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distances the differences are very great; since the beginning of the Diestien the ground has e.g. sunk 20 meters at Grave, 92 meters at Goes, 450 meters at Amsterdam. The countries adjoining on the south and the west, Belgium and England, have not taken part in this movement.

So we find a real sinking of the land in the Netherlands, which movement has been confined to a comparatively small region.

What then can be the practical significance of the supposed stability during the 200 years preceding the year 1860 in connection with the gradual considerable sinking in the latest geological periods?

Not one single movement of the crust of the earth takes place uninterruptedly in the same direction without intervals of rest or of movement in the opposite direction. Nor does it here. At least since pliocene times the ground has continually sunk, but no doubt this movement has been interrupted by periods of rest or slight opposed movement, which can be really proved, as was stated above.

But these are only slight sinuosities in a continuous line, whose general direction is downward. We cannot assume on geological grounds, that a movement, which has proceeded regularly in the same direction during a long series of centuries, however irregular it may be if only a short portion of time is considered, should have ceased just now, because we have not succeeded in demonstrating it by measurement during the last two centuries. No, we must much sooner assume that the two centuries before 1860 present one of the numerous small inflections in the line of movement, which on the whole runs downward. The rest will certainly be of short duration, probably it has already been replaced by a descending movement, and geologically speaking we may say in spite of the rest during the 200 years preceding the year 1860 observed at Amsterdam: the ground of the Netherlands has constantly sunk at least since pliocene times, and is still in the same long period of subsidence.

*The Hague*, June 11<sup>th</sup> 1909.

G. A. F. MOLENGRAAFF.

*Note on the sinking of the level of the ground of the Netherlands.* By J. M. VAN BEMMELN.

The depths at which the old layers of peat in the quaternary period of the strata of the earth are found, render the assumption of a lowering of our soil necessary, which is not unimportant. Dr. LORIÉ has derived from several borings that the sinking in that time has at least amounted to 18 meters, for at this depth the layer of peat has been found, though originally it has lain at the surface, and the

pools in which the peat has been formed, and to the bottom of which it has sunk, can have been but a few meters deep as a rule. How long it is, however, since such a peat layer was formed in those pools, is not to be estimated. So we cannot calculate how many years this sinking has continued, or to how much it has amounted in a thousand years or in a century, supposing it to have been regular throughout that time.

If we consult the opinions of geologists on this subject, we see how divergent these opinions are.

Mr. STARING considers the hypothesis of a sinking in recent times improbable, and ascribes the sinking for so far as it has been observed here and there, to the pressure of the woods, which have grown on the layers of peat.

SUES arrives at a negative result for our North-sea and the Baltic-sea shores. He is of opinion that visible sinkings were brought about by landslips, or by ruptures in not embanked places, or by storms, or by climatic changes in the Baltic region.

PENCK does not assume a sinking for the latter part of our present geologic period, and does not admit any measurable shifting of the coastline for the last thousand years.

DE GEER, too, assumes that the beach in our days is comparatively in a period of rest.

GRINITZ adduces some new facts, it is true, which point to a sinking, and mentions the formation of the Zuiderzee and the bay of the Dollard in the Netherlands, of the Jahde bay in North-Germany, the tradition of the Cimbric flood, but does not consider them as certain proofs.

SCHUCHT accepts, indeed, a secular lowering at the time of the depositing of the layers of old-alluvial silt and the formation of marshes (e. g. of the Weser), but is of opinion that no lowering can be ascertained at the time in which the Dutch range of dunes was broken and the conditions of ebb and flood were modified on the Northsea-coast.

SCHÜTTE thinks that the fact that the seaclay looses its chalk in course of time and the silt-layers shrink by desiccation and compression in consequence of the weight of the new silt-layers, could bring about at the utmost a time of rest in the lowering. Formerly it is true, he thought he could accept a lowering of 7,5 mm. a year (so 7,5 m. every 1000 years). Afterwards, however, he has revised his opinion, and has rejected the grounds for it.

Dr. REYNOLD estimated the sinking of the ground of the East-Frisian Dollard-polders at 8,8 mm. a year, and VENEMA <sup>1)</sup> has thought

<sup>1)</sup> VENEMA. Over het dalen van de noordkuststreken van ons land.

he could derive from the present height of the Groningen Dollard-polders, a sinking of 8 mm. a year. If it was allowed to apply that cypher to a longer period, the sinking would amount to 2—2,2 m., in the time from 1545 (the year of the first embankment) till 1850 and of 8—9 meters in 1000 years. This estimation exceeds so much the estimations derived from other data that for this very reason it appears to be unacceptable.

We bear in mind, however, that VENEMA's values also comprise the sinking of the ground of the Dollard-polders in consequence of the shrinking of the clay and peat layers during those 200—300 years. Beneath the clay the rests of the layer of peat remain, of which the ground consisted in earlier times and on which the Dollard-clay has settled. How thick these rests are (probably 1—2 m.) and to how much the shrinking in consequence of the deposited clay has amounted, is unknown, and so no estimation is possible.

In 1872 Dr. G. A. VAN GEYTENBEEK <sup>1)</sup> made a study of the situation of the layer of peat or of "derrie" (clayey peat) under the clay and of the layer of clay in the Zealand polders. He found that the upper surface of the layer of "derrie" lay at about 2 m. below A.P. From the height of the surface of the polders diked in between the 10<sup>th</sup> and 19<sup>th</sup> century with regard to the open sea, he derives a sinking of the surface of 2,865 m., so on an average 2,9 mm. a year.

The Insp.-Gen. A. A. BEKAAR has (according to the paper by Mr. J. C. RAMAER, Chief-Engineer, made this calculation from the data of two hundred polders, and found a sinking of the surface of 1.8 m., so about equally large. This sinking, however, cannot be considered as a sinking of the ground, it is only a sinking of the surface of the polders. Two factors come into play, first the shrinking of the clay by compression, secondly the actual lowering of the ground. From the height of the polders during the successive embankments from the eleventh century up to the present time the amount of this shrinking may be roughly estimated; probably about 1 m. On this supposition the actual lowering of the ground in Zealand would have amounted to only 0,8 m., so not quite one meter.

The old remains on the beach at Domburg (namely the temple of Nehellennia, coffins of a cemetery and many dwellings) lay behind the range of dunes in earlier times. Now they become visible on the beach, and have often been visible since 1680, when the wind continues to blow from the East or Northeast for a considerable time

<sup>1)</sup> Proeve eener Geologische Verh. over de prov. Zeeland gedurende het heden-daagsche tijdvak.

and the water at ebb has been very low. Thus the self-registering gauges at Westkapelle on the beach indicated the positions:

from 1877—1880	2.68 m. below A.P.
1881—1890	2.95 „ „ „
1891—1900	2.81 „ „ „

On the beach at Katwijk the low-water-mark is  $-1.84$ . There the ruins of the "Brittenburg" became visible in the 18th century.

These remains date from the beginning of our era, and would therefore point to a sinking of from 1,5 to 3 meters, unless the situation should be modified by other causes.

From these observations it might be deduced that the beach at Domburg lies from 2—3 m. below A.P. This result is one of the principal which have led to the opinion that a not inconsiderable lowering of our ground has taken place on the west coast of our country since the beginning of our era.

There are, however, many reasons for attributing this fact to other causes.

Since that time dunes have been blown inland over the beach, so that they lay more westward in earlier times. According to the map published by N. VISSCHER in 1670 there were still 4 or 5 ranges of dunes on the present beach of Walcheren, and now only one narrow range is left. So the others were washed away or blown inland. There was great pressure of these dunes on the beach at one time, but this has now ceased. The soil, there, consists of clay (which now presents a blue colour). This clay rests on a layer of peat.

Even now detached pieces of peat are found on this beach. This layer of clay is the "kwelder" an alluvial deposit outside the dike on which as on the Zealand islands in general (and also in Friesland and Groningen) the clay sediments were deposited, and on which the Frisian and Groningen Mounds ("Terpen") "terps" and the Zealand Mounds (hillocks "Hills") were erected.

Now there is a picture extant of the beach, made in the year 1860, when it was again quite laid bare by the winds, and the remains of the habitation were clearly visible. This picture shows that the coffins of the old burial ground from the first centuries after Christ lie on the beach; so the sand, in which they have lain, has been washed away. Yet they must have been at some depth *under* the earth of the burial ground, and not uncovered on the bare strand.

As now the dunes have passed over them, they were exposed to a pressure at one time. It is, however, the question if the clay soil was

softer then. It may therefore be questioned if the upper soil was peaty then, and if the oldest inhabitants of this coast-settlement have settled on peat. This, however, is not probable, but the clay layer *rested* on peat at all events, for the fen layer is found in Walcheren at  $\pm 2$  m. below A. P.

It is, therefore, of much importance to investigate at what depth this clay and this peat layer of the Domburg beach lie under the dunes, and how thick they are there. This knowledge is still wanting. Till then we shall have to suspend our decision as to the sinking, for not till then can we get a fixed point for the degree of compression of these layers. At present there is still too much discrepancy between the accounts of the situation of the foundation of the finds, the situation of the clay, and the situation of the peat at Domburg.

So we cannot yet decide how much less than 2—3 m. the compression of the ground, and therefore the sinking can have been at Domburg, and if a sinking of any importance remains after that.

It would be of importance to know in what century or centuries the shifting and narrowing of the dunes from the outside inland took place on the western coast of Walcheren to such an extent that some ranges of dunes have disappeared and the place (at earlier times behind the dunes) where the temple of Nehellennia, the burial ground with coffins and the dwelling-places stood, has become a beach covered with sand. But this time is not accurately known. Yet we should have to know it, to be able to conclude when it first became possible that this place was sometimes laid bare with continued east wind, and with very low ebb, and revealed itself with its remains to the people on the beach, as happened for the first time in the beginning of 1647, and has happened later on, even up to the present time <sup>1)</sup>.

This cannot have been much before 1646, for on N. VISSCHER's map of 1670, some ranges of dunes are drawn, which have now disappeared from the map of Walcheren, so that only one narrow line is to be seen. In 1647, however, the displacement and removing of the dunes by the wind must have been in full progress, and even far advanced, else this place could not have become a beach. Before 1647 there can have been hardly any chance of these remains being laid bare, because some dunes still rested on them; else the inhabitants of Dom-

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<sup>1)</sup> Observed in 1687, 1705, 1706, 1707, 1749, 1817, 1832, 1835, 1860, 1850—1866, 1879, according to Dr. PLEYTE, and observed 1906 by Miss MARIE DE MAN, who then clearly distinguished the foundation of a house, consisting of square pieces of clay, which lay regularly side by side with a pole in the middle, and with traces of a fence of paling.

burg would certainly have destroyed these remains, as they did afterwards.

So this displacement of the dunes inland must have taken place between 800--1000 before Christ and 1647. During the first centuries after Christ the coast immediately behind the dunes was still inhabited. But because the dunes were blown inland, this coast was deserted for so far as it became beach, and the inhabitants moved to those parts of the island which had been raised and made habitable by deposition of silt. Yet the coast, which had partly become beach, continued to be used, for some years after 1647 the remains of a canal were discovered, which was used by the boats of the herring fishery, and is reproduced by Mr. FREDERIKS on his map of 1866.<sup>1)</sup> It is known that Domburg had still a harbour in 1544, from which the boats sailed out for herring fishing.

So there is no reason to assume that first a sinking should have taken place between the beginning of our era and the tenth century, and still less that a rise should have taken place between the 10<sup>th</sup> century and the seventeenth century, which caused the remains of the temple, the burial ground, and the dwellings from the Roman time to reappear. A rise has not been necessary to bring this about.

J. C. RAMAER, head-engineer of the hydrographic survey, has derived 1<sup>st</sup> a sinking of 1,3 mm. a year from the water levels observed on 8 accurate gauges during 35 years, 2<sup>nd</sup> a sinking of 1.6 mm. from the observations of a series of gauges in our country during 47 years, 3<sup>rd</sup> a sinking of 1.4 mm. a year from observations during 6 years.

H. G. VAN DE SANDE. BAKHUYZEN has subjected these records of RAMAER's gauges to a strict critical examination, and has arrived at the conclusion, that no reliable results are to be derived from them.

It seems to me that the Mounds in Friesland and Groningen, and also those in East-Friesland, Oldenburg and Holstein might teach us something about the sinking, if we examine the bottom or the floor (of the mound or hillock) (Wierde, Word or Wurth) with respect to the mean high water mark of A.P. For it may be assumed that the erection of the Mound or Wierde has taken place on a "kwelder"<sup>2)</sup> (Schor, Groden) which was dry at low water, and gave protection from the high water by the raised Mounds, as PLINIUS

<sup>1)</sup> Miss MARIE DE MAN: Que sait-on de la plage de Dombourg? 1899 G. TH. BOM EN ZOON. P. 51.

<sup>2)</sup> A "kwelder" is a new alluvial deposit of clay-silt outside the last dike, or outside the coast.

already described accurately<sup>1)</sup>. So the knowledge of the elevation of the floor above A. P. must be of much importance.

For Friesland and Groningen Mr. VAN GIFFEN has collected data about this, and for Oldenburg Prof. J. MARTIN (at Oldenburg). From this appears that for the north of the Netherlands no greater sinking than  $\frac{1}{2} - \pm 1$  m. can be derived from these data, nay for many Mounds a sinking which is hardly appreciable, or no sinking at all.

In the first half of the nineteenth century about 1845 Dr. ACKER STRATINGH and Dr. WESTERHOFF stated about the Mounds at Warffum, Uskwerd, and about the Groningen Mounds in general that their bottom lay from two to three meters below the level of the arable ground. The height of the arable ground round the Mound with respect to A. P. was, however, not given, and in no case ascertained by levelling.

Moreover ACKER STRATINGH and WESTERHOFF have very probably set down the foundation (the floor or bottom) of the Mound as too low. This foundation could be most easily ascertained between the layer of manure at the bottom of the Mound and the untouched ground. But it is just at these places that the floor probably lies deeper, for the manure at the bottom of the Mound often lies in dug holes. Such holes have, e.g., been found in the Mounds of Baaijum and of Dongjum. There the remains are found of fresh water basins overgrown with rushes and filled with manure. These basins must have been dug in the earth at the building of the Mounds. When later on the Mound was made higher (which took place with all of them), they were filled up with the manure of the cattle-keepers, as still happens in the Halligen.<sup>2)</sup>

We can now by no means derive the depth of the floor of the Mounds, and much less the extent of the lowering, from the accounts of STRATINGH and WESTERHOFF.

<sup>1)</sup> Cf. "Beschrijving over het tegenwoordig standpunt onzer kennis van de Nederl. Terpen". E. J. BRILL Leiden 1908 p. 144—145.

<sup>2)</sup> The Halligen are oblong, unembanked islands ("kwelders"), now inhabited by cattle-keepers, who do not occupy themselves with agriculture. They were raised high enough by washed ashore silt and mud in former times to be protected from the flood and to be habitable. They lie along the Sleswick coast. On these islands "wurthen" have been raised. If one digs down to the bottom of the Mound one finds the remains of a fresh water basin (Fething) as described above overgrown with rushes and filled with manure. Why and when this happened, is unknown to me. These Wurthen or Mounds date from the preceding century, so they are of recent date.



Some fifteen Mounds in Friesland and Groningen have been examined by Mr. VAN GIFFEN.

*Hoogebeintum.* On the Mound lies the churchyard, which is very high in itself, and on this the church. The height of the real Mound is 5.80 m. + A.P. north-west of the church.<sup>1)</sup> The Mound must be 1500 years old at least, and the church not less than 700 years, for it was originally built of Tuff-stone, and not before 1200 after Christ bricks came into use as building material, of which the newer parts of the church are composed. The Mound is one of the highest, so we may safely assume that it cannot have been higher after 800. The boundary of the grave-yard (found in the Mound) lies at the edge of the Mound, at  $\pm \frac{1}{2}$  m. above A.P., and as the relics of this grave-yard date from the Merovingian time of 500—750 after Christ, this grave-yard can be no older than 1500 years. Now the Mound-earth of this Mound does not go any deeper than  $\pm 0,3$  m. above A.P.

The foundation of this Mound consists partly of sandbanks in layers running from the north to the south, and which have been washed ashore from the north-west. The height of these banks (which clearly show "kwelder" vegetation) is from 0,10 to 0,60 m. + A.P.

If the lowering of the ground under the Mound had only amounted to 1 mm. a year, it would have amounted to as much as 1,5 m. after 1500 years, and the graveyard would now lie deeply buried in the ground.

In general the relics from the first centuries after Christ occur in the oldest Mound-layers, especially those from the Roman era, so from the latter half of the first century *before* Christ, e.g. in the Mound at Besseburen near Beetgum, and also the Saxon urns from the Merovingian period. These lowest Mound layers do not lie below A.P. or only a little below it.

*The Mound at Baayum.* To determine the foundation, the ground close by the side of the Mound was investigated. Under the turf a layer of "knik"<sup>2)</sup> was found, which downward gradually passed into light yellow sandy soil in layers, and under this bluish sand with shells, *Scrobicularia*, *Cardium*, *Tellina* etc.

<sup>1)</sup> The threshold height of the church is 8.50 m. + A.P.; the highest point of the church-yard lies at 8.95 M. + A.P. This point was formerly erroneously taken for the height of the Mound, which was accordingly given as much too high.

<sup>2)</sup> "Knik" is a clay hardened by mixture with oxyde of iron, and a moist situation during a long time.

Under the Mound the condition was for the greater part the same as in the arable ground. The floor from 0,10 to 0,30 m.  $\pm$  A.P. consists of layers of sandy clay. Some parts of this foundation lay on the North- and on the North-west side. In the basins rush-peat was formed, namely a layer  $\pm$  0,85 m. thick. They point to places of excavation for the acquisition of ground for the older Mound. In later times this Mound was made higher, and extended over the original hollows, in which peat had been formed in the meantime. This is the more probable, as no peat is found in the arable ground. The peat mentioned has been greatly compressed by the pressure of the Mound, and yet it lies but little below A.P.

That the foundation of this Mound had not sunk was also derived from this, that under the second surface of habitation, so from the first time of the Mound, shards of *Roman* crockery were found. In the lowest layer of the Mound lay the manure; in the middle of the Mound it passed downward into deep holes, where no manure was found, and the earth had a dark colour, probably in consequence of the oldest habitation. On these different layers, with which the height of the Mound was successively increased, were found, separated by layers of ashes. These layers of ashes mark the different times the Mound was made higher, and each of them we may assume to have been the temporary surface of habitation of the Mound.

The foundations of 7 Groningen and 9 Frisian Mounds were found at a height from just below to just above A. P.

*Joeswerd* 0,2 above to slightly below A. P.

*Dorkwerd* at 0.45 m. below A. P.

*Oostum* at 0.15—0.3 m.  $\pm$  A. P.

*Feerwerd* at 0.1—0.5 m.  $\pm$  A. P.

*Garnwerd* at 0.15—0.5 m.  $\pm$  A. P.

*Leermens* not considerably below the arable ground.

*Westeremden* not considerably below the arable ground.

*Dongjum* at  $\pm$  A. P. to 0.2 m.  $\pm$  A. P.

*Fatum* at 0.025—0.26 m.  $\pm$  A. P.

*Vlaeren* at 0.3 m.  $\pm$  A. P.

*Aalsum* at the height of the arable ground.

*Ferwerd* 0.30 — A. P. to 0.05  $\pm$  A. P.

*Pingjum* (the village) slightly above A. P.

*Terp near Pingjum* height of the arable ground.

*Kimswerd* about the height of the arable ground.

*Marsum* the same.

Oberahn near Sande in the bay of Jahde lies 1.0 m. above A. P. In the Mound at Farmsum the foundation lay 0.65 m. below A.P., but it rested on 0.4 m. of clay and almost 4 m. of low peaty ground. So it is clear that the situation of the foundation does not betray a sinking, but a shrinking of the thick peat-layer.

Two Frisian Mounds, which rested on diluvial sand, presented a succession of layers, which pointed to a post-diluvial lowering, so a lowering of earlier times, *before* the erection of the Mound.

On the diluvial sand, (brown on the upper side), followed:

1. A layer of high peaty ground, which contains "rietstokken" (reeds intercrossed with roots) in the lower parts, higher however it contains heather, peat moss, birchwood etc.

2. On this a layer of clay with "kwelder" vegetation. This layer is 1.5—2.0 m. thick under the Mound of Dokkum. In the lowest parts it contains remains of *Triglochin maritimum*.

So the original surface was diluvial sand.

But since the ground sank and was flooded, so that a vegetation arose in water, which gradually was decomposed and formed a layer of low peaty ground. The sinking of the ground continued, so that clay was washed ashore and deposited by the sea-water. On this sea-clay the Mound was afterwards built. Together the layers are  $\pm 3$  m. thick near Dokkum, and to this cypher must amount the post-diluvial sinking, which extended over thousands of years, for the above-mentioned Mounds have taught us that no sinking has taken place for the last two thousand years, or only an insignificant one. After the deposition of the sea-clay the post-diluvial sinking must have ceased, or at least have become very slight.

J. MARTIN furnished some data on the Mounds in Oldenburg.

In the Mound at Bant the floor lies 0.3 m. below the arable land, and cannot have been much higher; for the "kwelder" outside the dike does not lie higher. The ground was rediked in 1529.

The Mound between Ellerdem and Sande, on which a church used to stand in former times, has a recognisable floor, i. e. a sand-layer, which includes a layer of bog, and lies 0.3 m. below the arable ground.

The Mound at Haddien in Jeverland contains a layer of knik-clay which contains many shards down to 1.06 m., under which, sharply defined, a bog layer from 1.1 to 1.5 m. Here the floor lies about at the same level as A.P. The Mound contains many urns with burned remains, hence it dates from the pre-Frankish time.

A Mound at Tettens has a floor which lies 1.2 m. below the level of the "kwelder" outside the dike ( $= 0.30$  above A.P.).

A graveyard of urns, in which many coffins lie, showing the shape of trees, presents an "Oer<sup>1)</sup> soil" of pure gray clay. It is noteworthy that the younger tree-coffins lie deeper. The older urns with burned remains, which were found in it, lie close to the surface and date from the 3<sup>rd</sup> century.

So if these Mounds in Oldenburg show a sinking of the ground, it is certainly smaller than 1 m.

If we now summarize the results of the investigations, they teach us that:

Some Mounds have shown a post-glacial sinking of  $\pm 3$  m., which took place before the beginning of our era.

The calculations about the lowering of the beach at Domburg are still quite uncertain, because this situation depends on the influence of different other factors. The same thing applies to the beach at Katwijk.

In Zealand the situation of the basis or floor of the Mounds teaches us but little about the lowering. The floors in Walcheren lie from 0.10 m. — A. P. to  $\pm 0.80$  m. + A. P., certainly to 0.50 m. + A. P. They only allow the assumption of a slight lowering. REYNOLD and VENEMA's calculations on the lowering of the Dollard-polders must be rejected.

It follows from the heights of the floors in the Mounds of Friesland, Groningen, and Oldenburg, that the lowering is only a few decimeters, or that there is none at all.

A lowering in the Mound of Farmsum of 0.65 m. may be ascribed to a shrinking of a thick layer of peat under the Mound.

From the data of the gauges at Amsterdam and elsewhere in the Netherlands RAMAER has derived a lowering of  $\pm 1.5$  mm. a year during the preceding century, but according to VAN DE SANDE BAKHUYZEN *no reliable result* can be derived from these data about the lowering of the ground in the last hundred years.

We must further call attention to the uncertainty, that prevails as to whether the sinking of the ground in the north of the Netherlands has been the same as in the south, and in the east the same as in the west.

But on this point we have not yet any data laying claim to the least certainty with regard to Zealand, South- and North Holland, Friesland, Groningen, East-Friesland, Oldenburg, Holstein and Sleswick, which would point to this.

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<sup>1)</sup> "Oer" is a layer of sand, containing still more oxide of iron than the "knik" soil, and hardened by it.

However this may be, this is certain that it has been derived from the geological observations that in the quaternary period there must have been a lowering of the ground of at least 18 m. A determination of the duration of this period is, however, not possible.

In virtue of this, and of a post-glacial lowering before the beginning of our era, which may perhaps be derived from some Mounds, we may state, *that we are still in a period of sinking*, but also that *most probably this sinking has ceased for the last two thousand years*, or at least been very slight during this time.

**Zoology.** — *“On the Age of Salmon to be Derived from the Structure of the Scales”*. By Dr. P. P. C. HOLK.

(Communicated in the meeting of November 27, 1909.)

Quite independent of human influence, salmon ascend the rivers they think fit in numbers which vary very much periodically. The influence exercised by man — be it men fishing, or men inhabiting and polluting the banks, or men as navigators or river engineers — interferes greatly with the natural production; it makes it difficult, in fact nearly impossible, to obtain an exact notion regarding the extent, the periodicity etc. of the natural fluctuations. Yet the correctness of the ascent varying periodically is not to be concealed by this circumstance: we see that groups of richer years alternate in a very striking way with groups of years of a considerable smaller catch; and they do so at present as well as formerly, judging from statistics at our disposal, say 30 or 50 years ago.

Now seeing how the catches are composed, we soon discover that there is a good reason for this being the case. If we analyse the catch of a certain year we find that considerable differences in size occur between the specimens composing that catch. However, not all possible sizes between the smallest and the largest specimens are represented; on the contrary, according to their size the ascending salmon can be rather easily divided into three categories or size-groups of about the following dimensions:

small	salmon (“grilse”= Jacob-salmon)	of 55—67 cm.
middle-sized	„ (small summer-salmon)	„ 78—90 „
and large	„ (large summer-salmon and winter-salmon)	„ 100—110 „

Based on a long experience and on a careful study of the sizes of the ascending salmon, which was begun by the Basel Professor MIESCHER RUESCH (1880) and continued by the present author (1894), the opinion is now well established that the smallest salmon of a certain year and the middle-sized ones of the next year, as well