

## **ESTIMATION OF CLIMATIC RESOURCES FOR SUMMER SPORT RECREATION IN THE JEWISH AUTONOMOUS REGION OF RUSSIA**

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**ABSTRACT** This paper presents the results of an assessment of climatic resources for summer sport recreation. The focus is on the physical facets of climate (referred to in Russia as technological assessment of climate) to determine the number of days that are favorable for certain types of recreational activity such as hiking, rafting, swimming etc. Taking into account both climate and the various physiological aspects of the human body, it is possible to determine circumstances that are best suited to, or that limit, recreational activities. The study region is the Jewish Autonomous Region of Russia. The analysis identifies two recreational climate zones. They differ in the amount of days favorable for summer recreation, including opportunities for swimming etc. For the warm season, the periods and regions are identified in which it is not desirable to undertake certain activities because of the strong influence of the limiting factors such as sultry weather, precipitation, cold, strong wind etc. The characteristics of sport-climatic resources of the Jewish Autonomous Region that were identified may be useful for the seasonal planning and timing of outdoor recreational activities in a region characterized by climate extremes.

**KEYWORDS:** *Sport recreation, limiting factors, warm period, monsoon climate, southern Far East of Russia*

### **INTRODUCTION**

Tourism is considered to be of economic benefit in many countries and like recreation relies heavily on natural resources. The climatic resources have special importance as they determine the attractiveness of conditions for tourism and recreation, they can limit times during which a particular recreational activity can take place and they can have medical-biological implications (Mirzekhanova, 2003). Where improved health is a motive for recreation, the aim is to avoid morphological and functional deterioration of the body, but it is assumed that exposure to the climate elements during exercise will not itself put stresses or

strains on the body leading to undesirable consequences (Ivanov, 2001). In this case, severe or extreme climatic conditions will be unfavorable for health or 'spa tourism' because of the risk to the body's well-being.

So called sport recreation is motivated by people's desire to relax and enjoy the experience. Hiking can still take place while it drizzles, but strong precipitation hinders this type of recreational activity. The best conditions for hiking are those that result in no negative effects. Some weather phenomena such as high temperatures, sultry humid weather conditions may recreational activities must stop, as conditions can cause physiological strain even in a healthy person. Thus, if both weather conditions and their physiological effect are taking into account simultaneously the suitability of various climates for sports recreation can be assessed and used to provide information that may be useful for the seasonal planning and timing of outdoor recreational activities, especially in regions with extreme climatic conditions.

## **METHODS**

Data for the study area is drawn from five hydrometeorological stations (HMS) in the Jewish Autonomous Region (JAR) (Climatic Books of the USSR, 1967-1969). The archival data from the Centre on Hydrometeorology and Monitoring of the Environment in Khabarovsk were also used. HMS Obluchye and Bira are situated in the mountains. The stations Smidovich, Yekaterino-Nikolskoye and Leninskoye are located in the plains.

The Jewish Autonomous Region is located in the southern far east of Russia. The study area is located in the temperate monsoon climatic zone characterized by an extreme continental regime of annual temperatures. The typical feature here is the effect that winter and summer monsoons have on each other. Winter monsoons cause frosty weather with few clouds and low snow cover. The mean monthly temperature in January (the coldest winter month) ranges from -21.2 °C in the south to -26.5 °C in the north (with an absolute minimum of -52 °C). The summer monsoon is characterized by warm damp conditions with mean temperatures in July of 19 – 21 °C (with the absolute maximum of +40 °C). In this season 60 % of the annual precipitation is recorded. Several authors (e.g. Gorbatcevic, 1894, Matukhin, 1971) have highlighted the extreme climate found in this area: in winter the conditions in the southern far east are similar to those in Siberia; and in the summer the climate is similar to that of the warm humid tropics. Human discomfort in monsoon climate conditions in the far east is a function of the low temperatures and high wind in winter and the combination of high air temperatures with high relative humidity creating an unpleasant, sultry feeling in summer.

The physical facets of climate (referred to in Russia as technological assessment of climate) can be used to ascertain the number of days that are favorable for certain types of recreation. Here we analyze what is the required by recreationists of the climatic environment taking into account the physiological effects. The parameters that are used for this in the warm period of the year are: equivalent-effective temperature (EET); radiation-effective temperature (RET); sultry weather (mean daily air temperature is higher 23 °C with relative humidity over 80%) and weather dryness (mean daily air temperature is higher than 27 °C with relative humidity < 30 - 40 %); precipitation (> 1 mm) and wind over 7-8 m/s; and water temperature in lakes and water bodies used for recreation (Kolotova, 1998, Derkacheva, 2000, Grigorieva, 2003). EET (°C) is an indicator of thermophysiological well-being given by Aizenshtat (1964) as:

$$EET = T (1 - 0.003(100 - f)) - 0.385 V^{0.59} ((36.6 - T) + 0.622 (V - 1)) + \\ + ((0.0015 V + 0/008)(36.6 - T) - 0.0167) (100 - f),$$

where T is the temperature of the air outdoors (°C), V is wind speed (m s<sup>-1</sup>), and f is relative humidity (%). Thermal environment in the warm period of the year is usually classified according to scale of thermal sensation as presented by Kolotova (1998). Comfortable conditions are taken as those that are thermally neutral EET = 17–22°C, cool conditions when EET = 8–16°C, cold when EET < 8°C and very hot when EET > 23°C.

RET (°C) is an indicator of the appeal of conditions for people to sunbathing and can be estimated by the formula devised by Butyeva (Isaev, 2001):

$$RET = 0.83 EET + 12.$$

In all of the above assessments it is assumed the recreationist is a healthy adult.

## RESULTS

The duration of the period that is favorable for summer sport recreation in the JAR is determined by EET using a scale of thermal sensation described by Kolotova (1998) and shown in Table 1. On average, the period with comfortable thermal sensation favorable for summer recreation lasts 55 days (28 % of the entire warm period). It lasts from the end of June to the end of August. Together with cool thermal sensation, when some restrictions for recreational activity are necessary, the beginning of the examined period shifts to the first week of May and ends the last week of September. In this case the duration is about 135 days.

**Table 1: Reiteration of days with various thermal sensation, warm seasons, %, the JAR**

HMS	Comfortable (neutral) weather (EET = 17–22°C)	Cool weather (EET = 8–16°C)	Cold weather (EET < 8°C)
Obluchye	24	48	28
Bira	37	40	23
Birobidzhan	28	42	30
Smidovich	45	46	9
Yekaterino-Nikolskoye	29	41	30

The number of days favorable for summer sport recreation is determined while taking into account limiting conditions (sultry and dry weathers, weather with precipitation, and weather with strong wind) (Table 2).

**Table 2: Number and frequency of days suited to sport recreation during the JAR warm season.**

HMS	Duration of season (days)	Number of days favorable for summer recreation	Frequency (%) of days favorable for summer recreation
Obluchye	197	109	55
Bira	197	121	61
Birobidzhan	198	107	54
Smidovich	198	108	55
Yekaterino-Nikolskoye	204	104	51
<i>Average</i>	<i>199</i>	<i>110</i>	<i>55</i>

The result show that the duration of the period favorable for summer recreation is short in all parts of the study region and amounts only to 55 % of the warm season. The various factors that limit recreation are: dry and sultry weather, precipitation, strong winds, and low uncomfortable air temperature. These factors are most prominent at the beginning and at the end of the warm period (summer). Monsoon climate with tropical air in summer is characterized by regular repetition of days with sultry weathers. They are measured more often in the plains (in Birobidzhan, Smidovich and Yekaterino-Nikolskoye) – about 27 days. About 14 days with strong winds are observed here during the season. The mountain regions (HMS Obluchye, Bira) are more suitable for summer recreation as the days with sultry weather and strong winds occur less often than the plains (Grigorieva and Khristoforova, 2004).

The data on RET and temperature of water in reservoirs allow us to correct the results on the duration of the period favorable for swimming. RET characterizes the opportunities for people to sunbath and can be estimated from the formula offered by Butyeva (Isaev, 2001). The zone of comfort is determined for naked humans (Tab. 3).

**Table 3: Number of days and their reiteration for a warm season with RET in comfort zone, the JAR**

HMS	Number of days	Frequency %
Obluchye	49	25
Bira	46	23
Birobidzhan	46	23
Smidovich	49	25
Yekaterino-Nikolskoye	54	26

The most favorable period for sun-bathing lasts from May to September due to the amount and intensity of radiation during the day. At the same time, these months are uncomfortable for sun-bathing due to the thermal sensation of unclothed humans. Hence, sun-bathing can be recommended in the summer during the period with active ultra-violet radiation, which generally occurs in late June and early July.

Water temperatures in the rivers reach comfortable values for swimming (+24 °C) in the summer period. Swimming in low-lying rivers is possible from mid-June to the beginning of September - 70 days in total. In the mountains the temperature of water bodies is favorable for swimming only in lakes; this type of recreation can be recommended here within a period of 50 - 60 days.

The analysis of climatic resources for sport recreation for the warm season of the year has resulted in the determination of two recreation-climatic zones with subzones. They differ in the amount of days favorable for summer recreation including swimming (Tab. 4).

**Table 4: The characteristic of climatic-recreational zones, the Jewish Autonomous Region**

Zone	amount of days favorable for summer recreation	opportunities for swimming recreation
Mountains, <i>subzones</i> : Northwest, central Southeast	109 109 – 121	swimming is possible only in reservoirs with standing water
Plains, <i>subzones</i> : East Central Southern	108 107 104	everywhere

This differentiation of climatic recreational resources for the JAR will be useful to tourism planners and recreational organizers for determining suitable times and places for outdoor activities.

## CONCLUSION

The characteristics of sport climatic resources in the JAR based on a physiological assessment are presented here. The results allow for better planning of recreational activities, taking into

account the influences of the climatic environment on humans. During the warm season the time-periods and regions are identified when and where outdoor recreation should be avoided because of limiting factors, such sultry or excessively dry weather, heavy precipitation, strong wind etc. This information on climatic recreational resources can be used to plan different types of summer sport recreation without risking harm to the human body.

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