### Comisión Interamericana del Atún Tropical Inter-American Tropical Tuna Commission

IATTC



### Outline

- Importance/Value of tagging
- Historical tagging studies conducted at IATTC
- The 2019 2023 regional tuna tagging project
- Future Directions



### Utility of Tagging

- Movements (linear displacements)
- Stock structure and estimates of mixing rates
- Growth (with reliable recovery measurements)
- Estimates of exploitation rates (fishing mortality)
- Estimates of natural mortality
- Daily movements, behavior, and habitat through the use electronic archival tags



### Historical Tagging

- IATTC began tropical tuna tagging experiments in the eastern Pacific in 1955 and continued at regular intervals through 1964. This tagging was conducted throughout the range of the fishery, from northern Mexico to northern Chile
- During 1969 through 1974 there were several tuna tagging cruises undertaken on purse-seine (PS) vessels, which continued sporadically until 1980
- During 1979 through 1981 there were several tropical tuna tagging cruises undertaken on chartered live-bait pole-and-line vessels with tagging conducted from Mexico to Ecuador, and around some offshore islands
- Limited opportunistic tagging took place from 1981-1988 on both pole-and-line and sportfishing vessels
- During 2000 2006, six tagging cruises were undertaken primarily targeting bigeye tuna, however considerable numbers of yellowfin and skipjack tuna were also tagged and released.
  - These tagging efforts also incorporated the use of electronic archival tags



### Tropical tuna releases and recoveries from IATTC historical tagging campaigns 1955 - 1988

	Yellowfin Tur	าล		Skipjack Tun	а	Bigeye Tuna		
Released	Returned	% Returned	Released	Returned	% Returned	Released	Returned	% Returned
110,205	14,746	13.4	127,709	12,881	10.1	612	15	2.5

### Skipjack tuna returns, >30d at liberty (*n* = 8,769)



### Yellowfin tuna returns, >30d at liberty (*n* = 6,098)





Bigeye tuna tagging program in the equatorial eastern Pacific 2000 - 2006

### Plastic Dart Tags (PDTs)

	Bigeye Tur	าล		Skipjack Tu	na		Yellowfin Tuna			
Released	Returned	% Returned	Released	Returned	% Returned	Released	Returned	% Returned		
19174	8249	43.0	3425	563	16.4	2234	405	18.1		

### Archival Tags (ATs)

	Bigeye Tur	าล		Skipjack Tu	na	Yellowfin Tuna			
Released	Returned	% Returned	Released	Returned	% Returned	Released	Returned	% Returned	
323	162	50.2	134	7	5.2	53	8	15.1	



Bigeye tuna tagging program in the equatorial eastern Pacific 2000 - 2006

### Bigeye tuna PDT recoveries, >30 d at liberty n = 6,674









### **Project objectives**

- Tag and release 15,000 skipjack with PDTs and an additional 600 with ATs
- Tag 2,500 yellowfin and 2,500 bigeye tunas with PDTs
- Tag 150 yellowfin and 150 bigeye tunas with ATs
- Simultaneously conduct a tag seeding experiment to evaluate reporting rates and reporting accuracy
- Invest in tag recovery programs to obtain as much high confidence (validated) return information as possible
- Redesign the IATTC tagging database and incorporate a server-based system to fully support all staff tagging activities and data utilization
- Ultimately develop methods using tag-mark-recapture data to derive indices of abundance and natural mortality



*F/V Her Grace* 





Vessel Tracks for the Three Tagging Cruises Conducted During 2019-2022













### Conventional Tag Types and Tag Applicator





### Archival Tag Types





**Conventional and Archival Tag Placement** 





### Summary of tag seeding

			Returned									
	Total				Different		Total High Confidence					
Departure Port	Seeded	Same Port	<b>Different Port</b>	Same Vessel	Vessel	Total (%)	(% of returned tags)					
Flamingo, PA	25	0	24	24	0	24 (96.0)	23 (95.8)					
Manta, EC	942	636	213	821	28	849 (90.1)	665 (78.3)					
Manzanillo, MX	30	26	0	26	0	26 (86.7)	5 (19.2)					
Mazatlán, MX	705	525	85	569	41	610 (86.5)	515 (84.4)					
Paita, PE	25	0	25	25	0	25 (100.0)	23 (92.0)					
Puerto Madero, MX	25	0	0	0	0	0 (00.0)	0 (00.0)					
Total	1,752	1,187	347	1,465	69	1,534 (87.6)	1,231 (80.2)					



# The direct link for the conventional tagging in 2020 video: <u>https://www.youtube.com/watch?v=tfeJGlvkSKc</u>



### The direct link to the electronic tagging on SKJ video: <u>https://www.youtube.com/watch?v=f79anAur8j8</u>



# The direct link for the electronic tagging on YFT video: <u>https://www.youtube.com/watch?v=jm80o78vHEs</u>



Tag recovery specialists located in Mazatlan, Mexico, and Posorja and Manta, Ecuador.

Extensive advertising aboard vessels, in canneries, and throughout ports where tagged fish may be encountered.





PROGRAMA DE MARCADO DE ATUNES DEL PACIFICO ORIENTAL Recompensas por marcas en barriletes, aletas amarillas, y patudos

Devuelva marcas y reciba recompensas - También entrada a sorteos anuales para premios de US\$1000



Longitue fuscal (em)

#### US\$10 o US\$15 por marcas plásticas (MP) y US\$250 por marcas electrónicas (ME) de dentro de pescados

Cuando se encuentre un pescado marcado, NO remueva las marcas del pescado hasta que primero haya intentado contactarse con un representante en una de las siguientes oficinas de la CIAT para instrucciones adicionales Ecuador Las Playas (4) 276 5471, Manta (5) 282 1943 México: Manzanillo (314) 333 7290; Mazatlán (669) 982 3520 Panamá (507) 260 7546 Venezuela: Cumaná (293) 431 977

Por favor registre la siguiente información y proporcione con marca(s) a un representante de la Comisión del Atún, o siga las instrucciones abajo. Especie y longitud furcal (línea recta desde la punta de la mandíbula a la bilurcación de la cola)

- Números de las marcas para marcas plásticas y marcas electrónicas
- Fecha y lugar de captura.
- Nombre del buque pesquero y tipo de arte que capturó el pescado.
- Nombre del descubridor y detalles de contacto completos.

Comisión Interamericana del Atún Tropical (CIAT) SI NO PUEDE CONTACTARSE CON UN REPRESENTANTE LOCAL DE LA CIAT POR FAVOR VISITE EL SITIO DE INTERNET DE LA CIAT PARA REPORTAR RECUPERACIONES DE MARCAS en www.iatto.org/tagging/tagretums o envie la información anterior por correo electrónico y una fotografía del pescado marcado a tagreturns@iattc.org





尾义長 (cm)

#### プラスチック標識(PT)の報告には、10米ドルもしくは15米ドル 電子標識 (ET)の報告には、250米ドル

標識の付いた魚を発見したときは、標識を抜き取り、次の情報を下記のウェブサイトに報告してください。

- 魚種名と尾叉長(cm)(下吻から尾びれ中央のくぼみまで、ノギスでまっすぐに潮定)
- 標識表面に記載のタグ番号
- 漁港日と漁港位置(植理・経営)
- 渔船名と漁法名 .
- 発見された方のお名前と連絡先(住所、e-mailアドレスなど)

Inter-American Tropical Tuna Commission (IATTC) 全米熱帯まぐろ類委員会 報告はIATTCのホームページを通じてお願いいたします(www.iattc.org/tagging/tagreturns)

もしくは、上記の情報と標識の付いた魚の写真を次のメールアドレスまで(tagreturns@iattc.org)

### Summary of Releases and Returns for Skipjack Tuna

	Plastic Dart Tags											
Year	Released	< 30 d	30-89 d	90-179 d	180-365 d	> 365 d	Other	Total (%)	Total High Confidence (%)			
2019	177	4	16	5	2	1	2	30 (16.9)	19 (63.3)			
2020	5,869	756	468	212	94	20	79	1,629 (27.8)	302 (18.5)			
2022	135	28	6	2	0	0	0	36 (26.7)	5 (13.9)			
All	6,181	788	490	219	96	21	81	1,695 (27.4)	326 (19.2)			

	Archival Tags											
Year	Released	< 30 d	30-89 d	90-179 d	180-365 d	> 365 d	Other	Total (%)	Total High Confidence (%)			
2019	43	5	3	0	2	0	0	10 (23.3)	6 (60.0)			
2020	181	10	13	8	8	0	0	39 (21.5)	29 (74.4)			
2022	26	9	1	1	0	0	0	11 (42.3)	11 (100.0)			
All	250	24	17	9	10	0	0	60 (24.0)	46 (76.7)			



### Skipjack Tuna Length Frequency Distributions



CIAT IATTC Co-funded by European Union

Skipjack tuna returns, >30d at liberty (*n* = 733)

Longest DAL = 800.8d, Recaptured 4120 nm from release location.

93% recaptured within 1000 nm.





### Skipjack Tuna AT MPTs, >30d at Liberty





### Summary of Releases and Returns for Yellowfin Tuna

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Year	Released	< 30 d	30-89 d	90-179 d	180-365 d	> 365 d	Other	Total (%)	Total High Confidence (%)
2019	805	9	26	27	22	13	12	109 (13.5)	47 (43.1)
2020	264	11	18	6	7	4	5	51 (19.3)	13 (25.5)
2022	610	20	61	31	5	0	0	117 (19.2)	62 (53.0)
All	1679	40	105	64	34	17	17	277 (16.5)	122 (44.0)

	Archival Tags											
Year	Released	< 30 d	30-89 d	90-179 d	180-365 d	> 365 d	Other	Total (%)	Total High Confidence (%)			
2019	241	21	14	6	4	3	0	48 (19.9)	34 (70.8)			
2020	9	0	0	0	0	0	0	0 (0.0)	0 (0.0)			
2022	221	9	10	20	1	0	0	40 (18.1)	38 (95.0)			
All	472	30	24	26	5	3	0	88 (18.7)	72 (81.8)			



### Yellowfin Tuna Length Frequency Distributions



CLAT IATTC Co-funded by European Union

Yellowfin tuna returns, >30d at liberty (*n* = 204)

Longest DAL = 1286 d, Recaptured 1328 nm from release location.

Longest displacement = 3480 nm, DAL = 547

92.1% recaptured within 1000nm.





### Yellowfin Tuna AT MPTs, >30d at Liberty





### Summary of tag recoveries for bigeye tuna



Plastic Dart Tags											
Year	Released	< 30 d	30-89 d	90-179 d	180-365 d	> 365 d	Other	Total (%)	Total High Confidence (%)		
2019	142	10	13	11	15	3	0	52 (36.6)	<u>37 (71.2)</u>		
2020	9	1	1	0	0	2	1	5 (55.6)	3 (60.0)		
2022	114	19	22	5	1	0	1	48 (42.1)	33 (68.7)		
All	265	30	36	15	16	5	3	105 (39.6)	73 (69.5)		

	Archival Tags											
Year	Released	< 30 d	30-89 d	90-179 d	180-365 d	> 365 d	Other	Total (%)	Total High Confidence (%)			
2019	46	2	1	3	9	1	0	16 (34.8)	15 (93.8)			
2020	0	0	0	0	0	0	0	0 (0.0)	0 (0.0)			
2022	11	1	5	0	0	0	0	6 (54.5)	6 (100.0)			
All	57	3	6	3	9	1	0	22 (38.6)	21 (95.5)			



### **Bigeye Tuna Length Frequency Distributions**



CLAT IATTC Co-funded by European Union

Bigeye tuna returns, >30d at liberty (*n* = 69)

Longest DAL = 781 d, Recaptured 820 nm from release location.

Longest displacement = 2147 nm, DAL = 153

94.2% recaptured within 1000nm.



CLAT INTTC Co-funded by European Union

### Bigeye Tuna AT MPTs, >30d at Liberty





### Conclusions

- There were four key factors inhibiting IATTC from completely meeting the project objectives
  - High PS fishing effort throughout the equatorial EPO
  - PS vessels setting Tropical Atmosphere Ocean (TAO) buoys where tagging was historically successful
  - Little industry cooperation in providing dFADs locations for fishing and tagging
  - Most of the cruise time is spent searching for fish, rather than fishing and tagging
- SKJ Released (returned): 6,181 (1,695) PDTs and 250 (60) ATs
- Tag recovery specialists located in three of the busiest unloading ports are critical to project success, although there were access issues during the COVID pandemic
- Tag seeding is a useful tool to evaluate real-time reporting rates and reporting accuracy during tagging campaigns. It also trains unloaders to search for tags
- Using PDT and AT tag data collected from these cruises, and the six cruises from the early 2000's, a lengthstructured spatiotemporal tagging model has been developed



### **Future Directions**

- Evaluate the efficacy of using a portable sea cage to hold fish for tagging and other in-situ experiments
  - Tag PS captured tunas from different set types
  - Provide the opportunity to tag tunas when they don't bite
  - Provide the opportunity to estimate tagging induced mortality
- Identify opportunities to tag aboard pole-and-line vessels operating from coastal states (Ecuador?)
- Develop relationships with company/vessel owners/captains to provide access to dFADs so more time can be spent fishing rather than searching
- Develop an agreements with fishing companies to deploy dFADs specifically for tagging cruises
  - May have value for conducting dFAD design and echo-sounder buoy experiments as well



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