

## NARRATIVE

A barking of seals on the Monterey breakwater, the chug of fishing boats, seagulls in a line along the roof peak of the dock warehouses, surf breaking along the unprotected outer harbor rim - - these signaled the start of RV TE VEGA'S Cruise 19 at 0600 on 28 June 1968.

A mere two weeks at anchor had meant an even more intensive than usual last minute rush in getting all gear aboard and stowed, if only temporarily. An impression from the last days before departure was that all members of the scientific party would "turn to" when required and this impression was amply confirmed throughout the cruise. The three day run to San Diego was filled with reorganization of scrambled equipment and supplies, testing of sampling gear, assignment of an advisor for each student, student conferences, preparation of individual work areas, and emergency drills called by Captain Chylinski.

Our first tows with the Tucker trawl and meter net were made at a spot west of Los Angeles and just east of the San Juan Seamount. This was an especially rich area, with one daytime and one evening tow yielding many crustaceans and numerous larval squids. The numbers and kinds of cephalopods were impressive and there were also pteropods (Cuvierina columnella and Clip sp.) and one intact heteropod (Carinaria sp.). In the night tow, five species of lantern fishes were taken. Flying fish were first spotted near San Clemente with many students commenting on their ability to turn while airborne. On 30 June, most but not all of us showing semi-recovery from the most common of ocean-allied afflictions, we tried out the otter trawl and were rewarded with pelagic as well as benthic organisms. Brittle stars in abundance, sea stars, sponges, several crabs (probably Lithodes couesi) and, of the fish, several large slickheads in nearly perfect condition were among the specimens taken.

Although rail and bunk were now being less frequented by those of us with disturbed middle ears, the enthusiasm with which our stop at San Diego was greeted could be only partially explained by a desire to shop and do laundry. Several of the party visited Scripps, Dr. Wiebe joined the ship, Dr. Gilmartin returned to Monterey, and Jerry Norton delivered some badly needed gear including the "dazzler", our unique water sampler which was the most worked piece of gear throughout the rest of the cruise. Departing San Diego late the same night, we arrived off Guadalupe on the 3rd and Dr. Wiebe calibrated the flow meters in preparation for quantitative work later. As we continued down along Baja California, a program of nightly tows was started with the meter net to gather live material for several of the students. The first of these yielded a cranchiid cephalopod, transparent as glass, still alive and healthy. These plankton items were carefully removed to fresh seawater and refrigerated. A small specimen of the ribbonfish, Trachyterus altivelis, also came up alive but soon died.

We were now better acquainted with each other's program of research and the overall requirements for ship time and space. It seemed a good idea to coordinate our work as much as possible to make maximum use of the physical facilities and more important, to measure many parameters for common water samples that our data might be of greater value. With these goals, several of the original research projects were modified and a number of joint studies initiated.

On the evening of the 5th, following our first day of weather-by-which-to-get-sunburned, Mr. Boysen gave an illustrated talk on sailing ships, their handling and terminology. The next day he gave a vivid example of concern for TE VEGA and her 18' keel when a false trace on the Simrad made by the dazzler caused him to use the lead sounding line. His was the only attention given such serious matters because the ship's scientific complement was gazing skyward in a busy testing of its new knowledge of stays, shrouds, halyards, sheets, lazy jacks, and so on.

Fishing on the fantail was in vogue as we headed for Cabo San Lucas and the first catch was a yellowfin tuna, Thunnus albacares, by the Chief Steward, Mr. Rolita. Other hook and line advocates came up with dolphin and with all this luck we had what turned out to be some excellent fish dinners. We had now come far enough south that the salon was uncomfortably hot and Mr. Davoll, Senior Technician, made more serious use of the fantail by giving his lecture on major pieces of collecting gear and accessories there.

Sunday, 7 July dawned with the barest outlines of the rugged hills of Baja California to be seen through the mist. It had been a hot, muggy, ship-rolling night, and all students had made a good start on their projects so it was heartily welcomed and well deserved that the cool veranda of Cabo San Lucas' only hotel proved to be such an excellent place to drink beer and overlook the beach. Tom Malone, John Ensminger, Paul Stofan, George Knauer, Nancy Toye, and Margie Berry left the shade to go collecting along the rocky cape. Everyone was back on board at the stipulated hour, the mood was contentment, and we had our first practice run in preparation for the 30-hour stations to come later in the cruise. This rehearsal was necessary since logistics of the complicated sampling procedure and handling were to be critical to so many workers. With a gratifying minimum of exceptions, the "dry run" went well and a critique held the following day was valuable in helping us take out many of the "bugs".

The 8th of July could stand as a perfect example of compounded oceanographic frustration although, as such, it was a good lesson for all of us to temper our expectations to reality. A hydrocast to 1000 meters had pretripped Nansen bottles from the 600 meter depth on down; Niskin samplers and the dazzler on the bottom were not tripped at all; a second hydrocast brought the station to 4½ hours; the mouth of our bongo net snapped shut at the surface rather than at 400 meters depth ("we'll call it an oblique"). It is hoped that the request made by the captain the same day for us to explain the "purpose of this cruise" was only unfortunate timing! Tom Malone offset the day for us by giving a talk on physical oceanography in the Eastern Tropical Pacific that evening, and the following day he covered productivity in the same region. These talks set the style for future presentations - - each became a wide-open discussion and was well received.

By this time several of the projects were taking unforeseen yet gratifying turns. Dependent as so many of us were on the array of equipment, both for present work and for assigning priority to future work, we were extremely appreciative of the efforts made by Mr. Davoll and Mr. Seielstad to keep it all in operation. It was only through their success that several of the projects could be carried to completion.

The week before entering Acapulco was eventful and the water alive with large organisms. Tuna continued much in evidence, marlin jumped in the early evenings, a manta ray was seen by Lynn Stafford, and we passed through several large dolphin schools, evidently Stenella graffmani, the common Pacific spotted dolphin. On 9 July, from the warm surface water (27-28°C) we collected two species of siphonophores. One was a tiny Physalia and the other a delicate sea dime, Porpita. The latter had tentacles which were regularly pulled beneath the disc and then wafted freely out beyond the periphery. The rhythmic contractions were timed at 18-20 seconds in one specimen and presumed to be part of feeding behavior. Once a bird feather was recovered which was completely cloaked by eggs that hatched into water striders (Halobates) while we were in port in Acapulco. During the week, another mock trial was made of our 30-hour experiments and the participants again adjusted their plans in order to smooth out the performance and ensure that the 2-hour modules would be feasible at an actual station.

A very successful 1000 meter otter trawl was run on the 10th. Dr. Bradbury recovered 74 batfish (Dibranchius spongiosa) and many other organisms became available for those fond of marine animals of a size to be held between thumb and forefinger. As if this abundance had not been enough to occasion excitement we were provided with a totally unexpected catch - - a 23' long log whose bark was also cloaked with organisms and from which living Teredo were recovered. During the few days before reaching Acapulco, each of the students presented an outline of the research which he or she hoped to accomplish during the expedition and these seminars were spirited, much to the satisfaction of the senior scientists.

Early on the morning of the 13th we arrived in Acapulco, a day ahead of the schedule originally planned. As we anchored in the harbor awaiting a spot to dock, a schooner which looked to be the sister ship of TE VEGA was glimpsed nearer shore. That our expedition had jelled was evidenced by the considerable pride with which each of us noted that it was actually a "much smaller ship". A fairly long list of supplies had to be acquired and meanwhile, scientists and crew sampled the markets, bars, and restaurants of this picturesque city. Dr. Gilmartin rejoined us and much thought was given to revising the cruise track so that we could make better use of our underway periods and also pick up time that might be spent in the Galápagos. A decision was made to abandon the north-south transect between Acapulco and the equator, the new plan being to survey the Costa Rica Dome before stopping at Genovesa in the Galápagos on the way to Guayaquil.

As we neared the sought upwelling, temperature, oxygen, and salinity measurements were taken every three hours to help us locate and define an area best suited to all wishing to make measurements that might be compared with more "normal" ones taken outside the Dome. The 19°C isotherm at 15 meters, located at 9°05'N and 89°10' W on 22 July was considered sufficiently distinct that it became the focal point for return after first heading southeast for a comparative station outside. During the run back in, Jim Cox went into the final collecting phase of his experiment comparing response of phytoplankton taken at several locations to all the different water samples taken at these same locations. Dr. Wiebe constructed a drogue and by evening of the 23rd, he, John Ensminger and Ron Karlson were ready for their series of stratified tows which would usher in our 30-hour station to be held at the center of the Dome.

At 2100 on the evening of 23 July 1968, myth became reality - - our first 30-hour station was underway. As these tows, accompanied by many problems with improperly opening nets (patience in their use was to be admired), were completed they were immediately followed by a hydrocast the following morning. Breakfast had been moved up to 0500 so that everyone could get an uninterrupted start and beginning at 0600 and every two hours thereafter, water samples collected at various depths were divided and subdivided to individuals for salinity, nutrient, O<sub>2</sub>, pigment, dissolved carbon, productivity and other analyses. The DSL was also monitored continuously throughout the 30 hour period. A dire forecast that disaster would accompany our "impossible task" proved unfounded, largely due to the ease with which everyone adapted to the demanding routine. As the day wore on, the participants shaved time off the various procedures and had no problem setting enough aside for meals. Sleep was another matter, many getting only what could be squeezed between sample times as catnaps. A second wind came with daybreak, sampling continued until a little past noon, the final hydrocast was completed and following the final series of stratified tows and loss of the drogue, we set sail for Guardian Banks.

Chart marks indicated depths as shallow as 5½ fathoms surrounded by 2000 fathom soundings and the prospect of finding benthic algae, not to mention other expected organisms, was exciting. Unfortunately, the actual existence of these Banks is still debatable because we were unable to locate them and just before noon on the 26th changed course for Genovesa in the northern Galápagos. During this run all data from the 30-hour station were worked into preliminary form and a review was held which indicated that, from the point of view of procedures all would again go smoothly at the next one. Plans were laid for work to be done in the reportedly anoxic Bahia Darwin of Genovesa, found to be partially flushed in early March by Barber and Norton (Cruise Report 17). Dr. Gilmartin wished to find out whether the bottom waters were again anoxic at this time, five months later, and gave us a seminar on the conditions under which such basins develop. Following early morning anchorage within the bay on the 31st, Dr. Wiebe, Jim Cox, and Tom Malone made a detailed transect study of the physical properties to supplement the work of Dr. Gilmartin. The bay turned out to be flushed but a trawl of the bottom yielded few live organisms, as if flushing had been recent and animals had reinvaded only a short time before. George Knauer stayed aboard the ship to continue morning sampling for his AM/PM study and then he and others who had assisted with the hydrographic work made for Arcturus Lake for some shoreside plankton tows. Dr. Bradbury poisoned two tidepools in the hope of collecting a microdesmid fish but, although the pools were rich, the rare fish did not appear. John Ensminger selected a small rocky spit as a perch from which observations on the habits of Grapsus grapsus could be sketched and recorded; Dr. Newhouse, together with Misses Berry and Stafford, collected algae, although none of the browns which are his special interest. There could be no doubt that this was the most enjoyable day for all since leaving Monterey. Frigate birds and boobies, mocking birds and swallow-tailed gulls, pelicans and herons; we were surrounded by thousands of apparently fearless birds, fishing, nesting, and expressing curiosity at the human invasion. Marine iguanas cruised inshore, lay basking on the warm rocks and raspily skittered at what they considered too close an approach. Three parties found seals, 2 near the landing beach, 9 on the northern side of the island and several on the western edge of the bay. As the different parties wandered back to the beach in late afternoon, there was consensus that time had been all too short - - this fascinating island could offer many days of interest. We took leave just before dark, stopping for a hydrocast outside the bay and then setting course for Guayaquil.

The nightly seminar series was resumed with a presentation by John Ensminger titled "Philosophy and Science" in which he made a provocative analysis of changes in Western metaphysics. Progress reports were given by the students and routine sampling continued since almost all were now working on several projects, at least one of which could be continued on a daily basis with surface samples. Captain Chylinski, who had been in bed with a cold complicated by chest pains, put the ship on water rations and it was a new experience for many of us to find that the real luxuries of life are not always recognized as such. On entry to the Gulf of Guayaquil an otter trawl yielded large red shrimp, the usual macrourids and brotulids, but also several firsts including two large snipe eels, a large Proboscis eel, and a large smooth black fish probably related to whale fish. Paul Stofan continued his habit of regularly photographing specimens from deep hauls.

South America rose out of the water on 4 August as oil derricks atop mist shrouded cliffs which gave way to mangrove as we moved up the Estero Salada toward Guayaquil. By the morning of the 5th our pilot had brought us to anchor some distance from the port and after we had been cleared by the officials, a water taxi took us further upstream to the port gate although the TE VEGA was later moored within skiff distance of the warehouse and dock area. The delights of Guayaquil were many and varied. Cold beverages, seafoods and ice cream were heavily consumed, necessary supplies were picked up, a number of the students opted for a settling night ashore, and the Instituto Nacional de Pesca was paid several visits. Our enjoyment of the city was somewhat allayed, albeit spiced, by demonstrations over a change in Civil Service law passed by the lame duck president. These were complete in the full tradition of street marching, car burning, cherry bombs, furniture smashing, and tear gas. The Polizia Nacional and regular army kept things under muted control and we rapidly picked up the technique of flitting from building to building at the sound of chanting crowds.

Numerous changes took place in our personnel. Dr. Marshall, Mr. Chesbrough, and Mr. Pesantes, a chemical oceanographer from the Instituto, joined us in the scientific party. Mr. Bowhay replaced Captain Chylinski who left on vacation and to have a medical checkup for his chest ailment. Dr. Gilmartin and Mr. Seielstad also departed, the former to join his family in Costa Rica and the latter to return to Monterey. The students were asked to review and firm up their research proposals covering the points of purpose, procedures, date to be gathered, and time requirements. These finished, our new scientific party assembled and, satiated with the satisfactions of liberty, we departed for Wreck Bay in the Galápagos at 0700 on the 9th of August. Excellent time was made on the passage to San Cristobal where it would be necessary to clear with the authorities before doing work in the Galápagos. By the 12th, it appeared that we would arrive a day early but close to dark. Rather than having to delay all night waiting for service from the port authorities the following morning, Captain Bowhay, Dr. Newhouse, and Engineer Tenorio left in one of the skiffs to make the 25 miles ahead faster than it could be covered by the TE VEGA. This arrangement provided time for a Niskin bottle cast and an otter trawl tow and by 2300 that evening, we were rejoined at Wreck Bay by these three and the authorities who gave us entry into the Galápagos.

Academy Bay of Santa Cruz appeared early the next morning under a cloudy sky. Several parties were formed, one remaining on board to run an experiment, one headed to the beach to collect, one going in to the Darwin Station and one visiting the hospital for two students who were the current victims of the rash of respiratory problems plaguing us since Monterey. Dr. Marshall, wishing to stay on in the islands for his coccolithophore work, was able to get accommodations at the Station. Mr. Perry took time from his schedule to escort us around this busy place, with visitors roaming the grounds and scientists going about their work. Several of us saw specimens of the rare San Cristobal tortoise subspecies, two females of which had laid eggs and renewed hope that a colony would build up. Finches and other small birds were numerous due to the practice of regularly feeding them rice. In view of the unique and invaluable studies which can be made at the Darwin Station, we trust it will remain in operation sufficiently long for a fourteenth finch to evolve, one with beak adapted to rice eating. Mrs. Hovenhogel of the Belgian husband and wife hydroid specialist team was met and remembered the TE VEGA as their transportation from Academy Bay to Genovesa the last time the ship had visited the archipelago. In the late afternoon, Andre and Jacqueline DuRoy, 13 year residents of the Galápagos, came out to visit the TE VEGA. They had been informed by Dr. Robert I. Bowman, one of the leaders in the building of the Darwin Foundation, that Dr. Bradbury was on board and wished to exchange help and advice in the collecting of benthic organisms. This remarkable couple had dredged to a depth of 100 meters from a motorless dingy, so they were very interested in our bottom-sampling devices.

Amidst light rain we steamed from Academy Bay at 1830 for  $00^{\circ}92^{\circ}$  W, and the second of our 30-hour drift stations. Preparations made on the 14th we were off and running at 0600 on the 15th with a watch schedule to obviate the necessity for anyone to stay up throughout the entire period. All phases of sampling and handling went well, unlike at the first station where incubators were lost and some of the depth samples were suspected to be contaminated with surface water carried down by the dazzler. This time our problem was of another kind --- a 60 mile westward drift had occurred during the 30 hours and since we could not be sure of being in the same chunk of water for the stratified Bongo net tows, these were omitted. Moreover, this drift coupled with news the previous day that our fuel supply was insufficient to carry TE VEGA through to 6 September should the intended north-south-north transects be followed, required an assessment of work priority, running times, amounts of fuel, and the time left to complete the cruise. A general meeting was called at which the decision was made to cancel the equatorial current system transects and to concentrate instead on Tagus Cove, Isabela, where another 30-hour station and hydrographic survey were planned. The engine warmed up, TE VEGA turned on its heels and set for the Galápagos again.

Our time was excellent and we awoke at dawn of the 17th to find Isabela to port and Fernandina to starboard. Dr. Bradbury made a successful open-net Tucker trawl and this was followed by a Niskin-oriented hydrocast by Miss Berry as all of us gazed at the dust clouds issuing from the crumbling walls of the Fernandina crater. Going on ahead, and to meet us in Tagus Cove that night, Captain Bowhay, Dr. Wiebe, Mr. Rolita and Nancy Toye, took the long boat for some supplementary fishing, augmenting both the Tucker trawl catch and the food larder. By evening, securely anchored at Tagus Cove and following a particularly busy day by Tom Malone and George Knauer in preparation for what was to be our major station of the cruise, many aboard were amazing themselves by catching lobsters with hook and line.

Station 118 was underway at 0600 on the 18th. Unlike the two earlier 30-hour stations of this type, where samples were taken from as deep as 100 meters, the deepest here were to come from 25 meters. Tide and the Simrad combined to undo us and after thunking bottom at 23.5 meters with the first dazzler cast, as the bottom sediments settled we did the same for something slightly less deep. Junior scientists were blasé by now to the demanding routine ("couldn't we sample every hour") and welcome excitement came from the news that, on this day, Dr. Bradbury caught the first fish of her life. Less success was had by hunters in search of goats among the hills surrounding the cove, although they could be heard bleating from the ship which, itself, was surrounded by diving cormorants, pelicans, frigate birds and all manner of wild life. The sampling phases of the station were discontinued at 0800 the following morning because of the excessive requirements imposed by simultaneous incubations and all that remained was another day of filtering the 24-hour series. These had been suspended from a buoy system seaward of the anchorage and, when retrieved at night with the skiff, one could occasionally see beautiful phosphorescent trails of seals punctuating underwater darkness. Shore parties with varying degrees of ambition formed. Tom Malone, Paul Stofan, Ron Karlson, Margie Berry and Lynn Stafford investigated the crater lake immediately behind the cove and collected some net tow samples. George Knauer, John Ensminger, and Nancy Toye set out for the rain forest on the nearest mountain, returning the next day with tales of tortoise shells and land iguanas. Dr. Wiebe, Mr. Davoll, and Jim Cox made a futile and painful attempt to scale Fernandina, showing scars and shoes to us the next day that attested to the rigors of Galápagos hiking. Less ambitious but more successful was a fishing excursion by Dr. Bradbury, Mr. Chesbrough and Mr. Pesantes.

Our stay in Tagus Cove completed, the TE VEGA pulled out for Pta. Espinosa on Fernandina across the strait. Midway, the long boat was lowered and a group dispatched to Coleta Black on Isabela for a day of collecting and wildlife observation before rejoining the rest of the scientific party and crew for a picnic featuring excellent food prepared by Mr. Rolita, cold beverages, and a bottle of cognac graciously donated by Nancy Toye. At sunset the sea lion bulls appeared in large numbers, each extremely protective of his own territory, his mate, and his cubs. The usual birds, ever-present marine iguanas, crabs, small lizards, seals, mangroves, jagged lava, and a beautiful sunset combined with stillness soft enough to be heard in making it a memorable evening.

The following day was made up of more collecting trips, an orientation study with Grapsus grapsus by John Ensminger, a counting of filters from the 30-hour Tagus Cove station, and expeditions for fishing and seeing the land iguanas back on Isabela. That evening we left for Istmo Perry on the same island the next morning several groups went in to the mangrove-surrounded lagoon known as a breeding ground for loggerhead turtles. Dr. Newhouse augmented his rapidly accumulating collection of brown algae and hiked to the top of the nearest cinder cone, from which it was possible to see Santa Cruz to the east. Seminars the night before by Jim Cox and Ron Karlson on the history of zooplankton sampling were resumed on the same subject this evening by George Knauer and Lynn Stafford. Several pipe dredges were tried as we left but their yields were poor and not as exciting as the prospect of again heading for Academy Bay.

Good speed was made in Bahia Elizabeth but after turning the southwestern tip of Isabela, it was reduced somewhat and TE VEGA was several hours from the small town of Villamil at daybreak. Rather than continue on to Academy Bay and arrive just in time to anchor overnight, we elected to visit this isolated town. The entry to Villamil harbor is protected by crashing surf well worth the breaching effort. Once inside, we found an extremely obliging Ecuadorian naval representative, flamingos, the road to St. Thomas where bananas, oranges and limes are grown, a salt flat, and the shore end of a road leading from "the largest crater in the world" where sulfur is commercially mined.

School was in session in the village and our host, the Harbor Master, took us to visit each of the two classrooms, where we met the smiling young teachers and their giggling charges.

Dr. Marshall rejoined us at Academy Bay on the 24th and reported that he had had a profitable and enjoyable time working out of the Darwin Station to several of the other islands where he pursued his major interests. It turned out that Dr. Marshall had succeeded in getting transportation to several islands the TE VEGA had not visited and had arrived back from his last short cruise just the night before. Following him came a steady stream of visitors, beginning with Mr. Forrest Nelson; next, Andre and Jacqueline DuRoy, who brought a small collection of scorpions for Dr. Bradbury, one of whose colleagues is interested in these fierce arthropods. By afternoon, some of the people from the Darwin station arrived, including the Director, Dr. DeVries, and the Guy Hovenhogels who had sailed from Academy Bay to Tower Island on TE VEGA six months before during Cruise 17. Meanwhile, TE VEGA people paid their last visits to their new friends in Academy Bay (how we managed to find so many people at home when it seemed they were all aboard the ship is something of a mystery). Dr. Marshall had discovered that one man, whose boat and services he had chartered during his stay, Mr. Karl Angermeyer, was also a talented painter; several of us saw and made purchases from Angermeyer's collection of paintings of the Galápagos.

While leaving Academy Bay we dredged the bottom for the brown algae which Dr. Newhouse was hopeful of collecting. The bottom turned out to be covered with coralline algae (as predicted by our informants in Academy Bay) which served as holdfasts for the fronds of other algae which we took in large enough quantities to keep Dr. Newhouse up late mounting them. Two good-sized batfish, Ogcocephalus darwini, also tumbled from the dredge; these we were able to keep alive in Ron's Planktonkrisel, and ultimately were able to deliver one alive to Steinhart Aquarium in San Francisco (the other died during the plan ride home).

Fresh water was again turned off as we approached San Cristobal to retrieve our passports before finally departing the Galápagos for Salinas on 25 August. The ship's officers were to pick up our passports, which had been held by the authorities in Wreck Bay during our entire stay in the archipelago, and to complete all the formalities concerned with departing and having an extra man aboard (Mr. MacFarland). The first boatload in, under the command of our Bosun, Mr. Agren, encountered a dinghy near shore whose two occupants hailed us. The gunwales of the dinghy disappeared below wavelets from time to time. . . . . we changed course and drew alongside them exactly at the moment the dinghy sank. Her crew retrieved everything -- oars, billfolds, the dinghy, even cigarettes - and the entire kit and kaboodle was brought safely ashore.



This time as we left the Galápagos we cruised along the north shore and there was romance in the thought that it was here where Darwin first landed in the islands. The exotic gave way to tedium as all set about the processes of sifting data, analyses, and report writing. Our senior scientists gave their final reports and starting on the 27th and for the next few days thereafter, the junior scientists presented a summary of completed work. The informality of these presentations was an indication of the thoroughness with which each scientific party member understood and appreciated the work of all the others.

Our recent schedule had been predicated on the possibility of making no more than 4 knots/hour on the return to the South American mainland and we had set an expected arrival in Salinas on 1 September. After departure, however, it was soon obvious that we would arrive several days ahead of time and reconsideration was forced of an earlier decision to terminate the cruise a few days early. This decision had been based on a desire to get as many as possible of our group away from potential trouble attendant to the inauguration of the new Ecuador president on the 6th. We were informed that the inauguration had been moved up to the 1st and taking this as an omen of preventive haste on the part of the Ecuador government, arranged for departure to the United States on 31 August for most of the scientific party. Remaining aboard ship for a 5 day survey of the Gulf of Guayaquil were Drs. Bradbury and Wiebe, Mr. Davoll, Mr. Chesbrough, Ron Karlson and Nancy Toye. They were rejoined by Captain Chylinski, happy to be back on board again and well rested by his vacation.

The senior scientists would like to express appreciation to all who sailed on the TE VEGA during Cruise 19 for helping to make it a productive training and research period. In particular, I wish to thank Dr. Bradbury who permitted me to liberally adapt portions of her diary as part of this narrative.

W. Jan Newhouse