



Overview of Development and Implementation of PIFSC Bio-Sampling Field/Market Program in the US Pacific Islands Region (PIR)

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Overview: Commercial Fisheries Field/Market Sampling Program

- Development and implementation of the Commercial Fisheries Bio-Sampling Field Program (CFBS-FSP)
 - ✓ Geographic, historical & regulatory context - US Pacific Islands Region (PIR)
 - ✓ Overview PIR insular fisheries monitoring Guam, CNMI & American Samoa
- Data collection objectives & requirements
 - ✓ Monitoring challenges...leading to short and long term monitoring goals and opportunities.
 - ✓ *Small % of CFBS-FSP sample goes to CFBS Life History Program (CFBS-LHP)*
- Development of biosampling teams in each island area
 - ✓ Adapting to local landings; marketing, technical & cultural framework; available agency support
 - ✓ *Put into perspective CFBS-FSP sample in relation to total landings & market data*
 - ✓ Strengths, weaknesses and constraints in CFBS-FSP by insular area
 - ✓ Strategies for improvement in processing, coverage and integration with other monitoring
- Data management support
 - ✓ WPacFIN programming and technical support for fishery-dependent data
 - ✓ CFBS-FP software design
 - ✓ Automated summaries of CFBS-FP data (quality control and annual for agencies & Council)



Development & Implementation: Regulatory Context & Funding

- Funding for CFBS made available to provide for additional requirements Revised Magnuson-Stevens Fishery Conservation & Management Act of 2006 (RMSA) placed on US states, territories & insular areas
- US Congress/NMFS provided funding to bolster our ability to assess and manage stocks sustainably & improve fishery-dependent data collections, under the broad umbrella of “Bio-Sampling”
 - ✓ “Bio-Sampling” programs were enhanced in other regions of the US
 - ✓ PIR needs were unique (no existing program, less funding & infrastructure; sparse monitoring & regulatory support; most fisheries/stocks “data poor”, not assessed; many more species)
- Stock assessment requires information such as
 - ✓ Continuous harvest and population data (ideally size- or age-structured data)
 - ✓ Length/age-weight relationships
 - ✓ Size at maturity
 - ✓ Length/age-at-recruitment
 - ✓ Size/age-specific mortality
- PIR basic monitoring need was to identify species harvested, amounts/proportions by different gear types, CPUE & basic life-history characteristics



Development & Implementation: PIR Fisheries Monitoring Traditions & Challenges

FISH CATCH/SALES REPORTING GENERALLY NOT REQUIRED

- **Catch** (*kept, released/lost*) or **landings** (*brought ashore*) **mostly not reported.**
- **Some reporting by seafood vendors/dealers/markets** (*sales/purchases from fishers*)
 - ✓ **American Samoa**
 - Fishers are not required to report, except federal programs (*longline logbooks*)...*auxiliary federal observers and purse seine cannery monitoring*
 - Seafood purchases from fishers must be reported by store owners (no successful central fish market)
 - ✓ **CNMI**
 - Fishers (or vessels) are not required to report, except federal bottomfish logbook program (*little participation*)
 - Reporting of purchases from fishers by "fish vendors" recently required by law (*not yet fully implemented*)
 - ✓ **Guam**
 - Fishers are not required to report
 - No reporting requirement for fish vendors/purchasers
 - GFCA the major fishing cooperative (60-70% of commercial sales) provides significant voluntary reporting
 - ✓ **Hawaii**
 - State law requires licensing & monthly reporting by commercial fishers (trip-level for one fishery)
 - "Fish dealers" that purchase directly from fishers must report monthly, but are not licensed (a reporting requirement, on the books for decades, was fully implemented in 2000)



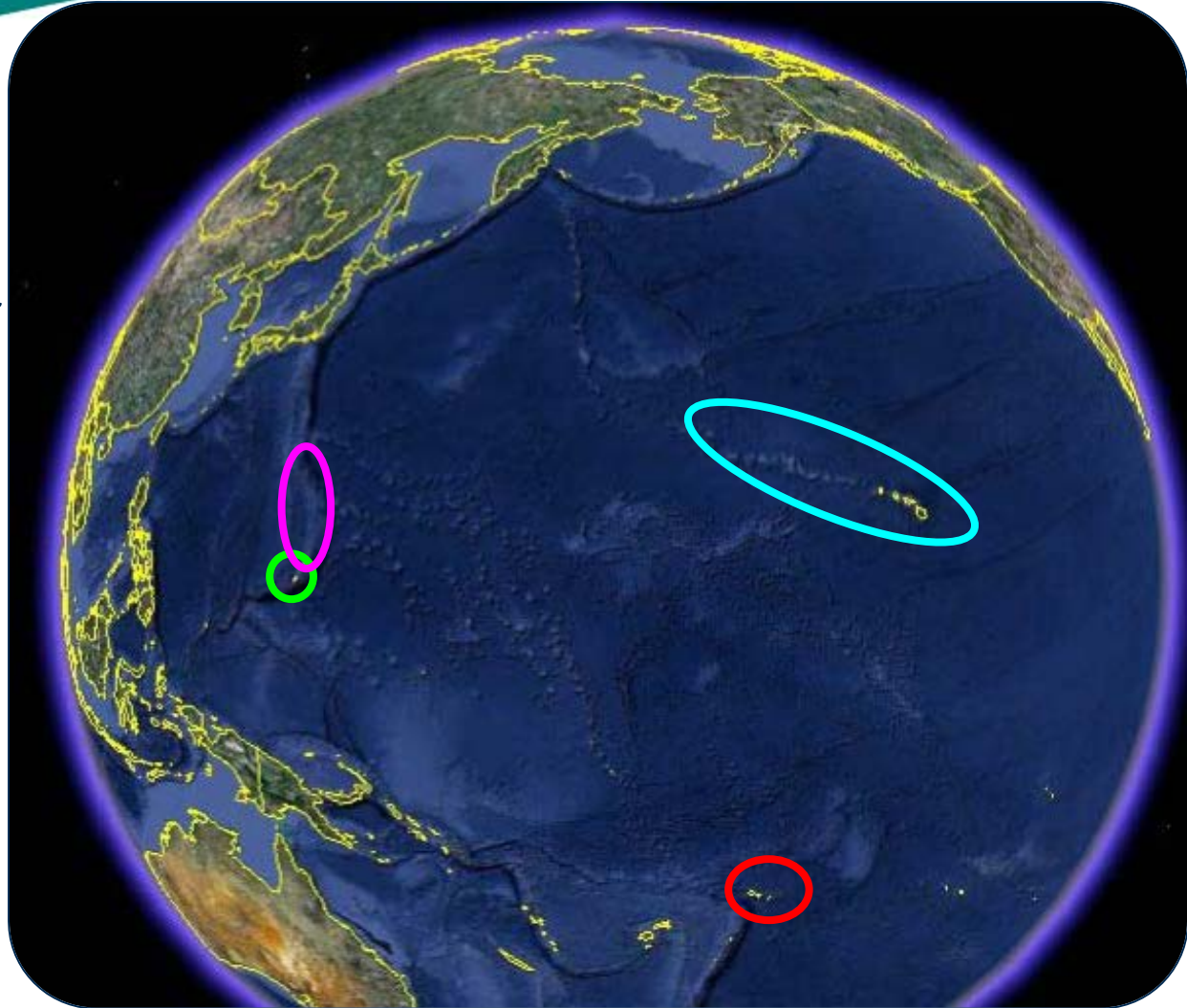
Development & Implementation: PIR Fisheries Monitoring Challenges

- For the three insular areas we'll discuss, fishers and seafood vendors who provide data are volunteers:
 - ✓ Significant justification or political consensus is needed to require reporting
 - ✓ There is more general acceptance of a need for commercial reporting or monitoring large-scale fishing operations and foreign vessels
 - ✓ **This makes monitoring fish catch and sales data challenging, but necessary...**
 - Fisheries and markets spring up and sometimes disappear
 - Adaptation to emerging fisheries & monitoring needs is challenging
 - With funding the greatest limitation, this new program provided an opportunity to make substantial improvements (starting with the least known of those accessible via markets).
 - ✓ **Creel surveys (Boat-Based and Shore-Based) are the longest standing method of monitoring catch and effort by fisheries agencies in American Samoa, Guam and the CNMI, but some fishing activities are harder to capture (remote/night fishing).**
 - ✓ **Monitoring of commercial purchases 2nd most common method, but did not previously include hands-on measurement or detailed species identification.**



Program includes three of four US PIR Insular Areas:

1. American Samoa
 2. Commonwealth of the Northern Mariana Islands (CNMI)
 3. Guam
- *Hawaii not included in the current biosampling program*
 - *Funding invested (state taxes)*
 - *Different regulatory, enforcement and monitoring regimes*





***Low Hanging
Fruit***



- Recognizing the challenges in US insular areas, PIFSC gave Guam, CNMI & American Samoa highest priority to improve fisheries-dependent data.
- Began developing pilot Bio-sampling programs in 2009, starting on Guam where there was significant support from the Guam Fishermen's Coop.
- Goals were set at a basic level that would represent a significant step forward for the region
 - ✓ Broad scale look at commercial landings (by fisher/trip, gear & area fished)
 - ✓ Length and weight frequencies of whole commercial landings per fisher-trip (with an effort to also sample landings not sold commercially)
 - ✓ Accurate species identification (huge step forward)
 - ✓ Develop accurate local length-weight curves (so length measurements can be used to estimate weight of landings)
 - ✓ Begin developing in-depth life history information, starting with commonly caught, less studied bottomfish and insular species



Development & Implementation: General Goals & Objectives Developed to **Fill in** **Gaps/Weaknesses in other Data Collections**

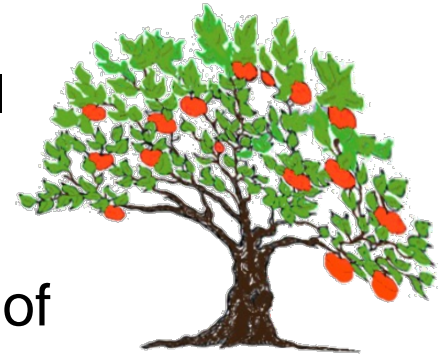
- **Identify commercial catches to species**
 - ✓ Commercial (even creel) survey data often identified by groups (families & multi-taxonomic categories "assorted reef/troll fish", price categories, traditional common names)
 - ✓ Market goals (rapid efficient sales) vs. fisheries monitoring goals (**detailed species data**) 🍎
- **Establish trip-level monitoring of fishery-dependent age/size-structured catch by gear with accurate species identification**
 - ✓ Develop **accurate length-weight relationship data by species** 🍎
 - ✓ **% species, size and sex/maturity composition of commonly grouped fisheries categories** 🍎
- **This work is complementary to existing monitoring programs (funding intermittent and unknown duration; not intended to replace long term monitoring programs)**
- **Collect samples for LHP research to determine assessment- and management-related life history information**
 - ✓ **Size at reproductive maturity** 🍎
 - ✓ **Seasonal spawning characteristics** 🍎
 - ✓ Age and growth
 - ✓ Size-sex composition (including aspects sequential hermaphroditism on population structure)
 - Protogyny (scarids, labrids, serranids); protoandry (pomacentrids, eels, threadfins)
 - **Sex changes & sex ratios associated with reproductive aggregations and size at recruitment** 🍎
 - **Identify fisheries targeting specific size/sex/color/etc. (e.g. parrotfishes)** 🍎



FSP Data Collection Goals



- Basic Effort Data (gear, location, etc.)
- Length and weight by species (*no price/lb*)
 - -----
- Whole fish (2-3 “voucher” specimens all species & photographs to verify species identification; include rare species)
- Fin clips collected for DNA “Barcode of Life” (*just to validate species*)
- Otoliths collected (detailed age & growth studies by LHP, starting with a few commonly commercial species, found in a wide size range all year round)
- Gonads (same species/sizes) collected and “staged”





Resulting subsample of the catch is different for each insular area

- What is currently sampled has been determined by the accessibility and cooperation of the markets & commercial fishers.
- We have been fortunate to experience extraordinary cooperation from both fishers and markets/vendors and to work with a highly capable, innovative and evolving group of agency staff and contractors
- There is variable overlap with creel survey and commercial purchase data collected by island fisheries agencies in each insular area
- We have adapted to setbacks and challenges, developing new approaches & techniques.
- **CFBS-FSP is NOT designed to estimate total commercial landings**
 - ✓ Opportunistic sampling of whole catches by gear with in-depth length-wt & life history data collection for a limited subsample of the available market
 - ✓ No random sampling by gear or area... biased by gears/trips we can identify & intercept
 - ✓ Driven by market preferences and "the kindness of strangers" (who have become friends)
 - ✓ No conversion to whole commercial landings, let alone total landings...
- **Illustrate by taking a look at development of biosampling pilots by island area**



Development of Biosampling: Guam



- Guam was the first Biosampling pilot study (August 2009)
 - ✓ Enthusiastic support from the Guam Fishermen's Cooperative Association (GFCA), where fishermen bring their catch
 - ✓ Staffing was originally via Joint Inst. Marine & Atmospheric Research (JIMAR, Eric Cruz)
 - Sampling alone, Cruz implemented use of voice recorder (which became obsolete)
 - Cruz eventually became a federal employee with multiple other responsibilities
 - Project has gone through a variety of configurations, but has been able to maintain high standards with biosampling contractors trained and managed by Cruz with support from GFCA
 - GFCA is the primary sampling location, and has a harbor and offloading site nearby
 - GFCA also the main staffing support, supplemented by various other contractors for periods of up to a year at a time (Council, Ocean Associates, Freestone)
 - ✓ Guam Division of Aquatic & Wildlife Resources (DAWR) did not get directly involved, but offered a work space where fish were processed for the 1st year
 - ✓ GFCA, would eagerly inform us of incoming trips (*not many were missed*) and provided:
 - Staff to help move fish
 - Refrigeration and space
 - NOAA eventually developed and outfitted a laboratory for biosampling work
 - GFCA has continued to be incredibly accommodating, allowing fish to be remove from the Coop, sampled at the lab and returned.
 - ✓ Guam Biosampling data represent species & sizes sold to the Coop (not all fish landed commercially on Guam)



Development of Biosampling: Saipan, CNMI

- PIFSC began developing a Biosampling Pilot on Saipan (December 2010)
 - ✓ The market and landings situation is completely different from Guam & much more challenging
 - Several failed attempts to develop a centralized market or fishing cooperative on Saipan
 - Vendors sell from storefronts & roadside stands; fishers at disperse landing sites (all hours of day & night)
 - Outreach to fishermen and vendors very important, to build trust and find ways and times of day to conduct sampling before fish go on sale, without interrupting the flow (fishermen & market processes)
 - ✓ Original intent (pilot) was to build on LHP that existed at the Division of Fish & Wildlife (DFW)
 - DFW was intended to be the lead in extraction, fish ID and processing (grant failed over multiple years)
 - Economic downturn and other factors affected this outcome (CNMI, including DFW, still recovering)
 - DFW still receives and processes life history samples from the program for species they continue to work on
 - Some DFW staff helped build the program during the period of government furloughs
 - ✓ Contract to Micronesian Environmental Services (MES), originally for field work and transport of fish to DFW for processing, developed into much more due to the initiative of the contractor
 - MES worked out relationships with vendors and fishermen, and is the primary sampling entity
 - Also does preliminary processing/collection of life history samples
 - Sampling at vendor designated times and locations
 - Fishermen also allow their catch to be sampled before they attempt to sell (some go to multiple vendors)
 - ✓ Saipan Biosampling data represent a subset of fish sold to vendors on Saipan, and a portion of the Boat-Based fishery that is not well captured via creel surveys. The pelagic fishery is better represented in DFW's creel surveys and commercial purchase data.



Development of Biosampling: Tutuila, American Samoa

- **PIFSC began developing a Biosampling Pilot on Tutuila, American Samoa (Oct. 2010)**
 - ✓ **The market and landings situation is similar to Saipan, but has many unique features**
 - American Samoa is a very traditional culture, with villages that share resources and chip in together for important events.
 - Fishermen would like to sell, but if fish are not sold, they are used for family and village
 - There is no well-established central market or cooperative, but there have been several attempts
 - Fishermen sell to small markets and at the roadside (so this is where biosampling began)
 - Few fishing boats (and few owners), so many people fish from shore (floating on almost anything)
 - Several fishers may rent a boat (each fisher or family group sells or trades their own fish)
 - Outreach to fishermen important (as always), to build trust and find ways to reach them under acceptable conditions (meet them as they come ashore, at the market or roadside, before they begin selling or set aside catch).
 - Markets are required to report, but because of the need to get effort data they weren't the best source
 - ✓ **PIFSC/DMWR's first failed attempt was to hire fishermen as contractors (time frame for reimbursement was unacceptable)**
 - ✓ **A grant to the Department of Marine & Wildlife somewhat successful in providing training:**
 - Workers could not be scheduled and compensated during off-hours; pay increases not forthcoming
 - Payment of fish and/or ice not allowed by government policy (this is true for all three areas)
 - However, the biosampling laboratory was well supported and **there continues to be significant support from and involvement of the DMWR**



Development of Biosampling: Tutuila, American Samoa

- ✓ **Third configuration, supported by two DMWR Directors, was a contract with Fisheries Chief Domingo Ochavillo to work with DMWR staff as subcontractors during off hours**
 - Ochavillo was able to involve and train DMWR staff in species identification
 - Work progressed well within the DMWR laboratory, although quality control was sometimes an issue
 - One DMWR employee excelled in the laboratory aspects (otolith and gonad extraction)
 - Another DMWR team specialized in finding fishers and conducting a full sample of the catch
 - **A market opened up across the street from DMWR and fishers were encouraged to come and allow biosampling** (this was a clean environment, good for data collection, but not a good market for fishermen)
 - **This morphed into a process of picking up fishers at their villages and bringing them to the market for sampling, but they had a hard time selling fish** (did better in villages and at roadside with no overhead).
 - **Fishers began coming to the DMWR lab for sampling** (or getting a ride there from staff)
 - **A great collaboration developed, with fishers also learning and helping with sampling, but the process was disruptive to normal fishing & marketing** (fishers began to schedule their trips around biosampling)
 - Of equal concern, **fishers preferred biosampling and avoided participation in creel surveys**
 - We are now examining a new approach we hope can be incorporated with DMWR's creel surveys
 - The process will begin with species identification & measurement training for all creel survey staff
- ✓ **On Tutuila, the Biosampling data represents a subset of the night spear fishery, with a few bottomfish trips included (similar to Saipan). It is a subset of the Shore-Based and non-pelagic Boat-Based fishery.**



CFBS-FSP had to Develop Relationships & Trust

General Guidelines for all CFBS-FSP

- Adapt to unique characteristics of each region and culture
- Fieldwork must produce minimal or no impact on markets and fisheries.
- Develop trusting relationships
- Honor & protect confidentiality of fishers and vendors (without them, there would be no monitoring program)
- Sticking with the principal of gathering low hanging fruit first, FSP sought out reef & bottomfish fishers to sample their catch, since these are the least known fisheries (*previous monitoring targeted pelagic species*).
- An effort is made to intercept fishers at the end of a trip and before fish go to market.
- Any mutilation of fish reduces their value; LHP samples purchased (or price differential paid)
- These constraints resulted in various pre-market sampling methods. Whatever is least disruptive to fishing, markets, or other monitoring programs is the best local solution.





**UNINTENDED RESULT:
INCREASED % DATA FOR
ROADSIDE VENDORS,
BACK DOOR MARKETS,
NIGHT TIME & POORLY
KNOWN FISHERIES**



CFBS-FSP PIR Sampling Summary

Commercial Fisheries Biosampling Program: Summary by Insular Area													
			FSP							Collected for LHP			
	Island(s)	Pilot FSP Began	# Species	# Fish/Inverts	Trips	Lengths	Weights	Otoliths	Gonads	# Species	# Fish	% LHP	Trips
American Samoa	Tutuila (some Aunu'u)	Oct. 2010	278	226,248	2,056	224,608	91,146	4,357	4,309	16	2,179	0.96%	592
CNMI	Saipan (few trips Rota, Tinian, other islands)	Dec. 2010	225	190,727	2,578	188,703	77,814	9,132	9,132	17	4,566	2.39%	1,297
Guam	Guam and outer banks	Aug. 2009	241	122,602	1,594	122,454	88,531	1,958	1,703	66	979	0.80%	532
<p><u>Field Sampling (FSP)</u> # Species = all species sampled from markets/fishers Trips = Fisher-trips sampled</p>													
<p><u>Life History Program (LHP)</u> # Species = # for which any samples taken (not all studied/selected for in-depth) Trips = Trips that provided life history samples % LHP = number organisms sampled for LHP/number of fish/inverts sampled</p>													

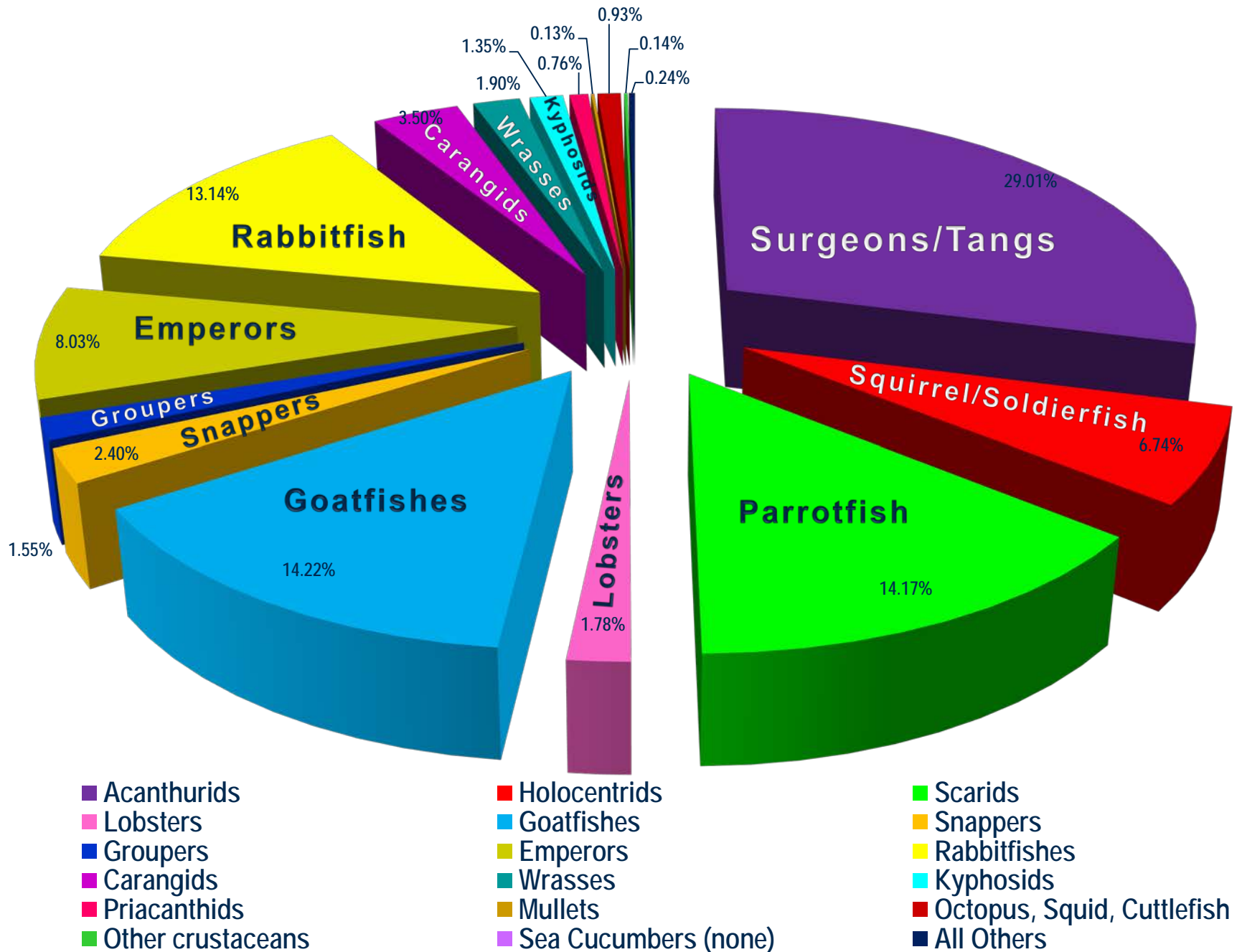
CFBS Pacific Pilot Overview: Catch Composition

Cumulative Percentage of Catch by Commercial Fishermen Sampled (Not all catch sold)			
COUNTRY →	CNMI	GUAM	AMERICAN SAMOA
Families ↓			
Tangs, Squirrelfish, Parrotfish & Lobsters	52%	58%	82%
Add Goatfishes, Snappers & Groupers	70%	75%	92%
Add Emperors & Rabbitfishes	91%	91%	96%

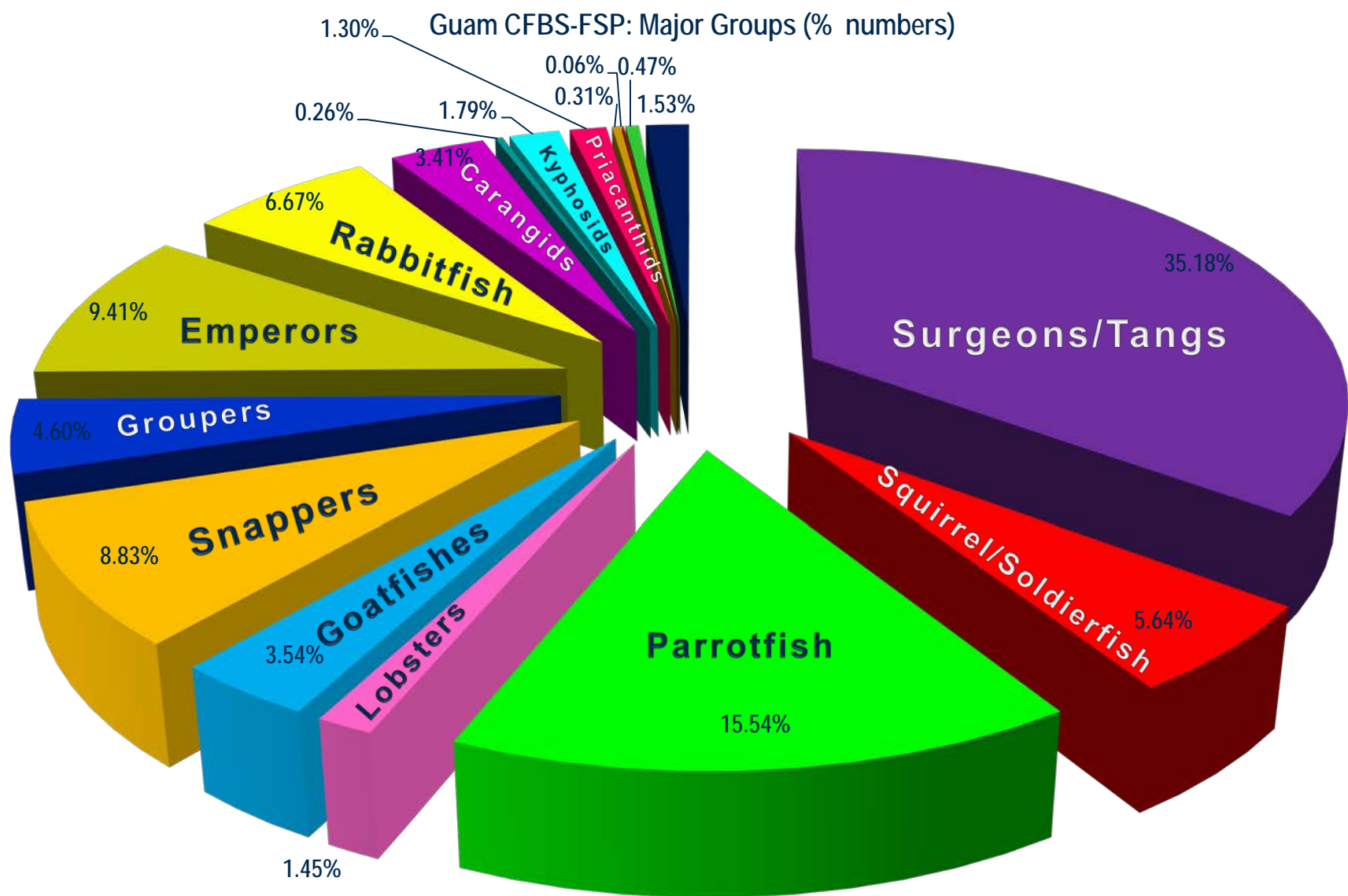
REASONS FOR DIFFERENCES

- Geography (species distributions)
- Gears/markets surveyed
- Cultural differences (targeting by fishermen)

Saipan, CNMI CFBS-FSP: Major Groups (% numbers)



Guam CFBS-FSP: Major Groups (% numbers)

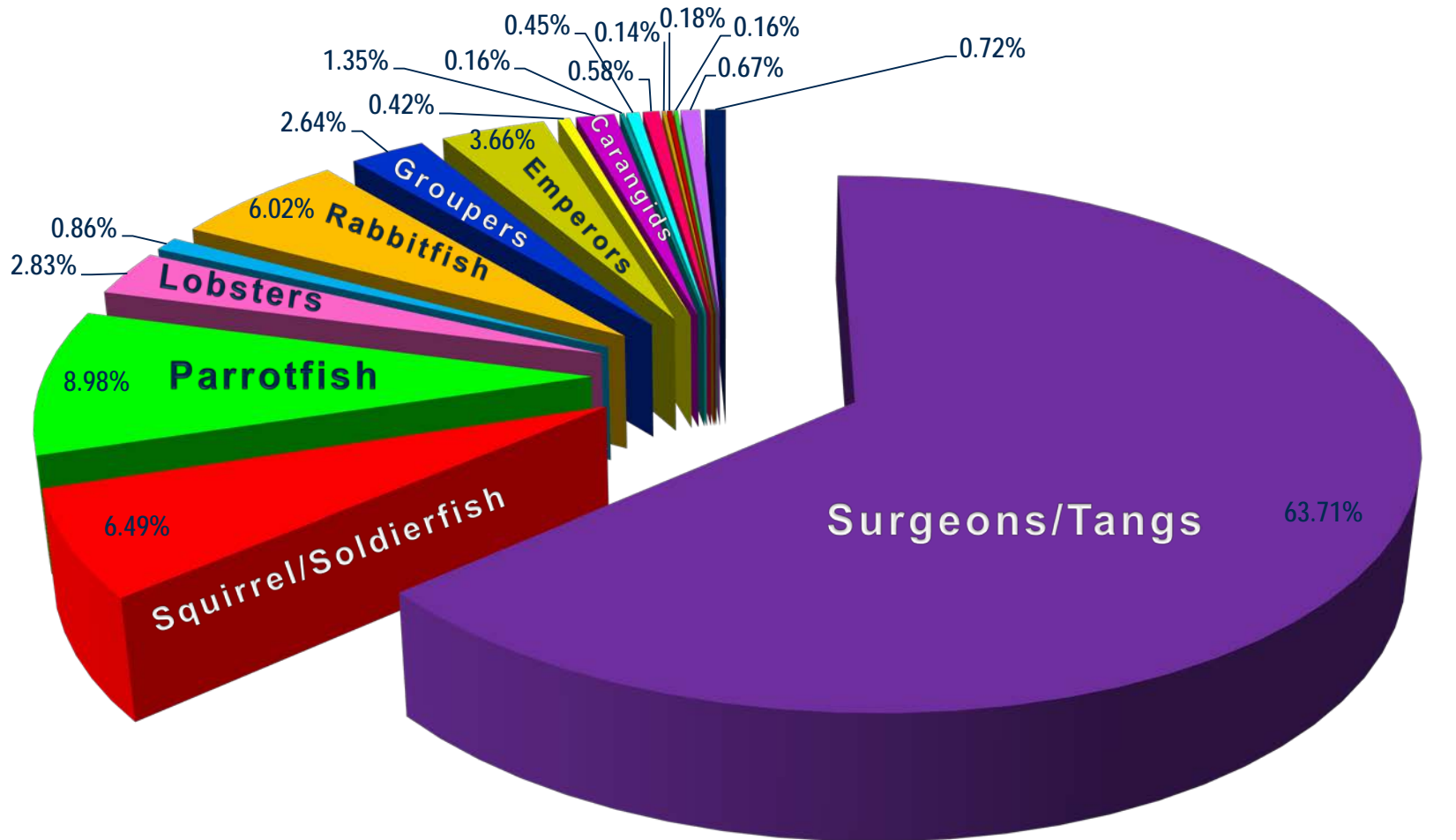


Acanthurids
 Lobsters
 Groupers
 Carangids
 Priacanthids
 Other crustaceans

Holocentrids
 Goatfishes
 Emperors
 Wrasses
 Mullet
 Sea Cucumbers (none)

Scarids
 Snappers
 Rabbitfishes
 Kyphosids
 Octopus, Squid, Cuttlefish
 All Others

American Samoa CFBS-FSP: Major Groups (% numbers)



- | | | | |
|-----------------|----------------|---------------------|---------------------|
| ■ Acanthurids | ■ Holocentrids | ■ Scarids | ■ Lobsters |
| ■ Goatfishes | ■ Snappers | ■ Groupers | ■ Emperors |
| ■ Rabbitfishes | ■ Carangids | ■ Wrasses | ■ Kyphosids |
| ■ Priacanthids | ■ Mullet | ■ Octopuses, Squids | ■ Other crustaceans |
| ■ Sea Cucumbers | ■ All Others | | |



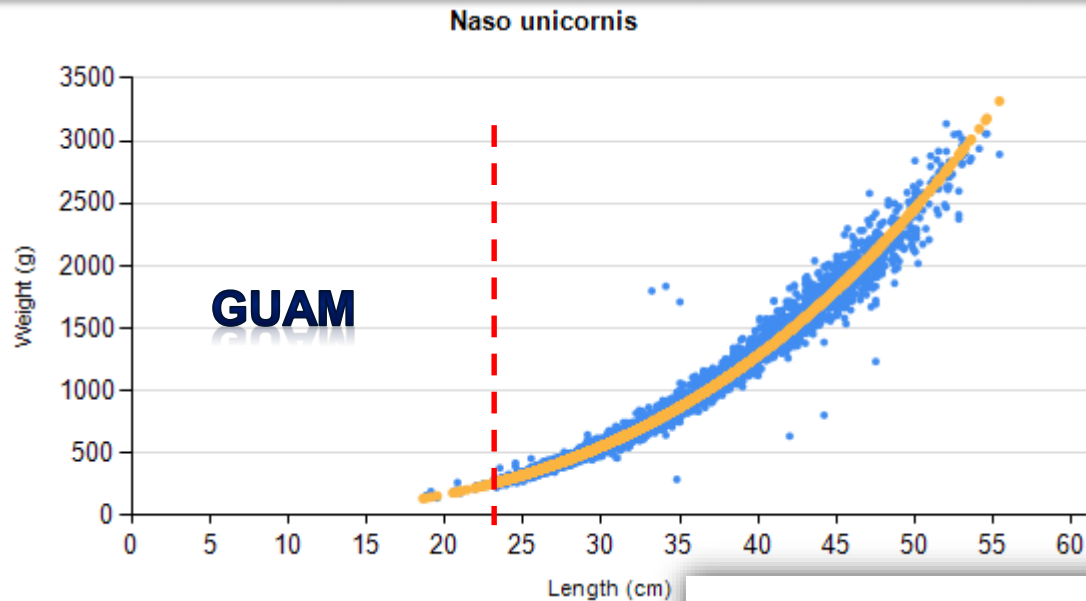
WPacFIN Tapped to Develop Software for FSP Q/C & Data

CFBS FSP is the front end of the Laboratory Program

- A subset of the fish sampled (1-3%) selected for life history studies
- Data support for the field program is via the Western Pacific Fishery Information Network (WPacFIN).
- Although committed to other projects (limited staff), WPacFIN quickly developed a data entry system, with built in quality control features, capable of preparing data for export and upload to the central database (WPacFIN Central)
- On site software produces simple summaries of data sampled by species, area, gear or time period; performs useful calculations; and aids in quality control during and after data entry by highlighting anomalies.
- Export function by species for laboratory processing (small subset) with tracking to sample location (when, where, gear, fisher, and field notes).
- More detailed summaries of the data sampled are also produced by WPacFIN Central and distributed to the local agencies, PIFSC and the Council each year.

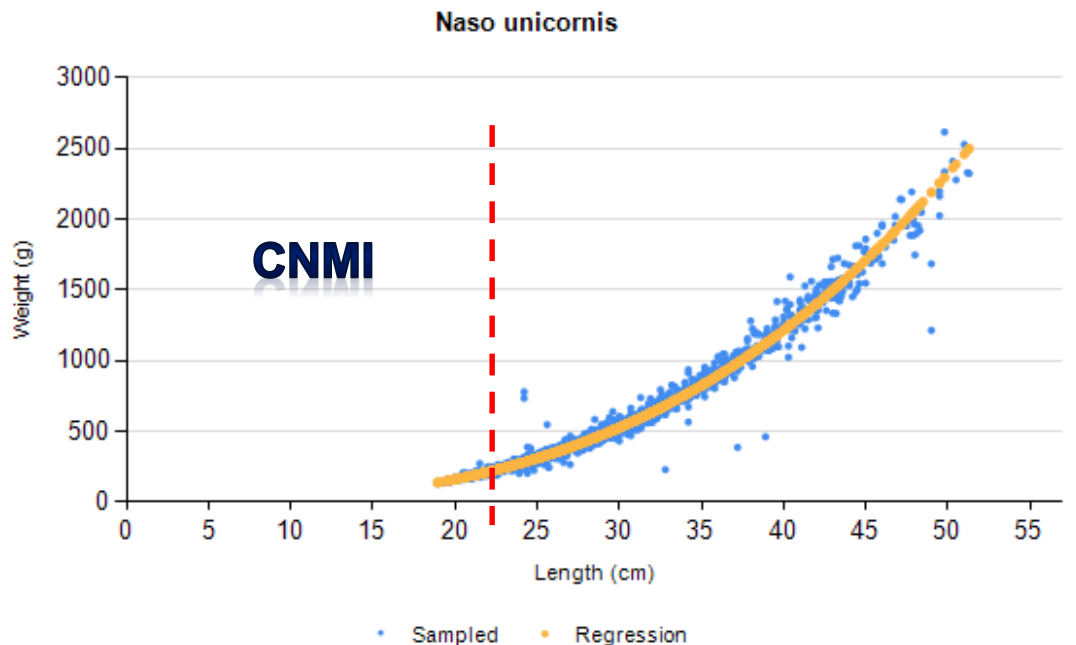


Examples of WPacFIN Automated Summary Output: Length-Weight Regression



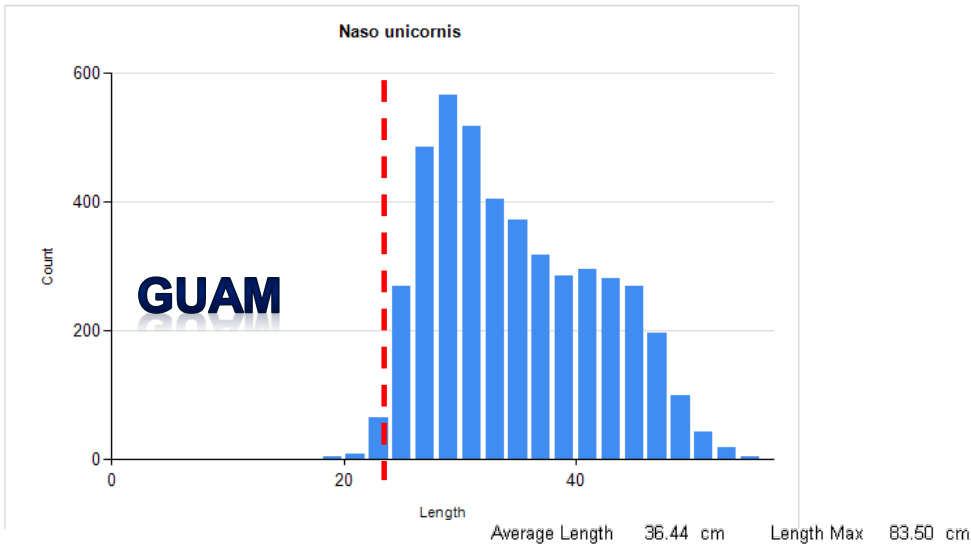
- Outliers can be easily identified and checked for accuracy (edited)
- Mouse-over identifies sample ID
- Once length-wt relationship calculated, weights can be estimated.

- Size at recruitment is shown
- Differences in min-max size by gear or area.
- Smaller sizes identified may be targeted, using alternate fishing methods

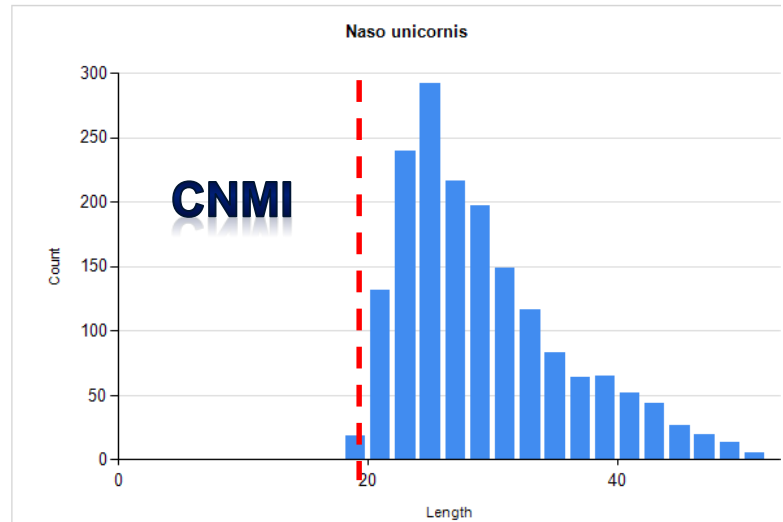


Examples of Automated Summary Output: Length-frequency Histograms

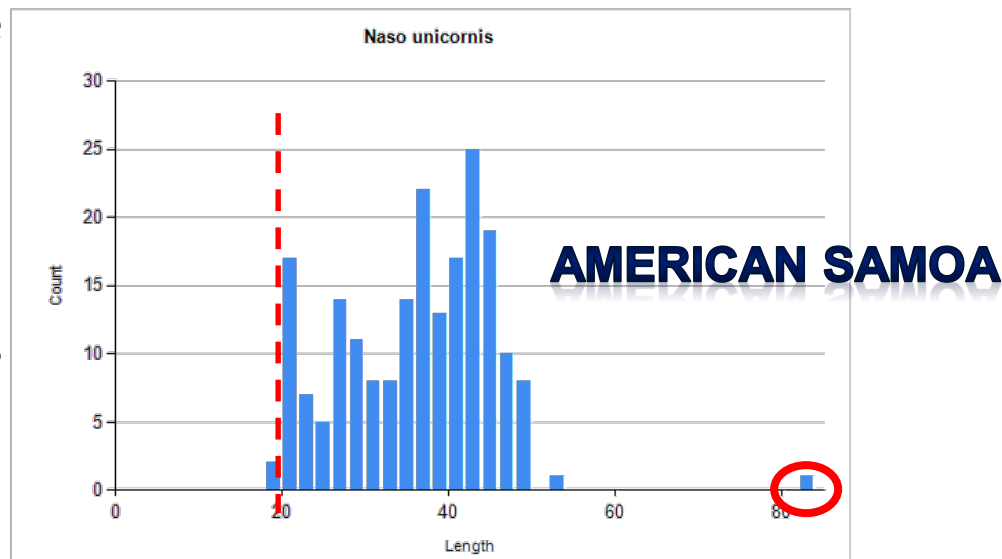
Average Length 34.99 cm Length Max 55.40 cm



Average Length 29.38 cm Length Max 51.30 cm



- Select variable size increments
- Select a range of dates to visually review recruitment & growth of cohorts
- Size at recruitment by gear evident
- Outliers obvious





CFBS-FSP Examples of Customized Reports (WPacFIN produces annually)

YEAR	METHOD CODE	METHOD NAME	NUMBER INTERVIEWS	NUMBER BOATS	HOURS FISHED	NUMBER FISHERS (SAMPLED)	FISHER HOURS (SAMPLED)	TOTAL MEASURED WT (LBS)	TOTAL EST. WT (LBS)
2010	4	SPEAR/SNORKEL	2	0	7.5	4	15	41	41
2011	2	BOTTOM	2	1	22.0	5	56	300	300
2011	4	SPEAR/SNORKEL	525	0	2,507.4	1,092	5,319	20,478	21,733
2011	10	HOOK & LINE	1	0	11.0	2	22	20	20
2012	2	BOTTOM	34	4	601.5	78	1,290	6,457	6,459
2012	3	ATULAI	1	0	8.0	2	16	69	69
2012	4	SPEAR/SNORKEL	488	0	2,333.5	771	3,820	7,811	15,942
2012	10	HOOK & LINE	1	0	10.0	2	20	18	18
2013	2	BOTTOM	18	7	420.5	50	1,283	6,598	6,893
2013	3	ATULAI	64	0	394.0	110	687	675	1,448
2013	4	SPEAR/SNORKEL	611	0	2,907.9	1,078	5,500	12,951	27,878
2013	10	HOOK & LINE	5	0	43.0	11	103	73	141
2013	12	CAST NET	1	0	1.0	1	1	0	28
2014	3	ATULAI	2	0	11.0	3	17	1,550	5,803
2014	4	SPEAR/SNORKEL	140	0	632.3	259	1,208	1,548	5,762

CFBS-FSP Example of Customized Report (WPacFIN produces annually)

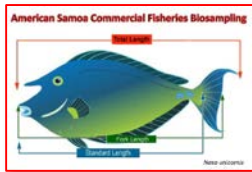
YEAR	METHOD	METHOD NAME	SPECIES CODE	SCIENTIFIC NAME	COMMON NAME	TOTAL NUMBER PIECES SAMPLED	NUMBER PIECES W/ NO WT MEASURED	MEASURED WT (G)	EST. WT (G)	MEASURED WT (LBS)	EST. WT (LBS)
2011	2	BOTTOM	32302	Aphareus rutilans	SILVERMOUTH	6	0	46,640	46,640	103	103
2011	2	BOTTOM	31405	Caranx lugubris	BLACK JACK	1	0	4,840	4,840	11	11
2011	2	BOTTOM	31409	Elagatis bipinnulata	RAINBOW RUNNER	1	0	3,869	3,869	9	9
2011	2	BOTTOM	28917	Epinephelus octofasciatus	8 Barred Grouper	3	0	27,274	27,274	60	60
2011	2	BOTTOM	32304	Etelis carbunculus	EHU SNAPPER	28	0	16,129	16,129	36	36
2011	2	BOTTOM	32305	Etelis coruscans	ONAGA SNAPPER	1	0	5,920	5,920	13	13
2011	2	BOTTOM	32310	Lutjanus kasmira	BLUELINED SNAPPER	5	0	1,367	1,367	3	3
2011	2	BOTTOM	32316	Pristipomoides argyrogrammicus	BLUE-LINED GINDAI	5	0	1,008	1,008	2	2
2011	2	BOTTOM	32319	Pristipomoides flavipinnis	YELLOW EYE OPAKAPAKA	23	0	28,465	28,465	63	63
2011	2	BOTTOM	32321	Pristipomoides zonatus	GINDAI	1	0	677	677	1	1
2011	4	SPEAR/SNORKEL	41207	Acanthurus blochii	WHITE-BAR SURGEONFISH	252	0	87,270	87,270	192	192
2011	4	SPEAR/SNORKEL	41202	Acanthurus dussumieri	EYE-STRIPE SURGEONFISH	6	0	3,247	3,247	7	7
2011	4	SPEAR/SNORKEL	41204	Acanthurus guttatus	WHITESPOTTED SURGEONFISH	5	0	951	951	2	2
2011	4	SPEAR/SNORKEL	41206	Acanthurus lineatus	BLUEBANDED SURGEONFISH	5,120	426	766,557	834,084	1,690	1,839
2011	4	SPEAR/SNORKEL	41233	Acanthurus mata	ELONGATE SURGEONFISH	1	0	961	961	2	2
2011	4	SPEAR/SNORKEL	41208	Acanthurus nigricauda	EPAULETTE SURGEONFISH	459	30	97,048	103,062	214	227
2011	4	SPEAR/SNORKEL	41211	Acanthurus olivaceus	ORANGEBAND SURGEONFISH	8	0	1,873	1,873	4	4
2011	4	SPEAR/SNORKEL	41214	Acanthurus triostegus	CONVICT TANG	337	0	40,005	40,005	88	88
2011	4	SPEAR/SNORKEL	41215	Acanthurus xanthopterus	YELLOWFIN SURGEONFISH	185	0	71,590	71,590	158	158
2011	4	SPEAR/SNORKEL	44551	Aluterus scriptus	FILEFISH	1	0	285	285	1	1
2011	4	SPEAR/SNORKEL	32301	Aphareus furca	REEF SILVERMOUTH	18	0	4,944	4,944	11	11
2011	4	SPEAR/SNORKEL	32303	Aprion virescens	JOBFISH	1	0	3,622	3,622	8	8
2011	4	SPEAR/SNORKEL	32351	Caesio caeruleaurea	SCISSOR-TAILED FUSILIER	56	1	8,812	8,933	19	20
2011	4	SPEAR/SNORKEL	36402	Calotomus carolinus	BUCKTOOTH PARROTFISH	340	0	110,601	110,601	244	244
2011	4	SPEAR/SNORKEL	31422	Carangoides ferdau	BAR JACK	51	0	25,317	25,317	56	56
2011	4	SPEAR/SNORKEL	31403	Carangoides orthogrammus	YELLOW SPOTTED JACK	58	0	22,382	22,382	49	49
2011	4	SPEAR/SNORKEL	31404	Caranx ignobilis	GIANT TREVALLY	1	0	2,350	2,350	5	5
2011	4	SPEAR/SNORKEL	31405	Caranx lugubris	BLACK JACK	1	0	2,012	2,012	4	4
2011	4	SPEAR/SNORKEL	31406	Caranx melampygus	BLUEFIN TREVALLY	60	1	29,456	29,796	65	66



Acknowledgements: CFBS-FSP PIR Partners

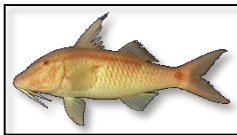
Fa'afetai tele lava ~ Si Yu'us Mā'āse'

NOAA Pacific Islands Fisheries Science Center (PIFSC) Fisheries Research and Monitoring Division (FRMD) Honolulu, Hawaii



American Samoa

- Domingo Ochavillo (*PIFSC biosampling contractor*)
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Guam

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QUESTIONS?