



# STATE OF THE POLAR BEAR REPORT 2020

Susan J. Crockford



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## About the author

Dr Susan Crockford is an evolutionary biologist and has been working for more than 40 years in archaeozoology, paleozoology and forensic zoology.<sup>1</sup> She is a former adjunct professor at the University of Victoria, British Columbia and works full time for a private consulting company she co-owns (Pacific Identifications Inc). She is the author of *Rhythms of Life: Thyroid Hormone and the Origin of Species*, *Eaten: A Novel* (a polar bear attack thriller), *Polar Bear Facts and Myths* (for ages seven and up, also available in French, German, Dutch, and Norwegian), *Polar Bears Have Big Feet* (for preschoolers), and the fully referenced *Polar Bears: Outstanding Survivors of Climate Change* and *The Polar Bear Catastrophe That Never Happened*,<sup>2</sup> as well as a scientific paper on polar bear conservation status.<sup>3</sup> She has authored several earlier briefing papers, reports, and videos for GWPF on polar bear and walrus ecology and conservation.<sup>4</sup> Susan Crockford blogs at [www.polarbearsience.com](http://www.polarbearsience.com).



## Preface

From 1972 until 2010,<sup>5</sup> The Polar Bear Specialist Group (PBSG) of the International Union for the Conservation of Nature (IUCN) published comprehensive status reports every four years or so, as proceedings of their official meetings, making them available in electronic format. Until 2018 – a full eight years after its last report – the PBSG had disseminated information only on its website, updated (without announcement) at its discretion. In April 2018, the PBSG finally produced a standalone proceedings document from its 2016 meeting,<sup>6</sup> although most people would have been unaware that this document existed unless they visited the PBSG website.

This *State of the Polar Bear Report* is intended to provide a yearly update of the kind of content available in those occasional PBSG meeting reports, albeit with more critical commentary regarding some of the inconsistencies and sources of bias present in the corpus of reports and papers. It is a summary of the state of polar bears based on a review of recent and historical scientific literature. It is intended for a wide audience, including scientists, teachers, students, decision-makers and the general public interested in polar bears and Arctic ecology.

## Executive summary

- Results of three new polar bear surveys were published in 2020. All three populations were found to be either stable or increasing.
- Southern Beaufort polar bear numbers were found to have been stable since 2010, not reduced as previously assumed, and the official estimate remains about 907.
- M'Clintock Channel numbers more than doubled, from 284 in 2000 to 716 in 2016, due to reduced hunting and improved habitat quality (less multiyear ice).
- Gulf of Boothia numbers were found to be stable, with an estimate of 1525 bears in 2017; body condition improved between study periods and thus showed 'good potential for growth'.
- At present, the official IUCN Red List global population estimate, completed in 2015, is 22,000–31,000 (average about 26,000) but surveys conducted since then, including those made public in 2020, would raise that average to almost 30,000. There has been no sustained statistically significant decline in any subpopulation.
- Reports on surveys in Viscount Melville (completed 2016) and Davis Strait (completed 2018) have not yet been published; completion of an East Greenland survey is expected in 2022.
- In 2020, Russian authorities announced the first-ever aerial surveys of all four polar bear subpopulations in their territory (Chukchi, Laptev, Kara, and Barents Seas), to be undertaken between 2021 and 2023.
- Contrary to expectations, a new study has shown that females in the Svalbard area of the Barents Sea were in better condition (i.e. fatter) in 2015 than they had been in the 1990s and early 2000s, despite contending with the greatest decline in sea ice habitat of all Arctic regions.
- Primary productivity in the Arctic has increased since 2002 because of longer ice-free periods (especially in the Laptev, East Siberian, Kara, and Chukchi Seas, but also in the Barents Sea and Hudson Bay), but hit records highs in 2020; more fodder for the entire Arctic food chain explains why polar bears, ringed and bearded seals, and walrus are thriving despite profound sea ice loss.
- In 2020, contrary to expectations, freeze-up of sea ice on Western Hudson Bay came as early in the autumn as it did in the 1980s (for the fourth year in a row) and sea-ice breakup in spring was also like the 1980s; polar bears onshore were in excellent condition. These conditions came despite summer sea-ice extent across the entire Arctic being the second-lowest since 1979. Data collected since 2004 on weights of females in Western Hudson Bay have still not been published: instead, polar bear specialists have transformed standard

body condition data collected in 1985–2018 into a new metric for population health they call ‘energetics’, which cannot be compared with previous studies. Meanwhile, they continue to cite decades-old raw data from previous studies to support statements that lack of sea ice is causing declines in body condition of adult females, cub survival, and population size.

- Contrary to expectations, in Western Hudson Bay many polar bears remained on the deteriorating sea ice much longer than usual in summer, and stayed ashore longer in fall after official freeze-up thresholds had been reached, calling into question the assumed relationship between sea-ice coverage and polar bear behaviour and health. Some bears that left the ice in late August and then returned before late November would have spent only three months onshore – about one month less than normal in the 1980s, and two months less than in the 1990s and 2000s.
- There were few problem polar bear reports in 2020, except for one fatal attack in August, in a campground near Longyearbyen, Svalbard. Ryrkaypiy, Chukotka, which in 2019 was besieged by more than 50 bears that had congregated to feed on walrus carcasses nearby, avoided a similar problem in 2020 by posting guards around the town. The town of Churchill, Manitoba saw the lowest number of problems bears in years.
- In 2020, virtually all polar bear research was halted across the Arctic for the entire year due to restrictions on travel and efforts to isolate vulnerable northern communities from Covid-19.





## 1. Introduction

The US Geological Survey estimated the global population of polar bears at 24,500 in 2005.<sup>7</sup> In 2015, the IUCN Polar Bear Specialist Group estimated the population at 26,000 (range 22,000–31,000),<sup>8</sup> but additional surveys published since then have brought the total to near 30,000 and may arguably be as high as 39,000.<sup>9</sup> This is only a slight-to-moderate increase, but it is far from the precipitous decline polar bear experts expected given a drop of almost 50% in sea-ice levels since 1979.<sup>10</sup> This indicates summer sea-ice levels are not as critical to polar bear survival as USGS biologists assumed.<sup>11</sup> Despite 2020 having had the second lowest September ice extent since 1979 (after 2012), there were no reports from anywhere around the Arctic that would suggest polar bears were suffering as a result: no starving bears, no drowning bears, and no marked increases in bear conflicts with humans. Indeed, contrary to expectations, several studies have shown that polar bears in many regions have been doing better with less summer ice, either because multiyear ice has been replaced with more productive seasonal ice, or because the increased primary productivity that has come with longer open-water seasons has been a net benefit.

## 2. Conservation status

Polar bears currently have a relatively large population size and their historical range has not diminished due to habitat loss since 1979. The International Union for the Conservation of Nature (IUCN), in their 2015 Red List assessment, again listed the polar bear as ‘vulnerable’ to extinction, just as it did in 2006.<sup>12</sup> Similarly, in 2016, the US Fish and Wildlife Service upheld its 2008 conclusion that polar bears were ‘threatened’ with extinction under the US Endangered Species Act (ESA).<sup>13</sup> In both of these instances, polar bear conservation status is based on computer-modelled future declines, not observed declines.

In contrast, in 2018 the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) decided to continue to list the polar bear as a species of ‘Special Concern’, as it has done since 1991, rather than upgrade the status to ‘Threatened.’<sup>14</sup> Since roughly two thirds of the world’s polar bears live in Canada, the decision means that most of the species is still managed with an overall attitude of cautious optimism. This brings a refreshing spark of rationality in the world of polar bear conservation.

None of these official assessments changed in 2020.

### **3. Population size**

#### **Global**

Since 1968, the PBSG has produced a number of estimates of the global polar bear population. The latest, appearing in September 2019, mentions the IUCN's 22,000–31,000 global estimate in passing, but it rejects without explanation the figures used in the IUCN assessment for the Laptev Sea, East Greenland, and Kara Sea subpopulations, and insists on a global average figure of 25,000.<sup>15</sup>

Survey results postdating preparation of the 2015 Red List assessment, including those made public in 2020, have brought the mid-point total at 2017 to almost 30,000. Survey results from Davis Strait and Viscount Melville, all completed in 2018 or before but not yet made public, may put that global mid-point estimate above 30,000.<sup>16</sup> While there is a wide margin of error attached to this figure it is a far cry from the 7,493 (6,660–8,325) bears we were assured would be all that would remain<sup>17</sup> given the sea-ice levels that have prevailed since 2007.<sup>18</sup>

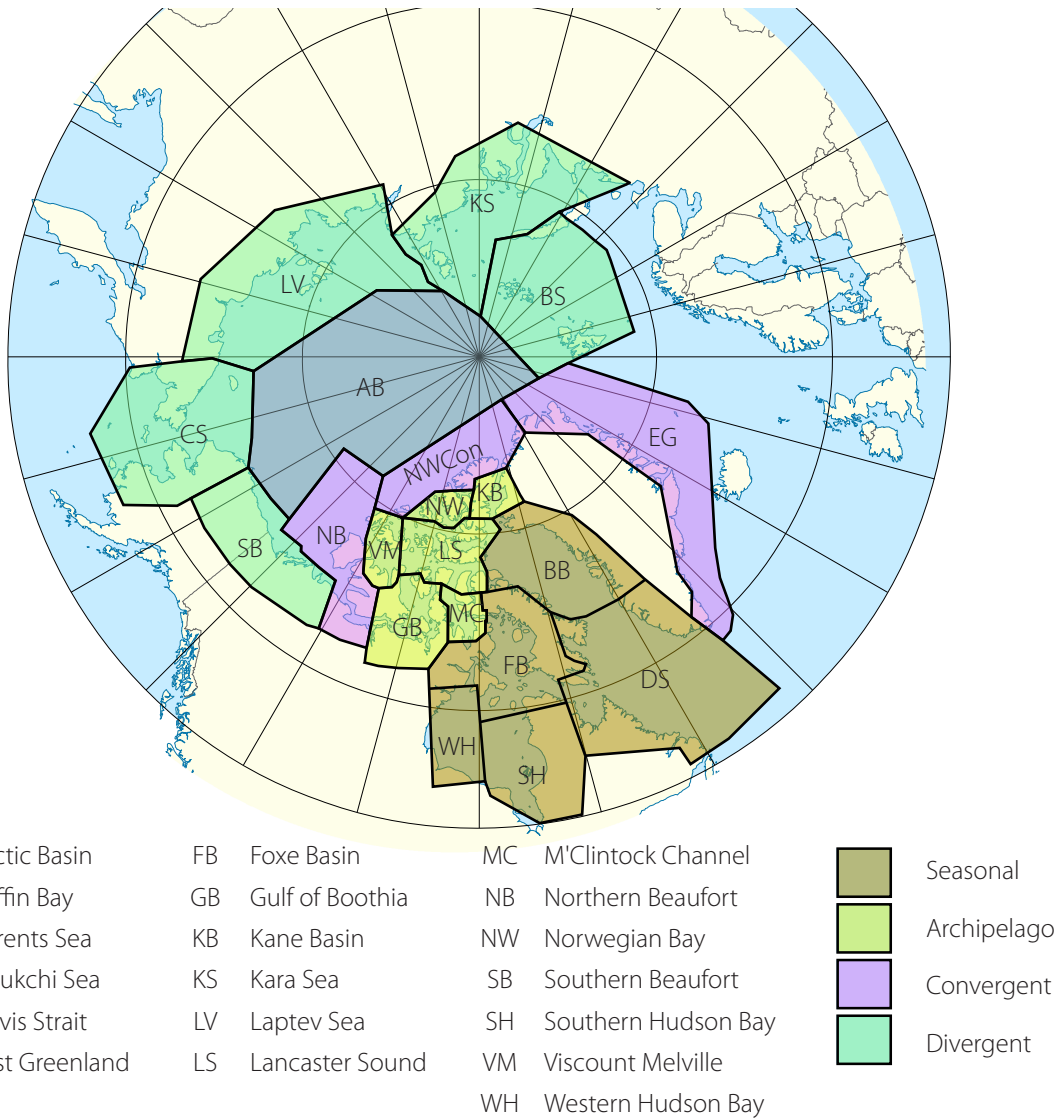
In early 2020, Russian authorities announced their plan to perform aerial population surveys of the entire Russian Arctic. These would begin in the Chukchi and East Siberian seas in 2021, proceed with the Laptev and Kara seas in 2022, and end with the eastern Barents Sea (including Franz Josef Land) in 2023.<sup>19</sup> It remains to be seen if this project will go ahead as planned, given travel restrictions due to Covid-19.<sup>20</sup>

#### **Subpopulations by ecoregion**

In 2007, the US Geological Survey defined four Arctic sea-ice 'ecoregions' (Figure 1).

- The 'Seasonal' ecoregion represents all the subpopulation regions where sea ice melts completely during the summer, stranding polar bears onshore.
- The 'Divergent' ecoregion includes all subpopulation regions where sea ice recedes from the coast into the Arctic Basin during the summer, leaving bears the option of staying onshore or remaining with the sea ice.
- The 'Convergent' ecoregion is the subpopulation regions where ice formed elsewhere drifts towards shore all year long.
- The 'Archipelago' ecoregion represents subpopulations in the Canadian Arctic archipelago.

The ecoregion concept now appears to have been accepted as a useful assessment methodology for polar bear health<sup>21</sup> although this was abandoned in favour of an individual subpopulation approach for a model published in 2020 that predicted future survival potentials<sup>22</sup>, almost certainly because it is now apparent that all subpopulations within a single sea ice 'ecoregion' have not responded similarly to local declines in summer sea ice.<sup>23</sup> The 'ecoregion' approach is used here to present the current subpopulation status of each management region in the Arctic, updated to 2020.



**Figure 1: The four Arctic sea ice ecoregions.**

The Arctic Basin (AB) is not considered to be a sea ice ecoregion. The Convergent region 'NWCon' (also known as 'Queen Elizabeth – Convergent') is not a recognized polar bear subpopulation.

***Baffin Bay – Seasonal***

The polar bear subpopulation estimate at 2013 for Baffin Bay (BB) was  $2,826 \pm 767$ , a 36% increase over 1997. In 2019, the PBSG considered the BB trend 'data deficient', effectively dismissing the 2013 survey results, although aboriginal traditional knowledge assessed the population in 2018 as 'stable'.<sup>24</sup> However, in March 2020, one of the authors of a paper on changes in body condition and litter size that resulted from the 2013 survey, PBSG member Stephen Atkinson, stated that the group's findings were consistent with the Inuit view.<sup>25</sup>

***Davis Strait – Seasonal***

Estimates of the Davis Strait (DS) subpopulation have been repeatedly revised upwards, from 726 in the 1970s<sup>26</sup> to 2,158 (range 1,833–2,542) after a comprehensive survey in 2007.<sup>27</sup> Subsequent growth in the harp seal population<sup>28</sup> provided the potential for a further increase in polar bear numbers and this is probably

reflected in the 2018 Environment Canada status assessment as 'likely increasing'.<sup>29</sup> As a consequence, it is highly likely that the actual population size at 2018 (eleven years after the last survey) was well above 2,500, especially since harp seal numbers have grown further still, according to a new population survey published in 2020.<sup>30</sup> However, the results of a 2017–2018 survey of polar bears in DS has yet to be made public (although a preliminary report on the first year of the survey indicated that bears of all ages were generally 'well-fed' and that the density of bears was 'as expected').<sup>31</sup> In 2019, the PBSG listed DS bears as 'likely stable' rather than increasing.<sup>32</sup>

#### ***Foxe Basin – Seasonal***

Estimates of the Foxe Basin (FB) population have grown from 2,197 (1,677–2,717) in 1994, to around 2,580 in 2009–10.<sup>33</sup> The population was considered 'stable' by Environment Canada in 2014, as well as by the PBSG in 2014 and 2019, while traditional knowledge considered numbers to be increasing.<sup>34</sup>

#### ***Western Hudson Bay – Seasonal***

Regehr and colleagues performed repeated mark–recapture surveys of a core region of Western Hudson Bay (WH), estimating the population in 2004 at 935 (range 794–1,076), a statistically significant decline from the previous survey in 1987.<sup>35</sup> This result was used as persuasive evidence that polar bears were threatened with extinction.<sup>36</sup> Subsequent surveys have covered different parts of the region and used different methodologies, making comparisons difficult, and it is not clear that there has really been a decline in population.

In a late 2018 interview with UK journalist David Rose, polar bear researcher Andrew Derocher conceded that there had been 'a recent period of stability' in the region.<sup>37</sup> But WH polar bears may be doing even better than just holding their own: in late 2018, the Nunavut Government insisted that several indicators suggested that the WH population had increased in size, with sea-ice coverage since 2016 similar or better than in the 1980s (i.e. 'normal').<sup>38</sup> Despite this, in 2019 the PBSG listed the WH subpopulation as 'likely decreased'.<sup>39</sup>

#### ***Southern Hudson Bay – Seasonal***

By 2005 the Southern Hudson Bay (SH) subpopulation had been stable since the mid-1980s at about 1000 animals.<sup>40</sup> Results of a more recent aerial survey, completed in 2016, showed a 17% decline in population size, from 943 to 780 (range 590–1029), but this was not statistically significant.<sup>41</sup> However, something called a 'Monte Carlo simulation' (a technique never used before in polar bear population size estimates, as far as can be determined) was applied 'to better inform managers about the status of the subpopulation'. Since this test determined that the decline could be real, the authors reported an actual drop in abundance for the first time in SH. However, information on sea ice conditions and the body condition of the bears have not been

published,<sup>42</sup> although one of the authors has conceded that any population decline seems uncorrelated with ice levels.

Since 2016, as for WH, SH sea ice has been more like it was in the 1980s (i.e. 'normal').<sup>43</sup> Traditional knowledge indicates an increase in SH bear numbers while the PBSG in 2019 considered it 'likely decreased'.<sup>44</sup>

### ***Barents Sea – Divergent***

The Barents Sea (BS) population was found to be around 2,650 (range 1900–3600) in 2004,<sup>45</sup> with nearly three times as many bears in the Russian sector as in the Norwegian.<sup>46</sup> A 2015 survey of the Norwegian sector reported a 42% increase in abundance, although the large uncertainty meant that the increase was not statistically significant.<sup>47</sup> If the results had been extrapolated to the entire region, the BS population would be about 3,749.<sup>48</sup> This approach, which is not unusual in the field,<sup>49</sup> would have been reasonable in this case because sea-ice conditions in the Russian sector have been less seasonally volatile than in the Norwegian sector.<sup>50</sup> However, the researchers involved did not adopt it, and the proceedings document from the 2016 PBSG meeting argued that because there was no statistically significant increase between 2004 and 2015, it could not conclude that the population had grown.<sup>51</sup> As a consequence, the official BS population size remains at 2,650 (range 1900–3600) and in 2019 the PBSG considered it 'likely stable'.<sup>52</sup>

### ***Kara Sea – Divergent***

A first-ever Kara Sea (KS) population estimate, completed in late 2014, potentially added another 3,200 or so bears to the global total.<sup>53</sup> This estimate (range 2,700–3,500), derived by Russian biologists from ship counts, was included in the official global count published in 2015 by the IUCN Red List.<sup>54</sup> An earlier estimate of about 2,000 bears at 2005 was used by American biologists to support the 2008 ESA status assessment, but this was an unofficial figure that does not appear in any document.<sup>55</sup> However, if it was accurate at the time, it may indicate a population increase has taken place. Despite this, the PBSG in 2016 and 2019 still listed the Kara Sea status as 'unknown'/'data deficient' and did not mention the 2014 Russian estimate.<sup>56</sup>

### ***Laptev Sea – Divergent***

In its 2005 assessment, the PBSG gave an estimate for the Laptev Sea (LS) population of about 1,000, based on den counts from the 1960s to the 1980s,<sup>57,58</sup> but changed this assessment to 'data deficient' in 2013 and 'unknown' in later years.<sup>59,60</sup> In contrast, the 2015 IUCN Red List assessment used the out-of-date estimate of 1,000.<sup>61</sup> However, hunting of polar bears has been banned in the region since 1957, and sea ice declines in all seasons have been less than in the neighbouring Kara and Barents Seas.<sup>62</sup> This suggests the population is almost certainly three or more times bigger.<sup>63</sup> Despite this, the PBSG in 2019 listed this subpopulation as 'data deficient' and the population size as 'unknown'.<sup>64</sup>

### ***Chukchi Sea – Divergent***

Considered 'declining' by the PBSG in 2009, based on existing and projected sea ice losses,<sup>65</sup> the assessment for the Chukchi Sea (CS) changed to 'data deficient' in 2013 and 'unknown' in 2014–17.<sup>66</sup> However, because a number was required for predictive models, the long out-of-date estimate of 2,000 was used for the 2015 Red List assessment.<sup>67</sup>

However, a 2016 capture-recapture survey<sup>68</sup> generated a population size of about 3,000 (range 1522–5944), making it the largest subpopulation in the Arctic. Larger-than-average family groups were also found,<sup>69</sup> suggesting that CS bears were in good condition and reproducing well.<sup>70</sup>

It was also reported that bears spending the summer on Wrangel Island, the region's main terrestrial denning area, had reversed a previously observed decline, with the population rising from about 200–300 individuals in 2012 and 2013 to 589 in 2017.<sup>71</sup> A 2019 fall survey of the northern part of the island found bears to be in good condition, with at least one litter of four cubs photographed.<sup>72</sup> All indicators suggest this subpopulation is productive and healthy despite recent changes in summer sea ice that means bears that come ashore for the summer arrive about 20 days earlier than they did in the 1980s.<sup>73</sup> Poaching is no longer considered an issue and in 2019 the PBSG listed the subpopulation as 'likely stable'.<sup>74</sup>

### ***Southern Beaufort Sea – Divergent***

As noted above, although officially categorised as a subpopulation in the Divergent ecoregion, there are good reasons to believe that the sea ice conditions in the Southern Beaufort Sea (SB) are unique. The first survey of the region in 1986 generated an estimate of about 1,800 individuals, and this fell to about 1,526 at the start of the new century, after a series of thick spring sea ice episodes. By 2010, the population was thought to have fallen to 907 (range 548–1270),<sup>75</sup> although the survey may not have sampled the entire geographic range adequately. The PBSG did not, however, make an adjustment to the population estimate as they had previously done for other subpopulations when such problems with estimates later became evident (e.g. Davis Strait).<sup>76</sup>

A report published in 2020 regarding a population survey completed in 2015 of the Alaska portion of the SB found 573 bears in 2015 compared to 562 in 2010 for the same region, indicating the population had not declined as expected.<sup>77</sup> The study authors concluded that since Alaska now made up 78% of the entire subpopulation (after the boundary change in the east), 'abundance and survival rate estimates derived from bears sampled in Alaska should serve as a robust index for survival rates and abundance of the entire [SB] subpopulation'.<sup>78</sup> As a consequence, the current population size is estimated at 907.

The report on polar bears by the Committee on the Status of Endangered Wildlife in Canada published in June 2019 acknowledges concerns that the 2010 estimate was lower due to 'annual

variability in ice conditions' (see Section 5) that resulted in bears shifting to the Northern Beaufort (NB).<sup>79</sup> It therefore proposed an 'equally valid' estimate for SB of 1,215 bears at 2006 (arrived at by taking 311 bears away from the 2006 SB estimate of 1,526 and adding it to NB subpopulation estimate).<sup>80</sup> This figure is currently the one used by the joint Inuvialuit/government body charged with managing SB and NB subpopulations in Canada.<sup>81</sup> For management purposes in Canada, the SB subpopulation is considered to be in 'likely decline' and the PBSG considers it to be 'likely decreased'.<sup>82</sup> However, many Inuit in the Canadian portion of the region feel that polar bear numbers have been stable or increasing within living memory.<sup>83</sup>

### ***Northern Beaufort Sea – Convergent***

The last population count for the Northern Beaufort Sea (NB) was made in 2006, so is now more than ten years out of date. It generated an estimate of 980 (range 825–1,135), although the lead author of the study suggested a more accurate estimate would be 1,200–1,300 due to northern areas that were not sampled.<sup>84</sup> At that time, the population appeared to have been relatively stable over the previous three decades. The boundary with SB has been moved east, to near Tuktoyaktuk, for Canadian management purposes, a change provisionally accepted by the IUCN PBSG in 2017.<sup>85</sup> Updated maps from Environment Canada now incorporate this boundary change.<sup>86</sup> The current population estimate suggested to account for the boundary change with SB is 1,291 (980 plus 311, see discussion in SB above) but the estimate used for management purposes is 1,710 (an adjustment for unsampled areas of the region during the 2006 count); the population is considered stable or 'likely stable' by Inuit and Canadian government authorities; it is listed as 'likely decreased' by the PBSG.<sup>87</sup>

### ***East Greenland – Convergent***

Although there has been no comprehensive survey of the East Greenland (EG) subpopulation, in 2001 the PBSG estimated there were 2,000 bears (in part based on harvest records that indicated a fairly substantial population must exist).<sup>88</sup> However, this figure was subsequently reduced, for no apparent reason, to 650 bears,<sup>89</sup> and by 2014, EG numbers were simply said to be 'very low.' It is simply not true that the PBSG has never provided an estimate for EG, as they now claim on their website.<sup>90</sup>

Surveys of hunters in northeast Greenland in 2014 and 2015 suggested an increase in numbers of bears coming into communities compared to the 1990s,<sup>91</sup> and in the southeast it was said that an abundance of seals was increasing the bear population.<sup>92</sup> In 2019, the PBSG listed EG as 'data deficient' with an 'unknown' population size.<sup>93</sup> The first comprehensive population survey should be completed by 2022.<sup>94</sup>

### ***Arctic Basin – a subpopulation but not an ecoregion***

In the original classification of the sea-ice ecoregions, a narrow portion of the Arctic Basin (AB) north of Greenland and Ellesmere

Island was at first called 'Queen Elizabeth – Convergent' and later 'Northwest – Convergent' (NWCon; Figure 1), but that nomenclature now seems to have been abandoned, probably because it is not a distinct subpopulation region for polar bears.<sup>95</sup> The PBSG treats the Arctic Basin as a 'catch-all' region because it contains bears moving between regions and those from peripheral seas (such as the Southern Beaufort and Barents) who use it as a summer refuge during the ice-free season. Both single bears and family groups have been seen feeding on ringed seals during the summer, and both ringed seals and their fish prey have been documented as being present.<sup>96</sup> AB is given a population size estimate of zero but there is some evidence that the productivity in some areas of this region is higher than previously assumed and it is thus possible that a small number of polar bears may live there year-round.<sup>97</sup>

### ***Kane Basin – Archipelago***

A 2013 survey of Kane Basin (KB) polar bears confirmed what local Inuit and some biologists have been saying for years: that contrary to the assertions of PBSG scientists, KB polar bear numbers have not been declining.<sup>98</sup> Previously, the PBSG had confidently said they were declining due to suspected over-hunting. The 2013 survey generated an estimate of 357 (range 221–493) and the population was suggested to be 'stable to increasing'.<sup>99</sup> However, the survey authors expressed concerns with sampling methodology and differences in the areas surveyed, and suggested 'some caution in interpretation of population growth' was necessary.<sup>100</sup> However, traditional knowledge says numbers have increased and the PBSG assessment for 2019 concluded that the population had 'likely increased'.<sup>101</sup>

### ***M'Clintock Channel – Archipelago***

The first population size estimate generated for M'Clintock Channel (MC) was about 900 bears in the mid-1970s and a mark-recapture study in 2000 generated an estimate of  $284 \pm 59$  bears, a significant decline blamed on over-hunting.<sup>102</sup> Hunting was subsequently halted but later resumed at a much-reduced level, after which the population was presumed to be increasing. Results of a three-year genetic mark-recapture study were published in 2020 and showed the population had more than doubled, from 284 in 1998–2000 to 716 (range 545–955) in 2014–2016. Numbers of both males and females increased between the study periods due to reduced hunting and 'improved habitat quality' (i.e. less thick multiyear ice).<sup>103</sup> While traditional knowledge in 2018 considered this subpopulation had declined in recent years due to overhunting, the PBSG assessed it as 'very likely increased' in 2019.<sup>104</sup>

### ***Viscount Melville – Archipelago***

The first survey of the Viscount Melville (VM) subpopulation was completed in 1992 and generated an estimate of  $161 \pm 40$ .<sup>105</sup> This estimate is now over 25 years old; while a new genetic mark-recapture survey was completed in 2014, the results had still not been made public by the end of 2020; traditional knowledge indicates



the population is stable or increasing, while the PBSG in 2019 considered it 'data deficient'.<sup>106</sup>

#### ***Gulf of Boothia – Archipelago***

The Gulf of Boothia (GB) is one of the smallest polar bear sub-population regions. The first survey in 1986 generated an estimate of about 900 bears, but by 2000 this had risen to  $1,592 \pm 361$  bears, a significant increase, and a very high population density.<sup>107</sup> A new estimate for the area based on genetic mark-recapture published in 2020 showed the population has been stable since the last assessment. The mean abundance estimate was 1,525 (range 1231–1819) for 2015–2017, a statistically non-significant change from the earlier survey.<sup>108</sup> Mean litter sizes showed no trend between study periods but body condition (i.e. fatness) in the spring increased (see Section 7), while overall population survival indicators suggested 'a good potential for growth'. The PBSG in 2019 list this subpopulation as 'likely stable' while traditional knowledge considers it to have increased.<sup>109</sup>

#### ***Lancaster Sound – Archipelago***

The Lancaster Sound (LS) subpopulation, in the middle of the Canadian Arctic archipelago, has one of the highest population counts of polar bears anywhere, although it is one of the smaller regions. The latest population surveys in LS were conducted from 1995 to 1997, giving an estimate of  $2,541 \pm 391$  bears, a significant increase over the previous estimate (from 1977) of 1,675.<sup>110</sup> Traditional knowledge says numbers in the region have increased while the Polar Bear Technical Committee assessed it as 'likely stable' in 2018.<sup>111</sup> In 2017, the PBSG considered the population to be stable but change this to 'data deficient' in 2019.<sup>112</sup>

#### ***Norwegian Bay – Archipelago***

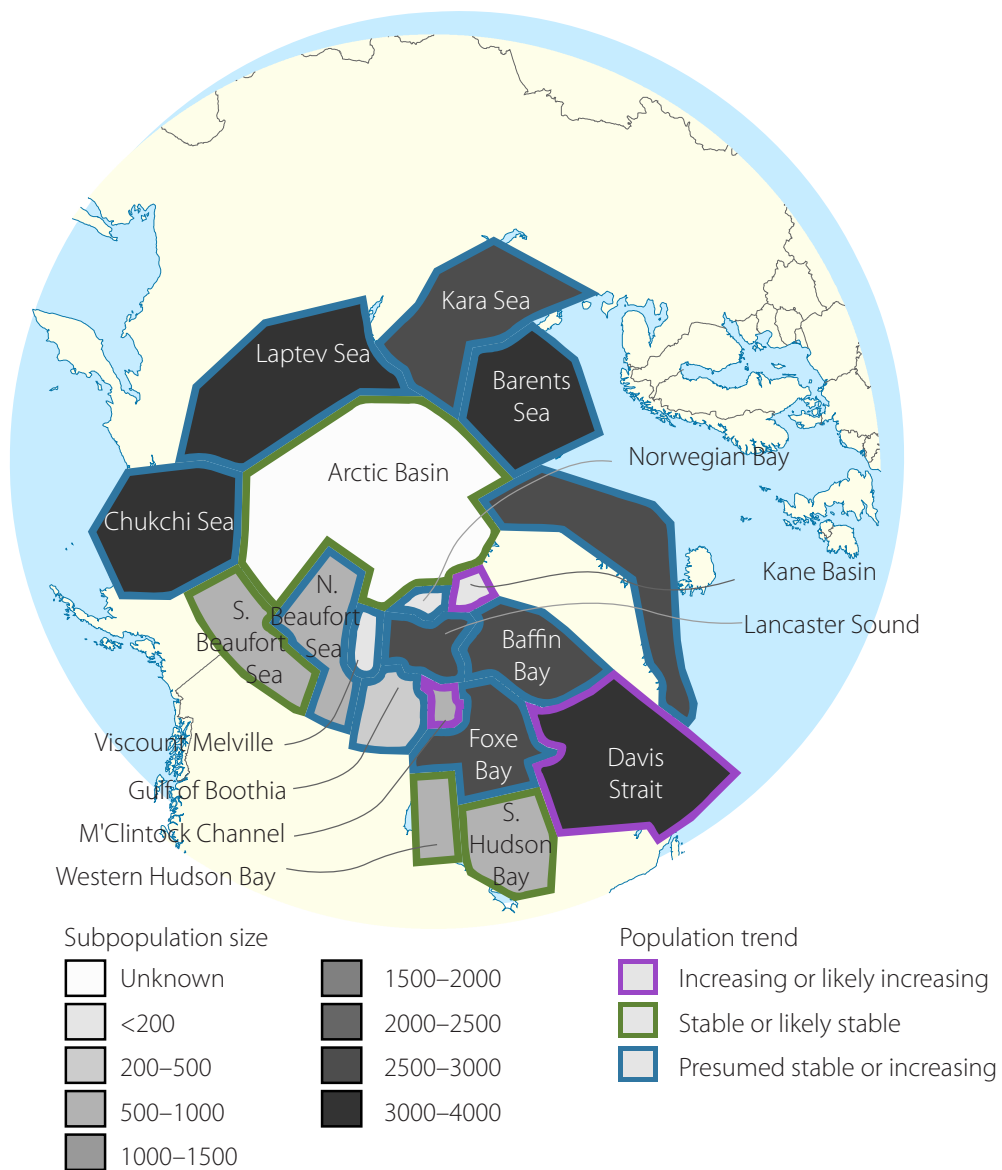
The last population count for Norwegian Bay (NB) was done in 1993–1997 in conjunction with the Lancaster Sound survey, and is therefore well out of date.<sup>113</sup> It generated a population estimate of  $203 \pm 44$ .<sup>114</sup> The PBSG in 2019 listed this subpopulation as 'data deficient' while traditional knowledge considered it stable.<sup>115</sup>



## 4. Population trends

In 2018, the Government of Canada published a global polar bear population status and trend map (unchanged at 31 December 2020), based primarily on 2017 PBSG data,<sup>116</sup> and in 2019, the PBSG posted an updated assessment. Since these figures are now out of date, Figure 2 shows a more realistic representation of current polar bear population trends based on all available information (survey results as well as studies on health and habitat status published up to 31 December 2020). This gives the following classification totals at 2020:<sup>117</sup>

- three 'increasing' or 'likely increasing' [KB, DS, MC]
- three 'stable' or 'likely stable' [SB, WH, SH]
- twelve 'presumed stable or increasing' [EG, LS, VM, NB, GB, LS, BB, BS, KS, CS, FB, NW]



**Figure 2: Trends in polar bear subpopulations at 2020.**

Number of bears per subpopulation. Former 'data deficient' regions are marked 'likely stable or increasing' to reflect current research on studied populations.

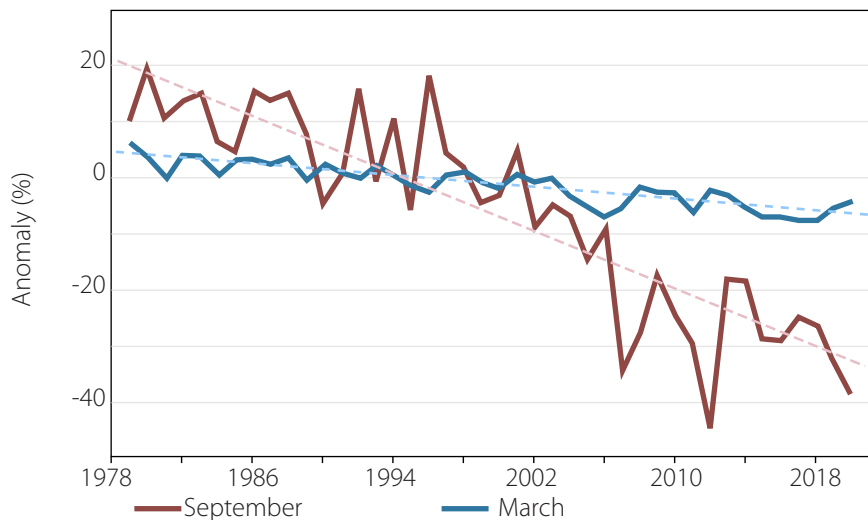
## 5. Habitat status

### Global sea ice

Summer sea-ice extent (at September) has declined markedly since 1979, but winter ice levels (at March) have declined very little. Moreover, there has been essentially no trend in March sea ice coverage since 2004 and no trend in summer ice since 2007 (Figure 3).<sup>118</sup> March extent in 2020 (15.05 mkm<sup>2</sup> at March 5), was the highest since 2013, and the extent in September dropped to the second lowest (after 2012) since 1979 (3.74 mkm<sup>2</sup> at 21 September).<sup>119</sup> As far as is known, record low extents of sea ice in March 2015, 2017 and 2018,<sup>120</sup> which were so similar to 2006, had no impact on polar bear health or survival (ice cover at March 2019 and 2020 were higher than all three of those years).

Figure 3: Sea-ice extents, 1979–2019.

Anomalies against 1981–2010 mean. Source: Arctic Report Card.



Sea ice extent in June has declined, on average, from just over 12 mkm<sup>2</sup> in the 1980s to just under 11 mkm<sup>2</sup> in 2019 and 2020.<sup>121</sup> However, this still leaves a great deal of ice throughout the Arctic to act as a feeding and mating platform for polar bears (see Section 6). Moreover, despite September 2020 having the second-lowest ice cover since 1979, there were no media or community reports of polar bear phenomena commonly blamed on lack of summer sea ice: no reports of widespread starvation amongst polar bears that spent the ice-free season on shore, no incidents of cannibalism, and no deaths by drowning.<sup>122</sup> Nor does the lack of sea ice seem to have led to an increase in fatal polar bear attacks (see Section 9).

It will be at least another year (and maybe two in some regions) before field researchers can properly assess the impact of the low ice levels of summer 2020, but the experience of 2012, when sea ice dropped even lower (Figure 3), suggests there will be few problems. For example, polar bears in the Chukchi Sea were thriving in 2012 and 2013, as were those in the Barents Sea (despite the most summer ice loss of any subpopulation).<sup>123</sup> And in the Southern Beaufort, the slight decline in numbers from 2012 to 2013 was negligible compared to the aftermath of the thick spring ice episodes of the 1970s and 2000s (discussed below in more detail).<sup>124</sup>

### ***Increased primary productivity due to reduced summer sea ice***

One of the most important lessons of the profoundly low extent of summer ice in 2020 in particular (and less summer ice in general since 2002) is that a longer ice-free season has been a net benefit to most animals in the Arctic and peripheral seas because less ice means more sunlight and more upwelling, which increases the ocean's primary productivity. In simple terms, less ice means ideal conditions for phytoplankton, the single-celled plants that are the basis for all life in the ocean.

Primary productivity during the ice-free season has been on the increase since 2002, but hit record highs in 2020, especially in the Laptev, East Siberian and Kara Seas, the Chukchi and Barents Seas, and Hudson Bay (Table 1).<sup>125</sup> One study published in 2020 found primary productivity across the Arctic had increased by 57% between 1998 and 2018, and the authors refer to this dramatic change as a 'regime shift'.<sup>126</sup> Such changes have also been documented in several Arctic regions during the warm period of the early Holocene that began about 9000 years ago.<sup>127</sup>

All the way up the food chain – where polar bears hold the top spot – more primary productivity means more food (fat newborn seals) for bears in the spring when they need it most, a fact that has been documented conclusively in the Chukchi Sea. Besides ringed seals, bearded seals, and polar bears, bowhead whales have also been shown to have benefitted from this increased primary productivity and the large recent population size and health of Pacific walrus suggest they are another species that has been the beneficiary of less summer sea ice since 2003.<sup>128</sup> Reports of markedly increased primary productivity in the Barents Sea between 2003 and 2019, as well as documented increased body condition of adult female bears over the same time period, suggest polar bears in that region, like bears in the Chukchi Sea, have benefitted from reduced summer sea ice.<sup>129</sup> As a consequence, given that a marked increase in primary productivity was documented across the Arctic in the summer of 2020, it is reasonable to expect that even if it has not been documented, Laptev Sea polar bears are also thriving as a result. This conclusion is in marked contrast to one polar bear researcher, who suggested that 'no ice = no ice bears.'<sup>130</sup>

Table 1: Changes in primary productivity 2020 vs 2003–19

Region	Change %
Eurasian Arctic (East Siberian, Laptev, Kara Seas)	117.2
Amerasian Arctic (Chukchi, Beaufort, Canadian Archipelago)	107.9
Barents Sea	102.5
Hudson Bay	107.1

Source: Frey et al. 2020, Table 1.

Ironically, although sea ice coverage has been below average in the summer in the Laptev Sea, the region continues to act as the primary 'sea ice generator' for the Arctic: during fall and winter, the severe continental weather in Siberia blows offshore into the shallow Laptev Sea, creating the upwelling conditions necessary for almost constant sea ice formation from October to April.<sup>131</sup>

### ***Long term variability of Arctic sea ice***

Sea ice varies between seasons, of course, but it is often highly variable from year to year within a sea ice ecoregion and across the Arctic as a whole. Over longer periods (decades, centuries, millennia), Arctic sea ice has also been quite variable, at times more extensive than today and at others, less extensive.<sup>132</sup> Polar bears and their prey species – ringed and bearded seals, walrus, beluga, and narwhal – have survived these and other changes with no apparent negative effects.<sup>133</sup> Their inherent flexibility in dealing with changing ice conditions past and present (see Section 8) mean that evolutionary adaptation, as it is usually defined, has not been necessary.

An important study published in 2020 provided strong evidence that the Northern Hemisphere cold period known as the Little Ice Age (ca. 1300–1850 AD) was initiated by a spontaneous, century-long increase in Arctic sea ice flowing into the North Atlantic in the early 1300s that had no apparent external trigger; it also found evidence for another spontaneous pulse of sea ice lasting nearly a century off east Greenland in the 15th century that coincided with the abandonment of Norse colonies.<sup>134</sup> Lead author Giff Myles stated: "we do have physical, geological evidence that these several decade-long cold sea ice excursions in the same region can, in fact do, occur."<sup>135</sup> Similarly, another paper published in 2020 found evidence that the Laptev and East Siberian Seas were often ice-free in summer during the early to middle Holocene warm period, as they have been in recent years, but that the lack of summer ice in the past was due to natural causes.<sup>136</sup>

### **Sea ice by subpopulation**

Regehr and colleagues in 2016<sup>137</sup> provide details of the amount of sea ice loss (number of days with ice cover of >15% concentration) per year for the period 1979–2014 per polar bear subpopulation. This metric varied from a high of 4.11 days per year in the Barents Sea to a low of 0.68 in the southern-most region, Southern Hudson Bay. Most subpopulations have lost about one day per year since 1979, although a few have lost somewhat more or less.<sup>138</sup>

#### ***Variable ice levels in Barents Sea***

Surprisingly, despite the Barents Sea having the greatest loss of ice since 1979, polar bear numbers have been increasing. In 2019, litter counts were as high as in 1993 (Section 7).<sup>139</sup> In 2020, winter ice in the Svalbard region of the Barents Sea was unusually extensive: by late February 2020, it was well above average for that time of year – higher than it had been in two decades – with extensive

ice present on the west coast of the archipelago for the first time since February 2000.<sup>140</sup> By 3 April, ice extent around Svalbard was the sixth highest since 1967, only slightly less than it had been in 1988, and Bear Island (Bjørnøya) to the south of the Svalbard Archipelago was surrounded by ice between late February and mid-May, a most unusual occurrence this century.<sup>141</sup> Ice north of Svalbard was also unusually thick and remained so into May, which presented some logistical problems for marine traffic in the area and resupply for MOSAiC researchers deliberately stuck in ice aboard the *Polarstern* icebreaker just north of Svalbard.<sup>142</sup> However, in May there was a remarkable reversal: ice extent declined abruptly and by 25 August ice extent was the lowest it had been on that date since records began in 1967<sup>143</sup> and extent remained below average for the rest of the year.<sup>144</sup> Although there were no negative impacts on polar bears reported, researchers were not allowed into the field to investigate because of Covid-19 concerns and so could not assess the condition of bears in a systematic way.

### ***Freeze-up and breakup date changes for Hudson Bay***

Contrary to predictions, freeze-up of sea ice along Western and Southern Hudson Bay came as early in 2017, 2018, 2019, and 2020 as it did in the 1980s; in addition, summer breakup in 2019 and 2020 was as late as it was in the 1980s – making 2019 and 2020 phenomenally good years for Hudson Bay polar bears – even though this information has not yet been incorporated into the scientific literature.<sup>145</sup> These ice conditions allowed most WH and SH bears to resume seal hunting four weeks earlier than in 2016 (when freeze-up was quite late) and has meant six good seasons in a row for these bears (with the last two being very good).<sup>146</sup> Although year-to-year variability is quite normal for Hudson Bay, a return to 1980s-like freeze-up dates four years in a row was not only unexpected but could not be explained by external forcing, such as the June 1991 volcanic eruption of Mount Pinatubo that seemed to cause a later-than-average breakup in 1992 and earlier-than-usual freeze-ups in 1991 and 1993.<sup>147</sup> Polar bear specialists have implied natural variation was to blame.<sup>148</sup>

Despite the overall drop in ice-covered days since 1979, several polar bear studies have demonstrated that there has been no statistically significant change in either breakup or freeze-up dates for WH since the mid-1990s and recent data is unlikely to change that.<sup>149</sup> Most of the change, an increase in the total ice-free period of about three weeks, came about 1998.<sup>150</sup> Note that is three weeks total, not three weeks at breakup and another three weeks at freeze-up, as is sometimes claimed.<sup>151</sup> As discussed in Section 8, many WH bears have been staying out on the melting ice long past the time they would have done a decade ago, which implies that breakup dates no longer mean what they once did for polar bears. Perhaps because of this, WH polar bear papers published in recent years have only presented sea ice data since 2015 as part of an index or correlation, not as simple data that can be compared to previous studies or to reports by observers of dates of polar bears' arrival onshore.<sup>152</sup>

There is less data, both formal and informal, for SH than there is for WH. However, sea ice charts show the pattern is similar for both, with breakup and freeze-up dates for SH coming a bit later than for WH. The ice-free season has increased in SH by about 30 days since the 1980s, but, as for WH, most of that change came in the late 1990s, with much yearly variation in breakup and freeze-up dates since then.<sup>153</sup>

Since 2017, the time polar bears are spending onshore has not increased as expected with declining ice levels. It is almost exactly the same as it was in the 1980s, before sea ice changes were evident. Even more astonishing is that some bears that left the ice in late August and then returned in late November 2020 would have spent only three months onshore – about one month less than in the 1980s and two months less than in the 1990s and 2000s.<sup>154</sup>

## **6. Prey base**

### **Polar bears, seals, and sea ice**

Ringed and bearded seals, and particularly their pups, are the primary prey of polar bears worldwide.<sup>155</sup> In some regions, other seal species, walrus, beluga, and narwhal are consumed too,<sup>156</sup> and bears may also scavenge whale carcasses.<sup>157</sup>

### **Seal numbers**

#### ***Ringed and bearded seals***

While ringed seals and bearded seals were both listed as ‘threatened’ under the US Endangered Species Act (ESA) in 2012, there is no evidence that either species has declined in number or registered any other negative impact due to reduced summer sea ice.<sup>158</sup> The ‘threatened’ status is based exclusively on the presumption that future harm will be caused by further reductions in summer sea ice.<sup>159</sup> However, no other Arctic nation has taken this conservation step for ringed and bearded seals, and neither has the IUCN Red List, which lists both as ‘Least Concern.’<sup>160</sup>

In October 2020, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) released their 2019 assessment of the ringed seal, which changed the conservation status from ‘not at risk’ to ‘special concern’ due to ‘reductions in area and duration of sea ice due to climate warming’ and because the Canadian population is ‘predicted to decline over the next three generations and may become threatened.’<sup>161</sup> The designation ‘special concern’ is the same status COSEWIC have assigned to the polar bear and is meant to indicate concerns that a species *may* qualify as ‘threatened’ in the near future (i.e. is predicted to decline but has not done so already).

The report cites as its primary evidence a study by Steven Ferguson and colleagues published in 2017 on Western Hudson Bay that assumed, but did not conclusively demonstrate, that a very warm year in 2010 was the cause of poor ringed seal body condition and birth of fewer pups in the few years following (2011–





2013).<sup>162</sup> Noting a correlation of ovulation rate in 2011 with the length of the open-water season in 2010, the authors blamed low ice levels for the decline in population, although they conceded that longer open-water periods in summer should actually allow ringed seals to feed for longer. Moreover, other explanations were possible. The authors also conceded that a recent unexplained shift in fish availability and abundance noted by other authors<sup>163</sup> could have been to blame, as could a respiratory illness, of which there was anecdotal evidence. In addition, the authors noted that heavy ice or snow in spring could also have reduced population health.<sup>164</sup>

Despite these compelling caveats, the COSEWIC ringed seal assessment for 2019 summarily concluded that a 'warm year' was the cause of the poor health and short-term population decline of WH ringed seals 2010–2013, without mention of any other possible factors.

### ***Harp seals***

Harp seals are an important alternate prey for polar bears in Davis Strait, Foxe Basin, Hudson Bay, southern Baffin Bay, East Greenland, and the Barents Sea.<sup>165</sup> A survey in 2012 determined there were an estimated 7.4 million harp seals in Atlantic Canada (range 6.5–8.3 m), an order-of-magnitude increase over the early 1980s when perhaps only half a million remained.<sup>166</sup> The results of a 2017 count of harp seal pups off Newfoundland and Labrador was published in 2020. Numbers had increased to 7.6 million (range 6.6–8.9 m).<sup>167</sup> This abundant prey base is likely to have resulted in a modest increase in polar bear numbers in Davis Strait and/or increased body condition since the last count in 2007 and, therefore, improved overall bear health and survival.<sup>168</sup>

## **7. Health and survival**

### **Body condition**

There were no images of starving polar bears circulated in 2020, although video footage of a lean young bear that boarded a Russian cargo ship got a small amount of international attention in April.<sup>169</sup> In August, a young male bear killed a camper in Svalbard, but its condition was not reported and no photographs of the bear were permitted (more details below).<sup>170</sup> As has been the case for several years, in 2020 most problem bears shown in photographs have been fat and healthy.<sup>171</sup>

Female body condition of polar bears has been reported to be somewhat worse in a few areas (SB, SH, DS, BB), but not below threshold levels necessary for reproduction.<sup>172</sup> The connection between body condition and reproductive success is, however, somewhat obscure. Laidre and colleagues note that:<sup>173</sup>

the functional and temporal relationships between declines in body condition and recruitment, and declines in subpopulation size, are poorly understood....

### ***New metrics of body condition***

A study published in 2020 by Amy Johnson and colleagues used a new metric for comparing the health of WH bears between 1985 and 2018.<sup>174</sup> It combined estimates of the number of bears onshore in summer with estimates of 'energy density' and 'storage energy' (based on body-condition data). The results were then correlated with sea ice loss over time. Such a novel metric cannot be compared to previous studies but at this time is the only published paper which considers individual body condition data collected between 2007 and 2018. Their conclusion, that energy density and storage energy had declined significantly over the 34-year study, was followed by a shockingly obvious caveat that this result was due, in part, to the decline in population size over time.<sup>175</sup> As a consequence, it cannot be concluded with any confidence that body condition of WH bears had, in fact, declined.

In contrast, shore-based observers in WH, including polar bear specialists and officials at the *Churchill Polar Bear Alert Program*, have noted that from 2017 through 2020, virtually all WH bears have been in excellent condition and in 2020 a mother with a triplet litter (an indicator of a bear in very good condition, seen commonly in the 1970s and 1980s but rarely in recent years) was observed outside of Churchill on multiple occasions between September and November.<sup>176</sup> A triplet litter was also reported in the fall of 2017.<sup>177</sup> As noted in Section 5 with regard to WH sea ice breakup and freeze-up dates, none of this recent information on body condition for WH bears has made its way into the scientific literature in a format comparable to previous studies.<sup>178</sup>

Another recent study also used a novel 'index' of body condition rather than raw body condition data, to try to determine the effect of changing sea ice levels.<sup>179</sup> Melissa Galicia and colleagues based their index on adipose lipid content in fat samples collected from individual bears harvested by Inuit hunters from 2010 to 2017 in BB, DS, FB, GB, and LS.<sup>180</sup> Their results suggest that the body condition of the bears increased long past local dates of ice breakup. This implies that they were hunting successfully despite rapidly deteriorating ice conditions, and suggests that the decision of WH bears in 2017–2020 to stay out on the ice long past the breakup may represent common behaviour (Section 5). That said, this study presents a real conundrum: the lipid content data suggests that bears in all subpopulations were in good or very good condition in January–March (i.e. before the seal pupping season), contradicting previous studies (using body measurement data) that indicated bears were generally in their worst condition at that time of year.<sup>181</sup> This contradiction does not prove the Galicia study is flawed, but does call the results into question.

### ***Improvements in some areas***

A report on GB bears published in 2020<sup>182</sup> found that, contrary to expectations, body condition of all bears captured in spring increased between the 1998–2000 and 2015–2017 study periods despite a marked decline in sea ice; evidence from survey

counts indicated the population had remained stable (but not increased) over time (see Section 3). In neighbouring MC, body condition of all bears was found to have increased between the 1998–2000 and 2014–2016 study periods despite a profound change in sea ice; evidence from survey counts indicated the population had more than doubled over time (from about 325 to 716).<sup>183</sup>

Surprisingly, in the Svalbard region of the BS, the body condition of both male and female bears has increased despite a marked decline in sea ice. In-progress reports of field results showed that most male bears in 2019 were in better condition than they had been since 1995.<sup>184</sup> Similarly, a peer-reviewed study published in 2019 found that adult female bears captured from 2005 to 2017 around Svalbard were in significantly better condition than they had been in the 1990s and early 2000s, despite the most dramatic declines of summer and early winter (Dec-Feb) ice of all polar bear regions:<sup>185</sup>

Unexpectedly, body condition of female polar bears from the Barents Sea has increased after 2005, although sea ice has retreated by ~50% since the late 1990s in the area, and the length of the ice-free season has increased by over 20 weeks between 1979 and 2013. These changes are also accompanied by winter sea ice retreat that is especially pronounced in the Barents Sea compared to other Arctic areas.

In summary, it is clear that recent data collected from across the Arctic do not support the assumption stated repeatedly by polar bear specialists that sea ice loss inevitably leads to reduced body condition of polar bears.<sup>186</sup>

## Hybridization

There were no reports or published papers on additional hybridization events in 2020, although a news report about grizzlies in Wapusk National Park, Manitoba again raised the issue of potential hybridization with polar bears, since some WH polar bears spend the summer or make maternity dens in the park.<sup>187</sup> A blonde grizzly shot in 2016 north of the park, near Arviat, was initially thought to have been a hybrid but this was disproven by DNA analysis.<sup>188</sup> The increase in reported grizzly numbers in Manitoba<sup>189</sup> (all of which have been lone animals, probably males since male tundra grizzlies are known to travel thousands of kilometres) was blamed on climate change by one researcher. However, not mentioned was the obvious alternative explanation – that hunting restrictions have led to a population increase and an expansion of their range.<sup>190</sup> As far as we know, hybridization in the wild has been between female polar bears and male grizzlies: as a result, the offspring are raised as polar bears and live on the sea ice (true also for second generation grizzly × polar bear crosses); the opposite cross (male polar bear × female grizzly) is so far only known from captive animals.<sup>191</sup>

## **Effect of contaminants**

Contaminants have been shown to be present in polar bears, but have not been shown to have done any harm. All of the so-called ‘evidence’ for negative effects is currently circumstantial and inconclusive.<sup>192</sup> In 2020, a review of all ‘new and/or emerging’ contaminants across Hudson Bay, East Greenland, and Svalbard was simply a list of potentially nasty compounds found in polar bears but did not show any documented harm.<sup>193</sup> Despite this, a study published in early 2021 (but accepted in September 2020) assumed that a number of organic contaminants would have profound negative health and reproductive effects on polar bears across the Arctic. The authors’ computer model indicated that 10 out of 15 polar bear subpopulations were likely to decline as a consequence.<sup>194</sup>

## **Denning on land vs. sea ice**

Many polar bear females den on land across the Arctic but denning on the sea ice is also a viable option. In Seasonal ice ecoregions, including WH, SH, FB, and DS, all bears make their dens on land because sea ice melts completely in the summer. But in other ecoregions, including SB, CS, and BS, bears can choose between land dens or sea ice dens.

In 2020, Kristin Laidre and Ian Stirling documented, for the first time, polar bears denning on or around grounded icebergs in northern and northeastern Greenland.<sup>195</sup> Another paper published in 2020 updated previous studies and summarized known land den areas in Canada, using information from a variety of sources, including traditional ecological knowledge.<sup>196</sup> A number of major and minor terrestrial polar bear denning areas have also been recorded in other regions, including Wrangel Island, Franz Josef Land, Svalbard, and the Laptev Sea.<sup>197</sup>

In 2020 the issue of SB bears denning on land became an issue due to intensified efforts to thwart oil exploration and extraction in Alaska (details below).

## **Ice-free period on land**

In recent years, the Southern Beaufort has been virtually 100% covered by sea ice between November and June, and the majority of bears stay on the ice as it retreats north in the summer; only 17.5% stay on land.<sup>198</sup> SB bears that spend all or a part of the summer on land seem to benefit from scavenging on the carcasses of bowhead whales that have been legally harvested by aboriginal residents,<sup>199</sup> although it is primarily males and mothers with cubs (not pregnant females) that use these resources. In 2020, the ice-free period in the SB was shorter than it has been for years, making this a good ice year for polar bears there. There was not extensive open water off Alaska until the end of June and extensive ice had returned by the third week in October, although it is unknown if this made a difference to the health of bears that had spent the season on shore.<sup>200</sup> However, 2020 was also a shorter than usual ice-free period for polar bears in WH –

for the fourth year in a row (see Section 5) – and bears there were reported to be in excellent condition.<sup>201</sup>

### **Threats from oil exploration and extraction in Alaska**

In 2018, renewed concerns were expressed regarding the risks to polar bears from planned oil exploration and extraction activities in the Arctic National Wildlife Refuge Area of Alaska (ANWR).<sup>202</sup> However, less than half of SB females make maternity dens in this area,<sup>203</sup> and biologists have found that while females are generally loyal to either land or sea for denning, as well as to a particular stretch of coast, they are not loyal to a specific place. Such flexibility is probably necessary because of annual variations in weather, sea ice conditions and prey availability.<sup>204</sup> In other words, there is strong evidence to suggest that if drilling or other activities were to disturb a pregnant female at a particular den location one year, she simply would not try to den in that spot again. Moreover, it is unlikely she would den in the same spot even if she was *not* disturbed. In addition, the small proportion of the polar bear population that spends some part of the summer on land are concentrated at the whale bone piles at Kaktovik and a few lesser known beach sites, which should be easy for drilling and exploration crews to avoid.<sup>205</sup>

Surprisingly, oil exploration and extraction activities – from the 1990s in the Eastern Beaufort (around Tuktoyaktuk in Canada) and from the 1970s in the Canadian High Arctic – were expected to cause a marked increase in the number of defense kills and unacceptable disruptions to denning but they did not.<sup>206</sup> However, in 2020 increased efforts to stop oil exploration and extraction resulted in two new studies that purported to assess possible threats to survival of SB polar bear cubs. One modelled the probable effectiveness of a variety of seismic survey designs that might be used by oil industry teams.<sup>207</sup> Another study assessed probabilities of disturbance to denning polar bears, but the authors were surprised to find that bears were less reactive to disturbance than expected:

We found significant probabilities for disturbance among all stimulus classes, with aircraft showing the highest potential for initiating den abandonment. However, while all human activities elicited varying degrees of response, the overall response intensity was less than anticipated, even under high-use scenarios. Our data indicate that the current guideline of a 1.6 km (1 mile) buffer zone effectively minimizes disturbance to denning polar bears.<sup>208</sup>

Public commentaries regarding this issue continued in 2020.<sup>209</sup> However, in September a US government report combined the results of the recent SB population survey with a count of polar bear dens: it showed that the population in fact had not declined since 2010 as expected (see Section 2), but that few dens could be expected in the area scheduled for oil exploration. The report concluded that an estimated 123 dens (range

69–198) could be expected in the entire SB population (about 908 bears) every year and, of those, a little more than half (66 dens, range 35–110) would be situated on land. The number of dens expected in the Arctic Coastal Plain, where oil exploration has been proposed, was 14 (range 5–30).<sup>210</sup> In other words, only about 11% of dens were at risk of *possible* disturbance due to oil exploration and extraction activities, and females are not particularly disturbed by such activities anyway. This result seems at odds with the claim that this area is critical denning territory for the survival of polar bears in Alaska and that the risk posed by oil exploration is unacceptably high.<sup>211</sup> However, because this is a highly political issue in the US, the controversy continues.<sup>212</sup>

### **Litter sizes**

Litter sizes are one way to assess the reproductive success of polar bears. Recent litter size counts have given no cause for concern, including those reported during 2020.

## **8. Evidence of flexibility**

Polar bears do not maintain territorial home ranges like grizzly and black bears and this is one of the most distinctive aspects of the species.<sup>213</sup> Since Arctic sea ice changes almost constantly from timescales of days, seasons, years, decades and millennia, one of the polar bear's most critical evolutionary adaptations is the ability and willingness to move around as sea ice and prey availability changes. Researchers are only documenting some of this flexibility now because marked changes in sea ice coverage did not routinely happen between the 1970s and the start of the 21st century.

### **Sea ice preferences**

While polar bear specialists have for years insisted that polar bears prefer sea ice of 50% or more over continental shelves, regardless of season, recent research has shown bears utilize sea ice well below this threshold. In the Southern Beaufort Sea and Western Hudson Bay, bears were found to use ice of 0–20% concentration; in some cases SB bears were tracked to areas registered by satellites as open water.<sup>214</sup> Similar behaviour has been observed among WH bears in 2017–2020. Perversely, they have also been staying onshore for an extra two weeks or more in the fall despite ice levels being adequate for them to leave. Researcher Andrew Derocher calls this 'behavioural plasticity'.<sup>215</sup> In fact, this phenomenon had been observed before 2017, but its significance was not addressed.<sup>216</sup>

This ability to adapt to low ice concentrations during summer and a reticence to leave in the fall, even when ice is available offshore for hunting, indicates inherent flexibility in the polar bear, one that probably always existed but was not evident until sea ice changes became so pronounced.<sup>217</sup>

## **9. Human/bear interactions**

### **Attacks on humans**

A major 2017 scientific summary of polar bear attacks on humans (1880–2014), authored by biologist James Wilder and colleagues,<sup>218</sup> concluded that such attacks are extremely rare and that the threat to human safety from polar bears is exaggerated. However, this may be because they essentially ignored attacks on Inuit and other indigenous people that live and hunt in the Arctic. By attempting to generate information that could be assessed with statistical methods, the authors ended up with data so skewed and incomplete that it does not provide a plausible assessment of the risk to humans of attacks by polar bears. Acknowledging that well-reported attacks on Europeans (or recorded by them) make up the bulk of the data used in the paper does not adequately address the weakness of the authors' conclusion that polar bears are not particularly dangerous.

This means that, except for well-reported incidents in the last few decades, virtually all attacks on the people most likely to encounter polar bears were not included in this study and the authors discount the almost perpetual danger from predatory polar bear attacks that Inuit and other indigenous people endured — and still endure in many areas — because those people in the past existed in 'relatively low numbers.'<sup>219</sup>

In 2020, an important paper was published that showed traditional bear spray – used routinely outside the Arctic for protection against brown and black bears – is more effective than assumed at relatively low temperatures and might be a useful option at close range for protection against polar bears.<sup>220</sup>

### **Unusual sightings, problem bears and attacks in 2020**

#### ***Winter/spring***

Winter is the leanest time of year for polar bears, since fat Arctic seal pups won't be available for another 2–3 months and meals for polar bears are hard to come by; this makes the bears especially dangerous when they come into contact with humans.<sup>221</sup> By spring, bears are in hunting-mode, as they pack on as much fat as possible to aid their survival over the summer months of fasting, and humans do well to avoid being the focus of these hunts.<sup>222</sup> Even well-fed bears continue to seek out sources of food.

#### ***Svalbard 2020 problem bears winter/spring***

On 15 January 2020, just east of Longyearbyen, a bear ran at a dog sled tour group as they neared home in the winter darkness at the end of a six-hour trip. The driver stopped the sled but said there was not enough time to reach his rifle, so he smacked the bear several times across the nose with the heavy noose-shaped brake rope that hung on the front of his sled. This assault caused the bear to run off and it was eventually chased away from the





area by helicopter.<sup>223</sup> On 20 January 2020, a 62-kg female bear that had been prowling the area across the fjord from Longyearbyen for weeks was tranquilized after being chased for almost an hour by helicopter. She unfortunately died on the flight to a remote area of northeast Svalbard, of undetermined causes.<sup>224</sup> On 1 May 2020, a bear was sighted in an area of recreational cabins west of Longyearbyen but caused no trouble before moving off.<sup>225</sup>

#### ***Labrador and Newfoundland 2020 problem bears winter/spring***

Oddly, in 2020 there was only one media report of polar bears onshore in Labrador: the community of Cartwright noted on 15 February that one or more bears had recently been spotted in the area.<sup>226</sup> According to Canadian Ice Service charts, sea ice was less extensive along the Labrador coast in early 2020, but there was certainly ice present from late January until early May. So either bears were not going ashore or sightings were not being reported.

There were also surprisingly few reports of bears onshore in Newfoundland between January and April 2020. Several sightings of bears and/or their tracks were reported near the town of St. Anthony in Newfoundland in mid-March, but no specific problems were noted; a bear was sighted on Fogo Island, Newfoundland on 6 April, but again there were no conflicts.<sup>227</sup> According to Canadian Ice Service charts, sea ice was less extensive than usual off the north coast of Newfoundland in 2020 but there was definitely some off the coast from at least late February until mid-April.

#### ***Summer/autumn***

Where all or a portion of the subpopulation comes ashore during the ice-free season, there is a different human–bear dynamic than what is seen in winter. For five months or so in some regions, but less in others, encounters between bears and people are much more likely in summer and autumn. Compared to sixty years ago, when hunting restrictions were put in place, there are many more bears and also more people. While serious attacks have always been relatively rare in summer, the number of bears shot or removed before tragedy strikes (especially in remote regions) have only recently been closely tracked.<sup>228</sup> For example, since polar bears have been protected in Canada, defence kills in Nunavut have been counted as part of the yearly quota of bears that a community is allowed to hunt, so they were rarely reported as something other than a legal harvest. The same may be true in Greenland, where bears are also hunted by native residents. In contrast, in the 1960s and early 1970s, many ‘problem’ bears in the community of Churchill, Manitoba were shot every year in defence of life or property, but presumably all were officially reported.<sup>229</sup>

#### ***Russia 2020, problem bears in summer/autumn***

In late October 2020, at a location in the Kara Sea (the exact location is not confirmed, but it is probably Novaya Zemlya), ten fat polar bears – including at least two mothers with cubs – besieged a stalled garbage truck stuck on a road. The bears climbed into

the open truck to get at the food scraps inside. Luckily, no one was hurt, but the driver was shaken up (a driver in another truck called for help).<sup>230</sup> In the Russian Far East in 2020, the residents of Ryrkaypiy on the Chukchi Sea apparently came up with a solution with assistance from the World Wildlife Fund (WWF): although more than 30 polar bears were seen near town in late December, guards placed around the town kept the bears from entering the community and causing problems as they had in 2019.<sup>231</sup>

***Western Hudson Bay problem bears in summer/autumn***

All Western Hudson Bay polar bears are forced ashore by melting ice in the summer, and Churchill, Manitoba is located near a primary staging area for the many bears that wait for the ice to form in the autumn. Churchill’s problems with polar bears extend back to the 1960s and took time and money to become as well-managed as they are today.<sup>232</sup> Table 2 shows the tallies of problem bears recorded by the Polar Bear Alert Program for the years 2015–2020.

Although correlations between an increase in the ice-free season over time and increased problems with bears in Churchill have been attempted several times (‘less ice = more problem bears’),<sup>233</sup> a study published in 2020 by Sarah Heemskerk and colleagues found that the number of problem bears increased between 1970 and 1998 but showed no trend between 1999 and 2018; overall, however, there were remarkably fewer problems with bears after 2001 than there were before (601 vs. 1409). Their data show the years with highest number of polar bear incidents were 1983 (when there was also a fatal attack) and 2003 (the highest for the entire 1970–2018 period); 2017 and 2018, as noted above, had relatively few and the years with the fewest number of conflicts were 1980 through 1982.<sup>234</sup> The paper stated that ‘after 2011 there was a continued decrease in abundance’ (i.e. a further population decline) but cite only ‘unpublished data’ to corroborate such a claim; they also claim a correlation over time with an increase in the ice-free season but the fit with that trend line is less than convincing, since there were fewer attacks in the one year with longest ice-free season (>190 days) than there were in three years when the season was much shorter (<150 days).<sup>235</sup> Also,

Table 2: Polar bear problem bears in Churchill, Manitoba

Year	Period	Number of incidents
2020	16–22 Nov	116
2019	11–17 Nov	138
2018	5–11 Nov	246
2017	20–26 Nov	148
2016	5–11 Dec	386
2015	16–22 Nov	333

Source: Polar Bear Alert Program, Churchill, Manitoba

while other authors, including polar bear specialists, acknowledge that a step-change in summer sea ice added about three weeks to the ice-free season in 1998 but has not changed since, Heemskerk and colleagues present a continuing increase in the ice-free season since 1979.<sup>236</sup> In other words, they note a step-change in polar bear incident data but not the sea ice data. Ultimately, however, they conceded that changes in management protocols (such as the increased vigilance after the near-fatal attack in 2013) meant that none of the trends over time they identified – including an apparent decrease in problems due to documented or implied declines in population size – were reliable: none of their correlations were scientifically valid because the way that ‘problem’ bears were defined and dealt with changed over time.

In Arviat to the north, increased attention to managing bears in the immediate area of town since 2014 continues to be successful at avoiding serious incidents with bears.<sup>237</sup> In the fall of 2020 in Arviat, a whale carcass blown onshore near town by a storm attracted a mother and two cubs, so to reduce any danger to residents community ‘bear monitors’ dragged the carcass out to sea and sank it. According to social media reports by one resident, there were many bears around Arviat in 2020 but bear monitors drove them away before they could cause any trouble.<sup>238</sup> However, the fatal attacks that have occurred north of Churchill have taken place well outside communities, where it is almost impossible to predict where bears will be or how they will behave.

#### ***Baffin Bay sightings summer/autumn***

There was a probable polar bear sighting on 6 July 2020 near the city of Iqaluit (on southeastern Baffin Bay) in Sylvia Grinnel Territorial Park. However, there were no further sightings of the bear and no problems were reported.<sup>239</sup>

#### ***Svalbard fatal bear attack summer/autumn***

In 2020, Svalbard had its first fatal polar bear attack since 2011, in the early hours of 28 August 2020, just outside the main town of Longyearbyen, at a camping site along a beach beside the Longyearbyen airport. The camping site provided low-cost accommodation for visitors, but did not have a guard posted or an electric fence installed to protect against polar bears. About 4 a.m., a bear grabbed a Dutch camper as he slept in his tent and his screams brought others to his aid; someone managed to shoot the bear but not before the man was fatally mauled. The bear was a three-year-old male but his condition was not described: historically, subadult bears are responsible for most attacks on people and they are known to be especially dangerous.<sup>240</sup> This bear was one of at least four that had been seen in the area that week. Apparently, supplies to build an electric fence had arrived in March but construction was delayed when Covid-19 restrictions shut down the arrival of all visitors; by the time visitors were allowed, the ground was too soft to install the fencing.<sup>241</sup> Lack of sea ice cannot be blamed for this attack – or for the numerous reports of bears in the area at the time – since Norwegian Ice Service charts showed

ice coverage around the archipelago had been better in the spring of 2020 than they have been for decades.<sup>242</sup> While there was no ice off Svalbard at the time of the attack, that is not unusual for late August, and most bears onshore at that time should have been in excellent condition.

#### ***Labrador and Newfoundland problem bears summer/autumn***

In 2020, in late September, a Canadian search and rescue helicopter left out overnight at the remote airstrip in Saglek on the northern coast of Labrador was damaged by a polar bear. The bear pushed in the side door, popped out an emergency exit window and ripped the cover off the nose cone, but did not enter the helicopter and no one was injured.<sup>243</sup> The damage to the helicopter happened very near where a near-fatal polar bear attack took place in late July 2013, when a bear grabbed a camper – tent and all – and headed off down the beach. The victim was only saved by a fellow camper who shot flares at the bear until he dropped the man and ran off. Several accounts of the incident unfairly blamed lack of sea ice due to climate change for the attack, and most failed to acknowledge the rather dramatic increase in polar bear numbers that had been documented in the region.<sup>244</sup>

## **10. Discussion**

Even in 2020, polar bears continue to be described as ‘canaries in the coal mine’ for the effects of human-caused climate change, despite evidence that far from being a highly-sensitive indicator species, it is thriving across the Arctic, even in regions that have had the most dramatic recent declines in sea ice.<sup>245</sup>

The current health and abundance of polar bears is also markedly at odds with a new model that attracted worldwide media attention in 2020 because it predicted the near extinction of the species by 2100 due to climate change.<sup>246</sup> This model depended on one critically flawed assumption: it used the RCP8.5 carbon dioxide emissions scenario, which most observers consider so extreme as to be discredited as scientifically implausible.<sup>247</sup> In addition, although the model estimated theoretical ‘fasting thresholds’ expected to limit the number of cubs produced and adult survival, it did not take into account the increased primary productivity recorded across the Arctic as a result of reduced summer sea ice, which we know from regional studies means that many bears have more to eat in the spring, so that they enter the summer fast period in excellent condition. Nor did the study take into account the documented willingness of bears to adjust their denning and feeding locations as sea-ice changes occur. Fortunately for the authors, they did not make specific claims for future effects of sea-ice loss on polar bear abundance that would encourage scientific hypothesis testing, as their colleagues did in 2007: they stuck to vague descriptors, such as ‘possible’ and ‘likely’, to describe future negative impacts, knowing that all of their predicted ‘inevitable’ effects were half a century or more from critical scrutiny.<sup>248</sup>

Despite the fact that in 2020, summer sea-ice levels declined to the second lowest levels since 1979 – but still no further than about 3 mkm<sup>2</sup> – there were no reports of widespread starvation of bears, acts of cannibalism, or drowning deaths that might suggest they were having trouble surviving the ice-free season. In general, there were no more reports of problem bears than normal.

Studies that presented data up to and including 2020 showed that primary productivity in the Arctic has increased because of longer ice-free periods. A report on the abundance of harp seals off Newfoundland and Labrador suggested that this important food source for polar bears had increased since 2012. Other surveys have been delayed, some because of Covid-19 or for other reasons that are less clear. The increase in primary productivity explains in part why polar bears in the Chukchi and Barents Seas have been thriving in recent years –and suggests that bears in the Laptev, East Siberian and Kara Seas, as well as Hudson Bay, are likely also doing well, although a lack of recent studies means documentary evidence is wanting. Recent body-condition surveys give more grounds for optimism, although polar bear specialists tend to cite decades-old data,<sup>249</sup> or to use new metrics of body condition in order to present a pessimistic view.

The long-predicted decline in polar bear populations still hasn't happened. Results of three polar bear population surveys were published in 2020 and all were found to be either stable or increasing. Importantly, Southern Beaufort polar bear numbers were found to have been stable since 2010 at about 907 bears, not reduced as expected. Overall, studies published between 2016 and 2020 suggest that the most up-to-date global population total should be about 30,000 (and could be even higher), up from about 26,000 in 2015.<sup>250</sup> Reports in progress may increase this further.

Overall, 2020 appears to have been another good year for polar bears.

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