

ENHANCED MONITORING OF LARGE PELAGIC FISHES CAUGHT BY THE VENEZUELA ARTISANAL OFF-SHORE FLEET TARGETING TUNA AND TUNA-LIKE SPECIES IN THE CARIBBEAN SEA AND ADJACENT NORTHWESTERN ATLANTIC WATERS: A PRELIMINARY ANALYSIS

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SUMMARY

The Venezuelan Artisanal Off-shore (VAOS) fleet vessels average in length ~15 m; is characterized by using four types of gear, pelagic longline (for tuna and tuna-like species), bottom longline (for snapper-grouper and sharks), hand-line (for Scomberomorus sp., serranids, carangids, and other species), and gillnets (for Scomberomorus sp., and other species). At-sea and port sampling to monitor the VAOS fleet targeting tuna and tuna-like species using pelagic longline gear was conducted from 2 ports, one in the Island of Margarita (Juan Griego) and the other in the northeastern mainland coast (Morro Puerto Santo) from July 2011 to February 2012. Close quarters, relaxed safety, and community oriented crew forced to alter the at-sea sampling scheme by training voluntary skilled Captains to fill-out observer data forms, identify, measure and sex fish species. At-sea sampling consisted of 1 trained observer trip and 11 observed trips by 7 voluntary trained Captains. Three trips fished in the Caribbean Sea, three in the Atlantic side, and the rest fished in both areas. The number of sets deployed in each trip varied between 8 and 16, soak time were from 6:30 am to 12:00 pm, the number of hooks varied from 400 to 1040 hooks/set, and depth of fishing gear varied between 9 and 27 m. The overall main target species reported and validated included 546 dolphinfish (42-156 cm FL), 732 sailfish (80-189 cm LJFL), and 166 white marlin (106-179 cm LJFL) measured and sexed. Secondary target species included catches of silky sharks which consisted mostly of small individuals (25-144 cm FL) and scalloped hammerhead sharks (48-160 cm FL), which were the most abundant in number of shark specimens caught. The tuna sample were mostly formed by BLF (22-100 cm FL), YFT (78-108 cm FL), and ALB (79-106 cm FL). Additional bycatch species caught and kept included several specimens of longbill and roundscale spearfishes from which tissue and scale samples were collected for posterior positive identification. Port sampling activities recorded landings from 37 vessels during the sampling period, all billfish and shark species were identified and length measures were recorded, all shark specimens were sexed.

RÉSUMÉ

Les navires de type offshore de la flottille artisanale vénézuélienne mesurent en moyenne 15 m de longueur. Une caractéristique de la flottille est d'utiliser quatre types d'engin : palangre pélagique (pour les thonidés et les espèces apparentées), palangre de fond (pour le vivaneau et les requins), ligne à main (pour les Scomberomorus spp., serranidae, carangidae et autres espèces), et les filets maillants (pour les Scomberomorus spp. et d'autres espèces). Des échantillonnages en mer et au port visant à contrôler la flottille artisanale vénézuélienne ciblant les thonidés et les espèces apparentées à la palangre pélagique ont été réalisées à partir de deux ports : un sur l'île de Margarita (Juan Griego) et l'autre sur la côte Nord-Est de la partie continentale (Morro Puerto Santo) entre juillet 2011 et février 2012. L'espace réduit, une sécurité relâchée et des membres d'équipage très unis entre eux ont contraint de modifier le programme d'échantillonnage en mer en formant des capitaines volontaires expérimentés à remplir les formulaires de données des observateurs, à identifier, mesurer et déterminer le sexe des espèces de poissons. L'échantillonnage en mer a pris la forme d'une sortie avec un observateur formé et de 11 sorties observées par sept capitaines formés et volontaires. Trois sorties se sont déroulées dans la mer des Caraïbes, trois dans l'Atlantique et le reste dans les deux zones. Le nombre d'opérations dans chaque sortie a fluctué entre huit et 16, les heures de mouillage s'étendant de 06h30 à 24h00, le nombre d'hameçons variant de 400 à 1.040 hameçons/opération et la profondeur de l'engin de pêche allant de 9 à 27 m. Les principales

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espèces déclarées et validées incluíaient 546 coryphènes communes (42-156 cm FL), 732 voiliers (80-189 cm LJFL) et 166 makaires blancs (106-179 cm LJFL), qui ont été mesurées et dont on a identifié le sexe. Les espèces cibles secondaires incluíaient les prises de requins soyeux qui consistaient principalement de petits spécimens (25-144 cm FL) et de requin-marteau halicorne (48-160 cm FL), lesquels étaient les plus abondants en nombre de spécimens de requins capturés. Les thonidés échantillonnés étaient essentiellement formés de thons à nageoires noires-BLF (22-100 cm FL), d'albacores-YFT (78-108 cm FL) et de germon-ALB (79-106 cm FL). Les autres espèces accessoires capturées et conservées incluíaient plusieurs spécimens de makaire-bécune et de makaire-épée dont des échantillons de tissus et d'écaillés ont été prélevés à des fins d'identification positive postérieure. Les activités d'échantillonnage au port ont consigné les débarquements de 37 navires au cours de la période d'échantillonnage, toutes les espèces d'istiophoridés et de requins ont été identifiées et les longueurs ont été enregistrées, le sexe de tous les spécimens de requins a été déterminé.

RESUMEN

Los buques de las flotas costeras artesanales de Venezuela (VAO) tienen una eslora media de ~15 m. La flota se caracteriza por la utilización de cuatro tipos de arte: palangre pelágico (para túnidos y especies afines), palangre de fondo (para pargo y tiburones), liña de mano (para *Scomberomorus* spp. serránidos, carángidos y otras especies) y redes de enmalle (para *Scomberomorus* spp. y otras especies). Desde julio de 2011 hasta febrero de 2012 se realizaron operaciones de muestreo en puerto y en mar para realizar un seguimiento de la flota VAO que se dirige a los túnidos y especies afines con artes de palangre pelágico desde dos puertos: uno en Isla Margarita (Juan Griego) y otro en la parte septentrional de la parte continental (Morro Puerto Santo). Debido a la estrecha convivencia, la relajación en cuanto a normas de seguridad y la fuertes relaciones existentes entre la tripulación se tuvo que alterar el programa de muestreo en mar y se formó a patronos voluntarios y con capacidades para que cumplimentaran los formularios de datos de observadores, midieran los peces y determinaran su sexo. El muestreo en el mar consistió en una marea de observador formado y 11 mareas observadas por siete patronos voluntarios formados. Tres mareas tuvieron lugar en el mar Caribe, tres en el lado Atlántico y el resto en ambas zonas. El número de operaciones de pesca de cada marea osciló entre 8 y 16, el horario de inmersión del arte fue de 6:30 a 24:00 h, el número de anzuelos osciló entre 400 y 1.040 anzuelos por calado, y la profundidad del arte varió entre 9 y 27 m. Las especies objetivo principales comunicadas y validadas incluían 546 dorados (42-156 cm FL), 732 peces vela (80-189 cm LJFL), y 166 agujas blancas (106-179 cm LJFL). Se midieron estos ejemplares y se determinó su sexo. Las especies objetivo secundarias incluían capturas de tiburón jaquetón, compuestas sobre todo de ejemplares pequeños (25-144 cm FL) y de cornuda común (48-160 cm FL) que fueron las especies más abundantes en número de ejemplares de tiburones capturados. Los túnidos muestreados fueron sobre todo atún aleta negra (22-100 cm FL), rabil (78-108 cm FL) y atún blanco (79-106 cm FL). Las especies adicionales capturadas de forma fortuita y retenidas fueron algunos ejemplares de aguja picuda y marlín peto de los cuales se recogieron muestras de tejidos y escamas para su posterior identificación. En el marco de las actividades de muestreo en puerto se muestrearon los desembarques de 37 buques durante el periodo de muestreo, se identificaron todas las especies de tiburones e istiofóridos, se consignaron todas las mediciones de talla y se determinó el sexo de todos los ejemplares de tiburones.

KEY WORDS:

Artisanal longline fishery, Caribbean Sea, Venezuela, billfish, sharks, tunas.

1. Introduction

The small scale artisanal fleet that targets tuna and tuna-like species formerly known as 'Flota Artesanal de Media-Altura y Altura' is now referred to as 'Flota Artesanal Costa-Afuera' (*i.e.*, Artisanal Off-shore Fleet) by the National Fishery Agency (INSOPESCA). The Venezuelan Artisanal Off-Shore (VAOS) fleet operates on the same fishing areas as the Venezuelan industrial tuna fleets (PS, BB, and LL) in the Caribbean Sea and adjacent Atlantic waters. However, the VAOS fleet is formed by vessels around 15 m in length, targeting DOL, BIL, SHK and TUNas (Marcano et al., 1995). This fleet has never been under an enhanced monitoring program, resulting in unrealistic reported landings, in which most of the catch is landed without species identification. In consideration of ICCAT REC 10-10 GEN paragraph 1b, that calls for CPCs employing an alternative scientific monitoring approach to fleets similar to the VAOS fleet, and noting that recent ICCAT Recommendations: 11-07 BIL and 11-08 BYC, call for data collection programs, capacity building in artisanal fleets from developing coastal CPCs that target silky sharks (FAL) for local consumption. A three-year data improvement project was proposed to the JDMIP in order to comply with these ICCAT Recommendations, so Task I and II data from these fleets can be reported to ICCAT. Considering that the JDMIP is for data improvement to be submitted to ICCAT, the three-year project was developed to help Venezuela's Fishery Agency to fulfill the new ICCAT Recommendations by implementing a reliable monitoring system for the VAOS fleet targeting tuna and tuna-like species that would be undertaken by the National Fishery Agency (INSOPESCA) once it was completed. The three-year Project is to be executed by the Instituto Oceanográfico de Venezuela of the Universidad de Oriente in cooperation with INSOPESCA, the National Fishery Agency. The present document reports on the activities conducted during the first year of the project (June-2011 through February 2012). The report will be sectioned to reflect the information of the fleet's operation and characteristics and on the results obtained from at-sea and port sampling activities.

2. Methods

Two key communities were selected to implement the Project: Morro de Puerto Santo, Sucre in the mainland and Juan Griego, in Margarita Island (**Figure 1**). The selection was based on the strong tradition of these communities to fish offshore with pelagic longline gear, and because it is where most of the vessels of this fleet targeting tuna and tuna-like species are based.

At-sea sampling

Do to the difficulty of placing observers on board vessels from the VAOS fleet in one of the selected communities (Morro Puerto Santo, Sucre), it was decided to instruct selected voluntary Captains to perform scientific observer duties during their fishing operations. A new observer data form was created in conjunction with the Captains (see **Annex 1**); a training course was conducted for 4 voluntary Captains before their first trip, and was reinforced after each trip. Once the vessel with a voluntary Captain arrived at port, debriefing was conducted by the local project personnel (INSOPESCA officer) on site to check for correct species ID, and fishing operations. A follow-up of the debriefing of the Captains was conducted by visits of the P.I. to the location before the next observed trip took place. One camera was given to one of the Captains to help in species ID.

The only observer placed on board a vessel was done from Margarita Island. However, this was because of strong close ties between the vessel Captain, Project personnel in Margarita Island (INIA retired officer) and the observer. Since the observer is no longer available, a similar effort to that of the other fishing community (Morro Puerto Santo) in using selected voluntary Captains to perform limited observer tasks was conducted. Three Captains were identified and instructed with the same observer forms as those used in Morro Puerto Santo. Operations from Margarita Island started January 2012. In the case of Juan Griego (Margarita Island), debriefing was conducted by local project personnel (INIA retired officer) upon arrival of the vessel to check for correct species ID, and fishing operations, and a follow-up was also reinforced by visits of the P.I. to the location. As in the other community, one camera was given to one of the Captains to help in species ID.

Port Sampling

Vessel owners fishing with pelagic longline were contacted and asked to report in advance to INSOPESCA personnel their arrival to port so they could be sampled. INSOPESCA personnel once notified proceeded to sample the landings from vessels at port during that day using forms designed for that purpose (see **Annex 1**). The process is slow until it becomes a habit; it is still a work in progress. It is expected it will take more than 6 months of continued uninterrupted practice before it can be fully operational. Port sampling in Margarita Island

is more difficult because there are several landing ports, alternative from their base-port (Juan Griego), in which arriving vessels can choose, and because most landings take place late into the night (01:00-03:00 am). Project personnel (INIA retired officer) with close ties in the community identified Fish Houses and Captains and asked them to notify him on arrival. This resulted in sampling the catch of a particular vessel when it was sold to the Fish House, regardless of the time of landing.

All data collected was entered in an MSACCESS format and reported to ICCAT Secretariat every 6 months. Biological samples collected at present include tissue samples from istiophorid and shark species for genetic ID; shark jaws are also collected for similar looking species for identification purposes. All tissue samples are sent to Dr. M. Shivji of Nova University, USA for analyses. Currently, gonads from sailfish are weighted for developing a gonad index.

3. Results

Fleet, gear, operations, and fishing grounds

The VAOS fleet vessels are made of wood, averaging in length ~15 m (range 11-18 m) and beam ~4.3 m (range 3.0-5.5 m) (**Figure 2**). The fleet is characterized by using four types of gear, pelagic longline (for tuna and tuna-like species), bottom longline (for snapper-grouper and small sharks), hand-line (for species of *Scomberomorus*, serranids, carangids, and other mid water species), and gillnets (for species of *Scomberomorus*, and other mid water species). On any given trip, vessels may carry 2-3 types of gear which can be used alternatively depending on the target. However, gillnets are never combined with longlines in any given trip. The artisanal denomination is because fishing operations (gear set and haul) are done manually; some vessels have a longline spool but it is handled manually. The number of hooks in the longline gear used by the fleet, range between 400 and 1040 hooks per set, with an average of ~776 hooks/set. Bait used is live sardine (*Sardinella aurita*) or a small carangid when sardine is not available, but it rarely occurs; the bait volume ranges between 240-300 kg per trip. Regular average number of sets per trip is about 10-16 sets, and days at sea are in the range of 15-28 days which can vary depending on the fishing grounds of operation, the time to locate and load the bait (usually bought to other fishers on route to fishing grounds), and the condition of the bait. On occasions, when the bait dies or the price of large pelagics fall, the vessels switch to bottom longline within the same trip. The VAOS fleet targeting tuna and tuna-like species normally operates in the Caribbean Sea around the offshore Islands off Venezuela, and in the Atlantic Ocean east of Trinidad, east of the Orinoco Delta, and east-northeast of Guyana and Suriname (**Figure 3**). The VAOS fleet based in Morro de Puerto Santo normally fishes in the Caribbean Sea, east of Margarita Island, and in the Atlantic Ocean, east of Trinidad and the Orinoco Delta; while the VAOS fleet in Margarira Island operates across the entire fishing grounds. Although, the VAOS fleet based in Margarita Island targets tuna and tuna-like species year round; the VAOS fleet based in Morro de Puerto Santo switches target to *Scomberomorus* fishing from June to September.

At-sea sampling

12 at-sea sampling activities were conducted between June 2011 and February 2012, the end of the first year of the Project (**Table 1**). The sampling activities consisted of 1 scientific observer covered trip from Juan Griego (Margarita Island) in August 2011, and 11 trained-Captain observed trips covered between November 2011 and February 2012. Five at sea-sampling activities were reported from Morro de Puerto Santo and the rest were reported from Juan Griego (Margarita Island).

The spatial distribution of the observed covered trips is presented in **Figure 4**. Of the trips observed from Juan Griego (Margarita Island), 4 fished in the Caribbean Sea, west of Margarita Island, 2 fished in both areas (Caribbean Sea and Atlantic) during the same trip, 1 fished entirely in the Atlantic. While four of the observed trips from Morro Puerto Santo fished entirely in the Atlantic, two fished in the Atlantic and east of Margarita Island in the Caribbean Sea.

The total landed catch in each observed trip with voluntary Captains as observers varied between 811 and 8,980 kg (**Table 2**), where DOL could represent 50-75% of the landed catch, BIL around 30-60%, SHK represented under 10%, and TUN varied around 10%, which mostly depended on the fishing area and the fishing vessel's operation.

The recorded and observed catch for the 12 trips are shown in **Figure 5** by fleets combined and separated by base ports. In both cases, DOL represents > 70% of the observed and landed catch, which consists mostly of

Coryphaena hippurus, and maybe < 1% of *C. equiselis* based on the few samples recorded. SAI (*Istiophorus albicans*) and WHM (*Tetrapturus albidus*) were the next most important species recorded, SAI represented >10%, while WHM was at or below 4%. Tuna species consisted mainly of BLF (*Thunnus atlanticus*), ALB (*T. alalunga*), and YFT (*T. albacares*), BLF was the most recorded tuna species from the fleet in Juan Griego, while BLF and YFT were from the fleet based in Morro Puerto Santo. Within the species of sharks, FAL (*Carcharhinus falciformis*) was the most representative, mostly from the fleet based in Juan Griego (Margarita I.). Other shark species were recorded but with a low contribution in the recorded catch. A more detailed observed catch composition is shown for each observed trip in **Figure 6**. It can be noted that the DOL observed catch can be between 6 and 83%, but when the DOL catch is very low (<10%), the SAI and WHM catch increases substantially (>60%). SAI was the most caught billfish by the fleets, followed by WHM in which most of the time the WHM catch was around or below 11%. The shark catch, mostly of FAL was recorded in half of the trips observed, varying between <1% and 15.5% of the catch. Important tuna catches (>10%) were recorded in 4 trips, and consisted of BLF, ALB, and YFT.

The only scientific observer placed on board this fleet had sound experience in elasmobranch species and was thorough in the information recorded as well as the biological samples collected. The trip took place during the end of July and early part of August. Fishing operations were N and NW of the Island of La Tortuga in the Caribbean Sea (see **Figure 4**). Most of the landed catch was evenly distributed between DOL and BIL through most of the sets which consisted of mostly SAI, 70%, followed by WHM, 20%, and SPF, 10%. The shark catch consisted of 1 BSH, and an important volume of PLS in the last set of the trip. This occurrence served to alert the other fishers to note catches of batoid species which usually go undetected in landings. In addition, 1 tuna (BET) and 1 WAH were caught in one set. Information on other by-catch species was recorded. The observer was an experienced photographer as well and edited a video of the fishing trip and operations (the video is available upon request to the P.I.).

The sampled species during the 12 observed trips included metrics and sex identification, and were classified into target species, secondary target species, and retained by-catch (**Table 3**). The main target species included 546 DOL (\bar{x} = 86.2 cm FL), 732 SAI (\bar{x} = 158.7 cm LJFL), 166 WHM (\bar{x} = 144.8 cm LJFL), 10 SPF (\bar{x} = 146.6 cm LJFL), and 7 BUM (\bar{x} = 171.3 cm LJFL) measured and sexed. The secondary target species included sharks as well as tuna species. Among these, a total of 6 shark and one ray species were measured and sexed. Noteworthy were the catches of FAL which consisted mostly of small individuals (\bar{x} = 70.6 cm FL) and SPL (\bar{x} = 110.8 cm FL), and were the most abundant in number of specimens caught. The tuna sample was mostly formed by BLF (\bar{x} = 64.4 cm FL), YFT (\bar{x} = 95.1 cm FL), and ALB (\bar{x} = 100.3 cm FL). Size frequency distributions (SFD) of the most relevant species revealed a normal-like distribution in SAI, similar to what is observed in the industrial longline catch; in contrast, the WHM size frequency distribution was more like a uniform-type with an important number of male fish (**Figure 7**). Noteworthy was the FAL SFD, in which most of the catch consisted of small sharks (<100 cm FL). The BLF SFD showed a broad distribution in the sizes with no clear trend. In the case of DOL SFD most of the sampled catch consisted of females of 50-100 cm FL.

The condition when the fish is brought on board was also recorded by the scientific observer and voluntary Captains, the results indicated that the highest proportion of live specimens were among the shark species (**Table 4**), which were in the range of 90-100% alive. In billfishes, the condition varied, 32.8% alive in SAI versus 70% in SPF. While in tunas, the highest proportion alive was in YFT followed by BET, but the number of fish was low compared to BLF, where the proportion of live fish was ~27%.

Port sampling

The port sampling data information collected during the period of the present report extend from July 2011 through February 2012, with the exception of September when no vessels fishing with pelagic longline gear were available for sampling. A total of 37 vessels fishing with longline gear were sampled, indicating that they were targeting either DOL (59%), BIL (24%), TUN (11%), or KGM (5%) (**Table 5**). The vessels days at sea per trip were from as low as 4 to as long as 22 days, while the number of longline sets deployed in a single trip varied between 1 and 20 sets. The very low number of sets deployed occurred when the target was KGM, when 1-4 longline sets were deployed in a given trip. The majority of the trips fished in section 6 (56.8%) located in the Atlantic side, followed by sections 2 (13.5%) and 1 (10.8%) located in the Caribbean Sea (**Figure 8**). Total catch of the sampled trips varied between 152 and 5052 kg; of which total species-group catch by trip like DOL varied between 75 and 4315 kg, SAI varied between 20 and 1900 kg, BLF varied between 42 and 1439, and SHK varied between 17-320 kg (see **Table 5**). When a trip targeted KGM, the catch could vary between 1293-4646 kg in a single trip.

A total of 1059 specimens were identified to species, measured, and sexed in the case of shark species during port sampling activities in Morro de Puerto Santo and Margarita Island. Most of the sampled species were gutted and headed (BIL and most SHK), others were only gutted (TUN, DOL). In the case of billfishes (SAI, WHM, BUM, SPF, SPG), measurements were based on length measurement pectoral fin – fork length (PFL), for which there are conversions to LJFL (see ICCAT Manual); however, for *T. pfluegeri* (SPF) and *T. georgii* (SPG), none exist, but the project is trying to build them for these species. In the case of some shark species (FAL, SVD, SPL), those that were headed and gutted, the only measurement possible was the dorsal trunk (TR, length from origin of the anterior part of first dorsal fin to the origin of the anterior part of second dorsal fin). At present the project is building a conversion formula to FL from samples measured in the at-sea sampling activity.

The most sampled and measured species were SAI (752), BLF (116), YFT (65), WHM (31), FAL (30), SVD (27), SPL (14), and BUM (12), the rest of the species measured (SPF, SPG, BSH, TIG, SMA, CCL, SPK, SWO) were < 5 individuals per species. Size frequency distributions of the most common are presented in **Figure 9**; for the rest of the species, range and mean are presented in **Table 6**.

4. Discussion

The logistics initially proposed for monitoring (port sampling) the VAOS fleet were based on the assumptions observed in the operation of the fishery during the decade of the 1990s when observed by the Enhanced Billfish Research Program (EBRP) in Margarita Island and by INIA officials in Morro de Pto. Santo (Sucre) (Arocha *et al.*, 2006). The assumptions were: that the majority of the fleet when operating pelagic longline, only carried one type of gear and fished large pelagic fish; that the majority of the vessels landed their catch at their base-port during regular hours. Thus, vessels from Margarita Island would be landing their catch in Juan Griego during morning hours (6am-10am), and vessels from Morro de Pto. Santo would do the same. In the case of at-sea sampling, the assumption was based on the experience obtained in the industrial pelagic longline fishery with its observer program, sponsored by ICCAT's EBRP in Venezuela; where observers were trained and placed on volunteered vessels that would accept them.

The assumptions changed due to the dynamics of the operation of the fleet in the last decade (2000), and did not reflect the activities observed in the 1990s (Marcano *et al.*, 1995, Marcano *et al.*, 1998). The first change noted was that the majority of the landings occurred during odd hours of the night (11 pm - 3 am) and directly to a Fish House Company truck that would pick up the catch and transport it to the Fish House Company freezer, which normally in a different town than that of the landing site. The procedure avoids onlookers and unwanted giveaways, plus is more secure for fishers. In addition, some vessels land part of their catch in different ports (when *en-route* to their base-port) making it more difficult to sample. The second change is the fishing gear; vessels now carry several gears during a trip which include pelagic longline, bottom longline, hand-lines, and gillnets.

In the case of at-sea sampling, due to the nature of the fishery, placing scientific observers became difficult. The limited space on board the vessels and the relaxed safety on board preclude getting standard scientific observers on a regular basis to board any vessel from the fleet. The fleet's vessels have close quarters, where 7-8 fishers live during a long fishing trip (~10-20 days at-sea). Most of the crew are relatives, or from the same community. Thus, making a strong bond between crewmembers, and difficult to host a stranger (*i.e.*, scientific observer).

The solutions to resolve the logistics issues were put forth with the help of the local project collaborators, and had to be location specific. The results presented here show that the solutions to resolve the sampling logistics were a success, of the 8 at-sea sampling activities proposed for the first year, we managed to successfully complete 12 observed trips in eight months that lasted YEAR 1 of the Project. The information provided by those 12 observed trips show that the at-sea sampling became a key component in monitoring the VAOS fleet. These and future results will provide the necessary information to estimate total catch by species from this fleet and be reported efficiently following ICCAT data procedures.

The port sampling activities are still important in giving an idea of the size distribution of the landed catch by species in the different ports, although the number of sampling is relatively low when compared to other major ports like Cumana, La Guaira, or Pto. Fijo, it still provides good data and helps train the fishers in identifying species, regardless of the commercial given name. It is acknowledged that with this fleet is difficult to track landings more frequent due to its high mobility and versatility when selecting a landing site, which can vary between a beach, a dock, and/or a formal port, and not necessarily near the base port.

In a preliminary effort to estimate the size of the VAOS fleet, gross vessel counts were conducted during the 2011 Christmas holidays when all the fleet was at their base ports (Juan Griego and Morro Puerto Santo). It seemed that the pelagic longline VAOS fleet from both communities is formed by 40-50 vessels each. We are working with INSOPESCA personnel to have a more accurate estimate of the size of the fleet, at least from these 2 base ports covered by the Project. It is expected that when the Fishery Administration release their yearly information in 2012, we may be able to estimate the proportion the ICCAT-UDO Project is recording in order to produce estimates of total catch and effort from these fleets in future reports.

Advances during the second year of the project (March to July 2012) include the completion of 17 observed trips (with trained Captains), of the 10-15 initially planned for the whole YEAR 2, and port sampling activities continue as planned. Ties have been strengthening between project personnel and fishers which have resulted in a clear interest in providing accurate information. The lessons learned to monitor an artisanal fishery are, close contact with the community by having a local member a project personnel, and the frequent visits of the PI to refresh and update changes to the sampling activity needs. Presenting the results of their work and how it will be utilized by the scientific community is another aspect that is very important and strengthens that bond between fishers and scientific community.

5. References

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Table 1. Number of fish by species sampled, total number of hooks fished, and total number of sets observed in at-sea sampling activities in the Venezuelan Artisanal Off-Shore (VAOS) fleet during July 2011-February 2012.

<i>Trip_No.</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i># Sets</i>	12	14	12	10	10	10	10	14	13	8	14	16
<i># Hooks</i>	25080	32000	16950	18720	24960	24975	13200	45000	35100	11475	36660	65520
<i>Species</i>	<i>Number of fish</i>											
ALB						22					1	
BET	1			9								2
BLF			54			5	5		59			
BSH	1								1			2
BUM		2						1	1		1	4
DOL	235	99	97	94	450	7	174	790	373	18	508	545
DUS			10									
FAL	1	1			104	5	1		8	1	37	
OCS												1
PLS	6											
SAI	71	53	5	35	111	40	31	77	53	43	129	96
SKJ				1								
SPF					1				3			6
SMA											1	
SPG												24
SPL				7	5				1		5	
SPM									1			
SPZ		1										
TIG				1								
WAH	1											1
WHM	22	17				29		61	3	8	7	16
YFT		28				2		13				

Table 2. Total landed catch (kg) and total landed catch (kg) by commercial species groups by observer (Observer/trained Captains) covered trips in at-sea sampling activities in the Venezuelan Artisanal Off-Shore (VAOS) fleet during July 2011-February 2012.

TRIP #	MONTHS	DOL	BIL	SHK	TUN	OTHER	TOTAL
2	Nov-2011	1668	985	<50	331		3034
4	Nov/Dec-2011	1300	680	99	<50		2129
3	Nov/Dec-2011	1740	101	65	458		2364
5	Jan-2012	1800	1050	200	150		3200
6	Jan-2012	189	1056	30	495		1770
7	Jan-2012	-	400	-	50	MERO:580	1030
8	Feb-2012	7080	1600	300	-		8980
9	Feb-2012	1571	1114	31	115		2831
10	Feb-2012	275	432	4	100		811
11	Feb-2012	2400	800	120	100		3420
12	Feb-2012	4500	1700	-	-		6200

Table 3. Species metrics of target, secondary target, and retained bycatch in at-sea sampling activities in the Venezuelan Artisanal Off-Shore (VAOS) fleet during July 2011-February 2012. BIL species length measurement is LJFL, fish and shark species is FL, with the exception of PLS, which is disk width (DW).

		Species	LENGTH min (cm)	LENGTH <i>mean</i> (<i>cm</i>)	LENGTH max (cm)	Numbers
TARGET	BILLFISH	DOL	42	86,2	156	546
		SAI	80	158,7	189	732
		WHM	106	144,8	179	166
		SPF	126	146,6	172	10
		BUM	127	171,3	270	7
SECONDARY TARGET	SHARKS	DUS	10	61,5	94	10
		FAL	25	70,6	144	128
		SPL	48	110,8	160	20
		SPZ	-	106,0	-	1
		SMA	-	183,0	-	1
		TIG	-	146,0	-	1
		BSH	160	180,8	190	4
	PLS	51	58,7	68	27	
	TUNAS	YFT	78	95,1	108	44
		ALB	79	100,3	106	22
		BLF	22	64,4	100	118
		BET	53	78,9	102	12
		SKJ	-	57,0	-	1
RETAINED BY CATCH	OTHER FISHES	WAH	101	118,5	136	2
		GBA	61	74,0	92	4
		BES	70	92,7	108	3
		GES	58	79,0	100	2
		RRM	55	55,5	56	2

Table 4. Condition of the species when hauled on deck in at-sea sampling activities in the Venezuelan Artisanal Off-Shore (VAOS) fleet during July 2011-February 2012.

		Species	#Alive	#Dead	% Alive
TARGET	BILLFISH	SAI	233	477	32,8
		WHM	87	75	53,7
		SPF	7	3	70,0
		BUM	3	4	42,9
SECONDARY TARGET	SHARKS	DUS	9	1	90,0
		FAL	117	7	94,4
		SPL	15	5	75,0
		SPZ	1	0	100,0
		TIG	1	0	100,0
		BSH	4	0	100,0
		PLS	27	0	100,0
	TUNAS	YFT	26	11	70,3
		ALB	3	19	13,6
		BLF	32	86	27,1
		BET	8	4	66,7
		SKJ	0	1	0,0

Table 5. Recorded landed catch (kg) by species in port sampling activities in Morro Puerto Santo (MORR) and Margarita Island (MARG) by the Venezuelan Artisanal Off-Shore (VAOS) fleet during July 2011-February 2012 when declared operating at least 1 pelagic longline set and/or declaring targeting tuna and tuna-like species. SPx refers to SPF or SPG; SH1 and SH2 refers to the 1st and 2nd most abundant shark species in the landings. FishArea: *see* **Figure 8**.

Port	Date	TARGET	D-at-sea	# sets	FishArea	SAI	WHM	BUM	SPx	SH1	SH2	KGM	BLF	DOL	TOTAL
MARG	July-11	DOL	16	6	6	922	0	0	0	38	0	0	90	0	1991
MARG	July-11	DOL	12	8	6	926	0	0	0	0	0	0	70	1200	2196
MORR	July-11	KGM	22	20	6	0	0	0	0	17	0	4246	0	0	4263
MARG	July-11	DOL	6	6	1	570	0	0	0	28	0	0	0	730	1328
MARG	August-11	DOL	4	4	1	276	0	0	0	0	0	0	42	308	626
MORR	August-11	BIL	16	16	6	900	16	0	0	0	0	0	0	0	916
MARG	August-11	DOL	13	7	6	956	0	0	0	0	0	0	76	1161	2193
MARG	August-11	DOL	5	3	1	495	0	0	0	35	0	0	0	130	680
MORR	August-11	TUN	7	7	2	20	0	0	0	116	0	0	1439	0	1575
MARG	August-11	DOL	12	6	6	650	0	0	0	320	0	0	0	1098	2068
MORR	October-11	KGM	19	1	5	45	0	0	0	24	0	4000	0	100	4169
MARG	October-11	DOL	16	10	6	760	0	0	0	0	0	0	0	3440	4200
MARG	October-11	DOL	16	12	6	1800	0	0	0	0	0	0	0	2400	4200
MARG	October-11	DOL	15	2	6	140	0	0	0	0	0	0	110	163	413
MARG	October-11	DOL	13	10	1	962	543	165	0	0	0	0	0	1380	3050
MORR	November-11	TUN	16	14	6	602	0	0	0	0	0	0	0	0	602
MARG	November-11	DOL	11	11	3	1800	0	0	0	0	0	0	0	2000	3800
MARG	November-11	DOL	13	11	6	1900	0	0	0	0	0	0	0	2200	4100
MORR	November-11	TUN	14	12	6	592	10	0	15	0	0	0	0	0	617
MORR	November-11	DOL	11	11	2	0	0	0	0	75	0	0	250	2000	2325
MARG	November-11	DOL	13	13	7	0	0	0	0	197	0	0	65	0	262
MORR	November-11	TUN	12	10	6	243	0	0	0	0	0	3450	238	0	3931
MORR	December-11	BIL	9	9	4	352	0	0	0	0	0	0	0	0	673
MORR	December-11	BIL	17	17	6	273	0	0	0	52	0	0	0	0	5052
MARG	December-11	DOL	8	8	2	0	0	0	0	120	0	0	43	0	163
MORR	December-11	DOL	12	12	7	252	0	0	5	0	0	0	0	980	2060
MORR	January-12	BIL	6	5	6	289	0	0	119	0	0	0	0	75	464
MORR	January-12	BIL	6	6	6	700	0	0	0	153	95	0	0	600	1584
MORR	January-12	DOL	7	6	2	75	0	0	0	0	0	0	0	450	525
MORR	February-12	BIL	14	14	7	627	0	0	0	0	0	1293	0	916	2836
MORR	February-12	BIL	7	4	2	173	0	0	0	0	0	0	0	0	285
MORR	February-12	DOL	19	16	6	455	0	0	0	0	0	0	0	2468	3289
MORR	February-12	DOL	17	17	6	659	31	0	33	0	0	0	0	4315	5038
MARG	February-12	BIL	16	10	6	930	50	40	0	0	0	0	0	2230	3350
MARG	February-12	BIL	16	11	6	1000	90	40	0	0	0	0	0	2300	3430
MORR	February-12	DOL	13	1	6	94	0	0	0	58	0	0	0	0	152
MORR	February-12	DOL	9	9	5	300	0	0	0	0	0	0	0	986	1286

Table 6. Species metrics (length and number of samples) from port sampling activities in Morro Puerto Santo (MORR) and Margarita Island (MARG) by the Venezuelan Artisanal Off-Shore (VAOS) fleet during July 2011-February 2012 when declared operating at least 1 pelagic longline set and/or declaring targeting tuna and tuna-like species. BIL species length measurement is PFL, fish species is FL, and SHK species is TR. SPK* was FL. All measurement are in centimeters (cm).

	<i>min</i>	<i>mean</i>	<i>max</i>	<i>n</i>
BUM	116	131,0	155	12
SAI	78	124,5	177	752
SPF	117	118,0	119	2
SPG	119	123,5	128	2
SWO	70	70,0	70	1
WHM	94	115,5	144	31
BLF	28	58,3	75	116
YFT	55	82,8	110	65
BSH	52	59,0	66	2
CCL	79	79,0	79	3
FAL	20	30,5	43	30
SDV	26	31,1	41	27
SHX	33	33,8	35	4
SMA		55,0		1
SPK*		150,0		1
SPL	23	53,1	94	14
TIG		60,0		1



Figure 1. Red stars indicate sampling locations, Morro de Puerto Santo in the mainland, and Juan Griego in Margarita Island, the blue star is Cumana, location of the Instituto Oceanográfico de Venezuela-Universidad de Oriente.

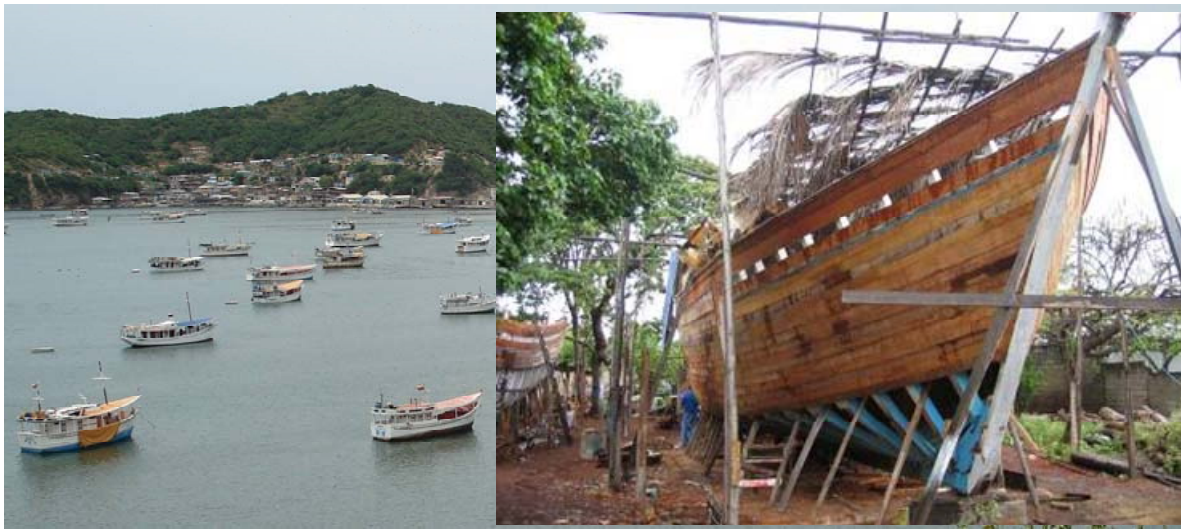


Figure 2. Typical vessels of the VAOS fleet in Morro Pto. Santo bay, and a vessel under construction in Juan Griego, Margarita Island, the captain and owner of this vessel is contributing with the JDMIP Project.

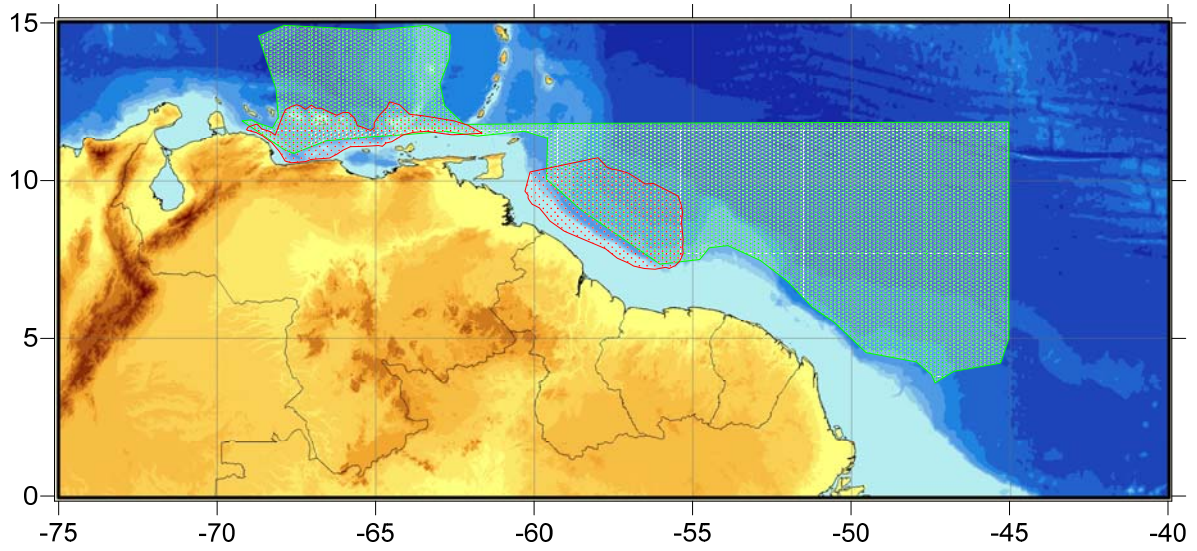


Figure 3. VAOS fleet fishing areas in red, and Venezuelan industrial pelagic longline fishing areas in green.

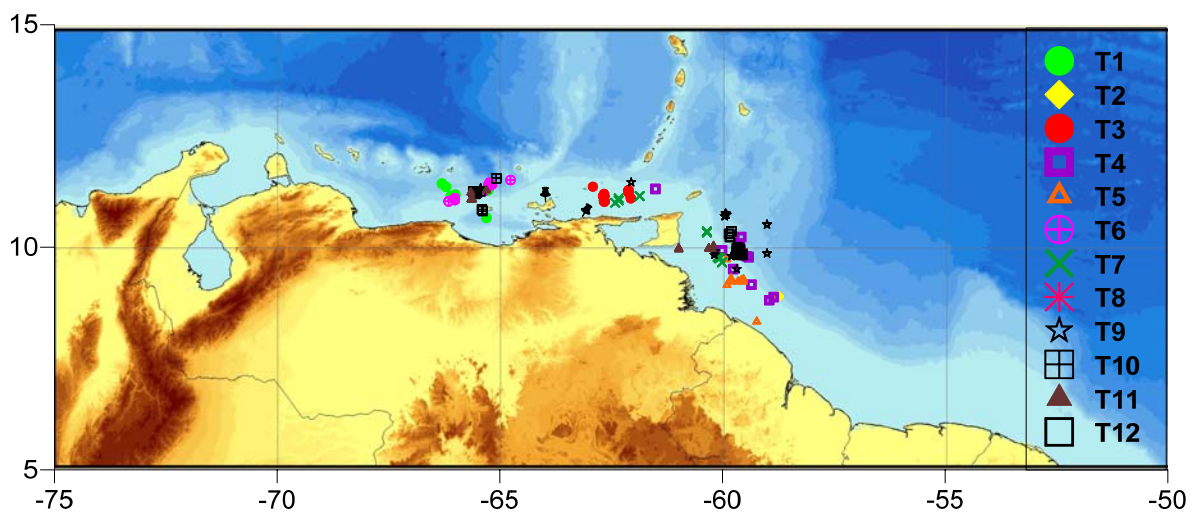
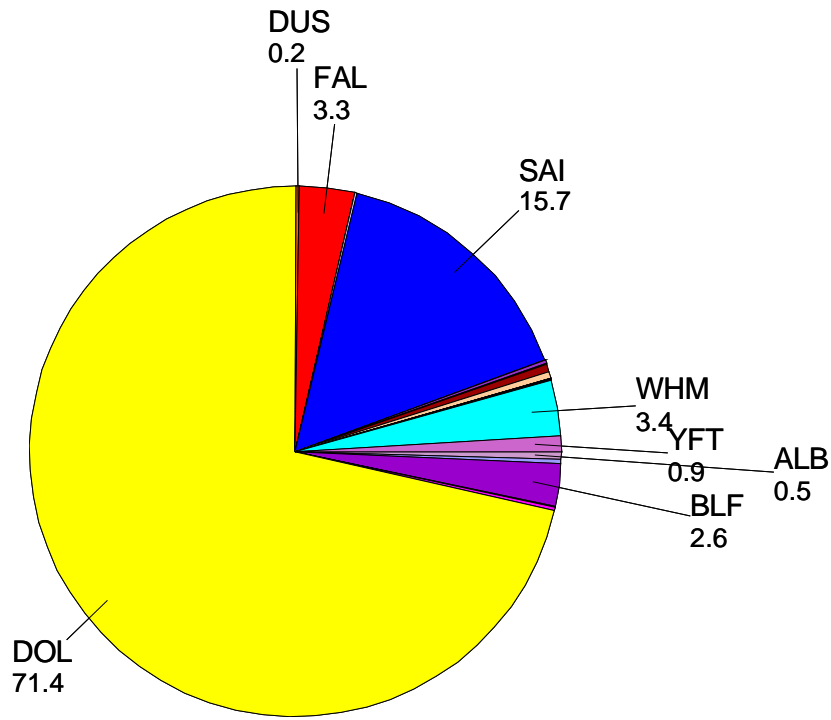
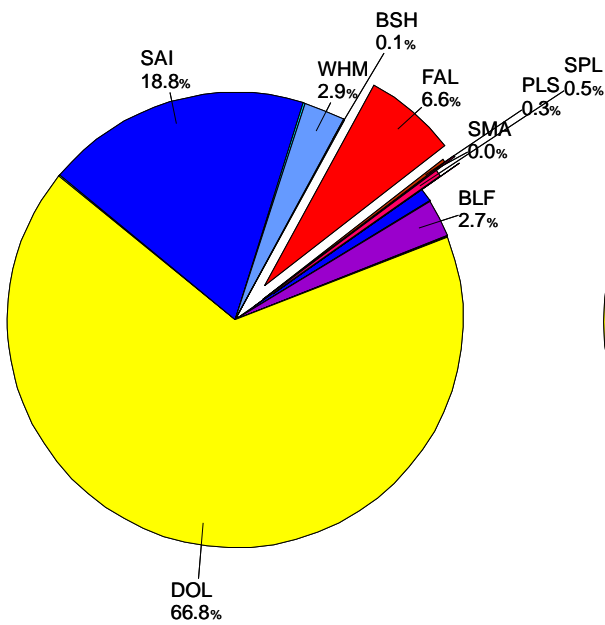


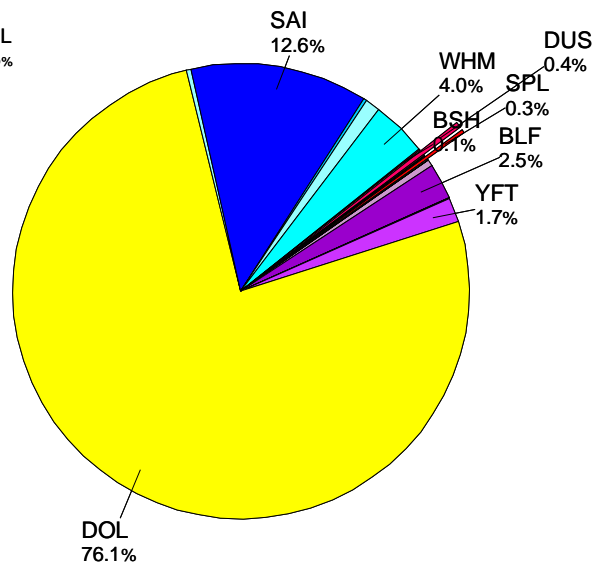
Figure 4. Spatial locations of sets per observed trip of the VAOS fleet during July 2011-February 2012. Legend indicates the trip number and symbol each reported set.



Combined fleets



Juangriego (Margarita I.)



Morro Pto. Santo

Figure 5. Species composition of the reported catch of all observed trips combined (T1-T12), and separated by base ports in the VAOS fleet during July 2011-February 2012. Numbers in pie slices reflect percentage of the species in the total catch.

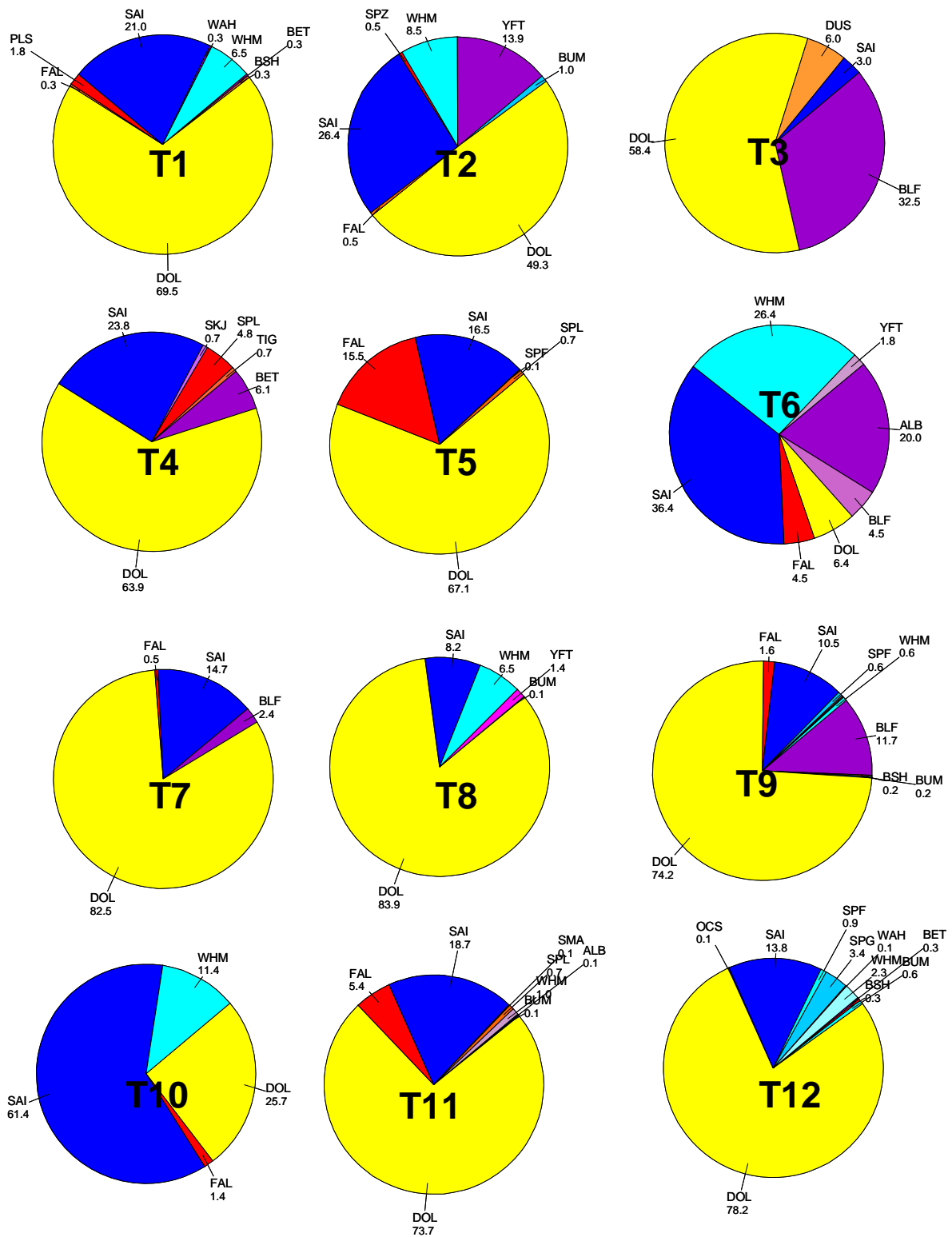


Figure 6. Species composition of the reported catch by each observed trip (T1-T12) in the VAOS fleet during July 2011-February 2012. Numbers in pie slices reflect percentage of the species in the total catch.

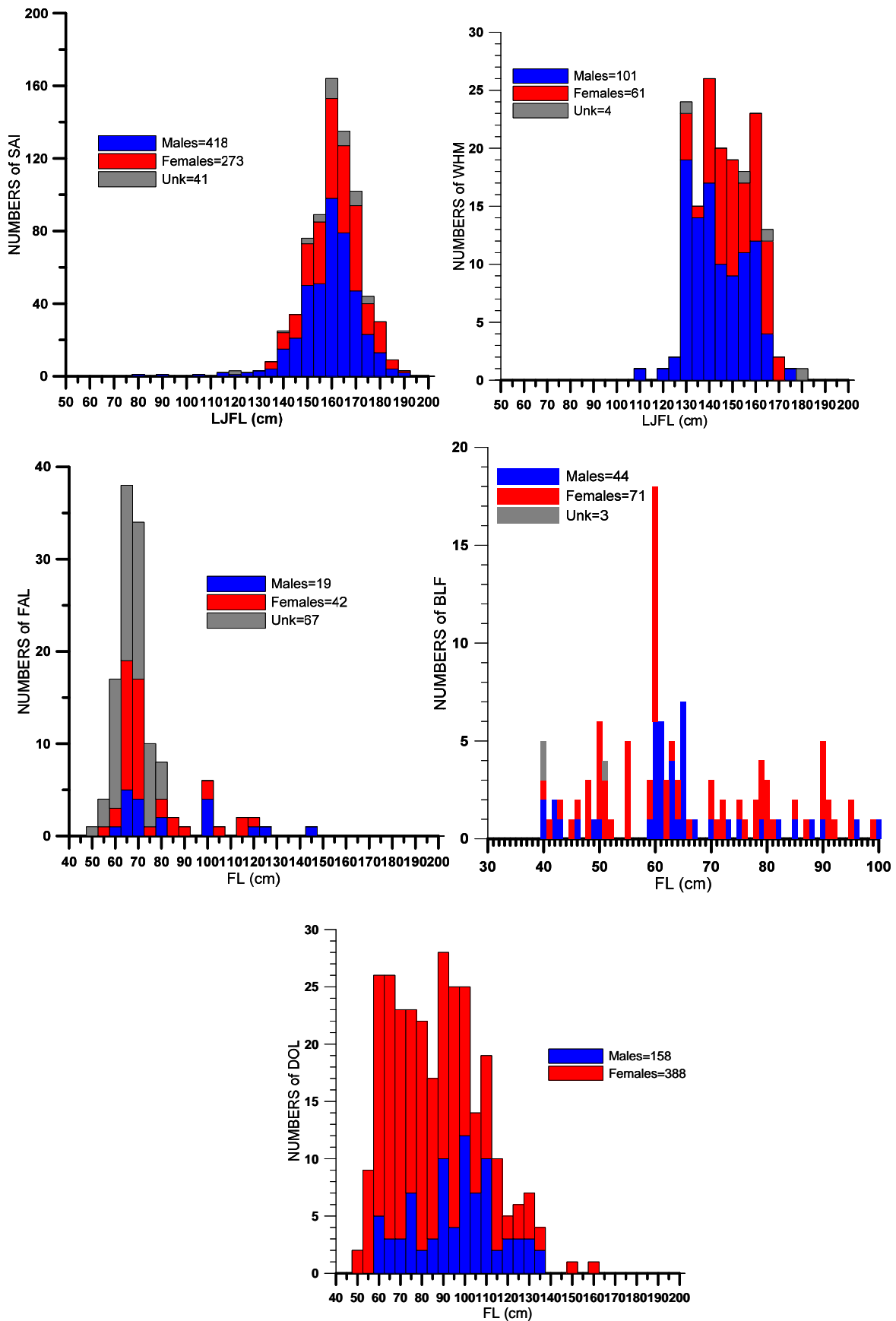


Figure 7. Size frequency distributions of the most frequent species caught by the observed VAOS fleet (T1-T12) during July 2011-February 2012.

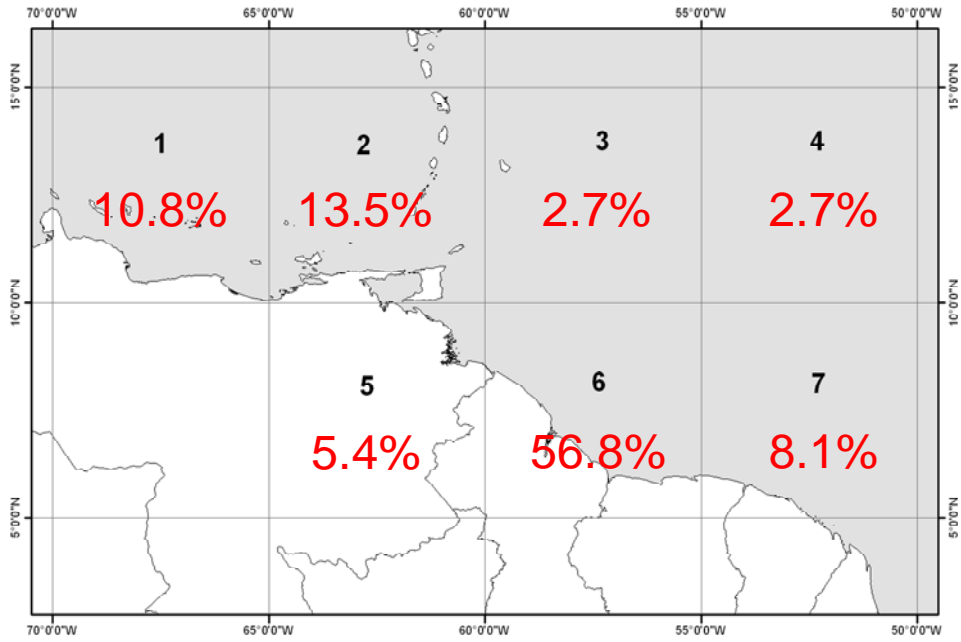


Figure 8. Fishing areas defined for the port sampling activities forms of the VAOS fleet in Morro Puerto Santo and Margarita Island during July 2011-February 2012. Percentage in each fishing section reflects the number of trips fishing in that section during the period of sampling.

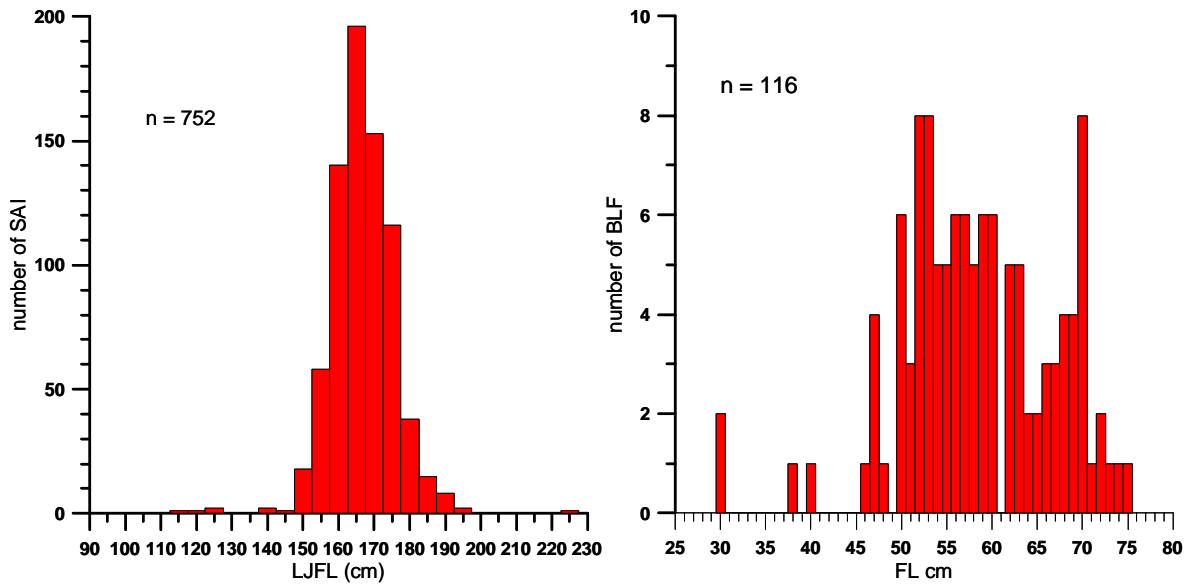


Figure 9. Size frequency distributions of the most frequent species landed by the sampled VAOS fleet in both communities (Morro Puerto Santo and Margarita Island) during July 2011-February 2012.