

SEA TURTLES- American Fisheries Society Presentation

G.H. BALAZS

7:00  
Criteria

WILDLIFE SOCIETY  
Molokai Rm  
2<sup>ND</sup> fl IZIKAI

Program Changes

AFS/IAGFCC

AFS

Session 3  
Tropical Fisheries Management

Add:

"The Biology of Hawaii opihi; an Edible Intertidal Limpet"  
A. Kay, Univ. of Hawaii, Honolulu

Session 7  
Hawaii Session

Add:

"Survival Status of the Green Turtle (Chelonia agassizi) Nesting and Basking  
Colony at French Frigate Shoals, Northwestern Hawaiian Islands"  
G. Balazs, Univ. of Hawaii, Honolulu

Transferred to Session 3:

"The Biology of Hawaii opihi"  
A. Kay

IAGFCC

Friday Afternoon Session

Substituting for George Turcott:

Frank A. Edwards  
Assistant Director for Minerals Management  
Bureau of Land Management

Survival Status of the Green Turtle (Chelonia agassizi) Nesting and Basking Colony at French Frigate Shoals, Northwestern Hawaiian Islands

by George H. Balazs, Hawaii Institute of Marine Biology, University of Hawaii, Kaneohe, Hawaii, U.S.A. 96744

INTRODUCTION

Although two species of marine turtles are known to inhabit the Hawaiian Archipelago, the Pacific green (<sup>aga sea</sup> Chelonia agassizi) is the only one which still occurs in any number. The hawksbill (Eretmochelys imbricata) is now an exceptionally rare species and, as in most other areas where it occurs, continued survival is questionable. Early Hawaiians were well acquainted with both of these turtles, calling the green, "Honu" and the hawksbill, "E'a". As recently as the early 1900's numerous beaches in the major inhabited islands were still used by the green turtle for nesting purposes\*, with areas such as Polihua on the Island of Lanai, Napali\* and Polihale on the Island of Kauai and Mokapu\* and Lanikai on the Island of Oahu serving as viable reproductive sites. Sporadic nesting continued to occur at several locations into the 1950's, however, today, for all practical purposes, turtle reproduction has been eliminated from the major Hawaiian Islands.\* Factors responsible for the demise included both increased and more efficient means of exploitation as well as habitat destruction. This pattern of ecological disaster for marine turtles is by no means unique to Hawaii as the same uncontrolled forces have been allowed to reduce or destroy numerous colonies at any of a number of locations in the Atlantic, Pacific and Indian Oceans.

French Frigate Shoals (~~Figure 1~~), an area extending for 26 km of shallow reefs and small sand islands located in the Hawaiian Islands National Wildlife Refuge approximately 770 km northwest of Honolulu, is today the only remaining breeding and nesting site for the Pacific

green turtle in the Hawaiian Archipelago. Although not generally recognized, the colony utilizing French Frigate Shoals has several very distinctive characteristics. In terms of national interest, the colony represents the last aggregate nesting of green turtles left in the United States. Because the turtle's life cycle is completed entirely within the confines of the Archipelago, migration into foreign territorial waters does not occur. This is a major complicating factor in the conservation of other green turtles where feeding takes place in one country and reproduction in another. Also unique to Hawaii's green turtle colony is a basking or land emergence behavior that is displayed by both males and females only on the shorelines at French Frigate Shoals and other undisturbed islands in the northwestern portion of the Archipelago.

Because of the importance of French Frigate Shoals to the continued survival of the green turtle in the United States, investigations were initiated during 1973 to determine the status of this little studied nesting and basking colony. Although turtles have been tagged and measured at various times and locations by U. S. Fish and Wildlife personnel in the Northwestern Hawaiian Islands, no intensive research has been conducted throughout periods of reproduction. Nesting studies of this nature are essential for censusing the colony and understanding its structure and dynamics. Objectives of the investigation therefore were: 1. to conduct an intensive census-tagging study at East Island, French Frigate Shoals, during a significant portion (~~June and July~~) of the 1973 nesting season<sup>1</sup>. East

*This encompassed June and July.*

Island was focused upon because earlier visits suggested that it hosted the greatest number of turtles; 2. to make periodic surveys on the five other islands within the atoll where nesting occurs in order to determine the number of turtles using these locations; and 3. to obtain data on such characteristics as: carapace measurements; re-nesting intervals and locations; number of eggs laid; and the inter-relationship of nesting and basking.

*Principal* \* 1 FFS - midpoint of Archipelago - major Islands  
 \* 2 FFS chart - Crescent shaped w/ double reef open to the west, small islands along inner reef.  
 METHODS include 3 L-Gun and Gun - void of vegetation  
 \* 4 W-5 - 16 Acres; \* 5 Trig (Gannet and Tern); \* 6 East 11 acres  
 \* 7 44 species sea birds; \* 8 rare Hawaiian monk seal.

Methods of investigation included the designation of 17 50 meter shoreline segments on East Island for identification purposes (Figure 2). Specific areas were not given to the non-vegetated sand and broken shell point which comprises the west end of the island. Nesting activity was monitored nightly over the entire island at two hour or less intervals and individuals\* were identified by spray painting consecutive numbers on their carapace. ~~These numbers were visible from a distance, remained legible for approximately five to ten days, and were repainted when possible.~~ Observations were made on the number of successful and unsuccessful nesting pits as well as nesting and re-nesting areas. "Nesting pit" within the context of this study referred to the depression in the ground resultant from turtle nesting activity. As numerous pits were formed before actual egg deposition, the presence of eggs in a pit was difficult to determine unless careful monitoring of nesting progress was conducted. During the latter cover-up stages of each nesting or as conditions warranted, carapace\*

measurements were taken and permanent tags\* were attached to the front flippers. Census surveys of nesting pits were periodically carried out on Tern, Trig, Whale-Skate, Gin and Little Gin Islands. New pits located during each visit were marked with colored tags for subsequent recognition.\*

#### FINDINGS

Findings revealed that during the period under investigation only 67 females emerged at East Island for nesting purposes.\* Straight line carapace lengths taken on these animals were found to range from 83.2 cm to 103.5 cm or  $32 \frac{3}{4}$  in to  $40 \frac{3}{4}$  in with a mean of 92.4 cm or  $36 \frac{3}{8}$  in (~~figure 3~~)\*. Six turtles were observed that had been previously tagged by U. S. Fish and Wildlife personnel on visits to the atoll dating back to 1968. A comparison of measurements on these animals indicated that very little, if any, growth had taken place. A total of 340 nesting pits was formed on East during the study. Two individuals contributed 57 pits to this count with only a single successful egg deposition by one of them. Normal nesting ~~by both turtles~~ was seriously impaired by the loss of significant portions of their hind flippers.\* Counts taken during oviposition on a random sample of six turtles showed that from 85 to 144 (mean 115) eggs were laid at each successful nesting.

\*The number of successful nestings taking place in each of the 50 meter segments (~~figure 4~~) revealed that areas 1, 5 and 15 <sup>hosted</sup> had the greatest number while no success resulted in areas 8, 10 or 11.

Although turtles regularly emerged at the non-vegetated west end, none were able to form suitable pits due to sand slippage. Successful nesting therefore appeared to be primarily a function of substrate quality.\* Reoccurrence of successful nesting on East by the same individual averaged 18 days with a range of 12 to 31 days. This relatively long interval between nestings suggested that a multiple island nesting pattern may have been displayed by some individuals. Many turtles returned to nest in the same or adjacent 50 meter area (Table-1). Only one individual re-nested on the opposite shoreline from its initial nesting.

Observations on basking\* turtles showed that only 26 of the 67 females or 39% identified while nesting on East were subsequently seen basking. Only one of these animals was seen basking on another island (Whale-Skate). Most basking occurred during the mid and late afternoon hours, however, on 23 different occasions male baskers were noted between 2100 and 0600 hours, often remaining emerged for up to five hours. Total numbers of animals basking declined steadily after the middle of June. This appeared to coincide with a reduction in the number of males present and mating activity observed.\*

During the investigation a total of 225 pits was recorded on the island of Whale-Skate, while Trig had 47, Tern 27, and Gin and Little Gin 18 each. Except for Whale-Skate, the presence of baskers on any of these islands was minimal. Estimates of the number of nesting turtles representative of the pits counted on each island were calculated by using the mean number of pits formed by each

animal on East Island. Due to the presumably atypical behavior of the two turtles with hind flipper injuries, pits formed by these animals were deleted from the total count. Sixty-five nesters using East were therefore responsible for 283 pits ( $340 - 57 = 283$ ) or a mean of 4.3 pits per animal. \* Pits formed on Whale-Skate were divided by 4.3 to arrive at a population estimate of 52 animals for that island ( $225 \div 4.3 = 52$ ). Similar calculations were made for each of the other islands (~~Table 2~~). Using these values, the total number of females nesting during the investigation was calculated to be 144 (East 67 + other islands 77 ~~= 144~~). \*<sup>That is</sup> Since the majority of females (and males) are known to arrive at the nesting grounds prior to the onset of egg laying, it was felt that those animals censused closely approached the total number actually present. Fewer new animals were observed after July 1, further indicating that an identification of all females may have been close to accomplishment. In order to account for any possible late arrivals after the termination of the study as well as for a degree of error in nesting pit counts, the value of 144 was considered to represent 80% of the actual 1973 nesting population. Using this assumption, 180 females would have been present during the 1973 season, a liberal estimate in view of the available evidence. If the green turtles using French Frigate Shoals nest on the average, once every three years, as they do at other locations in the world, the value of 180 could be multiplied by three to arrive at an estimate for the total number of reproductive size females remaining in the Hawaiian archipelago.



No estimates were made on the number of males present within the atoll. Little data are available on sex ratios in green turtle colonies and cyclic reproductive patterns in males. Collection of such data at French Frigate Shoals would have involved considerable disruption of the unique basking behavior and was therefore considered undesirable.

Size estimates offered for the nesting population are based on the most comprehensive collection of French Frigate Shoals green turtle data to date. Previous estimates offered with caution by Hendrickson<sup>1</sup> in 1969 using limited information collected by the Smithsonian Institute, placed the combined male and female population for the 1965 season between 2600 and 5200 animals. The far lower estimate of the present study may reflect a significant population decline, a greater reliability of the data used or a combination of the two.

Two turtles tagged during the study were subsequently captured by fishermen off the islands of Oahu and Maui, representing minimum migrations of 810 km and 950 km, respectively. These recoveries further confirm earlier findings by the U. S. Fish and Wildlife Service that turtles feeding in the eight major Hawaiian Islands nest at French Frigate Shoals.

#### SURVIVAL OUTLOOK

Protection of these animals while at French Frigate Shoals has been assured over the past ten years and will probably continue due

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<sup>1</sup> Hendrickson, J. R., Report on Hawaiian marine turtle populations. IUCN Publ. New Ser. Suppl. Pap., (20): 89-95.

to rigorous enforcement of the area's National Wildlife Refuge status, a status that has existed since 1909 but greatly ignored through 1959 with respect to the killing of turtles. By far, the greater portion of the turtle's life is spent feeding around the major Islands where until recently the animals were completely unprotected and subjected to substantial commercial pressure. In lieu of a complete moratorium, during May, 1974 the State of Hawaii adopted its first marine turtle protection regulation which bans commercialization and places a 36 inch size limit on animals taken for home consumption. The effectiveness of this long overdue protection remains to be seen in view of enforcement problems and the dangerously low nesting population level reported in this study. Survival of the colony may now only be possible by imposing a ban on the capture of all turtles while at the same time taking steps to ensure the continued undisturbed status of the single remaining nesting site. Considering the case histories of other turtle colonies throughout the world that have been similarly reduced in both range and size, it would seem unlikely that viability could be retained at French Frigate Shoals without the immediate implementation of such measures.

67-identified, 51 measured, 42 tagged.

Recoveries - east, W-S.

4 hatched successfully 3 times.

9 " " 2 times.

21 " " once.

33 Not observed successful.

Not end of April - no nesting but many @'s

JUNE 1 - East 37 pits; WS-36; TRig-3; Tern-14  
GIN-10; Little GIN-0.

Short nesting season mid-May through August.

Atlantic -

Bermuda

Cambear Cayman

Dry Tortugas

Miskito Cays - Nicaragua

Pacific -

Borneo - SABAH

SANDA - HAWKSBILL

MEXICO - Pacific Ridley

Australia -

INDIAN -

ALDABRA

Survival Status of the Green Turtle (*Chelonia agassizi*) Nesting and Basking Colony at French Frigate Shoals, Northwestern Hawaiian Islands

ABSTRACT

Investigations of the 1973 green turtle nesting and basking colony at French Frigate Shoals (Hawaiian Islands National Wildlife Refuge) indicated that fewer than 180 females were present during the reproductive season (May to August). Of the six locations where nesting occurred, East Island hosted the largest number (approx. 84), Whale-Skate Island the second largest (approx. 65), with Trig, Tern, Gin and Little Gin Islands accounting for the remainder.

Intensive monitoring of nesters on East Island revealed that an average of four pits were excavated for every clutch of eggs deposited. Counts taken during oviposition showed that from 85 to 144 (mean 115) eggs were laid at each successful nesting. A comparatively long interval elapsed between subsequent renestings (mean 18, range 12-36 days), suggesting that multiple island nesting may take place in a portion of the population. Many individuals observed renesting displayed a strong preference for specific sections of the island, with egg deposition often occurring in the same or adjacent 50 meter beach front area.

East Island nesters were found to have a mean straight line carapace length of 92.4 cm (36-3/8 in) and width of 72.0 cm (28-3/8 in). Mean curved length equaled 97.5 cm (38-3/8 in) and width 90.8 cm (35-3/4 in). The greater curved to straight width ratio (an indication of thickness) is one of the characteristics which differentiates this species from the Atlantic green turtle.

Members of both sexes were observed basking at select sites, however, only 39 percent of the females that were identified while nesting on East Island were subsequently seen to engage in this habit. Incidence of basking declined steadily after the first month of egg laying (mid-June). This appeared to coincide with a reduction in the number of males present and mating activity observed.

Six nesters were identified that had been previously tagged in the atoll between 1968 and 1973. No measurable growth was detected in these animals. Two turtles tagged during the present study were subsequently captured by fishermen off the islands of Oahu and Maui, representing minimum transoceanic migrations of 810 km and 950 km, respectively. These recoveries further confirm earlier findings by the U. S. Fish and Wildlife Service that French Frigate Shoals is the nesting grounds for turtle populations feeding in the eight major Hawaiian Islands. In view of the present small size of the nesting colony, special protective measures appear essential if viability is to be retained.

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The green turtle (Chelonia sp.) in the Hawaiian Archipelago -  
a case study of an endangered Pacific resource

GEORGE H. BALAZS

Hawaii Institute of Marine Biology, Kaneohe, Hawaii 96744

The green turtle is the most common of the three species of marine turtles found in Hawaiian waters. Feeding habitat for this valuable herbivore consists of shallow coastal areas abundant in algae. Although reproduction formerly took place on the major inhabited islands of Kauai, Oahu, Molokai and Lanai, none occurs today. Habitat destruction, more efficient and intensified fishing pressures, and increases in commercial demand due to tourism have acted to reduce the population in both distribution and numbers. Nesting in the Archipelago now takes place on only six small islets at French Frigate Shoals (23°45'N 166°10'W). Comprehensive investigations of population parameters at this site during 1973 and 1974 revealed that fewer than 200 adult females were present during each breeding season. In view of this small nesting population, special protective measures are necessary if viability is to be retained.

Available evidence on the status of other marine turtle populations in the Pacific indicates that similar declines are occurring. Conservation programs emphasizing public education, research, and varying levels of protection need to be initiated to ensure long-term, wise utilization of this resource.



# THE WILDLIFE SOCIETY

HAWAII CHAPTER

sent  
oct 15



September 25, 1974

Mr. George H. Balazs  
Jr. Marine Biologist  
Hawaii Institute of Marine Biology  
P. O. Box 1346  
Kaneohe, HI. 96744

Sec.-Treas. T.W.S.  
P. O. BOX 1671  
Lihue, HI. 96766

Dear George:

I am in the process of preparing a master copy of the Fifth Hawaii Wildlife Symposium proceedings for eventual publication and dissemination to Wildlife Society members.

I was not able to obtain a copy of your paper on "Green Sea Turtles" at the annual meeting on September 10th. Could you please forward a copy to me at your earliest convenience, so that I may proceed with the work at hand?

Please forward the copy to me at: P. O. Box 1671 - Lihue, Kauai, HI. 96766. Thank you for your participation in the symposium.

Sincerely yours,

Thomas C. Telfer, Secretary - Treas.  
Hawaii Chapter, The Wildlife Society

cc: Ken Baker

**American Fisheries Society**

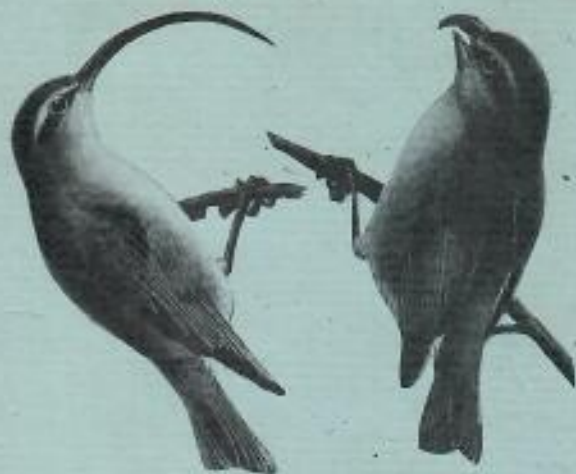
104th ANNUAL MEETING

SEPTEMBER 9-11, 1974

**International Association  
of Game, Fish and  
Conservation Commissioners**

64th ANNUAL MEETING

SEPTEMBER 11-13, 1974



**SHERATON—WAIKIKI HOTEL**

**Honolulu, Hawaii**



Conference attire: In keeping with the tropical climate of Hawaii, Conferees may select aloha shirts, sport shirts or business suits for wear to all conference functions.



**George R. Ariyoshi**  
**Acting Governor of the State of Hawaii**

Welcome to the State of Hawaii. On behalf of all of our people, I extend to each and everyone of you a warm Aloha.

I am pleased that the American Fisheries Society and the International Association of Game, Fish and Conservation Commissioners have chosen to meet in Hawaii. We have here the finest meeting facilities and a scientific climate that is most conducive to the deliberations of meetings such as yours.

We are proud of our natural assets as well as the spirit of Aloha that pervades the people of our State. I hope that after your meetings are over, you will find time to visit with us for a while and enjoy the beauty and charm of our Islands. I'm sure you will find the experience most rewarding.

I wish you a most successful meeting and an enjoyable stay in Hawaii.

Sincerely,

A handwritten signature in cursive script that reads "George R. Ariyoshi".

**GEORGE R. ARIYOSHI**  
Acting Governor

Cover photographs: The Akiakoa, with the long decurved bill, and the Maui Parrotbill are two endangered species of our honeycreeper family. The Hawaiian honeycreepers are perhaps the best example of adaptive evolution within a single family of birds. They display a marvelous array of bill shapes and sizes, each adapted for specialized foods and feeding habits. Those with long bills characteristically seek nectar from tubular flowers. Heavy, stout bills are better suited for tearing into bark and wood in search of insects. Of the 40 known varieties of Hawaiian honeycreepers, 15 are classed as endangered and 14 are believed to be extinct. In 1973 a previously unknown species was discovered in a remote forest area on Maui. Further surprises may follow as efforts are continued toward field studies of the honeycreepers.



**Sunao Kido**  
**Chairman**  
**Department of Land**  
**and Natural Resources**

The Hawaii Department of Land and Natural Resources and its Division of Fish and Game are pleased to welcome you to Honolulu and to the 1974 meetings of the American Fisheries Society and the International Association of Game, Fish and Conservation Commissioners.

As your hosts for these meetings we will endeavor to support you in any way we can. Our people will be readily identifiable by the "host" ribbons they will be wearing. Seek these people out and ask for assistance.

We hope that your meetings will be productive and your stay in Hawaii will be enjoyable and memorable.

*Sunao Kido Michio Takata*

SUNAO KIDO

MICHIO TAKATA

**Michio Takata**  
**Director**  
**Division of Fish and Game**



## **AMERICAN FISHERIES SOCIETY**

**104th Annual Meeting**  
**Sheraton—Waikiki Hotel**  
**September 9-11, 1974**

**AFS**  
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**AFS Officers 1973-74**

President .....	Raymond E. Johnson
President-Elect .....	Reeve M. Bailey
First Vice-President .....	J. Cameron Stevenson
Second Vice-President .....	Robert F. Hutton



**Raymond E. Johnson**  
**President**

**PROGRAM**  
**American Fisheries Society**

**104th Annual Meeting**

**Sheraton-Waikiki  
Honolulu, Hawaii**

**Monday, September 9, 1974**

**9:00-10:15 a.m.**

**Session 1**

**Opening and Keynote Address  
Molokai Room**

Call to Order, Determination of Quorum

Welcome from the State of Hawaii

Sunao Kido, Chairman

*Board of Land and Natural Resources,  
Honolulu, Hawaii*

President's Address—Raymond E. Johnson

Keynote Address—Dr. John P. Craven

*Dean of Marine Programs, Univ. of Hawaii  
and Marine Affairs Coordinator, State of Hawaii*

**10:15 a.m.-6:00 p.m.**

**Session 2**

**Plenary Session**

**Symposium on Optimum Sustainable Yield as a  
Concept in Fisheries Management . . . . . Molokai Room**

**10:30-10:40 a.m.**

Opening

Chairman, Richard H. Stroud  
*Sport Fishing Institute,  
Washington, D.C.*

**10:40-11:10 a.m.**

Keynote

David Wallace,  
*National Oceanographic and Atmospheric  
Administration, U.S. Dept. of Commerce,  
Rockville, Md.*

**11:10-11:35 a.m.**

Review of Fisheries  
Yield Models

William F. Royce,  
*National Marine Fisheries Service,  
U.S. Dept. of Commerce,  
Washington, D.C.*

**11:35-12:00 N**

Economics of Optimum  
Sustained Yield Theory

James A. Crutchfield, Jr.,  
*Univ. of Washington,  
Seattle*

**12:00-1:15 p.m.**

Lunch Break

**1:15-1:40 p.m.**

Application of Optimum  
Sustained Yield Theory  
to Marine Fishes

John Radovich,  
*California Dept. of Fish  
and Game, Sacramento*

**1:40-2:05 p.m.**

Application of Optimum  
Sustained Yield Theory  
to Inland Fisheries

Richard O. Anderson,  
*Univ. of Missouri,  
Columbia*

**2:05-2:25 p.m.**

Commercial Fisheries  
Views

Robert G. Maurmann,  
*The Texas Shrimp Assoc.,  
Brownsville, Texas*

**2:25-2:45 p.m.**

Recreational Fisheries  
Views

Frank E. Carlton,  
*National Coalition for Marine  
Conservation, Savannah, Ga.*

**2:45-3:10 p.m.**

Multidisciplinary  
Aspects

John P. Harville, Exec. Dir.,  
*Pacific Marine Fisheries Commission,  
Portland, Ore.*

**3:10-3:40 p.m.**

Discussion of Optimum  
Sustained Yield Concept

Audience

**3:40-4:00 p.m.**

Break

**4:00-5:30 p.m.**

Panel Response and Discussion

Richard H. Stroud, Chairman  
Fisheries Management  
(State)

Thomas L. Linton,  
*North Carolina Dept. of  
Administration, Raleigh*

Economics (Academia)

Salvatore Comitini,  
*Univ. of Hawaii,  
Honolulu*

Commercial Fisheries  
(User)

Frank K. Goto,  
*United Fishing Agency, Ltd.  
Honolulu, Hawaii*

Recreational Fisheries  
(User)

Frank L. Cassidy,  
*Son Sales, Inc.,  
Portland, Ore.*

"Wise Owl" (Experience)

Richard S. Croker,  
*Laguna Niguel, Calif.*

**5:30-6:00 p.m.**

Critique and Summary

Philip M. Roedel,  
*National Oceanographic and Atmospheric  
Administration, U.S. Dept. of Commerce,  
Rockville, Md.*

Research and management programs designed to serve the recreational fisheries interests reflect a basic fish management philosophy that differs materially from that which has traditionally underlain commercial fisheries programs. The commercial fisheries programs have featured a maximum-sustained yield concept which looks toward a maximum yield of protein. Recreational fisheries have traditionally featured optimum-yield or maximum economic yield concept. This symposium will examine and debate the issues inherent in liberalization of

the maximum sustained yield concept that would be required to accommodate broadening the multiple use of the fisheries resources. The goal is to develop an understanding of the various factors and considerations which must be accommodated in managing fisheries to achieve optimum sustainable yields, and to identify related points of view and possibly achieve consensus.

10:15-12:00 N

**Session 3**

**Tropical Fisheries Management ..... Lanai Room**

R. E. Johannes, *Univ. of Georgia, Athens*, Chairman

"An Overview of the University of Hawaii Sea Grant Advisory Program: Conservation Education and Fishery Services"

J. Ball, *National Oceanic and Atmospheric Administration Sea Grant Program, University of Hawaii, Honolulu*

"Age and growth of the Hawaii anchovy (*Stolephorus purpurus*) as determined by daily growth layers in the otoliths."

P. Struhsaker & J. Uchiyama, *National Marine Fisheries Service, Honolulu*.

"Commercial exploitation of Hawaii reef-fishes for the aquarium trade."

L. Taylor, *Hawaii Cooperative Fishery Unit, Univ. of Hawaii, Honolulu*

"Exploitation and degradation of shallow marine food resources in Oceania."

R. E. Johannes, *Dept. of Zoology, Univ. of Georgia, Athens*

2:00-3:30 p.m.

**Session 4 Two Concurrent Programs**

**Pan-Pacific Fisheries ..... Oahu Room**

D. B. McCarraher, *Davies and Moore, Park Ridge, Ill.*, Chairman

A discussant program with several background papers dealing with fisheries problems in the Pacific area. Australian, Hawaiian and Japanese fisheries biologists will participate.

**Biological Controls for Aquatic Weeds ..... Waiianse Room**

William J. Hauser, *Univ. of California at Davis*, Chairman;

Mondell L. Beach, *Florida Dept. of Natural Resources*; J. Bruce

Kimsey, *Bureau of Reclamation, U.S. Dept. of the Interior, Sacramento, Calif.*

A discussant panel and two experience papers on biological weed control. Recent data on the grass carp and other weed eating fishes will be presented.

"*Tilapia zilli* as a Biological Control Agent for Aquatic Weeds"

William J. Hauser, *Univ. of California, Davis, Calif.*

2:00-6:00 p.m.

**Session 5**

**Human Behavior Aspects of Fishery**

**Management ..... Lanai Room**

John C. Hendee, *Wildlife Recreation Research, Forest Service, U.S. Dept. of Agriculture, Seattle, Washington*, Chairman

This session consists of five papers and a 3-member discussant panel. The subject matter ranges from high mountain lake fishing in wilderness or back country to quality trout fishing on streams through a discussion of the human behav-

ioral aspects related to technological development in fisheries, e.g. why don't Puerto Rican fishermen want to change to more efficient technology or why do Great Lakes salmon charters stay in business when they're losing money?

**Papers:**

**"High Lake Fishing Behavior: Management Implications."**

John Hendee, Roger Clark and Tom Daily, *U.S. Forest Service and Univ. of Washington, Seattle*.

**"Fly Fishing as a Minority Leisure Interest"**

Hobson Bryan, *Univ. of Alabama, Univero*

**"Values, Behaviors, & Attitudes of Fishermen in the High Uintas Primitive Area"**

James Kennedy, *Utah State Univ., Logan*, and Perry Brown, *Colorado State Univ., Fort Collins*

**"Management of Charter Fishing on Lake Michigan: A Survey and Analysis"**

W.A. Strang and Bob Ditton, *Univ. of Wisconsin, Madison and Texas A & M, College Station*

**"Impact of a Large Recreation Development: Fishing"**

James A. Ballas, Ann Williams, Kitty K. Dick and C. Jack Gilkrist, *Montana State Univ., Bozeman*

3:45-6:00 p.m.

**Session 6 Two Concurrent Sessions**

**Artificial Destratification of**

**Lakes and Reservoirs ..... Wailua Room**

Roger Schoumacher, *West Virginia Dept. of Natural Resources, Elkins*, Chairman

A panel of discussants and four papers on artificial aeration of lakes as a management tool including a discussion of oxygenation of the hypolimnion with liquid oxygen and limiting fish kills in a Hawaiian reservoir.

**"Artificial Aeration of Lakes as a Fisheries Management Technique"**

A.W. Fast, *Aquatic Environmental Sciences, Tarrytown, N.Y.*

**"Oxygenation of the Hypolimnion with Liquid Oxygen"**

A.W. Fast, *Environmental Sciences, Tarrytown, N.Y.*, William J. Overholtz and Richard A. Tubb, *Ohio Cooperative Fishery Unit, The Ohio State Univ., Columbus*

**"Limitation of Fish Kills in the Wahiawa Reservoir, Island of Oahu, Hawaii, by Partial Destratification through Injection of Air"**

W. Devick, *Hawaii Division of Fish and Game, Honolulu*

**"Limnological Aspects of Preoperation Experience with Pump Storage in a High Mountain Lake"**

James L. LaBounty, *Engineering and Research Center, Bureau of Reclamation, U.S. Dept. of the Interior, Denver, Colo.*

**Aquatic Ecosystem Considerations in Design of Nuclear and Conventional Steam-Electric Power Plants ..... Oahu Room**

Rajendra K. Sharma, *Argonne National Laboratory, Argonne, Ill.*, Chairman

In the environmental impact assessment of power plant operations, the question that must be answered by fisheries scientists is—What changes can result in irreversible and significant damage to fish and fisheries of an ecosystem? The

answer is urgently sought since the rapid increase in the number of power plants is necessitating increased water usage and the resulting environmental costs must be weighed against derived benefits for appropriate allocations of the natural resources. This panel of discussants will present a series of experiences and research papers covering such widely divergent locations as barge-mounted floating nuclear plants on the eastern and gulf coasts, a nuclear power plant on the relatively unaffected estuary of the Slocum River in temperate southeastern Massachusetts where seasonal changes have a major effect on the composition and abundance of the fish fauna and a hypothetical plant using cooling water at a rate of 1 million gpm with the intake 1) in Tampa Bay and 2) offshore in spawning grounds of pink shrimp, Tampa Bay is considered to be representative of subtropical estuaries.

**"Floating Nuclear Power Plants: A Biological Assessment"**

Roy D. Stoecker and Carl L. Armour, *Environmental Analysts, Inc., Garden City, N.Y.*

**"Calculation of Impact of Zooplankton Entrainment by Power Plants"**

M.D. Dahlberg and P.V. Morgan, *N.U.S. Corp., Pittsburgh, Pa.*  
**"Detecting and Predicting Changes in the Fish Fauna of a Southeastern Massachusetts Estuary"**

Richard M. Ibara and James G. Hoff, *Southeastern Massachusetts Univ., North Dartmouth, Mass.*

**"Environmental Studies at Nuclear Power Sites in California"**

B. Laurent and D. Gotshall, *California Dept. of Fish and Game, Monterey, Cal.*

**Tuesday, September 10, 1974**

**9:00 a.m.-12:30 p.m.**

**Session 7**

**Two Concurrent Sessions**

**Hawaii Session ..... Oahu Room**

John A. Maciolek, *Hawaii Cooperative Fishery Unit, Univ. of Hawaii, Honolulu, Chairman*

**"Effect of Salinity on the Hatching Success of Threadfin Shad (*Dorosoma petenense*: Clupeidae)"**

J. Struhsaker and R. Iversen, *National Marine Fisheries Service, Tiburon, Calif. and Honolulu, Hawaii*

**"Habituation to Visual Stimuli in Hammerhead Sharks"**

F.D. Klopfer, *Univ. of Hawaii, Honolulu*

**"The Biology of Hawaii *opihii*; an Edible Intertidal Limpet"**

A. Kay, *Univ. of Hawaii, Honolulu*

**"Postlarval Flatfishes: Observations on the Identity and Ecology of 12 Hawaiian Species"**

P. Struhsaker and B. Higgins, *National Marine Fisheries Service, Honolulu, Hawaii*

**"The Ecology of Fishes in Kahana Estuary, Oahu, Hawaii"**

A. Timbol, *Hawaiian Tuna Packers, Honolulu, Hawaii*

**"Growth and Feeding Periodicity in *Iao* (*Pranesus insularum*: Atherinidae), a Hawaiian Baitfish"**

J. McMahon, *Univ. of Hawaii, Honolulu*

**"Diel Changes in the Vertical Distributions of Some Common Fish Larvae in Southern Kaneohe Bay, Oahu, Hawaii"**

W. Watson, *Univ. of Hawaii, Honolulu*

**"Patterns of Reproduction and Larval Development of Hawaiian Fishes"**

J. Leis, *Univ. of Hawaii, Honolulu*

**"Nearshore Abundance of Hawaiian Yellowfin Tuna *Thunnus albacares* Larvae; Ecological and Environmental Implications"**

John M. Miller, *Univ. of Hawaii, Honolulu*

**"Fishes of the Mixohaline Pond Systems of the Kona, Hawaii Coast"**

R.E. Brock, *Univ. of Washington, Seattle*

**"The Status of Hawaii's Freshwater Fauna"**

J.A. Maciolek, *Univ. of Hawaii, Honolulu*

**Estuarine and Marine Fisheries Session ..... Lanai Room**

James A. Sykes, *Atlantic Estuarine Fisheries Center, National Marine Fisheries Service, Beaufort, S.C., Chairman*

**"Economic Implications of Washington's Commercial Fishing Fleet"**

James Crutchfield, *Univ. of Washington, Seattle*

**"Forecasting of Catches of Atlantic and Gulf Menhaden"**

James E. Sykes, *National Marine Fisheries Service Beaufort, N.C.*

**"Selectivity of Gill Nets on Estuarine Fishes from St. Andrew Bay, Florida"**

Lee Trent, *National Marine Fisheries Service, Panama City, Fla.*

**"Effective Fishing Area of a Commercial Crab Trap and Biomass of the Commercial Spider Crab, *Chionecetes opilio*"**

R.J. Miller, *Newfoundland Biological Station, St. John's, Newfoundland*

**"Movements of Striped Bass, *Morone saxatilis* (Walbaum) Tagged in Maryland Waters of Chesapeake Bay"**

Charles J. Moore and Dennis T. Burton, *The Academy of Natural Sciences of Philadelphia, Benedict, Md.*

**"History and Status of the Weakfish Resource of the Middle Atlantic Coast"**

J.V. Merriner, *Virginia Institute of Marine Science, Gloucester Point, Va.*

**9:00 a.m.-12:30 p.m.**

**2:00-3:45 p.m.**

**Session 8 ..... Molokai Room**

**Symposium on interaction of nuclear powerplants and marine ecosystems: operating experience predictive capability, emerging challenges.**

Harold Berkson, *Atomic Energy Commission, Washington, D.C., Chairman*

**"Power Plant Design, Operating, and Siting Characteristics of Biological Importance"**

John J. Bolen, *Atomic Energy Commission*

**"Biological Effects of Nuclear Power Plant Operation: Impingement, Thermal Shock, and Gas Bubble Disease"**

Thomas D. Cain, *Atomic Energy Commission*

**"The Effects of Passing Marine Animals Through Power Plant Cooling Water Systems"**

Allan D. Beck and Neal Lackie, *Environmental Protection Agency*

"Power Plants, Chlorine, and Estuarine Environments"

J.H. Gentile, J. Cardin, M. Johnson, and S. Sosnowski, *Environmental Protection Agency*

"Predicting Dispersion of Aquatic Thermal Discharges from Steam-Electric Generating Plants"

Roy Overstreet, *Atomic Energy Commission*

"Projecting Ecosystem-Power Plant Interactions"

Charles W. Billups, *Atomic Energy Commission*

"Biology and the Law: Employing Field Biology in Administration of the 1972 Amendments to the Federal Water Pollution Control Act, Section 316 (a)"

Jan C. Prager and Charles Corkin, *Environmental Protection Agency*

"Siting Nuclear Power Plants Offshore:"

Harold Berkson, *Atomic Energy Commission*

Within the past year or two sufficient numbers of nuclear-fueled electric generating plants have come on line to permit examination of broad operating experiences. Simultaneously, requirements for the preparation of environmental impact statements have increased and water quality regulations mandated by the most recent amendments to the Federal Water Pollution Control Act have augmented the social responsibilities of professional fisheries scientists and increased the interface between science and law.

The symposium will include an examination of the operating experience that is only now becoming available; a look at some of the emerging predictive capability and methodology that is being developed in response to the requirements of the National Environmental Policy Act (NEPA); and discussion of the emerging challenges to fisheries scientists relating to the bio-legal aspects of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) and from recent proposals for offshore siting of floating power plants and concluding with an extended audience participation discussion to permit adequate airing of identified issues.

The participants have been selected from scientists of the Directorate of Licensing of the USAEC and of the National Marine Water Quality Laboratory of the EPA.

9:00-11:00 a.m.

Session 9

Toxic Substances in Aquatic Ecosystems ..... Ewa Room

Kenneth J. Macek, *Bionomics, Inc., Wareham, Mass.*,  
Chairman;

Robert L. Borovicka, *Bureau of Land Management,*  
*Portland, Ore.*;

Paul Ochs, *Environmental Protection Agency,*  
*Washington, D.C.*;

and Frank L. Davido, *Environmental Protection Agency,*  
*Washington, D.C.*

A discussant panel and five papers on the effect of toxic substances in the aquatic environment such as aircraft and rocket propellants, pesticides and mercury with a background paper on the pesticide surveillance program of EPA.

"Comparative Toxicity of Propellants on Fish and Amphibian

Species"

A.R. Slonim, *Environmental Quality Branch, Wright-Patterson Air Force Base, Dayton, Ohio.*

"Bioaccumulation of Pesticide Residues in Bluegill Continuously Exposed to <sup>14</sup>C-labeled Chemicals in Water"

Kenneth J. Macek, *Bionomics, Inc., Wareham, Mass.*

"Dieldrin Accumulation by Channel Catfish—a Field and Laboratory Investigation"

Ross V. Bulkley, *Iowa Cooperative Fishery Unit, Ames, Iowa*

"Some Effects of Mercury on Survival and Development of Larval Grass Shrimp, *Palaemonetes vulgaris* (Say)"

Paul A. Sandifer and Malcolm H. Shealy, Jr., *Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Dept., Charleston*

"The Use of Chemical Fire Retardants Near Aquatic Environments"

Theodore H. Blahm, *National Marine Fisheries Service, Seattle, Wash.*

Robert L. Broovicka, *Bureau of Land Management, Portland, Ore.*

11:15 a.m.-1:15 p.m.

Session 10

Contributed Papers I ..... Ewa Room

A. Jonez, *Bureau of Reclamation, U.S. Dept. of the Interior,*  
*Washington, D.C.*, Chairman

"The Effect of Reduced Levels of Dissolved Oxygen on the Temperature Avoidance Response of the White Perch, *Morone americana*"

John W. Meldrin and James J. Gift, *Ichthyological Associates, Inc., Middletown, Del.*

"Comparative Biochemical Genetics (Isozyme Analyses) of Bass Tribe Micropterini, Family Centrarchidae"

William F. Childers and Gregory S. Whitt, *Illinois Natural History Survey, Urbana, Ill.*

"Thermoregulatory Behavior and Diel Activity Patterns of Bluegill, *Lepomis macrochirus*, Following Thermal Shock"

Thomas L. Beltinger, *The Univ. of Wisconsin, Madison*

"Effects of Temperature and Salinity on Metabolism and Swimming Speed of White Perch, *Morone americana*"

Bernard R. Petrosky and J.W. Meldrin, *Ichthyological Associates, Inc., Middletown, Del.*

"Evidence that Zooplankton is Frequently Responsible for Oxygen Depletion in Channel Catfish Production Ponds"

William M. Lewis and Duane Koehl, *Southern Illinois Univ., Carbondale, Ill.*

"A System for Classifying Aquatic Environments for Land Use Planning and Management"

William S. Platts and Robert W. Phillips, *U.S. Forest Service, Boise, Idaho and Portland, Oregon*

"Ecology of Fishes in a Newly Constructed Reservoir, Lake Anna, Virginia"

Werner Wieland and James Reed, Jr., *Virginia Commonwealth Univ., Richmond, Va.*

2:00-3:45 p.m.  
Session 11

Two Concurrent Programs

Student Papers ..... Hilo Room

- Leighton Taylor, *Hawaii Cooperative Fishery Unit, Univ. of Hawaii, Honolulu*, Chairman
- "Crepuscular Behavior in the Longnose Butterflyfish, *Forcipiger flavissimus* (Chaetodontidae) in Hawaii"  
G. Ludwig, *Univ. of Hawaii, Honolulu*
- "Photoperiodic Control of Reproductive Periodicity in a Marine Tropical Damselfish, *Microspathodon chrysurus* (Pomacentridae) with Respect to Seasonal Meteorological Variability"  
C. MacDonald, *Univ. of Hawaii, Honolulu*
- "Thermal Selection in the Mullet (*Mugil cephalus*) in Hawaii"  
P. Major, *Univ. of Hawaii, Honolulu*
- "The Nitrogen and Energy Budget of a Juvenile Goatfish (*Parupeneus porphyreus*) Fed Brine Shrimp (*Artemia salina*)"  
J. Corbin, *Univ. of Hawaii, Honolulu*
- "Chemical Senses and Food Acquisition in the Hawaiian Goatfish *Parupeneus porphyreus* (Mullidae)"  
K. Holland, *Univ. of Hawaii, Honolulu*
- "Effects of Temperature on Survival of Two Species of Hawaiian Fishes, *Caranx mate* (Carangidae) and *Polydactylus sexfilis* (Polynemidae)"  
M. San Terre, *Univ. of Hawaii, Honolulu*
- "Sexual Dimorphism in a Hawaiian Freshwater Goby"  
E. Lau, *Loyala Univ., New Orleans, La.*
- "Life History of O'opu Nopili, an Endemic Hawaiian Freshwater Goby (*Sicydium stimpsoni*)"  
M. Tomihama, *Univ. of Washington, Seattle*

Contributed Papers II ..... Oahu Room

- David L. Koch, *Desert Research Institute, Univ. of Nevada, Reno, Nevada*, Chairman
- "Acclimatization Studies of Eagle Lake Rainbow Trout (*Salmo gairdnerii aquilarum*) to the Waters of Pyramid Lake, Nevada"  
Jack Knoll and David Koch, *Univ. of Nevada, Reno*
- "The Swimming Speed of Grayling Relative to Highway Culverts in Alaska"  
Craig MacPhee and Fred J. Watts, *Univ. of Idaho, Moscow*
- "Adult Steelhead Migration in the Snake River"  
C.M. Falter and R.R. Ringe, *Univ. of Idaho, Moscow*
- "Differentiation into Subpopulations and Cause of Decline of Sockeye Salmon of the Karluk River System, Alaska"  
Richard Gard, *Colorado State Univ., Fort Collins*
- "A Closed Recirculating Laboratory Raceway System for the Intensive Culture of Channel Catfish, *Ictalurus punctatus* Rafinesque"  
James L. Reed and Stanford R. Wells, *Virginia Commonwealth Univ., Richmond, Va.*
- "Production of Rough or Commercial Fishes in Elephant Butte Lake, New Mexico"  
Douglas B. Jester, *New Mexico State Univ., Las Cruces*
- "Systematics and Morphology of the Bonitos"  
B.B. Collette and L.N. Chao, *U.S. National Museum, Washington, D.C.*

2:00-3:45 p.m.  
Session 12

Symposium—The Impact of Off-Shore Oil Development ..... Lanai Room

- I.B. "Buck" Byrd, *National Marine Fisheries Service, U.S. Dept. of Commerce, St. Petersburg, Florida*, Chairman
- A special jointly-sponsored IAGFCC and AFS session involving presentations by four oil ecologists, Bill Gusey of Shell Oil, T.R. "Pete" Samsell of Continental, Keith Hay of American Petroleum Institute and J.R. Jackson, Exxon. The program will consist of formal presentations followed by a discussion group composed of the members of the Marine and Estuarine Resources Committee of the International Association of Game, Fish and Conservation Commissioners.

4:00-6:00 p.m.

Business Session ..... Molokai Room



### American Fisheries Society Committee Meetings

#### Sunday, September 8, 1974

		Room
1:00 p.m. - 4:30 p.m.	Resolutions	Ewa
1:00 p.m. - 4:30 p.m.	Water Quality	Kohala
1:00 p.m. - 5:30 p.m.	Executive	Niihau
1:30 p.m. - 4:30 p.m.	Editorial Board	Kona

#### Monday, September 9, 1974

1:30 p.m. - 5:00 p.m.	Executive	Niihau
4:30 p.m. - 6:30 p.m.	Fish Culture Section	Hilo

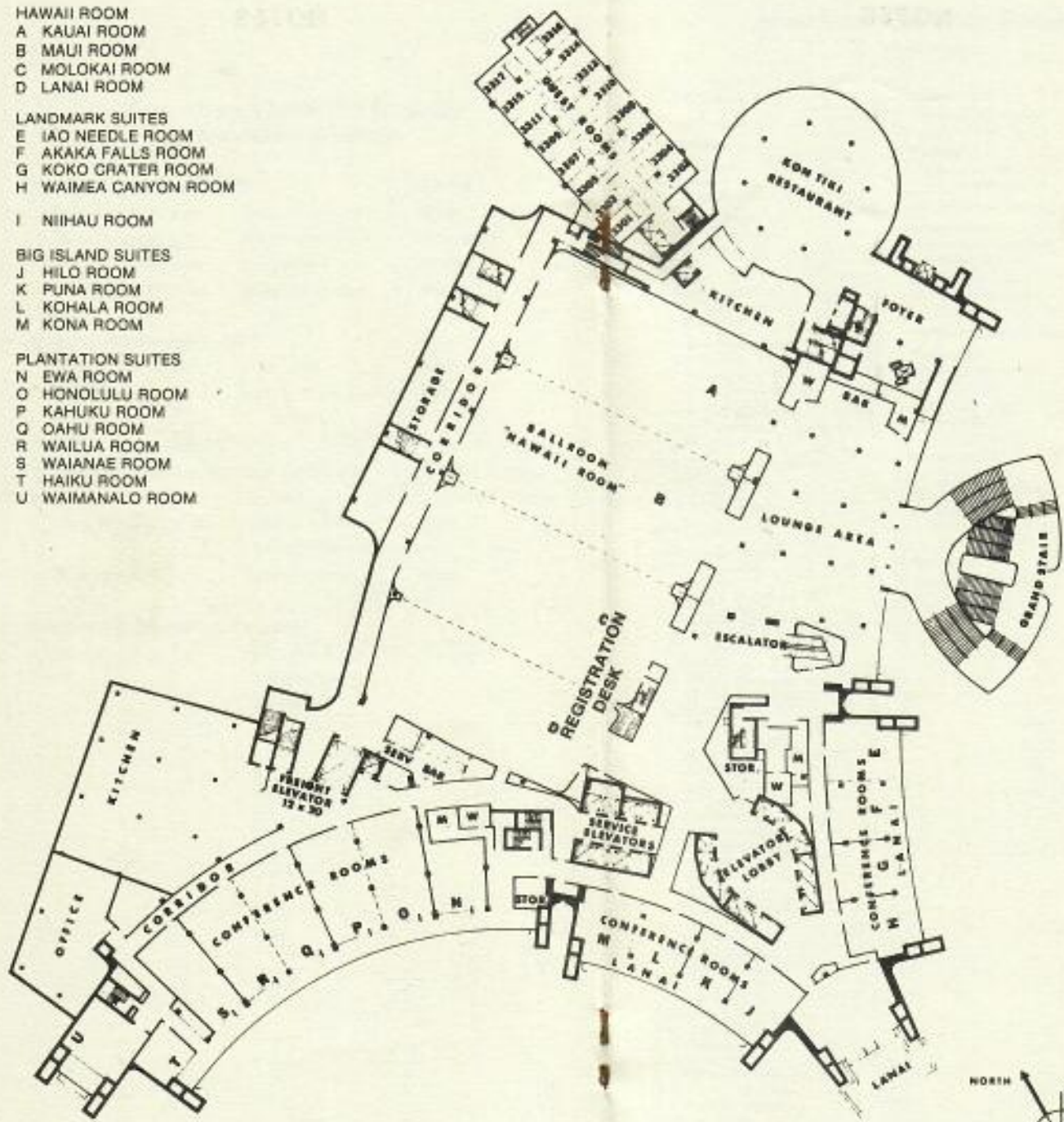
#### Tuesday, September 10, 1974

12:30 p.m. - 2:30 p.m.	Past Presidents	Ocean Terrace
	Luncheon	Coffee House
1:30 p.m. - 3:30 p.m.	Fishery Administration Section	Ewa
3:30 p.m. - 5:30 p.m.	Time & Place	Ewa

#### Wednesday, September 11, 1974

7:00 a.m. - 9:00 a.m.	Incoming Executive Committee	Kahuku
	Breakfast	

- HAWAII ROOM
- A KAUAI ROOM
- B MAUI ROOM
- C MOLOKAI ROOM
- D LANAI ROOM
- LANDMARK SUITES
- E IAO NEEDLE ROOM
- F AKAKA FALLS ROOM
- G KOKO CRATER ROOM
- H WAIMEA CANYON ROOM
- I NIIHAU ROOM
- BIG ISLAND SUITES
- J HILO ROOM
- K PUNA ROOM
- L KOHALA ROOM
- M KONA ROOM
- PLANTATION SUITES
- N EWA ROOM
- O HONOLULU ROOM
- P KAHUKU ROOM
- Q OAHU ROOM
- R WAILUA ROOM
- S WAIANAE ROOM
- T HAIKU ROOM
- U WAIMANALO ROOM



## NOTES

## American Fisheries Society Committees

### AAAS Council

### AAAS Program

### AIBS Board

### Arrangements

Kenji Ego,  
Chairman, HI

### Award of Excellence

Justin W. Leonard,  
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### Awards

### Bi-Centennial

Robert F. Hutton,  
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Acting Chairman, OR

### Chemicals in Fisheries

Charles R. Walker,  
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### Constitutional Consultant

### and Review

John L. Funk,  
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### Editorial Board

### Endangered Species

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Chairman, IL

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Fish Culture Sect., MN

Kenji Ego,  
Arrangements, HI

Editorial Board-vacant  
John Gottschalk,  
Finance, DC

C. Richard Robins,  
Names of Fishes, FL

Robert C. Summerfelt,  
Nominating, OK

J. Bruce Kimsley,  
Program, CA

Gerald R. Bouck,  
Water Quality, OR

Gerald R. Bouck,  
(Acting), Bd. of Certification, OR

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### Exotic Fish

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### International Fisheries

### Membership

J. Cameron Stevenson,  
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### Names of Fishes

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### National Research Council

### Nominating

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### Ornamental Fish

Ross Socolof,  
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### Water Quality

Gerald R. Bouck,  
Chairman, OR

### Program

J. Bruce Kimsley,  
Chairman, CA

### Resolutions

### Student Affairs

### Time and Place

## American Fisheries Society

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Colburn C. Wood, Plymouth, Massachusetts  
Fred A. Thompson, Vancouver, Washington

## American Fisheries Society INTERNATIONAL ASSOCIATION OF GAME, FISH AND CONSERVATION COMMISSIONERS

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Ronald L. Walker, Vice Chairman, IAGFCC  
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Takuji Fujimura, Exhibits and Displays  
Paul Y. Kawamoto, Finance  
Joan K. Moriyama, Ladies Social  
Lillian A. Nishihira, Registration and Information  
Henry M. Sakuda, Accommodations and Housing  
Stanley I. Shima, Publicity  
David H. Woodside, Tours and Field Trips  
James J. Yamashiro, Welcoming  
Richard N. Yoshida, Program and Printing

## Special Activities

### Aloha Reception

An ice-breaking Aloha (Welcome) Reception will be held in the Molokai Room from 6:00 to 7:00 p.m. on Sunday, September 8. Conference registrants will find tickets for two cocktails at this function in their packets.

### Annual Banquet

The annual AFS/IAGFCC joint banquet will be held in the Kauai-Maui Room on Wednesday, September 11, commencing at 7:30 p.m., preceded by a 6:30 p.m. hosted reception in the second floor lounge area. Tickets will be available for purchase at the registration desk until 4:00 p.m. on Monday, September 9.

### Ladies Hospitality Room

All wahines (members of the fair set) are cordially invited to the Kohala-Kona Room between 9:00 a.m. and 5:00 p.m., Monday through Friday, for some friendly chit-chat and relaxation. Complimentary coffee and pastries will be served (come early before the pastries are gone).

Sessions on lei (flower garland) making, coconut hat making and basic hula lessons will be held in the Ladies Hospitality Room. Scheduling of these sessions will be announced via the bulletin board in this Room.

### Victor Division—Woodstream Corporation Hospitality Room

The Victor Division of Woodstream Corporation, Lititz, Pennsylvania is hosting a hospitality room in their suite during the meeting of the IAGFCC. You are invited to visit with them from 11:30 a.m. to 1:00 p.m. and from 5:30 p.m. to 7:30 p.m. on Wednesday, September 11; Thursday, September 12; and Friday, September 13.

### Film Showings

Two entertaining and enlightening films will be shown in the Wailua Room from 6:30 to 8:30 p.m. on Monday, September 9. The films are entitled (1) "The Aquatic Ecologist" and (2) "Behaviour and Ecology of the Tropical Reef-Fishes of the Family Chaetodontidae (butterflyfish)." We thank the New York Chapter of the AFS for the former film, and Dr. Ernie Reese of the University of Hawaii for the latter. Everyone is invited to view these films.

### Information and Assistance

An Information and Assistance Desk will be manned in the Conference Headquarters (Akaka Falls Room) to aid attendees with any inquiries concerning the Conference. Also, **all attendees are urged to frequently peruse the bulletin board in the registration area (lobby) to be apprised of inevitable changes and other developments during the course of the Annual Meeting.**

## Tours and Field Trips

Because of the multitude of easily accessible attractions and things to do in Honolulu, only one field trip has been scheduled (details are given below). Those desiring transportation to places of interest within a reasonable distance from the Sheraton Waikiki Hotel will be accommodated at the Courtesy Transportation Desk in the Conference Headquarters (Akaka Falls Room).

Information on commercial attractions can be secured at the Travel and Tours Desk in the registration (lobby) area.

### Field Trip to Hawaii Institute of Marine Biology

The Hawaii Institute of Marine Biology is a renowned research facility of the University of Hawaii, and is located on Mokuoloe Island in Kaneohe Bay on the northeastern side of Oahu. Due to a limitation on the number of people that can be accommodated on the short boat ride to the island, this tour will be limited to the first 40 who sign up. Details follow:

1. When to sign up: **During registration.**
2. Departure time: **12:45 p.m., Wednesday, September 11.**
3. Return time: **About 5:00 p.m.**
4. Transportation charge: **None**
5. The tour will include a stop enroute at the Nuuanu Pali State Park for a spectacular view of Kaneohe Bay; a talk by Dr. John Bardach (Director of the Institute); and a tour of the research facilities.

## Convention Contributors

Woodstream Corporation  
Hawaiian Printing Company  
Liana of Hawaii  
Hawaiian Airlines  
Aloha Airlines

NOTES

**INTERNATIONAL ASSOCIATION  
of  
GAME, FISH and CONSERVATION  
COMMISSIONERS**

**64th Annual Meeting  
Sheraton—Waikiki Hotel  
September 11-13, 1974**

**IAGFCC  
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**IAGFCC Officers**

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First Vice-President.....	Ken H. Doan
Second Vice-President.....	John E. Phelps
Treasurer .....	Chester F. Phelps
General Counsel .....	Seth Gordon



**Dr. O. Earle Frye, Jr.  
President**

# IAGFCC

## Annual Meeting, Sheraton-Waikiki Hotel Honolulu, September 12-13, 1974

**THEME: Wildlife Administration in a Changing Environment**

**Thursday, September 12**

**Morning Session** **Molokai Room**

- 9:10 Call to Order—Dr. O. Earle Frye, President
- 9:30 Welcome—George R. Ariyoshi, Acting Governor
- 9:50 President's Address—Dr. O. Earle Frye
- 10:05 Keynote Address—Daniel K. Inouye, U.S. Senator, Hawaii
- 10:30 Break
- 10:45 Recent Developments: Law of the Sea Convention  
—Howard W. Pollock, Deputy Administrator, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
- 11:15 Integrating Indians in Wildlife Conservation  
—Carl N. Crouse, Director, Department of Game, Washington
- 11:45 Report of the Executive Vice-President—John S. Gottschalk

**Afternoon Session** **Molokai Room**

- Dr. Kenneth H. Doan, First Vice-President, Presiding
- 1:30 Dynamic Change in Wildlife Administration  
—Dr. Gustav A. Swanson, Head of School of Fisheries and Wildlife, Colorado State University, Ft. Collins
- 2:00 Land-Use Planning: A Modern Imperative  
Panel I: The Coastal Zone  
The Coastal Zone Management System  
—Robert A. Knecht, Director, Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce  
—Dr. Thomas L. Linton, Director, Division of Commercial and Sports Fisheries, North Carolina  
—Dr. Shelley M. Mark, Director, Department of Planning and Economic Development, Hawaii

- 3:30 Panel II: The Federal Land-Use Act, Its Implications and Implementation  
—Lance Marston, Director, Office of Land Use and Water Planning, U.S. Department of the Interior  
—Steven P. Quarles, Special Counsel, Senate Interior Committee

**Friday, September 13**

**Morning Session** **Kauai Room**

- John E. Phelps, Second Vice-President, Presiding
- 9:00 Coordinating Fish and Wildlife Interests in Water Development Projects  
—Dr. F. Eugene Hester, Associate Director, Fish and Wildlife Service, U.S. Department of the Interior  
—Carl R. Noren, Director, Missouri Department of Conservation  
—Irvin Reister, Chief, Planning Division, Corps of Engineers, U.S. Department of the Army
- 10:30 The 1973 Endangered Species Act: A Challenge in Federal, State and Citizen Relations  
—Lynn A. Greenwalt, Director, Fish and Wildlife Service, U.S. Department of the Interior  
—Robert L. Herbst, Commissioner, Department of Natural Resources, Minnesota  
—Charles H. Callison, Executive Vice-President, National Audubon Society

**Afternoon Session** **Kauai Room**

- Charles D. Kelley, Chairman of the Executive Committee, Presiding
- 1:30 The Pros and Cons of Strip Mining  
Strip Mining and the Public Lands  
—George Turcott, Associate Director, Bureau of Land Management, U.S. Department of the Interior  
Strip Mining and Wildlife  
—Russell Stuart, Commissioner, North Dakota Game and Fish Department
- 3:00 Annual Business Meeting, Dr. O. Earle Frye, Presiding

5:00 Executive Committee Meeting **Oahu Room**



**International Association of Game,  
Fish and Conservation Commissioners  
Committee Meetings**

**IAGFCC COMMITTEE APPOINTMENTS**

1973-74

<b>Monday, September 9, 1974</b>		
9:00 a.m.- 3:30 p.m.	Resolutions	Wailua
10:30 a.m.-12:30 p.m.	Special Finance Committee	Ewa

<b>Tuesday, September 10, 1974</b>		
9:00 a.m.- 5:00 p.m.	Resolutions	Wailua
2:00 p.m.- 5:00 p.m.	Legislative	Niihau
3:30 p.m.- 5:30 p.m.	Time and Place	Ewa

<b>Wednesday, September 11, 1974</b>		
9:00 a.m.- 5:00 p.m.	Resolutions	Wailua
9:00 a.m.- 5:00 p.m.	Executive	Niihau
9:00 a.m.-11:00 a.m.	Nongame Species —Rare and Endangered Species	Oahu
9:00 a.m.-11:00 a.m.	Professional Improvement	Honolulu
10:00 a.m.-12 noon	Special Library	Kahuku
11:00 a.m.-12 noon	Conservation TV Program	Ewa
1:00 p.m.- 4:00 p.m.	Land Resources	Ewa
1:00 p.m.- 5:00 p.m.	Predator Animal Policy	Oahu
4:00 p.m.- 5:30 p.m.	Nominating	Hilo

<b>Thursday, September 12, 1974</b>		
1:00 p.m.- 3:00 p.m.	Grants-in-Aid	Hilo
4:45 p.m.- 6:30 p.m.	Hunter Safety	Molokai
7:00 p.m.-10:00 p.m.	State-Federal Cooperation (Ad hoc)	Oahu
7:30 p.m.- 9:30 p.m.	National Coordinating and Water Resource	Hilo

<b>Friday, September 13, 1974</b>		
9:00 a.m.-12 noon	Program	Oahu
5:00 p.m.- 9:00 p.m.	Executive	Oahu

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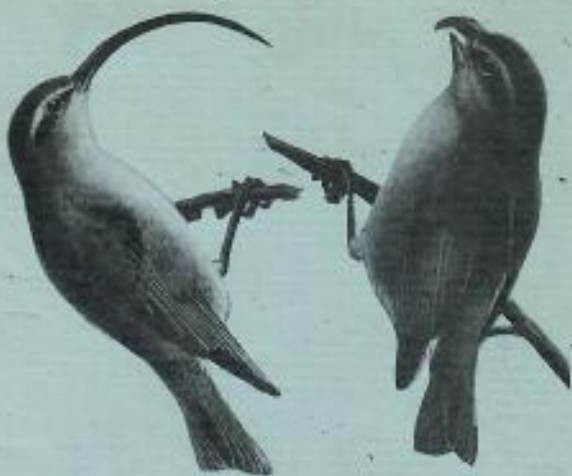
104th ANNUAL MEETING

SEPTEMBER 9-11, 1974

**International Association  
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64th ANNUAL MEETING

SEPTEMBER 11-13, 1974



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