SCTB15 Working Paper

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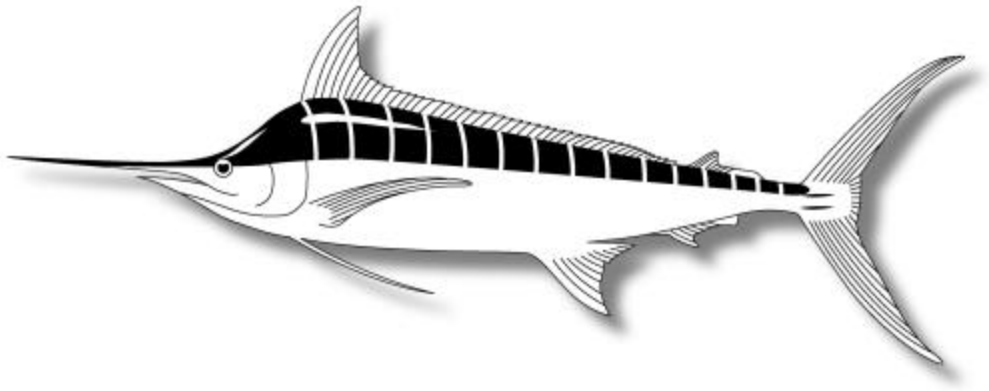
An estimation of the life history and ecology of opah and Monchong in the North Pacific



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An investigation of the life history and ecology of opah and monchong in the North Pacific[1]

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Introduction

Two miscellaneous pelagic species incidentally caught by Hawaii-based longliners targeting bigeye tuna are the opah (*Lampris guttatus*) and monchong (*Taractichthys steindachneri* and *Eumegistus illustris*) (Fig. 1). Particularly valued by restaurants, these exotic, deep-water fishes are generally harvested in small, but nevertheless significant, quantities. For the period 1987-99, as much as 300,000 lbs. of "monchong" were landed at United Fishing Agency (UFA) with individual fish averaging 14.2 to 17.7 lbs. Mean price ranged from $1.35 to $2.06 per lb. with annual ex-vessel revenue ranging from negligible (<$10K) to $420K. Over the same time period, 150,000 to 1.2 million lbs of opah have been landed annually with individual fish weighing 97-111 lbs. Annual ex-vessel revenue for opah ranged from $240K to $1.4 million at a price per lb ranging from $0.87 to $1.40 (R. Ito, NMFS Honolulu Laboratory, pers. comm.). Since neither are targeted species, these fishes have historically been poorly studied and as a result available information pertaining to the biology and ecology of these resources are virtually nonexistent. A study, supported by the Pelagic Fisheries Research Program, was recently undertaken to obtain fundamental data on life history and ecology of opah and monchong in the North Pacific. We describe the project, its objectives, and current status here.

Opah, also commonly known as moonfish, are typically found well offshore in temperate and tropical waters of all the world's oceans, including the Mediterranean and Caribbean Seas (Russo 1981, Heemstra 1986). In the North Pacific, opah were a common incidental take in the now defunct Asian high-seas surface driftnet fisheries. In the Hawaii-based longline fishery opah landings increased each year up to 1998 when over 9000 individuals were brought in (Ito and Machado 2001). The opah catch rate around Hawaii is usually highest in the fourth quarter of the calendar year. (Fig. 2).

Opah are generally believed to be solitary fish (Orkin 1950, Palmer 1986) and attain about 90 kg in weight (ca. 200 lbs.). Little information is available on spawning habits, size at maturity, age, growth, or migrations. A single large female caught in the early spring off the west coast of North America appeared to be nearly ready to spawn suggesting that spawning probably takes place during the spring months (Fitch and Lavenberg 1968). Eggs and larvae are

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pelagic; larvae range from less than 4.7 mm to 10.5 mm at which size fin development is complete and juveniles resemble miniature adults in form (Olney 1984).

Monchong or pomfret harvested in Hawaii-based fisheries are composed principally of two species: the sickle or bigscale pomfret (*T. steindachneri*) and the lustrous pomfret (*E. illustris*) and their CPUE peaks in the second quarter of the calendar year (Fig. 3). Unfortunately, for most, if not all, of the existing data pertaining to monchong the distinction between the two species is not made and all information is logged as pooled "monchong"; they can be readily distinguished by diagnostic systematic characters. Adult and juvenile (30-150 mm SL) sickle pomfret are widely distributed in the tropical waters of the Pacific and Indian Oceans (Mead 1972). Lustrous pomfret are also known from the tropical Pacific and eastern Indian Ocean but unlike other bramids, are typically found in association with topography (e.g., near islands and over seamounts or submarine ridges) (Mead 1972, Prut'ko 1986, Chave and Mundy 1994).

Sickle pomfret will attain lengths >65 cm TL. No maximum size for lustrous pomfret has been reported but a single 70 cm FL individual was taken bottomfishing at Johnston Atoll (Ralston et al. 1986). The range of pomfret weights in an exploratory deep bottomfish study off Hawaii was 2.2-9.6 kg and averaged 5.5 kg (Okamoto 1982). Little information is available on other life history aspects. A 60 cm sickle pomfret weighing 11 kg was estimated to be 8 years old (Smith 1986). A 78 cm TL mature female (*T. longipinnis*) taken in the Southeast Pacific possessed ova spherical in shape and 1.2 mm in diameter (Dotsu 1980). The mature ovaries were small and about 90 g in weight, the gonadosomatic index (GSI, ovary weight/total weight) was less than one and the ovaries contained about 7.0×10^5 eggs (Dotsu 1980). Female sickle pomfret examined recently from spring catches in the current study all had mature ovaries with GSI ranging from 3.35-5.11.

Through the water column both opah and monchong are known to inhabit the lower epipelagial-mesopelagic depths in excess of 300 m and tend to be caught in association with bigeye and albacore tunas and lancetfish (*Alepisaurus ferox*); more than 99% of the opah and monchong taken in the Hawaii longline fishery are caught on deep sets targeting bigeye tuna. However, capture of opah in surface driftnets during the asian high seas squid and large mesh fisheries for tunas and billfishes as well as the smaller scale fisheries off California, however, suggests that this species will also make excursions into surface waters. Catch rates for opah and monchong also increase with longlines settling at deeper depths and both are often taken in the vicinity of seamounts (Boggs 1992, Nakano et al. 1997). Little or no information is available regarding the food or feeding habits of opah or monchong species. The few items that have been found in stomach contents suggest that these fishes are midwater predators of mesopelagic micronekton.

Project Activities and Objectives

The primary objective of the study is to investigate and define some of the fundamental life history and ecological characteristics of the opah and monchong resource in the North

Pacific through a combination of comprehensive shoreside data and biological sample collection, analysis and merging of industry data (NMFS observer and logbook, North Pacific driftnet, auction), research, and environmental datasets, and capture depth information collected from vessels of opportunity. Products will include (1) comprehensive seasonal and where possible, interannual biometric summaries and relationships (e.g. length-weight, sex ratio, etc.), (2) determination of reproductive parameters (size and age at maturity, fecundity, spawning season, gonadosomatic index), and elucidation of distribution patterns, preferred habitat, faunal associations, and trophic relationships for both "specific" resources. These results will provide fishery managers with new and much needed fundamental biological information that will help refine a precautionary reference point and provide insights into factors that enhance or reduce the incidental take of these species.

The project activities for both the opah and monchong resources fall under two major categorical subprojects: (1) a comprehensive shore-based biological sampling program and (2) an analysis of spatial distribution patterns, preferred habitat, faunal associations, and trophic relationships.

The comprehensive shore-based biological sampling program has been set up at the UFA to monitor landings and catch composition and at three selected fish buyers/dealers to obtain the metrics (length, weight, sex) and samples (ovaries, otoliths, and stomachs) required to conduct a comprehensive biological and ecological assessment. For monchong, special attention is given to species differentiation between *T. steindachneri* and *E. illustris* enabling treatment of species individually; preliminary results from species specific sampling conducted during 1987-91 suggest considerable differences between the size of species landed at the auction. Special efforts are being made to link the UFA collected metric data with the biological samples extracted for the corresponding fish at the dealers. Worth noting with regards to the shore-based sampling:

- It was fortunately discovered early on that opah exhibit sexual dimorphism (Fig.4) thereby enabling the determination of sex without having to cut into the body cavity to access the gonads; this determination has saved considerable time and energy, allowing substantially more data collection.

- The age and growth part of the project has been undertaken by NMFS fishery biologist, Robert Nishimoto. After preliminary examination of hard parts for the various species, it was determined that fin rays for opah and both sagittal otoliths and fin rays for monchong provide the best opportunity for ageing these animals. As suspected, sagittal otoliths in opah are of vaterite form and are not conducive to daily increment enumeration. The sampling protocol attempts to sample 25 fish per sex, per species, per month.

The assessment of spatial distribution patterns, preferred habitat, faunal associations, and trophic relationships involves the analysis and merging of industry data (NMFS observer and logbook, North Pacific driftnet, auction), research, and environmental datasets, and capture depth information collected from vessels of opportunity. Thus far in the project, efforts have been focused on identifying and assembling available datasets from the various fisheries that include

opah and monchong in their catch records.

- We were particularly successful in obtaining capture depth information for both opah and monchong as well as biological samples on a 20-d commercial longline fishing trip aboard the F/V *Tucana*. A total of 87 monchong and 16 opah were caught on13 longline sets. Of these, 13 monchong and 1 opah were caught on the sections of longline instrumented with a series of time-depth-temperature recorders (TDRs) and hook timers. Additionally, another 2 opah (1 male at ca. 110 lbs and 1 female at ca. 85 lbs.), and 1 monchong (ca. 25-30 lbs.) were instrumented with Wildlife Computers popup satellite archival tags (PSATS) upon capture and released. The male opah apparently died shortly after release and the tag popped off providing no information on vertical movement. The remaining female opah and monchong apparently remain at liberty.

A work in progress, the Opah-Monchong Project will continue data and sample collection and analysis. The first summaries will be generated in 2003.

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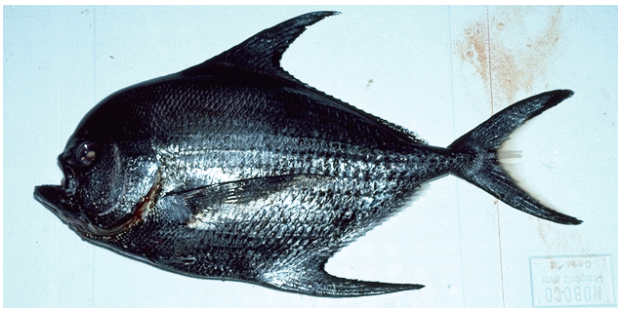
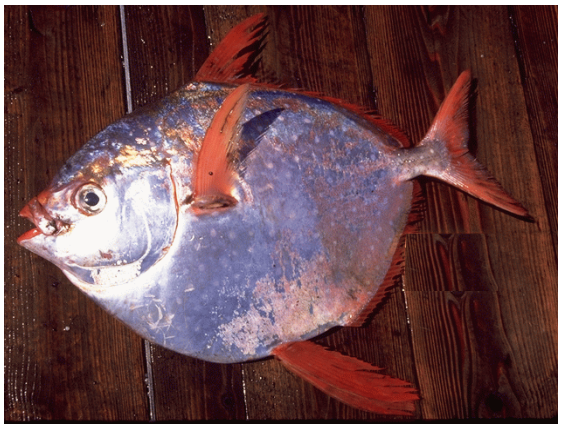
Lustrous pomfret, ***Eumegistus illustris***



Sickle pomfret, *Taractichthys steindachneri*



Moonfish or opah, *Lampris guttatus*

Figure 1. The proposed study fish species: lustrous pomfret (monchong), *Eumegistus illustris* (top), sickle pomfret (monchong), *Taractichthys steindacheri*, and opah (moonfish), *Lampris guttatus*.

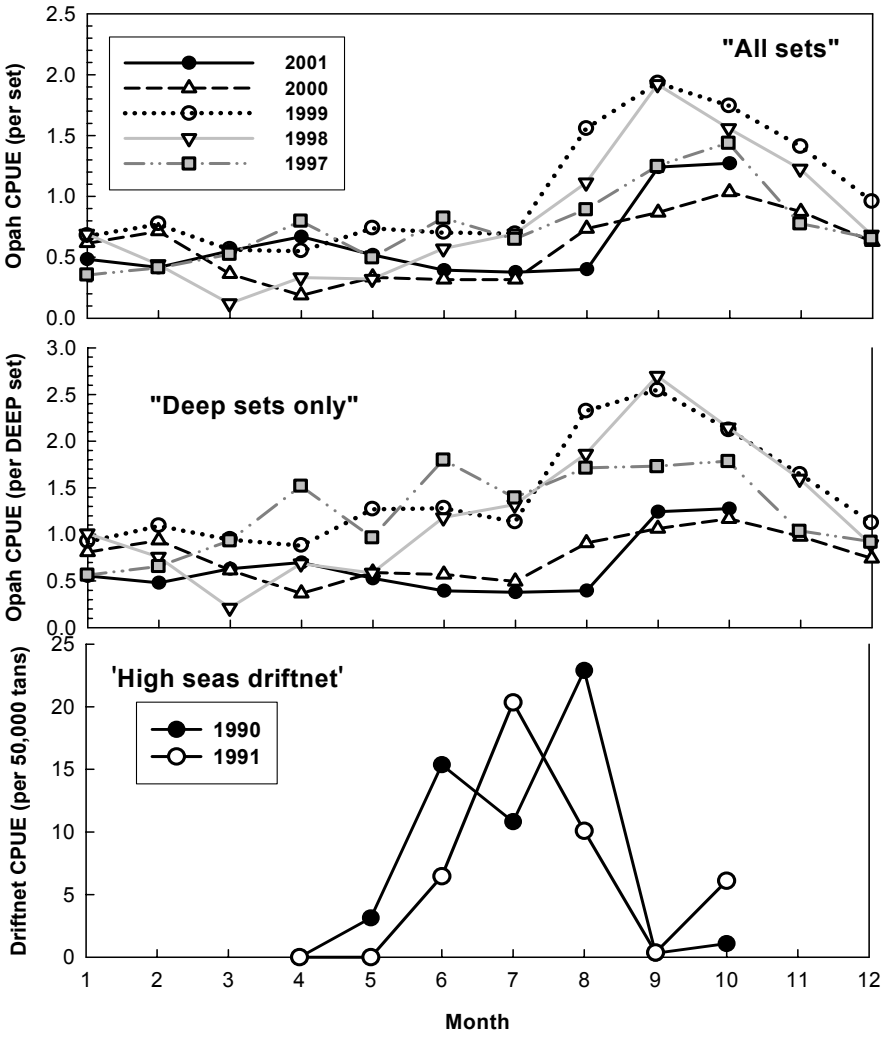


Figure 2. CPUE of opah (number per set) for all sets (top) and for only deep sets targeting bigeye tuna (center) in the Hawaii-based longline fishery; CPUE (catch per standardized 50,000 shackles) for opah in observer monitored foreign driftnet sets

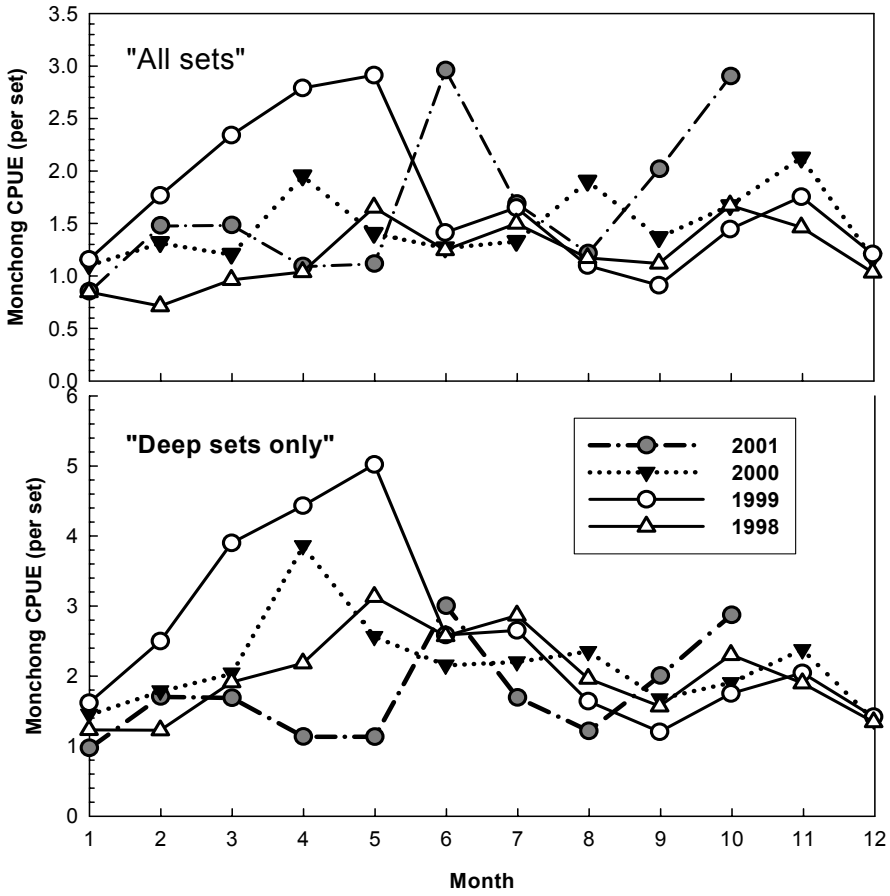


Figure 3. CPUE of monchong (number per set) for all sets (top) and for only deep sets targeting bigeye tuna (bottom) in the Hawaii-based longline fishery.

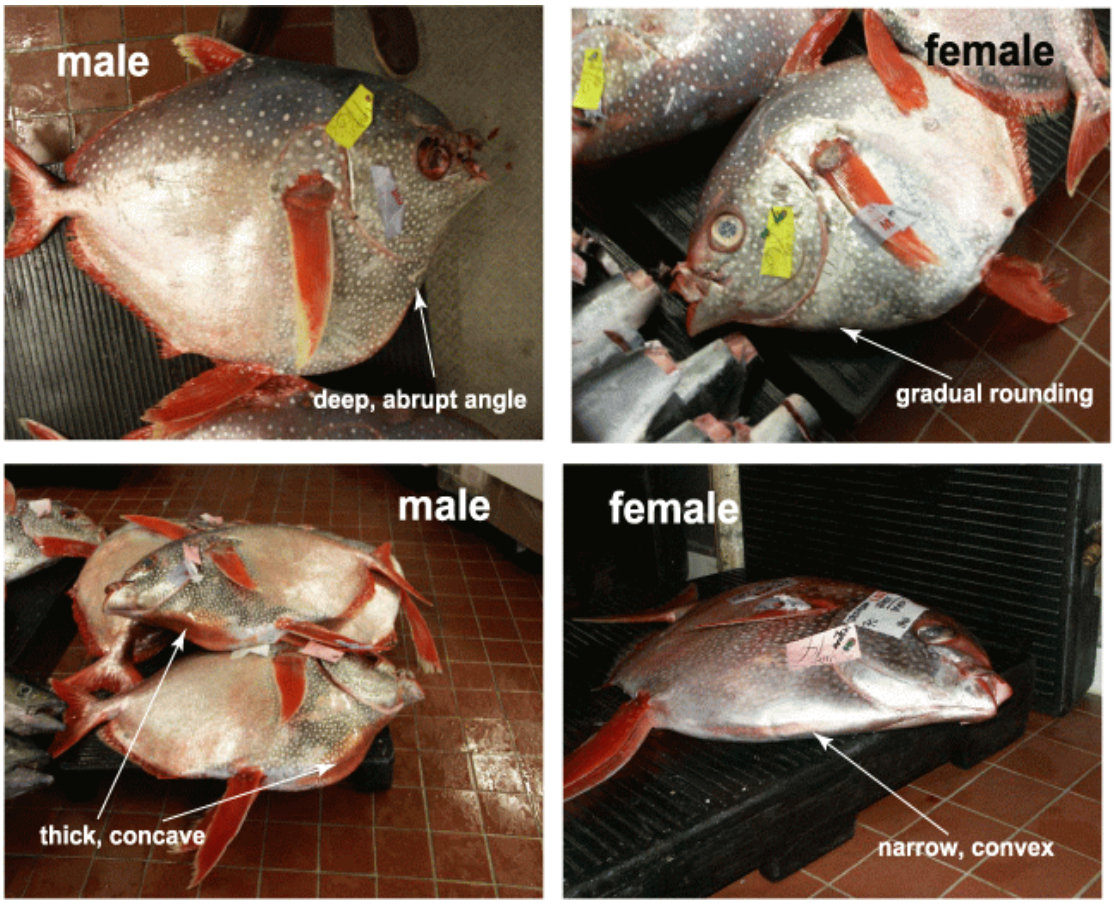


Figure 4. Apparent morphometric sexual dimorphism of the opah, *Lampris guttatus*.