

Biology and Ecology of
Kawakawa,
Euthynnus affinis (Cantor,
1849)

Diagnostic Features (outside)

- Body naked except for corselet and lateral line;
 - Maximum; Females and males 100 cm FL; weight 14 kg. The all-tackle
 - Max record; 96.5 cm FL, 11.80 kg (Merimbala, New South Wales, 1980)
- Pectoral fin rays 25-29; Dorsal spines (total): 10-15; Dorsal soft rays (total): 11-15; Anal spines: 0; Anal soft rays: 11-15;
- Anterior spines of first dorsal fin much higher than those mid-way.
- Bony caudal keels on 33 and 34 vertebrae.

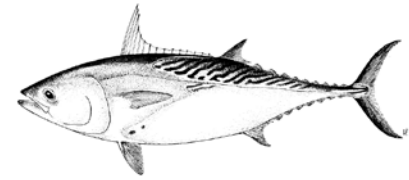


Color (body)

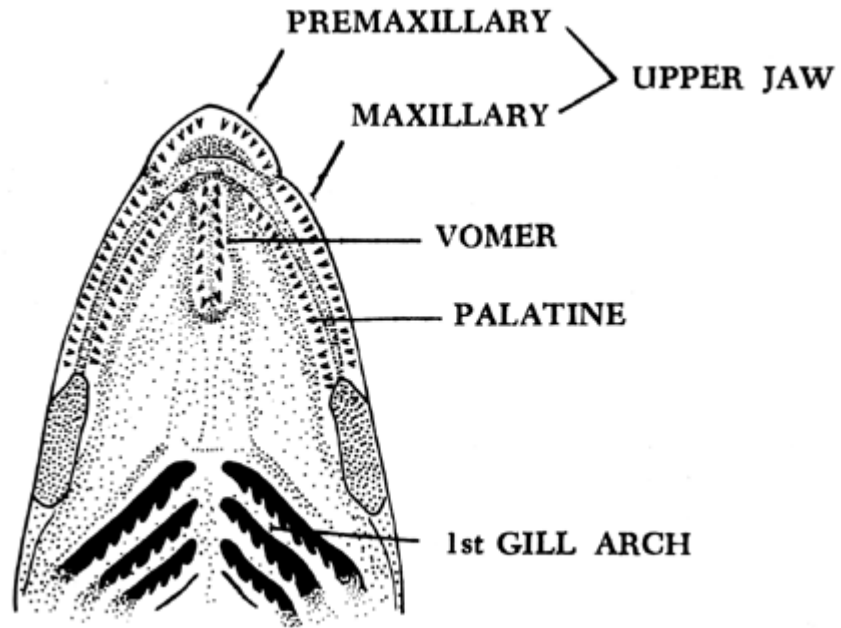
- Several black spots usually present between pectoral-and pelvic-fin bases;
- Back dark blue-green with a complex striped pattern under dorsal fin bases;



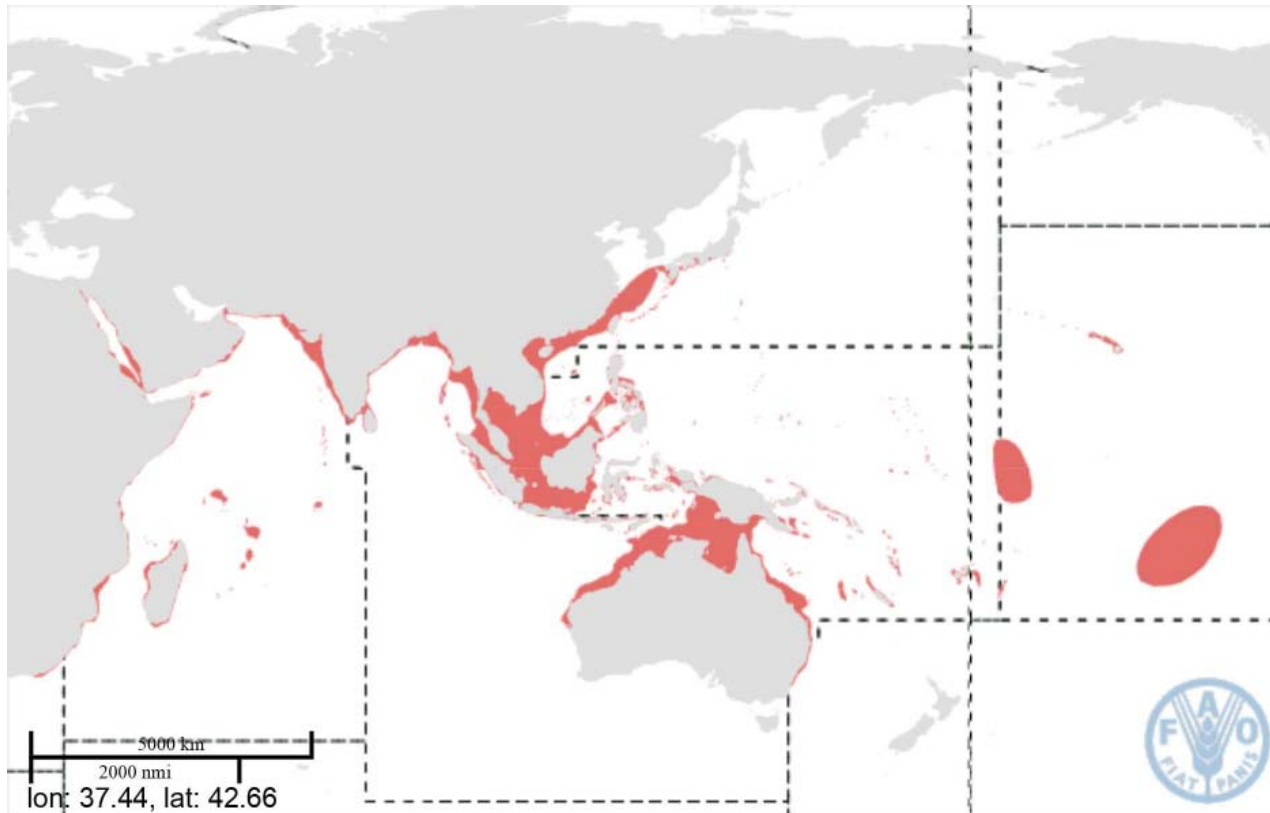
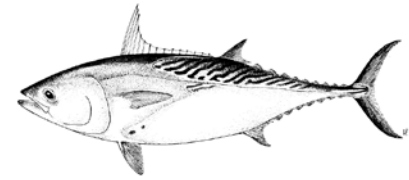
Diagnostic Features (inside)



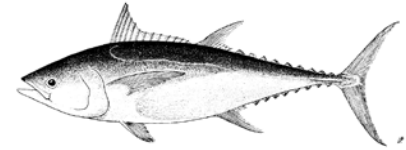
- Gillrakers 29 to 33 on first arch; gill teeth 28 or 29;
- Vomerine teeth absent? (FAO, 1983); present? (Nakabo, 2001)
- Vertebrae 39;
- Swim bladder absent.



Geographical Distribution



- Throughout the warm waters of the Indo-West Pacific, including oceanic islands and archipelagos.
- A few stray specimens have been collected in the eastern tropical Pacific (Los Angeles).



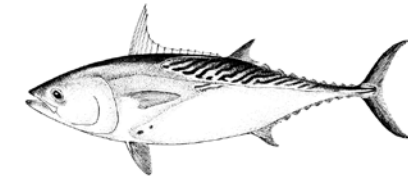
Length-Weight Relationships

$$W = a * L^b$$

Region	a	b	Units	Reference
Hawaii	2.10627E-05	2.99	(FL) cm – kg	Uchiyama and Kazama, 2003
India	0.0254	2.89		Prathibha et al, 2012
off Pakistan/ Arabian Sea.	0.0076	3.09	(TL) cm -g	Quratulan Ahmed, et al., 2016

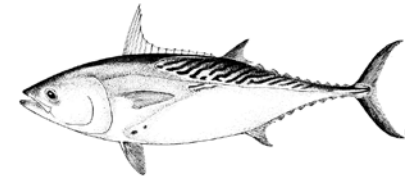
Estimated Growth Parameters (von Bertalanffy)

$$L_t = L_\infty (1 - e^{-k(t-t_0)})$$

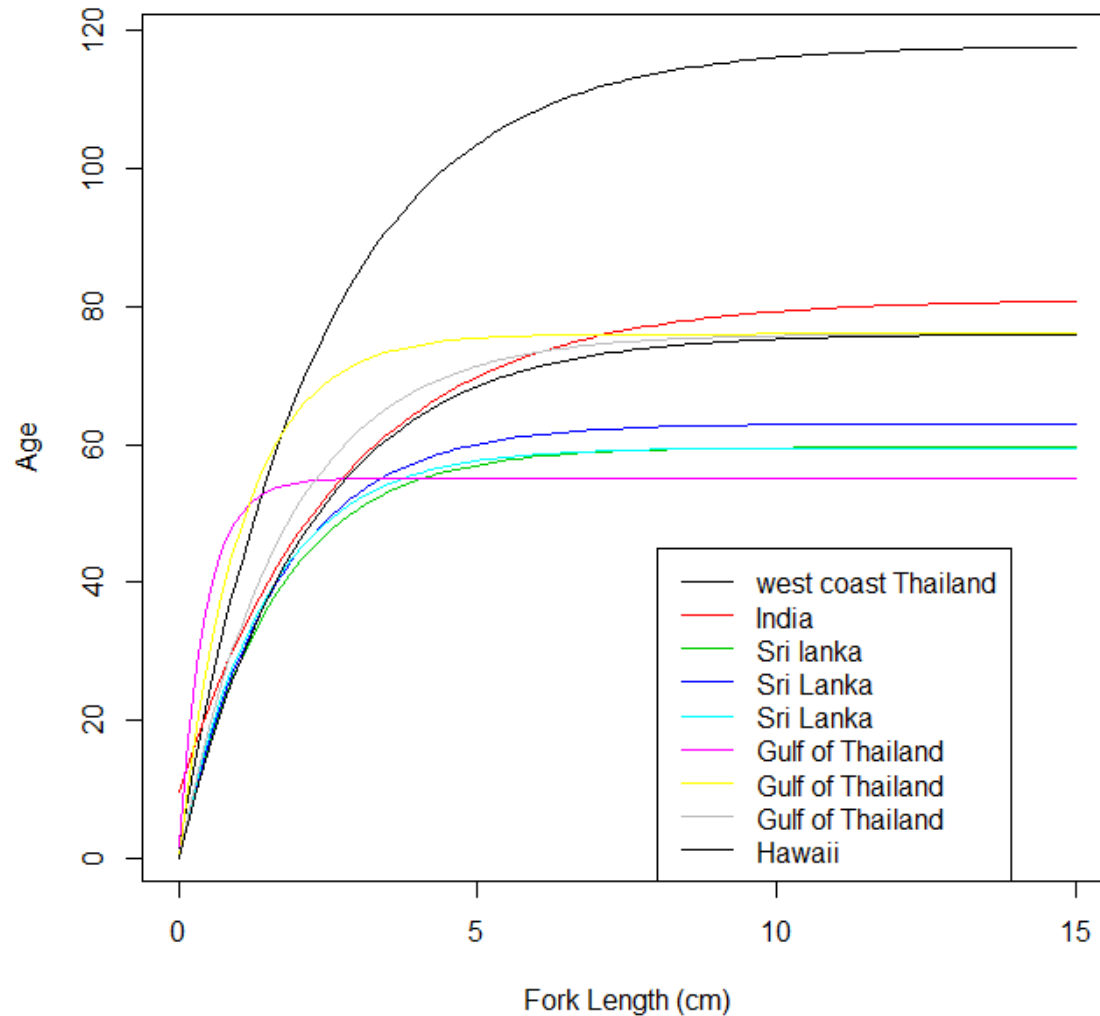


Region	L_∞ (FL: cm)	k (year ⁻¹)	t_0 (years)	Aging Metho d	Reference
west coast Thailand	76	0.46	-	Modal progres.	Yesaki, 1982
India	81	0.37	-0.344	ELEFAN	Silas et al., 1985b
Sri lanka	59.6	0.63	-	ELEFAN	Joseph et al., 1987
Sri Lanka	63	0.61	-	ELEFAN	
Sri Lanka	59.5	0.69	-	Bhattach arya	
Gulf of Thailand	55.1	2.23	-0.015	Modal progres.	Supongpan and Saikliang, 1987
Gulf of Thailand	76	0.96	-	Modal progres.	Yesaki, 1989b, 10-day intervals
Gulf of Thailand	76	0.56	-	Modal progres.	Yesaki, 1989b, monthly intervals
Hawaii	117.8	0.42	-0.03	otoliths	Uchiyama, 1980

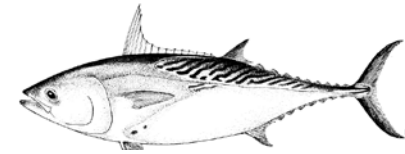
Age-Length Relationship



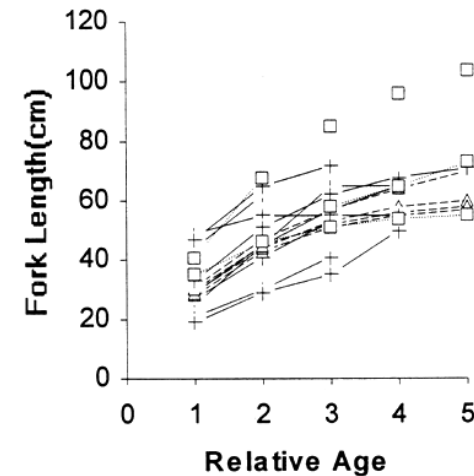
$$L_t = L_\infty(1 - e^{-k(t-t_0)})$$



Maturation

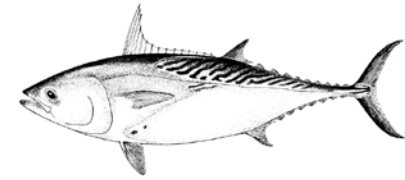


Kawakawa



- The smallest mature females
 - Philippines: 38.5 cm (Ronquillo, 1963)
 - Gulf of Thailand: 37.0 cm (Klinmuang, 1978)
 - Gulf of Thailand: 33.4 cm (Cheunpan, 1984)
 - West coast Thailand: 38 cm (Yesaki, 1982)
 - Papua New Guinea: 48.9 cm (Wilson, 1981)
- 50% Maturity:
 - Gulf of Thailand: 40 cm (Cheunpan, 1984)
 - Mangalore, India: 43-44cm (Muthiah, 1985)
- ->Most probably Kawakawa start maturation from age 1.
- Fecundity:
 - India: 210,000 ~680,000/spawning (48.5 ~ 65.0 cm FL) (Rao, 1964)
 - India: 202,000 ~1,570,000/spawning (39.4 ~ 67.0cm FL) (Muthiah, 1985)
 - SCS: av. 1,730,000/spawning (39.5 to 51.0cm) (Klinmuang, 1978)
- Kawakawa is a multiple spawner releasing ova at frequent intervals during a spawning season.

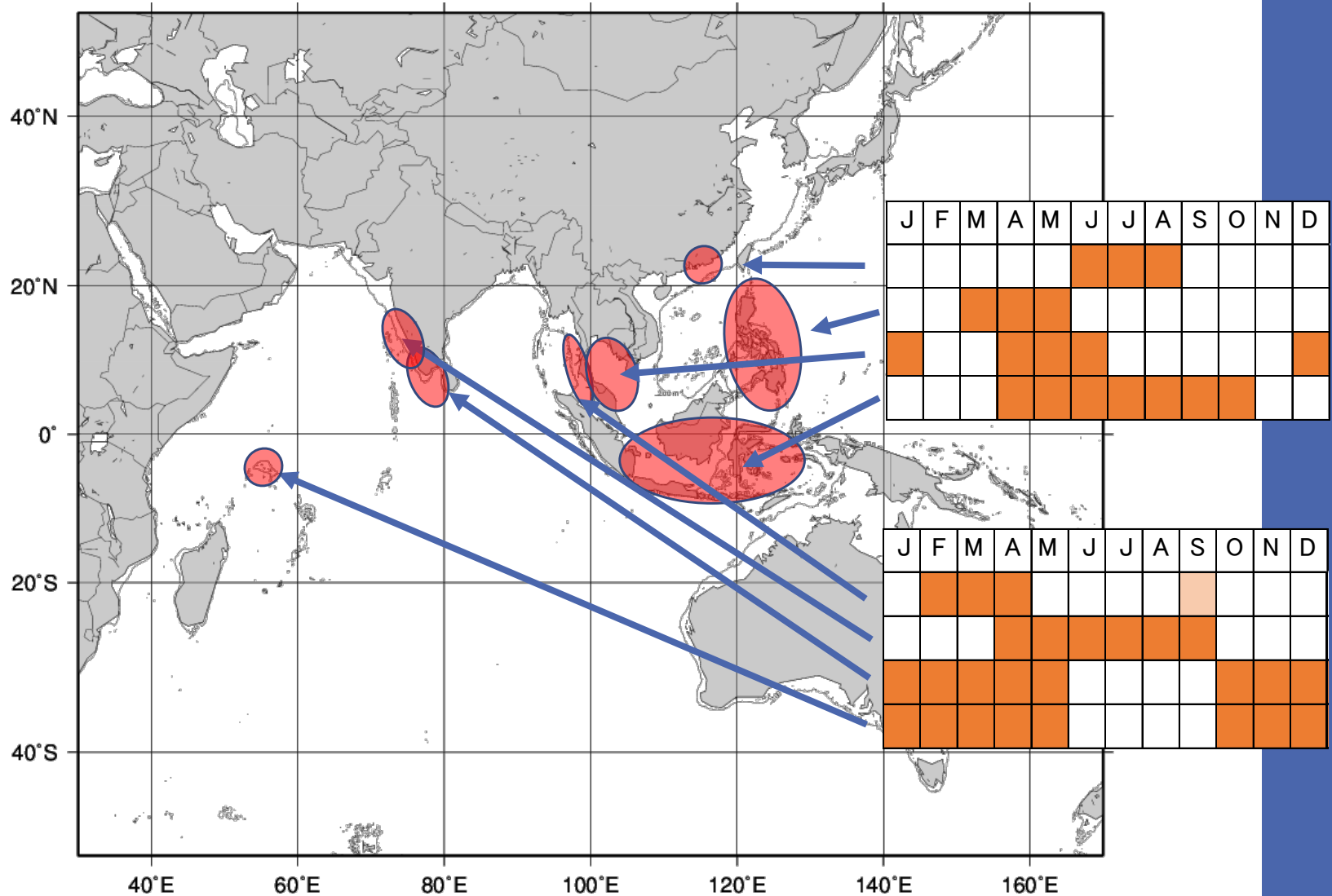
Spawning Seasons



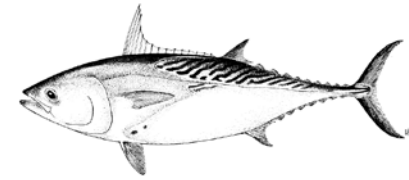
- Philippine waters; March ~ May
- Seychelles; during the period of the NW monsoon (October/November ~ April/May)
- off East Africa; from the middle of the NW monsoon period to the beginning of the SE monsoon (January ~ July)
- off Indonesia ; probably from August ~ October



Spawning Areas and Seasons

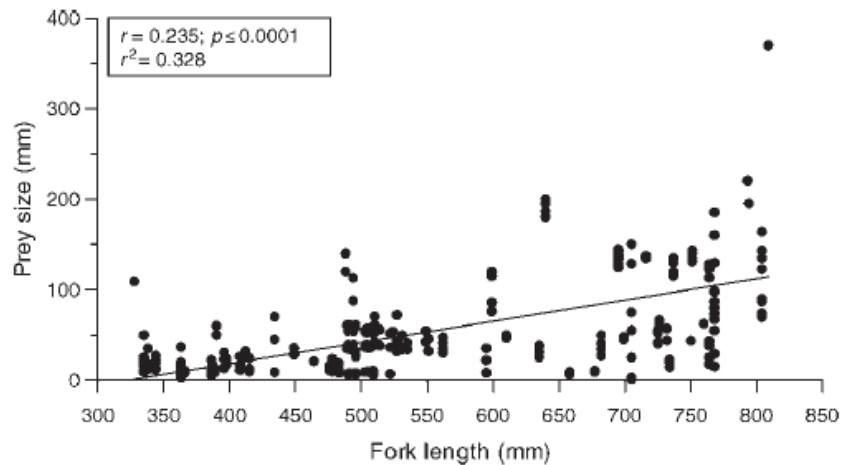
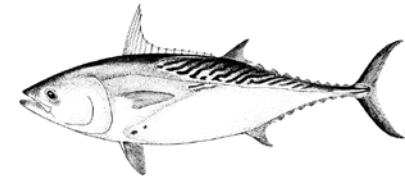


Diet Composition

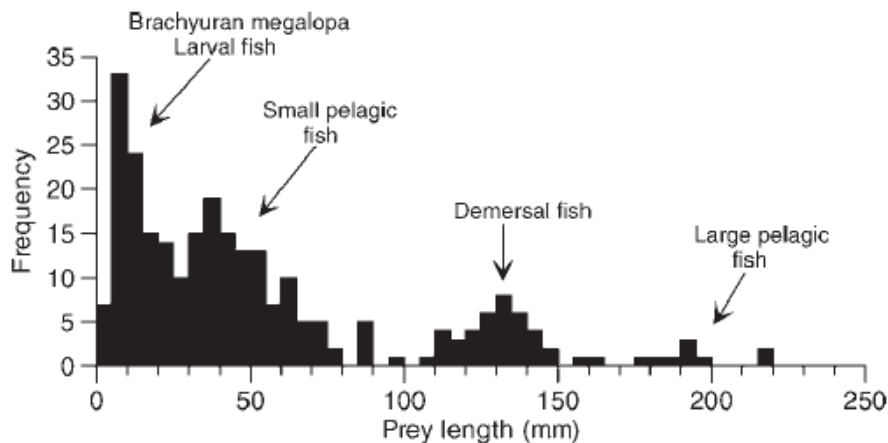


- Australian neritic waters; Overall 43 prey taxa
 - primarily pelagic clupeoids (78% by WW; 71% by FO)
 - demersal fish (19% WW; 32% FO).
- Seasonal Change
 - Autumn; virtually only engraulids
 - other seasons; engraulids were still the dominant, but a greater variety of other prey were consumed.
- Size difference
 - Small tuna; small pelagic crustaceans and teleosts
 - Medium/large tuna; larger pelagic and demersal teleosts

Prey Size and Diversity

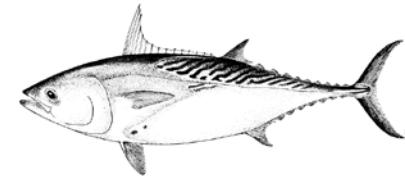


- Fish size: 33~80cm
- Prey size in length: mostly ~200mm
- Prey types consisting of four distinct prey size modes
- Moderate correlation between prey size and fish size



(Griffiths et al, 2009)

Prey-Predation Relationships

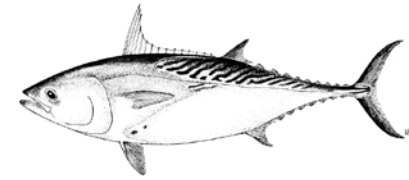


- *E. affinis* is a highly opportunistic predator feeding indiscriminately on fish, shrimps and cephalopods.
- In turn, it is preyed upon by other predators.

Number and incidence of kawakawa juveniles in the stomachs of predators sampled from tropical waters (modified from Argue et al., 1983).

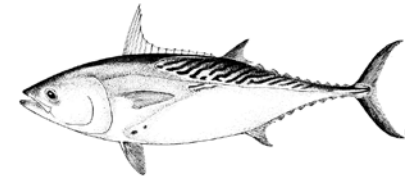
Predator	<u>Predators examined for full stomach tuna content</u>		No of juveniles	Predators with juveniles	Juveniles per 100 predators	% predators with juveniles
	content	juveniles				
<u>Katsuwonus pelamis</u>	3,896	8,175	31	19	0.38	0.23
<u>Thunnus albacares</u>	1,018	1,711	30	2	1.75	0.12
<u>Euthynnus affinis</u>	145	233	2	1	0.90	0.45

Habitat



- An epipelagic, neritic species inhabiting waters temperatures ranging from 18 to 29° C.
- LOT vs KAW; both species inhabit on continentail shelves
 - LOT is generally dominant in areas with **broad continental shelves** such as the Gulf of Thailand, east coast of Peninsular Malaysia and north coast of Australia (Yesaki, 1994),
 - While KAW are dominant in areas with **narrow continental shelves** such as Sri Lanka and the Philippines (Yesaki, 1994).
- Pre-adults (20 - 40 cm) distributed principally in the inner-neritic area (0 -to approximately 50 m depth) off west coast of Thailand. It began leaving from the innerneritic area with increasing size, and moved into the outer-neritic after 40 cm. (Yesaki, 1982)
- However, KAW were also found under FADs deployed deeper than 200 m depths (Lee, 1982, Frusher, 1986).
- Like other scombrids, *E. affinis* tend to form multispecies schools by size, comprising from 100 to over 5 000 individuals.

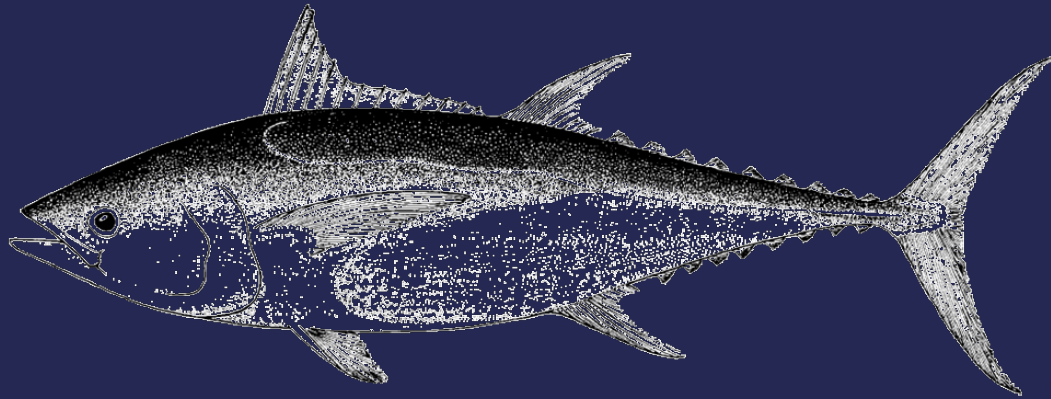
Summary: Kawakawa



- An epipelagic, predominantly neritic species inhabiting tropical to temperate provinces of the Indo-Pacific, max size 96.5cm FL.
- Age1: ~30cm, Age2: ~40cm, Age3; ~60cm FL
- Most probably start maturation from age 1+
- Fecundity: 200,000~1.5 million eggs/batch
- Spawning season differs depending on the areas
- Opportunistic feeder, its diet includes many species of pelagic/demersal fish, crustaceans, cephalopods at varying percentages. moderate correlation of prey size and fish size.
- Tend to form multispecies schools by size
- Predated by other tuna species and large carnivorous fishes
- Little information on the early life history, migration, and sub-populations

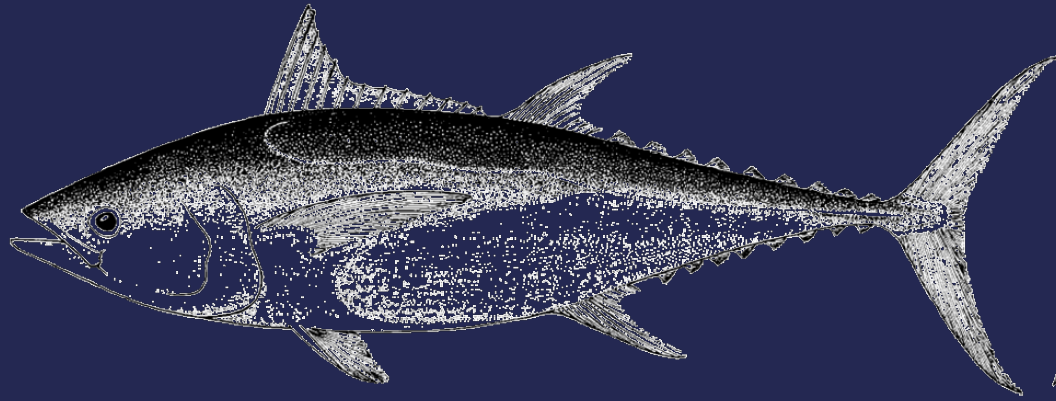


**Please provide us local information
of Neritic Tunas, including reports
and documents written in local
languages**



Thank you for your attention





Thank you for your attention

Terima Kasih

