IATTC 2nd Circle hook workshop
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Hooking location of sea turtles in longline fisheries

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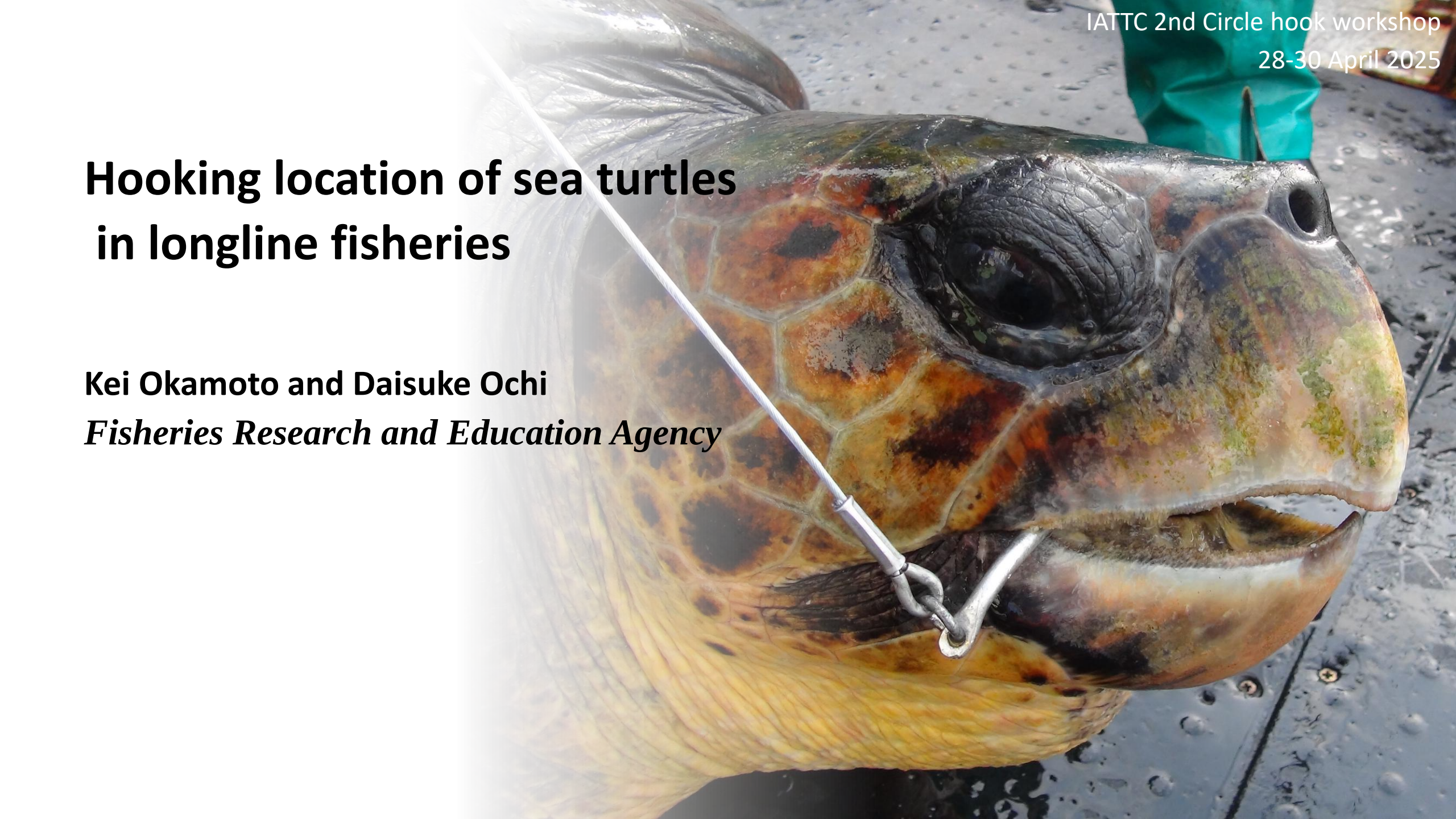


Introduction

In longline fisheries, one of major concerns is bycatch of sea turtles, especially leatherback turtle is listed as critically endangered

The impact on individuals varies depending on the hooking location, for example, foul hook or swallowed may seriously damage

The hooking location may vary by intra-/inter-species and hook type

However ...

Only a few studies focused on hooking locations in the Japanese tuna hook (Huang et al. 2016)

Not well be focused on hooking location of leatherback turtle (Watson et al. 2005; Stokes et al. 2012; Huang et al. 2016)

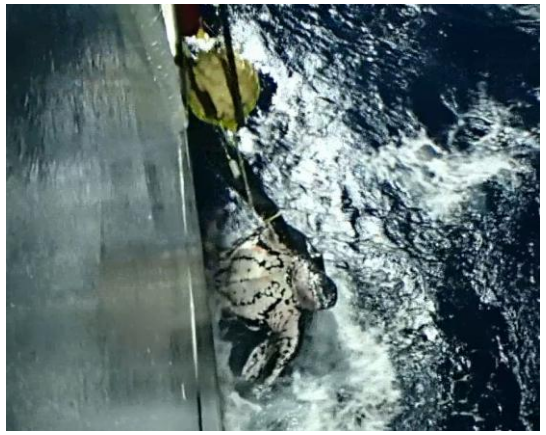
The aims for this study

Investigating the hooking location in the Japanese tuna hook

Reviewing the hooking location of leatherback turtle

Materials and methods

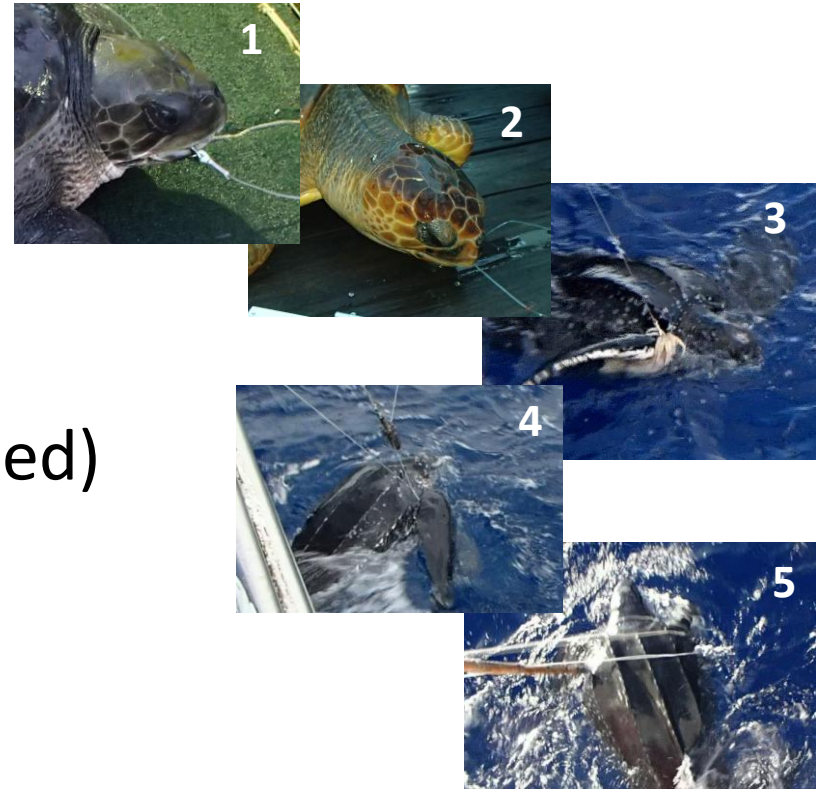
- Images and/or videos recorded by scientific observers were checked
- Species and hooking locations were identified
- Recorded in the ICCAT and WCPFC areas in 2019 – 2024
- Images of a total of 200 individuals were investigated
- Only Japanese tuna hooks were used



Materials and methods

Categorized in 5 patterns as follows;

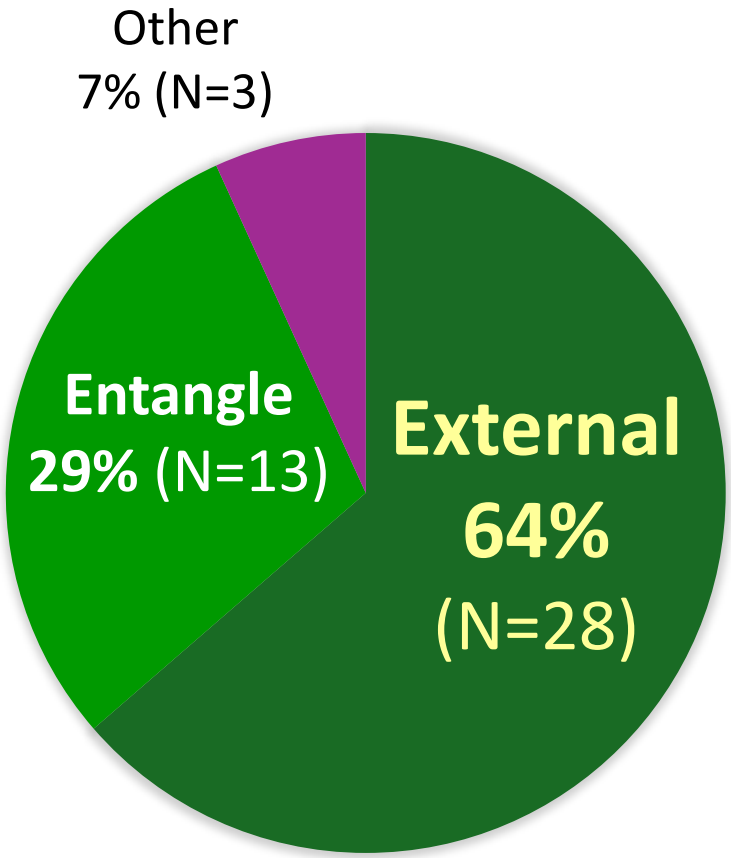
1. Mouth-hooking
2. Swallowed or hooked in mouth
3. External hooking (hook visible and not tangled)
4. Entangled (tangled and not hooking)
5. Other than branch line



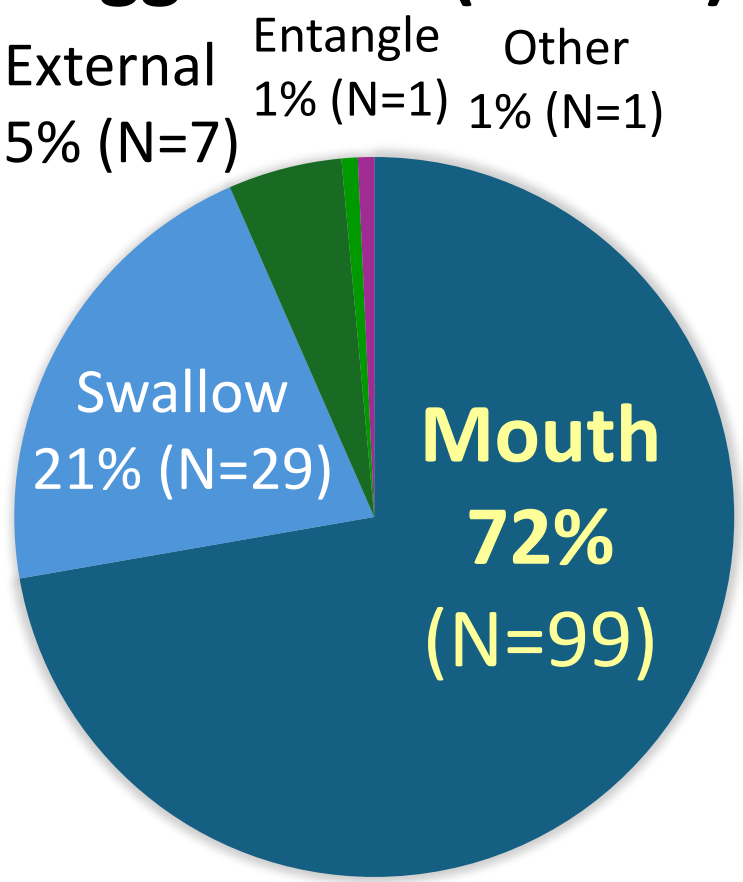
Hooking location was summarized by species

Results: Hooking location by species

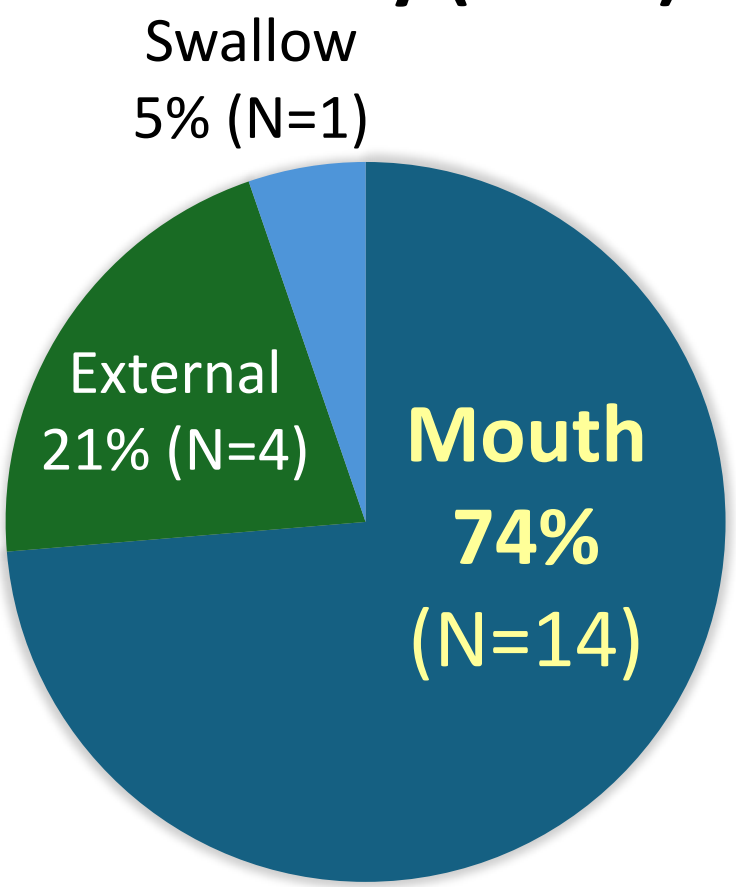
Leatherback (N=44)



Loggerhead (N=137)



Olive ridley (N=19)



External or entangled

Mouth-hooking or swallowing

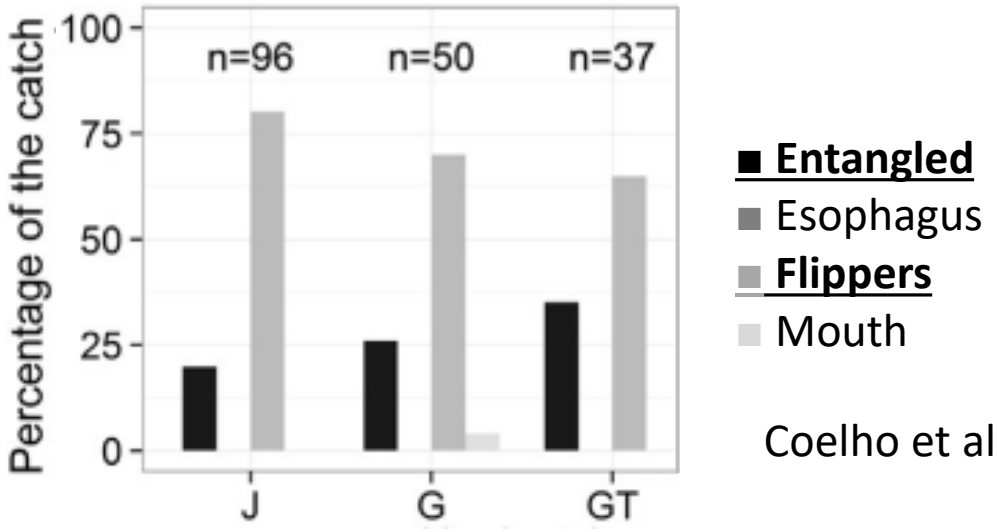
Mouth-hooking and swallowing were ***NOT*** recorded for ***Leatherback***

Results: Hooking location of leatherback by hook type

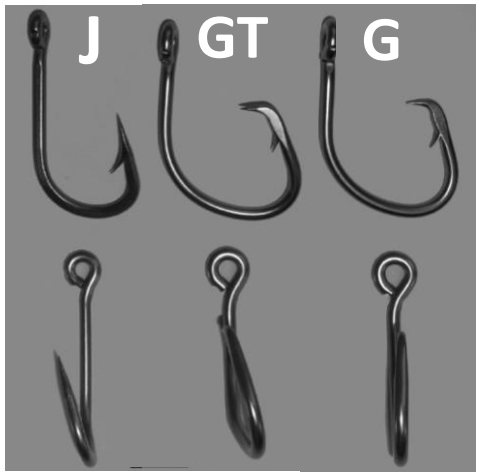
J-hook vs Large circle hook

	N	External	Mouth/beak
C-0°	137	**83.9**	16.1
C-10°	70	**97.1**	2.9
J-0°	47	**74.5**	25.5
J-20°	34	**91.2**	8.8

Stokes et al. 2012



Coelho et al. 2015



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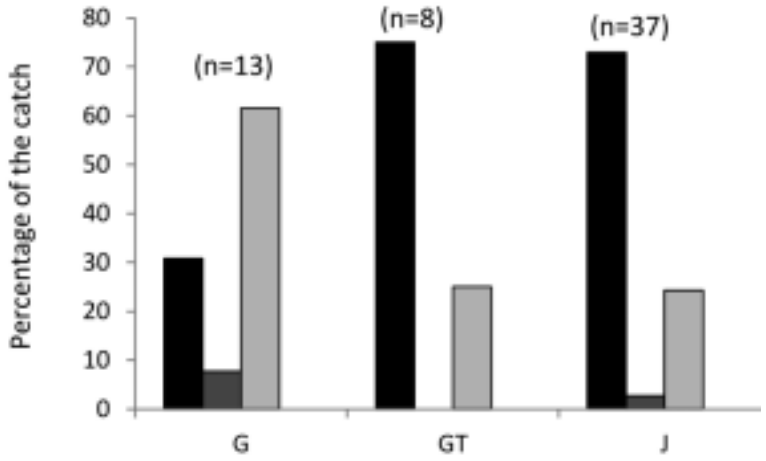
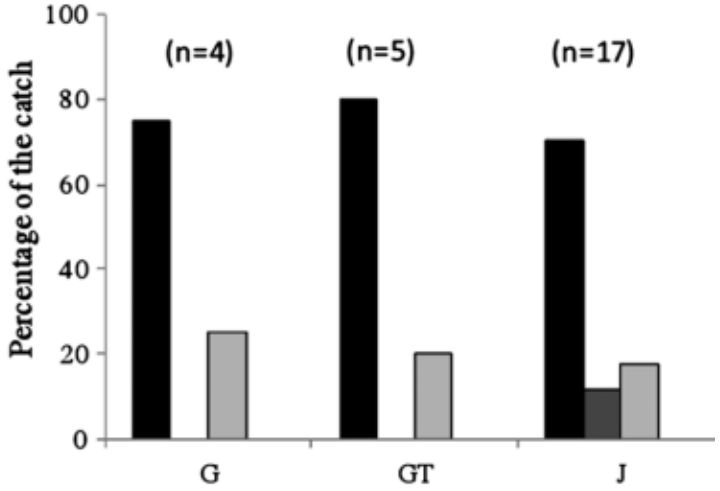


Santos et al. 2012

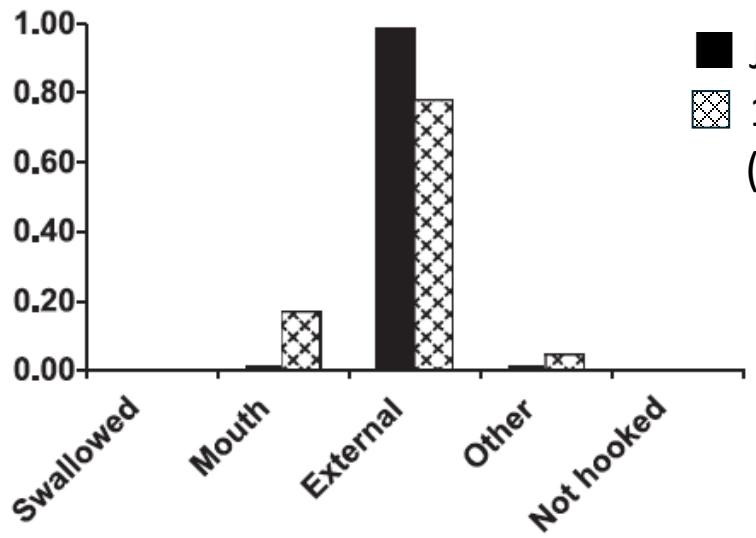


Santos et al. 2013

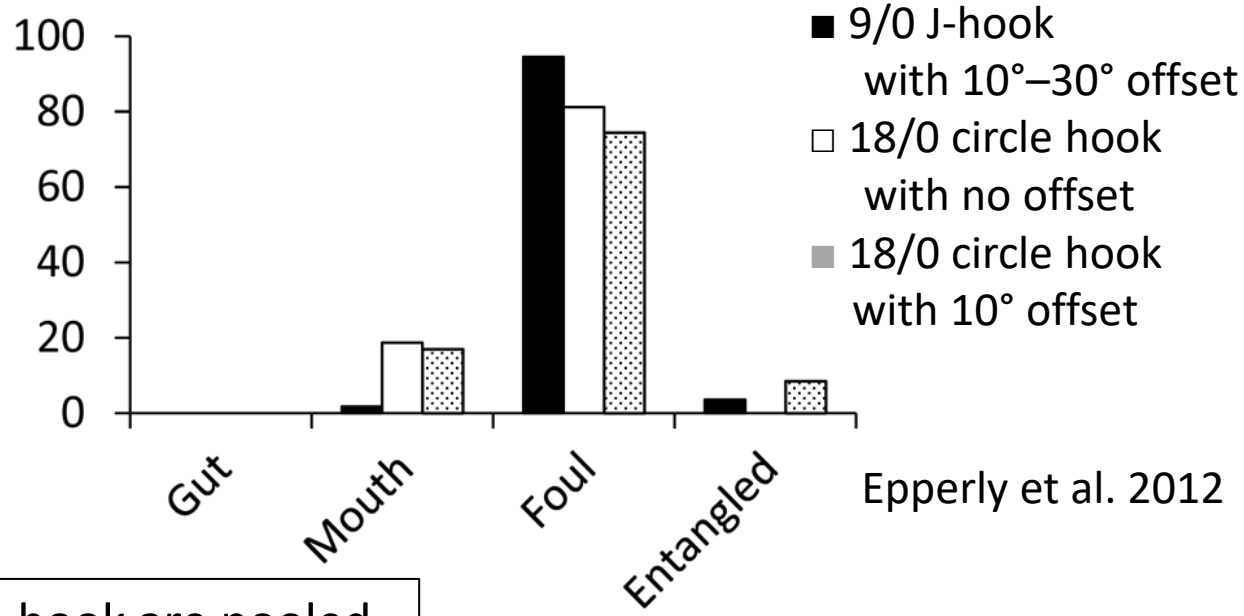
External hooking or entanglement is the majority in both hook types

Results: Hooking location of leatherback by hook type

J-hook vs Large circle hook



J-hook and circle hook are pooled
External N=115
Not hooked (Entangled?) N=18
Mouth N=8
Unidentified N=7 Watson et al. 2005



Epperly et al. 2012

J-hook and circle hook are pooled
External or entangled N=22
Mouth N=4, Unidentified N=2
Sales et al. 2010

Most of 13 bycaught leatherback were **entangled**
Read 2007

Bycatch rate is lower in large circle hook than J hook
Reviewed in Gilman et al. 2017

High proportion of external hooking and entanglement regardless of hook types

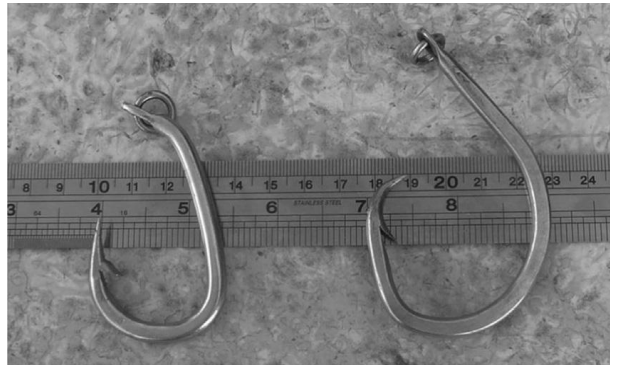
Degree of mouth hooking ratios by hook types varies by study

Results: Hooking location of leatherback by hook type

Japanese tuna hook vs Large circle hook

No. of indiv.	Jpn. tuna	Large C
Entangled	**19**	
External	**11**	**11**
Internal	5	6
Unknown	2	1

No. Indiv.	Logger head	Olive ridley	Leather back
Tuna	1	3	14
Large C		3	15
Entang		1	18



Huang et al. 2016

Leatherbacks are most often foul hooked or entangled in line
Hard-shelled turtles are more likely to bite baited hooks
Use of relatively wider circle hooks was not associated with fewer sea turtles captured

Huang et al. 2016

	Jpn. tuna
Entangled	**13**
External	**28**
Other	3

This study

No. of study is limited but these are still **the best available information**

Higher ratio of external hooking or entanglement not depending on hook types

Bycatch rate of the Japanese tuna hook is like that of large circle hook

Discussions: Hooking location by species

Mouth hooking and swallowed were NOT recorded for leatherback

Previous study shows similar results in the Atlantic
（e.g. Watson et al. 2005; Epperly et al. 2012; Coelho et al. 2015; Huang et al. 2016）

Almost 80%< of bycaught leatherbacks were external hooking or entangled

Proportion of bycatch rate by hook type is as follows;

J-hook > Large circle hook (Watson et al. 2005; Gilman et al. 2017)

Japanese tuna hook = Large circle hook (Huang et al. 2016)

The Japanese tuna hook may have similar effects with large circle hook in terms of bycatch rate reduction from J-hook for leatherback

Changing the hook type (Japanese tuna to large circle) would be less effective for bycatch reduction of leatherback

Discussions: Bycatch mitigation measures

Injuries by hook shape for leatherback

Large circle hook inflicts more serious injuries than the J-hook

（Parga, M. in the 1st circle hook WS）

Using more large circle hooks can severely injure more leatherback

Bycatch mitigation measures for hardshell turtle vs leatherback

The process and mechanism leading to bycatch may be completely different

Causes of bycatch may also differ

Large circle hook may seriously damage for leatherback

What is important component for mitigating leatherback bycatch?

Thank you for your attention