

# Grids & Datums

## REPUBLIC OF EQUATORIAL GUINEA

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The first inhabitants of the region that is now Equatorial Guinea are thought to have been Pygmies, of whom only isolated pockets remain in northern Rio Muni. Bantu migrations between the 17th and 19th centuries brought the coastal tribes and later the Fang. Elements of the latter may have generated the Bubi, who immigrated to Bioko from Cameroon (*PE&RS*, May 2007) and Rio Muni in several waves and succeeded former Neolithic populations. The Annobón population, native to Angola, was introduced by the Portuguese via São Tomé. The Portuguese explorer, Fernando Po (*Fernão do Póo*), seeking a route to India, is credited with having discovered the island of Bioko in 1471. The Portuguese retained control until 1778 when the island, adjacent islets, and commercial rights to the mainland between the Niger and Ogoue Rivers were ceded to Spain in exchange for territory in South America. From 1827 to 1843, Britain established a base on the island to combat the slave trade. The Treaty of Paris settled conflicting claims to the mainland in 1900, and the mainland territories were united administratively under Spanish rule. The majority of the Equatoguinean people are of Bantu origin. The largest tribe, the Fang, is indigenous to the mainland, but substantial migration to Bioko Island has resulted in Fang dominance over the earlier Bantu inhabitants.

Bioko Island lies about 40 km from Cameroon. Annobón Island lies about 595 km southwest of Bioko Island. The larger continental region of Rio Muni lies between Cameroon and Gabon (*PE&RS*, September 1998) on the mainland; Equatorial Guinea includes the islands of Corisco, Elobey Grande, Elobey Chico, and adjacent islets. Bioko Island, called Fernando Póo until the 1970s, is the largest island in the Gulf of Guinea – 2,017 km<sup>2</sup>. It is shaped like a boot, with two large volcanic formations separated by a valley that bisects the island at its narrowest point. The 195 km coastline is steep and rugged in the south but lower and more accessible in the north with excellent harbors at Malabo and Luba, and several scenic beaches between those towns. On the continent, Rio Muni covers 26,003 square kilometers (10,040 sq. mi.). The coastal plain gives way to a succession of valleys separated by low hills and spurs of the Crystal Mountains. The Rio Benito (Mbini), which divides Rio Muni in half, is not navigable except for a 20 km stretch at its estuary. Temperatures and humidity in Rio Muni are slightly lower than on Bioko Island. Annobón Island, named for its discovery on New Year's Day 1472, is a small volcanic island covering 18 km<sup>2</sup>. The coastline is abrupt except in the north; the principal volcanic cone contains a small lake (*U.S. Department of State Background Note*, March 2009).

Initial published geodetic surveying in only the southern region was done solely by the French Navy. The Spanish Navy apparently had done some hydrographic surveys prior to 1954 as reported below by the French. Lafargue of the French Navy established the Gabon River Datum in 1914 at Cape Esterias as:  $\Phi_0 = +0^\circ 36' 48.58''$  North,  $\Lambda_0 = +9^\circ 19' 19.02''$  East of Greenwich. The defining azimuth was from Banda to Tranchée:  $\alpha_0 = 158^\circ 59' 56.0''$ . The usual Hatt Azimuthal Equidistant Grid had the same origin as the Datum. The triangulation stations monumented by Lafargue for this survey were pyramids constructed of cement, and the south side was imprinted

“M.H.A.E.F. 1921.”

According to John W. Hager, “In 1951, William Mussetter of the U.S. Coast & Geodetic Survey was on his way to observe astronomical stations (astros) in the Sudan on the 30<sup>th</sup> Meridian and stopped in Gabon to observe the astro at Cap Esterias. On 9-13 September 1951, Mussetter observed the position as:  $\Phi_0 = +0^\circ 36' 48.65''$  North,  $\Lambda_0 = +9^\circ 19' 19.06''$  East. References are: <sup>(1)</sup> *Annales Hydrographiques*, 4e série, Tome Neuvième, Année 1958, «*Triangulation De La Baie De Corisco (1954-1955)*», p 75, and <sup>(2)</sup> the same, Tome Dixième (1959-1960) p 82. A further reference is *Repertoire des Coordonnees des Points Astronomiques et Géodésiques*; Feuille 1/200,000 Libreville NA-32-IV, Paris 10-58. This is the trig list compiled by IGN.»

In 1955, Mannevy of the French Navy reoccupied an astro station at Cape Esterias for the triangulation of the Bay of Corisco, North of Libreville. The Cadastral Service of Libreville measured a three-kilometer baseline in Libreville in concert with the French Hydrographic Mission. The Cape Esterias Datum of 1955 origin is identical to the Gabon River Datum of 1914. The Department of Public Works of Gabon (*Travaux Publics du Gabon*) assisted Mannevy by building towers for the triangulation of the Bay of Corisco. The triangulation was performed with WILD T3 theodolites using eight sets of angles. The design of the towers and targets were patterned after those used in Madagascar (*PE&RS*, February 2000). The first computations on the Universal Transverse Mercator Grid in Gabon were computed by Mannevy with the Clarke 1880 ellipsoid, Fuseau 32 (zone 32), where Central Meridian ( $\lambda_0$ ) =  $+9^\circ$  East of Greenwich. The Cape Esterias 1955 Datum is used for Libreville and points north in Gabon and Equatorial Guinea. The Equatoguinean connection of these French Navy Geodetic and Hydrographic surveys was actually performed in November of 1954 by M. le Capitaine de Frégate Guyot, assisted by M. Dars. Entry to the Spanish Isle of Corisco was authorized by diplomatic relations established between the French vessel *Beautemps-Beaupré* and the Station Commandant Canovas de Castillo. The Spanish authorities also offered to aid in the local administration of the survey to furnish one important document produced by their Spanish Geographic Service (recent chart at 1:100,000 scale) which showed large divergences from the French Navy chart. *Les autorités espagnoles offraient également l'aide de l'administration locale et fournissaient une importante documentation provenant du Service Géographique (carte au 1/100 000 récente) qui montrait de larges divergences avec la carte marine française.* The triangulation station established on the south shore of Corisco Island was Station Gobé, but curiously, the French did not publish its coordinates. The approximate scaled coordinates are:  $\phi = +0^\circ 53' N$ ,  $\lambda = +9^\circ 20' E$  (*Levé de la Baie de Mondah (6 Novembre – 3 Décembre 1954) Mission Hydrographique de la Côte Ouest d'Afrique, Annales Hydrographique*, pp. 60-62).

Datums known (*or I thought so – Ed.*) to exist in Equatorial Guinea include: Annobón Island Datum; Biao, Bioko Island Datum; Kogo, Rio Muni Datum; Rio Benito, Rio Muni Datum; Gabon 1951; and M'Poraloko Datum, the latter two primarily found in Gabon.

The following details are according to Hager: “For Annobón at Punto

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Astronómico Palé (P. A.)  $\Phi_0 = 1^\circ 24' 04.5''$  S,  $\Lambda_0 = 5^\circ 37' 50.1''$  E, GRS 80. This I got from *Mapa De La Republica De Guinea Ecuatorial, Isla De Annobon (Ambó), 1:10,000*. I believe that this was one of the Spanish maps with a coordinate list printed on the sheet. For Kogo or Cogo at  $\Phi_0 = 1^\circ 04' 48.50''$  S,  $\Lambda_0 = 9^\circ 41' 39.45''$  E. This was from *Guinea Continental Española; Reseñas de los Puntos Astronómicos*, a collection of astros with descriptions that AMS obtained from the Spanish. I never saw this used as a datum. Also, with the same name is  $\Phi_0 = 1^\circ 04' 53''$  S,  $\Lambda_0 = 9^\circ 41' 51''$  E. This was a position obtained 25 Feb. 1952 by observing a total solar eclipse. Rio Benito at  $\Phi_0 = 1^\circ 35' 06.50''$  S,  $\Lambda_0 = 9^\circ 36' 58.50$  E. This was from the same source as Kogo and I never saw it used as a datum."

The latest edition of *TR8350.2* by the National Imagery and Mapping Agency (NIMA) published in July of 1997 lists the three-parameter shift from M'PORALOKO (*sic*) Datum to WGS 84 Datum as:  $\Delta X = -74$  meters,  $\Delta Y = -130$  meters,  $\Delta Z = +42$  meters. Note that only one point was used to determine the published shift, and the accuracy is stated at  $\pm 25$  meters for each component.

Hager commented: "Phare du Cap Lopez at  $\Phi_0 = 0^\circ 37' 54.2''$  S,  $\Lambda_0 = 8^\circ 42' 13.2''$  E, Clarke 1880. (*Phare is French for lighthouse - Ed.*) This datum for the *Société des Pétroles d'Afrique Équatoriale Française (SPAEF)* is M'Poraloko and Phare du Cap Lopez is connected to it by the main SPAEF triangulation north from Port Gentil. See reference <sup>(2)</sup> above, p 169."

The only grid system known to exist is the UTM, other than the small Hydrographic system described above. All offshore mineral rights boundary treaties with other countries have referenced only the WGS 84 Datum. Significant hydrocarbons have been found in offshore areas, so geodetic surveys and detailed topographic mapping may accompany major economic growth in the republic.



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