty of obtaining enough naturally produced chinook salmon adults to develop supplementation broodstocks.

EVALUATION

We are in the process of completing the five year summary report encompassing information from all project cooperators. The success of ISS could be assessed by a number of factors including, but not limited to the following: Adult to adult returns and number of smolts produced per redd.

Incorporating new information regarding uncertainties:

ISS cooperators meet regularly to exchange and compare results and discuss adaptations to the project as necessary.

Increasing public awareness of F&W activities:

This project would increase public awareness of the region's efforts to enhance chinook salmon in Idaho if current supplementation measures or alternative methods suggested through this project's research, result in an increase in wild/natural chinook salmon returning to Idaho.
If current measures are not sufficient, this project will help show the public what supplementation methods might work the best for reintroducing chinook salmon to the Salmon River drainage.
In addition, the size and scope of ISS make it pertinent to anadromous fish management throughout the northwest.

RELATIONSHIPS

RELATED BPA PROJECT	RELATIONSHIP
9401700 Idaho Model Watershed Habitat Projects	ISS Project Leader is a member of the Technical Advisory Committee and EF Salmon R. Watershed Plan Committee of the Model Watershed.
5501400 Salmon River Production Program	ISS helps plan, implement, and monitor the hatchboxes of SRPP
8300700 Intensive Smolt Monitoring	ISM collects data in the upper Salmon River and Crooked River which is used by ISS.
9405000 Salmon River Habitat Enhancement	SRHE and ISS work in many of the same streams where data is mutually collected and exchanged.
9005500 Steelhead Supplementation Studies	Companion study to ISS looking at steelhead supplementation in Idaho Rivers. Data is exchanged between projects.
8909801 US Fish and Wildlife Service	Cooperator
8909802 Nez Perce Tribe	Cooperator
8909800 Idaho Dept. of Fish and Game	Idaho Department of Fish Game (IDFG), Nez Perce Tribe, and U.S. Fish & Wildlife Service are all cooperators in ISS each having responsibility for different streams.

RELATED NON-BPA PROJECT	RELATIONSHIP
Lower Snake River Compensation Plan (LSRCP)/BPA	LSRCP is funded by the US Fish and Wildlife Service and shares information with ISS.

OPPORTUNITIES FOR COOPERATION:

ISS is a cooperative effort between Idaho Department of Fish and Game, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the U.S. Fish & Wildlife Service. Each cooperating agency has responsibility for investigation of different streams within Idaho. All cooperators meet together to plan project activities and discuss adaptive changes necessary to maintain project relevancy and effectiveness. Equipment and personnel are shared as available and possible.

COSTS AND FTE

1997 Planned: $172,000
1996 Unobligated: $62,000

FUTURE FUNDING NEEDS:

PAST OBLIGATIONS (incl. 1997 if done):

FY	$ NEED	% PLAN	% IMPLEMENT	% O AND M
1998	$181,000	10%	10%	80%
1999	$190,000	10%	10%	80%
2000	$200,000	10%	10%	80%
2001	$210,000	10%	10%	80%
2002	$210,000	10%	10%	80%

FY	OBLIGATED
1992	$106,920
1993	$138,078
1994	$118,200
1995	$120,000
1996	$121,000
1997	$233,992
TOTAL:	$838,190

Note: Data are past obligations, or amounts committed by year, not amounts billed. Does not include data for related projects.

OTHER NON-FINANCIAL SUPPORTERS:
US Fish and Wildlife Service, Lower Snake River Compensation Plan, USDA Forest Service, Nez Perce Tribe, Idaho Department of Fish and Game

LONGER TERM COSTS: $210,000.00
Continued implementation

1997 OVERHEAD PERCENT: 26%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:
Portion of direct costs: personnel and fringe benefits

CONTRACTOR FTE: 4

SUBCONTRACTOR FTE: 0