

RESEARCH

Arthur T. Landis, Jr.

New High Pressure Research Animal? A moving picture made from the submarine *Diving Saucer* during the recent operation by Westinghouse and Scripps Institution off Cape San Lucas shows a green turtle feeding on sand crabs at a depth of 950 feet. This is the deepest known dive by an air-breathing animal except for the great sperm whales which have been known to entangle submarine cables at a depth of over 3,000 feet. But who can keep a sperm whale in the laboratory? Green turtles, on the other hand, are already familiar aquarium specimens, and this observation of their diving capabilities opens up a new field of study of diving respiration in an air-breathing vertebrate.

National Academy of Engineering Studies Ocean. The new National Academy of Engineering, created early this year under the 1864 charter of the National Academy of Sciences, featured a Symposium on Ocean Engineering at its meeting in New York City on October 21. As one of its first projects, the NAE has established a Committee on Ocean Engineering under the chairmanship of Dr. Thomas C. Kavanagh of Praeger-Kavanagh-Waterbury, New York City.

Scripps Vessel to Study Layered Sediments. Professor John Isaacs of Scripps Institution, who presented a talk on Fishery Technology at the NAE symposium, described the results of tracing fish scales in the layered sediments of Southern California offshore basins. The layers can be dated using carbon-14 techniques, and the relative proportions of, for example, sardine and anchovy scales in various layers can be used to obtain

an idea of the relative abundance of various kinds of fish in the past. Professor Isaacs feels that the recent decline of the sardine and increase in abundance of the anchovy represents a natural fluctuation that has occurred more than once in the past few thousand years.

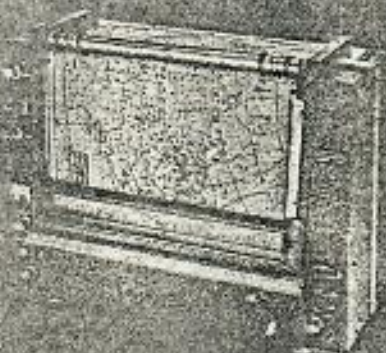
The Scripps vessel *Alexander Agassiz* sailed at the end of October on a two-month cruise to the coastal waters between Salina Cruz, Mexico, and Callao, Peru, to prospect for other basins where similar layered sediments may be encountered. She will also take observations in the Humboldt Current.

Dissolved Copper Caused Sea Pollution. A rare case of marine pollution produced by man-made inorganic chemicals has been reported from the Dutch coast. Professor P. Korringa of the Royal Institute for Fishery Research at IJmuiden, traced a fish kill in April to the dumping of several tons of copper sulfate crystals 80 miles away. About 1910, a ship carrying copper sulfate was wrecked on the south coast of England and the resulting pollution badly damaged a local oyster fishery, but such incidents are extremely rare.

East Coast Drought Affects Oceanography. A good example of the interrelationship between meteorology, oceanography, and marine biology is provided by this year's experience in the Chesapeake. The outflow of fresh water from the Susquehanna and Potomac has been drastically reduced by drought. As a result, the salinity of the Bay has become much higher than normal. Bathing beaches have been rendered useless by increased populations of the stinging jellyfish known locally as "sea nettles," and the wooden structures of boats, duck blinds, and wharves have been attacked by the shipworm *Bankia*. Boat owners unaccustomed to seeing marine fouling have suddenly found their boat bottoms covered with barnacles, sea squirts, and hydroids. The higher salinity has also permitted the oyster diseases, MSX, to move farther up the Bay to destroy beds formerly immune.



Weather maps are produced from magnetic tape which recorded original studio line transmission.



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SANTA BARBARA • SANTA CRUZ

SCRIPPS INSTITUTION OF OCEANOGRAPHY

GEOLOGICAL RESEARCH DIVISION
LA JOLLA, CALIFORNIA 92093

5 January 1976

Dr. George H. Balazs
Hawaii Institute of Marine Biology
University of Hawaii at Manoa
P. O. Box 1346
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

Please forgive my long delay in replying to your request for information regarding movie film which I helped to take of sea turtles from Cousteau's diving saucer. I regret that I do not have the time to go thoroughly through my notes and the pictures we obtained, but I do know that we did sight turtles feeding at at least 125 m, and we saw rather distinct tracks of turtles at approximately 180 m.

If you or Tom Clark should be coming through La Jolla at any time after this coming July, I would be happy to let you go through the pictures we have at your leisure.

Very truly yours,

A handwritten signature in dark ink that reads "Joseph R. Curray". The signature is written in a cursive style with a long horizontal stroke at the end.

Joseph R. Curray

JRC/drc

Cur

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GEOLOGICAL RESEARCH DIVISION
LA JOLLA, CALIFORNIA 92093

28 May 1980

Dr. George H. Balazs
Assistant Marine Biologist
and Deputy Chairman
IUCN/SSC Marine Turtle Group
University of Hawaii at Manoa
Hawaii Institute of Marine Biology
P. O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

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Please let me know if you would like to go through any of these films, or if you would have an opportunity to come through La Jolla at some time.

Sincerely,

A handwritten signature in black ink that reads "Joseph R. Curray".

Joseph R. Curray

JRC/drc

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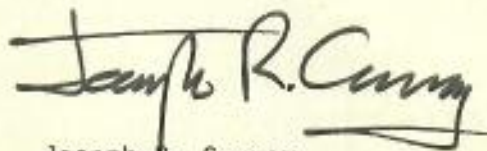
4 August 1980

Dr. George H. Balazs
Assistant Marine Biologist
University of Hawaii at Manoa
Hawaii Institute of Marine Biology
P. O. Box 1346, Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

I am sorry not to have replied to your letter of June 4 earlier. I have finally succeeded, however, in locating what I believe is footage on deep-sea turtles, cut out from the other films from my submersible dives off the coast of Mexico. I located this section of film a few weeks ago and had hoped to have an opportunity to view it myself before sending it off, to confirm this assumption. I have unfortunately not found the time to get a projector, rewind the film, and view it. Also, I will be leaving for sea in approximately two weeks. I am therefore mailing this to you now as is. Please use what you want of this material, including copying some of the film if you wish. I would appreciate return of this original, but even more, I would appreciate learning what you have concluded from examination of this film.

Sincerely,


Joseph R. Curray

JRC/drc
Enclosure



University of Hawaii at Manoa

Hawaii Institute of Marine Biology

P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744

Cable Address: UNIHAW

1 September 1980

Dr. Joseph R. Curray
Geological Research Division
Scripps Institution of Oceanography
La Jolla, CA 92093

Dear Dr. Curray:

I have viewed your excellent and unique movie film and I can report with certainty that the turtles shown are olive ridleys, Lepidochelys olivacea. As I mentioned earlier, Landis in Under Sea Technology reported the species to be the green turtle, Chelonia mydas. Furthermore, in reviewing my reprint file, I have noticed that Harold Berkson (Physiological adjustments to deep diving in the Pacific green turtle, Comp. Biochem. Physiol. 1967, vol 21) cited the Landis note. Berkson's exact statement is as follows: "Loggerhead turtles have been captured in nets at 60-80 m (Ingle & Smith, 1949) and Pacific green turtles have been seen feeding at 73-110 m (Curray, personal communication) and at 290 m off Cape San Lucas (Landis, 1965)."

To my knowledge, your film documents the deepest dive known for a sea turtle. With you as coauthor, I would very much like to prepare and hopefully publish a short note providing details of the film, and pointing out that the turtles are olive ridleys. Hopefully you will be agreeable to this proposal. If so, I would appreciate learning some of the background circumstances and the exact location of your submarine dive to 290 m. Perhaps there has been a publication or popular article that tells of this research venture. Actually, I could almost envision an entire research project being formulated to use submarines to study the deep diving behavior of ridleys!

Incidentally, the feeding activity filmed almost seems to have been initiated by the submarine's illumination of the prey. Did you receive this impression at the time?

I am accepting your kind offer allowing me to make a copy of the film. This is being carried out by Kodak laboratories and will take at least two weeks. I will return the film by air mail just as soon as the duplicate is completed.

Sincerely,

George H. Balazs
Assistant Marine Biologist



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GEOLOGICAL RESEARCH DIVISION
LA JOLLA, CALIFORNIA 92093

5 November 1980

Dr. George H. Balazs
Assistant Marine Biologist
Hawaii Institute of Marine Biology
University of Hawaii at Manoa
P. O. Box 1346, Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

I have just returned to La Jolla yesterday, after being away since late August. I was very pleased on my return to receive your letters commenting on the turtle movies taken off the coast of Mexico. To the best of my recollection, however, I did not see turtles in the one dive I made off Cabo San Lucas. I believe that all of the turtle observations were made off the state of Nayarit on the mainland side of Mexico south of Mazatlan, and those films were excerpted from films of several dives made in that area. Without having had a chance to relocate my notes or listen to tapes made during the dives, I suspect that that 110-meter depth mentioned is probably the maximum depth of our turtle observations.

I would be very pleased to work with you as a co-author in putting together some kind of a publication on these observations. I should first, however, review the movies of the turtles and get out my notes and listen to the tapes of the dives to attempt to provide you with more reliable information than I could do from my faulty memory. I will start on this as soon as possible and will go through the movies as soon as you return the original film.

I look forward to working with you on this small project.

Sincerely,

A handwritten signature in black ink that reads "Joseph R. Curray".

Joseph R. Curray

JRC/drc

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96744

December 23, 1980

Dr. Joseph R. Curray
Geological Research Division
Scripps Institution of Oceanography
La Jolla, California 92093

Dear Dr. Curray:

I hope that you safely received the sea turtle movie film which I returned to you by "air mail special delivery" during the latter part of November. A U. S. Department of Commerce government mailing label was utilized, as allowed under my temporary employment affiliation with the National Marine Fisheries Service, Honolulu Laboratory. After you have had the opportunity to review the film and your field notes, I will be interested to learn of the exact locations and maximum depth of the turtles observed. In one of your earlier letters, you mentioned seeing "rather distinct tracks of turtles at approximately 180 m." I am sure that it would be worthwhile to compile the specifics for these observations for inclusion in our short publication.

Do you have any idea what data base was used by Landis when he reported turtles being seen at a depth of 290 m off Cape San Lucas? Do you know Landis, or where he can be contacted at the present time?

I look forward to hearing from you at your earliest convenience. Best wishes for the holidays and the New Year.

Sincerely,

George H. Balazs
Assistant Marine Biologist

GHB:md

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96744

May 12, 1982

Dr. Joseph K. Curray
Geological Research Division
Scripps Institution of Oceanography
La Jolla, California 92093

Dear Dr. Curray:

I am writing to you once again about our continuing detective work on deep-diving sea turtles. When you last wrote to me in November of 1980, you hoped to review the movie, along with your notes and tapes, in order to get more reliable information on depth of dive and exact location off Nayarit. In an earlier letter, you also mentioned the possibility of having seen the tracks of turtles at about 180 meters. If correct, this would be a valuable point to include in our short article.

Since last writing to you, I have followed up several leads on turtle diving records. The enclosed correspondence is somewhat self-explanatory. As near as I can tell, the story of a "loggerhead" seen at "300 meters" off Southern California results from confusion with the turtles (olive ridleys) you saw off Mexico. With Rick Grigg's assistance, I was able to look through notes of tapes taken during dives in the La Jolla Canyon (Feb. 1964). There was no mention of turtles being seen in these records. However, if a Jim Stewart is still at Scripps, it would be good to check with him.

It has indeed been interesting tracking this information down all these years, but I hope we can now wrap it up soon and get what we know into print. I hope to hear from you again soon.

Best regards.

Sincerely,

GEORGE H. BALAZS
Assistant Marine Biologist

GHB:ec

Encls.



SCRIPPS INSTITUTION OF OCEANOGRAPHY

GEOLOGICAL RESEARCH DIVISION
LA JOLLA, CALIFORNIA 92093

17 August 1982

Dr. George H. Balazs
Hawaii Institute of Marine Biology
University of Hawaii at Manoa
P. O. Box 1346, Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

I am really embarrassed about how long it has been since you have been very patiently and politely asking me for more information on my turtle observations off Mexico. I had really not forgotten about it for these past two years, but somehow that seemed to be one of the items, along with completing some of my own manuscripts, which has always slipped off the bottom of the list. I am now on sabbatical and am passing through La Jolla for only a few days a month. One of my goals on this sabbatical, however, is to dig out all of the information you need.

I have been in La Jolla for the past few days, and being somewhat conscience-stricken by this matter, have spent some time digging through, finding, and trying to interpret my old notes and records regarding those dives. I have made some progress, and have found notes which I had not been able to locate before. But unfortunately I cannot yet give the real definitive answers to your questions. Let me, however, provide the following limitations on the observations which I am alleged to have made.

I made a total of seven dives in the Cousteau Saucer. One was in La Jolla in 1964, I believe, and the others were in Mexican waters in January 1965. One of those remaining six was at Gorda Bank near Cabo San Lucas at the tip of Baja California. The other five were off the Nayarit coast at approximately $21^{\circ}45'N$, $106^{\circ}10'W$. The deepest I went on any of those latter dives was 180 meters.

To start with, I did not observe any turtles, or possible turtle tracks, in my dives off La Jolla and at the tip of Baja California. I did, in fact, observe turtles in my dives off Nayarit, where they are common swimming around on the surface. As of today, after a couple of days of search, the deepest I can absolutely document having observed a turtle was at 120 meters. Inasmuch as we did not go any deeper than 180, we certainly observed no evidence of turtles below that depth. I do remember very distinctly that I observed what we interpreted as turtle tracks at below 120 meters, and from re-examining some of our photographs, it may have been as deep as 180 meters.

17 August 1982

My notes are in two forms. Some are on paper, others on tape made aboard the Soucoupe. The ones on paper are detailed regarding my geological observations, but the biology at that time was only incidental, although interesting. So I did not necessarily transcribe into those notes all observations of turtle tracks or other biological indications. The notes on tape, however, are much more complete, and every time we observed a turtle or turtle tracks or galateid tracks, we commented on the tape recorder. My embarrassment today is that I am leaving on a plane in just a couple of hours, and I have not been able to find a reel-to-reel tape recorder in the Institution through which I can listen to and relive my tapes. Please believe me, I will listen to those tapes when I come back a month from now for a week in the middle of September. In the meantime, I hope that these limitations I have placed on observations will be of some use to you.

Sincerely,



Joseph R. Curran

JRC/drc



SCRIPPS INSTITUTION OF OCEANOGRAPHY

GEOLOGICAL RESEARCH DIVISION
LA JOLLA, CALIFORNIA 92093

22 September 1982

Dr. George H. Balazs
Assistant Marine Biologist
Hawaii Institute of Marine Biology
University of Hawaii at Manoa
P. O. Box 1346, Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

I have made some progress this week in my few days in La Jolla, interspersed with other parts of my sabbatical. I have located all the tapes, I have located all my former notes, and I have succeeded in replaying some of the tapes. I still do not have a definitive answer as to the deepest evidence we have for turtle occurrence, but I think I am able to now narrow it down with much more confidence.

I know of nobody who has observed these turtles off La Jolla. I personally did not observe these turtles off the tip of Baja California, and observed them only off the Nayarit coast in rather great abundance. The dive in which I made my deepest observation of turtles is at 21°30'N and 105°55'W. It was a dive we took from the outer edge of the shelf, down over the shelf break on the upper slope, to a maximum depth of 180 m. The deepest photograph I have of a turtle is 125 m, but in my notes I have observations of having seen turtles at a greater depth than this, and it is my recollection, as refreshed from my notes, that at a maximum depth of 180 m we saw marks on the bottom which we believed had been made by turtles feeding. We did see turtles abundantly at the surface and on many other dives, but I believe this is the deepest confirmed observation.

On my next visit to La Jolla, I may be able to narrow these observations down a little bit more. One of the sets of tapes made on each dive was made from the tape recorder in the diving saucer which runs continuously at a very slow speed. I have been unable this week to locate a tape recorder to replay those without sounding like a chipmunk.

Please let me know if there are any other important questions to be answered regarding these observations. With luck, I may be able to determine the precise maximum depth of a direct observation of a turtle, but perhaps with the observation that there were markings to 180 m this may not be necessary.

Again, I am sorry for the delays.

Sincerely,

Joseph R. Curray
Joseph R. Curray

JRC/drc



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Feb 20, 87

Jerry-

Attached are copies of most of the letters I exchanged with Dr. Curray in order to correctly ID the turtle referred to by Landis back in the 1960's. Quite a bit of effort went into this, especially on Dr. Curray's part locating his notes, slides and superb film footage. My letter dated September 1, 80 provided Dr. Curray with the accurate identification, Lepidochelys olivacea (olive ridley), not C. mydas as repeatedly published.

Since Dr. Curray apparently told you about our earlier detective work and reidentification, I wonder if you would please consider crediting us for this information in the paper you and Karen Eckert plan to publish? I would be most appreciative, unless of course you feel such credit is inappropriate. You might list it as "J. Curray and G. Balazs, personal communication".

What needs to be done now is depth recording work on the olive ridley. I can take you to a nice place in Michoacan to do this, if you have the grant money!

Aloha,





SCRIPPS INSTITUTION OF OCEANOGRAPHY

GEOLOGICAL RESEARCH DIVISION
LA JOLLA, CALIFORNIA 92093

28 May 1980

Dr. George H. Balazs
Assistant Marine Biologist
and Deputy Chairman
IUCN/SSC Marine Turtle Group
University of Hawaii at Manoa
Hawaii Institute of Marine Biology
P. O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

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Please let me know if you would like to go through any of these films, or if you would have an opportunity to come through La Jolla at some time.

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Joseph R. Curray

JRC/drc



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4 August 1980

Dr. George H. Balazs
Assistant Marine Biologist
University of Hawaii at Manoa
Hawaii Institute of Marine Biology
P. O. Box 1346, Coconut Island
Kaneohe, Hawaii 96744

Dear Dr. Balazs:

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Sincerely,

A handwritten signature in black ink that reads "Joseph R. Curray". The signature is stylized with a large, sweeping "J" and "C".

Joseph R. Curray

JRC/drc
Enclosure



University of Hawaii at Manoa

Hawaii Institute of Marine Biology
P.O.Box 1346 • Coconut Island • Kaneohe, Hawaii 96744
Cable Address: UNIHAW
1 September 1980

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Geological Research Division
Scripps Institution of Oceanography
La Jolla, CA 92093

Dear Dr. Curray:

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George H. Balazs
Assistant Marine Biologist



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LA JOLLA, CALIFORNIA 92093

5 November 1980

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Hawaii Institute of Marine Biology
University of Hawaii at Manoa
P. O. Box 1346, Coconut Island
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Joseph R. Curray

JRC/drc

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96741

December 23, 1980

Dr. Joseph R. Curray
Geological Research Division
Scripps Institution of Oceanography
La Jolla, California 92093

Dear Dr. Curray:

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Assistant Marine Biologist

GHB:md

UNIVERSITY OF HAWAII
Hawaii Institute of Marine Biology
Coconut Island • P. O. Box 1346 • Kaneohe, Hawaii 96704
May 12, 1982

Dr. Joseph K. Curray
Geological Research Division
Scripps Institution of Oceanography
La Jolla, California 92093

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Feb 20, 87

Jerry-

Attached are copies of most of the letters I exchanged with Dr. Curray in order to correctly ID the turtle referred to by Landis back in the 1960's. Quite a bit of effort went into this, especially on Dr. Curray's part locating his notes, slides and superb film footage. My letter dated September 1, 80 provided Dr. Curray with the accurate identification, Lepidochelys olivacea (olive ridley), not C. mydas as repeatedly published.

Since Dr. Curray apparently told you about our earlier detective work and reidentification, I wonder if you would please consider crediting us for this information in the paper you and Karen Eckert plan to publish? I would be most appreciative, unless of course you feel such credit is inappropriate. You might list it as "J. Curray and G. Balazs, personal communication".

What needs to be done now is depth recording work on the olive ridley. I can take you to a nice place in Michoacan to do this, if you have the grant money!

Aloha,



23 March 1987

Mr. George H. Balazs
National Marine Fisheries Service
2570 Dole St.
Honolulu, Hawaii 96822-2396

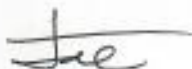
Dear George:

I was pleased to receive your note. Every so often in my office I move the turtle file from one place to another, and think about the possibility of our getting out that short note. Is it too late? If not, let's do so before it is too late. I can provide some base maps as necessary to show the location, but you as first author should describe and document the identification of the turtles. I can add any description you think appropriate about the dives, the environment, etc.

Jerry Kooyman recently reminded me of the turtle business. When he borrowed the movies, however, he could not find the turtle sections. It may be that we had high-graded the routine movies, and had them in a separate reel which I could not locate. Help me to refresh my memory. If we cannot find them, I might want to copy your copy.

I am currently at the start of a six month sabbatical, hiding in the mountains of Utah. Writing manuscripts is my goal for the sabbatical, so this is a good time for me to contribute to this short note. I hope you are agreeable to the idea. I have many little loose ends like this I would like to tidy up.

Sincerely,



Joseph R. Curray

→ [Temporary address:
Box 141
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Schedule

- Feb. 3 - biological investigations in La Jolla Canyon and region between canyon branches to depths of about 600 ft. Fager in charge, Stewart and possibly Flechsig diving.
- Feb. 4 - geological observations at break of shelf north of Sumner Canyon to depths of 600 ft. Winterer in charge.
- Feb. 5 - geological observations at canyon intersections - first in upper Sumner and second at lower end - depths to 1000 ft. Shepard in charge.
- Feb. 6 - geological observations along Sumner canyon, depths to 1000 ft. Inman in charge.
- Feb. 7 - geological observations in canyon as directed by Shepard.
- Feb. 8 - geological observations in canyon as directed by Inman, possibly including dive by E. Murray.
- Feb. 9 - thermal microstructure measurements off coast (about 10 miles, as directed) to depths of 500 ft. Helle in charge.
- Feb. 10 - thermal microstructure, continued. Helle in charge.
- Feb. 11 - geological observations on Coronado Bank to depth of 300 ft. Curray in charge.
- Feb. 12 - Instrument test operation off SIO for IGPP to depths of 500 ft. Deadner in charge, possibly Snodgrass and Munk diving also.
- Feb. 13 - geological observations in La Jolla and Sumner Canyons, depths to 1000 ft. Dill in charge.
- Feb. 14 - available to work on items of interest developed during previous period.

Saucer dives made by workers at Scripps Institute of Oceanography*

<u>Date</u>	<u>Dive</u>	<u>Map Legend</u>	<u>Depth</u>	<u>Observer</u>
Jan. 29	126		170 m	Dr. Spiess
Feb. 3	134		160 m	Dr. Fager
Feb. 3	135	7	165 m	Mr. Flechsig
Feb. 3	136	1	140 m	Mr. Stewert
Feb. 4	137		140 m	Dr. Winterer
Feb. 5	138	11	170 m	Dr. Shepard
Feb. 5	139	6	240 m	Dr. Shepard
Feb. 6	140	2	150 m	Dr. Inman
Feb. 6	141	12	175 m	Dr. Inman
Feb. 7	142	4	310 m	Dr. Shepard
Feb. 11	145	8	195 m	Dr. Curry
Feb. 12	146		80 m	Dr. Munk
Feb. 12	147	10	140 m	Mr. Dill
Feb. 13	148	9	116 m	Mr. Murray
Feb. 14	149		100 m	Dr. Bradner
Feb. 14	150	5	180 m	Dr. Fager
Feb. 14	151	3	120 m	Mr. Ford

* Actual schedule deviated only slightly from planned schedule.

The diving saucer at Scripps Institute of Oceanography

In February of 1964, Scripps Institute of Oceanography leased the the diving saucer or Soucoupe, also nicknamed Denise, from Underseas Division of Westinghouse Electric Corporation under an agreement this company has with Captain Jacques-Yves Cousteau, builder of the craft. The February sojourn for Scripps consisted of one week for Westinghouse, two weeks for Scripps, another week for Westinghouse and finally a week at San Clemente Island.

On March 4, 1964, an additional dive in the Bathyscaph "Trieste" was made by Francis P. Shepard and Robert Dill, to a depth of 450 fathoms on the alluvial fan outside the inner canyons.

The trial operation with the saucer had two main objectives; to study the Scripps and La Jolla Canyons to depths of 1000 feet and to test the operational versatility of the saucer with the possibility of purchase at a later date.

The objectives of those scientists from Scripps Institute participating in the project more specifically included, the origin of the submarine canyons, erosional processes, sediment transport, distribution and abundance of marine life and the placement and location of bottom instruments.

Thirteen scientists from Scripps Institute took part in the two week study. These workers took photographs (still and moving), made a limited number of collections and recorded their observations verbally on a tape recorder.

A Short History and Description of the Saucer

In 1959, marine science fiction became fact. Capt. Jacques-Yves Cousteau had directed the development of a two man baby submarine, capable of dives up to 1000 feet for periods of 4 to 6 hours. This same team has continued research in this exploratory field and later this year (1964) in conjunction with Westinghouse, will launch a vehical twice the size of the 4 by 6 foot soucoupe. It will be called the Deepstar and will be able to carry three men to 12,000 feet.

The two man submersible is also known as "Denise", after the wife of her designer. It has now made dives all over the world and recently was used in Cousteau's "Home in the Sea" experiment in the Red Sea. (Conshelf II)

The first model was initially tested in the Mediterranean, but as the unmanned saucer dipped below the surface, a cable parted and the steel bubble sank some 3,300 feet below. Echo sounding records showed that it remained in tact and thus the Cousteau team were confident of a 3 to 1 safety factor for 1000 foot dives.

The first manned undersea flight in the saucer was made off Puerto Rico in 1959 during the National Geographic-Calipso Expedition. It proved successful. "Ca marche!"

The saucer hull consists of two, three-quarter inch steel discs which have been welded together and fibreglassed. A control instrument panel girdles the interior of the pressurized hull: depth gages, barometer, compass, ammeters, hydraulic pump, tape recorder, an EDO sonar unit that gives readings of the distance from the surface, bottom or any obstacle, an air cleaning system that removes CO₂, and a sonar pinger which allows location

from the surface. Exterior equipment includes; headlights, a high speed still camera, flash for the camera, a retractile flood lamp and a moveable arm.

About 50 pounds of balast is added before every dive and is dropped just prior to ascent. Mercury balast controls horizontal balance. And finally, a 330 pound weight can be jettisoned in case of an emergency.

On the top of the shell is a large hatch that is fastened down from the inside. Two plexiglas ports allow observation and photography. If the vehicle somehow becomes lodged or caught on the bottom, escape is possible. By increasing the internal pressure, the hatch can be lifted. Two aqualungs are available for this rare emergency.

Thus the Soucoupe represents a gigantic step enhancing the progress of oceanographic exploration. Similar developments like the Deepstar will even further this quest. Hopefully what has been too deep for direct observation will soon become a laboratory for the marine scientist. Perhaps within a decade the continental shelves and their resources will no longer be a secret known only to nature.



Figure 1. Stan Waterman is pictured entering the saucer before a dive off San Clemente Island. Photo by Ron Church.

Transect running 020° across La Jolla Canyon

Falco

Area: Cod Hole (Range, La Valencia Dome on white life guard stand in La Jolla Cove)

Just west of transect line

Sheepshead (*Pimelometopon pulchrum*), Blacksmith (*Chromis punctipinnis*)

Eugorgia rubens, *Lophogorgia chilensis*, *Muricea californica*; sand-rock interface

30 mtrs, 85° slope, rock-sand

Rust coral (*Adelogorgia phyllosclara*)

Barred Pile Perch (*Rhacochilus vacca*), white sponges on rock

Has appearance of being scoured in this area--many small tributaries like Cape San Lucas Canyon

40 mtrs. Sand rock interface

Shelf covered with sediment

Lots of detrital algae (*Phyllospadix*, *Egredia*, *Laminaria*)

Crossing what appears to be transect line

Drop off

More detrital algae on slope (*Phyllospadix*, etc.)

Canyon looks like it might have slid off in here. Lots of rubble rock, usual types of gorgonian (*Eugorgia rubens*, *Lophogorgia chilensis*, *Adelogorgia phyllosclara*)

We are in bottom of tributary

50 mtrs, still light

Adelogorgia phyllosclara very common

Small white brachiopods, probably like Fager saw.

Small yellowish, solitary coral abundant on rock; at least two genera collected

School of *senoritas* (*Oxyjulius californicus*) Lots of snow

Several types of bryozoans--*Phidolapora pacifica*

Crested gobie (*Coryphopterus nic*) white sponge on rocks

Large pinkish brachiopods three inches across. May be *Terebratalia transversa*

Many solitary corals

Broken rocks, probably shale, on sediment slope shows signs of heavy boring

Still have light

New sponge coming in, bright yellow

50 mtrs.

Crested gobie

Tree fish (*Sebastodes serriceps*)

Sun star (*Pyconopodia helianthoides*)

Lizard fish (*Synodus lucioceps*)

Catalina gobie (*Lythrypnus zebra*)

Small sculpin (*Scorpaena guttata*)

Small yellow brachiopods we found on Murray's Point, here in rock

Detrital *Macrocystis* and *Phyllospadix*

Still 50 mtrs.

Canyon has much the same appearance of Cape San Lucas Canyon

Looks like piece of 1/2-inch copper pipe, sticking out of rock; must be worm tube

Convict fish (*Oxylebius pictus*)

More solitary coral

Looks like start of branching stoney coral but may be sponge. Too far to see

Crested gobie (*Coryphopterus nicholsi*)

Large bluish-purple cancer-like crab under rock, about 12 inches across

Small astropecten-like starfish on sediment. Lots of *Lythrypnus zebra*

Very rounded appearance to bottom of tributary, sediment lapping up on sides of slope.

Picked up piece of orange gorgonian, probably *Adelogorgia phyllosclara* on rock

Large *Eugorgia rubens* 2-1/2 to 3 feet

Looks like octopus has eaten cancer crab

Very small crested gobie (*Coryphopterus nicholsi*)

Large population of rock fish (*Sebastodes minniatus*)

Detrital algae--*Phyllospadix*, etc.

Area has appearance of area under waterfall at "Shepard's Rock." Pieces of rock lying on sediment slope

Collected another rock (small rock with *Adelogorgia phyllosclara*, solitary corals)