Revised 10/13/02

HARBOR PORPOISE (*Phocoena phocoena*): Southeast Alaska Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). The harbor porpoise primarily frequents coastal waters and in the Gulf of Alaska and Southeast Alaska, they occur most frequently in waters less than 100 m in depth (Waite and Hobbs, in review). The average density of harbor porpoise in Alaska appears to be less than that reported off the west coast of the continental U.S., although areas of high densities do occur in Glacier Bay, Yakutat Bay, Copper River Delta, and Sitkalidak Strait (Dahlheim et al. 2000; Waite and Hobbs, in review). Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992) and is summarized in Osmek et al. (1994). Two distinct mitochondrial DNA groupings or clades exist. One clade is present in California, Washington, British Columbia and Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991). Further genetic testing of the same data mentioned above along with additional samples found significant genetic differences for 4 of the 6 pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic or migratory, and that movement is sufficiently restricted to evolve genetic differences. This is consistent with low movement suggested by genetic analysis of harbor porpoise specimen from the North Atlantic. Numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles. Unfortunately, no conclusions can be drawn about the genetic structure of harbor porpoise within Alaska because of insufficient samples. Only 19 samples are available from Alaska porpoise and 12 of these come from a single area (Copper River Delta). Accordingly, harbor porpoise stock structure in Alaska remains unknown at this time.

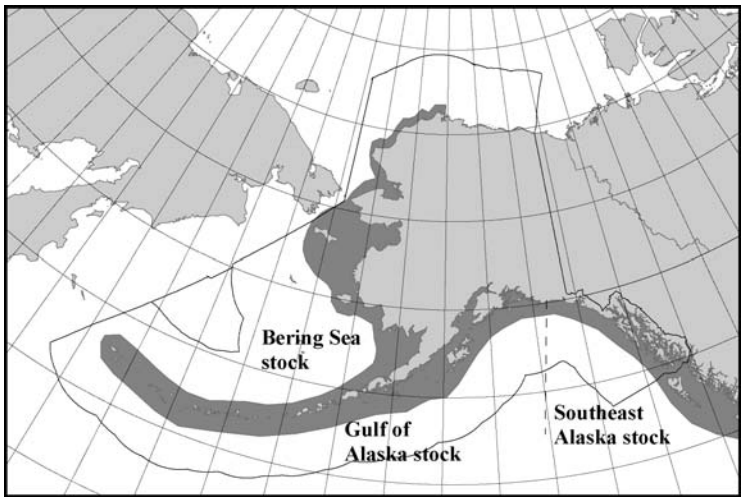

Figure 23. Approximate distribution of harbor porpoise in Alaska waters (shaded area).

Although it is difficult to determine the true stock structure of harbor porpoise populations in the northeast Pacific, from a management standpoint, it would be prudent to assume that regional populations exist and that they should be managed independently (Rosel et al. 1995, Taylor et al. 1996). The Alaska SRG concurred that while the available data were insufficient to justify recognizing three biological stocks of harbor porpoise in Alaska, it did not recommend against the establishment of three management units in Alaska (DeMaster 1996, 1997). Accordingly, from the above information, three separate harbor porpoise stocks in Alaska are recommended, recognizing that the boundaries were set arbitrarily: 1) the Southeast Alaska stock - occurring from the northern border of British Columbia border to Cape Suckling, Alaska, 2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, and 3) the Bering Sea stock - occurring throughout the Aleutian Islands and all waters north of Unimak Pass (Fig. 23). Information concerning the 4 harbor porpoise stocks occurring along the west coast of the continental United States (Central California, Northern California, Oregon/Washington Coast, and Inland Washington) can be found in the Stock Assessment Reports for the Pacific Region.

POPULATION SIZE

In June and July of 1997, an aerial survey covering the waters of the eastern Gulf of Alaska from Dixon Entrance to Cape Suckling and offshore to the 1,000 fathom depth contour resulted in an uncorrected abundance estimate of 3,698 (CV = 0.162) animals (Waite and Hobbs, in review). Included were The inside waters of Southeast Alaska, Yakutat Bay, and Icy Bay were included in addition to the offshore waters. The total area surveyed across inside waters, was 106,087km^2. Only a fraction of the small bays and inlets (<5.5 km wide) of Southeast Alaska were surveyed and included in this abundance estimate, although the areas omitted represent only a small fraction of the total survey area. The observed abundance estimate was multiplied by correction factors for availability bias (to correct for animals not available to be seen because they were diving) and perception bias (to correct for animals not seen because they were missed) to obtain a corrected abundance estimate. Laake et al. (1997) estimated the availability bias for aerial surveys of harbor porpoise in Puget Sound to be 2.96 (CV = 0.180); the use of this correction factor is preferred to other published correction factors (e.g., Barlow et al., 1988; Calambokidis et al., 1993) because it is an empirical estimate of perception bias. A second independent observer was used to estimate the average availability bias as 1.56 (CV = 0.108). The estimated corrected abundance from this survey is 10,947 (3,698 × 2.96; CV = 0.242) harbor porpoise for Southeast Alaska.

Minimum Population Estimate

For the Southeast Alaska stock of harbor porpoise, the minimum population estimates (N_{MIN}) for the aerial and vessel surveys are calculated separately, using Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842*[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimates (N) of 10,947 and its associated CV (0.242), N_{MIN} for this stock is 8,954.

Current Population Trend

The abundance of harbor porpoise in Southeast Alaska was estimated for 1993 and 1997. The 1993 estimate was 10,301 (Dahlheim et al. 2000). The 1997 estimate of 10,947 is not significantly different from the 1993 estimate (Waite and Hobbs, in review). However, these estimates are not directly comparable because the area surveyed in 1997 was larger than that in 1993, and because the 1997 abundance estimation involved direct calculation of perception bias, while the 1993 estimate used a correction factor based on some untested assumptions about observer behavior and visibility of harbor porpoise. Thus, while the estimates are not significantly different, there is no reliable information on trends in abundance for the Southeast Alaska stock of harbor porpoise.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not currently available for the Southeast Alaska stock of harbor porpoise. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate of 4% be employed (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5, the value for cetacean stocks with unknown population status (Wade and Angliss 1997). Thus, for the Southeast Alaska stock of harbor porpoise, PBR = 90 animals (8,954 × 0.02 × 0.5).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Some fishing effort by vessels participating in the Gulf of Alaska (GOA) groundfish longline fishery occurs in the offshore waters of Southeast Alaska. The levels of fishing effort levels are insignificant for the portion of the GOA groundfish trawl and pot fisheries operating in these waters. However, during the period from 1990 to 1998, 21-31% of the GOA longline catch occurred within the range of the Southeast Alaska harbor porpoise stock. This fishery has been monitored for incidental take by NMFS observers from 1990 to 1998 (8-21% observer coverage), although observer coverage has been very low in the offshore waters of Southeast Alaska (<1-5% observer coverage). No mortalities from this stock of harbor porpoise incidental to commercial groundfish fisheries have been observed.

The only source of information on the number of harbor porpoise killed or injured incidental to commercial fishery operations is the self-reported fisheries information required by the MMPA. During the period between 1990 and 1998, fisher self-reports from the Southeast Alaska salmon drift gillnet fishery (Table 21) resulted in an annual mean of 3.25 mortalities from interactions with commercial fishing gear. However, because logbook records (i.e., fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), this is considered to be a minimum estimate. There were no other fisher self-report mortalities for any other fishery within the range of the Southeast Alaska harbor porpoise stock. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).

Table 21. Summary of incidental mortality of harbor porpoise (Southeast Alaska stock) due to commercial fisheries from 1990 through 1998 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from fisher self-reports. Mean annual mortality was based on the fisher self-reports from 1991to 2001 where more than 5 years of data were available. n/a indicates that data are not available.

Fishery name	Years	Data type	Range of observer coverage	Reported mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Observer program total	90-01					0
Southeast Alaska salmon drift gillnet	90-01	logbooks/ self-reports	n/a	2, 2, 7, 2, n/a, n/a, 2, n/a, 1, n/a, n/a, n/a	n/a	[≥2.8]
Minimum total annual mortality						≥2.8

For this stock of harbor porpoise, the estimated minimum annual mortality rate incidental to commercial fisheries is 3 animals (rounded up from 2.8), based entirely on fisher self-report data. However, a reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of the absence of observer placements in Southeast Alaska fisheries. Therefore, it is unknown whether the kill rate is insignificant. At present, annual mortality levels less than 9 animals per year (i.e., 10% of PBR) can be considered to be insignificant and approaching a zero mortality and serious injury rate.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska have not been reported to take from this stock of harbor porpoise.

STATUS OF STOCK

Harbor porpoise are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Logbook records are most likely negatively biased (Credle et al. 1994) resulting in an underestimate of incidental kill. However, based on the best scientific information available, the estimated level of human-caused mortality and serious injury (3) is not known to exceed the PBR (90). Therefore, the Southeast Alaska stock of harbor porpoise is not classified as a strategic stock. Population trends and status of this stock relative to OSP are currently unknown.

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HARBOR PORPOISE (*Phocoena phocoena*): Gulf of Alaska Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). The harbor porpoise primarily frequents coastal waters, and in the Gulf of Alaska and Southeast Alaska, they occur most frequently in waters less than 100 m in depth (Waite and Hobbs, in review). The average density of harbor porpoise in Alaska appears to be less than that reported off the west coast of the continental U.S., although areas of high densities do occur in Glacier Bay, Yakutat Bay, Copper River Delta, and Sitkalidak Strait. Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992) and is summarized in Osmek et al. (1994). Two distinct mitochondrial DNA groupings or clades exist. One clade is present in California, Washington, British Columbia and Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991). Further genetic testing of the same data mentioned above along with additional samples found significant genetic differences for 4 of the 6 pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic or migratory, and that movement is sufficiently restricted to evolve genetic differences. This is consistent with low movement suggested by genetic analysis of harbor porpoise specimen from the North Atlantic. Numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles. Unfortunately, no conclusions can be drawn about the genetic structure of harbor porpoise within Alaska because of insufficient samples. Only 19 samples are available from Alaska porpoise and 12 of these come from a single area (Copper River Delta). Accordingly, harbor porpoise stock structure in Alaska remains unknown at this time.

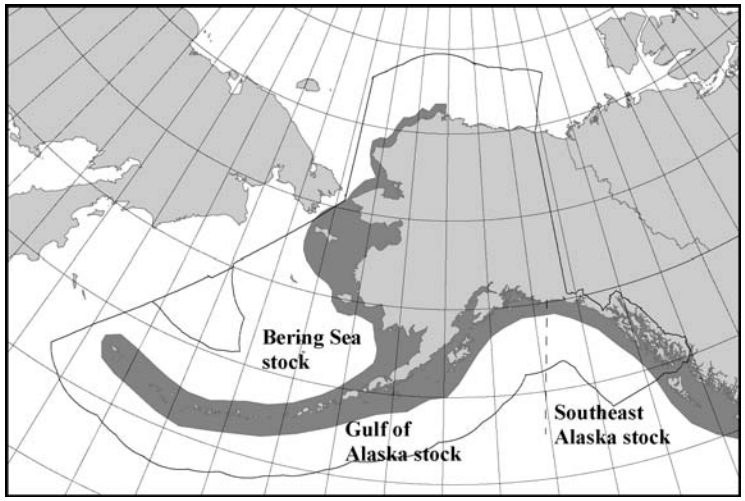

Figure 24. Approximate distribution of harbor porpoise in Alaska waters (shaded area).

Although it is difficult to determine the true stock structure of harbor porpoise populations in the northeast Pacific, from a management standpoint, it would be prudent to assume that regional populations exist and that they should be managed independently (Rosel et al. 1995, Taylor et al. 1996). The Alaska SRG concurred that while the available data were insufficient to justify recognizing three biological stocks of harbor porpoise in Alaska, it did not recommend against the establishment of three management units in Alaska (DeMaster 1996, 1997). Accordingly, from the above information, three separate harbor porpoise stocks in Alaska are recommended, recognizing that the boundaries were set arbitrarily: 1) the Southeast Alaska stock - occurring from the northern border of British Columbia border to Cape Suckling, Alaska, 2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, and 3) the Bering Sea stock - occurring throughout the Aleutian Islands and all waters north of Unimak Pass (Fig. 24). Information concerning the 4 harbor porpoise stocks occurring along the west coast of the continental United States (Central California, Northern California, Oregon/Washington Coast, and Inland Washington) can be found in the Stock Assessment Reports for the Pacific Region.

POPULATION SIZE

In June and July of 1998 an aerial survey covering the waters of the western Gulf of Alaska from Cape Suckling to Sutwik Island, offshore to the 1000 fathom depth contour resulted in an uncorrected abundance estimate for the Gulf of Alaska harbor porpoise stock of 10,306 (CV = 0.115) animals (Waite and Hobbs, in review). The uncorrected abundance estimate was multiplied by correction factors for availability bias (to correct for animals not available to be seen because they were diving) and perception bias (to correct for animals not seen because they were missed) to obtain a corrected abundance estimate. Laake et al. (1997) estimated the availability bias for aerial surveys of harbor porpoise in Puget Sound to be 2.96 (CV = 0.180); the use of this correction factor is preferred to other published correction factors (e.g., Barlow et al., 1988; Calambokidis et al., 1993) because it is an empirical estimate of availability bias. A second independent observer was used to estimate the average perception bias as 1.372 (CV = 0.066). The estimated corrected abundance estimate from this survey is 30,506 (10,306 × 2.96 = 30,506; CV=0.214).

The latest estimate of abundance (30,506; CV = 0.0.214) is based on surveys conducted in 1998, and is considerably higher than the previous estimate in the 1999 SAR (8,271; CV = 0.309). This disparity largely stems from changes in the area covered by the two surveys and differences in harbor porpoise density encountered in areas added to, or dropped from, the 1998 survey, relative to the 1991-93 surveys . The survey area in 1998 (119,183 km^2) was greater than the area covered in the composited portions of the 1991,1992 and 1993 surveys (106,600 km^2). The 1998 survey included the waters of Prince William Sound, the bays, channels, and inlets of the Kenai Peninsula, the Alaska Peninsula and Kodiak Archipelago whereas the earlier survey included only open water areas. Several of the bays and inlets covered by the 1998 survey had higher harbor porpoise densities than observed in the open waters. In addition, the 1998 estimate provided by Waite and Hobbs (in review) empirically estimate the perception bias, and use this in addition to the correction factor for availability bias. And finally, the 1998 estimate extrapolates available densities to estimate the number of porpoise which would likely be found in unsurveyed inlets within the study area. The 1998 survey result is probably more representative of the size of the Gulf of Alaska harbor porpoise stock since it included more of the inshore habitat commonly used by harbor porpoise.

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated using Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842*[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 30,506 and its associated CV of 0.214, N_{MIN} for the Gulf of Alaska stock of harbor porpoise is 25,536.

Current Population Trend

At present, there is no reliable information on trends in abundance for the Gulf of Alaska stock of harbor porpoise.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not currently available for the Gulf of Alaska stock of harbor porpoise. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate of 4% be employed (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5, the value for cetacean stocks with unknown population status (Wade and Angliss 1997). Thus, for the Gulf of Alaska stock of harbor porpoise, PBR = 255 animals (25,536 × 0.02 × 0.5).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Three different commercial fisheries operating within the range of the Gulf of Alaska stock of harbor porpoise were monitored for incidental take by NMFS observers during 1990-95: Gulf of Alaska groundfish trawl, longline, and pot fisheries. No incidental mortality of harbor porpoise was observed in these fisheries. Observers also monitored the

Prince William Sound salmon drift gillnet fishery in 1990 and 1991, recording 1 mortality in 1990 and 3 mortalities in 1991. These mortalities extrapolated to 8 (95% CI 1-23) and 32 (95% CI 3-103) kills for the entire fishery, resulting in a mean kill rate of 20 (CV = 0.60) animals per year for 1990 and 1991. In 1990, observers boarded 300 (57.3%) of the 524 vessels that fished in the Prince William Sound salmon drift gillnet fishery, monitoring a total of 3,166 sets, or roughly 4% of the estimated number of sets made by the fleet (Wynne et al. 1991). In 1991, observers boarded 531 (86.9%) of the 611 registered vessels and monitored a total of 5,875 sets, or roughly 5% of the estimated sets made by the fleet (Wynne et al. 1992). Logbook reports from this fishery detail 6, 5, 6, and 1 harbor porpoise mortalities in 1990, 1991, 1992, and 1993, respectively. The extrapolated (estimated) observer mortality accounts for these mortalities, so they do not appear in Table 22. The Prince William Sound salmon drift gillnet fishery has not been observed since 1991; therefore, no additional data are available for that fishery.

An additional source of information on the number of harbor porpoise mortalities incidental to commercial fishing operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990 and 1998, fisher self-reports from 2 unobserved fisheries (see Table 22) resulted in an annual mean of 4.5 mortalities from interactions with commercial fishing gear. In 1990, logbook records from the Cook Inlet set and drift gillnet fisheries were combined. As it is not possible to determine which fishery was responsible for the harbor porpoise mortalities reported in 1990, both fisheries have been included in Table 22. In 1990, observers also boarded 59 (38.3%) of the 154 vessels participating in the Alaska Peninsula/Aleutian Island salmon drift gillnet fishery, monitoring a total of 373 sets, or roughly 4% of the estimated number of sets made by the fleet (Wynne et al. 1991). The low level of observer coverage for this fishery apparently missed interactions with harbor porpoise which had occurred, as logbook mortalities were reported in 1990 (see Table 22) which were not recorded by the observer program. Note that this fishery operates south of the Aleutian Islands, but had been incorrectly addressed in earlier versions of the SAR as an interaction with the Bering Sea stock of harbor porpoise. Because logbook records (i.e., fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. These totals are based on all available fisher self-reports for Gulf of Alaska fisheries, except the Prince William Sound salmon drift gillnet fishery for which observer data were presented above. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).

Table 22. Summary of incidental mortality of harbor porpoise (Gulf of Alaska stock) due to commercial fisheries from 1990 through 1998 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from fisher self-reports or stranding data. n/a indicates that data were not available.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Prince William Sound salmon drift gillnet	90-91	obs data	4-5%	1, 3	8, 32	20 (CV = .60)
Cook Inlet salmon drift gillnet	1999	obs data		0	0	0
Cook Inlet salmon set gillnet	1999	obs data		0	0	0
Observer program total						20

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
				Reported mortalities		
Cook Inlet salmon drift and set gillnet fisheries	90-01	logbooks/ self-reports	n/a	3, 0, 0, 0, n/a, n/a, n/a, n/a, n/a, n/a, n/a, n/a	n/a	[≥0.75]
AK Peninsula/Aleutian Island salmon drift gillnet	90-01	logbooks/ self-reports	n/a	2, 0, 1, 0, n/a, n/a, n/a, n/a, n/a, n/a, n/a, n/a	n/a	[≥0.75]
Kodiak salmon set gillnet	90-01	logbooks/ self-reports	n/a	8, 4, 2, 1, n/a, n/a, n/a. n/a, 1, n/a, n/a, n/a	n/a	[≥3.2]
Minimum total annual mortality						≥24.7

Strandings of marine mammals with fishing gear attached or with injuries caused by interactions with fishing gear are a final source of mortality data. In the period from 1990 to 1994, 12 harbor porpoise scarred with gillnet marks were discovered stranded in Prince William Sound (Copper River Delta). These stranding reports were likely the result of operations in the Prince William Sound salmon drift gillnet fishery. The extrapolated (estimated) observer mortality for this fishery accounts for these mortalities, so they do not appear in Table 22.

A reliable estimate of the mortality rate incidental to commercial fisheries is considered unavailable because of the absence of observer placements in several gillnet fisheries mentioned above. However, the estimated minimum annual mortality rate incidental to commercial fisheries is 25 based on observer data (20), and logbook reports (rounded to 5) where observer data were not available. This estimated annual mortality rate is greater than 10% of the PBR (16.6) and, therefore, cannot be considered to be insignificant and approaching a zero mortality and serious injury rate.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska have not been reported to take from this stock of harbor porpoise.

Other Mortality

In 1995, 2 harbor porpoise were taken incidentally in subsistence gillnets, one near Homer Spit and the other near Port Graham.

STATUS OF STOCK

Harbor porpoise are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Logbook records are most likely negatively biased (Credle et al. 1994) resulting in an underestimate of incidental mortality. However, based on the best scientific information available, the estimated level of human-caused mortality and serious injury (27; 25 mortalities in commercial fisheries plus 2 in subsistence gillnets) is not known to exceed the PBR (255). Therefore, the Gulf of Alaska stock of harbor porpoise is not classified as a strategic stock. Population trends and status of this stock relative to OSP are currently unknown.

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HARBOR PORPOISE (*Phocoena phocoena*): Bering Sea Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). The harbor porpoise primarily frequents coastal waters, and in the Gulf of Alaska and Southeast Alaska, they occur most frequently in waters less than 100 m in depth (Waite and Hobbs, in review). The average density of harbor porpoise in Alaska appears to be less than that reported off the west coast of the continental U.S., although areas of high densities do occur in Glacier Bay, Yakutat Bay, Copper River Delta, and Sitkalidak Strait. Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992) and is summarized in Osmek et al. (1994). Two distinct mitochondrial DNA groupings or clades exist. One clade is present in California, Washington, British Columbia and Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991). Further genetic testing of the same data mentioned above along with additional samples found significant genetic differences for 4 of the 6 pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic or migratory, and that movement is sufficiently restricted to evolve genetic differences. This is consistent with low movement suggested by genetic analysis of harbor porpoise specimen from the North Atlantic. Numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles. Unfortunately, no conclusions can be drawn about the genetic structure of harbor porpoise within Alaska because of insufficient samples. Only 19 samples are available from Alaska porpoise and 12 of these come from a single area (Copper River Delta). Accordingly, harbor porpoise stock structure in Alaska remains unknown at this time.

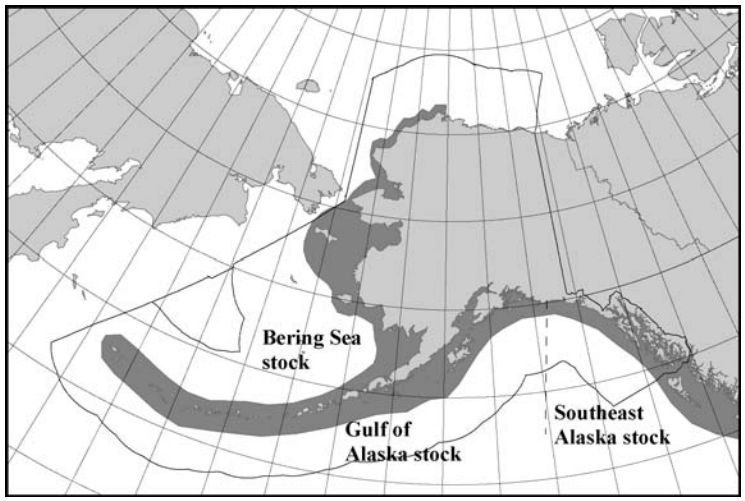

Figure 25. Approximate distribution of harbor porpoise in Alaska waters (shaded area).

Although it is difficult to determine the true stock structure of harbor porpoise populations in the northeast Pacific, from a management standpoint, it would be prudent to assume that regional populations exist and that they should be managed independently (Rosel et al. 1995, Taylor et al. 1996). The Alaska SRG concurred that while the available data were insufficient to justify recognizing three biological stocks of harbor porpoise in Alaska, it did not recommend against the establishment of three management units in Alaska (DeMaster 1996, 1997). Accordingly, from the above information, three separate harbor porpoise stocks in Alaska are recommended, recognizing that the boundaries were set arbitrarily: 1) the Southeast Alaska stock - occurring from the northern border of British Columbia border to Cape Suckling, Alaska, 2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, and 3) the Bering Sea stock - occurring throughout the Aleutian Islands and all waters north of Unimak Pass (Fig. 25). Information concerning the 4 harbor porpoise stocks occurring along the west coast of the continental United States (Central California, Northern California, Oregon/Washington Coast, and Inland Washington) can be found in the Stock Assessment Reports for the Pacific Region.

POPULATION SIZE

In June and July of 1999, an aerial survey covering the waters of Bristol Bay resulted in an abundance estimate of 47,356 (CV = 0.223). This estimate incorporated the Laake et al. (1997) correction factor for availability bias (2.96; CV = 0.18), and an estimate of 1.337 for average perception bias (CV = 0.062; Waite and Hobbs, in review). The estimate for 1999 can be considered conservative, as the surveyed areas did not include known harbor porpoise range near either the Pribilof Islands or in the waters north of Cape Newenham (approximately 59°N).

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated using Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842*[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 47,356 and its associated CV of 0.223), N_{MIN} for the Bering Sea stock of harbor porpoise is 39,328.

Current Population Trend

The abundance of harbor porpoise in Bristol Bay was estimated in 1991 and 1999. The 1991 estimate was 10,946 (Dahlheim et al. 2000). The 1999 estimate of 47,356 is significantly higher than the 1991 estimate (Waite and Hobbs in review). However, there are some key differences between surveys which complicate direct comparisons. Transect lines were substantially more dense in 1999 than in 1991 and large numbers of porpoise were observed in 1999 in an area which was not surveyed intensely in 1991 (compare sightings in northeast Bristol Bay depicted in Figure 5 in Waite and Hobbs (in review) with Figure 4 in Dahlheim et al. 2000). In addition, the use of a second correction factor for the 1999 estimate confounds direct comparison. The density of harbor porpoise resulting from the 1999 surveys was still substantially higher than that reported in Dahlheim et al. (2000), but it is unknown whether the increase in density is a result of a population increase or is a result of survey design. Thus, at present, there is no reliable information on trends in abundance for the Bering Sea stock of harbor porpoise.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not currently available for this stock of harbor porpoise. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate of 4% be employed (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5, the value for cetacean stocks with unknown population status (Wade and Angliss 1997). Thus, for the Bering Sea stock of harbor porpoise, PBR = 393 animals (39,328 × 0.02 × 0.5).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Three different commercial fisheries operating within the range of the Bering Sea stock of harbor porpoise were monitored for incidental take by NMFS observers during 1990-98: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries. The harbor porpoise mortality was observed only in the Bering Sea groundfish trawl fishery. The range of observer coverage over the 9-year period, as well as the annual observed and estimated mortalities are presented in Table 23. The mean annual (total) mortality rate resulting from observed mortalities was 1.1 (CV = 0.39).

An additional source of information on the number of harbor porpoise mortalities incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period from 1990 to 1998, fisher self-reports from 2 unobserved fisheries (see Table 23) resulted in an annual mean of 0.5 mortalities from interactions with commercial fishing gear. However, because logbook records (i.e., fisher self-reports required during 1990-94)are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. These totals are based on all available fisher self-reports for fisheries occurring within the range of the Bering Sea harbor porpoise stock, except the Bering Sea groundfish fisheries for which observer data were presented above. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95

phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).

Fisher self-reports for three fisheries listed in Table 23 did not report any harbor porpoise mortality over the 1990-93 period. These fisheries have been included above because of the large number of participants and the significant potential for interaction with harbor porpoise.

Table 23. Summary of incidental mortality of harbor porpoise (Bering Sea stock) due to commercial fisheries from 1990 through 2001 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from logbook reports. Data from 1994 to 1998 are used in the mortality calculation when more than 5 years of data are provided for a particular fishery. n/a indicates that data were not available.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Bering Sea/Aleutian Is. (BSAI) groundfish trawl	97-01	obs data	62-77%	1, 1, 0, 0, 1	2, 1, 0, 0, 2	1.1 (CV = 0.39)
Observer program total						1.1
				Reported mortalities		
AK Peninsula/Aleutian Island salmon set gillnet	90-01	logbooks/ self-reports	n/a	0, 0, 2, 0, n/a, n/a, n/a, n/a, n/a, n/a, n/a, n/a	n/a	[≥0.5]
Bristol Bay salmon drift gillnet	90-01	logbooks/ self-reports	n/a	0, 0, 0, 0, n/a, n/a, n/a, n/a, n/a, n/a, n/a, n/a	n/a	[0]
Bristol Bay salmon set gillnet	90-01	logbooks/ self-reports	n/a	0, 0, 0, 0, n/a, n/a, n/a, n/a, n/a, n/a, n/a, n/a	n/a	[0]
AK Kuskokwim, Yukon, Norton Sound, Kotzebue salmon gillnet	90-01	logbooks/ self-reports	n/a	0, 0, 0, 0, n/a, n/a, n/a, n/a, n/a, n/a, n/a, n/a	n/a	[0]
Minimum total annual mortality						≥1.6

The estimated minimum annual mortality rate incidental to commercial fisheries is rounded up to 2 animals, based on observer data (1.1) and logbook reports (0.5) where observer data were not available. However, a reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of the absence of

observer placements in the gillnet fisheries discussed above. Therefore, it is unknown whether the kill rate is insignificant. At present, annual mortality levels, less than 39 animals per year (i.e., 10% of PBR), can be considered to be insignificant and approaching zero.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska have not been reported to take from this stock of harbor porpoise.

Other Mortality

During the period from 1981 to 1987, 7 harbor porpoise mortalities have resulted from gillnet entanglement in the area from Nome to Unalakleet, 3 were reported near Kotzebue from 1989 to 1990, and some take of harbor porpoise is likely in the Bristol Bay gillnet fisheries (Barlow et al. 1994). A similar set gillnet fishery conducted by subsistence fishers incidentally took 6 harbor porpoise in 1991 near Point Barrow, Alaska (Suydam and George 1992). When averaged over the period from 1981 to 1990, the resulting annual mortality attributable to subsistence gillnets is 1.4 porpoise ((7 + 3 + 6)/11 = 1.4)

STATUS OF STOCK

Harbor porpoise are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. The lack of surveys in a significant portion of this stock's range results in a conservative PBR for this stock. Logbook records are most likely negatively biased (Credle et al. 1994) resulting in an underestimate of incidental kill. However, based on the best scientific information available, the estimated level of human-caused mortality and serious injury (4, based on 2 mortalities in commercial fisheries plus 2 (rounded up from 1.4) in subsistence gillnets) is not known to exceed the PBR (86). Therefore, the Bering Sea stock of harbor porpoise is not classified as a strategic stock. Population trends and status of this stock relative to OSP are currently unknown.

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