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EDITORIAL

Pioneers of Plankton Research: Enrique Balech (1912 - 2007)

Enrique Balech is well known as a dinoflagellate taxonomist to those of us who work on phytoplankton. A simple Google Scholar search reveals that his name appears in 695 articles in the *Journal of Phycology*, and in 354 *Harmful Algae* articles. But as pointed out in his obituary published in *Harmful Algae* (Akelsman et al. 2008), Balech was actually much more than dinoflagellate taxonomist. He was a pioneer of plankton research in South America. While he was not the first in South American to publish on plankton (e.g., Faria and Cunha, 1917), Balech appears to have been the first career planktologist. In 1938, at age 26, he published his first paper on euglenoid flagellates of the freshwater plankton (Balech and Dastugue, 1938). His last paper appeared nearly 7 decades later, in 2008, a year after his death, on the biogeography of Argentinian Seas (Balech and Ehrlich, 2008). Balech actually worked then on a wide variety of topics and over a very considerable span of time. His studies, although frequently focused on Argentine waters, concerned systems ranging from the Antarctic, the Caribbean Sea, the Mediterranean Sea, to the North Pacific. Balech published abundantly, authoring at least 125 works, totaling nearly 4000 pages. He wrote mostly in his native Spanish. However he also published in French, in English, and even in Esperanto! Balech was also talented with a pencil, evidenced by not only his illustrations of microplankton, but also his cartoons, as shown in his auto-caricature in Fig. 1. Apparently he was also a playful man. According to Andrés Boltovskoy, the story behind the auto-caricature is that Balech, on a cruise, every night posted a caricature of a crewmember in the mess area. When suspicions among the crew grew that Balech was the artist, he posted a picture of himself to deflect attention. Here, an attempt is made to introduce Enrique Balech, both his life and his work, to the plankton researchers of today. First, an account of the interesting life and career path of Enrique Balech is given. Then, a brief summary of Balech's contributions to plankton research is provided.



Fig. 1. Enrique Balech, as depicted by himself likely in the 1950's (a colored version given to Andrés Boltovskoy by Balech) and Balech in 1985 at conference on harmful algae in St. John's, NB, Canada.

Life and Career of Enrique Balech

The following account of Enrique Balech is a distillation based on several sources (Parodiz and Balech, 1992; Akselman, 2008; Akelsman, et al. 2008; Murphy, 2008; Anon., 2007; Cappozzo, 2007) and information gleaned from Balech's publications.

Enrique Balech was born August 17, 1912 to Juana Capdeville and Emilio Fernando Balech. His parents were members of a French immigrant colony in Telén in the La Pampa province of Argentina. His grandfather, Alfonso Capdeville, was one of the founders of the settlement. When Balech was quite young the family moved to Buenos Aires. Sadly, little information is available on Balech's personal or early life. We know he was enrolled in the teacher's college, *Instituto Superior del Profesorado Secundario J. V. González* in Buenos Aires in 1934. He married Electra I. Megías, who also graduated from the teacher's college.

It was during his years of study at the teacher's college that he began working as a volunteer at the natural sciences museum in Buenos Aires, *Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"* (MACN). He was at first planning to work on bats, not plankton. Balech was introduced to microscopy and microscopic organisms as student of Doello Jurado at the teacher's college. Balech worked in the department of protozoology on the protists of the freshwater plankton. Balech graduated in 1937 from the teacher's college with the title "*Profesor de Ciencias Naturales*". His diploma entitled him to be a high school biology teacher but he also worked at the MACN as staff member in the department of protozoology. Balech published his first paper on freshwater euglenoid flagellates (Balech and Dastugue, 1938). However, he soon turned his attention to marine plankton. It was in 1938 that he first visited the *Estación Hidrobiológica* of the MACN in Quequén, about 500 km south of Buenos Aires, and made his first observations on marine plankton.

In 1940 Balech was named head of the department of protozoology at the MACN but by 1941 he had moved with his wife Electra from Buenos Aires to Necochea, the city across the Quequén River from the *Estación Hidrobiológica* where he would work for rest of his long career (Fig. 2). Balech's first paper on marine plankton reported observations made during his 1938 visit (Balech and Motti, 1941). Although living in Necochea and working in Quequén, he signed his publications as contributions of the department of Protozoology of the MACN. In the early years, Balech worked only on tintinnids of the marine microplankton. He actually stated that he lacked the scientific literature he needed to work on dinoflagellates (Balech, 1944).

It was not until 1947 that Balech began publishing on dinoflagellates. That same year when Juan Perón assumed control of the government of Argentina, there were major changes at MACN. The long-time head of the MACN was replaced and many researchers were fired or strongly urged to resign, and some researchers did leave Argentina. Balech resigned his museum position but continued working at the *Estación Hidrobiológica* and took a teaching post in Necochea. He

described himself during this time an 'amateur plankton researcher' as his paying job was as a teacher. He taught for many years in the high school *Escuela Nacional "J.M.Estrada"*. After his resignation, Balech gave as his affiliation in his publications as *Estacion Hidrobiologia*. Many publications he signed as simply "Necochea, Argentina". In 1949 Balech published his first paper in French and it included an abstract in Esperanto (Balech, 1949). He was an avid proponent of Esperanto. Balech served a term as President of the *Liga Aregentina de Esperanto*, published a Spanish-Esperanto dictionary (Balech and Menéndez, 1951), advocated its use for scientific communications (Balech 1953), gave talks in Esperanto (e.g., Balech, 1958), and he even authored a book on plankton in Esperanto "*Planktono kaj mara produktado*" (Balech, 1974).



Fig. 2. From 1941 until his death in 2007, Enrique Balech lived in the city of Necochea and worked in Quequén. Mornings he worked at the *Estación Hidrobiológica* in Quequén, located across the Quéquén River from Necochea, and afternoons at his home. The *Estación Hidrobiológica* is a museum and field laboratory.

Coincidentally or not, the appearance of Balech's first paper in French was soon followed by his first overseas stay, in France, financed by a grant from the French government. In 1952 he spent the months of July and August in Roscoff (on the Atlantic Coast of France) working on dinoflagellates in the sandy intertidal zone, at the instigation of Jean Dragesco, a French protistologist. Balech published the results of his Roscoff studies in 1956 (Balech 1956). He spent the months of March, April and May on the Mediterranean coast of France, working on mostly in Villefranche-sur-Mer at the *Station Zoologique* due to the courtesy of the Director, Gregor Trégouboff. He also visited the *Laboratoire Arago* in Banyuls and the *Station Marine d'Endoume* and obtained plankton samples. Balech's stay in France yielded his first monograph on plankton, "*Tintinnoinea del Mediterraneo*" (Balech, 1959a).

A few years after his return to Necochea, Balech applied for a prestigious Guggenheim Fellowship to work at the Scripps Institution of Oceanography in California. He was granted a two-year fellowship and spent the years of 1957 and 1958 at Scripps working with Beatrice Sweeney, Francis Haxo, and Martin Johnson. Balech described two new genera of dinoflagellates from Sweeney's cultures (Balech, 1959b). He also conducted field studies. As late 1957- early 1958 was an unusual warm-water period, Balech sampled off the Scripps Pier, and compared the phytoplankton composition with archived samples from a cold-water year taken by Winifred Allen from the Scripps Pier in 1937-1938 (Balech, 1959c). It was only after showing the differences in the phytoplankton communities, that the director of Scripps at the time, Roger Revelle, suddenly took an interest in Balech and his work (Rut Akselman, pers. comm.). Perhaps most importantly, Balech began working on plankton samples of the Pacific Ocean from the Norpac and Downwind expeditions. He continued his sample analyses after his return to Argentina. He was now a researcher of the *Consejo Nacional de Investigaciones Cientificas y Técnicas*. The Norpac and Downwind material yielded Balech's second major plankton monograph (of 252 pages) "*Tintinnoinea y Dinoflagellata del del Pacífico según material de las expediciones Norpac y Downwind del Instituto Scripps*" (Balech, 1962).

Balech did not stay long in Necochea before traveling again. Financed by an international cooperation program between Argentina and Texas A & M University, Balech spent a year (1964-1965 academic year) in College Station, Texas, on the coast of the Gulf of Mexico. There he worked with Sayed Z. El-Sayed of the Department of Oceanography, with whom he shared an interest in the plankton of the Southern Ocean. While they did publish on the microplankton of the Weddell Sea (Balech and El-Sayed, 1965), the major work of Balech was his analysis of samples from the Gulf of Mexico and the Caribbean Sea obtained and examined in part while he was in College Station. The samples formed the basis of four publications on dinoflagellates and tintinnids (Balech, 1967a; 1967b; 1968; 1971).

From mid-1970's Balech worked mostly on dinoflagellates. He published a monographic work on Antarctic dinoflagellates in 1976 (Balech, 1976) and his first paper on toxic dinoflagellates in 1977 (Balech and Rojas de Mendiola, 1977). Balech officially retired in 1982. However, he continued to publish extensively on toxic dinoflagellates, and in 1988 he published his 'magnus opus', "*Los dinoflagelados del Atlantico Sudoccidental*", a 310 page monograph (Balech 1988). His last major work was a monograph on the genus *Alexandrium*, translated into English and published by the Sherkin Marine Laboratory in 1995 when he was 83 years old (Balech, 1995).

Enrique Balech passed away on August 2007 at the age of 95. Several obituary notices in the scientific press paid tribute to his life (Akselman, 2008; Akelsman et al., 2008; Murphy, 2008; Anon., 2007). The esteem in which he was held by his home community was shown by the commissioning of a sculpture in his honor by the city of Necochea (Fig. 3).

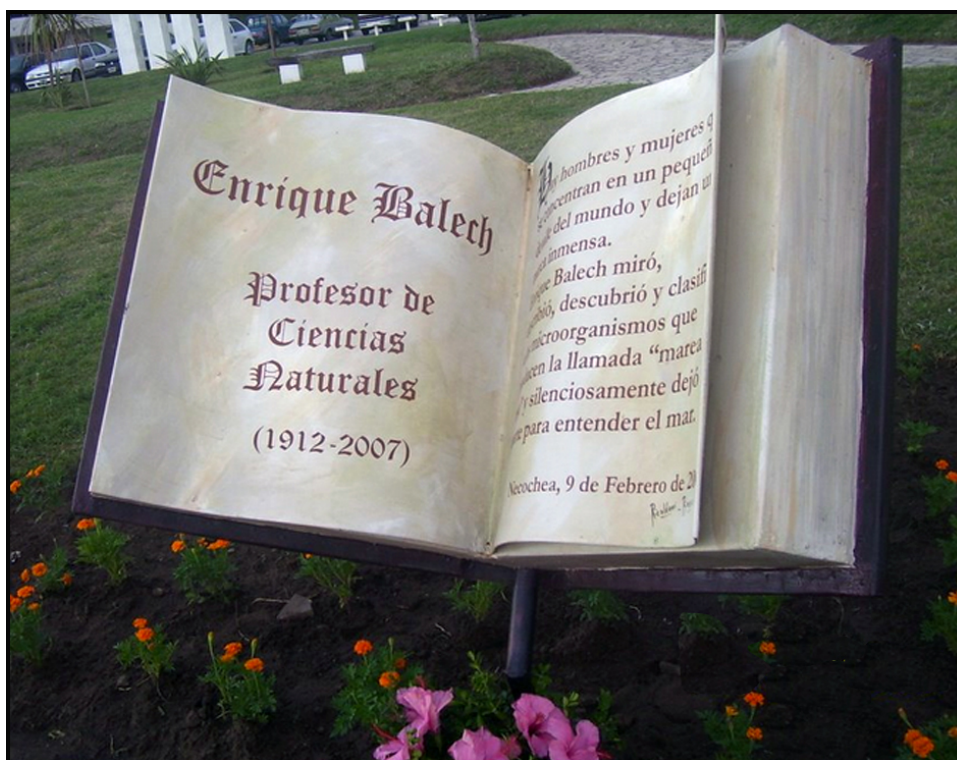


Fig. 3. Balech monument, in his city of Necochea in a park near the seaside, created by the sculptor Hernán Ricaldo in February of 2008. The text reads "*Hay hombres y mujeres que se concentran en un pequeño detalle del mundo y dejan una marca inmensa. Enrique Balech miró, describió, descubrió y clasificó los microorganismos que producen la llamada marea roja y silenciosamente dejó un aporte para entender el mar.*" (There are men and women who concentrate on small details of the world and leave an immense mark. Enrique Balech watched, described, discovered and classified the microorganisms that produce red tides and quietly contributed to understanding the sea. Translation by Martina López).

Balech's Contributions to Plankton Research

Before considering Balech's contributions to plankton research, it is worth noting the conditions under which Balech worked. Balech acquired his own microscope in 1952, when he went to France, an old monocular model, and used it until 1975. For his microscope, he made his own drawing tube, a *camera lucida*, to produce the sketches of the microorganisms he observed. Consequently, most of Balech's publications are based on his observation using an old microscope (perhaps the one shown in fig. 1!), and he produced his

striking, detailed, illustrations (e.g. Fig. 4) with a homemade drawing tube. In his early works, it is very clear that he lacked access to much of the scientific literature as he frequently acknowledged receipts of reprints and copies of articles from others. Balech typed all his reports on a manual portable typewriter. He was eventually gifted a new electric one, after remarking that he could use a good typewriter, by the attendees of a 1987 workshop on toxic dinoflagellates (Murphy, 2008). Given such conditions, it is indeed surprising that Balech's scientific production was prodigious and always nicely illustrated. In total, Balech's scientific publications contained an aggregate number of over 400 plates (illustrations occupying an entire page).

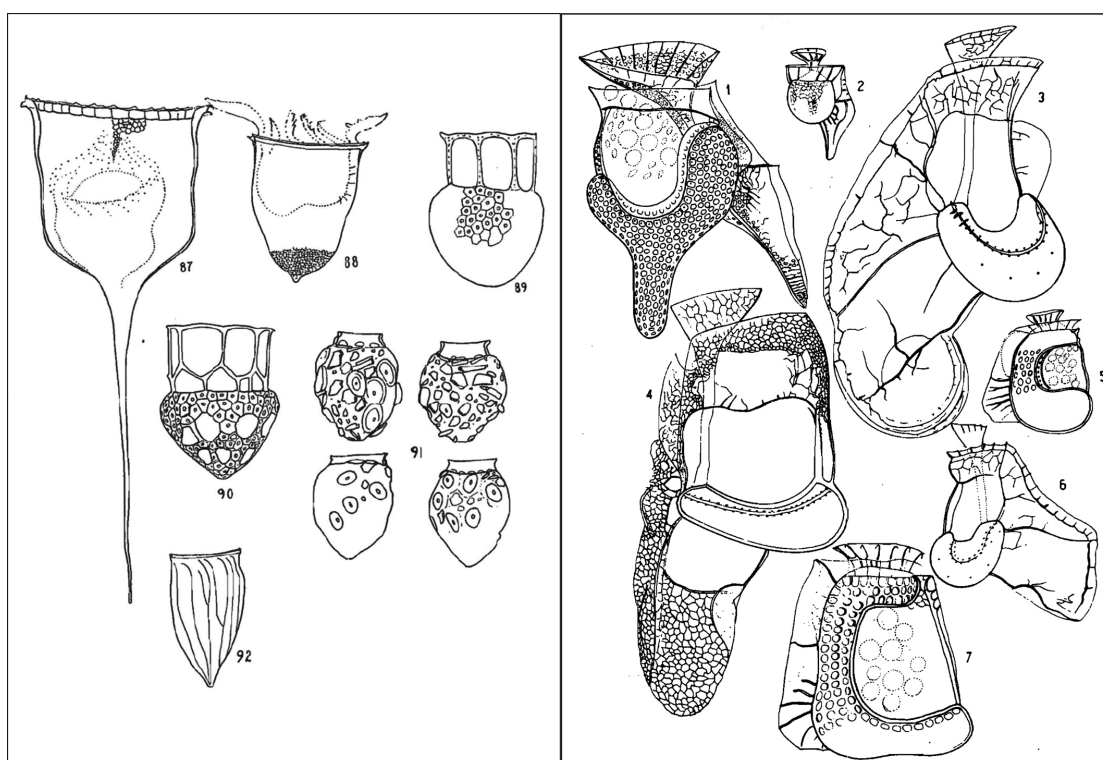


Fig. 4. Examples of illustrations from Balech's publications on tintinnid ciliates (Balech, 1962b) and dinoflagellates (Balech, 1988) based on drawings he made using his homemade *camera lucida* drawing tube.

As previously mentioned, Balech authored at least 125 works, and of those, 120 were scientific publications (see the supplementary data file). A word cloud using the most frequent terms in the 120 scientific titles, and the temporal distribution of the numbers of works and pages published by year are shown in Fig. 5. With regard to the temporal distribution of Balech's scientific works, over the considerable time span of the late 1950's to the late 1980's he published very prolifically, even by today's standards. The word cloud clearly shows that dinoflagellates dominate the titles of Balech's scientific works. However, a close examinations of Balech's works reveals that he made significant contributions to

Table 1. Summary data on the publications of Balech concerning the four topics on which he wrote the most often. The topics account for 97 of the 125 publications located, or found cited by Balech himself. Citation data was obtained from Goggle Scholar on June 30, 2022.

Topic	Σ # works	Σ # pages	Σ # cites	date range
dinoflagellates	62	1463	3830	1949-2002
tintinnids and dinoflagellates	16	871	627	1944-1973
tintinnids	11	238	317	1942-1981
biogeography	11	118	363	1940-2008

Many of Balech's publications, especially those reporting on results from oceanographic campaigns, contained detailed data such as species occurrences station by station. Others have used his detailed data in for example, in biodiversity studies (Coats and Clamp, 2009; Dolan and Pierce, 2013). Today, including raw data in publications is rare and so now researchers are urged to provide such data as supplementary files or expected to deposit data in public data banks. One could say then that Balech's publication practice of including detailed data was ahead of his time!

Balech is currently credited with the first discovery (original description) of 172 species according to the World Register of Marine Species (<https://www.marinespecies.org/index.php>). While dominated by dinoflagellates, the species attributed to Balech include 11 species of tintinnid ciliates from the marine plankton and 13 species of euglenoid flagellates of the freshwater plankton. With regard to euglenoid flagellates, 6 of "Balech's species" were described in his first paper (Balech and Dastugue 1938). The last species attributed to Balech were *Protopteridinium* species he described in 1999 (Balech 1999), over 60 years after his first species descriptions appeared. His work continues to be relevant today, even the early studies. Recently, the first ciliate Balech described, *Neobursaridium gigas* (Balech, 1941), has proven to be a key organism in untangling the phylogeny of ciliates (Serra et al., 2021).

Hopefully shown here is that Enrique Balech was an extraordinary plankton researcher. Self-taught, and with remarkably limited means, he made remarkably major contributions to our knowledge of microplankton. If you run across a species name with 'Balech' in it, for example, *Codonellopsis balechi* (Hada, 1970), or *Tintinnidium balechi* (Barria da Cao, 1981) or *Lisodinium balechii* (Carbonell-Moore, 1993) or *Gamberierdiscus balechii* (Fraga et al., 2016) you will know why.

SUPPLEMENTARY FILE INFORMATION

The supplementary file is an excel file containing all the Balech works I located. Most works are available (except the books) as PDF files through the WoRMS website by reasoned individual request as described in supplementary file.

<https://www.marinespecies.org/aphia.php?p=sources&adv=1>
(Literature, advance search, author contains, Balech, [request])

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