

Marx Hardy Machiavelli Joyce Austen  
Defoe Abbot Melville Montaigne Cooper Emerson Hugo  
Stoker Wilde Christie Maupassant Haggard Chesterton Molière Eliot Grimm  
Garnett Engels Byron Schiller  
Goethe Hawthorne Smith Kafka  
Cotton Dostoyevsky Hall  
Baum Henry Kipling Doyle Willis  
Leslie Dumas Flaubert Nietzsche Turgenev Balzac  
Stockton Vatsyayana Crane  
Burroughs Verne  
Curtis Tocqueville Gogol Busch  
Homer Tolstoy Whitman  
Darwin Thoreau Twain  
Potter Zola Lawrence Dickens Plato Scott  
Kant Freud Jowett Stevenson Andersen Burton Harte  
London Descartes Cervantes Wells Hesse  
Poe Aristotle James Hastings Voltaire Cooke  
Hale Shakespeare Bunner Chambers Irving  
Richter Chekhov da Shaw Benedict Alcott  
Doré Dante Swift Pushkin Newton  
Wodehouse



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**Catalogue of Violent and  
Destructive Earthquakes in the  
Philippines With an Appendix:  
Earthquakes in the Marianas  
Islands 1599-1909**

Miguel Saderra Masó

# Imprint

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## CATALOGUE OF VIOLENT AND DESTRUCTIVE EARTHQUAKES IN THE PHILIPPINES (1599-1909).

**Introduction.**—The occasion for publishing this catalogue of Philippine earthquakes which were of violent and destructive character has been furnished by a request from Prof. John Milne for a list of such phenomena, to be included in the General Earthquake Catalogue which this eminent seismologist is preparing under the auspices of the British Association for the Advancement of Science. The said general catalogue has been undertaken with a view toward reducing to uniformity and completing those published years ago by Robert Mallet (1859) and Perrey (1844-1871). The form adopted for Professor Milne's new catalogue is very concise, comprising only the date, intensity, and region together with principal localities affected. It will contain only the earthquakes of intensities VII to X according to the scale of De Rossi-Forel, and these will be divided into three classes: Class I will be formed by the earthquakes of sufficient force to produce cracks in buildings and to throw down chimneys; they correspond to force VII of De Rossi-Forel. Class II consists of the earthquakes which not only threw down chimneys but also walls and some weak structures; force VIII of De Rossi-Forel. Class III comprises the earthquakes which caused general destruction; force IX and X of De Rossi-Forel. As this classification is as purely conventional as every other and adopted only in the catalogue mentioned, we do not employ it in the present catalogue of Philippine earthquakes, but retain the almost universally adopted scale of De Rossi-Forel. We shall also present more details as to the towns and buildings damaged, the number of victims and other disastrous effects than enter into the catalogue of Professor Milne.

Hence, the differences between the list prepared for Professor Milne as well as the partial catalogue published in our Monthly Bulletin for February of the present year consist in the following: (1) This catalogue contains also several earthquakes whose intensities were between VI and VII, while in the former only such figure as according to their effects were decidedly of force VII. (2) The new

catalogue is more complete as to details concerning the towns, etc., which have been destroyed.

It is to be regretted that we are unable to present here a complete historical catalogue of all the destruction wrought in the Archipelago by earthquakes since the time when Legaspi and Urdaneta first set foot on these shores. But the old chroniclers, who dwell upon the political happenings with an attention to detail which is occasionally overdone, were invariably laconic when there was question of earthquakes and similar natural phenomena; as a rule they were satisfied with mentioning the occurrence in a general and therefore vague way, without any attempt at precision as to dates and places. Still the writers in the Philippines did nothing worse than imitate their colleagues throughout the rest of the world. This fact is responsible for the great contrast exhibited by our catalogue as regards the number and details of earthquakes which occurred prior to 1800, records of which have been preserved, and the same data for the period from 1800 to the present time. This same difference is observable in all catalogues of a similar nature, even in those which cover phenomena which occurred in Europe. As to the Philippine writers, an additional excuse is found in the peculiar conditions of life in these Islands. As far as we know, only two earthquakes which took place during the period which alone can come under consideration—that is, since the discovery of the Archipelago—have claimed a considerable number of victims, and these in the capital, because outside of Manila—if we except two or three of the principal cities—the buildings which could become dangerous during an earthquake have always been few.

[4]Moreover, in a country in which fires consume every year thousands of dwellings and where the terrible typhoons frequently destroy whole towns with heavy loss of lives, the damage done by earthquakes has rarely been so great as to impress those occurrences indelibly upon the memory. This is beyond doubt one of the reasons why prior to the beginning of the nineteenth century hardly any data can be found concerning the numerous earthquakes which during the preceding two centuries must have occurred in the Visayas and above all on the large Island of Mindanao.

The first earthquake of which the chronicles contain a mention is that of 1599. There is no reasonable doubt that during the twenty-eight years which had then elapsed since the founding of Manila by Legaspi, several strong and possibly even destructive earthquakes occurred in this part of Luzon Island, but, as the author of the "Verdadera relación de la grande destrucción \* \* \* del año 1645" tells us, "when first founded, Manila consisted of wooden houses roofed with a certain kind of palm leaves, the same which the natives use in their buildings." Hence the damage done by these earthquakes must have been insignificant. Much more terrible were the losses caused by conflagrations which within a few years twice wiped out the entire city.

The first Bishop of Manila, Domingo de Salazar, seeing the city exposed to such general destructions by fire like the one of February 14, 1583, gave the first impulse to the construction of stone buildings and worked indefatigably in this direction. In person he explored the surroundings of Manila in quest of stone quarries and by the middle of the year 1591 he had nearly finished his palace and the cathedral, when financial difficulties caused a temporary suspension of the work. At the same time a great number of public and private buildings were under construction. The enthusiasm for structures of stone or brick with tile roofs did not diminish during the next fifty years. The chroniclers tell us that "the Spaniards began to build their houses of stone and tiles without the so necessary precautions against earthquakes. \* \* \* Beautiful structures and dwelling houses were reared, so high and spacious that they resembled palaces; magnificent churches with lofty and graceful towers, within the walls of Manila as well as outside of them: all of which made the city very beautiful and gay and contributed equally to health and pleasure." The disaster of 1645, commonly called the earthquake of St. Andrew, as it occurred on the feast of this apostle, November 30, razed nearly every one of these buildings to the ground, and since then the style and appearance of buildings has changed greatly throughout the Archipelago, with a correspondingly great saving of lives in the subsequent earthquakes.

Masonry arches were henceforth banished from the churches; the heavy walls of the latter were further strengthened by massive buttresses; and the towers were given truly enormous substructures.

But even with these precautions there is at present hardly one out of the hundreds of churches built during the seventeenth and eighteenth centuries which did not some time or other require important repairs of its masonry work or even partial reconstruction owing to earthquake damages. The only structure of this class which thus far has withstood all convulsions, is the church of St. Agustin, Manila. Nevertheless, as we have stated before, the chroniclers hardly mention all this destruction, except in a very general and cursory manner. I do not hesitate to say: they were accustomed to see similar havoc created nearly every year in one part of the Archipelago or the other by some severe typhoon, accompanied by far greater loss of lives and property, and consequently much more felt by the people than the destruction of a church, *convento*, municipal building ("tribunal"), one or two bridges, or other masonry structure.

In the present catalogue our aim has been to present all that is known of the various violent and destructive earthquakes on record. The first column of each page contains the ordinal number of the disturbance for purposes of reference. In the second, the date is given as accurately as it could be ascertained, Roman numerals being used to designate the months. Unfortunately, of some earthquakes only the year is known; of others, the year and month. Of one (No. 32) the approximate hour has been recorded, but not the day of the month; while of another (No. 38) the hour has been preserved for posterity, but whether the phenomenon occurred during February or March, the records leave undecided. In the third column will be found, in the first place, the intensity of the [5]disturbance, Roman numerals representing the degrees of the scale of De Rossi-Forel (I-X); then the region affected most, and finally the damages caused, if known, and other information, if available.

In describing the epicentral regions, the present distribution of the Archipelago into provinces has been used throughout the catalogue. This division is shown on the first of the two maps of the Philippines which accompany this catalogue (Plate I). As to the designation "Benguet" occasionally occurring in the text where provinces are enumerated, but not found on the map, we beg to offer the excuse that the region thus named is exceedingly well known in the Philippines as it contains Baguio, *the* health resort of

the Islands. For the readers outside of the Archipelago we remark that Benguet is at present a subprovince of the Mountain Province, of which it forms the southernmost part. The location of Baguio is shown on the map on Plate II. A similar remark applies to Lepanto and Bontoc, likewise divisions of the Mountain Province, whose capitals, Cervantes and Bontoc, are indicated on the same map.

As we would hardly be justified in assuming that every reader is in possession of a detailed map of the Philippines, and a knowledge of the general distribution and the main directions of the principal mountain systems of an earthquake country is important, we add a second map on which these data are shown by means of dashes, together with the most important seismic regions, and the positions of the principal towns, bays, etc., mentioned in the text. (Plate II.)

Near the left margin of this second map will be found an index of the seismic regions just mentioned, each of them being represented by its ordinal number (large Roman figures). Near each of these ordinals is placed the corresponding number of earthquakes since 1862 contained in the catalogue (Arabic figures), which is followed, in brackets, by an analysis of the said number, in which Roman figures designate the degrees of the earthquake, scale of De Rossi-Forel, while small Arabic figures, written like exponents, give the number of earthquakes of each degree of intensity.

In drawing the map on Plate II it was not intended to represent the epicentric area of every individual earthquake center (which would have crowded the map beyond reasonable limits), but rather to show the principal seismic regions. Hence most of these curves contain more than one focus. The approximate position of each of the latter has, however, been indicated by a star, while the figure placed close to the star gives the number of earthquakes which proceeded from the said center.

A word must be said in apology for the constant use in the following list of the Spanish word "*convento*." This word which means monastery, cloister, or convent, is universally used in the Philippines to designate also the habitation of the clergy attached to a parish church. Although these are, as a rule, spacious buildings and were formerly inhabited well-nigh exclusively by friars, they can not properly be called monasteries. Wherefore, in order to avoid

lengthy circumlocutions, the Spanish word "*convento*" has been retained.

The reader who is not familiar with this country may find it strange that in reporting earthquake damages so much emphasis appears to be laid on the harm done to churches and *conventos*. This is easily explained by the fact that these buildings were often the only structures within the meizoseismal area, and built nearly everywhere in the most substantial manner.

In the present catalogue we have also included, by way of an appendix, the earthquakes which are known to have occurred in the Marianas or Ladrones group of islands. While their number is too small to warrant separate publication, we believe that the data concerning them will be welcome to the earthquake investigator.

[7]

## CATALOGUE OF VIOLENT AND DESTRUCTIVE EARTHQUAKES IN THE PHILIPPINES.

No.	Date.	Intensity.	Epicenter and effects.
	<i>Y. M. d. h. m.</i>		
1	1599 VI 25 3 20 IX		Manila and neighboring provinces. Damaged many private buildings in Manila; cracked the vault of the Jesuit Church so badly that it had to be demolished and replaced by a ceiling; fissured the walls and ruined the roof of Santo Domingo Church.
2	1600 I 2 0 0 VIII		Earthquake of destructive force and long duration in Manila; extent of damage unknown.
3	1600 XI — — — VI		Violent and protracted earthquake.
4	1601 I 16 0 — VIII		Manila and adjacent provinces. Did considerable damage to some churches and many private houses in Manila. Its duration was unusually great, it being said that during 7 minutes the shocks were almost continuous. There were several dead and a great number of injured. The repetitions were frequent throughout the year.

5	1608 XII 3 -- -- VI-VII	Leyte Island. Violent chiefly in the country around Dulag and Palo (E coast of northern Leyte). It does not appear to have been destructive.
6	1610 XI -- -- -- IX	Manila and provinces east of it. Several writers call it a "terrible earthquake which progressed from E to W."
7	1620 -- -- -- -- IX	Panay Island. Great convulsions of the ground; the Aclan River changed its course. The few stone buildings in the affected districts, as, for instance, the church at Passi, Province of Iloilo, were badly cracked, the wooden structures either fell, owing to the snapping of the uprights, or remained inclined in various directions. The provinces which suffered most were those of Iloilo and Capiz.
8	1627 VIII -- -- -- X	Northern Luzon. The historians mention it as one of the earthquakes which caused the greatest convulsions in northern Luzon, especially in Ilocos Norte and Cagayan, but above all in the region of the Central Central Cordillera, Lepanto, and Bontoc. The data are somewhat vague. It is said that part of the northern Caraballo Mountains subsided.

9	1628	-	-	-	-	IX	Camarines and Albay. A destructive earthquake in which, it is said, a mountain burst and emitted a river of water and mud which swept away the town of Camarines and others. The name of Camarines was at the time used to designate the present town of Camalig and the district near the southern slopes of Mayon Volcano. The flood mentioned was probably an avalanche of water, sand, volcanic ashes, and lapilli, such as also on other occasions have occurred on the slopes of the same volcano during periods of torrential rains.
No.[8]	Date.						Intensity. Epicenter and effects.
	<i>Y.</i>	<i>M.</i>	<i>d.</i>	<i>h.</i>	<i>m.</i>		
10	1636	XII	21	-	-	IX	Western Mindanao. Destructive earthquake. The epicenter appears to have been in Illana Bay. Great landslides are reported to have occurred at Point Flechas which is between the Bays of Illana and Sibuguey.
11	1641	I	4	-	-	X	Northern Luzon. Destructive earthquake, accompanied by great landslides in the mountains and eruptions of water and mud in the region of northern Luzon which comprises the Provinces of the

Ilocos, of Cagayan, and the Cordillera Central. All the historians of the Archipelago mention this cataclysm which occurred shortly after the almost simultaneous eruptions of Sanguir and Jolo.

The most terrible earthquake recorded in the annals of the Archipelago. It might almost be said that from Manila to Cagayan and Ilocos Norte it left no stone upon the other. In the capital, where during the preceding fifty years a great number of stone buildings had been erected, magnificent churches, palaces, and public buildings, as well as private residences and villas, the destruction was frightful. Ten churches were wrecked entirely, to wit: the Royal Chapel, Cathedral, Santo Domingo, those of the Recollects and Franciscans, Santiago, San Antonio, Nuestra Señora de Guia, and the parish churches of Binondo and San Miguel; only San Agustin and the Jesuit Church remained standing. Twelve monasteries, colleges, and hospitals were likewise converted into ruins. No better fared the palace of the Governor-General, the Real Audiencia and up to 150 of the finest residences which, as one

12      1645 XI 30 20 – X

author puts it, "in other cities would have been considerable palaces." The rest of the private houses were damaged to so great an extent that the majority had to be demolished. The number of persons killed exceeded 600 and the total of killed and injured is stated to have been 3,000.

Outside of Manila there was a general destruction of villas and other buildings which had been erected on both banks of the Pasig River. Throughout the neighboring provinces the masonry structures built by the missionaries suffered the same fate as those in Manila. From the farthest provinces in the north were reported great alterations of the surface with almost complete disappearance of some native villages, changes in the courses of rivers, subsidences of plains, eruptions of sand, etc. All the writers of the time qualify this disturbance as the most disastrous earthquake not only in Luzon, but likewise in Mindoro, Marinduque, and the other islands south of Luzon. On the other hand, the provinces of Camarines and Albay appear to have suffered little or nothing.

30 was followed by almost daily repetitions and countless aftershocks, one of which, on December 5, was of such intensity as to finish the wrecking of many buildings, "leaving [as a chronicler writes] the city in such condition that it was impossible to walk through it." Aftershocks of variable force continued to be very frequent throughout an entire year; that is, until the end of 1646.

No.[9]	Date.	Intensity.	Epicenter and effects.
	<i>Y. M. d. h. m.</i>		
14	1646 III -- -- VI		According to several chroniclers, the aforementioned aftershocks were more were more frequent and of greater intensity during the month of March, some of them assuming a violent character.
15	1648 -- -- -- VIII		Southern Luzon. Very violent earthquake, damaging many buildings (Von Hoff).
16	1653 V 1 -- -- VI		Earthquake in Manila and surrounding provinces.
17	1658 VIII 20 17 -- IX		Destructive earthquake. Some historians maintain that it was as severe as that of 1645; but it caused fewer ruins, partly on account of its short duration, partly because it found build-

				ings of less height and greater power or resistance than those erected before 1645. Nevertheless it destroyed the monastery of Santa Clara and did great damage to the churches and monasteries of the Dominicans and Recollects, likewise to the archiepiscopal palace, the Jesuit College, and a considerable number of private buildings. The epicentral region appears to have included only the southern part of Luzon.	
18	1665 VI	19	--	VIII	Destructive in Manila and adjacent provinces. In the ruins of numerous houses 19 persons perished and many more were injured. Of public buildings only the Jesuit Church is mentioned as having suffered to some extent.
19	1675 II	--	--	VIII	Destructive in northern Mindoro and Batangas Province. Mention is made of extensive landslides, the opening of many fissures and the subsidence of large tracts on the beach of the northeast coast of Mindoro. The repetitions were many and severe.
20	1683 VIII	24	--	VII	Damaged some buildings in Manila.
21	1687 II	--	--	VI	Several violent earthquakes, which, however, caused no

22	1699 — — — VII	<p>notable damages.</p> <p>Many chroniclers assure us that during this year and the following destructive earthquakes visited Manila; but there is great confusion as to the days and months in which they occurred.</p>
23	1716 IX 24 — — VII	<p>Vicinity of Taal Volcano. Violent in Manila and the Provinces of Rizal, Laguna, Cavite, and Batangas. Connected with an eruption of the volcano. At each spasm of the latter the earth shook so violently that many buildings in Manila and the provinces mentioned suffered much harm, especially those in the vicinity of Lake Bombon, within which is situated the said volcano.</p>
24	1728 XI 28 — — IX	<p>Remarkable on account of its having been very perceptible throughout the entire Archipelago. Caused considerable damage in Manila and towns in southern Luzon.</p>
25	1730 — — — IX	<p>Destructive in the Provinces of Tayabas and Laguna; ruined the church and the church and <i>convento</i> at Mauban and other buildings in this and other towns of the two provinces.</p>
26	1743 — — — IX	<p>Destructive in Tayabas Prov-</p>

ince, wrecking masonry structures in the town of Tayabas and others.

No.[10] Date.

Intensity. Epicenter and effects.

*Y. M. d. h. m.*

A violent eruption of Taal Volcano, which caused great havoc in all the towns on the shores of Lake Bombon. The shocks which accompanied each of the intermittent outbursts of the volcano were so severe that they left hardly any building undamaged throughout the provinces in the neighborhood of Manila – Rizal, Laguna, Cavite, Batangas, Tayabas, and in northern Mindoro. The convulsions of the ground were very remarkable; displacement occurred and fissures, both wide and deep, opened in the entire Province of Batangas and likewise in Cavite Province, up to Lake Bay. As the shocks occurred during many days, the majority of Manila's inhabitants abandoned the Walled City and lived under tents or in structures of bamboo and nipa. The greatest force of the earthquakes and, consequently, the greatest upheavals seem to have occurred in the region stretching from Taal Volcano

27 1749 VIII 12 9 – IX

28	1754 V 15 21 - X	<p>toward Talim Island (Lake Bay) and the Antipolo Mountain Range.</p> <p>Repetitions and aftershocks were frequent during nearly a year.</p> <p>Another eruption of Taal Volcano, the most terrible in the history of the Islands. All the towns which surrounded Lake Bombon were destroyed completely. When rebuilt, they were placed at a distance from the lake. There occurred most violent earthquakes which produced disasters in the neighboring provinces equal too, if not exceeding those of 1749. The spasms, separated by intervals of greater or less duration, lasted 7 months, the principal outbursts being always accompanied by very intense earthquakes which made themselves felt throughout a large part of Luzon, on Mindoro Island, and northern Panay.</p> <p>A violent earthquake, but did very slight damage in Manila. During the month many more earthquakes of less intensity were felt; in fact they had been frequent ever since the preceding August. There exist no data concerning the provinces around Manila.</p>
29	1766 XII 7 10 45 VII	