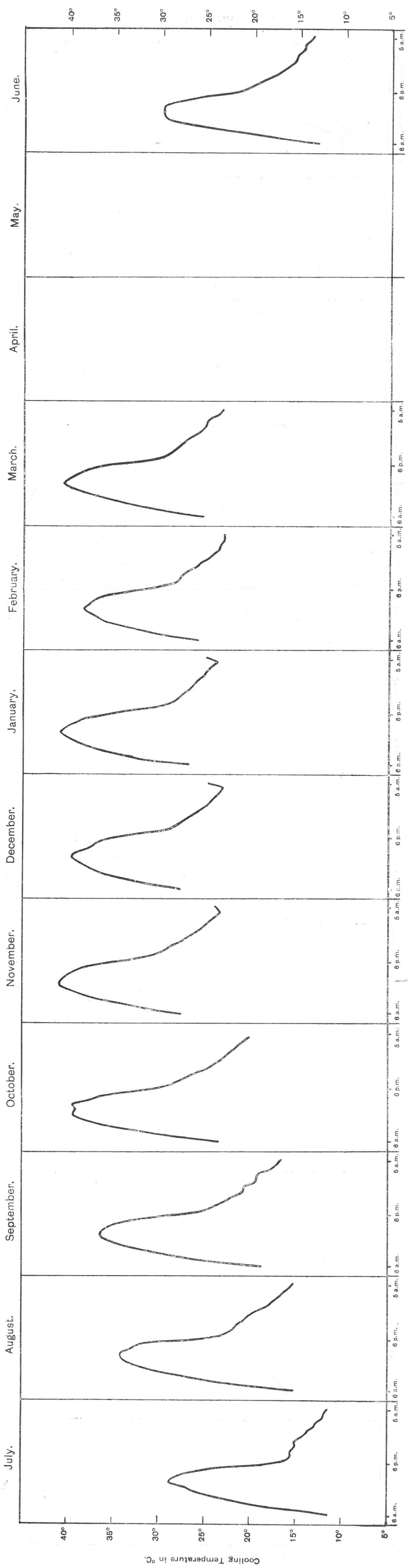


GRAPH X.

Bloemfontein. Cooling Temperature.

Each curve shows the average monthly values of the cooling temperature (in degrees Centigrade) for each of the 24 hours per day.



BLOEMFONTEIN.

temperature was continuously above 40° for about 7 hours on half the number of days in each of these months. During August, September and May readings below 20° were obtained on an average of 12 successive hours practically every day.

A detailed study of the table will illustrate more clearly the characteristic features of the cooling temperature conditions at Johannesburg. The same refers to the results obtained at the other stations.

2. The Cooling Temperature at Bloemfontein.

Graph X shows the mean hourly values of the cooling temperature at Bloemfontein. They increased very steadily from July until November. Then followed five months with very similar average values. In June, 1938, when the instruments were erected at the Boyden Station Observatory, the cooling temperature readings were very low.

TABLE 7.

Bloemfontein, Cooling Temperature: (A) Ranges, (B) Frequency of large Variations and (C) Periods with High and Low Values.

Month.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	
A. {	Range highest—lowest	16°	19°	20°	19°	17°	16°	17°	15°	17°	—	—	17°
	hourly mean value... Range 6p.m.—6 a.m.....	5°	8°	9°	9°	9°	8°	8°	7°	8°	—	—	7°
B. {	Total number of hours with variations greater than 10°	6	7	17	9	8	11	34	16	11	—	—	10
	Number of days on which these variations oc- curred.....	6	6	11	8	5	8	17	9	5	—	—	5
C. {	Average number of hours per day with more than 40° cool. temp.....	0	5	5	6	7	7	7	7	6	—	—	0
	Number of days on which these high cool. temp. were recorded.....	0	1	8	12	18	15	15	6	16	—	—	0
	Average number of hours per day with less than 20° cool. temp.....	15	10	11	8	10	5	5	5	0	—	—	13
	Number of days on which these low cool. temp. were recorded.....	29	30	14	8	1	1	1	1	0	—	—	26

A. *Ranges.* The effect of the rainy season on diminishing the daily range of cooling temperature was less pronounced in Bloemfontein than in Johannesburg, the difference between day and night readings being large the whole year round. The average daily range, namely 17° , was 1° lower than at Johannesburg.

The average drop during the nights was also great, being approximately 8° .

B. Variations: The frequency of large and rapid changes of the cooling temperature was distinctly smaller than in Johannesburg. Only January showed a relatively great number of jumps of more than 10° during one hour, namely 34 times on 14 days.

C. High and Low Values: During the months October, November, December, January and March periods of 6 to 7 hours with cooling temperatures above 40° were recorded quite frequently. The winter months, July and August, 1937, and June, 1938, showed altogether only one day with such high readings. These winter months, however, showed numerous periods with very low readings. Cooling temperatures below 20° for 10-13 hours per day occurred practically every day.

3. The Cooling Temperature at Nelspoort Sanatorium.

Measurements of the cooling temperature at Nelspoort were unfortunately not taken from the middle of December, 1937, until the beginning of March, 1938, and again from the beginning of May until the middle of June, 1938.

TABLE 8.

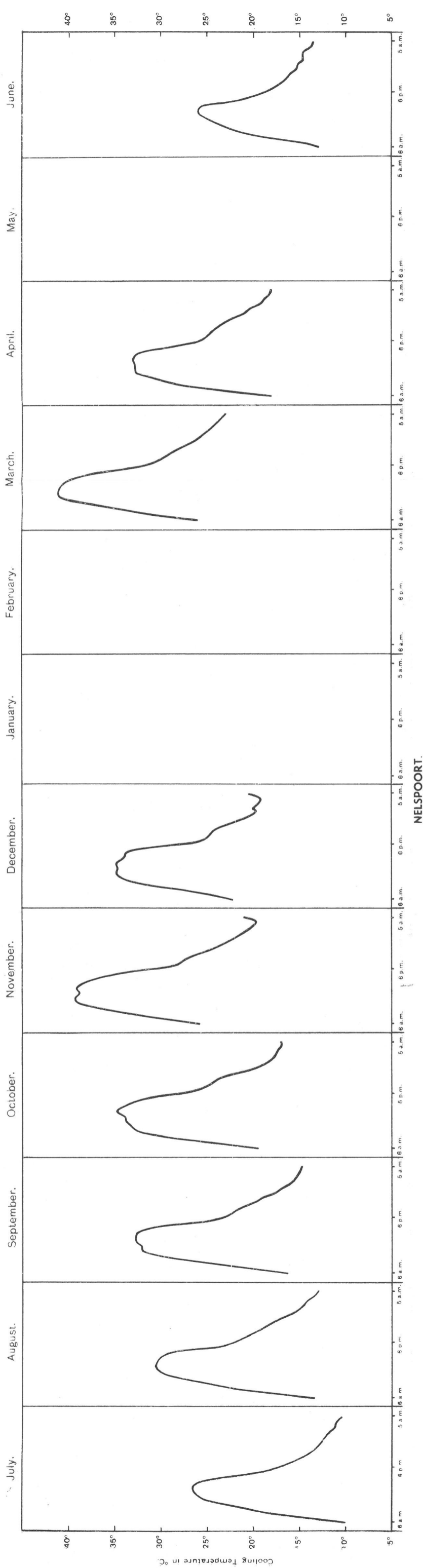
Nelspoort Sanatorium, Cooling Temperature: (A) Ranges, (B) Frequency of Large Variations and (C) Periods with High and Low Values.

Month.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	
A. {	Range highest—lowest	17	18	18	18	20	16	—	—	18	15	—	—
	hourly mean value....	7	9	9	10	9	8	—	—	9	8	—	—
B. {	Total number of hours with variations greater than 10°	16	12	20	9	31	22	—	—	15	21	—	—
	Number of days on which these variations occurred.....	14	11	17	8	19	12	—	—	13	13	—	—
C. {	Average number of hours per day with more than 40° cool. temp.....	0	0	6	6	7	0	—	—	6.5	5	—	—
	Number of days on which these high cool. temp. were recorded.....	0	0	3	4	10	0	—	—	17	1	—	—
C. {	Average number of hours per day with less than 20° cool. temp.....	16	13	13	10	7	9	—	—	0	9	—	16
	Number of days on which these low cool. temp. were recorded.....	28	22	24	16	10	8	—	—	0	16	—	14

GRAPH XI.

Nelspoort. Cooling Temperature.

Each curve shows the average monthly values of the cooling temperature (in degrees Centigrade) for each of the 24 hours per day.

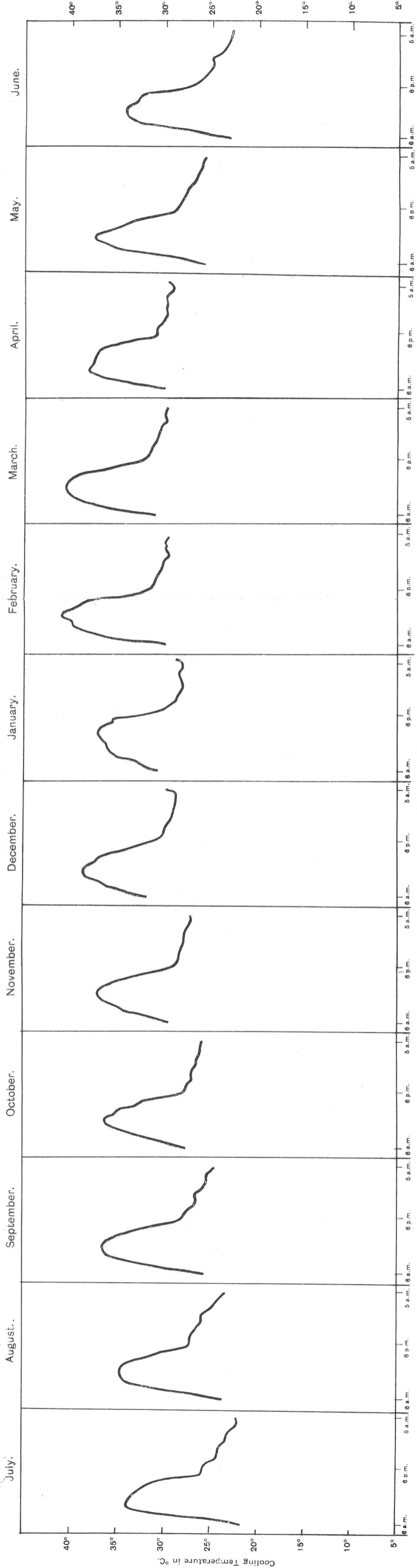


NELSPOORT.

GRAPH XII.

Durban. Cooling Temperature.

Each curve shows the average monthly values of the cooling temperature (in degrees Centigrade) for each of the 24 hours per day.



DURBAN.

The hourly mean cooling temperature for Nelspoort is given in Graph XI. As at the two other inland stations, Johannesburg and Bloemfontein, the hourly mean cooling temperature increased during the course of the year until December, when the readings showed a distinct drop. The difference between March and April was very marked; the mean highest readings were 8° lower in the latter month. During the second half of June, 1938, very low cooling temperatures were recorded.

1. *Ranges*.—The differences between the highest and the lowest hourly readings were great all the year round, the average being also 17° , as in Bloemfontein.

The average nightly range was also the same as in Bloemfontein, namely 8° .

B. *Variations*.—Large and rapid changes of the cooling temperature were more frequent in Nelspoort than in Bloemfontein, but they were less numerous than in Johannesburg.

C. *High and Low Values*.—The occurrence of very high and very low cooling temperatures during the course of the year cannot be given as the readings are incomplete. It can only be said that during the winter months July and August, 1937, and June, 1938, readings above 40° were never recorded. In that respect the conditions were similar to those at the other inland stations. As far as readings are available they seem to indicate that during the remaining months the frequency of periods with more than 40° cooling temperature is smaller in Nelspoort than in Johannesburg and Bloemfontein. Periods of 13-16 hours per day with cooling temperatures below 20° occurred during most days in July, August and September, 1937. The remaining months also showed a comparatively large number of long periods with very low cooling temperatures.

4. *The Cooling Temperatures at Durban.*

When considering the cooling temperature at Durban (given in Graph XII) there are two facts which are most striking: firstly the mean cooling temperature was rather high all the year round, and secondly it varied comparatively little during the course of the year. This is due to the influence of that great store of warmth, the ocean, which tends to lessen the variation of temperature from day to night and from summer to winter. During summer the sea is heated up by the sun and much heat is stored. A great deal of the heat is given off in winter and consequently there is less fluctuation of temperature at the coast than inland.

A third outstanding feature of the cooling temperature at Durban is that the daily ranges, given in Part A of the following table, were small during summer as well as during winter.

1. *Ranges*.—The yearly average drop from the highest to the lowest readings of the cooling temperature was only 11° ; it varied very little during the course of the year. The range during the nights was particularly small, it averaged only 2.5° . This illustrates very significantly the small refreshing qualities of the nights of the coastal climate at Durban.

TABLE 9.

Durban, Cooling Temperature: (A) Ranges, (B) Frequency of large Variations and (C) Periods with High and Low Values.

Month.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	
A. {	Range highest—lowest	12°	11°	12°	10°	10°	10°	9°	11°	11°	9°	11°	11°
	hourly mean value....	4°	4°	4°	2°	2°	1°	2°	2°	2°	1°	3°	4°
B. {	Total number of hours with variations greater than 10°.....	13	6	11	11	7	6	8	12	2	6	6	6
	Number of days on which these variations occurred.....	10	6	10	4	3	5	6	5	2	4	6	6
C. {	Average number of hours per day with more than 40° cool. temp.....	0	0	0	6	9	7	8	6	6.5	6	0	0
	Number of days on which these high cool. temp. were recorded.....	0	0	0	3	4	6	9	11	14	7	0	0
	Average number of hours per day with less than 20° cool. temp.....	6	5	0	0	0	0	0	0	0	0	0	5
	Number of days on which these low cool. temp. were recorded.....	5	1	0	0	0	0	0	0	0	0	0	3

B. Variations.—There were comparatively few days with large and rapid variations, nevertheless they occurred, most frequently during the months of July and September, 1937.

C. High and Low Values.—During the five months (July, August and September, 1937, and May and June, 1938) not a single period of 5 or more hours occurred with a cooling temperature of over 40°. Of the remaining months only February and March showed more than 10 days each with such high readings. In November and January a period of 9 and 8 hours were experienced on 4 and 9 days respectively. On the whole it can be said that the amount of periods with very high cooling temperatures was remarkably small, smaller than at any of the other stations. Cooling temperature values of less than 20° occurred only on very few days in July and August, 1937, and in June, 1938. The remaining 9 months had no periods of 5 hours or more with such low readings.

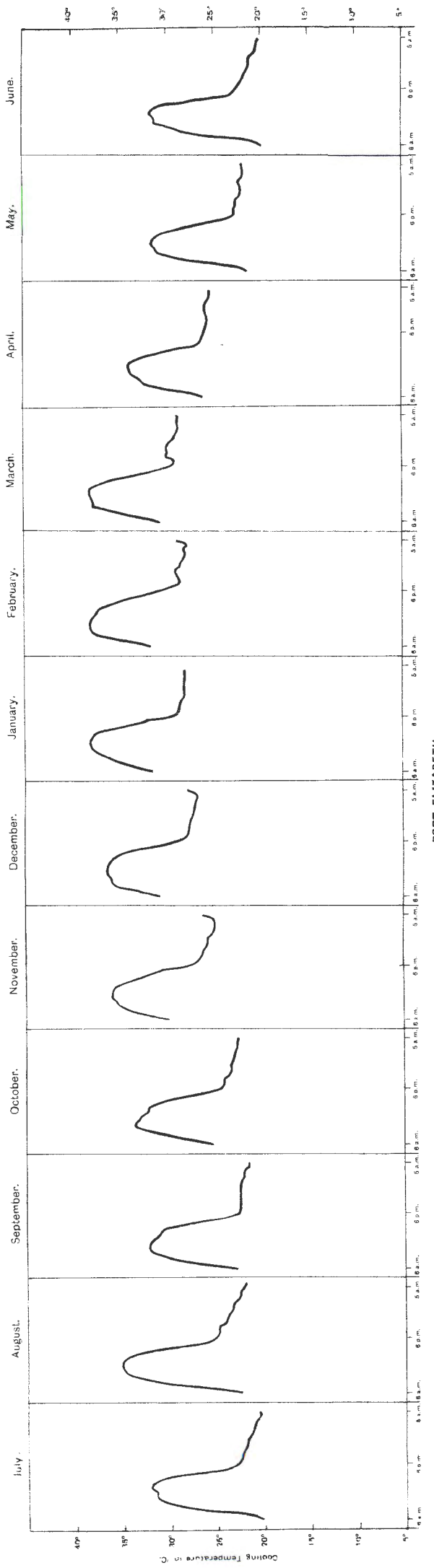
5. The Cooling Temperature at Port Elizabeth.

The graph of the mean hourly cooling temperature for Port Elizabeth (Graph XIII) also shows the influence of the sea. The mean cooling temperature was fairly constant the whole year round. There was a steady but not very pronounced increase from winter to summer.

GRAPH XIII.

Port Elizabeth. Cooling Temperature.

Each curve shows the average monthly values of the cooling temperature (in degrees Centigrade) for each of the 24 hours per day.

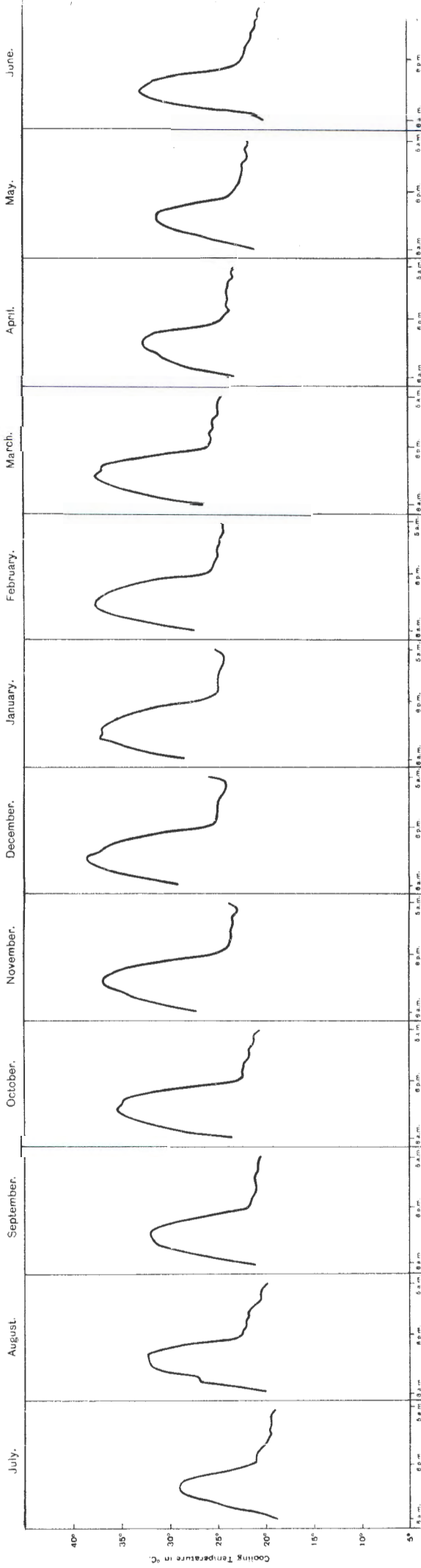


PORT ELIZABETH.

GRAPH XIV.

Cape Town. Cooling Temperature.

Each curve shows the average monthly values of the cooling temperature (in degrees Centigrade) for each of the 24 hours per day.



CAPE TOWN.

TABLE 10.

Port Elizabeth, Cooling Temperature: (A) Ranges, (B) Frequency of large Variations and (C) Periods with High and Low Values.

Month.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
A. {	Range highest—lowest hourly mean value	12°	13°	11°	11°	10°	10°	10°	9°	9°	10°	12°
	Range 6 p.m.—6 a.m.	2°	3°	1°	2°	1°	1°	0·4°	2°	1°	1°	2°
B. {	Total number of hours with variations greater than 10°	14	17	14	11	14	14	17	7	4	8	14
	Number of days on which these variations occurred	11	12	9	10	12	10	12	7	4	4	12
C. {	Average number of hours per day with more than 40° cool. temp.	0	8	0	7	5	7·5	8	8	5·5	7	0
	Number of days on which these high cool. temp. were recorded	0	5	0	1	2	2	7	7	5	1	0
	Average number of hours per day with less than 20° cool. temp.	10	8	13	8	0	0	0	0	0	6	10
	Number of days on which these low cool. temp. were recorded	15	7	6	6	0	0	0	0	0	2	15

A. Ranges.—The range between highest and lowest mean cooling temperature was on an average the same as in Durban, i.e., 11°; the variation of the range during the course of the year was also small. The average decrease during the nights was only 1·5°.

B. Variations.—Rapid variations of more than 10° during one hour occurred quite frequently and were more or less evenly distributed throughout the year.

C. High and Low Values.—Periods of 5 hours or more with a cooling temperature above 40° were not very often experienced. August, January and February had 5, 7 and 7 days respectively during which high readings for a period of 8 hours were recorded. It is remarkable that the winter month of August showed such long periods of high cooling temperatures on 5 days.

During the 5 summer months (November-March) periods with values below 20° were not recorded. Five other months experienced a few days each with low reading periods, but the two winter months July, 1937, and June, 1938, recorded 15 days each with low cooling temperatures over average periods of 10 hours.

6. *The Cooling Temperature at Capetown.*

The variations of the cooling temperature during the course of the year, as given in Graph XIV, were not very great; a slight and rather steady increase from winter to summer took place.

TABLE 11.

Cape Town, Cooling Temperature: (A) Ranges, (B) Frequency of large Variations and (C) Periods with High and Low Values.

Month.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	
A. {	Range highest—lowest	10°	13°	12°	15	14°	14°	13°	13°	13°	9°	10°	13°
	hourly mean value....	2°	3°	1°	3	2°	2°	2°	2°	2°	1°	2°	2°
B. {	Total number of hours with variations greater than 10°.....	11	13	24	28	16	6	13	1	5	11	9	17
	Number of days on which these variations occurred.....	6	8	13	18	10	5	5	1	3	9	6	7
C. {	Average number of hours per day with more than 40° cool. temp.....	0	6	6	7	5	7	7	6	5	5	0	5
	Number of days on which these high cool. temp. were recorded.....	0	2	1	3	5	4	8	3	3	1	0	4
	Average number of hours per day with less than 20° cool. temp.....	11	10	12	12	10	0	0	0	0	0	9	8
	Number of days on which these low cool. temp. were recorded.....	23	20	12	3	1	0	0	0	0	0	6	12

A. *Ranges.*—The average range between highest and lowest readings was 13°, a little greater than at the other coastal stations. The variation of this range during the course of the year was irregular.

B. *Variations.*—Rapid variations of more than 10° during one hour occurred in every month, but more frequently during the winter.

C. *High and Low Values.*—Periods with cooling temperatures of 40° and more occurred on a few days in every month except July, 1937, and March, 1938. The number of days with such high readings was, however, small all the year round.

Periods with readings below 20° were quite frequently recorded during September, 1937, and June, 1938.

Table 12 gives in the form of yearly averages for all stations a summary of the data already given. This table serves to emphasize the results already discussed and it enables one to compare the results of the different stations.

TABLE 12.

Cooling Temperature.—(A) Yearly Average Ranges, (B) Yearly Frequency of large Variations and (C) Yearly Frequency of Periods with High and Low Values at the Six Stations in the Union.

Stations.	Johan- nes- burg.	Bloem- fontein.	Nels- poort.	Durban.	Port Eliza- beth.	Cape Town.	
A. {	Yearly average range highest- lowest hourly mean values	18°	17°	17°	11°	11°	13°
	Yearly average range between 6 p.m. and 6 a.m.	7°	8°	8°	2.5°	1.5°	2°
B. {	Total number of hours with variations greater than 10°	334	129	146	94	142	154
	Total number of days on which these variations occurred.....	203	80	107	67	109	91
C. {	Yearly average number of hours per day with more than 40° cooling tempera- ture.....	6	6	6	7	7	6
	Total number of days on which these high cool. tem- peratures were recorded..	55	91	35	54	30	34
	Yearly average number of hours per day with less than 20° cooling tempera- ture.....	12	9	12	5	9	10
	Total number of days on which these low cool. tem- peratures were recorded..	139	111	138	9	57	77

COMPARISON OF THE COOLING TEMPERATURE READINGS AT SIX
STATIONS IN THE UNION.

The following points were chosen for a comparison of the results obtained at the six stations in the Union:

1. The mean value *for each hour* for the various seasons, i.e. the daily readings for the hours 1-2 a.m., 2-3 a.m. etc., were averaged over periods of three months. By means of these figures the seasonal average conditions *during the course of the day* can be compared with each other.

2. All the cooling temperature readings in each month were averaged. These values present the average change of conditions *during the course of the year*.

3. The mean monthly values of the daily maximum and minimum were calculated and are given together with the absolute highest and lowest readings for each month.

The following text deals with these three items separately.

1. *The Mean Seasonal Cooling Temperatures for each Hour of the Day.*

The mean seasonal cooling temperatures for each hour of the day are given in Table 14 and 14A, pages 423-426. The average is taken over periods of three months except during winter, which only includes the readings of two months, namely July and August, 1937. The following groups of months were taken to represent the different seasons:—Spring: September, October and November; summer: December, January and February; autumn: March, April and May, and winter: July and August, 1937. The summer and the winter average values are given in the form of a graph (Graph XV).

Graph XV discloses the following:—

(a) *Inland Stations: Winter.*—The cooling temperature at Johannesburg showed the greatest extreme values, the days having higher readings and the nights lower readings there than at any of the other inland stations. Bloemfontein registered distinctly higher values at night but in daytime the cooling temperature was lower than at Johannesburg. In Nelspoort the values were only a little higher at night, but distinctly lower during the days than at Johannesburg.

The average conditions in autumn and spring in Johannesburg approached nearer to the summer than to the winter conditions.

Another significant feature at the inland stations was that the rapid decrease of the cooling temperature in the afternoon continued even after sunset. Particularly was this the case at Johannesburg.

Summer.—Seasonal mean values cannot be compared as the readings were not registered continuously at Nelspoort Sanatorium.

(b) *Coastal Stations.*—The highest seasonal mean values of the cooling temperature during day and night and also in winter and summer were obtained at Durban; the average readings were only a little lower at Port Elizabeth and another 2° to 3° lower at Cape Town. In general, the average conditions at the three coastal stations showed no very distinct differences, although the individual daily readings sometimes varied considerably.

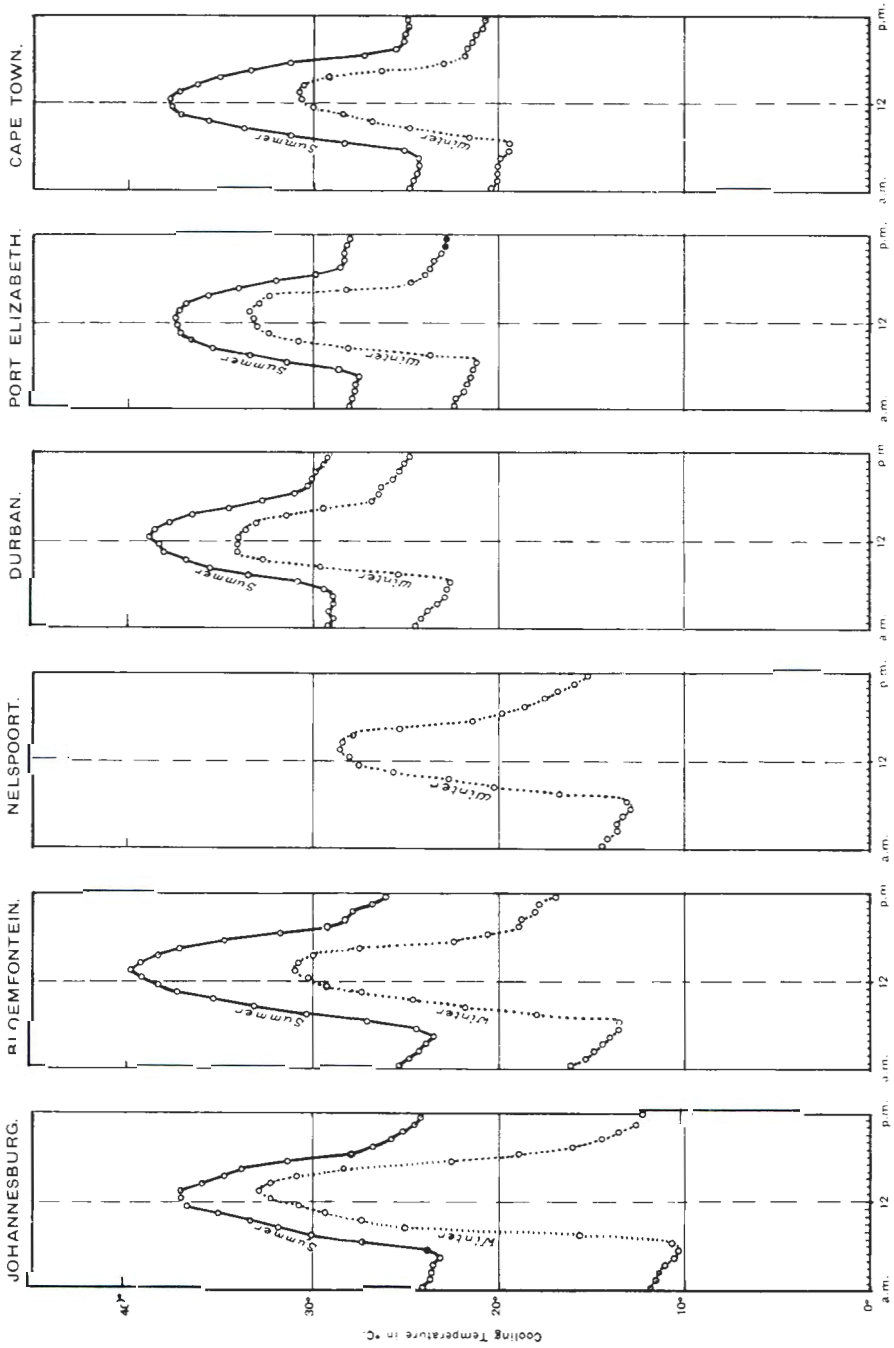
In contrast to the inland stations the average drop of the cooling temperature during the nights at the coastal stations was small for both winter and summer. The rapid decrease in the afternoon only lasted until sunset, immediately after which only a gradual drop was recorded.

2. *The Mean Cooling Temperature for all Hours of Each Month.*

The mean values of all hourly readings in each month are given in Graph XVI. This graph represents the average conditions of the cooling temperature at the various stations during the course of the year.

The most significant feature of this graph is the great increase of the mean cooling temperature from winter to summer at the inland stations. This average increase from July until November inclusive

GRAPH XV.
 Mean Cooling Temperature of Each Hour of the Day for the Winter and
 and Summer Season at Six Stations in the Union.



amounted in Johannesburg to 14.3° , Bloemfontein 13.8° and Nelspoort Sanatorium 12.8° . The increase over the same period for the coastal stations was: 4.3° in Durban, 5.1° in Port Elizabeth and 5.9° in Capetown.

Graph XVI shows further, that the monthly average cooling temperature in winter was distinctly lower at the inland stations than at the coastal stations. In summer, however, this difference was not very pronounced. On the contrary, the mean cooling temperature at the coast and in the interior was fairly similar. This may be emphasized by the following figures which give the mean cooling temperature for the summer and the winter seasons. Johannesburg 29.2° , Bloemfontein 31.0° , Nelspoort, Durban 32.7° , Port Elizabeth 31.8° and Capetown 29.7° . The respective figures for the two winter months July and August, 1937, were 19.7° , 21.0° and 19.3° at the inland stations and 27.9° , 26.1° and 25.7° at the coastal stations.

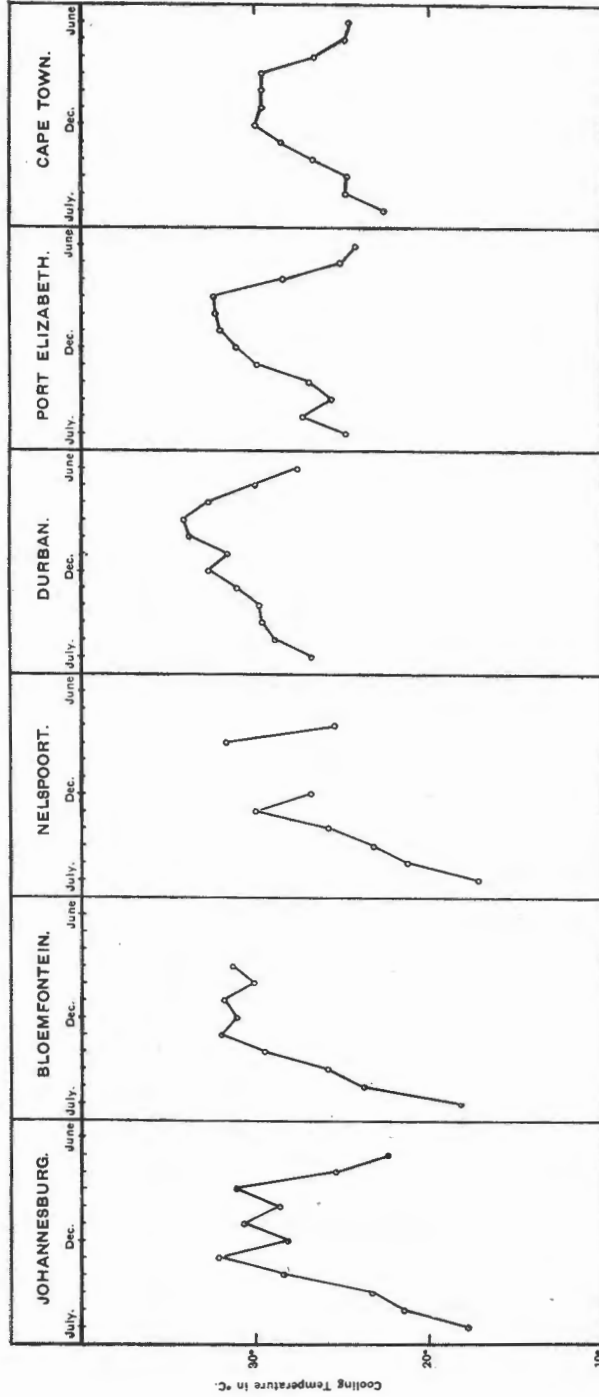
3. *The Mean, and the Absolute Highest and Absolute Lowest Readings of the Cooling Temperature per Month at the Six Stations in the Union.*

As already mentioned, extreme values are of special biological interest. They are not only represented by the number of periods with very high and very low cooling temperatures already discussed, but also by the actual maximal and minimal values of the cooling temperature. These are given in Tables 15 and 15A (pages 427 to 430). The former contains the average values for each month and the latter the absolute highest and absolute lowest readings. These tables enable one to make a twofold comparison. Firstly the maxima and minima at each station can be compared month by month and secondly the values for the same month at each station can be compared.

The figures in both tables are recommended for careful study as they contain some interesting information, which is too detailed and rather confusing to give in this text. Nevertheless a few outstanding features may be mentioned.

Mean Maxima.—The mean maximum of the cooling temperature at the inland stations was never for a long period distinctly higher or lower than at the coastal stations. There were however, a few months where such a distinct difference did exist. During November, January and March the cooling temperature maxima at the inland stations were higher than at the coastal stations. An exception to this occurred at Durban in March, when the readings were just as high as at the inland stations. It is also not definite that this applies to Nelspoort in January, as these readings are not available. The highest mean maxima were registered in Durban during 7 out of the 12 months under investigation. During two other months Durban recorded the second highest maxima, Cape Town registered during 5 months the lowest maxima.

GRAPH XVI.
 Mean Cooling Temperature of All Hours of Each Month at Six Stations in the Union.



Mean Minima.—A very pronounced difference is shown between the minima at the inland stations and at the coastal stations. The minima were always distinctly lower at the inland stations, the only exception being Cape Town which in November recorded a lower average minimum. In March the Cape Town readings were the same as at Johannesburg and Bloemfontein. Of the three coastal stations, Cape Town recorded the lowest mean minima during every month of the year except June, 1938.

Ranges.—The differences between mean maxima and mean minima varied little at the coastal stations during the course of the year. The ranges were always greater inland than at the coast.

The *absolute highest* cooling temperatures (Table 15A, page 429) show three maxima above 50° , namely in August and January at Port Elizabeth and in November at Johannesburg. During four months (September, November, March and April) the highest values were recorded at Johannesburg and Bloemfontein, during the remaining months they occurred at one of the coastal stations.

The *absolute minima* are much lower at the inland than at the coastal stations. The lowest cooling temperature registered during the year under investigation was 4° at Johannesburg in September, 1937.

Summarizing, the main facts emerging from the comparison of the cooling temperature measurements at the various stations, are:—

(a) *Inland Stations.*

1. *During winter the mean values show the greatest extremes during day and night at Johannesburg. Bloemfontein recorded higher readings at night, and Nelspoort distinctly lower readings during daytime, than Johannesburg.*

2. *The rapid decrease of the cooling temperature in the afternoon continued after sunset.*

3. *The average increase of the mean cooling temperature from winter to summer was great at all three inland stations.*

4. *The mean maxima were in general not higher than at the coastal stations except during November, January and March.*

5. *The mean minima, however, were always distinctly lower than at the coastal stations.*

6. *The ranges between the mean maxima and mean minima were always greater than at the coastal stations.*

7. *The absolute highest cooling temperature was measured at Johannesburg in November, 1937; the absolute lowest was also recorded in Johannesburg, in September, 1937.*

(b) Coastal Stations.

1. *The average conditions at the three coastal stations showed no very distinct differences. Throughout the year Durban's mean cooling temperature values were the highest. Next in order was Port Elizabeth, followed by Cape Town.*

2. *The rapid decrease of the cooling temperature in the afternoon only lasted until sunset, immediately after which the drop became much more gradual.*

3. *The average increase of the mean cooling temperature from winter to summer was small at all three coastal stations.*

4. *During 5 months the highest and during 2 months the second highest mean maxima were measured at Durban. Cape Town had during 5 months the lowest mean maxima.*

5. *The lowest mean minima were recorded in Cape Town during each of the 12 months except June, 1933.*

6. *The ranges between mean maxima and mean minima differed little during the course of the year.*

7. *Cooling temperatures above 50° were recorded in Port Elizabeth during August, 1937, and January, 1938.*

(c) The monthly average cooling temperature in winter was distinctly lower at the inland than at the coastal stations. In summer this difference was not pronounced.

In addition to the results presented in this paper data on the intensity of the direct solar radiation and various regions of the spectrum were taken periodically at Johannesburg, Onderstepoort, Bloemfontein, Stellenbosch and Durban. The results of the observations at Johannesburg and Stellenbosch have been published by the respective authors. [Matheson (1939), Richards (1939), De Villiers (1939)]. It is hoped to publish the data from the other stations in the future as also readings of the total amount of sun and sky radiation and of the cooling temperature taken at the Natal National Park.

SUMMARY.

The results of the physical measurements of the total amount of sun and sky radiation and the cooling temperature at 6 stations in the Union may be summarized as follows:—

A. RADIATION.

1. *How does the amount of radiation at the inland stations compare with that at the coastal stations?*

The amount of radiation obtained at the inland stations exceeded the amount at the coastal stations all the year round.

2. *Which station received the greatest, and which the smallest amount of radiation during the course of the year?*

During nine out of twelve months the greatest amount of radiation was obtained in the climatic zone of the highveld. During the remaining three months (December, January and February) the greatest amount was received at Cape Town.

The smallest amount of radiation was obtained during all twelve months at the coastal stations. In five of the twelve months Cape Town recorded the least, during five other months Durban received the smallest amount.

3. *During which month was the greatest and during which the smallest amount of radiation obtained at each station?*

At each station the greatest amount of radiation occurred during the months November or December, 1937. The smallest amounts were recorded during the winter months of July, 1937, and June, 1938.

4. *What was the ratio between the greatest and the smallest amount of radiation at each station?*

Johannesburg registered during the month of maximum radiation twice as much solar energy as it did during the month of minimum radiation. Comporable ratios were: 3·4 : 1 for Cape Town; nearly 3 : 1 for Port Elizabeth and 2 : 1 for Durban.

5. *How did the amount of radiation at each station vary during the course of the year?*

The amount of radiation at Johannesburg during the course of the year was rather irregular. At Bloemfontein and Nelspoort the increase of the monthly amount with the increase of the altitude of the sun was progressive. At Durban great variations in the amount of radiation was registered from month to month. Port Elizabeth showed a fairly regular distribution over the year. In Cape Town the amount also increased and decreased steadily in accordance with the sun's altitude and showed particularly high readings in December and January.

6. *How do the total amounts of radiation recorded at the stations during a period of six months compare with each other?*

During the first half year under investigation the total amount of sun and sky radiation was largest at Bloemfontein, next in amount was that at Johannesburg and at Nelspoort Sanatorium. At the coast, Cape Town and Port Elizabeth had an approximately equal amount of radiation. Durban's amount was distinctly smaller. Durban, being the station with the smallest amount of radiation during the first half year, recorded 22 per cent. less than Bloemfontein which had the greatest amount.

The second half year showed a greater amount of radiation at Johannesburg than at the coastal stations. These recorded fairly similar amounts during the period.

The total for the year was distinctly larger at Johannesburg than at the three coastal stations.

7. *How does the amount of radiation obtained in South Africa compare with the amount in Nairobi (Kenya), Davos (Switzerland) and Bad Nauheim (Germany)?*

In winter the amount of sun and sky radiation at Johannesburg was distinctly larger than at Davos situated at a similar altitude above sea-level and it was 5 to 10 times larger than at Bad Nauheim at a low altitude.

During two months in midsummer the amount at Davos was slightly larger than at Johannesburg during the comparable period.

Nairobi experienced a greater amount of radiation during the six months under investigation than any of the other places concerned in this comparison.

The ratio between the highest summer and lowest winter readings per month was 2.0 : 1 at Johannesburg, 4.5 : 1 at Davos and 10.4 : 1 at Bad Nauheim.

The yearly total amount at Johannesburg was 122 per cent. of what was received in Davos; Bad Nauheim obtained only 69 per cent. of that amount.

B. COOLING TEMPERATURE.

1. During winter the mean values of the cooling temperature showed the greatest extremes at the inland stations, particularly at Johannesburg. Bloemfontein recorded higher readings at night, and Nelspoort distinctly lower readings during day-time than Johannesburg. The average conditions at the three coastal stations showed no very distinct differences. Throughout the year Durban's mean cooling temperature values were the highest. Next in order was Port Elizabeth, followed by Cape Town.

2. The rapid decrease of cooling temperature in the afternoon continued after sunset at the inland stations but not at the coastal stations. In the latter the rapid decrease only lasted until sunset, immediately after which the drop became much more gradual.

3. The average increase of the mean cooling temperature from winter to summer was great at the inland stations, but small at the coastal stations.

4. In winter the monthly average cooling temperature was distinctly lower at the inland than at the coastal stations, in summer this difference was not pronounced.

5. The mean *maximal cooling* temperatures showed no regular difference between the interior and the coast, whereas the mean *minimal* readings were distinctly lower at the inland stations.

6. The absolute highest cooling temperature of 52.0° was registered at Port Elizabeth in August and in January, the absolute lowest reading of 4.0° was recorded at Johannesburg in September, 1937.

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