

NARRATIVE

Stanford Oceanographic Expedition 17 began on 3 January 1968 in Monterey, California. All hands spent the 3rd loading equipment on the ship and stowing and tying down gear. The ship cleared Monterey breakwater at 1800 right on schedule, a fine omen for the punctuality of the rest of the cruise. (It turned out that Cruise 17 made every scheduled arrival and departure on time, and with help of wind and current was even able to add a one day un-scheduled visit to Isabella Island on Leg 1.)

During the 2-1/2 day run down to San Diego the chief scientist discussed with each student the research he intended to do on Cruise 17. Each student had prepared a more or less detailed research proposal and with this preparation requirements for ship time and space could be discussed. Captain Chylinski gave a lecture on the ship, her operation, and the rules of life on shipboard. The major activity on the run between Monterey and San Diego was unpacking, setting up, and preparing equipment. It was a fine experience to have to set up the equipment while at sea; everyone learned rapidly the need for securing all gear. Te Vega entered a busy San Diego harbor at midnight on 5 January.

On 6 January the students spent all day at the San Diego Zoo and Drs. Barber and Dunson and Lt. Dunlap visited Dr. George Pickwell and were shown around the biology section of the Naval Undersea Warfare Center. The tour included a look at Deepstar, NUWC's submersible, and also a visit on board the R/V Alpha Helix which is docked at the nearby Scripps Institute of Oceanography pier.

Te Vega left San Diego at 1700 6 January and sailed down the coast of Baja California towards the next port, Acapulco, Mexico. In the morning of 7 January Mr. Davoll gave a talk on hydrocasts and the equipment and methods of physical oceanography. After the talk a hydrocast was made, the highlight of which was hanging 15 bottles on the wire and having 16 when the wire came up. Dr. Dunson talked on ionic and osmotic regulation in animals in general and reptiles especially. Mr. Norton talked on oceanographic chemistry the next morning and a second hydrocast was made. With the jib and fore-staysail aback Te Vega was stationary in the water and our wire angle was zero. The first trawl went into the water at 1900 on the 8th of January and while the trawl was down, Lt. Dunlap talked on his previous DSL research and his plans for this cruise. In addition the midwater trawl a plankton net was towed immediately behind a nightlight which was held down by a hydroweight. Both nets gave us an interesting introduction to the larger oceanic organisms. The next day we sampled successfully with the epibenthic dredge in 4000 m of water but the sediment contained no interstitial fauna, much to Miss McGinty's disappointment. The students all gave talks on their research during the next few days and continued to work on their individual research. Dr. Barber talked on primary production, its significance and how it is measured. Dr. Dunson talked on isotope tracer techniques and Miss McGinty talked on the nitrogen cycle and the forms of combined inorganic nitrogen found in the sea.

On 16 January the coast of Mexico was close by and we began to see sea snakes in the water along with many other organisms such as salps, Porpita, and swarms of blue pontellid copepods. Dr. Dunson netted 14 snakes which provided him with experimental material throughout the cruise. The snakes proved to be interesting laboratory pets; they fed and mated among other things and two were still alive at the end of the cruise. Te Vega sailed into Acapulco harbor and continued under sail right up to the anchorage.

In Acapulco, Te Vega loaded fuel, oil and water and picked up Dr. Kuenzler. Dr. Barber and several others spent the day aboard the University of Washington's ship the R/V Thomas G. Thompson. The Thompson's chief scientist, Dr. Dugdale, was chief scientist on Te Vega's Cruise 13 and had sailed with several of the scientific party on other ships so there was a great deal of ship talk all around. By 2000 Acapulco was astern, the stay there lasting only 28 hours.

From Acapulco the ship headed down the 100°W meridian towards a position south of the equator; along this section the main open ocean research of the cruise was to be done so the activity increased. Mr. Chandler and Lt. Dunlap gave a symposium on oxygen in the sea. Dredging, trawling and hydrocasts were done regularly. After the first successful, but tangled, epibenthic dredge more caution was used and less wire was put out. The result was that in three dredging attempts apparently none reached the bottom. A symposium on the reality of the community concept was held with Mr. Strickland and Mr. Howmiller attacking the concept, and Mr. Barr and Miss McGinty defending it.

On 20 January Te Vega made a hydrostation and a series of trawls and neuston samplings in a dense mid-ocean bloom of Rhizosolenia and accompanying zooplankters, especially radiolarions. The water temperature fell from 27.5°C to 25°C as we entered the bloom, and primary production was very high, 1.65 gC/m²/day in the bloom as compared to 0.25 gC/m²/day at the following station. The most dramatic difference, however, was the increase in the volume of the neuston in the bloom.

Dr. Barber talked to the crew and officers about biological oceanography and what it tries to accomplish. On 22 January a second successful epibenthic dredge haul was made in about 4000 m of water but again no interstitial fauna was found in the sediment. Hydrographic work, trawling and neuston sampling continued and the pace increased as we approached the equator and the stations were located at 1° intervals. A turtle was sighted on 23 January and Captain Chylinski's crew carried out a lightning-quick "man-overboard" launching of a Boston whaler. Art Weiner joined the crew in the whaler and bulldogged the turtle into the skiff in a few minutes. Dr. Dunson made a few measurements on salt excretion and the turtle was released unharmed, but undoubtedly a bit confused by all the activity. Among the animals that have had their salt metabolism investigated by Dr. Dunson were several seabirds. One of these birds, a boobie, was released on the fantail but liked the ship so much that it refused to leave. Such was the mood of Cruise 17; the cruise went so well that even birds once aboard didn't want to leave!

Te Vega had sailed continuously since she left Monterey except for a few brief becalmings off the coast of Baja. On the 25th of January we were under sail alone for the first time; the motion of the ship under sail alone was a delight to everyone and most importantly only 70 gallons of fuel oil was consumed in 24 hours. By the 27th the ship was at 1°N and we made bathythermograph lowerings every six nautical miles to document the Cromwell Current upwelling. Te Vega arrived at the equator exactly at 1400 on 28 January and King Neptune came aboard with his queen to initiate the polywogs into the mysteries of the deep. Despite some resistance, King Neptune, of course, carried the day and the kingdom of the sea has a few more shellbacks.

On the equator the scientific party trawled, made hydrocasts, sampled neuston and recovered from the crossing ceremony for two days. The midwater trawl group, Lt. Dunlap, Mr. Peterson, Mr. Anctil, worked more or less continuously for 48 hours, and Mr. Strickland was a regular resident on the bowsprit tending his neuston sled.

At 3° and 4°S Mr. Weiner made hydrocasts to the bottom looking for evidence of Antarctic water. The 100°W section was completed on 3 February and the ship turned northeast heading under sail alone towards 94°W and 2°S where another 3-station section was to begin. On 5 February the section began and stations at 2°S, 1°S and 00° were occupied. The increased richness of the water at 94°W was impressive, reflecting the surfacing of the Cromwell Current as it collides with the Galápagos Islands.

Dr. Kuenzler discussed his work on phosphorus cycling and the excretion of dissolved organic phosphorus and Dr. Dunson discussed his current findings on the salt metabolism of sea snakes and some research he did early in the cruise on O₂ consumption by the red crab, Pleuroncodes planipes. When the second section was completed Te Vega headed towards Isabella Island of the Galápagos. An approach was made on 9 February to an area which appeared to offer a good anchorage and sheltered water for diving and shore work. The day of February 10th was spent working in this area named Noah's Coves by one of the seamen. A poison station, diving, beach collecting, as well as an inland hike were carried out. The hike acquainted everyone with the inhospitable Galapagos terrain. The shore around Noah's Coves consisted of fields of boulder-sized lava rubble; the rubble is crumbly and very sharp and very difficult to cross. We left Noah's Coves about 1700 and had a beautiful night of sailing around the southeast tip of Isabella. On 12 February the students began progress reports covering their research during the first leg. The night before the reports began Miss McGinty ably supervised an all-student-prepared meal. Mr. Chandler was chef and prepared Yorkshire pudding and roast beef.

In the middle of a progress report the scientific party was told that the ship was entering large patches of red water. Feverish activity began including a hydrostation, productivity measurements, and collection of the causative organisms, Cyclotrichium meunieri.

Dr. Barber had found red water caused by the same organism in 1966 in a location 90 miles to the south of Te Vega's position. As there are no other records of this organism causing red water on the Ecuadorian coast, everyone was interested and impressed with the extent and vividness of the bloom of Cyclotrichium meunieri. Perhaps the most startling finding was that at dusk the organisms seemed to disperse downwards. First the red patches became fainter, then they disappeared completely, and observers on the spreaders were unable to see any red water where previously it had stretched to the horizon. During the day the secchi disc visibility in the red water was 0.3 m; after dark with a nightlight the secchi disc was visible 10 m down. In the red water and at the surface at night after the red ciliates had dispersed downwards there were extremely rich zooplankton populations. Surprisingly large numbers of the diatom, Rhizosolenia, were also present in the surface water.

After the excitement of the red water 15 February was a quiet day. The ship entered the Gulf of Guayaquil, picked up a pilot and proceeded up Estero Salado to the Puerto Neuavo, the new ship docking facilities of Guayaquil.

Leg 1 of Cruise 17 was a success in all respects. All the planned activities were carried out, although some operations such as the dredging didn't yield the results that were hoped for. No project was curtailed due to gear failure or ship-related problems. In addition to being productive and trouble-free, Leg 1 also set some Te Vega records for endurance. The ship was 26 days out of sight of land, Acapulco to Isabella Island, and 30 days from port to port, Acapulco to Guayaquil. That they had been at sea for 30 days was clearly evident by the eagerness with which all hands went ashore. The shore liberty had been well earned.

While in Guayaquil in addition to resupplying and refueling the ship several days were spent purchasing scientific equipment and chemicals. Trips to the chemists and scientific suppliers with an agent from the Grace Company proved to be a fascinating, and rewarding, experience since eventually everything that was required was found. Dr. Hedgpeth and Mr. Baldrige joined the ship, bringing with them the anxiously awaited mail.

Each day in Guayaquil various groups investigated the surrounding mangroves. One of the objects of this study was to compare the mangrove community in the Estero Saluda estuary with the mangrove communities found in the Galapagos. The mangrove work was supervised by Dr. Kuenzler and later he ably summarized and presented the findings in a mangrove seminar that was held shortly after leaving Guayaquil late in the afternoon on 20 February. After dropping the pilot two hauls were made with the epibenthic dredge in the shallow waters of the Gulf of Guayaquil. Each haul provided a garbage can full of sediment which was examined for interstitial fauna by Miss McGinty. Two hauls with the small otter trawl were also made in about 30 fathoms of water in the Gulf and each yielded an extremely diverse catch of crustaceans and fishes.

On 21 February the ship was approaching the area where the red water had been found seven days earlier. The sea was calm with very pronounced glassy slicks and a large swell. The slicks were confused with no obvious orientation to the swell or wind, indicating that they were neither internal wave nor convection cell slicks. At 1600 the red water was spotted again about 30 miles east of the location where Te Vega had encountered it on 14 February. The first activity was for Dr. Kuenzler and Mr. Barr to go overboard with SCUBA to see how thick the bloom was. They found it to be about 10 ft thick and although visibility in the bloom was less than one foot there was enough light beneath the bloom to take photographs. Productivity and chlorophyll measurements indicated that this bloom was as rich as the one found a week earlier. The causative organism was definitely the same and great numbers of the ciliate were harvested by centrifugation for pigment analysis and morphological studies. As the sun set the red patches became fainter and eventually disappeared just as the previous bloom had done. All the ciliates in a 30/l. carboy accumulated in a layer on the bottom of the vessel as it became dark; the next morning some of them began to swim upwards as the sun came up. Other experiments with ciliates in small bottles indicated that the organisms were strongly attracted to weak or moderate strength sunlight, but that cells placed in full noon sun in bottles soon disintegrated.

As with the first bloom everyone was impressed with the important role these blooms must play in the biological economy of this area. The general richness of the area was underscored when on 22 February we encountered about 12 sperm whales. The ship circled and pursued them, making pass-after-pass right through the pods. One pod with a very small calf allowed the ship to pass very close several times.

On the evening of 22 February a red water seminar lead by Dr. Barber was held. Many of the observations on the red water blooms were summarized and integrated. On 23 February Dr. Hedgpeth gave a thorough and fascinating lecture on the history of marine biology.

At dawn on 24 February the island of San Cristobal was in sight. The captain went ashore to complete formalities necessary for entering the Galapagos. By noon we were on our way to Academy Bay. Arriving in the afternoon in heavy downpour Te Vega anchored in the famous bay off the Darwin Foundation Research Station. Ashore the scientific party met the staff of the Station, Dr. DeVries, the assistant director, and Mr. Severs, the manager. Mr. Perry, the director, was off climbing on Fernandina as part of his continuing search for tortoises on that island.

The second day at Academy Bay one group went inland attempting to reach the turtle reserve, but most of the scientific party went diving and began their Leg II research projects. It was not appreciated until later, but Academy Bay and environs offered some of the best diving available in the Galapagos. The water is relatively warm, quite clear, and great faunal variety is present. After another day of diving and intertidal work Te Vega left Academy Bay heading for Conway which is on the northwest side of the same island as Academy Bay. Three guests from the Station joined Te Vega for

transportation to Genovesa Island. They were Dr. and Mrs. Hovenhogel, a Belgian couple studying the hydroids of the islands, and Mr. Gilsäter a photographer filming documentaries for Swedish television.

Early on 27 February Te Vega anchored off Conway Bay and all hands went ashore to assist Dr. Hedgpeth in a study of the beaches. The beaches at Conway Bay as well as elsewhere in the Galápagos were found to have a relatively sparse fauna associated with them. For example, we had a standing order for 25 living Emerita from Mr. Eickstaedt at Hopkins Marine Station. Despite some effort to find them, only three Emerita were seen during the entire cruise.

After the beach study was completed our scheduled departure from Conway Bay for Genovesa Island was delayed a few hours while the chief mate returned from a goat hunt. While waiting, Mr. Gilsäter shot films of Te Vega sailing among Guy Fawkes Rocks. Mr. Gilsäter assured us that the footage is excellent with several telephoto shots of Te Vega with all sail up.

The ship left Conway Bay at sunset on 27 February and arrived at Genovesa at dawn on the 28th. The ship anchored outside of the bay formed by the flooded caldera while the chief mate, Mr. Boysen, bouyed a channel across the sill that separates Darwin Bay from the open sea. While the sounding and bouying were being done, the scientific party began their work. Mr. Chandler and Mr. Howmiller assisted by Bruce Babcock set out overland for Arcturus Lake, the hypersaline lake found by Beebe and named by him after his ship. Among the equipment packed into the lake was a rubber raft, in situ oxygen meter, Van Dorn bottles, sample bottles, and plankton net, so the resulting work was thorough.

Mr. Boysen was able to locate and mark a 100 m wide, 10 fm deep channel across the sill. The hydrographic chart of Genovesa Island shows only one or two fathoms of water over the sill, but the soundings taken by Mr. Boysen showed depths much greater all along the sill.

Once inside the caldera that forms Darwin Bay, Te Vega anchored off the small landing beach and our guests went ashore to set up their camp. During the stay within the caldera hydrocasts were made on three days and a party went inland to Arcturus Lake each day. The lake was extremely productive, anoxic below 10 m and very saline. Among the many projects carried on were Mr. Baldrige's study of the rare Galapagos fur seal and Mr. Dunson's study of the salt metabolism of the marine iguanas. In retrospect everyone agreed that Genovesa was the most interesting island Te Vega visited in the Galapagos. The wealth of unique environments and organisms would justify a stay of a month.

On 3 March after a final busy day at Genovesa Te Vega left the island heading for Isabella Island. With a 2-knot boost from the current the ship arrived off Cape Berkeley, the northwestern tip of Isabella, at 0700 on 4 March and made a hydrocast on the equator and about 5 miles off the island. At 1400 Te Vega anchored in the cove to the south of Espinosa Point and several groups went ashore.

The shallow areas around Espinosa proved to be harder to work than Genovesa or Academy Bay. There were fewer organisms, visibility was poor and the water was cold. After two days at Espinosa Te Vega crossed Bolivar Canal to an anchorage between Black Cove and Tortuga Point. The ship's longboat was unable to land because of the heavy surf so the ship moved down the coast a few miles to the protected water of Tagus Cove. During the day spent here Drs. Hedgpeth and Dunson, Mr. Baldrige and Miss McGinty visited the long beaches between Tortuga Point and Black Cove. Mr. Howmiller and Miss Gramoni studied the saline lake inland from Tagus Cove, and Mr. Strickland continued his work on the behavior and movements of sea urchins by marking individuals in the cove.

After midnight on 7 March Te Vega left the cove for the short run down to Perry Isthmus. Enroute down the Bolivar Canal between Isabella and Fernandina the otter trawl was fished in waters from 31 to 68 fms. Despite reports of foul and generally untrawlable bottom, no trouble was encountered and the trawl, in addition to being full, was undamaged. The catch consisted of a large variety of fishes and invertebrates with solitary corals most abundant. Among the unusual fishes were 20 batfish of various sizes.

At dawn on 8 March Te Vega anchored close to several small islands in what proved to be a rich and interesting area. Mr. Chandler found dense and varied stands of benthic algae and Mr. Barr was able to continue his observations on lobsters. The 20°C water made diving without a wetsuit difficult; future workers in the Galapagos are advised to bring wetsuits. The most impressive organisms of the many present on the cliff faces were great furry masses of gorgonians.

Mr. Weiner and Mr. Howmiller found a small mangrove surrounded lagoon that had relatively fresh, warm water on the surface and cold seawater on the bottom. They included this lagoon in their studies of the "limnology" of the Galapagos.

On 10 March the ship moved a few miles from Perry Isthmus to Noah's Coves, Te Vega's first anchorage in the Galapagos a month before. After a full day's work here the ship sailed after midnight to Iguana Cove on the southwestern tip of Isabella. The shore around Iguana Cove looked interesting. The marked intertidal zonation with dense zones of brown algae attested to the violent surf which keeps the high zones constantly wet. The coast was very steep and the slopes of the mountain rising straight from the water were heavily forested. Unfortunately no landing or safe-diving location was found; reluctantly the ship left heading towards Academy Bay. A hydrostation was made in 2000 m of water just a few miles off Iguana Cove.

At dawn on 12 March the ship was once again anchored in front of the Darwin Foundation Research Station. One of the benefits the scientific party reaped from Captain Chylinski's navigating and piloting skill was that the ship was able to make most of the intra-island hops at night. Thus the scientific party lost a minimum of precious daylight time and everyone was able to experience many times the special thrill of going on deck at dawn and seeing a new island.

On this visit to the Darwin lab Te Vega picked up a much-needed drum of outboard motor fuel and attempted to fill the SCUBA tanks with Dr. Hovenhogel's compressor as our compressor had broken down at Genovesa. As it happened, the shore-based compressor was also inoperative, thus the scientific party was forced to make do with the small amount of air remaining in the air tanks and compressor bank.

The students, especially those working on coral distribution and physiology, Mr. Weiner and Miss Gramoni, were eager to work again in the waters around Academy Bay. Corals and several other groups of organisms common at Academy Bay and Genovesa were either very reduced in number or completely missing in the subtidal zone on Isabella and Fernandina Islands. Mr. Chandler found that he was able to collect many species of benthic algae on his second visit to Academy Bay that he didn't find on our first stop. This experience, to a greater or lesser degree, was shared by everyone; as we became familiar with the intertidal and subtidal environments many things that went unnoticed at first now came to our attention. This awareness and partial understanding of a virtually unknown environment was one of the benefits everyone gained from Leg II of Cruise 17.

At 0400 Te Vega picked up the anchor at Academy Bay and headed to Las Plazas Islands. The ship arrived at the small islands, which are 20 miles northeast of Academy Bay and about 400 yards off Santa Cruz Island, at 0800 on 13 March. These islets are two tilted slabs of rock about a half-mile long with a narrow channel running between them. The area proved superb for diving and everyone was able to pursue his research problem profitably. After some discussion it was decided that we would remain at Las Plazas for three days. Dr. Dunson investigated the salt metabolism of the land iguanas which are very numerous on the southern islet. Mr. Strickland was able to observe the nocturnal behavior of sea urchins for several nights. Mr. Barr continued his lobster studies and included several nights of observation. Mr. Peterson and Mr. Anctil made another poison station, adding to their growing store of fishes to identify and measure. One of the interesting aspects of diving around Las Plazas was the manta that kept everyone company. They appeared to be feeding on swarms of blue copepods as they slowly swam around, circling and looping the loop with their mouths agape. On the third day at Las Plazas Mr. Barr and Dr. Barber speared a 13 ft manta and brought it to the ship where it was hoisted aboard.

As the manta was dissected on deck, it was possible to examine closely the very large and efficient filtering mechanism that these fish feed with. Unfortunately, the gut contained only a pea soup-like liquid; most probably the animal digested a great deal of its recently-eaten food during the 3 hour battle after it was harpooned. Despite the lack of identifiable gut contents it was a valuable exercise to take apart one of these common, but little-studied, animals.

The ship left Las Plazas at sunset on 15 March as the manta dissection was taking place. At dawn on 16 March Te Vega anchored off Cormorant Point of Santa Maria or Floreana Island. This area also proved excellent for diving; the water was relatively warm, that is 23°C to 24°C, and visibility was good. Sharks were quite abundant especially at night but not especially aggressive. Mr. Barr, during his night dives to observe the feeding behavior of spiny lobsters, met several large sharks at close range in Cormorant Bay. Around Cormorant Point and the nearby tiny rim of rocks called Onslow Island Mr. Weiner and Miss Gramoni found large areas of coral and Mr. Chandler collected some unusual forms of coralline algae.

All hands paid a visit to the mail barrel at nearby Post Office Bay and left mail for the next ship to pick up. The crew attached a plaque with Te Vega's name and called letters to the many around the mail barrel.

Dr. Kuenzler continued his mangrove studies in the area around the salt pond near Cormorant Point. Among the work done were attempts to estimate the amount of organic matter per unit area and a thorough collection of all the flora and fauna associated with the mangroves. By the end of the cruise Dr. Kuenzler had accumulated quite a store of information on the mangrove community; his work will contribute much to our understanding of the synecology of this community.

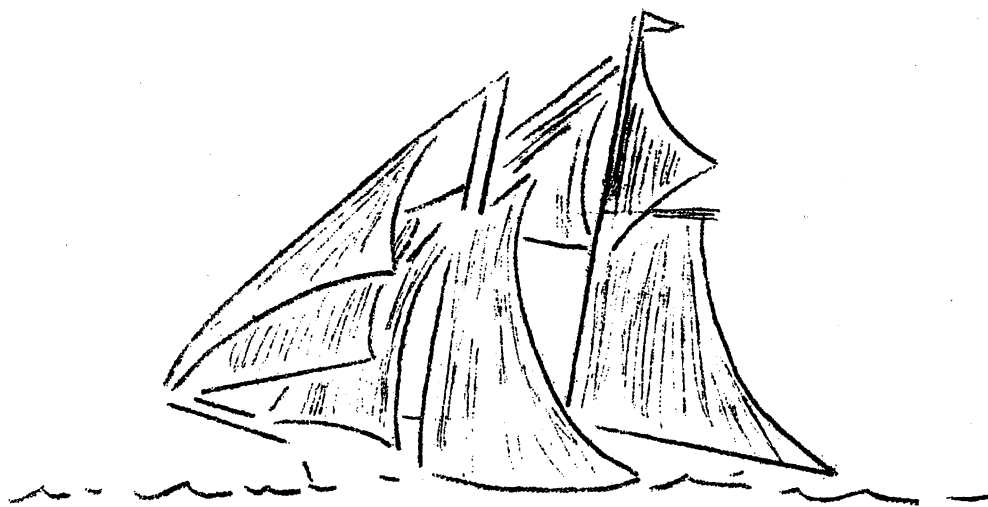
Dr. Hedgpeth found conditions around Cormorant Point ideal for his studies on beach fauna. On one side of the point there was a fine grained, firmly packed coral sand beach while on the other side of the point 100 yards away there was a steep, large grained, loosely packed lava sand beach. Mr. Baldrige spent the time here observing a colony of about 20 flamingos that live in the salt pond.

In the early morning of 18 March Te Vega upped anchor and moved a few miles down the coast of Floreana to the settlement of Black Beach. At this location Dr. Hedgpeth continued his work on intertidal zonation in various habitats in the Galapagos. Mr. Barr checked the area for lobster abundance and distribution while most of the rest of the scientific party hiked inland to the Wittmer's farm. Dr. Barber and Captain Chylinski spent the morning talking with Frau Wittmer, the authoress of the well known book Floreana. In addition to being an authority on the history of the Galapagos Islands Frau Wittmer was also a fascinating source of information on the various ships and scientific expeditions that have visited the Galapagos in the last 35 years.

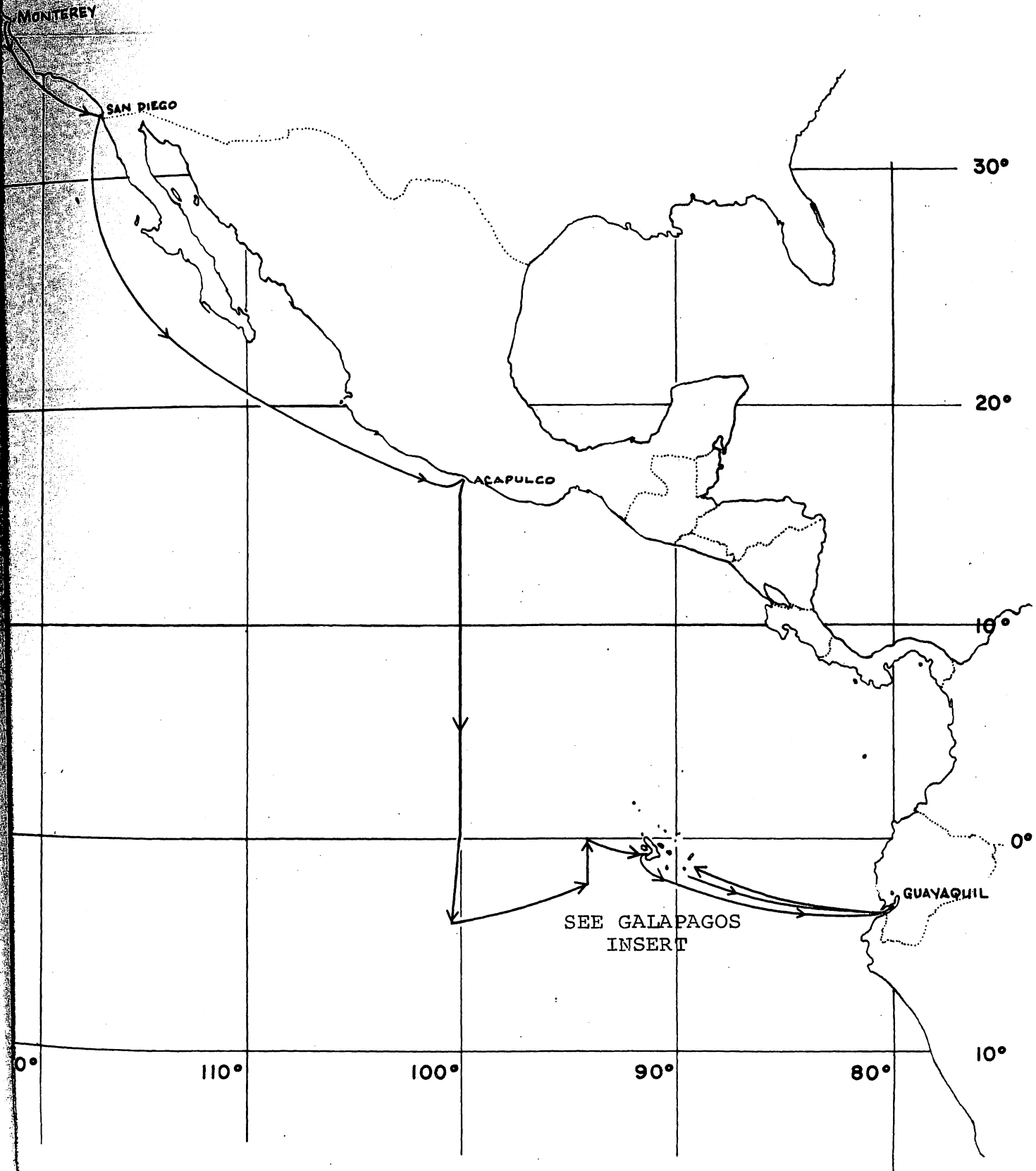
At sunset on 18 March after everyone had enjoyed the Wittmer's hospitality we sadly left our last anchorage in the Galapagos and started the long job of working up the data. At 0900 the next morning the ship stopped briefly in Wreck Bay so that Captain Chylinski could go ashore and formally leave the islands. The formalities were completed in a few hours and by noon Wreck Bay was disappearing astern. During the run from the Galapagos to the South American mainland the working space below decks was crowded with graph paper, charts and manuscripts covering all available space.

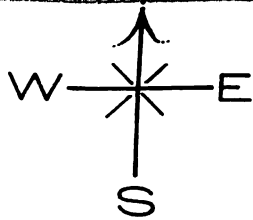
The students in their preparation of the cruise reports did a job of which the faculty is especially proud. The students completed and submitted on schedule 20 reports covering the work they had done on the cruise. To complete the reports under the crowded, hot, and vibrating conditions of the ship required a great deal of effort. The students' superb performance in this job was a fitting end to the cruise. When the coast of Ecuador came into sight all hands prepared to leave the ship and take some well-earned rest ashore.

Richard T. Barber



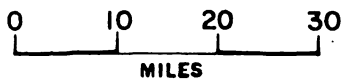
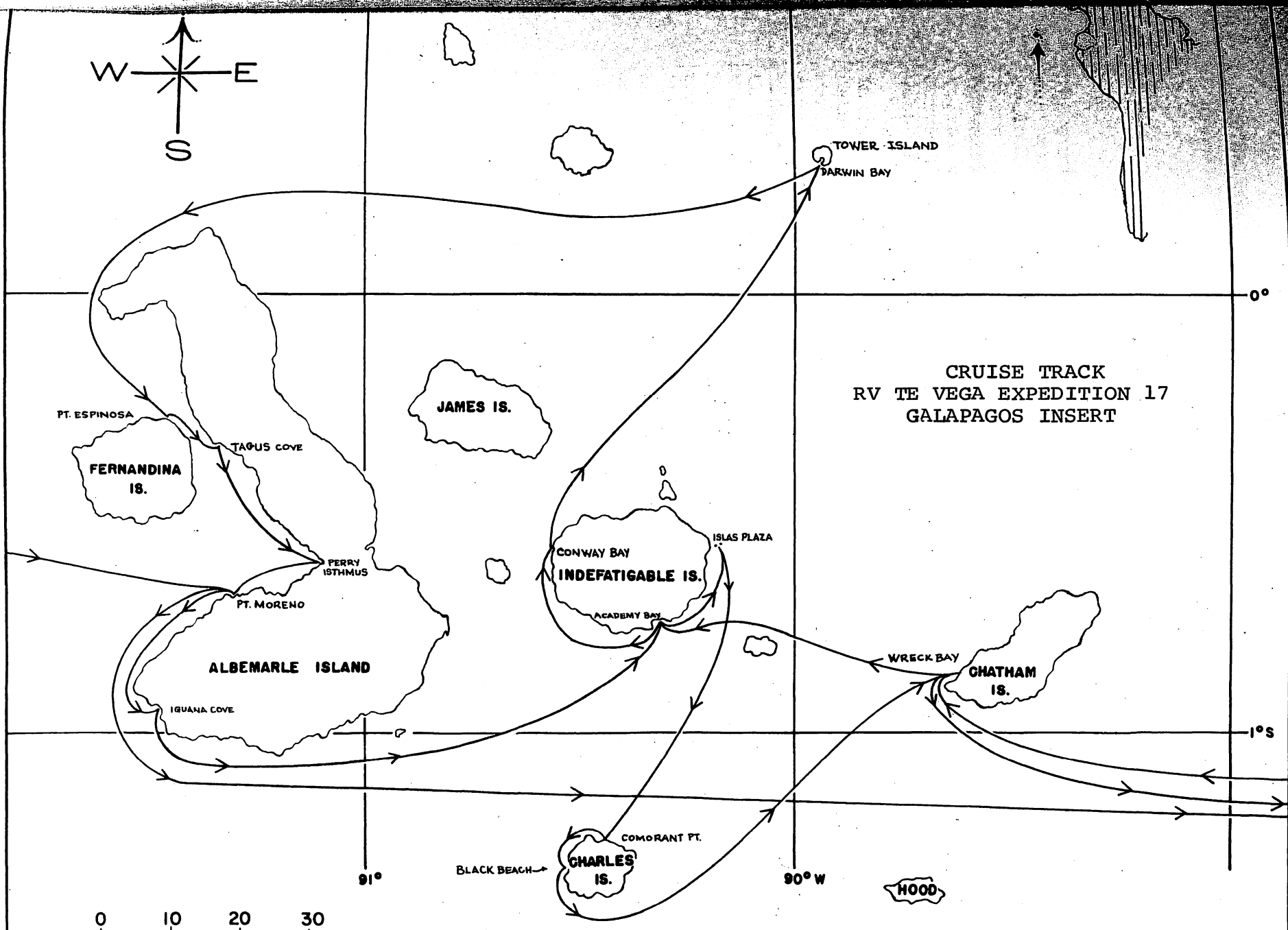
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GALAPAGOS INSERT

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GALAPAGOS ISLANDS

HOOD